NEI 04-02

REVISION 3 DRAFT (3R)

NUCLEAR ENERGY INSTITUTE

GUIDANCE FOR IMPLEMENTING A RISK-INFORMED, PERFORMANCE-BASED FIRE PROTECTION PROGRAM UNDER 10 CFR 50.48(c)

September 2016

ACKNOWLEDGEMENTS

The Nuclear Energy Institute (NEI) and JENSEN HUGHES recognize the following individuals for their contribution to this revision. Their time, effort, and valuable input contributed significantly to the project.

NEI NFPA 805 Task Force

NOTICE

REVISION RECORD

The following Frequently Asked Questions (FAQs) were incorporated into Revision 2:

FAQ	Rev	Subject	Closure Memo
06-0002	1c	NEI 04-02 Section 5.3.3 and App. I, Order of Questions for Change Analysis Screening (superseded by FAQ 12-0061)	ML070030276
06-0003	1b	Change Analysis Screening (superseded by FAQ 12-0061)	ML070030242
06-0006	2	High-low pressure interface definition and NEI 00-01/NFPA 805 discrepancies	ML070030117
06-0007	3	NFPA 805 Chapter 3 Requirements for Fire Brigades	ML072560733
06-0011	2	Clarify III.G.3 Compliance Transition (later modified by FAQ 08-0054)	ML080300121
06-0012	5	Clarify Manual Action Transition in Appendix B (later modified by FAQ 07-0030 and 08-0054)	ML072340368
06-0016	1	Ignition Source counting guidance for Electrical Cabinets (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 3)	ML072700475
06-0017	2	Ignition Source counting guidance for High Energy Arcing Faults (HEAF) (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 4)	ML072500300
06-0018	1	Ignition Source counting guidance for Main Control Board (MCB) (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 5)	ML072500273
06-0019	4	Define “power block” and “plant”	ML080510224
06-0020	1	Definition of “applicable”	ML072420286
06-0021	1a	Clarify that air drops are acceptable	ML072420306
06-0024	1	Define what “adequate clearance” is	ML072740225
06-0027	0	Clarify the “where provided” statement	ML082700328
06-0028	2	Clarify intent of “familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms” regarding scope of or depth of the training	ML072740233
07-0031	0	Miscellaneous Binning Issues (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 6)	ML072840658
07-0033	1	Review of Existing Engineering Equivalency Evaluations	ML082380395
07-0036	1	Define Compliance Categories for Table B-1	ML082380547

The following FAQs were incorporated into Revision 3:

FAQ	Rev	Subject	Closure Memo
06-0008	9	NFPA 805 Fire Protection Engineering Evaluations	ML073380976
06-0022	3	Acceptable Electrical Cable Construction Tests	ML091240278
07-0030	5	Establishing Recovery Actions	ML110070485
07-0032	2	Clarification of 10 CFR 50.48(c), 50.48(a), and GDC 3	ML081400292

FAQ	Rev	Subject	Closure Memo
07-0038	3	Lessons Learned on MSOs	ML110140242
07-0039	2	Lessons Learned – NEI 04-02 B-2 Table	ML091320068
07-0040	4	Non-Power Operations Clarifications	ML082200528
08-0054	1	Demonstrating Compliance with Chapter 4 of NFPA 805	ML110140183 ML15016A280
09-0056	2	Radioactive Release Transition	ML102920405
09-0057	3	New Shutdown Strategy	ML100960568
10-0059	5	NFPA 805 Monitoring	ML120750108
12-0061	3	NFPA 805 Change Process	ML15002A054
12-0062	1	UFSAR Content	ML121980557
12-0063	1	Fire Brigade Make-Up	ML121980572
12-0067	1	Transformer Oil Collection Drain Basin Inspection	ML13037A425
13-0069	4	Fire Brigade Member Qualifications	ML14210A144
14-0070	0G	Use of Non-Fire Treated Wood	ML15336A556
14-0071	0B	Acceptable Uses for Non-IEEE 383 Cables	ML16126A4543

Commented [A1]: Under review August 2016

Commented [A2R1]: NRC: Need to address revised FAQ

Commented [A3]: Under review August 2016

Commented [A4R3]: NRC: Need to address revised FAQ

Commented [A5]: NRC: corrected accession number

Appendix H, Regulatory Submittal & Transition Documentation, was revised in its entirety to reflect the final LA

R/Transition Report Template. In addition, typographical errors were corrected and information from Revision 1 of Regulatory Guide (RG) 1.205 were incorporated.

Subsequent to Revision 2 of NEI 04-02, a number of NFPA 805 FAQs related to Fire PRA and Fire PRA FAQs were developed and approved. Since the content of these FAQs is related to Fire PRA, NEI 04-02, Revision 3 does not include the content of these FAQs. The NFPA 805 FAQs related to Fire PRA and Fire PRA FAQs, and their respective closure memos are listed in Appendix M of NEI 04-02, Revision 3.

EXECUTIVE SUMMARY

On July 16, 2004 the Nuclear Regulatory Commission (NRC) amended 10 CFR Part 50.48 “Fire Protection” to add a new subsection, 10 CFR 50.48(c), that established acceptable fire protection requirements. The change to 10 CFR 50.48 endorses, with exceptions, the National Fire Protection Association’s 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants – 2001 Edition, as a voluntary alternative for demonstrating compliance with 10 CFR 50.48 Section (b) and Section (f).

This document provides guidance for implementing the requirements of this rule change, and to the degree endorsed by the NRC, represents methods acceptable to the NRC for implementing a risk-informed, performance-based fire protection program.

Revision 2 of Nuclear Energy Institute (NEI) 04-02 was issued in April 2008 (ML081130188) and was endorsed, with exceptions, in Regulatory Guide (RG) 1.205, Revision 1 in December 2009 (ML092730314). During the following years, a number of industry activities occurred related to NFPA 805 transition, including:

- Numerous NFPA 805 Frequently Asked Question (FAQ) submittals and approvals.
- Licensee pilot and non-pilot NFPA 805 submittals, Requests for Additional Information (RAIs) and responses, and Safety Evaluations.

Revision 3 of NEI 04-02 includes the incorporation of:

- Outstanding FAQs that supported the industry transition since Revision 2 of NEI 04-02 and RG 1.205, Revision 1,
- Certain exceptions and clarifications from RG 1.205, Revision 1, and
- Content and clarifications from RG 1.205, Revision 1 that were not included in NEI 04-02, Revision 2 or subsequent FAQs,
- License Amendment Request (LAR)/Transition Report Template in Appendix H, and
- An updated example license condition in Appendix O that addresses pilot and non-pilot lessons learned.

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1.0 INTRODUCTION

On July 16, 2004 the Nuclear Regulatory Commission (NRC) amended 10 CFR Part 50.48 "Fire protection" to add a new subsection, 10 CFR 50.48(c), that established fire protection requirements (69 FR 33536). The change to 10 CFR 50.48 endorses with exceptions the National Fire Protection Association's (NFPA) 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants – 2001 Edition, as a voluntary alternative for demonstrating compliance with 10 CFR 50.48 Section (b) and Section (f)[1].

Regulatory Guide (RG) 1.205, Risk Informed, Performance-Based Fire Protection for Existing Light Water Nuclear Power Plants, dated May 2006, endorsed Revision 1 of this document with clarifications and exceptions. Revision 3 of this document incorporates guidance from RG 1.205 and approved FAQs (See Regulatory Issue Summary 2007-19, Process for Communicating Clarifications of Staff Positions Provided in Regulatory Guide 1.205 Concerning Issues Identified during the Pilot Application of National Fire Protection Standard 805, for an explanation of the process.) Figure 1-1 depicts these relationships.

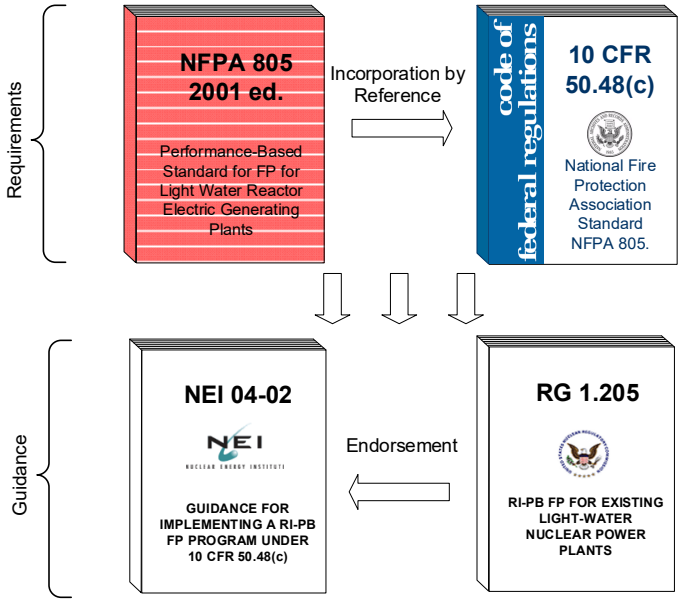


Figure 1-1 – 10 CFR 50.48(c) / NFPA 805 Transition – Implementation Requirements / Guidance

Definitions used in this document are contained in Appendix A of this document.

1.1 Background

Fire protection requirements predating the July 16, 2004 Amendment to 10 CFR 50.48 are prescriptive in nature and were established well before the emergence of risk-informed, performance-based analytical techniques. Consequently, the prescriptive requirements do not

[1] All references made to NFPA 805 are to the 2001 edition.

include the benefits of probabilistic risk assessments (PRAs) for fires, nor do they reflect insights into fire risk evident from the significant body of operating experience developed through risk-informed assessments. As PRA technology developed and additional operating experience was accumulated, the NRC, in SECY-93-143, Report on the Re-assessment of the NRC Fire Protection Program, determined that the situation had changed sufficiently to support a recommendation for a revised 10 CFR 50.48 that would take risk concepts into account. In addition, as discussed in SECY-96-134, Options for Pursuing Regulatory Improvement in Fire Protection Regulations of Nuclear Power Plants, dated June 21, 1996, a revised fire protection rule that would allow flexibility and facilitate the use of alternate approaches to meet the fire safety objectives may reduce the need for exemptions. The NRC in SECY-98-058, Development of a Risk-Informed, Performance-Based Regulation for Fire Protection at Nuclear Power Plants, assessed options for developing a new risk-informed, performance-based fire protection regulation. In it, the NRC staff recommended that NRC be authorized to work with NFPA on the development of a risk-informed, performance-based standard for nuclear plant fire protection. They further recommend that rulemaking to adopt the standard and a regulatory guide to interpret the standard be initiated following issuance of the standard.

As discussed in SECY-98-058, the NRC's adoption of NFPA 805 was considered consistent with the Commission's policy specified in Direction Setting Issue (DSI) 13, The Role of Industry; Office of Management and Budget Circular A-119, Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities; and Public Law 104-113, National Technology Transfer Act of 1995. These guidance documents encourage the U.S. Government's adoption of national consensus standards to carry out its policy objectives and activities.

NEI, representing the nuclear industry, is a proponent of the use of risk-informed, performance-based processes. NEI has worked to ensure that the adoption of a new fire protection licensing basis is optional, and not a requirement. NEI has also worked to ensure that the process of adoption of a new fire protection licensing basis is effective and comprehensive, without placing an unnecessary burden on licensees pursuing risk-informed, performance-based initiatives.

Subsequently, NFPA 805 was developed to provide a comprehensive risk-informed, performance-based standard for fire protection. The NFPA 805 Technical Committee on Nuclear Facilities is comprised of nuclear plant licensees, the NRC, insurers, equipment manufacturers, and subject matter experts. The standard was developed in accordance with NFPA processes, and consisted of a number of technical meetings and reviews of draft documents by committee and industry representatives. The scope of NFPA 805 includes goals related to nuclear safety, radioactive release, life safety, and plant damage/business interruption. The standard addresses fire protection requirements for nuclear plants during all plant operating modes and conditions, including shutdown and decommissioning, which had not been explicitly addressed by previous requirements and guidelines. NFPA 805 became effective on February 9, 2001. Although NFPA 805 provides many of the tools and processes necessary for risk-informed, performance-based fire protection, additional guidance and clarification was warranted. This implementing guidance is intended to provide that additional guidance and clarification.

1.2 Purpose and Scope

This implementing guidance for NFPA 805 has two primary purposes:

- Provide direction and clarification for adopting NFPA 805 as an acceptable approach to fire protection, consistent with 10 CFR 50.48 (c), and

- Provide additional supplemental technical guidance and methods for using NFPA 805 and its appendices[2] to demonstrate compliance with fire protection requirements.

NFPA 805 establishes a comprehensive set of requirements for fire protection programs at nuclear power plants. It incorporates both deterministic and risk-informed, performance-based concepts. The deterministic aspects of NFPA 805 are comparable to traditional requirements, and thus need little additional guidance. Although there is a significant amount of detail in NFPA 805 and its appendices, clarification and additional guidance for select issues will help ensure consistency and effective utilization of the standard. Accordingly, this implementing guidance focuses attention on the risk-informed, performance-based fire protection goals, objectives, and performance criteria contained in NFPA 805 and the risk-informed, performance-based tools considered acceptable for demonstrating compliance.

NFPA 805 addresses primarily technical issues and does not provide a framework or guidance pertaining to the regulatory processes for adopting NFPA 805 as a new licensing basis. This document provides that framework and detailed guidance for transitioning to a risk-informed, performance-based licensing basis.

NFPA 805 also does not address use of the analytical tools and processes within an existing licensing basis. The rule does not approve the use of NFPA 805 methods and analytical approaches for purposes other than demonstrating compliance with NFPA 805, any other use of those methods and analytical approaches requires the necessary NRC approvals under 10 CFR 50.90, 10 CFR 50.12, or other applicable regulations.

The scope of ~~the~~ this implementing guidance includes:

- Chapter 2 - Discussion of the regulatory framework for adopting NFPA 805 as the basis for compliance to fire protection regulations;
- Chapter 3 - Overview of the risk-informed, performance-based fire protection program process and available options;
- Chapter 4 - Implementing guidance for transitioning from a pre-transition fire protection licensing basis (Appendix R / fire protection license condition) to a new NFPA 805 fire protection licensing basis;
- Chapter 5 - Guidance for program maintenance and configuration control processes; and

This implementing guidance addresses only those elements of NFPA 805 that are within the scope of the NRC's jurisdiction under 10 CFR 50.48. The goals of Life Safety and Plant Damage/Business Interruption within NFPA 805 and its appendices are outside of the scope of 10 CFR 50.48 and thus are not addressed in this guidance.

1.3 Relationship with Other Rules, Regulatory Guidance, Standards, and Programs

This section includes a discussion of other Rules, Regulatory Guidance, Standards, and Programs and their relationship to NFPA 805.

- 10 CFR 50.48 and 10 CFR 50, Appendix R - refer to Section 2.0 of this document.

[2] NFPA 805 Appendices B, C, and D are not part of the requirements but the methodologies in them may be considered alternatives for the purposes of NFPA 805 Section (c)(4), to the extent the NRC has determined them acceptable methods

- NEI 00-01, Guidance for Post-Fire Safe Shutdown Circuit Analysis. Revision 2 – NEI 00-01, as endorsed by the NRC, contains the preferred methods of demonstrating compliance with certain aspects of NFPA 805.
- RG 1.189, NUREG-0800 Standard Review Plan Section 9.5.1 with Branch Technical Position CMEB 9.5-1, Branch Technical Position (BTP) APCSB 9.5-1, and Appendix A to APCSB 9.5-1. These documents contain acceptable methods of demonstrating compliance with NRC Fire Protection Regulations. Licensees should refer to their plant-specific licensing bases to determine the applicability of specific guidance to a specific plant. Licensee's commitments to these documents will be used as input into the transition process. See of this document.
- NUREG/CR-6850, (Electric Power Research Institute (EPRI)/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, Volumes 1 and 2 and Supplement 1, which presents a compendium of methods, data and tools to perform a Fire PRA and develop associated insights. The methodology documented in this report reflects the current state-of-the-art in Fire PRA. These methods are expected to form a basis for RI analyses related to the plant fire protection program. Volume 1, the Executive Summary, provides general background and overview information including both programmatic and technical, and project insights and conclusions. Volume 2 provides the detailed discussion of the recommended approach, methods, data and tools for conduct of a Fire PRA.
- American Society of Mechanical Engineers (ASME)/American Nuclear Society (ANS) RA-Sa-2009, Addenda to ASME/ANS RA-S-2008, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications, which provides guidance PRAs used to support risk-informed decisions for commercial light water reactor nuclear power plants and prescribes a method for applying these requirements for specific applications. The standard gives guidance for a Level 1 PRA of internal and external hazards for all plant operating modes. In addition, the standard provides guidance for a limited Level 2 PRA sufficient to evaluate large early release frequency (LERF). The standard applies to PRAs used to support applications of RI decisionmaking related to design, licensing, procurement, construction, operation, and maintenance.
- RG 1.200, An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities, Revision 2, issued March 2009, which provides guidance to licensees for use in determining the technical adequacy of the base probabilistic risk assessment (PRA) used in an RI regulatory activity, and endorses standards and industry peer review guidance. The RG provides guidance in four areas:
  - A definition of a technically acceptable PRA;
  - The NRC's position on PRA consensus standards and industry PRA peer review program documents;
  - Demonstration that the baseline PRA (in total or specific pieces) used in regulatory applications is of sufficient technical adequacy; and
  - Documentation to support a regulatory submittal.

  It does not provide guidance on how the base PRA is revised for a specific application or how the PRA results are used in application-specific decisionmaking processes
- 10 CFR 50.59 and NEI 96-07 Revision 1 – 10 CFR 50.59 establishes the conditions under which licensees may make changes to the facility or procedures and conduct tests or experiments without prior NRC approval. NEI 96-07 provides guidance for developing an effective and consistent 10 CFR 50.59 implementation processes. If a licensee

adopts the NFPA 805 licensing basis, the NFPA 805 change process is an acceptable method of evaluating fire protection program changes. NEI 02-03 –Guidance for Performing a Regulatory Review of Proposed Changes to the Approved Fire Protection Program, – provides a framework for making such changes to the fire protection program. See Section 5.3 of this document.

- 10 CFR 50.72 and 10 CFR 50.73 - The process to implement these regulations remain unchanged as a result of adopting 10 CFR 50.48(c).
- Reactor Oversight Process/Significance Determination process – Although this process would not change if a plant chooses to adopt the NFPA 805 regulation, the conditions for entry into the process would change because the types of non-compliances would be different, as illustrated by the modifications to terminology (safe shutdown versus nuclear safety, etc.) that may be required.
- 10 CFR 50.65 and NUMARC 93-01 - Maintenance Rule – the technique(s) used in the maintenance rule program may be used in the "monitoring" program described in NFPA 805. See Section 5.2 of this document.
- Corrective Action Program - This process would not change if a plant chooses to adopt 10 CFR 50.48(c). However, priorities for taking corrective actions might change consistent with the modifications to terminology (safe shutdown versus nuclear safety, etc.).
- NUMARC 91-06 (Shutdown) and NUREG-1449 - These documents provide input to the evaluation of non-power modes of operation. See Appendix F.
- Generic Letter 91-18, Revision 1 – This document discusses guidance for compensatory actions during temporary non-compliances. This process would not change if a plant chooses to adopt the 10 CFR 50.48(c). However, its use during the transition period (See Section 4.0) may be modified. In addition, modifications to terminology (safe shutdown versus nuclear safety, etc.) may be required.
- RIS 2000-17 adopting NEI 99-04 – This document discusses how licensees can modify regulatory commitments. This process would not change if a plant chooses to adopt 10 CFR 50.48(c); however, the change process (See Section 5.3 of this document) provides more specific detail of when a plant change process would change for the fire protection program.
- RG 1.174, An Approach for Using Probabilistic Risk Assessment in Risk Informed Decisions on Plant-Specific Changes to the Licensing Basis, Revision 2, issued May 2011, which provides the NRC staff's recommendations for using risk information in support of licensee-initiated licensing basis changes to a NPP that require such review and approval. The guidance provided does not preclude other approaches for requesting licensing basis changes. Rather, RG 1.174 is intended to improve consistency in regulatory decisions in areas in which the results of risk analyses are used to help justify regulatory action. As such, the RG provides general guidance concerning one approach that the NRC has determined to be acceptable for analyzing issues associated with proposed changes to a plant's licensing basis and for assessing the impact of such proposed changes on the risk associated with plant design and operation.

1.4 Responsibilities and Qualifications

1.4.1 Responsibilities

Licensees adopting 10 CFR 50.48 (c) should use this guidance to assist in developing and maintaining plant-specific risk-informed, performance-based programs. Responsibilities

associated with establishing and maintaining a fire protection plan are delineated in Section 3.2 of NFPA 805.

1.4.2 Qualifications

Qualifications for individuals responsible for administration of a fire protection program are discussed in Section 3.2 and Appendix A of NFPA 805. This includes recommendations that individuals responsible for day-to-day administration of the fire protection programs be experienced in nuclear power plant fire protection, preferably with qualifications consistent with member grade status in the Society of Fire Protection Engineers.

Due to the technical nature of risk-informed, performance-based fire protection analyses, additional minimum qualifications are recommended for individuals practicing fire modeling and quantitative fire protection risk assessments.

1.4.2.1 Fire Modeling

NFPA 805 Section 2.7.3.4 requires that "… personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations." Each licensee is responsible for establishing the qualification attributes for personnel who use and apply engineering analysis. Attributes to be considered include formal training in fire dynamics and use of the methods or models being used, knowledge of available data sources and validation studies for the method being used. In addition to modeling and analysis expertise, the successful application of modeling will involve an individual or team with experience in NPP systems and plant operations, all relevant regulations, plant configurations and QA/QC programs.

1.4.2.2 Fire Risk Assessment

Each licensee is responsible for establishing the qualification attributes for personnel who use and apply the Fire PRA. The qualifications necessary of personnel involved in quantitative fire risk assessment (i.e., Fire PRA) should be consistent with that applicable to individuals performing PRA studies. In general, the individual responsible for PRA should be an experienced engineer with formal training in PRA and Fire PRA. As such, the licensee should apply the same training and/or qualification standard to individuals conducting fire risk assessments. Individuals should also have experience in fire risk assessments, such as involvement in an Individual Plant Examination for External Events (IPEEE) effort.

1.5 Applicability

As stated in 10 CFR 50.48(c)(3)(i), any licensee's adoption of a risk-informed, performance-based program that complies with the rule is voluntary. Compliance with this rule may be adopted as an acceptable alternative method for complying with either 10 CFR 50.48(b), for plant licensed to operate before January 1, 1979, or the fire protection license conditions for plants licensed to operate after January 1, 1979, or 10 CFR 50.48(f), plants shutdown in accordance with 10 CFR 50.82(a)(1). Accordingly, the use of this guidance is also voluntary.

For the purpose of this document the term pre-transition fire protection licensing basis will be used and will apply equally to plants licensed to 10 CFR 50.48(b) or plant specific license conditions. The term "NFPA 805 licensing basis" will be used to describe plant licensing bases that use NFPA 805 and the new risk-informed, performance-based program.

2.0 REGULATORY FRAMEWORK

2.1 Introduction

The NRC has adopted NFPA 805, with a few specific exceptions, as an alternative, risk-informed, performance-based regulation for fire protection at nuclear power plants. Licensees may continue to comply with the current fire protection requirements or voluntarily transition to the new requirements (NFPA 805 licensing basis). This Section describes the regulatory actions that a licensee should take to transition its fire protection licensing basis to compliance with 10 CFR 50.48(c), NFPA 805.

2.2 Overview of the Rule

NFPA 805, 2001 Edition has been endorsed by the NRC ~~as~~ in its~~a~~ regulation except as noted in 10 CFR 50.48(c)(2), "Exception, modifications and supplementation of NFPA 805. These exceptions, modifications, and supplementations are summarized below:

- **Life Safety and Plant Damage/Business Interruption Goals, § 50.48(c)(2)(i) and (ii)** - The Life Safety and Plant Damage/Business Interruption goals, objectives, and criteria in Sections 1.3, 1.4, and 1.5 of NFPA 805 are not endorsed in this rule.
- **Feed and Bleed, § 50.48(c)(2)(iii) -** The NRC does not accept the use of a high-pressure charging/injection pump coupled with the pressurizer power operated relief valves (PORVs) as the sole fire protected shutdown path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability (i.e., feed-and-bleed) for pressurized water reactors (PWRs).
- **Uncertainty Analysis, § 50.48(c)(2)(iv)** - The uncertainty analysis required by Section 2.7.3.5 of the standard is not required for the deterministic approach because conservatism is included in the deterministic criteria.
- **Existing Cables, § 50.48(c)(2)(v) -** Section 3.3.5.3 of the standard provides that electric cable construction shall comply with a flame propagation test acceptable to the AHJ. For this rulemaking, the NRC is requiring compliance with 10 CFR 50.48(c)(2)(v), which provides for the use of flame-retardant coatings on electric cables or an automatic fixed fire suppression system in lieu of installing cables meeting an acceptable flame propagation test.
- **Water Supply and Distribution, § 50.48(c)(2)(vi) -** The italicized exception to Section 3.6.4 of the standard is not endorsed. The exception would allow a licensee to have a "provisional" manual fire-fighting standpipe/hose station system in place of seismically qualified standpipes and hose stations even though it was not approved in the licensing basis.
- **Performance-Based Methods, § 50.48(c)(2)(vii) -** The prohibition in Section 3.1 of NFPA 805 that does not permit the use of performance-based methods for the Chapter 3 fundamental fire protection program elements and minimum design criteria is not endorsed. The NRC takes this exception in order to provide licensees greater flexibility in meeting the fire protection program elements and minimum design requirements of Chapter 3 by the use of performance-based methods (including the use of risk-informed methods) described in the NFPA 805 standard. Licensees who wish to deviate from Chapter 3 requirements must submit a License Amendment Request for NRC approval.

  Refer to Appendix L for a method to be submitted in a LAR/Transition Report to allow fire protection engineering analyses to address NFPA 805 Chapter 3 requirements through the use of a bounding analysis approach. Using the bounding analysis approach, the licensee performs bounding performance-based analyses, demonstrates that the

bounding configuration is acceptable, and upon NRC staff approval, may use Fire Protection Engineering Evaluations (FPEEs) to justify changes to the plant within the bounds of the approved analyses.

- **Alternatives to Compliance with NFPA 805, § 50.48(c)(4) -** The final rule provides licensees the flexibility of requesting, via a license amendment, to use risk-informed or performance-based alternatives that deviate from compliance with NFPA 805.

NFPA 805, Chapter 1 establishes performance criteria, performance objectives, and goals for nuclear safety and radioactive release. NFPA 805, Chapter 3 establishes the fundamental elements of a fire protection program and the minimum design requirements for the fire protection systems and features. Chapters 2 and 4 of NFPA 805 establish the general approach for instituting fire protection requirements at a nuclear power plant and the methodology to determine the fire protection systems and features required to achieve the performance criteria outlined in Section 1.5 of NFPA 805. The methodology is permitted to be either deterministic or performance-based.

2.2.1 Incorporation by Reference

To avoid the need to reprint NFPA 805 in the CFR, the NRC obtained permission from the Federal Register to incorporate NFPA 805 by reference. This means that NFPA 805 is to be treated as if it had been included in its entirety in the CFR. The NRC has incorporated other industry standards by reference, most notably, the Boiler and Pressure Vessel Code promulgated by the American Society of Mechanical Engineers (ASME) and adopted in 10 CFR 50.55a, Codes and Standards. Thus, the NRC has developed a precedent for dealing with standards that have been incorporated by reference and that precedent will apply to NFPA 805.

Because the NRC has adopted this particular version of NFPA 805 (2001 Edition) by reference, any subsequent changes to NFPA 805 that may be made by the National Fire Protection Association do not change the rule. Therefore, if the NFPA were to revise NFPA 805, NRC licensees cannot apply those changes unless the NRC adopts the revised version through the rulemaking process. (10 CFR 50.48(c)(1)). For the ASME Code, the NRC conducts rulemakings periodically to adopt new versions of the Code. Similarly, licensees may not rely on interpretations of NFPA 805 by the NFPA unless the NRC has accepted those interpretations.

2.2.2 Relationship to Other Fire Protection Requirements

NFPA 805 is codified as 10 CFR 50.48(c). The new rule was placed deliberately in this location to show how it relates to existing fire protection requirements. The new rule establishes alternative requirements that a licensee may voluntarily adopt instead of continuing to comply with its current fire protection licensing basis. A fire protection program that complies with 10 CFR 50.48 (c), NFPA 805, as adopted by the NRC, is an acceptable alternative to compliance with either 10 CFR 50.48(b) (for plants licensed to operate before January 1, 1979 “Appendix R Plants”), or existing plant fire protection license conditions (10 CFR 50.48(c)(3)(i)) for plants licensed to operate after January 1, 1979 (Post-Appendix R Plants). For plants that have shut down and submitted the certifications required by 10 CFR 50.82(a)(1), compliance with NFPA 805 may be adopted as an acceptable method for complying with 10 CFR 50.48(f).

The new rule does not supersede the requirements of 10 CFR 50, Appendix A, General Design Criterion 3 (GDC 3) or 10 CFR 50.48(a). The new rule provides actions that may be taken to establish compliance with 10 CFR 50.48(a), which requires each operating nuclear power plant to have a fire protection program plan that satisfies GDC 3, as well as specific requirements in that section. The NRC in 69 FR 33536 provides the following clarification:

NFPA 805 does not supersede the requirements of GDC 3, 10 CFR 50.48(a), or 10 CFR 50.48(f). Those regulatory requirements continue to apply to licensees that adopt NFPA 805. However, under NFPA 805, the means by which GDC 3 or 10 CFR 50.48(a) requirements may be met is different than under 10 CFR 50.48(b). Specifically, whereas GDC 3 refers to SSCs important to safety, NFPA 805 identifies fire protection systems and features required to meet the Chapter 1 performance criteria through the methodology in Chapter 4 of NFPA 805. Also, under NFPA 805, the 10 CFR 50.48(a)(2)(iii) requirement to limit fire damage to SSCs important to safety so that the capability to safely shut down the plant is ensured is satisfied by meeting the performance criteria in Section 1.5.1 of NFPA 805. The Section 1.5.1 criteria include provisions for ensuring that reactivity control, inventory and pressure control, decay heat removal, vital auxiliaries, and process monitoring are achieved and maintained.

This methodology specifies a process to identify the fire protection systems and features required to achieve the nuclear safety performance criteria in Section 1.5 of NFPA 805. Once a determination has been made that a fire protection system or feature is required to achieve the performance criteria of Section 1.5, its design and must meet any applicable requirements of NFPA 805, Chapter 3. Having identified the required fire protection systems and features, the licensee selects either a deterministic or performance-based approach to demonstrate that the performance criteria are satisfied. This process satisfies the GDC 3 requirement to design and locate SSCs important to safety to minimize the probability and effects of fires and explosions.

See Tables 2-1 and 2-2 for a summary.

The transition process described in 10 CFR 50.48(c)(3)(ii) provides, in pertinent parts, that a licensee intending to adopt the new rule must, among other things, "modify the fire protection plan required by paragraph (a) of that section to reflect the licensee's decision to comply with NFPA 805." Therefore, to the extent that the contents of the existing fire protection program plan required by 10 CFR 50.48(a) are inconsistent with NFPA 805, the fire protection program plan must be modified to achieve compliance with the requirements in NFPA 805. All other requirements of 10 CFR 50.48(a) and GDC 3 have corresponding requirements in NFPA 805.

A comparison of the current requirements in Appendix R with the comparable requirements in Section 3 of NFPA 805 shows that the two sets of requirements are consistent in many respects. However, there are differences. Among them are the elimination of specific requirements for: (1) emergency lighting; (2) an alternative shutdown capability; and (3) cold shutdown. These topics are addressed in the transition of the nuclear safety performance criteria (Appendix B-2).

Table 2-1

10 CFR 50.48(a) Section(s)		Applicability / Compliance Reference
(1)	Each holder of an operating license issued under this part or a combined license issued under part 52 of this chapter must have a fire protection plan that satisfies Criterion 3 of appendix A to this part. This fire protection plan must:	See below
	(i) Describe the overall fire protection program for the facility	NFPA 805 Section 3.2

Table 2-1

10 CFR 50.48(a) Section(s)		Applicability / Compliance Reference
	(ii) Identify the various positions within the licensee's organization that are responsible for the program;	NFPA 805 Section 3.2.2
	(iii) State the authorities that are delegated to each of these positions to implement those responsibilities; and	NFPA 805 Section 3.2.2
	(iv) Outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage	NFPA 805 Section 2.7 and Chapters 3 and 4
(2)	The plan must also describe specific features necessary to implement the program described in paragraph (a)(1) of this section such as	See below
	(i) Administrative controls and personnel requirements for fire prevention and manual fire suppression activities;	NFPA 805 Sections 3.3 and 3.4
	(ii) Automatic and manually operated fire detection and suppression systems; and	NFPA 805 Sections 3.5 through 3.10 and Chapter 4
	(iii) The means to limit fire damage to structures, systems, or components important to safety so that the capability to shut down the plant safely is ensured.	NFPA 805 Section 3.3 and Chapter 4
(3)	The licensee shall retain the fire protection plan and each change to the plan as a record until the Commission terminates the reactor license. The licensee shall retain each superseded revision of the procedures for 3 years from the date it was superseded.	NFPA 805 Section 2.7.1.1 requires that documentation be maintained for the life of the plant.
(4)	Each applicant for a design approval, design certification, or manufacturing license under part 52 of this chapter must have a description and analysis of the fire protection design features for the standard plant necessary to demonstrate compliance with Criterion 3 of appendix A to this part.	Not applicable to plants licensed under 10 CFR 50.

Table 2-2

GDC 3, Fire Protection, Statement	Applicability / Compliance Reference
Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.	NFPA 805 Chapters 3 and 4

Table 2-2

GDC 3, Fire Protection, Statement	Applicability / Compliance Reference
Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room.	NFPA 805 Sections 3.3 and 3.11.4
Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety.	NFPA 805 Chapters 3 and 4
Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components	NFPA 805 Sections 3.4 through 3.10 and 4.2.1

2.3 Demonstration of Compliance with the New Requirements

Compliance with the performance criteria of Chapter 1 of NFPA 805 may be demonstrated by using either the deterministic or performance-based approaches in the standard (Chapter 4 of NFPA 805). Alternative methods and analytical approaches may be used only if accepted by the NRC in a license amendment in accordance with 10 CFR 50.48(c)(4). In deciding whether to grant such a license amendment, the Director of the Office of Nuclear Reactor Regulation will determine whether the alternative method and analytical approach: (1) satisfies the performance criteria, performance objectives, and goals for nuclear safety and radiological release; (2) maintains safety margins; and (3) maintains post-fire defense-in-depth (fire prevention, fire suppression, and post-fire safe shutdown capability.)

Compliance with Chapter 3 of NFPA 805 may be demonstrated by showing that the specific requirements are met either directly or by the use of alternative methods and analytical approaches. Alternative methods and analytical approaches must be accepted by the NRC in a license amendment per 10 CFR 50.48(c)(4). Contrary to Section 3.1 of NFPA 805, performance-based methods may be used. (See 10 CFR 50.48(c)(2)(vii)). Note licensees contemplating applying for permission to use an alternative method or analytical approach could pursue a generic approval process with other licensees and/or NEI. See Section 2.4 of this document. Note: During the pilot and non-pilot transition processes, licensees that utilized performance-based methods for compliance with the fire protection program elements and minimum design requirements in Chapter 3 of NFPA 805 under 10 CFR 50.48(c)(2)(vii) submitted the requests for approval as attachments to the transition LAR (i.e., Attachment L, refer to the LAR/Transition Report template in Appendix H).

Refer to Appendix L for a method to be submitted in a LAR/Transition Report to allow fire protection engineering analyses to address NFPA 805 Chapter 3 requirements through the use of a bounding analysis approach. Using the bounding analysis approach, the licensee performs bounding performance-based analyses, demonstrates that the bounding configuration is acceptable, and upon NRC staff approval, may use Fire Protection Engineering Evaluations (FPEEs) to justify changes to the plant within the bounds of the approved analyses.

Compliance with Chapter 3 may also be demonstrated by showing that the NRC has previously approved an alternative to a fundamental program attribute. A claim of prior NRC approval should be based on plant specific docketed correspondence from the NRC. Note that the plant configuration(s) addressed in this docketed correspondence/approval may have been modified

subsequently during the course of plant operation. If those modifications were made in accordance with an approved process (10 CFR 50.59, Fire Protection Program Regulatory Review Processes (NEI 96-07)) they are part of the plant's approved Fire Protection Program, but they are not considered previously approved by the NRC for the purposes of Chapter 3 of NFPA 805 unless they have been explicitly reviewed and approved by the NRC.

2.3.1 Previous Approval Determination

To implement the transition to an NFPA 805 licensing basis, a licensee should accurately determine its plant's pre-transition fire protection licensing basis and the extent to which the NRC has approved the fundamental program elements in the pre-transition licensing basis. Determination of the extent of previous NRC approval requires a detailed review and assessment of the plant's docket. Chapter 4 of this document provides the details of the documentation of the transition process.

Note that the prior approval determination is not limited to the fire protection program attributes in Chapter 3 of NFPA 805. The prior approval determination is also made for the licensee's compliance with 10 CFR 50, Appendix R, Section III.G and III.L or applicable sections of NUREG-0800, either as a requirement or as a licensing commitment, in order to transition to the new NFPA 805 fire protection licensing basis. This is consistent with the methodology depicted in Figure 2.2 of NFPA 805. NRC approved exemptions/deviations from the pre-transition fire protection licensing basis should be reviewed for applicability going forward to a new NFPA 805 licensing basis.

Previous NRC acceptance or approval is found by comparing licensee submittals with NRC responses (Safety Evaluation Reports, Exemptions Request approvals, deviation request approvals). For each instance for which a licensee wants to demonstrate prior NRC approval of a particular fire protection program attribute, the following strategy should be used:

- Review correspondence from the NRC (Safety Evaluation Reports, Exemption Request approvals, deviation request approvals) to determine whether the NRC has explicitly accepted or approved the program attribute. If so, retain supporting documentation as evidence of prior NRC approval. No additional steps need to be taken.
- If final correspondence, such as an SER from the NRC, contains only general statements of acceptance or approval, it is necessary to find the related chain of supporting correspondence between the NRC and licensee and other related documentation, such as NRC meeting minutes, to determine what information the NRC requested from the licensee and what information the licensee provided in responding to the NRC's request. Examples of the types of correspondence that may provide support are: letters, requests for additional information, licensee responses to Notices of Violation (NOVs) and NRC acknowledgements of the corresponding corrective actions, licensee responses to Unresolved Issues (URIs) and NRC acknowledgement of resolution of its concerns, licensees' responses to requests for additional information and NRC closeouts of them, and licensee presentations at NRC management meetings followed by NRC acknowledgement of them. Where the available documentation indicates that the NRC has been aware of and accepted a specific attribute of the fire protection program, but does not include an explicit NRC approval to that effect (e.g., Safety Evaluation Reports, Exemptions Request approvals, deviation request approvals), the licensee should document its basis for that conclusion in the Transition documentation (See Section 4.6.2 of this document) for explicit approval in the new licensing basis. The LAR/Transition Report template includes provisions and guidance where clarification of prior NRC approval is being sought. Refer to Attachment T of the LAR/Transition Report Template in Appendix H.

Commented [A6]: Tie back to FAQ 30 and prior approval of PCS

RG 1.205 Section 2.4

Commented [A7R6]: NRC: This material (recovery actions and PCS) does not seem to be present in this section. Is this comment a reminder to add it?

If during a review to determine previously approved documents by the NRC, the licensee finds that a fundamental design requirement or a program element does not meet Chapter 3 and there is not "prior approval", a licensee should 1) conform to specific requirements of Chapter 3, or 2) obtain a license amendment.[3] If a fire area pre-transition post-fire safe shutdown compliance strategy doesn't meet the nuclear safety criteria, the licensee may meet the deterministic requirements of Section 4.2.3 of NFPA 805, or use the performance-based approach of Section 4.2.4 of NFPA 805 to demonstrate that the nuclear safety performance criteria are satisfied. (See Section 4.4 of this implementing guidance).

2.3.2 Improper Determination of Previous NRC Approval

Where a licensee chooses to rely on an aspect of the pre-transition fire protection licensing basis as previously approved by the NRC, those elements relied upon remain subject to NRC inspection for compliance with the regulations that were applicable at the time of the NRC's approval. Such reliance will be documented as part of the transition process (See Section 4). If an inspection shows that the licensee's reliance on previous NRC approval was erroneous, either because such approval had not been granted, the requirement was not met, or the plant conditions changed, the licensee has the option of either coming into compliance with the original requirement or demonstrating compliance with the new, alternative requirement in NFPA 805.

2.3.3 Non-compliance with the Current Fire Protection Licensing Basis

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). After several revisions/updates, 10 CFR 50.48 enforcement discretion was added the NRC Enforcement Policy. Licensees should consult the NRC Web site for current information on enforcement discretion (http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html).

2.4 Alternate Methods and Approaches

10 CFR 50.48(c)(4) authorizes licensees to submit License Amendment Requests to use alternative methods and analytical approaches to demonstrate compliance with NFPA 805, including fundamental fire protection program and minimum design requirements identified in Chapter 3 of NFPA 805, in lieu of the methods and approaches specified in NFPA 805. Prior NRC approval of these License Amendment Requests to use alternatives will be necessary. Two alternative license amendment paths are available for obtaining NRC approval of an alternative method or analytical approach: (1) a plant specific License Amendment Request; or (2) a Topical Report (TR) which has been accepted by the NRC and which the licensee can demonstrate is applicable to the plant's proposal for an alternative.

2.4.1 Plant Specific License Amendment

A License Amendment Request (LAR) is required for any licensee proposal to use alternative methods and analytical approaches to demonstrate compliance with NFPA 805 (10 CFR 50.48(c)(4)). Where a licensee proposes to use an alternative method and analytical approach to support the transition to compliance with NFPA 805, that LAR may be incorporated in the LAR required under 10 CFR 50.48(c)(3)(i). Each request will need to be supported with the type of technical analysis that the station's procedures require to be provided for any substantive LAR. In addition, to demonstrate compliance with 10 CFR 50.48(c)(3)(i), the LAR

[3] Note: In accordance with 10 CFR 50.48(c)(2)(vii) the fire protection program elements and minimum design requirements of Chapter 3 may be subject to the performance-based methods permitted elsewhere in the standard.

must show that the alternative method and analytical approach meets the following requirements in 10 CFR 50.48(c)(4):

- Satisfies the goals, performance objectives, and performance criteria in Section 1.5 of NFPA 805 for nuclear safety and radiological release
- Maintains safety margins
- Maintains fire protection defense-in-depth by demonstrating an acceptable balance among fire prevention, fire suppression, and post-fire safe-shutdown capability.

The License Amendment Request should include complete and concise details of each of the proposed methods used to demonstrate that an alternative to compliance with NFPA 805 is acceptable. The License Amendment Request may reference generic methods (e.g., topical reports) that the NRC has previously approved and through which the licensee can demonstrate that the alternative is applicable for its intended use.

Where the proposed methods have been adequately described in the License Amendment Request and have been accepted by the NRC, these methods may be applied to the licensee's fire protection program upon issuance of a license amendment approving the methods. A licensee may apply these approved methods within the limits specifically described in its licensing basis to implement plant changes that affect the fire protection program.

Licensee self-approval of fire protection program changes using approved alternative risk-informed or performance-based methods may be granted in the fire protection license condition when appropriate. Subsequent changes to the approved alternative risk-informed or performance-based method must be submitted for NRC review and approval (through a License Amendment Request) before being applied to the licensee's fire protection program.

2.4.2 License Amendment Supported by Topical Report

To minimize licensee resources needed to obtain NRC approval of an alternative method or analytical approach, a licensee contemplating applying for permission to use an alternative could first determine whether other licensees are interested in that alternative. If a sufficient number of licensees indicate interest, those licensees could collaborate to develop a TR supporting that alternative. After the TR has been reviewed and approved by the NRC, as evidenced by the NRC's issuance of a SE, each licensee would be able to request approval to adopt the approved alternative by applying for a license amendment which demonstrates the licensee has met the criteria in the TR for such adoption. This alternative reduces each licensee's cost for obtaining a license amendment because the NRC's review of the License Amendment Request focuses on whether the criteria for applying the TR have been met by the requesting plant.

To be accepted for the TR program, the Topical Report should meet criteria established by the NRC (i.e., NRR Office Instruction LIC-500, Topical Report Process). The latest NRC guidance on the topical report process should be followed if pursued (http://www.nrc.gov/about-nrc/regulatory/licensing/topical-reports/requirements.html).

2.5 Frequently Asked Question (FAQ) Process

The NRC worked with NEI and two Pilot Plants (Oconee Nuclear Station and Harris Nuclear Plant) to define the licensing process for transitioning to a new licensing basis under 10 CFR 50.48(c) and NFPA 805. Both the NRC and the industry recognized the need for additional clarifications to the guidance provided in RG 1.205, NEI 04-02, and the requirements of NFPA 805. The NFPA 805 FAQ process was jointly developed by NEI and NRC to facilitate timely clarifications of NRC positions. This process is described in a letter from the NRC dated

July 12, 2006, to NEI (ML061660105) and in Regulatory Issues Summary (RIS) 2007-19, Process for Communicating Clarifications of Staff Positions Provided in RG 1.205 Concerning Issues Identified during the Pilot Application of NFPA Standard 805, dated August 20, 2007 (ML071590227).

Under the FAQ Process, transition issues are submitted to the NEI NFPA 805 Task Force for review, and subsequently presented to the NRC during public FAQ meetings. Once the NEI NFPA 805 Task Force and NRC reach agreement, the NRC issues a memorandum to indicate that the FAQ is acceptable. NEI 04-02 revisions incorporate the approved FAQs. Final closure of the FAQs occur when future revisions of RG 1.205, endorsing the related revisions of NEI 04-02, are approved by the NRC.

Approved FAQs are included in the Revision Record. Approved Fire PRA FAQs and NFPA 805 FAQs related to Fire PRA are listed in Appendix M.

3.0 RISK-INFORMED, PERFORMANCE-BASED FIRE PROTECTION PROGRAM PROCESS

3.1 Process Summary

The process for transitioning to the new risk-informed, performance based option is discussed in NFPA 805, Section 2.2. The process is summarized below in Section 3.2. Section 3.3 provides additional details and provides directions for the overall process for adoption of a new risk-informed, performance based fire protection licensing basis.

3.2 NFPA 805 Process

NFPA 805, Section 2.2 provides an outline of the steps to take to achieve a fire protection program in compliance with NFPA 805. Figure 3-1 (duplicate of NFPA 805, Figure 2.2) depicts the implementing guidance steps. Note that Figure 3-1 does not include all the steps required to establish a new NFPA 805 licensing basis (See Section 3.3 below).

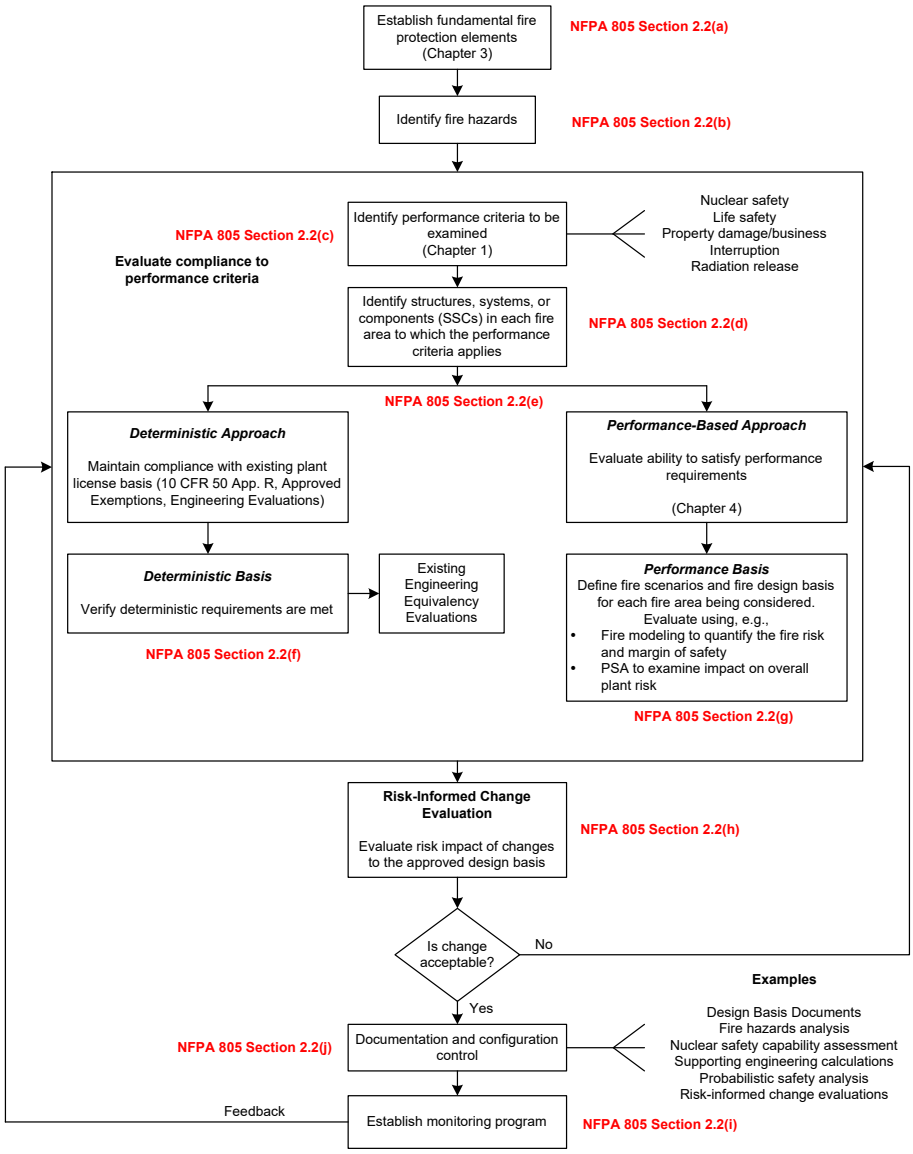


Figure 3-1 – NFPA 805 Process (Figure 2.2 of NFPA 805)

3.3 Overall Process for Implementing a New Licensing Basis

NFPA 805 and its appendices do not establish certain elements of the process that need to be followed, since NFPA 805 does not address the regulatory process. NFPA 805, due to its structure and content, does not provide an-all-inclusive process of the engineering analysis and licensing steps that should be followed. Figure 3-2 depicts a typical NFPA 805 Transition timeline. The following simplified flowchart (Figure 3-3) is intended to show the overall process for implementing a risk-informed, performance-based fire protection application:

- The **Process Phase** column categorizes the sequential phases of a licensee transition. Descriptions of the transition phases are discussed in Section 4.1.2.
- The **Simplified Process** column shows the major steps in the transition to a new risk-informed, performance-based fire protection program. The **Simplified Process** steps include a preliminary assessment, which is not part of the NFPA 805 standard. The rest of the steps are a simplified representation of steps addressed in NFPA 805. Table 3-1 provides a cross reference of steps in the **Simplified Process** to the steps within NFPA 805. References to applicable sections in the implementing guidance are provided in braces {}.
- The **Regulatory Documentation** column shows the major documentation developed, submitted, and received as part of the adoption of a new fire protection licensing basis.
- The flowchart does not show continuous processes (regulatory interface, etc.) and feedback loops (adjusting effort due to unfavorable results, requests for additional information, iterative decisions on practicality of risk-informed, performance-based approach, and iterative decisions on whether to adopt the new rule or use the process).

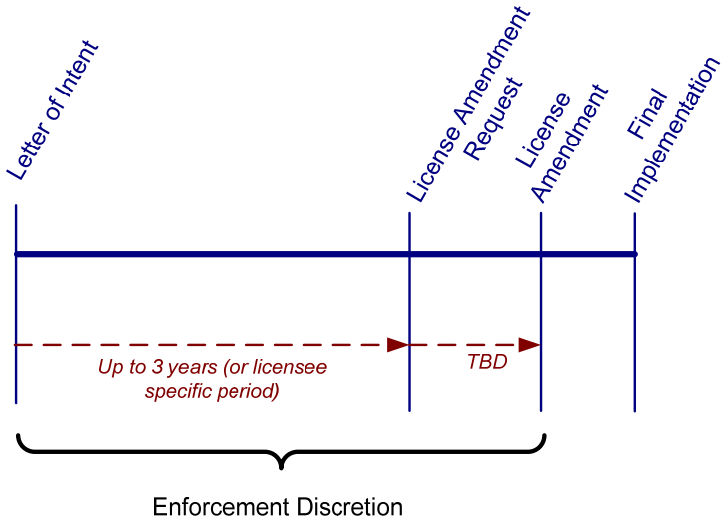
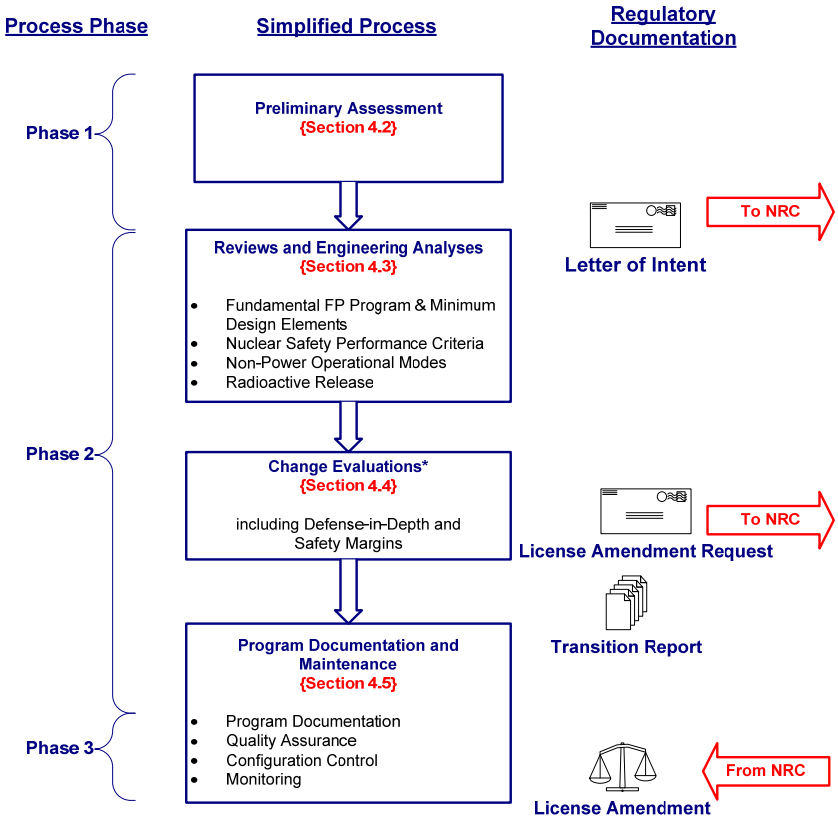


Figure 3-2 Typical NFPA 805 Transition Timeline



* During NFPA 805 transition process either fire risk evaluations or fire modeling approach was used.

Figure 3-3 Implementing the New Licensing Basis

Table 3-1 Risk-Informed, Performance-Based FP Process Summary

Step – Process	NFPA 805 Section	Step
Preliminary Assessment	N/A	Preliminary assessment is the work performed to assess the feasibility and practicality of transitioning to a new licensing basis.
Review and Engineering Analysis	2.2(a) – 2.2(g)	These steps follow the technical guidance in NFPA 805. ▪ Establish the fundamental fire protection program (NFPA 805 Chapter 3). ▪ Identify fire areas and associated fire hazards ▪ Identify the performance criteria that apply to each fire area (NFPA 805 Section 1.5). ▪ Identify systems, structures, and components (SSCs) in each fire area to which the performance criteria apply. ▪ Select the deterministic and/or risk-informed performance-based approach for the performance criteria (see NFPA 805 Chapter 4). ▪ When applying a deterministic approach, demonstrate compliance with the deterministic requirements (see NFPA 805 Chapter 4). ▪ When applying a risk-informed /performance-based approach, perform engineering analyses to demonstrate that applicable requirements are satisfied. These analyses should include, for example, engineering evaluations, probabilistic risk assessments and fire modeling calculations (NFPA 805 Section 2.4).
Change Evaluation	2.2(h)	▪ Perform the plant change evaluation that demonstrates that changes in risk, defense-in-depth and safety margins are acceptable (see NFPA 805 Section 2.4.4). If any one of these is unacceptable, additional fire protection features or other alternatives shall be implemented. ▪ During the transition process, this process was performed as part of the Fire Risk Evaluation approach per Section 4.2.4 of NFPA 805.
Program Documentation & Maintenance	2.2(i) – 2.3(j)	▪ Develop a monitoring program to monitor plant performance as it applies to fire risk. This program shall provide feedback for adjusting the fire protection program, as necessary (NFPA 805 Section 2.6). ▪ For the resulting plant fire protection program, provide adequate documentation, ensure the quality of the analyses, and maintain configuration control of the resulting plant design and operation (NFPA 805 Section 2.7).

3.4 Licensee Transition Documentation Overview

Two documents should be prepared to support the transition to a NFPA 805 licensing basis. They are:

1. A Letter of Intent to be sent to the NRC before beginning the transition process Section 4.2.2;

   When the Licensee decides to go forward with transition to a NFPA 805 licensing basis, a “Letter of Intent” will be submitted (See Appendix H.1). It will include a schedule for submitting a LAR and a description of the tasks involved in preparing for the transition. This will provide the Staff an understanding of the circumstances if a protracted schedule

is requested. To ensure enforcement discretion, the schedule should be consistent with the current NRC enforcement policy.

2. The License Amendment Request (LAR) required by 10 CFR 50.48(c)(3)(i);
   The LAR would include a schedule for transition to the risk-informed licensing basis, a schedule for any plant modifications that would be necessary to achieve final compliance and a summary of the risk informed licensing basis. Any performance-based analysis conducted to demonstrate compliance with a NFPA 805, Chapter 3 issue would be submitted as part of the LAR. A Transition Report that details the new NFPA 805 licensing basis and how it was derived from the current pre-transition fire protection licensing basis (Appendix H.2 and H.3, LAR/Transition Report Template.

Section 4 and Appendix H of this document provide additional discussion of the transition documentation and sample letters and reports.

As the pilot and non-pilot transition processes progressed, the content of the NFPA 805 License Amendment Request evolved into a comprehensive Transition Report. The term "LAR" in this document is synonymous with both the LAR (Transmittal Letter, Appendix H.2) and Enclosed Transition Report (Appendix H.3).

3.5 Compliance during the Transition Period

Enforcement discretion may be available for certain non-compliances during the transition period. Licensees should consult the NRC Web site for current information on enforcement discretion (http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html).

For existing non-compliances identified before submittal of the letter of intent, the non-compliance must have been entered into the corrective action program and it cannot be Red or be categorized as Severity Level I. A list of such previously identified non-compliances and their current status should be presented to the NRC inspection team during entrance meetings. The resident inspector should also be informed about the list. However, the list should not be included in the letter of intent or otherwise transmitted to the NRC because there is no requirement to report such non-compliances. If any non-compliance is otherwise reportable, it should have already been reported to the NRC.

For non-compliances discovered during the transition process, the licensee should ensure that they meet the criteria in the NRC Enforcement Policy. Thus, as with the previously existing non-compliances, a list of these compliances should be compiled. It should also include a short discussion of how each meets the enforcement criteria. Thus, for each non-compliance, explain how it was found during the transition review process, why it was not likely to have been found by routine efforts, and why it was not willful. Also give the status of each non-compliance. This list should be kept up-to-date and provided to the NRC inspection team during entrance meetings. The resident inspector also should be informed about the list. There is no need to formally transmit the list to the NRC because there is no requirement to report such non-compliances. However, if any such non-compliance is otherwise reportable, it should be reported to the NRC in accordance with the applicable reporting requirements.

4.0 TRANSITION FOR ADOPTION OF A NEW LICENSING BASIS

4.1 Transition - Introduction

4.1.1 Transition Process Overview

The transition process for adopting a new 10CFR 50.48 (c), NFPA 805 licensing basis is a critical step in the overall process. A comparison of the potential benefits with the known burdens associated with the transition to a new licensing basis is a significant consideration in a licensee's evaluation of the option. One critical aspect of any assessment of the benefits and burdens is the extent to which the pre-transition fire protection licensing basis can be incorporated ("brought forward") into the new NFPA 805 licensing basis as compared with the extent to which it will be necessary to take additional actions to establish compliance with various components of the new licensing basis.

The extent to which the pre-transition fire protection licensing basis can be incorporated into the new NFPA 805 licensing basis is determined by the extent to which the fire protection program can be shown to comply with the requirements in NFPA 805. However, exceptions are permitted for the following licensee-specific deviations from NFPA 805 requirements:

- Alternatives from the fundamental fire protection program attributes of NFPA 805 Chapter 3 [NFPA 805 Chapter 3 Section 3.1] previously reviewed and approved by the NRC.
- Exemptions/deviations from 10 CFR 50 Appendix R / Approved Fire Protection Program [NFPA 805 Figure 2.2] previously reviewed and approved by the NRC. Note the licensee will review these exemptions/deviations during the transition process to ensure the basis for acceptability is still valid.
- Existing Engineering Equivalency Evaluations [NFPA 805 Figure 2.2]. Note the licensee will review these equivalency evaluations during the transition process to ensure the quality level and the basis for acceptability is still valid.

FAQ 09-0057, New Shutdown Strategy, introduced the concept of utilizing an alternate safe shutdown strategy in lieu of transitioning the licensee's existing strategy.

In cases where alternate shutdown strategies and equipment are selected to support evaluation of the plant against the performance criteria of NFPA 805, Chapter 1, compliance with the deterministic requirements [NFPA 805, section 4.2.3] or the performance based approach [NFPA 805, section 4.2.4] should be performed consistent with the requirements of the standard. For this case,

- An engineering evaluation should indicate the strategy (1) satisfies the performance criteria, performance objectives, and goals for nuclear safety and radiological release; (2) maintains safety margins (3) maintains post-fire defense-in-depth (fire prevention, fire suppression, and post-fire safe shutdown capability); and (4) a quantitative assessment of the change in risk comparing the deterministically compliant [NFPA 805, section 4.2.3] and the new shutdown strategy should conclude that the new strategy/associated equipment meets the requirements for risk, defense-in-depth and safety margins.
- For areas where a performance-based evaluation has been performed (NFPA 805, section 4.2.4.2) utilizing an alternative safe shutdown strategy, the Fire PRA representing the alternative safe shutdown strategy should be the baseline and should be used as a basis for future fire risk evaluations [NFPA 805, section 2.4.4] to perform quantitative assessments of deviations from the deterministic requirements of Chapter 4.

The methodology requirements in Chapters 2 and 4 of NFPA 805 are very similar to those used to demonstrate compliance with the traditional NRC requirements (other than for fires originating in non-power operational modes and radioactive release). Accordingly, a plant's pre-transition fire protection licensing basis[4] for compliance with safe shutdown fire protection requirements should largely satisfy the nuclear safety requirements established by the amended regulation, 10 CFR 50.48 (c), for implementing a fire protection program based upon NFPA 805 Chapters 1, 2 and 4, except for non-power operations and radiological releases. Where the NFPA 805 requirements are not fully met, engineering equivalency evaluations may be used to show that the existing fire protection configurations and procedures comply. Otherwise, either programmatic changes or approval to use alternative methods will be necessary to demonstrate compliance.

For areas of the fire protection program that are not in compliance with NFPA 805, Chapter 3, the licensee may utilize the alternate performance-based methods as long as the method is approved by the NRC in a License Amendment. The NRC has taken exception to NFPA 805, Section 3.1 (See 10 CFR 50.48.c (2)(vii)).

Refer to Appendix L for a method to be submitted in a LAR/Transition Report to allow fire protection engineering analyses to address NFPA 805 Chapter 3 requirements through the use of a bounding analysis approach. Using the bounding analysis approach, the licensee performs bounding performance-based analyses, demonstrates that the bounding configuration is acceptable, and upon NRC staff approval, may use Fire Protection Engineering Evaluations (FPEEs) to justify changes to the plant within the bounds of the approved analyses.

In conclusion, although the traditional fire protection program requirements contained in 10 CFR 50.48 are not in direct alignment with those under the new rule, the requirements are similar enough to allow a structured transition without a complete design and licensing basis reconstitution. The intent of the transition assessment is to:

- Provide confirmation that the fire protection program, to the extent that the NRC has not previously approved its fundamental program attributes, meets the fundamental program elements and minimum design elements of Chapter 3 of NFPA 805, (Section 4.3.1 of this guide)
- Provide confirmation that the fire protection program meets the nuclear safety deterministic criteria, (Section 4.3.2 of this guide)
- Identify acceptable approaches and perform analyses to address fires originating in non-power operational modes and fire protection to effectively minimize radioactive release. (Sections 4.3.3 and 4.3.4 of this guide)
- Address risk-informed, performance-based attributes (i.e., safety margin, defense-in-depth) where the requirements of NFPA 805 are not met and are not previously approved in the licensee's pre-transition fire protection licensing basis. This may include performance of a change evaluation for nuclear safety aspects of the transition. (Section 4.4 of this guide)
- Verify/establish a monitoring program to ensure the availability and reliability of fire protection systems and features and to assess the fire protection program. (Section 4.5.3 of this guide)
- Confirm/establish adequate quality, documentation and configuration control to transition to a new licensing basis. (Section 4.5 of this guide)

[4] Exemptions/deviations from the pre-transition fire protection licensing basis have been reviewed and approved by the NRC and, are therefore considered acceptable as previously approved alternatives.

A simplified flowchart is provided as Figure 4-1.

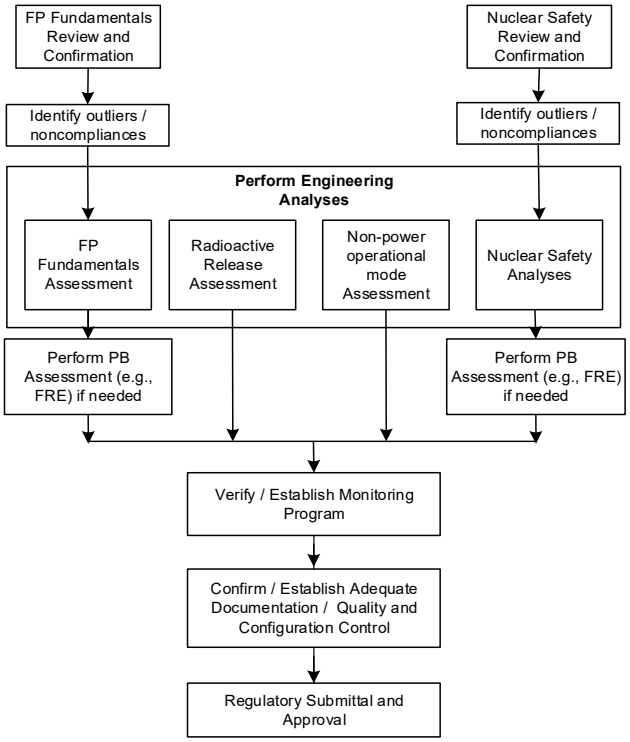


Figure 4-1 Transition Process (Simplified)

4.1.2 The Three Phases of the Transition Timeline

To transition from compliance with the current pre-transition fire protection licensing basis to a new NFPA 805 fire protection licensing basis, a licensee should take several steps. These steps can be grouped logically into a three-phase timeline for the transition process. Each phase is completed by the publication of a document. The three phases of the transition, their component steps, and their associated documents are identified below and are shown on Figure 3-2. The phases described below assume that a decision to transition to a new NFPA 805 licensing basis has already been made (see Section 4.2.1 of this document).

Phase 1: Preliminary Assessment and Letter of Intent

- Make preliminary determination of the activities that will be necessary to support the transition (the beginning of a Transition Report Document, See Appendix H3 of this document). One method of performing a preliminary assessment is contained in the September 17, 2004, NEI letter to industry Chief Nuclear Officers
- Make initial determination of any changes to the plant or fire protection program that may be necessary.

- Establish a tentative schedule for completing all of the actions necessary for the transition.
- Submit a Letter of Intent to the NRC. The letter's contents are described in Section 4.2.2 and Appendix H.1 of this document.

Phase 2: Analysis and License Amendment Request

- Conduct the transition activities to demonstrate compliance. Section 4.3 describes in detail how the current fire protection licensing basis can be used to support demonstrations of compliance with the requirements in NFPA 805.
- Determine extent to which the current fire protection licensing basis can be shown to demonstrate compliance with the new fire protection requirements.
- Determine any changes to the plant that will require a license amendment.
- Determine any alternative methods and analytical approaches that will be relied on to demonstrate compliance with the new fire protection requirements and will require a license amendment.
- Update the schedule for completion of transition activities.
- Submit a LAR/Transition Report to the NRC. The LAR/Transition Report contents are described in Section 4.6 and Appendix H of this document.

Phase 3: Completion of Transition

- While the NRC reviews the LAR/Transition Report, complete all of the transition activities which do not require prior NRC approval, including plant changes which do not require a license amendment under the current license condition, procedure changes, and training.
- After the NRC issues the license amendment, complete any changes to the plant that required a license amendment. Completion is performed in accordance with the requirements contained in the license amendment (i.e., the Safety Evaluation).
- Rely on alternative methods and analytical approaches acceptable to the NRC to demonstrate compliance with the new fire protection requirements.
- Adopt the new licensing basis. See Section 5.1.1 of this document.

Note: Non-pilot "lessons learned" resulted in licensees needing to change the scope of plant modifications that were referenced in the plant Safety Evaluation and in the new license condition. Dialogue between the industry and NRC led to guidance on this subject in a March 2, 2016 letter from the NRC to NEI (ML16015A416). This letter provides guidance on the regulatory expectations (i.e., license amendment process per 10 CFR 50.90) when licensees desire to modify some of the implementation obligations of their NFPA 805 amendment after it has been issued, but before all obligations have been fully implemented.

4.2 Preliminary Assessment

4.2.1 Technical and Regulatory Assessment

This step involves an initial scoping to assist in assessing the feasibility and practicality of adoption of the new fire protection rule. This step will include a cost-benefit review and will consider items such as:

- Alignment/mapping of pre-transition fire protection program elements with comparable NFPA 805 Chapter 3 elements and features;
- Clarity of existing fire protection licensing basis in documenting prior approval;

- Level of rigor associated with post-fire safe shutdown analysis and documentation of exceptions such as Generic Letter 86-10 evaluations of fire area boundaries, partial suppression/detection evaluations, manual action acceptability, etc.;
- Availability and reliability of cable and raceway data;
- Depth and status of fire risk analysis (i.e., Fire PRA, IPEEE);
- "Economies of scale" that may be attained due to application of process to similar units and sites;
- Plans for license renewal;
- Estimated costs of additional analyses and plant implementation of fire protection programs for other modes of operation and consideration of radioactive release;
- Estimated cost of resolving outstanding fire protection issues (i.e., condition reports, inspection/assessment findings) using traditional deterministic methods; and
- Cost benefit associated with reduced focus on non-safety significant issues.

4.2.2 Transition Letter of Intent

Following the management decision to transition to a new licensing basis, a Letter of Intent is prepared. The Letter of Intent should provide the NRC with enough information about the licensee's transition plans to enable the NRC to determine whether it can exercise the enforcement discretion for any non-compliances found as a result of conducting the transition process. A Letter of Intent will provide adequate information if it contains the following information:

- Identification of the plant(s) intended to be transitioned to a new licensing basis.
- Outline of activities needed to support the transition and estimated completion dates.
- Proposed transition schedule, including initiation and estimated duration of the transition.
- Enforcement discretion request, for existing non-compliances and non-compliances discovered during the transition, in accordance with the interim enforcement policy. Note in accordance with the guidance of Section 3.5 of this document, the letter should not list the current non-compliances.

A sample Letter of Intent is provided in Appendix H of this guide.

4.3 Reviews and Engineering Analyses

The need to perform additional engineering analyses as part of transitioning to a new NFPA 805 fire protection licensing basis stems from results of the transition reviews as discussed in the subsections below. Assessment of radioactive release due to fire suppression activities and the impact of fires occurring in non-power operational modes are not in most cases addressed in a licensee's pre-transition fire protection licensing basis. Thus, engineering analyses should be performed to evaluate the fire protection program against the performance criteria for these elements of NFPA 805.

4.3.1 Fundamental Fire Protection Program and Design Elements Transition Review

NFPA 805 Chapter 3 contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. These requirements are very similar to the guidelines of BTP 9.5-1 APCSB (May 1, 1976), BTP 9.5-1 Appendix A (February 24, 1977), or NUREG-0800 BTP 9.5-1 CMEB (July 1981). Each nuclear plant has an approved fire protection program that must demonstrate compliance with 10 CFR 50.48.

NFPA 805, Chapter 3 states, “These fire protection program elements and minimum design requirements shall not be subject to the performance-based methods permitted elsewhere in this guidance. Previously approved alternatives from the fundamental program attributes of Chapter 3 of NFPA 805 [by the NRC] take precedence over the requirements contained herein.” The NRC has taken exception to this section of NFPA 805 and notwithstanding the prohibition in Section 3.1; a licensee may apply for license amendment(s) to use performance-based methods to demonstrate compliance.

It is important that the “previously approved alternatives” be clearly determined in order to understand the level of review and potential upgrades necessary to meet the requirements in Chapter 3 of NFPA 805. Fire protection program features and systems, although previously reviewed and approved by the NRC, may have been changed since initial NRC approval. Such changes are part of the pre-transition fire protection licensing basis if they have been made in accordance with the correct application of the guidelines of Generic Letter 86-10, an evaluation of plant changes under the requirements of 10 CFR 50.59, or the fire protection standard license condition (NEI 02-03). The fire protection standard license condition allows changes to the “approved fire protection program without prior approval of the Commission if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire.” Where the changes from the original NRC review and approval have been made appropriately using an approved change process, the changes are considered an acceptable part of the pre-transition fire protection licensing basis. Licensees may rely on these changes to claim compliance but the NRC may inspect those changes and conclude that they do not comply with NFPA 805. However, they are not considered previously approved by the NRC for the purposes of superseding requirements in Chapter 3.

Refer to Appendix L for a method to be submitted in a LAR/Transition Report to allow fire protection engineering analyses to address NFPA 805 Chapter 3 requirements through the use of a bounding analysis approach. Using the bounding analysis approach, the licensee performs bounding performance-based analyses, demonstrates that the bounding configuration is acceptable, and upon NRC staff approval, may use Fire Protection Engineering Evaluations (FPEEs) to justify changes to the plant within the bounds of the approved analyses.

A flowchart of the fundamental program and design elements transition review is provided as Figure 4-2.

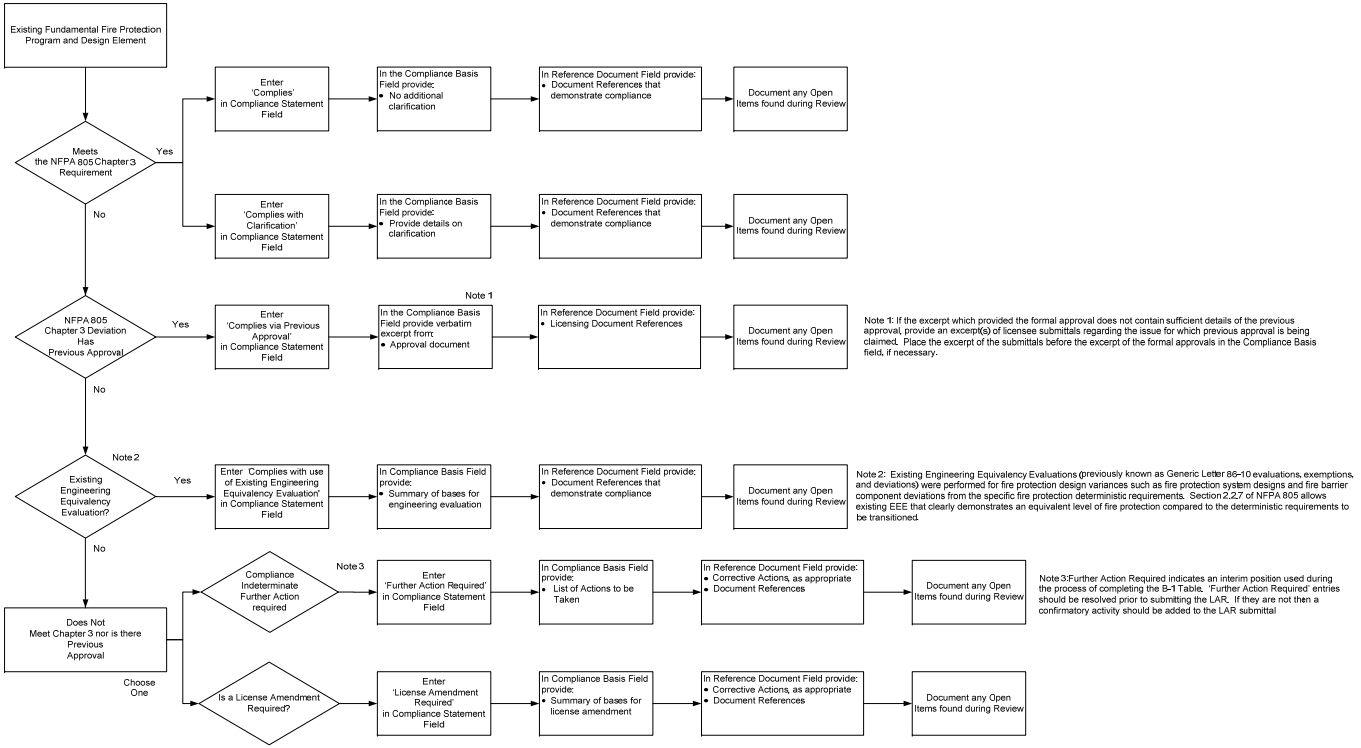


Figure 4-2 - Fundamental Program and Design Elements Transition Process (Simplified)

A systematic approach should be taken when assessing the transitioning plant's fire protection program against NFPA 805 Chapter 3 requirements. This is necessary to provide clear documentation of acceptance prior to moving forward with a new licensing basis. Specific acceptance of a plant configuration, as well as changes since original acceptance, should be documented. Each section and subsection of Chapter 3 should be reviewed against the current fire protection program. Licensees should provide specific compliance statements for each Chapter 3 attribute as follows:

- Complies - Items that are transitioning fully compliant "as-is".
- Complies with Clarification - Items that are not in 'literal compliance' with the requirement as listed in NFPA 805 but should be transitioned as complies. For example, NFPA 805 specifies that a requirement should be in the pre-plans but the licensee has it in a procedure. This is an editorial issue and compliance should be explained in the compliance basis field.
- Complies via Previous Approval – Items which previous NRC approval is being claimed or documented.
- Complies with Use of EEEEs – Items that are transitioning via the use of Existing Engineering Equivalency Evaluations (EEEEs) or engineering evaluations created during the transition process in accordance with current licensing basis.

Differences from NFPA 805 Chapter 3 identified during the transition review should be reconciled prior to transition to a new NFPA 805 licensing basis. For those cases where compliance cannot be demonstrated, or prior NRC approval is not adequately documented, the licensee may choose to comply with the deterministic requirements of NFPA 805, Chapter 3 or include a performance-based License Amendment Request with the transition submittal to the NRC.

Guidance on performing and documenting the fundamental element review is provided in Appendix B-1 of this document. A sample report showing NFPA 805 requirements, fundamental program and design elements, items for review, method of compliance, and licensing basis references are also shown in Appendix B-1 of this document. Guidance on reviewing existing engineering equivalency evaluations for transition is provided in Appendix B.3 of this document.

Plants licensed to operate after January 1, 1979 that have exemptions from 10 CFR Part 50 Appendix R related to NFPA 805 Chapter 3 that are deemed no longer necessary, should request that the exemptions be rescinded. The LAR Template in Appendix H has suggested wording and supporting information related to rescinding exemptions.

4.3.2 Nuclear Safety Performance Criteria Transition Review

Commented [A8]: FAQ 08-0054, R1 (ML15016A280) FAQ 07-0039, R2 (ML091320068)

Commented [A9R8]: NRC: FAQ 07-0030 proposes changes to this section that are not reflected in this section

Commented [A10R8]: NRC: FAQ 09-0057 proposes changes to this section that are not reflected in this section

The nuclear safety performance goals, objectives, and criteria are very similar to the requirements contained in Sections III.G and III.L of 10 CFR 50, Appendix R or applicable sections of NUREG-0800. Each nuclear plant has an approved fire protection program that must comply with the safe shutdown requirements in Sections III.G and III.L of 10 CFR 50, Appendix R (or applicable sections of NUREG-0800), or has documented exemptions/deviations from these requirements. For these reasons, part of an existing fire protection program may be transitioned to a new NFPA 805 licensing basis by performing a transition review and by addressing NFPA 805 topics not typically addressed in a previously approved fire protection program (i.e., fires originating in non-power operational modes and fires resulting in radioactive release). It is important to note one substantial difference between the requirements of 10 CFR 50, Appendix R and NFPA 805. Unlike 10 CFR 50, Appendix R which includes requirements to achieve cold shutdown, the nuclear safety goal of NFPA 805 requires "… reasonable assurance that a fire during any operational mode and plant configuration will

not prevent the plant from achieving and maintaining the fuel in a safe and stable condition." A licensee may also opt to perform a new nuclear safety capability assessment in accordance with NFPA 805. The discussion below outlines the process for demonstrating compliance with Section 2.4.2 and Chapter 4 of NFPA 805.

A systematic approach should be taken when assessing the transitioning plant fire protection program against the nuclear safety requirements of Chapters 1, 2 and 4 of NFPA 805. This is necessary to provide clear documentation of acceptance prior to moving forward with a new licensing basis. Specific acceptance of a plant configuration, as well as changes since original acceptance, should be documented. The review should consist of two tasks:

1. Review of the safe shutdown methodology for basic attributes (Chapters 1 and 2 of NFPA 805)
2. Fire area review (Chapter 4 of NFPA 805)

The safe shutdown methodology review evaluates the existing post-fire safe shutdown analyses (or new nuclear safety capability assessment) against the guidance provided in Section 2.4.2 of NFPA 805 for the Nuclear Safety Capability Assessment. This methodology review is implemented by a review of NEI 00-01 Chapter 3, Deterministic Methodology, as discussed in Appendix B-2 of this guidance. This review ensures that the basic elements (systems and equipment selection, circuit selection, equipment and cable location, and fire area assessment) are adequate to support transition to a new licensing basis for fires originating at power operations. Differences between the post-fire safe shutdown analysis/nuclear safety capability assessment and the requirements of NFPA 805 Section 2.4.2 identified during the transition review should be reconciled prior to transition to a new risk-informed, performance-based licensing basis. Where the licensing basis is unclear or silent on methodologies, care should be taken to establish a licensing basis going forward. Guidance on performing and documenting the NFPA 805 Chapter 2 methodology reviews is provided in Appendix B.2.1 of this guidance.

A simplified flowchart of the fire area transition review is provided as Figure 4-3 below.

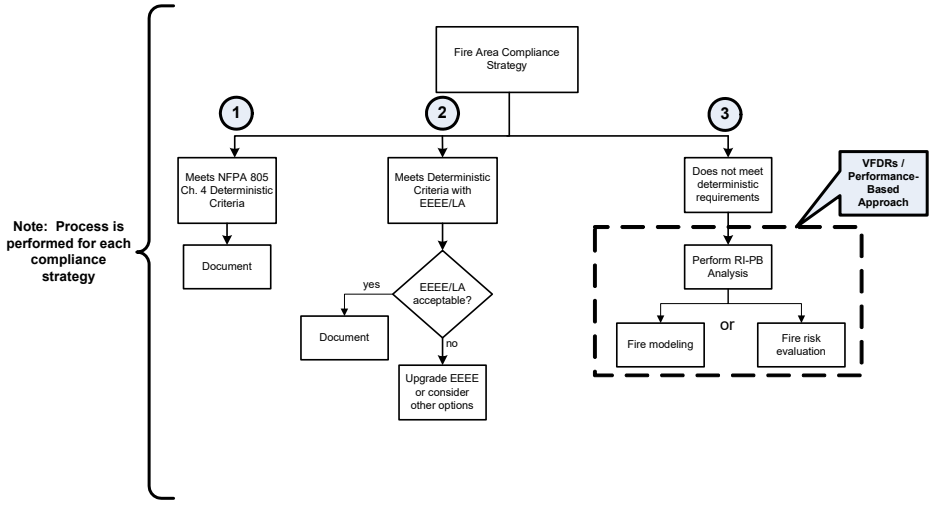


Figure 4-3 - Fire Area Transition Process (Simplified)

The review is intended to identify and document compliance strategies for each fire area:

1. Align with the NFPA 805 Chapter 4 deterministic methods for meeting the nuclear safety performance criteria in NFPA 805 Section 1.5; or
2. Align with the NFPA 805 Chapter 4 deterministic methods for meeting the nuclear safety performance criteria in NFPA 805 Section 1.5 with correctly implemented supporting engineering evaluations (Engineering Equivalency Evaluations or Licensing Actions); or
3. Do not align with the NFPA 805 Chapter 4 deterministic methods for meeting the nuclear safety performance criteria in NFPA 805 Section 1.5. Items that do not meet the deterministic requirements can be modified to bring into compliance or evaluated using risk-informed, performance-based methods as part of the transition.

Differences identified during the fire area transition review may be reconciled prior to transition to a new risk-informed, performance-based licensing basis. Items that can be addressed within the bounds of the pre-transition fire protection licensing basis prior to the transition (i.e., by performance of a fire protection engineering evaluation) should be addressed and documented as part of the transition process. Differences that cannot be resolved within the bounds of the pre-transition fire protection licensing basis may also be resolved by changing the plant/program to align with the NFPA 805 Chapter 4 deterministic methods (and associated Chapter 3 requirements) for meeting the nuclear safety performance criteria in NFPA 805 Section 1.5.

Where the licensing basis is unclear or silent on fire area compliances, care should be taken to establish a licensing basis going forward. Guidance on performing and documenting the NFPA 805 Chapter 4 reviews is provided in the tables in Appendix B.2 of this guidance. Guidance on reviewing existing engineering equivalency evaluations for transition is provided in Appendix B.3 of this document.

The new fire protection licensing basis may include components of the existing plant Fire Protection Program (including previously approved exemptions / deviations, and correctly implemented 10 CFR 50.59 / Fire Protection Regulatory Reviews) that can be shown to comply with Chapters 1, 2 and 4. This would be considered compliance with the deterministic requirements in NFPA 805 Chapter 4.

Fire protection program features and systems may have been changed since initial NRC approval. Such changes are part of the licensee's approved Fire Protection Program if they have been made in accordance with the correct application of the guidelines of Generic Letter 86-10, and evaluated under the requirements of 10 CFR 50.59, or the fire protection standard license condition (Fire Protection Program Regulatory Reviews).

The pre-transition fire protection standard license condition allows changes to the "approved fire protection program without prior approval of the Commission if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire." Where the changes from the original NRC review and approval have been made appropriately in accordance with the fire protection standard license condition, the changes are considered an acceptable part of the pre-transition fire protection licensing basis.

These Fire Protection Program changes generally fall into two broad categories. The first is essentially an engineering equivalency evaluation that demonstrates that a given situation (component, system, procedure, physical arrangement, etc.) is "functionally equivalent" to the corresponding code/listing requirement and is therefore considered to be compliant. The second demonstrates that a given situation (component, system, procedure, physical arrangement, etc.) is "adequate for the hazard."

The use of an engineering evaluation to demonstrate that a given minor change/situation (component, system, procedure, physical arrangement, etc.) is "functionally equivalent" to a corresponding technical requirement (e.g., evaluate the acceptability of posting a sign on a fire door without affecting its fire rating by considering the impact of the sign on the tested configuration of the fire door) is an accepted practice in nuclear plant design, operation and maintenance. Specifically, in fire protection engineering, this type of analysis has been used extensively inside and outside the nuclear industry in a variety of commercial and industrial applications to evaluate compliance to fire protection codes. To the extent a qualified fire protection engineer has concluded a minor change has not affected the component, system, procedure or physical arrangement functionality using a relevant technical requirement or standard, the licensee continues to meet the code requirement. This process applies equally to the requirements in NFPA 805 Chapter 3 and Chapter 4. Since the condition meets the underlying code or other technical requirement it continues to meet NFPA 805 (and therefore 10 CFR 50.48(c)) and as such, does not require prior NRC approval.

Use of this approach does not fall under NFPA 805, Section 1.7, Equivalency, because the condition can be shown to meet the NFPA 805 Chapter 3 requirement. Section 1.7 of NFPA 805 is a standard format used throughout NFPA standards. It is intended to allow owner/operators to use the latest state of the art fire protection features, systems, and equipment, provided the alternatives are of equal or superior quality, strength, fire resistance, durability, and safety. However, the intent is to require approval from the AHJ because not all of these state of the art features are in current use or have relevant operating experience. This is a different situation than the use of functional equivalency since functional equivalency demonstrates that the condition meets the NFPA 805 code requirement.

With regard to the second type of Fire Protection Program change (adequate for the hazard), four specific NFPA 805 sections include requirements that are based on the results of the analyses performed under NFPA 805 Chapter 4. The requirements for Fire Alarm and Detection Systems (Section 3.8), Automatic and Manual Water-Based Fire Suppression Systems (Section 3.9), Gaseous Fire Suppression Systems (Section 3.10) and Passive Fire Protection Features (Section 3.11) are only required when the results of the analyses performed in accordance with NFPA 805 Chapter 4, Determination of Fire Protection Systems and Features, indicate that they are necessary to meet the nuclear safety performance criteria. These four attributes in Chapter 3 are "performance-based."

Engineering evaluations related to minor deviations from these four NFPA 805 sections may use a qualified engineer's informed judgment (informed with respect to a technical requirement or a standard) as the basis for meeting the regulatory requirement. To the extent a qualified fire protection engineer has concluded a minor change has not affected the "adequacy for the hazard" using a relevant technical requirement, the licensee continues to meet 10 CFR 50.48(c). Therefore, minor changes to the four performance-based Chapter 3 elements that have been successfully evaluated using an engineering evaluation to show that the system or feature remains adequate for the hazard do not need prior NRC approval.

The example license condition presented in Appendix O, "Other Changes that May Be Made Without Prior NRC Approval," item (1), "Changes to NFPA 805, Chapter 3, Fundamental Fire Protection Program," includes this process for both "functionally equivalent and adequate for the hazard categories. An example license condition based on RG 1.205 Revision 1 and pilot and non-pilot lessons learned is included as Appendix O.

Note that any engineering evaluation of a minor change to a fire protection system or feature required by NFPA 805 Chapter 3 that does not conclude that the system or feature is fully compliant is not considered previously approved by the NRC for the purposes of superseding

requirements in Chapter 3 and as such should be submitted to the NRC for approval as a License Amendment Request.

As described in Section 4.1.1 of this document, Fire Protection Engineering Evaluations should be reviewed to ensure the quality level and basis for acceptability is still valid at the time of transition. Appendix B.3 provides detailed guidance on the review of engineering evaluations.

Plants licensed to operate after January 1, 1979 that have exemptions from 10 CFR Part 50 Appendix R related to NFPA 805 Chapter 3 that are deemed no longer necessary, should request that the exemptions be rescinded. The LAR/Transition Report Template in Appendix H has suggested wording and supporting information related to rescinding exemptions.

4.3.3 Non-Power Operational Modes Transition Review

The nuclear safety goal of NFPA 805 requires the evaluation of the effects of a fire "during any operational mode and plant configuration". The concept of protection of equipment from the effects of fire during plant shutdown conditions is discussed in NUREG-1449, Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States. In general, the underlying concerns are the differences between the functional requirements (i.e., different (or additional) set of systems and components) and time dependencies on decay heat removal system operation during non-power operations and full power operations. The current industry approach for evaluating risk during shutdown conditions involves the normal fire protection program defense-in-depth actions as well as qualitative and/or quantitative assessments and is based on NUMARC 93-01, Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants and NUMARC 91-06, Guidelines for Industry Actions to Assess Shutdown Management.

Appendix F provides additional discussion on the Non-Power Operational (NPO) Mode Transition Review, details of the Plant Operational States to be evaluated, and provides examples of this process and the documentation requirements anticipated.

4.3.4 Radioactive Release Transition Review

A licensee must also show that the radioactive release goals, objectives, and performance criteria are met. Therefore, licensees must now evaluate fire risks and fire protection for various scenarios (most likely not involving fuel damage (see below)) that could lead to radioactive release to an unrestricted area.

The treatment of radiological release to any unrestricted area due to fire is focused on potential radioactive release due to potential fuel damage and fire-fighting activities.

Fuel Damage

- The Nuclear Safety Performance Criteria (NSPC) already requires the prevention of fuel cladding damage. As such, radiological release due to fuel damage should not require a separate examination since no such damage is assumed to occur without violating the basic requirements of NFPA 805. This effectively limits the source of radiation (release source term). Containment integrity should not require specific examination. This means the scope of the fire protection analyses need not be expanded to include all containment isolation valves.
- The use of NFPA 805 Section 4.2.3 explicitly meets the radioactive release objective by limiting the source term (no fuel damage). The use of NFPA 805 Section 4.2.4 and Section 4.2.4.1 also explicitly meets the radioactive release objective by limiting the source term (no fuel damage and success path free of fire damage with margin between MEFS and LFS). The use of NFPA 805 Section 4.2.4 and Section 4.2.4.2 meets the radioactive release goal by providing "reasonable assurance that a fire will not result in a

radiological release that adversely affects the public, plant personnel, or the environment" via a measure of core damage frequency (CDF) and large early release frequency (LERF) along with defense-in-depth and safety margin considerations.

Fire-Fighting Activities

- The Radioactive Release Performance Criteria (NFPA 805 Section 1.5.2) requires that radiation release to unrestricted areas due to direct effects of fire suppression activities shall be low as reasonably achievable and shall not exceed the limits designated in the plant's Technical Specifications.

The combination of the above limits the radioactive release review to fire-fighting activities and the control of combustion products (smoke and particulates) and the control of fire-fighting agents (primarily water).

- The potential for radiological release due to fire-fighting activities should be addressed via fire pre-plans, fire brigade training, and engineering controls. The objective is to address the potential for the loss of boundary control for contaminated spaces.

To demonstrate compliance with the radioactive release goals, objectives, and performance criteria, the following strategy is recommended:

- Review fire pre-plans and fire brigade training materials to identify fire protection program elements (e.g., systems / components / procedural control actions / flow paths, etc.) that are being credited to meet the radioactive release goals, objectives, and performance criteria during all plant operating modes, including full power and non-power conditions.
- Review engineering controls to ensure containment of gaseous and liquid effluents (e.g., smoke and fire-fighting agents). This review should cover all plant operating modes (including full power and non-power conditions). Otherwise, provide a bounding analysis, quantitative analysis, or other analysis that demonstrates that the limitations for instantaneous release of radioactive effluents specified in the unit's Technical Specifications are met. (See Figure G-1)

Refer to Appendix G for examples of this process and the documentation requirements anticipated.

4.4 Licensing Basis Transition – Risk-Informed Performance-Based Approach

4.4.1 Summary

It is expected that risk-informed, performance-based approaches used as part of the transition to a new NFPA 805 licensing basis would be associated with cases where the nuclear safety performance criteria are not met and are outside of the pre-transition fire protection licensing basis, although there may be instances where risk-informed, performance-based methods could be used in a License Amendment Request to demonstrate conformance with criteria in NFPA 805 Chapter 3 criteria. The scope of performance-based approaches as part of the licensing basis transition is limited because:

1. An evaluation of fires originating in non-power operational modes would typically not exist prior to transition to a new licensing basis. Therefore, there would be no basis for measuring or determining the acceptability of a "change."
2. An evaluation of the impact of fire on radioactive release would typically not exist prior to transition to a new licensing basis. Therefore, there would be no basis for measuring or determining the acceptability of a "change."

Non-compliances are based on the regulations that were applicable to the licensee prior to the transition to a 10 CFR 50.48(c) fire protection program. Appropriate compensatory measures should be established and should remain in place until the condition is accepted via applicable plant change processes.

Guidance on the process and criteria for risk-informed, performance-based evaluations during the transition is provided in Appendix B. This includes the assessment of the change in risk associated with transition.

4.4.2 NFPA 805 Analytical Methods and Tools

4.4.2.1 General

NFPA 805, Section 2.7.3, has requirements for the quality of engineering analyses and associated methods that the licensee applies to demonstrate compliance with the performance criteria for nuclear safety and radioactive release.

4.4.2.2 Fire Models

Section 5.1.2 provides guidance on the fire models that licensees may use in an NFPA 805 transition, compliance with the NFPA 805 fire modeling requirements, and fire model verification and validation (V&V). These models should be acceptable to use to perform the performance-based evaluations in NFPA 805, Section 4.2.4, if each model is shown to have been appropriately applied within the range of its applicability and V&V.

Licensees may also propose the use of other fire models; however, licensees are responsible for providing evidence of the acceptable V&V of these fire models. Licensees should submit the V&V documents for licensee-proposed fire models with their License Amendment Requests for NRC review. A License Amendment Request may use other fire models, documented in generic reports (e.g., topical reports), which the NRC has previously reviewed and found acceptable, if the licensee can demonstrate that the model has been used within the range of its applicability and V&V.

4.4.2.3 Fire Probabilistic Risk Assessment

The Fire PRA used to perform the risk assessments in NFPA 805, Section 2.4.4 (plant change evaluation), and Section 4.2.4.2 (fire risk evaluation), should be of sufficient technical adequacy to support the application. During the license amendment review process, the NRC will review the PRA approach, methods, and data for acceptability, in accordance with Section 2.4.3.3 of NFPA 805. Two primary aspects are considered for technical adequacy. First, the underlying PRA (i.e., the baseline model) should be technically adequate. Second, the analyses, assumptions, and approximations to map the cause-effect relationship associated with the application should be technically adequate.

The licensee may address the first aspect for risk-informed applications by conforming to the peer review and self-assessment processes in RG 1.200. This regulatory guide provides one approach acceptable to the NRC for determining the technical adequacy of the baseline PRA model. RG 1.200 endorses, with certain clarifications and qualifications, Addendum A to the American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) RA-Sa 2009, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications.

The licensee should address the second aspect by describing the modeling of cause and effect relationships associated with the application. The NRC staff will review the engineering analyses, assumptions, and approximations made in developing and using the PRA model to determine whether they are appropriate, focusing on the key assumptions (i.e., those that are significant to the application), as outlined in Section 19.1 of NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.

The licensee should submit the documentation described in Section 4.2 of RG 1.200 to address the baseline PRA and application-specific analyses. For PRA Standard "supporting requirements" important to the NFPA 805 risk assessments, the NRC position is that Capability Category II is generally acceptable. Licensees should justify use of Capability Category I for specific supporting requirements in their NFPA 805 risk assessments, if they contend that it is adequate for the application. Licensees should also evaluate whether portions of the PRA need to meet Capability Category III, as described in the PRA Standard.

RG 1.200 contains guidance that the NRC may use to review all facility changes associated with implementing NFPA 805 that are submitted for prior staff review and approval. The NRC may rely on this guidance to provide confidence that self-approved changes meet the acceptance guidelines. The licensee's self-approval process should include an evaluation of all unresolved peer review issues to assess the potential impact of the unresolved issue on the application-specific evaluation. Any unresolved issue that could have a substantive impact on the results should be resolved. The licensee's self-approval process should also include the methods for modeling the cause and effect relationships.

The NRC and the EPRI have documented a methodology for conducting a Fire PRA in NUREG/CR-6850/EPRI 1011989, EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, issued September 2005. However, recognizing that merely using the methods explicitly documented in NUREG/CR-6850/EPRI 1011989 may result in a conservative assessment of fire risk, licensees may choose to perform more detailed plant-specific analyses to provide greater realism in the Fire PRA model.

Although a licensee may make the transition to an fire protection program based on NFPA 805 without a Fire PRA model that encompasses all the areas in its facility, licensees should develop a plant-specific Fire PRA of sufficient scope and technical adequacy to demonstrate that the risk-informed requirements in the rule are met for all areas where the risk-informed approach described in NFPA 805, Sections 2.4.3 and 4.2.4.2, is used. If a licensee develops a Fire PRA only for areas where the risk-informed approach is used, the licensee should develop, review, and maintain this limited-scope PRA in accordance with all applicable guidelines. The acceptance guidelines of RG 1.174 may require the total CDF, LERF, or both, to evaluate changes where the risk impact exceeds specific guidelines. If there are no areas that rely on the risk-informed approach, licensees may propose an alternative approach for making the transition to, and making changes to, an fire protection program based on 10 CFR 50.48(c).

4.4.3 Acceptance Criteria

The overall acceptance of the risk-informed, performance-based approach (for plants using the Fire Risk Evaluation compliance approach) will be in the form of a license amendment per 10 CFR 50.90, as required by 10 CFR 50.48(c)(3)(i). Acceptance criteria for individual fire risk evaluation are based on ensuring:

- The change in core damage frequency (ΔCDF) is acceptable, and
- The change in large early release frequency (ΔLERF) is acceptable, and
- Defense-in-depth and safety margins are maintained.

The change in CDF/LERF should be addressed individually (for each fire area) and cumulatively (for the entire plant). The defense-in-depth and safety margin treatment should be documented on an area basis.

Refer to Appendix B, Section B.2.2 for additional discussion on the acceptance criteria.

4.5 Licensing Basis Transition - Program Documentation and Maintenance

4.5.1 Program Documentation and Quality Assurance

As part of the transition review, fire protection program documentation should be reviewed to ensure that the program is adequately documented to support the transition to a new licensing basis. This review is not intended to be a design basis reconstitution, but rather a review to ensure that the program documentation used to define the "going forward" licensing and design basis is adequate and of sufficient quality. Documentation identified during the reviews that are not of sufficient quality or that lack configuration control should be updated to meet the requirements contained in Section 2.7 of NFPA 805. The transition process should be used to summarize and categorize program documentation in a manner that facilitates the long-term maintenance of a risk-informed, performance-based program.

Refer to Section 5.1 of this guidance for additional information on program documentation, configuration control, and quality assurance.

4.5.2 Configuration Control

A requirement for maintaining current program documentation is consistent with expectations and requirements under a traditional regulatory framework. It is not expected that any major or fundamental changes in plant processes would be required. Documentation created as part of the transition to and maintenance of a risk-informed, performance-based fire protection program would need to be incorporated into existing plant configuration control programs.

4.5.3 Monitoring

Other risk-informed, performance-based attributes include the establishment of a monitoring program, as discussed in Section 2.6 of NFPA 805. This includes establishing acceptable levels of availability, reliability, and performance levels, and ensuring that processes are in place to take corrective actions when established thresholds are not met.

The intent of the monitoring transition effort is not to establish new detailed programs that define numerical values for reliability and availability for fire protection systems and features. Instead, the transition review should be performed as a confirmation of the adequacy of the existing surveillance, testing, maintenance, and compensatory measures. The adequacy of existing plant programs (i.e., fire protection test/surveillance program(s) and corrective action program) is sufficient to allow a transition to a new licensing basis without extensive changes. The scope of the review addresses the adequacy of existing fire protection oversight and plant corrective action programs. This review should consider:

1. The adequacy of the scope of systems and equipment within existing plant programs (i.e., are important fire protection systems and features adequately inspected and tested, and are compensatory measures appropriate).
2. The adequacy of the plant corrective action program in determining causes of equipment and programmatic failures and in minimizing their recurrence.
3. The system and equipment availability should equal or exceed the availability assumed in the risk assessment.

Deficiencies identified during the monitoring transition review should be corrected and updated as part of the licensing basis transition. Refer to Section 5.2 and Appendix E of this guidance for additional guidance on monitoring.

4.6 Regulatory Submittal and Transition Documentation

Two documents should be prepared to support the transition to compliance with NFPA 805. They are:

1. A Letter of Intent to be sent to the NRC before beginning the transition process (discussed in Section 4.2.2)
2. The LAR required by 10 CFR 50.48(c)(3)(i) including the Transition Report which documents the transitioning plant's compliance with NFPA 805.

The LAR/Transition Report are required to address regulatory requirements and may also include alternative methods and analytical approaches.

4.6.1 Letter of Intent

An example of a letter of intent is included in Appendix H.

4.6.2 License Amendment Request and Transition Report

The contents of the LAR/Transition Report are established by 10 CFR 50.48(c)(3)(i) and if necessary, 10 CFR 50.48(c)(2)(vii) and /or 10 CFR 50.48(c)(4). The contents of the LAR/Transition Report are outlined in Appendix H.

The LAR should be developed in accordance with the plant's processes for all LARs under 10 CFR 50.90. The minimum regulatory requirements to be addressed in the LAR are established in 10 CFR 50.48(c)(3)(i). It requires the licensee to:

1. Identify all orders and license conditions that will need to be revised or superseded;
2. Identify all of the Technical Specifications that must be revised; and
3. Provide the proposed Technical Specification revisions as well as the supporting bases for them.

To address the requirements in 10 CFR 50.48(c)(3)(i), the LAR/Transition Report should include the following key components:

- A description of the process used to identify all orders, license conditions, and Technical Specifications and their bases that must be revised or superseded to implement compliance with NFPA 805. This will provide assurance to the NRC that the LAR/Transition Report addresses all of the changes the plant will need to adopt NFPA 805.
- The Technical Specifications to be revised or superseded (including their bases), necessary changes to the Technical Specifications and their bases, and explanations of why these changes are adequate to accomplish the plant's adoption of NFPA 805.
- The fire protection license conditions to be revised or superseded, a new license condition authorizing the use of the new fire protection licensing basis, and an explanation of why these revisions are adequate to accomplish the plant's adoption of NFPA 805.
- The orders and exemptions to be revised or superseded, the necessary revisions to orders and exemptions, and an explanation of why these revisions are adequate to accomplish the plant's adoption of NFPA 805.
- A finding of no significant hazards consideration and an environmental impact assessment finding no significant impact on the environment based on the proposed plant specific implementation of NFPA 805. If the licensee requests the NRC to approve

alternatives to some of the provisions in NFPA 805, the finding of no significant hazards consideration will also need to address those alternatives.

The technical details provided in the LAR/Transition Report should ensure that sufficient information is provided for the NRC to make its safety finding on the application.

In addition to the requirements of 10 CFR 50.48(c)(3)(i), the LAR/Transition Report should also include the following:

- A schedule for the implementation of the new NFPA 805 program and the installation of any modifications
- The total change in risk associated with the transition to NFPA 805. (See Appendix B Section B.2.2.4.2 for detailed information.)

  Note: Upon completing the transition to an NFPA 805 licensing basis, the baseline fire protection program risk will be the risk of the plant as-designed and operated according to the NRC-approved fire protection program licensing basis.
- A description of modifications that are necessary to support the new licensing basis.
- Assumptions, criteria, methodology, and overall results of the following topics should be specifically submitted to the NRC for review and approval:
  - Circuit Analysis selection and evaluation methodology for the evaluation of fire induced consequences (Documented in NFPA 805 LAR, Attachment B, See LAR Template in Appendix H.3)
  - MSO resolution (Documented in NFPA 805 LAR, Section 4.2.1.4 and Attachment F, See LAR Template in Appendix H.3)
  - Recovery Actions (Documented in NFPA 805 LAR, Section 4.2.1.3 and Attachment G, See LAR Template in Appendix H.3)
- Items for which 'previous approval' was identified during the Transition of Chapter 3 and 4 requirements
- Items for which NRC previous approval requires clarification
- Alternative methods and analytical approaches to demonstrate compliance with NFPA 805 (10 CFR 50.48(c)(4)). Where a licensee proposes to use an alternative method and analytical approach to support the transition to compliance with NFPA 805, that LAR may be incorporated in the LAR required under 10 CFR 50.48(c)(3)(i). Each request will need to be supported with the type of technical analysis that the station's procedures require to be provided for any substantive LAR. See Section 2.4.1 for additional information regarding the LAR/Transition Report content.
- Performance-based methods for compliance with the fire protection program elements and minimum design requirements in Chapter 3 of NFPA 805 under 10 CFR 50.48(c)(2)(vii). These requests should be submitted as attachments to the transition LAR/Transition Report. See Section 2.4.1 for additional information regarding the LAR/Transition Report content.
- Refer to Appendix L for a method to be submitted in a LAR/Transition Report to allow fire protection engineering analyses to address NFPA 805 Chapter 3 requirements through the use of a bounding analysis approach. Using the bounding analysis approach, the licensee performs bounding performance-based analyses, demonstrates that the bounding configuration is acceptable, and upon NRC staff approval, may use Fire Protection Engineering Evaluations (FPEEs) to justify changes to the plant within the bounds of the approved analyses.

The Transition Report is created by the licensee to provide a clear, complete, and accurate description of the new fire protection licensing basis demonstrates compliance with NFPA 805. The NRC can use the Transition Report to support its compliance determination under 10 CFR 50.48(c)(3). Therefore, the Transition Report should reflect the process used by the licensee to transition the licensing basis. This will enable the Transition Report to serve not only as a record of the transition but also as a management control tool for ensuring that the transition completely addresses all new fire protection requirements.

In the 2009-2010 timeframe, a number of public meetings and interactions occurred between NEI and the NRC regarding the content of an NFPA 805 LAR and NFPA 805 Safety Evaluation (e.g., ML102170205). The templates were adjusted during non-pilot review processes to incorporate lessons learned (e.g., ML122350232). Although the templates were not formally approved or endorsed, they served as valuable tools for consistent content of submittals and Safety Evaluations. A detailed Transition Report template is included in Appendix H of this document.

As the pilot and non-pilot transition processes progressed, the content of the NFPA 805 License Amendment Request evolved into a comprehensive Transition Report. The term “LAR” is synonymous with both the LAR (Transmittal Letter, Appendix H.2) and Enclosed Transition Report (Appendix H.3).

4.6.3 UFSAR Revision

As part of the transition to a fire protection program in compliance with 10 CFR 50.48(c), the licensee will update the Updated Final Safety Analysis Report (UFSAR) section on the fire protection program, to provide a general description of the NFPA 805 fire protection program and fire protection systems and features.

Guidance on the level of detail appropriate for updating FSARs is contained in NEI 98-03, Guidelines for Updating Final Safety Analysis Reports, which the NRC endorsed in RG 1.181, Content of the Updated Final Safety Analysis Report in Accordance with 10 CFR 50.71(e). According to this guidance, licensees may simplify their UFSARs by removing information that is duplicated in separate, controlling program documents (e.g., the Fire Protection Plan, etc.), as long as the controlling program documents are referenced. Accordingly, the licensee’s proposed UFSAR revision that provides a general description of the NFPA 805 Fire Protection Program should be in alignment with this guidance, since it references the appropriate documents.

The proposed UFSAR revision would indicate appropriate “general references” documents, but would not “incorporate by reference” those documents that provide a more detailed description and basis for the risk-informed, performance-based fire protection program (based on the definitions of “General References” and “Incorporation by Reference” in NEI 98-03, Revision 1). After the approval of the LAR, in accordance with 10 CFR 50.71(e), the fire protection section(s) of the UFSAR should be revised. The fire protection section should include the following (numbering may differ):

9.5.1 Fire Protection

Provide general discussion of the Fire Protection Program regulatory requirements.

9.5.1.1 Design Basis Summary

Provide a discussion of defense-in-depth

Provide general discussion of the nuclear and radioactive performance criteria

Provide a general discussion of compliance with Chapter 2, 3, and 4 NFPA 805.

Provide a discussion of codes of record

9.5.1.2 Systems Description

Required Nuclear Safety Capability Systems, Equipment and cables

Required Fire Protection System and Features

Required SSCs for radioactive release

Power Block Definition and Structures

9.5.1.3 Safety Evaluation (Fire Safety Analysis)

Point to and describe fire protection program design basis document(s)

9.5.1.4 Fire Protection Program

Point to and describe fire protection program plan document(s) that describe organization, responsibilities, processes/procedures, and qualifications.

An example is provided in Appendix N of this document.

5.0 PROGRAM MAINTENANCE AND CONFIGURATION CONTROL

The purpose of this section is to provide guidance on fire protection program maintenance and configuration control following the transition to new licensing basis.

5.1 Program Documentation, Configuration Control, and Quality Assurance

5.1.1 General Guidance for Program Documentation

As part of the transition, the fire protection program should be adequately documented to support the transition to a new licensing basis, as discussed in Section 4.

Following the transition, a risk-informed, performance-based fire protection program should be supported by appropriate documentation, maintained under configuration control and quality assurance processes. Rather than create new, restrictive processes for program documentation the intent is to ensure that basic documentation, configuration control, quality requirements and practices that are part of a nuclear power plant are reflected in the fire protection program, and that any new analyses or program documents are covered by the existing programs.

As part of the transition review, program documentation should be reviewed to ensure that the licensing and design basis meet the prerequisite requirements for transition and that any outliers are addressed. The transition process will summarize and categorize program documentation in a manner that facilitates the long-term maintenance of a risk-informed, performance-based program.

5.1.1.1 Program Documentation

A key aspect of program documentation is the Transition Report, which is described in Section 4.6.2 of this Implementing Guidance. A template is also included as Appendix H.3 of this Implementing Guidance. Following transition to a new licensing basis, it is important that the licensing basis information summarized in the transition report be updated and maintained as a "living document".

The distinction between licensing basis and design basis is not always clear since they often address the same items and elements. Therefore, it is important that the licensing and design aspects of the fire protection program be maintained current and consistent. NFPA 805 Sections 2.7 and A.2.7 discuss the fire protection "design basis document" but do not provide guidance on licensing basis information. The licensing basis information developed as part of the transition report may be included in the design basis document.

Section 2.7.1 of NFPA 805 requires that analyses be documented to demonstrate compliance with NFPA 805. The intent of the documentation is that the assumptions be clearly defined and that the results be easily understood, that results be clearly and consistently described, and that sufficient detail be provided to allow future review of the analyses. The documentation must be retained for the life of the plant.

A fire protection program design basis document is discussed in Section 2.7.1.2 of NFPA 805. As a minimum, this document should include 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.

This does not imply or require a rigid document format or structure, as discussed in Section A.2.7.1.2. The term "design basis document" does not mean the fire protection program is required to be documented as part of the plant's design basis document program, which has

specific requirements and meaning at individual sites. The design basis document, as described in NFPA 805, may be included in different forms, such as:

- Traditional design basis documents (DBDs)
- Analyses and Reports (i.e., fire hazards analysis, safe shutdown analysis)
- Calculations
- Correspondence

Appendix C of this document provides one example of the fire protection design/licensing basis documentation for a post-transition plant.

5.1.1.2 Configuration Control

Section 2.7.2 of NFPA 805 states that:

> *The design basis document shall be maintained up-to-date as a controlled document. Changes affecting the design, operation, or maintenance of the plant shall be reviewed to determine if these changes impact the fire protection program documentation.*
>
> *Detailed supporting information shall be retrievable records. Records shall be revised as needed to maintain the principal documentation up-to-date.*

This requirement is consistent with expectations and requirements under a traditional regulatory framework. It is not expected that any major or fundamental changes in plant processes would be required. Documentation created as part of the transition and maintenance of a risk-informed, performance-based program would need to be incorporated into existing plant programs.

5.1.1.3 Quality Assurance

Due to the evolving nature of fire protection engineering and use of risk in nuclear power plant decision-making, specific guidance is given in NFPA 805, Section 2.7.3 and Appendix A, on quality. The term “quality” as used in NFPA 805 and this implementing guidance is focused primarily on quality of engineering analyses, rather than “quality assurance” processes that cover a wide variety of activities at a nuclear power plant and, in particular, fire protection programs. Section A.2.7.3 of NFPA 805 provides a discussion on acceptability of technical references and the need to use methods that have gained wide acceptance within technical communities. Section A.2.7.3 provides a discussion of helpful factors in determining the acceptability of an individual method or source.

Section 2.7.3.1 of NFPA 805 addresses fundamental requirements such as independent verification of analyses, calculations, and evaluations. These are typical requirements for fire protection assessments under a traditional fire protection program and should not create any basic changes in process or practice.

Section 2.7.3.2 of NFPA 805 addresses verification and validation of calculational or numerical methods. This practice is typical for engineering calculations utilized for nuclear power plant calculations and analyses. Due to the evolving nature of fire science, the need for a specific requirement in NFPA 805 was warranted. There are no fire-related engineering methods or models that have been validated over the entire range of applications for which they might reasonably be used. There have been and are ongoing efforts directed at performing validation studies on calculation methods and modes.

Section 2.7.3.3 of NFPA 805 discusses limitations of acceptable use of engineering methods and numerical models.

Related to the limitations of acceptable use is the need for qualified users to use and apply engineering analysis and numerical models, as discussed in NFPA 805 Section 2.7.3.4. The competency and experience of individuals performing these analyses should be ensured as part of a plant's qualification, training, and business practices. This may vary from a qualification guide completion to demonstrate the performance of activities to management discretion, depending upon the business and training practices of the individual facilities.

An uncertainty analysis is required per Section 2.7.3.5 of NFPA 805 to provide reasonable assurance that the performance criteria have been met. Section A.2.7.3.5 provides a detailed discussion on the types of uncertainties and their relationship to risk-informed, performance-based fire protection. Uncertainty analysis with respect to risk assessments and change analysis is discussed in Section 5.3.

5.1.2 Fire Modeling Considerations

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 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 state that the fire models must be applied within their limitations and must be V&V'd.

Licensees should justify that the fire models and methods that the NRC has determined to be acceptable for use 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.

The NRC's Office of Nuclear Regulatory Research (RES) and the EPRI have documented the V&V for 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 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).

Since detailed fire modeling has typically not been performed and maintained as part of a traditional fire protection program, care should be taken to ensure that the input, assumptions, methods, and results are treated in a manner consistent with the requirements of NFPA 805 and plant-specific processes for engineering calculations and analyses. It is noted that key parameters/assumptions selected in fire modeling should be considered for monitoring.

5.1.3 Fire PRA Considerations

Configuration control of the Fire PRA model should be maintained by integrating the Fire PRA model into the existing processes used to ensure configuration control of the internal events PRA model. This process should align with Section 1-5 of the ASME PRA Standard and ensures that the licensee maintains an as-built, as-operated PRA model of the plant. Quality assurance of the Fire PRA is maintained via the same processes applied to the internal events model.

5.2 Monitoring

Section 2.6 of NFPA 805 discusses monitoring requirements associated with a risk-informed, performance-based fire protection program. The following are the requirements from Section 2.6:

> ***2-6* Monitoring.*** *A monitoring program shall be established to ensure that the availability and reliability of the fire protection systems and features are maintained and to assess the performance of the fire protection program in meeting the performance criteria. Monitoring shall ensure that the assumptions in the engineering analysis remain valid.*
>
> ***2-6.1 Availability, Reliability, and Performance Levels.*** *Acceptable levels of availability, reliability, and performance shall be established.*
>
> ***2-6.2 Monitoring Availability, Reliability, and Performance.*** *Methods to monitor availability, reliability, and performance shall be established. The methods shall consider the plant operating experience and industry operating experience.*
>
> ***2-6.3 Corrective Action.*** *If the established levels of availability, reliability, or performance are not met, appropriate corrective actions to return to the established levels shall be implemented. Monitoring shall be continued to ensure that the corrective actions are effective*

Section 2.3 of NFPA 805 provides additional requirements related to assumptions used in performing engineering analyses to support a risk-informed, performance-based fire protection program. The following requirements are included:

> ***2.3 Assumptions.*** *The following assumptions are provided to perform a deterministic analysis of ensuring the nuclear safety performance criteria are met. [Performance-based information (i.e., equipment out of service, equipment failure unrelated to the fire, concurrent design basis events) are integral parts of a PSA and shall be considered when performance-based approaches are utilized.]*

Section 2.4.2.1 of NFPA 805 discusses systems and equipment utilized to meet the nuclear safety performance criteria. One requirement cited for those systems and equipment relates to availability and reliability:

> ***2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection****…Availability and reliability of equipment selected shall be evaluated.*

Section 2.4.3.3 of NFPA 805 discusses PSA (i.e., PRA) analyses performed to support fire risk evaluations:

> ***2.4.3.3**** *The PSA approach, methods, and data shall be acceptable to the AHJ. They shall be appropriate for the nature and scope of the change being evaluated, be based on the as-built and as-operated and maintained plant, and reflect the operating experience at the plant.*

As part of the transition review, the adequacy of the inspection and testing program to address fire protection systems and equipment within plant inspection and the compensatory measures programs should be reviewed. In addition, the adequacy of the plant corrective action program in determining the causes of equipment and programmatic failures and minimizing their recurrence should also be reviewed as part of the transition to a risk-informed, performance-based licensing basis.

5.2.1 Existing Guidance and Programs

The Maintenance Rule (10 CFR 50.65) and RG 1.174 are provided as examples in NFPA 805 Section A.2.6 of acceptable monitoring programs. However, the appendices of NFPA 805 are not part of the 50.48(c) rule and flexibility is provided to allow plant-specific processes to be established for performance monitoring. NEI Document NUMARC 93-01, Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, provides an acceptable approach to meet the Maintenance Rule. It includes methods for selecting equipment, establishing and applying risk significance criteria and performance criteria, goal setting and monitoring, assessing and managing risk, performing periodic assessment of performance, and necessary documentation. Although not required, NUMARC 93-01 may be consulted for ideas in developing/updating a monitoring program for fire protection and NSCA SSCs. Due to the efforts expended in complying with the maintenance rule for plant safety systems, a plant may determine that the incremental effort associated with adding selected NSCA SSCs and fire protection program systems and features to previously established programs may be less than establishing a new process or effort. NUMARC 93-01 is very flexible in recognizing the utilization of existing plant programs..

Plant/owner-operator specific initiatives have been undertaken to optimize fire protection surveillance and testing practices and frequencies for fire protection SSCs. This is allowed under traditional regulatory framework using a fire protection standard license condition. Therefore, there are established programs that could be used, enhanced, or modified in an effort to meet the monitoring requirements for fire protection SSCs as discussed in NFPA 805. If a licensee plans to utilize these initiatives post-transition, a discussion should be included in the monitoring section of the LAR/Transition Report and NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program and Design sections of the LAR/Transition Report. Other entities such as the Department of Defense and Department of Energy have participated in performance-based fire protection inspection and testing efforts. Therefore, there are a number of resources available to establish and maintain a risk-informed, performance-based program.

Acceptable levels of availability, reliability, and performance must be established for both fire protection SSCs and NSCA SSCs. This does not imply or require detailed statistical analysis of all fire protection and NSCA systems, features, components, and sub-components. Instead, determining acceptable levels of availability, reliability, and performance should be commensurate with their risk significance and may be established at the structure, system, or component level, or aggregates of these, where appropriate. It is up to individual plants to establish goals and criteria for acceptable levels of availability and reliability.

5.2.2 Monitoring Program Development

It is expected that a monitoring program for a risk-informed, performance-based fire protection program would be established in phases, with elements added as more of the program relies upon risk-informed, performance-based techniques. It is important to identify parts of the program that may require additional attention during the transition and change evaluation process. Likely candidates would include monitoring of NSCA equipment or other plant equipment that is not part of the traditional 10 CFR 50, Appendix R post-fire safe shutdown analysis and whose availability is an important component of limiting fire risk. Other attributes may include features that are integral to successful fire modeling in an area, but may not have been considered important in a deterministic approach.

It is expected that a more refined monitoring program (availability, reliability, and performance goals) would be established for the parts of the program where these techniques have been employed. For example, as risk-informed, performance-based techniques are used as part of the change process (i.e., fire modeling in a fire area, change in equipment in PRA model,

change in equipment relied upon to achieve the nuclear safety performance criteria, change in surveillance frequencies of fire protection equipment), the scope and depth of the monitoring program would need to be adjusted accordingly.

See Appendix E of this document for additional guidance on establishing a monitoring program. This guidance is provided on the four major phases of program development:

- Phase 1 – Scoping (fire protection, radioactive release, and NSCA SSCs and programmatic elements)
- Phase 2 – Screening Using Risk Criteria
- Phase 3 – Risk Target Value Determination
- Phase 4 – Monitoring Implementation

5.2.3 Monitoring Considerations

Monitoring programs for fire protection systems and features are not a new concept being introduced as part of a risk-informed, performance-based fire protection program. Surveillance, testing, inspection and maintenance of fire protection systems and features have always been part of a sound program. In addition, the system engineer functions at nuclear power plants have stressed system and equipment health, reliability, and availability.

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Risk-informed, performance-based reactor oversight has also increased attention on plant systems and features (including fire protection) with the greatest contribution to risk. Adoption of a risk-informed fire protection licensing basis, however, may introduce some different considerations that may not have been present in a traditional fire protection program.

- Calculations and analyses such as fire modeling, particularly a maximum expected and limiting fire scenario, rely on ~~core~~ key assumptions that help form the basis for acceptability of configurations and changes to those configurations. These assumptions and input conditions may be different in content and form than previously analyzed.

  For example, a fire scenario in a traditional program may have assessed fire hazards by monitoring the combustible loading represented by a BTU/square foot value in an area, which would be monitored by a plant combustible control program. Under a risk-informed, performance-based program, fire modeling, using more advanced and accurate predictions of fire behavior, may rely on a certain quantity of oil spill from a pump motor or containment of spilled oil by a retaining berm. The factors that influence results of fire scenarios should be included within an administrative or design control/monitoring program.
- Suppression systems, relied upon specifically in a calculation for core damage frequency, have reliability and availability values that will have been used in the calculations. Systems that are integral to prevention of risk-significant fire scenarios may require monitoring to meet numerical availability numbers in order to satisfy risk acceptance criteria.
- Traditional safe shutdown analyses have relied upon safe shutdown equipment (e.g., NSCA SSCs) being in service at the start of a fire. A risk-informed, performance-based approach, particularly in a risk model that calculates core damage frequency, considers both NSCA SSCs and fire protection SSCs reliability and unavailability.
- The majority of NSCA SSCs relied upon to ensure post-fire nuclear safety performance criteria is met is equipment that is important for plant risk and mitigation of the consequences of design basis accidents. Therefore, most NSCA equipment important to fire risk will be subjected to inspection, testing, and performance monitoring as part of the Maintenance Rule process and subjected to a variety of plant controls and

processes. However, all NSCA equipment important to fire risk may not be part of an existing monitoring program. For example, there may be dominant fire risk contributors that are insignificant contributors to internal events risk. SSCs relied upon to recover from the event may, or may not, be safety significant for the Maintenance Rule. Outliers must be identified and incorporated as necessary into a monitoring program.

- Most of the fire protection features and systems are already being included in the existing fire protection inspection and test program and system/program health programs. The existing program is adequate for routine monitoring of the fire protection systems and features required by the fundamental program of Chapter 3 of NFPA 805 or of low safety significance for Chapter 4 of NFPA 805. The process outlined in Appendix E of this document determines those high safety significant fire protection systems and features, NSCA equipment and programmatic elements that may require additional monitoring beyond normal inspection, testing and surveillance activities.
- Due to different success criteria that are evaluated in a risk-informed, performance-based program, other fire protection systems and features may require monitoring. For example, a fire barrier previously not credited for 10 CFR 50, Appendix R compliance may be important to preventing fire from causing a fire-induced loss of offsite power or plant trip, which may prove to be risk significant. Another example is a fire barrier installed prior to efforts for compliance with 10 CFR 50, Appendix R that was abandoned in place without any credit taken for fire protection. This barrier may prove valuable in protecting risk significant circuitry against a credible fire (as determined by fire modeling).
- To demonstrate compliance with NFPA 805, action levels should be established for the monitored SSCs, which may be grouped together functionally in 'pseudo-systems' or 'performance monitoring groups' (PMG) to "ensure that the assumptions in the engineering analysis remain valid."
- Screening compartments and fire areas should also include considerations for design/operation/maintenance limitations. For instance, fire detection should not subdivide systems beyond the system/train/channel level used in normal operation/maintenance.

5.3 Plant Change Process

5.3.1 Overview

5.3.1.1 Regulatory Requirements and Guidance

The plant change evaluation is a required step in the methodology for all changes to previously approved fire protection program elements. NFPA 805 Section 2.2.9 states that:

> *In the event of a change to a previously approved fire protection program element, a risk-informed plant change evaluation shall be performed and the results used as described in 2.4.4 to ensure that the public risk associated with fire-induced nuclear fuel damage accidents is low and the adequate defense-in-depth and safety margins are maintained. [NFPA 805, Section 2.2.9]*

Section 2.4.4 of NFPA 805 provides the criteria against which the change evaluations are evaluated. It states that:

> *A plant change evaluation shall be performed to ensure that a change to a previously approved fire protection program element is acceptable. The evaluation process shall consist of an integrated assessment of acceptability of risk, defense-in-depth, and safety margins. [NFPA 805, Section 2.4.4]*

Details regarding the acceptance criteria are provided in Sections 2.4.4.1, 2.4.4.2, and 2.4.4.3 of NFPA 805.

- Section 2.4.4.1 requires the change in public health risk from any plant change be acceptable to the NRC as demonstrated by the change in CDF and LERF. The NRC already has established acceptable quantitative changes to the CDF and LERF in RG 1.174. The NRC has modified the quantitative acceptance criteria for making changes to the licensee's fire protection program without prior NRC review and approval. These acceptance criteria will be included in the licensee's post transition fire protection license condition. Specifically, these criteria should be applied to show that the public health risk associated with fire-induced nuclear fuel damage related to the change is acceptably low.
- Sections 2.4.4.2 and 2.4.4.3 for defense-in-depth and safety margin simply repeat the criterion in Section 2.2.9 requiring the adequate maintenance of these factors. Criteria complying with these requirements also are provided in RG 1.174 and this guidance. Note that sections 2.4.4.2 and 2.4.4.3 also indicate that the deterministic approach for meeting the performance criteria "shall be deemed to satisfy" requirements for defense-in-depth and safety margin.

Under the risk-informed, performance-based regulatory framework, Fire Protection Program changes ~~will~~ may be made without prior NRC approval, except where:

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- 10 CFR 50.48(c) changes that do not meet the acceptance criteria or other conditions of the approved license condition
- 10 CFR 50.48 (c)(2)(vii). Changes to the program that use 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). Changes to the program that use risk-informed or performance-based alternatives to compliance with NFPA 805 (i.e., methods that differ from those prescribed by NFPA 805)
- Combined changes where any individual change would not meet the risk acceptance criteria of the license condition.

This does not address all possible types of changes to the Fire Protection Program, which are described further in this section and Appendix J.

Commented [A13]: NRC: There was a section in the FAQ on definitions that was left out:

5.3.1.1DEFINITIONS

Two terms are used in this section to describe the process and documentation associated with Plant Change Evaluations as defined in NFPA 805 Section 2.2.9 and RG 1.205, Regulatory Position 3.2.

Fire Protection Change Impact Review – Process to consider the impact of plant or program changes on a case by case basis as they occur and to perform evaluation of the impact of Fire PRA periodic revisions.

NFPA 805 Change Evaluation Document –Engineering Evaluation (e.g., Calculation, Fire Safety Analysis, or Design Basis Document) that contains the changes to the NFPA 805 Fire Protection Program post-transition. It includes an evaluation of risk, defense in depth and safety margins relative to these changes.

For those changes that do require NRC approval, the licensee will 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.

A sample license condition, based on RG 1.205, Revision 1, with additional insights obtained during the pilot and non-pilot NFPA 805 Transition Process, is provided as Appendix O.

5.3.1.2 Process Overview

The change process (referred to as "Fire Protection Change Impact Review") under risk-informed, performance-based regulatory framework requires the explicit consideration of risk. The evaluation of risk is limited to the determination of whether an increase has occurred, and if so, whether the increase is within acceptable limits. A structured screening process can meet the requirements of NFPA 805 for this evaluation of risk. This screening process will be used to 'screen' minimal increases in risk. Minimal change in fire risk is defined as a change in fire risk that is so small or the uncertainties in determining whether a change in fire risk has occurred are

such that it cannot be reasonably concluded that the fire risk has actually changed (i.e., there is no clear trend towards increasing fire risk). For potentially higher risk changes, a more comprehensive treatment would be used. The intent of this approach is to provide analysis flexibility to address a wide range of issues and conditions. In general, the Fire Protection Change Impact Review process focuses on performing those Engineering Analyses needed to establish the acceptability of the change.

Note: Fire modeling is integral to a risk-informed, performance-based fire protection program. During the licensee transition process, some licensees may have elected to use the fire modeling approach of Section 4.2.4.1 of NFPA 805 to establish the compliance basis for certain fire areas in the plant. While this is an acceptable compliance approach, the post-transition change evaluation process must include the consideration of change in risk, defense-in-depth, and safety margin. While the fire modeling tools may provide the most efficient means to assist in that determination of a change in risk (e.g., no target damage shown through fire modeling can be extrapolated to no/low change in risk), the acceptance criteria of a change evaluation must be in accordance Section 2.4.4 of NFPA 805.

NFPA 805 Section 4.1, states that, "Deterministic requirements shall be "deemed to satisfy" the performance criteria and require no further engineering analysis." Chapter 4 of NFPA 805 provides the requirements for the baseline evaluation of the fire protection program's ability to achieve the performance criteria outlined in Section 1.5 of NFPA 805. The 'deemed to satisfy' without additional engineering analysis does not imply that a Fire Protection Change Impact Review would not be performed. For example, if a licensee was changing its current licensing basis in a fire area to a 'deterministic method', that change would require a 'Plant Change Evaluation'. Note the Defense-in-Depth and Safety Margin portion of the "Plant Change Evaluation' would be satisfied by the fact that a 'deterministic' option was chosen for compliance (See Sections 2.4.4.2 and 2.4.4.3 of NFPA 805).

Figure 5-1 depicts the Fire Protection Change Impact Review Process. The Fire Protection Change Impact Review can be divided into the following subtasks:

- Defining the Change (See Section 5.3.2)
- Performing the Preliminary Risk Screening (See Section 5.3.3)
- Performing the Risk Evaluation (See Section 5.3.4)
- Reviewing the Acceptance Criteria (See Section 5.3.5)

This process is intended to be guidance for review of individual plant changes, where the changes are assessed against the acceptance criteria. Another process for addressing Fire PRA updates (maintenance and/or upgrades)[5] and cumulative risk is provided in Appendix J. The process for addressing Fire PRA maintenance/upgrades and cumulative risk is intended to be performed periodically as Fire PRA maintenance/upgrades are made, but are not intended to replace the review of individual changes. In other words, for an individual change that warrants quantitative treatment, a change evaluation would be performed and documented. The cumulative risk treatment would be considered an integrated assessment that would evaluate potential risk increases that could occur since the last PRA update, and would include potential risk increases that may have been evaluated on an individual basis, as well as changes due to other reasons, such as data changes that result in changes to the risk profile.

[5] PRA updates can include either or both of maintenance and upgrade. PRA maintenance and PRA upgrade are defined in ASME/ANS RA-Sa-2009 or subsequent edition.

Appendix J contains additional information regarding the Fire Protection Change Impact Review. The following subsections provide guidelines for performing the reviews.

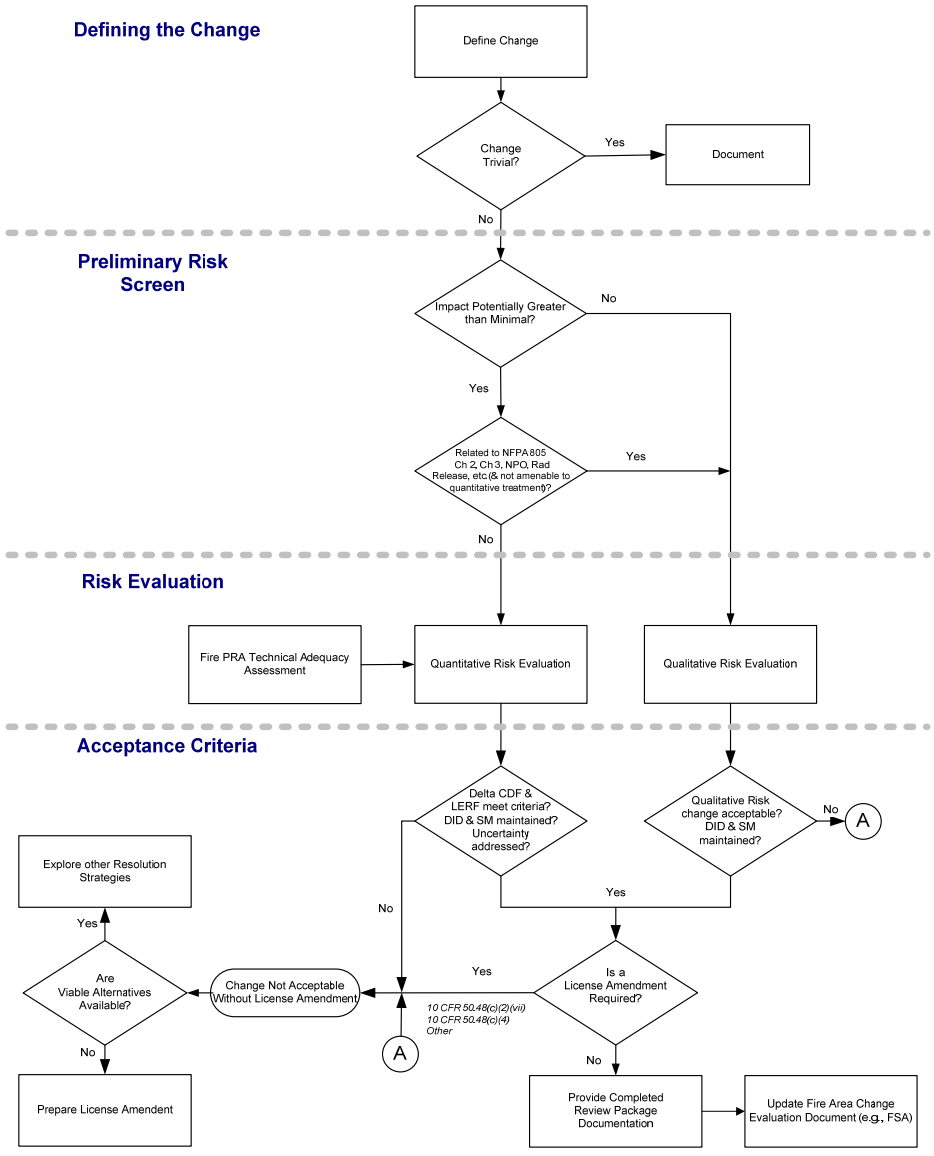

Figure 5-1 – Fire Protection Change Impact Review Process

5.3.2 Defining the Change

5.3.2.1 General Guidance

Changes can involve either physical components of the plant or specific details of the fire protection program. The need to perform a review can arise through a number of events or conditions.

- A physical plant modification that affects the fire protection program
- A programmatic change (e.g., change to a procedure, assumption, or analysis) that affects the fire protection program
- An in-situ condition (physical or programmatic) that is not in compliance with the plant's fire protection program. Note, appropriate compensatory measures, in accordance with the licensee's program, should be established and remain in place until the condition is accepted via applicable plant change processes

The Fire Protection Change Impact Review process begins by defining the change or altered condition to be examined and the compliant configuration as defined by the NFPA 805 Licensing Basis:

- The changed or altered condition or configuration that is not consistent with the current plant NFPA 805 Licensing Basis is defined as the proposed alternative. The proposed alternative may be another fully acceptable option under NFPA 805, but not currently used for the given situation.
- The compliant condition is defined as that plant condition or configuration that is consistent with the NFPA 805 Licensing Basis.

5.3.2.2 Specific Changes of Interest

It may not be appropriate to address certain types of changes to the fire protection program by quantitative risk-informed, performance-based treatment. These types of changes include:

- NFPA 805 Chapter 2 – Methodology/Process Changes
- NFPA 805 Chapter 3 – Fundamental Fire Protection Program and Design Elements
- Non-Power Operational (NPO) Modes
- Radioactive Release Performance Criteria

This discussion is not intended to prohibit the use of risk-informed, performance-based treatment. Certain aspects of these sections of NFPA 805 may not warrant or be conducive to a risk-informed, performance-based treatment (e.g., NFPA 805 Chapter 3 fire protection systems or features whose risk contribution can be quantitatively estimated using the Fire PRA). Other topics in these sections of NFPA 805 however, are programmatic in nature or clearly not amenable to risk-informed, performance-based treatment (e.g., Design Basis Document requirements in Section 2.7.2.1 of NFPA 805). The discussion below addresses ways to address these types of changes to the Fire Protection Program.

NFPA 805 Chapter 2 – Methodology/Process Changes

NFPA 805 Chapter 2 provides a general approach for establishing the fire protection requirements for the plant. NFPA 805 Chapter 2 provides a combination of:

- General methodology, and
- Requirements, which should be reviewed for impact, when changes are proposed to the fire protection program.

Plant-specific implementation of the methodology and requirements of NFPA 805 Chapter 2 are addressed in the NFPA 805 Safety Evaluation for the plant. Therefore, changes to the methodology for implementing NFPA 805 should be reviewed as part of the plant change process. Changes related to NFPA 805 Chapter 2 may not be the types of changes that can be measured in terms of change in risk or maintaining defense-in-depth and safety margins. Changes to methodologies, however, should be reviewed to determine acceptability and need to obtain approval from the NRC.

Methodology changes may be made to the plant fire protection program within the bounds of the license condition. Changes to the fire protection program related to NFPA 805 Chapter 2 can be made under the following circumstances:

- The change meets the literal requirements of NFPA 805 Chapter 2.
- The change is considered to be editorial or trivial in nature and clearly has no adverse impact on the fire protection program.
- The change is consistent with the plant specific licensing basis as defined in the NFPA 805 Safety Evaluation or accepted by the NRC in a formal process such as the NFPA 805 FAQ process and the results meet the appropriate acceptance guidelines.

Additional guidance on Fire PRA methods and determination of Fire PRA Technical Adequacy are provided in Appendix J.

NFPA 805 Chapter 3 – Fundamental Fire Protection Program and Design Elements

General Guidance

Comparison of the NFPA 805 Chapter 3 requirements for a licensee is addressed in the NFPA 805 Safety Evaluation. Therefore, changes to the plant's compliance with NFPA 805 Chapter 3, as approved in the Safety Evaluation and subsequent updates performed in accordance with the license condition, should be reviewed as part of the plant change process. Types of changes related to NFPA 805 Chapter 3 are not likely to be the types of changes that can be measured in terms of a quantitative change in risk.

Changes, however, should be reviewed to determine acceptability and need to obtain approval from the NRC. The changes should be reviewed against the approved configuration in the Safety Evaluation, as supplemented by subsequent Change Evaluations that have been performed since the approval of the Safety Evaluation in accordance with the license condition. The individual Fire Protection Change Impact Review should consider changes against the last approved fire protection program document (e.g., Fire Safety Analysis, Design Basis Document, etc.).

Certain aspects of Chapter 3 may warrant or be conducive to a risk-informed, performance-based treatment. For example, NFPA 805 Chapter 3 fire protection systems or features whose risk contribution can be quantitatively estimated using the Fire PRA. The change in risk associated with these types of changes should be measured quantitatively, as appropriate, and subject to the risk acceptance criteria of the license condition. Outstanding changes to the approved fire protection program are addressed on a cumulative basis as discussed in Appendix J, Section J.6.2.

10 CFR 50.48(c)(2)(vii)

As discussed in Section 2.2 and 5.3.1.1, 10 CFR 50.48(c)(2)(vii) provides additional requirements related to NFPA 805 Chapter 3. 10 CFR 50.48(c)(2)(vii) states, in part:

> *(vii) Performance-based methods. Notwithstanding the prohibition in Section 3.1 against the use of performance-based methods, the fire protection program elements and minimum*

design requirements of Chapter 3 may be subject to the performance-based methods permitted elsewhere in the standard. Licensees who wish to use performance-based methods for these fire protection program elements and minimum design requirements shall submit a request in the form of an application for license amendment under § 50.90…

The review of the change should ensure that the compliance with NFPA 805, Chapter 3, does not utilize performance-based methods, other than those approved as part of the transition process or allowed per the license condition (e.g., "functionally equivalent" or "adequate for the hazard" evaluations).

Special Considerations for Certain NFPA 805 Chapter 3 Sections

Prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3, fundamental fire protection program elements and design requirements for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to an NFPA 805, Chapter 3, element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer should perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard.

This condition does not apply to any demonstration of equivalency under Section 1.7 of NFPA 805.

The licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3, elements are acceptable because the alternative is "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer should perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

- "Fire Alarm and Detection Systems" (Section 3.8);
- "Automatic and Manual Water-Based Fire Suppression Systems" (Section 3.9)
- "Gaseous Fire Suppression Systems" (Section 3.10); and
- "Passive Fire Protection Features" (Section 3.11).

Licensees may request, in accordance with 10 CFR 50.48(c)(2)(vii), NRC approval of a method, using a bounding analysis approach, to use when evaluating minor changes to elements in NFPA 805, Chapter 3. Upon NRC approval of the bounding method, the licensee may make subsequent minor changes to Chapter 3 elements by performing an engineering analysis to demonstrate that the proposed change is within the scope of the approved method and complies with the bounding conditions. The licensee's fire protection license condition will reference the approval to make these changes.

See Appendix J for guidance on the treatment of changes related to NFPA 805 Chapter 3, Fundamental Fire Protection Program and Design Elements.

Non-Power Operational (NPO) Modes

Changes may be made to the plant response to fires originating in non-power operational modes using the same basic process as fires originating in at-power operational modes in the

NSCA. However, due to the current state of knowledge/practice in the industry, the change in risk associated with fire protection changes may be performed qualitatively, rather than quantitatively. Plant-specific approval of the process for addressing fires originating in non-power operational modes is contained in the NFPA 805 Safety Evaluation for the plant.

Changes, however, should be reviewed to determine acceptability and need to obtain approval from the NRC. The changes should be reviewed against the approved configuration in the Safety Evaluation, as supplemented by subsequent Change Evaluations that have been performed since the approval of the Safety Evaluation. The individual Fire Protection Change Impact Review should consider changes against the last approved fire protection program document (e.g., FSA, DBD, etc.).

Changes may be made to the plant fire protection program within the bounds of the license condition. Changes to the fire protection program related to NFPA 805 Chapter 4 for fires originating in non-power operational modes can be made under the following circumstances:

- The change meets the literal requirements of NFPA 805 Chapter 4, Section 4.2 for fires originating in non-power operational modes.
- The change is considered to be editorial or trivial in nature and clearly has no adverse impact on the fire protection program.
- The change is not editorial or trivial, but a qualitative evaluation of change in risk using an engineering evaluation shows the change is acceptable, including maintenance of defense-in-depth and safety margins.
- The change is evaluated using the process used in the transition or accepted by the NRC in a formal process such as the NFPA 805 FAQ process and the results meet the appropriate acceptance guidelines.

Radioactive Release Performance Criteria

Changes may be made to the plant fire protection program as it relates to meeting the radioactive release performance criteria. The change in risk associated with radioactive release changes is performed qualitatively. Plant-specific approval of the process for addressing the impact of fire on radioactive release is contained in the NFPA 805 Safety Evaluation for the plant.

Changes, however, should be reviewed to determine acceptability and need to obtain approval from the NRC. The changes should be reviewed against the approved configuration in the Safety Evaluation, as supplemented by subsequent Change Evaluations that have been performed since the approval of the Safety Evaluation. The individual Fire Protection Change Impact Review should consider changes against the last approved fire protection program document (e.g., FSA, DBD, etc.).

Changes may be made to the plant fire protection program within the bounds of the license condition. Changes to the fire protection program related to NFPA 805 Chapter 4, Section 4.3 can be made under the following circumstances:

- The change meets the literal requirements of NFPA 805 Chapter 4, Section 4.3.
- The change is considered to be editorial or trivial in nature and clearly has no adverse impact on the fire protection program.
- The change is evaluated using the process used in the transition or accepted by the NRC in a formal process such as the NFPA 805 FAQ process and the results meet the appropriate acceptance guidelines.

5.3.2.3 Trivial Changes

Trivial Changes - Changes such as editorial changes to procedures are not required to be processed through the Fire Protection Change Impact Review Process.

5.3.3 Preliminary Risk Screening

Once the definition of the change is established, a screening is performed. This screening is consistent with fire protection regulatory review processes in place at nuclear plants under traditional licensing bases. This process will address most administrative changes (e.g., organizational changes, plant administrative procedure changes, etc.).

The characteristics of an acceptable screening process that meets the "assessment of the acceptability of risk" requirement of Section 2.4.4 of NFPA 805 are:

- The quality of the screen is sufficient to ensure that potentially greater than minimal risk increases receive detailed risk assessments appropriate to the level of risk.
- The screening process must be documented and be available for inspection by the NRC.
- The screening process does not pose undue evaluation or maintenance burden.

If any of the above is not met, proceed to Section 5.3.4 Risk Evaluation.

The impact of the plant change on each of these factors can be evaluated (either qualitatively or quantitatively) and categorized as: "no" impact, "minimal" impact or "potentially greater than minimal" impact. The nature of the change would enable a licensee to choose among the three categories. The licensee should document the basis for the conclusion. The acceptance criteria also include consideration of defense-in-depth and safety margin, which would typically be qualitative in nature. The level of review for defense-in-depth and safety margin should be commensurate with the nature and complexity of the change. For those changes that do not meet the screening criteria, a more detailed Risk Evaluation is required.

The preliminary risk screening and risk evaluations should also identify decreases in risk that are associated with the change. Depending upon the nature and magnitude of the decrease, consideration should be given to updating the risk model to account for the decrease.

5.3.4 Risk Evaluation

The screening is followed by engineering evaluations that may include risk assessment techniques. The results of these evaluations are then compared to the acceptance criteria. Changes that satisfy the acceptance criteria of NFPA 805 Section 2.4.4 can be implemented within the framework provided by NFPA 805. Changes that do not satisfy the acceptance criteria cannot be implemented within this framework. The acceptance criteria also include consideration of defense-in-depth and safety margin, which would typically be qualitative in nature.

The change should be evaluated to determine the need for and nature of engineering analysis that may be necessary to support the change.

5.3.4.1 Quantitative Risk Evaluations

Overview

The quantitative risk evaluation involves the application of risk assessment techniques to obtain a measure of the changes in risk associated with the proposed change. In certain circumstances, an initial evaluation in the development of the risk assessment could be a simplified analysis using bounding assumptions provided the use of such assumptions does not unnecessarily challenge the acceptance criteria discussed in Section 5.3.5.

The quantitative Change Evaluation process begins by defining the change or altered condition to be examined and the compliant configuration as defined by the NFPA 805 Licensing Basis:

- The changed or altered condition or configuration that is not consistent with the NFPA 805 Licensing Basis, but is the anticipated final configuration, is defined as the proposed alternative (Case 1)
- The compliant condition is defined as that plant condition or configuration that is consistent with the NFPA 805 Licensing Basis (Case 2).

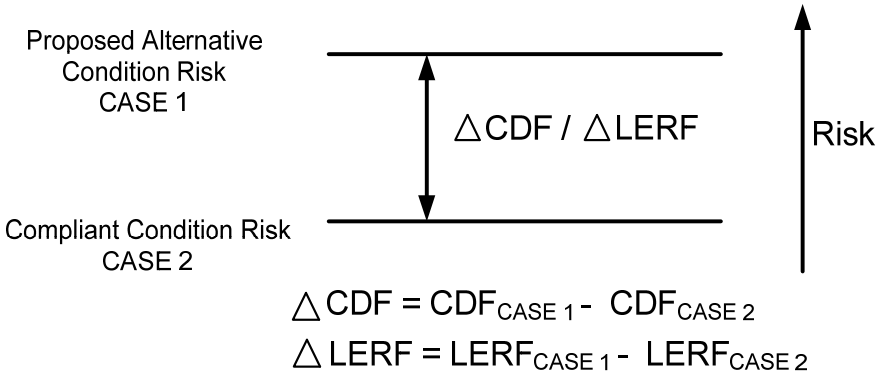

Figure 5-2 – Compliant versus Changed/Altered Conditions (for an example risk increase)

Note that the compliant condition (Case 2) is the risk associated with the NFPA 805 licensing basis, but not necessarily deterministic compliance with Section 4.2.3 of NFPA 805. It is also relative to the latest revision of the plant Fire PRA that has been evaluated per the process in Appendix J, Section J.6.1, Fire PRA Update Impact on Fire Protection Program.

Technical Adequacy

Section 2.4.3.3 of NFPA 805, which applies to the Fire PRA used during NFPA 805 transition in performing fire risk evaluations and post-transition in performing Change Evaluations, includes, in part, the following:

The PSA approach, methods, and data shall be acceptable to the AHJ.

In order to perform a quantitative risk evaluation using the Fire PRA, the technical adequacy of the Fire PRA must be ensured to support the specific change evaluation. The accuracy of the technical content of the Fire PRA must be sufficient to justify the specific results and insights that are used to support the change evaluation process.

Refer to Appendix J for additional detail on Fire PRA technical adequacy and treatment of changes to the Fire PRA.

5.3.4.2 Qualitative Risk Evaluations

Qualitative risk evaluations can be performed where quantitative treatment is not warranted. Qualitative risk evaluations can also be performed where engineering judgment and analysis provides a more appropriate assessment of risk than numerical treatment.

Qualitative risk evaluations are performed for topics such as:

- NFPA 805 Chapter 2 – Methodology/Process Changes
- NFPA 805 Chapter 3 – Fundamental Fire Protection Program and Design Elements
- Non-Power Operational (NPO) Modes
- Radioactive Release Performance Criteria

Qualitative risk evaluations may also be used to address changes to the "at power" Nuclear Safety Capability Assessment, in cases where the qualitative treatment provides an appropriate assessment of risk.

The risk evaluations should use engineering analysis to assess the impact of the proposed change. The complexity of the evaluation should be commensurate with the significance of the change. For example, the complexity and level of analysis to support a change identified as "not potentially greater than minimal" would likely not be extensive, while a substantial change to the NPO analysis may involve a more detailed review and assessment.

5.3.5 Review of Acceptance Criteria

5.3.5.1 Quantitative Risk Evaluations

Quantitative Risk Acceptance Criteria

Each licensee's plant-specific license condition (as well as the Example License Condition in Appendix O, includes risk acceptance guidance acceptable to the AHJ. The fire protection license condition either specifies or references the following quantitative risk acceptance criteria for self-approval of changes:

- Individual changes that result in a risk increase less than 1×10^{-7}/year (yr) for CDF, and
- Individual changes that result in a risk increase less than 1×10^{-8}/year (yr) for LERF.

Prior NRC approval is also not required for changes that clearly result in a decrease in risk.

If the self-approval guidelines are not met, a LAR must be submitted to the NRC for review and approval. The NRC will use the guideline values in RG 1.174 which are applicable to the cumulative change in risk of all changes in the Fire Protection Program, or credited for the Fire Protection Program, after transition to NFPA 805.

Defense-in-Depth

The result of the proposed change must also satisfy defense-in-depth and safety margin considerations. In general, the defense-in-depth requirement is satisfied if the proposed change does not result in a substantial imbalance in:

- Preventing fires from starting,
- Detecting fires quickly and extinguishing those that occur, thereby limiting damage, and
- Providing adequate level of fire protection for structures, systems and components important to safety so that a fire that is not promptly extinguished will not prevent essential plant safety functions from being performed.

A process to evaluate the defense-in-depth implications of changes to the Fire Protection Program was developed and applied during the transition to NFPA 805. This process should be applied to changes to the Fire Protection Program following transition.

Safety Margins

The licensee is expected to choose the method of engineering analysis appropriate for evaluating whether sufficient safety margins would be maintained. An acceptable set of

guidelines for making that assessment is summarized below. Other equivalent acceptance guidelines may also be used.

- Codes and standards or their alternatives accepted for use by the NRC are met, and
- Safety analysis acceptance criteria in the licensing basis (e.g., FSAR, supporting analyses) are met, or provides sufficient margin to account for analysis and data uncertainty.

A process to evaluate whether sufficient safety margins are maintained following changes to the Fire Protection Program was developed and applied during the transition to NFPA 805. This process should be applied to changes to the Fire Protection Program following transition.

The requirements related to safety margins for the change analysis is described for each of the specific analysis types used in support of the fire risk assessment. These analyses can be grouped into three example categories. These categories are:

- Fire Modeling
- Plant System Performance
- Fire PRA Logic Model

Fire Modeling

Fire modeling used in support of the NFPA 805 Change Evaluations (i.e., as part of the Fire PRA) should use evaluation tools that have been subjected to appropriate Verification and Validation testing. The use of the fire modeling tools ~~should~~ shall be within its limitations for use. Users should be qualified to use the models.

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Plant System Performance

The development of the fire risk assessment may involve the re-examination of plant system performance given the specific demands associated with the postulated fire event. The methods, input parameters, and acceptance criteria used in these analyses need to be reviewed against that used for the plant design basis events. This review would serve to establish that the Safety Margin inherent in the analyses for the plant design basis events have been preserved in the analysis for the fire event and therefore satisfy the requirements of this section.

Fire PRA Logic Model

The quantification for fire related CDF/LERF relies upon the Fire PRA model. It is recognized that use of a Fire PRA often requires model modifications to be performed to the internal events PRA. These modifications may include altering basic event failure probabilities, adding basic events, and logic structure changes. These changes should be evaluated against the methods and criteria for the overall Fire PRA model development for consistency, or confirmation of bounding treatment, to confirm that the Safety Margin inherent in the Fire PRA model is preserved.

Uncertainty Considerations

NFPA 805 Section 2.7.3.5 requires uncertainty analysis to provide reasonable assurance that the performance criteria have been met. This is accomplished by the analysis of uncertainties in the Fire PRA that support the change evaluation. As part of the review of the Fire PRA to support a NFPA 805 Change Evaluation, consideration should be given to sources of uncertainty that could affect the results.

Uncertainty can be addressed by identifying key assumptions and determining whether a reasonable alternative to those assumptions would substantively change the decision whether the proposed change is acceptable. There will be an uncertainly and sensitivity study that was

used to support the initial transition that reflects the method used by the licensee and the particular configuration of the plant.

5.3.5.2 Qualitative Risk Evaluations

Qualitative risk evaluations are performed for topics such as:

- NFPA 805 Chapter 2 – Methodology/Process Changes
- NFPA 805 Chapter 3 – Fundamental Fire Protection Program and Design Elements
- Non-Power Operational (NPO) Modes
- Radioactive Release Performance Criteria

Qualitative risk evaluations may also be used to address changes to the “at power” Nuclear Safety Capability Assessment, in cases where the assessment bounds numerical treatment or if the qualitative treatment provides a more appropriate assessment of risk than numerical treatment. The risk evaluations should use engineering analysis to assess the impact of the proposed change. The evaluation should also consider the impact of the change on defense-in-depth and safety margins, using the same process and criteria described in Section 5.3.5.1 for quantitative risk evaluations.

5.3.5.3 License Amendment Determination

Based upon the nature of the change and the results of the review, a decision is made as to whether prior NRC review and approval is needed. An example license condition based on RG 1.205 Revision 1 and pilot and non-pilot lessons learned is included as Appendix O. A number of steps in the review could identify the need for a license amendment, such as:

- Change in CDF or LERF associated with the change exceeds the criteria in the plant specific license condition and approval is desired.
- Defense-in-depth or Safety Margin are not maintained and approval of the configuration is desired.
- Fire PRA Technical Adequacy cannot be demonstrated and the Fire PRA methods, data or assumptions cannot be concluded to be “acceptable to the AHJ” and approval is desired.
- 10 CFR 50.48 (c)(2)(vii). Changes to the program to use NFPA 805 performance-based methods that were not previously approved by the NRC 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). Changes to the program to use risk-informed or performance-based alternatives to compliance with NFPA 805 that were not previously approved by the NRC (i.e., methods that differ from those prescribed by NFPA 805)
- Combined changes where any individual change would not meet the risk acceptance criteria of the license condition.
- Processes and methods described in the NFPA 805 LAR and approved in the NFPA 805 Safety Evaluation have changed to the extent that NRC approval is desired.
- Other regulations, technical specifications, license condition, or requirements requires NRC approval.

If the reviews determine that a License Amendment is necessary, the licensee should submit the request using licensee-specific processes for submittal under 10 CFR 50.90.

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A. DEFINITIONS

Section 1.6.3 of NFPA 805 defines Authority Having Jurisdiction (AHJ). The NRC is the AHJ for purposes of nuclear health and safety and common defense and security.

Refer to Section 1.6 of NFPA 805 for additional definitions associated with the Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants.

B. DETAILED TRANSITION PROCESS

B.1. Transition of Fundamental Fire Protection Program and Design Elements

Most plants have their pre-transition fire protection licensing basis documented with a comparison against BTP 9.5-1, Appendix A or NUREG-0800 and the NFPA 805 Chapter 3 requirements are similar to those requirements. Therefore, the transitioning of the licensee's licensing basis over to NFPA 805, Chapter 3 should be relatively straightforward. The team performing the NFPA 805, Chapter 3 transition should possess a detailed knowledge of all aspects of the stations licensing basis, active and passive fire protection features and the programmatic/procedural aspects of the fire protection program.

The steps to be used in developing the Chapter 3 Fundamentals Transition Package are shown in the flowchart depicted in Figure 4-2.

Using the pre-transition fire protection licensing basis documentation, the transition team systematically steps through the requirements outlined in NFPA 805, Chapter 3. Each of the Chapter 3 Fundamental Elements is reviewed and the basis for compliance documented. The basis for compliance should be either:

- Literal compliance with the requirement as listed in NFPA 805, which includes compliance with intent (e.g., NFPA 805 specifies a requirement should be in the pre-plans but the licensee has it in a procedure),
- Previous approval as documented in an NRC Safety Evaluation,
- For fundamental elements that can be transitioned over using engineering evaluations (existing or created during the transition) that have been made in accordance with an appropriate application of the currently deterministic guidelines (e.g., Generic Letter 86-10), and evaluated under the requirements of 10 CFR 50.59, or the fire protection standard license condition (Fire Protection Program Reviews), be considered acceptable for transition to the new fire protection licensing basis (FAQ 07-0033) These engineering evaluations will not be considered a change nor would they require NRC approval. The bases for acceptability of these engineering evaluations should be included in the documentation.

For fundamental elements that do not have one of these methods of compliance demonstrated, one of the following options should be chosen:

- Determine if the plant / program should be brought into compliance with the NFPA 805 requirements.
- Determine if this issue will be included in the transition License Amendment.

The review results should be documented in a retrievable form (e.g., relational database). The following considerations should be made when documenting 'compliance statements' to NFPA 805 Chapter 3:

- The use of the following terminology for documenting the 'level' of compliance with NFPA 805 Chapter 3
- Complies - Items that are transitioning fully compliant "as-is".
- Complies with Clarification - Items that are not in 'literal compliance' with the requirement as listed in NFPA 805 but should be transitioned as complies. For example, NFPA 805 specifies that a requirement should be in the pre-plans but the licensee has it in a procedure. This is an editorial issue and compliance should be explained in the compliance basis field.

- Complies via Previous Approval – Items which previous NRC approval is being claimed or documented. When claiming previous approval, excerpts from the NRC documents that provided the formal approval should be included in documentation, as well as appropriate excerpts from licensee's submittals. Compliance statements of "Complies via previous Approval" should be accompanied by confirmation that the bases for acceptability remain valid.
- Complies with Use of EEEEs – Items that are transitioning via the use of Existing Engineering Equivalency Evaluations (EEEEs).
- 'Gray areas' may arise during the determination of previous NRC approval. Refer to Section 2.3 of this document for guidance on this determination of what constitutes previous NRC approval.
- For each Reference Document that is referenced as part of the transition review, provide sufficient documentation to provide traceability back to the determination. For example, provide, as appropriate, information such as revision number, date, and section/page number in order to make the statements as clear as possible to facilitate reviews and long term configuration management.
- Some areas of the reviews may only be applicable to a single unit or to one or more fire areas. During review of the NFPA 805 Chapter 3 sections, applicability of specific compliance statements to specific unit(s) or fire area(s) should be documented.

The following are examples of a Table B-1 Report of the information necessary for the transition report.

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Table B-1 – NFPA 805 Chapter 3 Transition (Complies)

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document	Document Detail
3.3.1.3.3 [Control of Ignition Sources for Leak Testing]	3.3.1.3.3 Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing	Complies	No Additional Clarification	FPP-001, Fire Protection Program Manual, Rev. 029,	Section 8.3.2e

Table B-1 – NFPA 805 Chapter 3 Transition (Complies with clarification)

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document	Document Detail
3.3.1.3.2 [Control of Ignition Sources on Smoking Limitations]	3.3.1.3.2 Smoking and other possible sources of ignition shall be restricted to properly designated and supervised safe areas of the plant.	Complies with Clarification	Smoking is prohibited inside all site structures, and only allowed in specific designated outside areas per procedure AP-003. Restrictions for other possible ignition sources are addressed by section 3.3.1.3.1,3,4.	AP-003, General Plant Personnel Safety and Housekeeping, Rev. 026,	Section 6.2.6.5

Table B-1 – NFPA 805 Chapter 3 Transition (Complies via Previous Approval)

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document	Document Detail
3.5.5 [Water Supply Pump Separation Requirements]	3.5.5 Each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers.	Complies via Previous Approval	Submittal Document NLS-86-137 Section C.6.b(6) Project Conformance "As shown in FSAR Figure 9.5.1-1 two 100% capacity fire pumps, one electric and one diesel driven, installed in accordance with NFPA 20, are provided. The pumps are installed at opposite ends of the emergency service water intake structure which provides spatial separation in lieu of a fire wall." SER section 9.5.1 pg 9-51 states in part "The fire pumps are located in the emergency service-water screening structure. The fire pumps are separated by the intake water structure. A single fire is, therefore, unlikely to cause damage to both pumps. Based on its review, the staff concludes that the fire protection water supply system meets Section C.6.c of BTP CMEB 9.5-I and is, therefore, acceptable."	Shearon Harris FSAR Amendment 53, , Rev. , NUREG 1083, NUREG 1083, Rev. ,	section 9.5.1, page 9.5.1-21

Table B-1 – NFPA 805 Chapter 3 Transition (Complies with Use of EEEEs)

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document	Document Detail
3.5.10 [Water Supply Yard Main Code Requirements]	3.5.10 An underground yard fire main loop, designed and installed in accordance with NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be installed to furnish anticipated water requirements.	Complies via engineering evaluation	See NFPA 24 Code Compliance Evaluation	OFP-1017, Code Compliance Evaluation NFPA 24, Rev. 1,	

B.2. Compliance with Nuclear Safety Performance Criteria

B.2.1 Establishing Compliance with NFPA 805 Section 2.4.2

B.2.1.1 Background

Nuclear Safety Performance Criteria (NSPC) are established in Section 1.5.1 of NFPA 805. There are four substantial differences between these NSPC and traditional fire protection requirements/guidance from 10 CFR 50, Appendix R/NUREG-0800. These differences arise from the statements of the criteria, the scope of their applicability, and the nuclear safety goal they support. These differences are described below and guidance is provided on how to apply these differences in an evaluation of the extent to which the fire protection programs meet NFPA 805.

- The NSPC established in Section 1.5.1 of NFPA 805 require that "Fire protection features shall be capable of providing reasonable assurance that, in the event of a fire, the plant is not placed in an unrecoverable condition."
- This requirement on fire protection features introduces a change from the traditional requirements, which focus on achieving and maintaining safe shutdown in the event of a fire. By shifting the focus from safe shutdown to avoiding an unrecoverable condition, NFPA 805 introduces flexibility in the analysis necessary to show that the NSPC have been met. In particular, in many cases it will be sufficient to show that a plant can achieve and maintain hot shutdown (standby) in the event of a fire.
- A second substantial difference between the NSPC and existing requirements arises from the scope of applicability of the NSPC. NFPA 805 specifies the minimum fire protection requirements for existing light water nuclear power plants during all phases of plant operation, including degraded conditions, shutdown and decommissioning.
- By including all phases of plant operation, including shutdown, degraded conditions, and decommissioning, NFPA 805 requires additional analyses of fire protection features that have not generally been conducted by power plant licensees. Strategies for addressing this broadened scope of analysis of fire protection features for all plant conditions are discussed in the guidance in Appendix F of this document.
- A third substantial difference between the NSPC and existing requirements arises from the Nuclear Safety Goal (NSG) in Section 1.3.1 of NFPA 805. It states "The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition."
- By including any plant configuration, the NSG may require additional analyses of fire protection features. Because analyses of all configurations cannot be performed, bounding configurations must be identified and analyzed. An evaluation may show that existing fire protection analyses have included the bounding configurations for operation.
- The fourth substantial difference arises from the focus on maintaining the fuel in a safe and stable condition. Safe and Stable Conditions are defined in Section 1.6.56 of NFPA 805 as "For fuel in the reactor vessel, head on and tensioned, safe and stable conditions are defined as the ability to maintain K(eff) < 0.99, with a reactor coolant temperature at or below the requirements for hot shutdown for a boiling water reactor and hot standby for a pressurized water reactor. For all other configurations, safe and stable conditions are defined as maintaining K(eff) < 0.99 and fuel coolant temperature below boiling." Therefore, to be in a safe and stable condition, it may not be necessary to perform a transition to cold shutdown as currently required under 10 CFR 50, Appendix R/NUREG-0800.

Thus, the definition of safe and stable conditions provides more flexibility in showing that the NSPC have been met than for non-power modes of operation.

B.2.1.2Methodology Review Process

Summary

The suggested methodology for transition of the Nuclear Safety Performance Criteria is as follows:

Section 2.4.2 of NFPA 805 establishes the methodology for conducting a safety capability assessment for determining achievement of the nuclear safety criteria in NFPA 805 Chapter 1. To a large extent, the activities to be undertaken to implement this methodology have already been completed for the purposes of determining compliance with the existing requirements.

Tables B-2 and B-3 of this Appendix outline a recommended method to review the acceptability of a program for transition by examining the basic components of a nuclear safety capability assessment. These worksheets organize the transition of the 'pre-transition safe shutdown analysis' to the 'nuclear safety analysis' as follows:

1. Nuclear Safety Capability System and Equipment Selection
2. Nuclear Safety Capability Circuit Analysis
3. Nuclear Safety Equipment and Cable Location
4. Fire Area Assessment

The review should be conducted against the methodology provided in NEI 00-01 Chapter 3, "Deterministic Methodology". This review is intended to ensure that the transitioning nuclear safety analysis meets basic established criteria for identification and analysis of equipment and cables. Exceptions and clarifications identified during the transition review should be documented in order to provide a well-established baseline for future changes.

Note: NEI 00-01 Chapter 3 contains methodology and "acceptable methods", but does not contain regulatory requirements. NEI 00-01 Chapter 3 has methods that "can" and "may" be used to perform an analysis in an acceptable and/or efficient manner. Judgment will be necessary to determine the impact of a lack of alignment with NEI 00-01 guidance on the acceptability of the methodology transition.

Suggested Process

Figure B-1 depicts the suggest process.

Step 1 - Assemble Documentation

Gather industry and plant-specific information.

Industry Documentation

- NFPA 805, 2001 edition
- Applicable Sections of NEI 00-01
- Outstanding FAQs related to the Nuclear Safety Methodology Transition and status documents such as NRC comments and comment resolutions.

Plant specific calculations/analyses

Gather core methodology documents and plant specific calculations/analyses for:

- Safe shutdown system and equipment selection (NFPA 805 Section 2.4.2.1)
- Safe shutdown cable identification (NFPA 805 Section 2.4.2.2)

- Safe shutdown equipment and cable location (NFPA 805 Section 2.4.2.3)
- Fire area assessment and supporting analyses (operator manual action feasibility) (NFPA 805 Section 2.4.2.4)

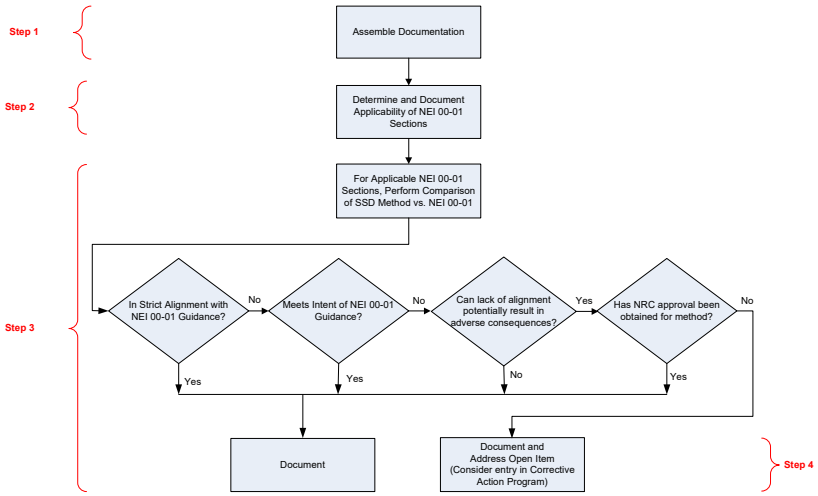

Figure B-1 – Summary of Nuclear Safety Methodology Review Process

Step 2 – Determine and Document NFPA 805 Applicability of NEI 00-01 Sections

Step 2.1 – Correlate the NFPA 805 Section 2.4.2 Section to the corresponding sections of NEI 00-01 Chapter 3.

Step 2.2 - Based upon the content of the NEI 00-01 methodology statements, determine if the section is applicable to the plant. Examples where a section may not be applicable include:

- For a PWR, guidance provided in NEI 00-01 specifically for BWRs.
- Specific references to equipment/component types/cable types that are not used at the plant under review.

Step 3 – Perform Comparison of Plant Specific Safe Shutdown Methodology to Applicable Sections of NEI 00-01

For each applicable NEI 00-01 section that is determined in Step 2 to be applicable, a comparison should be performed of the plant safe shutdown methodology against the applicable NEI 00-01 section.

- Determine if failure to maintain strict alignment with the guidance in NEI 00-01 could have adverse consequences. Since NEI 00-01 is a guidance document, portions of its text could be interpreted as 'good practice' or intended as an example of an efficient means of performing the analyses. In some instances, the commentary presents analytical preferences which can be performed in a number of different ways without impacting the validity of the results. These sections of NEI 00-01 can be dispositioned without further review. The basis for this determination should be documented.
- Document the following information for applicable NEI 00-01 Chapter 3 Sections:

Alignment Statement – Use one of the following statements:

- Aligns
- Aligns with intent
- Not in Alignment
- Not in Alignment, but Prior NRC Approval
- Not in alignment, but no adverse consequences

Alignment Basis – A description supporting the Alignment Statement. This basis may also include a discussion of the relevance of the step to transition (for NEI 00-01 sections that are not considered to be necessary for successful performance of a safe shutdown analysis).

- Reference Document – Reference documents supporting the alignment statement and basis.
- Comments and Other Details – Any clarification information to support the other statements.
- Unit Applicability - If particular review attribute is only applicable to a single unit, designate the applicability of the single unit.

Step 4 - Document Open Items associated with the review of the NEI 00-01 guidance.

Document open items applicable to the methodology review.

Non-conformances associated with the existing safe shutdown methodology that are considered non-compliances with 10 CFR 50, Appendix R or the approved pre-transition fire protection licensing basis must be entered into the corrective action program and dispositioned appropriately to ensure enforcement discretion.

Note: If the existing licensing basis is vague or silent on the methodologies identified, then a licensing basis should be clearly defined during the transition period. For example, if the existing licensing basis is vague or silent on the methodology for circuit analysis (selection and/or protection of circuits) or evaluation of the failures of circuits within a fire area (single failure, any and all, one-at-a-time, sequential/concurrent, cumulative effects) a licensing basis should be established against which changes can be assessed post transition.

An example Table B-2 is provided at the end of Appendix B.

B.2.1.3 Fire-Induced Circuit Failures (Multiple Spurious Operations)

A licensee should submit a summary of its approach for addressing potential fire-induced multiple spurious operations (MSOs) for NRC review and approval. At a minimum, the summary should contain sufficient information relevant to methods, tools, and acceptance criteria used to enable the staff to determine the acceptability of the licensee's methodology.

The NRC staff has reviewed Revision 2 of NEI 00-01 and concluded that Chapter 3 provides an acceptable deterministic approach for analysis of post-fire safe shutdown circuits when applied in accordance with the regulatory expectations described in RIS 2005-30 and when used in conjunction with NFPA 805 and the current RG 1.205 revision for a plant that has transitioned to a 10 CFR 50.48(c) licensing basis (Reference: RIS 2005-30 and RG 1.205 Revision 1). An acceptable Fire PRA as discussed in Section 4.4.2.3 includes methods for the selection of cables and detailed circuit failure modes analysis, as well as the integration of these circuit failures into the overall Fire PRA (e.g., NUREG/CR-6850 Tasks 3, 9, 10, and 14).

The approach outlined in Figure B-2 below is one acceptable method to address fire-induced MSOs.

This process is intended to be in support of transition to a new licensing basis. Post-transition changes would use the risk-informed, performance-based change process. The post-transition change process for the assessment of a specific MSO would be a simplified version of this process, and may not need the level of detail shown in the following section (e.g., An expert panel may not be necessary to identify and assess a new potential MSO. Identification of new potential MSOs may be treated as part of the plant's Operating Experience process.

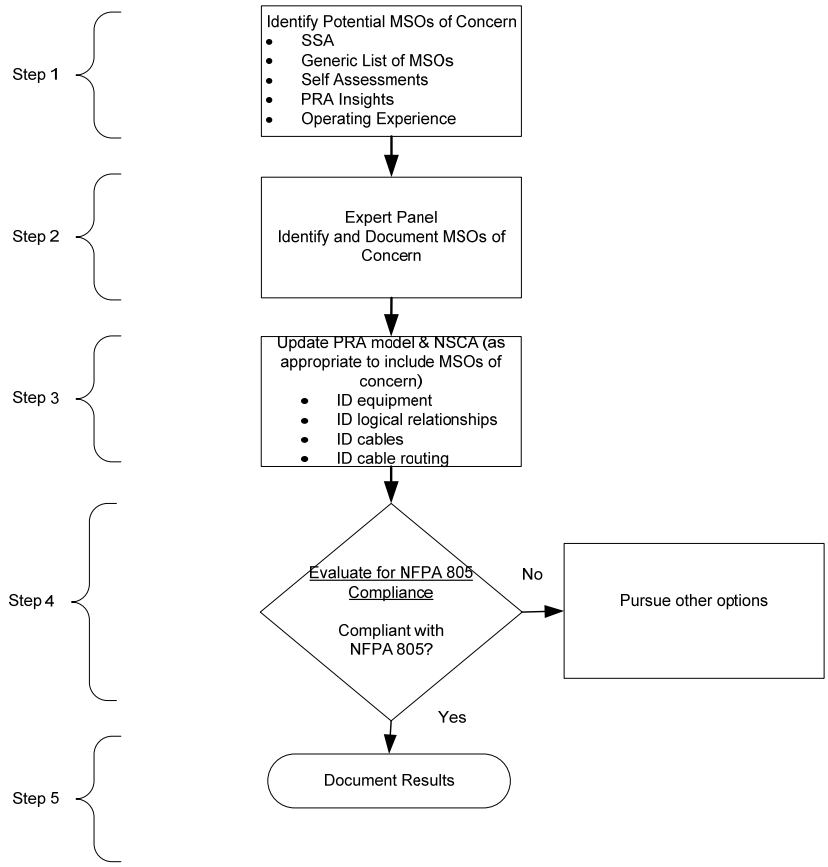

Figure B-2 – Multiple Spurious Operations – Transition Resolution Process

Step 1 - Identify potential MSOs of concern.

Information sources that may be used as input include:

- Post-fire safe shutdown analysis
- Generic lists of MSOs (e.g., from Owners Groups and/or later versions of NEI 00-01, if endorsed by NRC for use in assessing MSOs)

- Self-assessment results (e.g., NEI 04-06 assessments performed to addressed RIS 2004-03)
- PRA insights
- Operating Experience (e.g., licensee event reports, NRC Inspection Findings, etc.)

Step 2 - Conduct an expert panel to assess plant specific vulnerabilities (e.g., per NEI 00-01, Section F.4.2).

The expert panel should focus on system and component interactions that could impact nuclear safety. This information will be used in later tasks to identify cables and potential locations where vulnerabilities could exist.

The documentation of the results of the expert panel should include how the expert panel was conducted including the members of the expert panel, their experience, education, and areas of expertise. The documentation should include the list of MSOs reviewed as well as the source for each MSO. This documentation should provide a list the MSOs that were included in the PRA and a separate list of MSOs that were not kept for further analysis (and the reasons for rejecting these MSOs for further analysis).

Describe the expert panel process (e.g., when it was held, what training was provided to the panel members, what analyses were reviewed to identify MSOs, how was consensus achieved on which MSOs to keep and any dispute resolution process criteria used in decision process, etc.)

[Note: The physical location of the cables of concern (e.g., fire zone/area routing of the identified MSO cables), if known, may be used at this step in the process to focus the scope of the detailed review in further steps.]

Step 3 – Update the Fire PRA model and NSCA to include the MSOs of concern.

This includes the:

- Identification of equipment (NUREG/CR-6850 Task 2)
- Identification of cables that, if damaged by fire, could result in the spurious operation (NUREG/CR-6850 Task 3, Task 9)
- Identify routing of the cables identified above, including associating that routing with fire areas, fire zones and/or Fire PRA physical analysis units, as applicable.

Include the equipment/cables of concern in the Nuclear Safety Capability Assessment (NSCA). Including the equipment and cable information in the NSCA does not necessarily imply that the interaction is possible since separation/protection may exist throughout the plant fire areas such that the interaction is not possible).

Note: Instances may exist where conditions associated with MSOs do not require update of the Fire PRA and NSCA analysis. For example, Fire PRA analysis in NUREG/CR-6850 Task 2, Component Selection, may determine that the particular interaction may not lead to core damage, or pre-existing equipment and cable routing information may determine that the particular MSO interaction is not physically possible. In other instances, the update of the PRA may not be warranted if the contribution is negligible. The rationale for exclusion of identified MSOs from the Fire PRA and NSCA should be documented and the configuration control mechanisms should be reviewed to provide reasonable confidence that the exclusion basis will remain valid.

Step 4 – Evaluate for NFPA 805 Compliance

The MSO combinations included in the NSCA should be evaluated with respect to compliance with the deterministic requirements of NFPA 805, as discussed in Section 4.2.3 of NFPA 805. For those situations in which the MSO combination does not meet the deterministic requirements of NFPA 805 (VFDR), the issue with the components and associated cables should be mitigated by other means (e.g., performance-based approach per Section 4.2.4 of NFPA 805, plant modification, etc.)

The performance-based approach may include the use of feasible and reliable recovery actions. The use of recovery actions to demonstrate the availability of a success path for the nuclear safety performance criteria requires that the additional risk presented by the use of these recovery actions be evaluated (NFPA 805 Section 4.2.4).

Step 5 - Document Results

The results of the process should be documented. The results should provide a detailed description of the MSO identification, analysis, disposition, and evaluation results (e.g., references used to identify MSOs; the composition of the expert panel, the expert panel process, and the results of the expert panel process; disposition and evaluation results for each MSO, etc.). High level methodology utilized as part of the transition process should be included in the 10 CFR 50.48(c) LAR/Transition Report.

B.2.2 Demonstrating Compliance with Chapter 4 of NFPA 805

Background

The purpose of this section is to provide guidance for demonstrating compliance with Chapter 4 of NFPA 805 for 'at power conditions'. This section addresses the fire area review, with specific clarification on the documentation of variances from the deterministic requirements of Section 4.2.3 of NFPA 805 (VFDRs). This section also provides guidance on the performance-based approaches of Section 4.2.4 of NFPA 805 (i.e., Fire Modeling or Fire Risk Evaluations). The guidance for the non-power analysis is contained in Section 4.4.3 and Appendix F to this document.

Prior to beginning this process, the Nuclear Safety Capability Assessment (i.e., the 10 CFR 50 Appendix R / NUREG-0800 Safe Shutdown Analysis or a transition Nuclear Safety Capability Assessment) should be complete. This includes the incorporation of the following treatments:

- Multiple Spurious Operations (MSO)
- Establishing the safe and stable conditions for the plant including the determination of the strategy and assumptions concerning the division between the At-Power and Non-Power portions of the nuclear safety capability assessment.
- Note if a defined time is included in the safe and stable concept, the following information should be provided to the staff in the LAR/Transition Report:
  1. The physical or design constraints that form the basis of the defined time (what is the defined time based on?).
  2. What plant impact will occur if the time is exceeded (if a 72 hour time is being used, is there some physical limitation in the SSCs relied upon that could result in failure of the functions at 75 hours?). Describe any additional actions that must be taken to maintain safe and stable conditions beyond the time in sufficient detail to determine whether they are recovery actions or maintenance actions (refill water tank(s), refuel diesel storage tank(s), etc.).

3. Provide a qualitative assessment of the bases for why any identified physical limitations will not have an adverse impact on the risk (for example, within the defined time period the site emergency organization will be established, more resources will be available, additional material will be available from both within and outside the corporation, damage repairs can be completed before the end of the time resulting in additional success paths being made available, offsite power can be restored, etc.).

- Fire Suppression Activity effects on the ability to achieve the nuclear safety performance criteria
- The determination of Primary Control Stations

Definitions

For purposes of this process the following definitions were used:

- At-Power Analysis – Identifies systems and equipment required to place the plant in a safe and stable condition following a fire occurring while the plant is at power, or while maintaining hot standby or hot shutdown (as clarified by the definition of safe and stable).
- Non-Power Analysis – Identifies the set of systems and equipment required to support reasonable assurance that nuclear safety performance criteria are met for a fire occurring in the site specific treatment(s) for non-power operational modes.
- Primary Control Station –See NFPA 805 Section 1.6.52 and Section B.2.3.
- Safe and Stable Conditions – See NFPA 805 Section 1.6.56
- Variance from the Deterministic Requirements (VFDRs) – Conditions that do not meet the requirements of NFPA 805 Section 4.2.3.

Process Overview

The process for determining compliance with Chapter 4 of NFPA 805 can be divided into the following steps:

- Step 1 – Assemble documentation
- Step 2 – Document Fulfillment of Nuclear Safety Performance Criteria
- Step 3 – VFDR Identification, Characterization, and Resolution Considerations
- Step 4 – Performance-Based Evaluations
  - Fire Modeling Evaluations
  - Fire Risk Evaluations
- Step 5 – Final VFDR Evaluation
- Step 6 – Document Required Fire Protection Systems and Features

This process is depicted in Figure B-3.

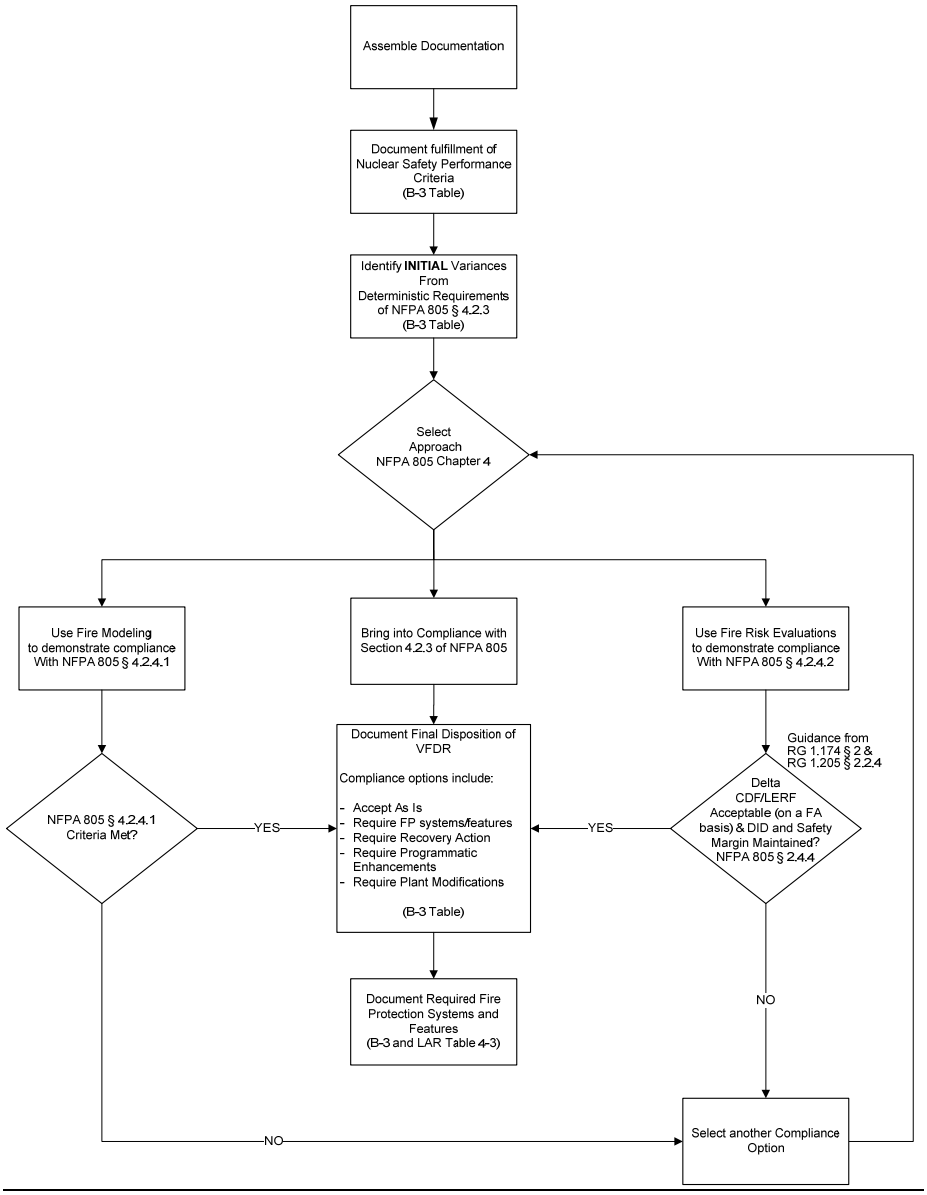

Figure B-3 – NFPA 805 Chapter 4 Compliance Assessment Process

B.2.2.1 Step 1 – Assemble Documentation

Gather industry and plant-specific fire area analysis analytical and licensing basis documents. The documentation should be organized by the fire area to the extent possible. Examples of documentation to be assembled include:

- Plant specific calculations/analyses for:
  - Fire area compliance assessment and supporting analyses
  - Operator manual action (Recovery Action) feasibility assessments
  - Resolution of multiple spurious operations
- Results of the Nuclear Safety Capability Assessment Methodology Review (NEI 04-02 Table B-2):
- Results of the Existing Engineering Equivalency Evaluation Reviews
- Results of the Licensing Action Reviews
- Corrective action documents related to compliance with 10 CFR 50, Appendix R (or FP license condition, as appropriate), such as:
  - Unapproved or 'not allowed' pre-existing operator manual actions (including feasibility issues)
  - Cable separation/protection issues
  - Raceway fire barrier deficiencies
  - Concerns related to fire-induced spurious operations

B.2.2.2 Step 2 – Document Fulfillment of Nuclear Safety Performance Criteria

The purpose of this step in the process is to determine how NFPA 805 Chapter 4 is met for each nuclear safety performance criteria. This entails 1) reviewing the current safe shutdown analysis (or new nuclear safety capability assessment), including the evaluation of MSOs on a fire area basis, 2) reviewing fire suppression activity effects, and 3) reviewing licensing actions and existing engineering equivalency evaluations. If a nuclear safety performance criterion is not met using the deterministic approach (NFPA 805 Section 4.2.3 including existing engineering equivalency evaluations and previously approved licensing actions) then compliance will be achieved via a proposed modification, or a VFDR will be generated to determine if the criterion can be met using the performance-based approach.

B.2.2.2.1 Assess Accomplishment of Nuclear Safety Performance Goals

On a fire area basis each nuclear safety performance criteria (NSPC) of NFPA 805, Section 1.5.1 will be reviewed and the method of accomplishing these criteria documented. The method of accomplishment should include a high level summary of required strategies that provide reasonable assurance that, in the event of a fire, the plant is not placed in an unrecoverable condition. To assist in the documentation of the methods of accomplishment the following is suggested:

- Document the Method of Accomplishment in summary level form for the fire area. Attempt to use concise, consistent terminology that provides a high level summary of credited strategies. For each NSPC include a clear positive statement that the NSPC is met or explain what exceptions are taken (and the basis for each). This consistency should be utilized for statements within a given fire area and for similar statements in different fire areas. Examples of high level statements are:
  - The reactor core isolation cooling pump flowpath is available.

- Cooldown using RHR Pump A and RHR Heat Exchanger A is available in suppression pool cooling mode.
- RC makeup from the Control Room using HPI Pump A for makeup and RCP seal injection with suction aligned from the BWST and RC letdown through RV head vent valves. Isolation of RCS is necessary to support inventory control.
- Control Room operation of makeup/charging using HPI Pump A, pressurizer heaters, and pressurizer safety relief valves credited for controlling system pressure.
- Manual reactor trip from the Control Room; shutdown margin maintained by adequate concentration of borated water from the BWST using HPI Pump A.

- Documenting the assessment of performance goal accomplishment for each fire area, reviewing fire area licensing actions, and reviewing engineering evaluations all may result in the creation of VFDR items that may need to be reviewed and assessed as part of the performance-based approach. Each VFDR item should be assigned its own distinct tracking number as opposed to being part of a group. See Section B.2.2.2.3 for additional clarification on the deterministic compliance with NFPA 805 Section 4.2.3.
- All VFDR items should be reviewed and categorized, by fire area and topic, if appropriate, in order to gain an overall understanding of the magnitude and complexity of the individual issues, as well as their aggregate impact. VFDR items associated with other tasks (e.g., Fundamental Fire Protection Program and Design Elements Review) should also be considered and where possible categorized by fire area and topic. Where necessary, provide a cross reference to the appropriate item in the NEI 04-02 B-1 table and the fire area analysis in the NEI 04-02 B-3 table. The VFDRs are candidates for resolution using the performance-based approach of NFPA 805.
- Once Step 3, VFDR Identification, Characterization and Resolution Considerations, is complete, the Method of Accomplishment should be revised to denote if a VFDR for a particular performance criterion exists. Example: Variance from the deterministic requirements of NFPA 805 exists for this performance criterion; Fire Risk Evaluation required.

The information documented in the transition report is intended to be summary level information that provides a concise summary of information, with references to specific supporting analyses and documents. The documentation of items such as fire-induced circuit failures and disposition of recovery actions are not expected to be documented in detail in the transition report. For example, the results of the nuclear safety capability circuit analysis are important in establishing compliance. However, it is not practical to document the detailed results for each VFDR in the transition report. Sufficient documentation should be available within the referenced documents such that traceability is provided for the specifics of the VFDR and the performance-based resolution.

B.2.2.2.2 Document Evaluation of Effects of Fire Suppression Activities

Section 2.4.1 of NFPA 805 states that “The effects of fire suppression activities on the ability to achieve the nuclear safety performance criteria shall be evaluated.”. Note previously performed analyses for 10 CFR 50, Appendix R, Section III.G.3.b compliance or to address Information Notice 83-41 “Actuation of Fire Suppression System Causing Inoperability of Safety-Related Equipment” may provide some or all of the necessary information.

Document in the NEI 04-02 Table B-3 the evaluation of the effects of fire suppression activities on the ability to achieve the nuclear safety performance criteria.

B.2.2.2.3 Clarification of Deterministic Compliance

B.2.2.2.3.a Fire Area Licensing Action Reviews

When reviewing a fire area to determine an NFPA 805 Chapter 4 compliance basis, previously approved licensing actions (exemptions/deviations/safety evaluations) may be used to demonstrate compliance with specific deterministic fire protection requirements.

The continued validity of the licensing action should be verified. The term "valid," used in this context, means that the technical basis for approval of the original exemption or deviation still applies (e.g., plant modifications or other changes have not invalidated the assumptions or analysis that formed the basis for the exemption or deviation; new information has not surfaced that would invalidate the original finding).

See additional information concerning recovery actions in Section B.2.3.

Plants licensed to operate after January 1, 1979 that have exemptions from 10 CFR Part 50 Appendix R that are deemed no longer necessary, should request that the exemptions be rescinded. The LAR/Transition Report Template in Appendix H has suggested wording and support information to support this request.

B.2.2.2.3.b Existing Engineering Equivalency Evaluation Reviews

When reviewing a fire area to determine an NFPA 805 Chapter 4 compliance basis, existing engineering equivalency evaluations (EEEEs) may be used to demonstrate compliance with specific deterministic fire protection requirements. A licensee may use EEEEs as described in Section 2.2.7 of NFPA 805 to demonstrate equivalency to the deterministic requirements, in cases where an exemption or deviation was not granted, provided the following are true:

- The EEEE clearly demonstrates an equivalent level of fire protection compared to the deterministic requirements in NFPA 805, Chapter 4.
- The EEEE is not based on a risk calculation.
- The EEEE does not include any recovery actions, as defined in NFPA 805, Section 1.6.52, to demonstrate the availability of a success path for the nuclear safety performance criteria.

The continued validity of the existing engineering equivalency evaluations should be verified

See Appendix B.3 of this document for the process of evaluating existing engineering equivalency reviews.

B.2.2.2.3.c Pre-transition OMA Review

NFPA 805 Section 4.2.3.1 states:

> *One success path of required cables and equipment to achieve and maintain the nuclear safety performance criteria without the use of recovery actions shall be protected by the requirements specified in either 4.2.3.2, 4.2.3.3, or 4.2.3.4, as applicable. Use of recovery actions to demonstrate availability of a success path for the nuclear safety performance criteria automatically shall imply use of the performance-based approach as outlined in 4.2.4.*

Perform a review of pre-transition OMAs to determine those actions taking place outside of the main control room (MCR) or outside of the primary control station(s) (PCS) that demonstrate the availability of a success path for the nuclear safety performance criteria. If the activity to demonstrate a success path for the nuclear safety performance criterion takes place outside of a MCR or PCS, then it is classified as a potential recovery action and will be retained for further evaluation in the process (associated with the VFDR which the recovery action mitigates). If

activities are performed from the MCR or PCS, then the activity is not considered a recovery action. These activities are compliant with Section 4.2.3.2 of NFPA 805. See Section B.2.3 for additional information.

B.2.2.3 Step 3 – VFDR Identification, Characterization and Resolution Considerations

Variances may be generally categorized as either a separation issue or a degraded fire protection system or feature. In this step of the process proposing a modification to bring the variance into deterministic compliance is also a possible approach. All VFDRs not brought into deterministic compliance with NFPA 805 Section 4.2.3 will be evaluated per the performance-based approach of NFPA 805, Section 4.2.4. Note: If an acceptable initial performance based solution cannot be achieved for a given VFDR, other solutions should be considered.

Non-compliances with the current licensing basis should be identified in the corrective action program and annotated as being planned for resolution as part of the NFPA 805 transition process. These VFDRs should be identified in the NEI 04-02 Table B-3, as VFDRs requiring evaluation. VFDRs that do not meet NFPA 805 Section 4.2.3, but are compliant with the pre-transition fire protection licensing basis (e.g., feasible alternative shutdown operator manual actions, previously approved operator manual actions, etc.) are not non-compliances and therefore do not need to be in the corrective action process.

The VFDR problem statements should be written with enough detail to support fire risk evaluations. For example:

- Description: A short text description of the variant condition including components and functions (e.g., auxiliary feedwater pump), initiating failure(s) (cable/power/interlock/control failures, etc.), and general characterization of the concern (e.g., spurious start of pump and pump remains energized, cable failures resulting in undesired lineup, etc.).
- A statement that describes the section of NFPA 805 that is not met, type of VFDR (pre-transition OMA, separation issue or degraded fire protection system), and proposed evaluation per applicable NFPA 805 section.

B.2.2.4 Step 4 – Performance-Based Evaluations

Commented [A15]: NRC: FAQ 07-0030 proposes to delete this section.

NFPA 805 Section 4.2.4 provides a “performance-based alternative to the deterministic approach provided in 4.2.3”. The following subsections provide guidance on the fire modeling and fire risk evaluations.

B.2.2.4.1 Fire Modeling Evaluations

NFPA 805 Section 4.2.4.1 identifies the specific use of fire modeling as a performance-based method. The Fire Modeling Evaluation process consists of the following steps:

- Step 1 – Identify the targets
- Step 2 – Establish damage thresholds
- Step 3 – Determine limiting condition(s)
- Step 4 – Establish fire scenarios (Maximum Expected and Limiting)
- Step 5 – Determine protection of required nuclear safety success path(s)
- Step 6 – Provide operations guidance, as necessary.

The overall acceptance of the transition Fire Modeling Evaluation will be in the form of a license amendment per 10 CFR 50.90, as required by 10 CFR 50.48(c)(3)(i). The acceptance criteria for the Fire Modeling Evaluation consist of two parts.

- Target Damage Occurs? – The fire modeling analysis defines and evaluates a postulated scenario involving the Maximum Expected Fire Scenario (MEFS). If target set damage does not occur, then the first acceptance criterion is met.
- MEFS<<LFS? – The performance of fire modeling involves a degree of uncertainty. This uncertainty is addressed indirectly by the determination of the Limiting Fire Scenario (LFS). A comparison of MEFS and LFS is used to determine if a sufficient fire modeling margin exists. If sufficient fire modeling margin exists, then the fire modeling approach is acceptable. A quantitative risk assessment does not have to be performed since qualitatively the conclusion can be made that the VFDR has a minimal impact on risk (MEFS does not generate damage, and MEFS - LFS margin is sufficiently large to address uncertainties in modeling.)

Sections 4.4.2.2 and 5.1.2 provide guidance on documenting the fire models used, and justifying that these fire models and methods are acceptable for use in performance-based analyses when performed by qualified users, have been verified and validated, and are used within their limitations and with the rigor required by the nature and scope of the analyses.

B.2.2.4.2 Fire Risk Evaluations

NFPA 805, NEI 04-02, RG 1.205 and RG 1.174 provide requirements and guidance on the Fire Risk Evaluation (FRE) process.

The following subsections describe the methodology used to prepare a FRE and to evaluate the results. Figure B-4 is an outline of the FRE process during NFPA 805 transition.

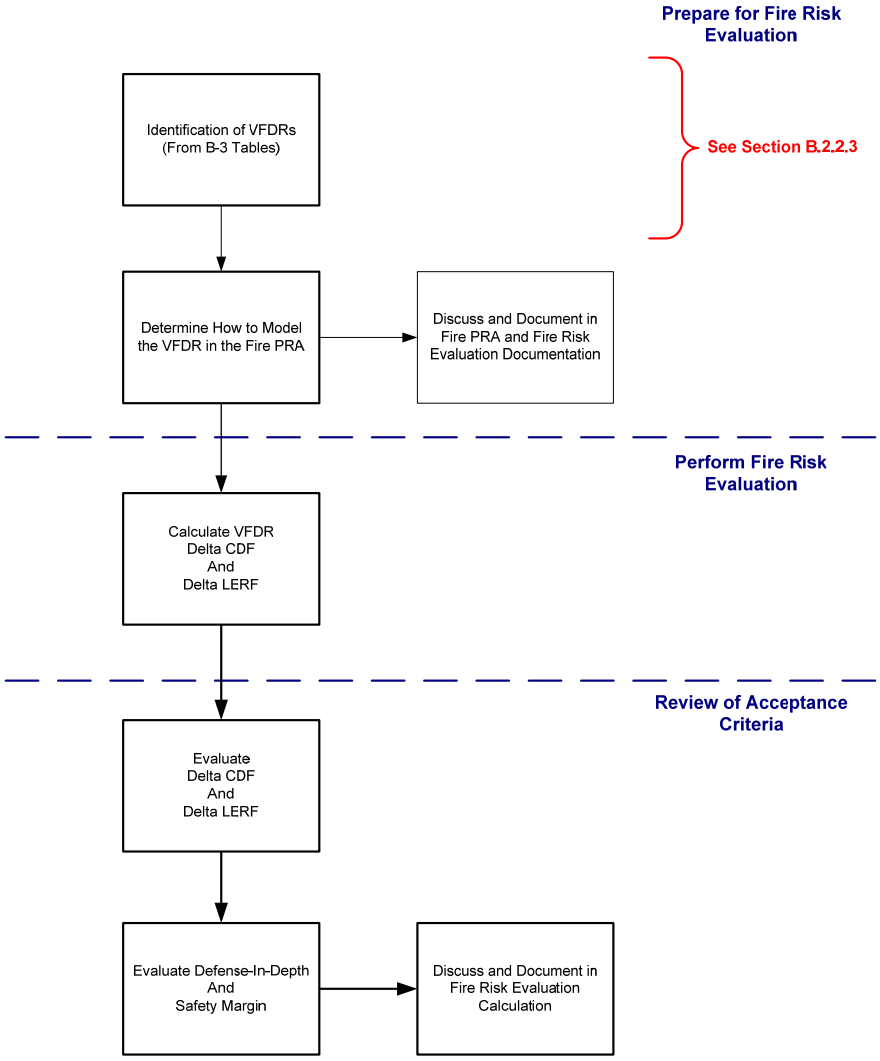

Figure B-4 – FRE Process (NFPA 805 Transition)

B.2.2.4.2.a Prepare for the Fire Risk Evaluation

Variant vs. Compliant Condition

The FRE process begins by identifying the variant condition to be examined (VFDRs identified in Step 3 of this process) and the compliant configuration as defined by NFPA 805 Section 4.2.3.

The deterministically compliant condition is defined as that plant condition or configuration that is consistent with Section 4.2.3 of NFPA 805 (shown as Case 2 in Figure B-5). The variant condition or configuration, either 'as found' or proposed by a plant change, that is not consistent with Section 4.2.3 of NFPA 805, is defined as the variant condition (shown as Case 1 in Figure B-5).

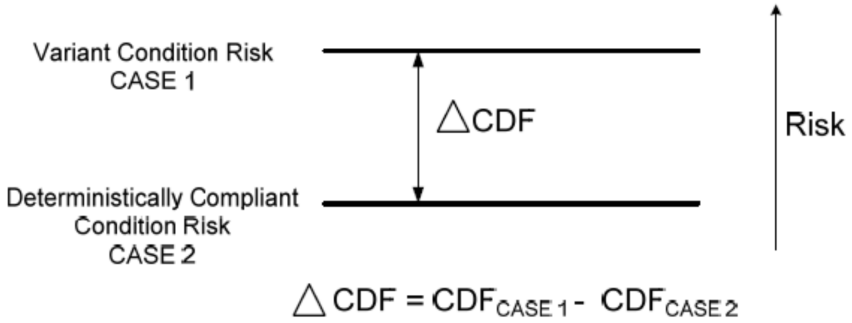

Figure B-5 – Compliant versus Variant Conditions

The "deterministically compliant plant", also referred to as "an ideal plant", may not exist or be feasible in practice. Based on experience with the pilot and non-pilot transitioning plants, the risk of most variances from the deterministic requirements can readily be evaluated by postulating modifications, such as moving or protecting cables, which would meet the deterministic requirements. This provides the base case against which the added risk of the proposed alternative is evaluated. Because of the similarity between the deterministic criteria of NFPA 805 and the requirements in Appendix R to 10 CFR Part 50, it should be clear, in most cases, what the compliant configuration would be.

An exception might occur for fire scenarios where evacuation of the main control room is necessary. For example, pre-transition operator manual actions not taken at the Primary Control Station that are currently characterized as alternative shutdown (pre-transition) may not have a single, 'deterministically compliant condition' for comparison purposes, therefore some judgment may be necessary. One option would be to define a 'compliant case' that is not based on the actual fire area configuration, but based on a configuration that meets the deterministic criteria of Section 4.2.3 of NFPA 805.

Organization and Grouping of Fire Risk Evaluations

Due to the nature and complexity of individual changes that will be addressed as part of the transition FRE, it is necessary to organize and group individual changes. To the maximum extent possible, VFDRs being addressed by FREs should be organized by plant location (i.e., fire area).

The rationale for this grouping is:

- This grouping meets the analysis requirements of NFPA 805 Section 2.4.2.4
- Key analytical tools for measuring compliance (e.g., the nuclear safety capability assessment) are organized in this manner. This will facilitate the clear documentation of a 'compliant case' for use in the evaluation.
- Analytical tools for measuring fire risk (i.e., Fire PRA) are primarily spatially oriented and can focus analyses on specific targets and scenarios.
- This grouping supports reporting guidance for the NFPA 805 transition LAR/Transition Report.

Preparatory Evaluation – Fire Risk Evaluation Team Review

Using the information obtained during the development of the NEI 04-02 B-3 Table and the Fire PRA, a team review of the VFDR should be performed. Depending on the scope and complexity of the VFDR, the team may include the Safe shutdown/NSCA Engineer, the Fire Protection Engineer, and the Fire PRA Engineer. The purpose and objective of this team review would be to address the following;

- Consolidate the information into a manageable group of issues that can be assessed as part of the same evaluation. Examples of logical groupings within a fire area include:
  - Multiple cable failures within a given fire area for a single component that represent the same component failure. These may be identified as separate line items in a safe shutdown/NSCA database report, but represent the same issue for resolution.
  - Multiple component-cable failures, where the multiple failures are required in order to get the undesired state. For example, if the undesired state is loss of a pump power supply concurrent with a valve failing to open, then the failure of 'both' components (due to the cables/equipment in the fire area) should be grouped together for target identification. Note that exported data from the safe shutdown/NSCA database may not include all of the information necessary to identify the component combinations and review of the logic model and fire area details may be necessary.
  - Component failures related to a single failure (e.g., a single power supply or interlock circuit cable failure in a fire area cascades / propagates to affect multiple components).
  - Failure modes related to a single plant damage state (e.g., several component failures result in loss of cooling, tank draindown, etc.) that may be resolved by a single solution.
- Review the Fire PRA to determine if the VFDRs are adequately reflected in the Fire PRA. For example:
  - Perform a confirmatory review of the NUREG/CR-6850 Task 2 Component Selection, Task 3 Cable Selection, and Task 5 Fire-Induced Risk Model results, as necessary, to ensure that the modeling of the VFDR in the Fire PRA is appropriate.
  - If the discrepancy involves the potential spurious opening of a valve and undesired consequences, then the PRA should be modeled to reflect the same failure mode (consequence) or a justification provided in PRA documentation.
  - Appropriate modeling of fire-induced hot shorts resulting in spurious operation should be ensured. If assigned, the 'probability of spurious actuation based on cable damage' failure probabilities should account for the type of cable and configuration (multiconductor / single conductor, thermoset / thermoplastic, cable tray / conduit).

- If the Fire PRA does not adequately reflect the ability to measure the change associated with the VFDR, update the Fire PRA model and associated documentation or document why the modeling in the Fire PRA provides sufficient treatment to bound the risk impact.
- Based on the inputs above and grouping of issues, establish a discrete list of targets based on the VFDR. For safe shutdown/NSCA related issues, this primarily involves cables. Note also that based on the circuits involved, this may also involve sensitive electronic equipment that may have a lower damage threshold than cables.
- For electrical cables that are the targets of concern, identify the raceway routing and termination points within the fire area. Perform walkdowns as necessary to refine target locations if not previously performed as part of the Fire PRA development.
- Identify transient and fixed ignition source fire scenarios.
- Identify preliminary FRE scenario candidates. These scenarios may be refined based upon additional reviews. Consider truncating the review after a conservative screening analysis to only those fire initiating events whose calculated CDF is greater than 1E-08/yr, or whose calculated LERF is greater than 1E-09/yr. If this truncation is used, then ensure that the reporting of the change in CDF and LERF accounts for the truncation and is appropriately documented.

B.2.2.4.2.b Perform Fire Risk Evaluation

FREs are typically performed by the Fire PRA Engineer but depending on the complexity and results, coordination with and further input/reviews by the Safe Shutdown/NSCA Engineer and the Fire Protection Engineer may be needed.

Use of Bounding Approaches

Simplifying approaches may be used to bound the risk characterization of VFDRs in the fire area. For example, the point estimate of fire risk (CDF/LERF) for all of the scenarios in a fire area may be assumed to serve as a measure of the maximum possible ΔCDF and ΔLERF associated with the area. The use of surrogates (e.g., CDF for all of the scenarios within a fire area) provides a conservative estimate of risk for a fire in an area, would simplify long term configuration management of analyses, and would allow resources to be focused on refining and addressing variances that are risk significant. This approach may prove to be cost-effective for addressing risk associated with complicated scenarios with many variables (e.g., multiple spurious operations) in a fire area that otherwise has non-significant fire risk contribution. However, the use of bounding approaches does not obviate the need to perform a confirmatory review of the NUREG/CR-6850 Task 2 Component Selection, Task 3 Cable Selection, and Task 5 Fire-Induced Risk Model results, as necessary, to ensure that the modeling of the VFDR in the Fire PRA is appropriate.

Change in Risk Calculation

The change in risk (ΔCDF, ΔLERF) is the difference between the aggregate risk for the condition associated with the VFDR and the aggregate risk for a deterministically compliant condition. In most cases, the risk associated with the VFDR condition is the same as the risk results from the Fire PRA and reflects the in-situ plant configuration. In other cases, the VFDR condition may include some variation of the in-situ plant configuration as defined in the VFDR description. The change in risk is then determined by comparing this risk with that of a configuration which is deterministically compliant.

The compliant condition is created by manipulating the Fire PRA model to ‘remove’ the VFDR(s) and thereby creating a compliant condition. The necessary Fire PRA manipulations should be adequately documented to facilitate review and reproduction. Fire PRA manipulations may

involve excluding specific PRA basic events to remove the potential fire induced failure associated with the VFDR.

For low risk fire areas a simplified approach could be used where the change in risk is bounded by creating a single compliant case with all of the fire-induced failures associated with each VFDR removed simultaneously. To facilitate identification of the important risk contributors in this case, the delta risk for the fire area could be taken as the summation of the individual delta risk contributions for each VFDR in the fire area. To confirm that potential masking of change in risk has not occurred, this result should be compared to the overall change in risk by considering all VFDRs in the fire area concurrently.

Additional Risk of Recovery Actions – General

Refer to the discussion of additional risk of recovery actions in Appendix B, Section B.2.3.

Cold Shutdown Considerations

Depending on the plant-specific definition of the safe and stable endpoint, the scope of treatment of VFDRs may be different. If a plant chooses to maintain the safe and stable endpoint for NFPA 805 as cold shutdown, the VFDR identification in the B-3 Table should include those items related to achieving and maintaining cold shutdown.

If the plant has defined safe and stable at a different mode, then the VFDRs will be based on that defined safe and stable state.

If the VFDR involves equipment/cables required only for cold shutdown or whose function is not modeled in the PRA, then a qualitative risk assessment will be performed. This qualitative assessment should include the following:

- The desired safe end state for the traditional treatment of post fire safe shutdown under the provisions of 10 CFR 50.48(b) is cold shutdown. The transition to invoke the provisions of 10 CFR 50.48(c) includes the use of a Fire PRA. The safe end state evaluated in a PRA is not cold shutdown, but is instead a condition characterized as 'safe and stable.' This is typically hot standby/shutdown conditions. The PRA treatment of the plant response to a fire event does not necessarily require or credit the use of plant systems exclusive to cold shutdown. As such, the treatment of any such systems and functions in the context of a FRE would generally result in no measurable impact on the calculated plant risk.
- There are however, some possible exceptions.
  - If the fire induced plant transient is of such a nature that in order to achieve safe and stable conditions, cold shutdown related systems and/or functions are required, the PRA would inherently require those functions to be successful. In these cases, the calculated risk metrics for the postulated fire event includes the consideration of failures that would disable the systems and/or functions (these cold shutdown related systems and/or functions should be included in the calculation of delta-risk), or
  - If the variance would affect achievement of a key safety function during a non-power higher risk-evolution, then options should be considered in accordance with the non-power operations methodology (additional defense-in-depth measures should be implemented to reduce fire risk).

B.2.2.4.2.c Fire Area Change in Risk Summary

The change in risk for all fire scenarios affected by the VFDRs for a particular fire area should be combined to report the change in risk for the fire area. See Table B-5 for an example. The process for transition to NFPA 805 as well as the ongoing maintenance of the program post-

transition includes provisions for offsetting risk reductions. With regards to self-approved changes, offsetting risk reductions can only be claimed to the extent that they affect fire risk. Reductions that arise from other hazard categories such as internal events cannot be claimed without NRC review and approval. For the purposes of the transition process, the changes in plant risk should be summarized and aggregated. The total risk increase associated with VFDRs should be provided as well as the total risk reduction associated with plant modifications or other changes. The net change in risk for each fire area should be provided as well as the same type of information for the plant in total.

Table B-5 is an example Fire Area Risk summary table.

See Section B.2.3 for acceptance criteria when "previously approved" recovery actions are involved.

B.2.2.4.2.d Review of Acceptance Criteria (Overall)

The overall acceptance of the transition FRE will be in the form of a license amendment per 10 CFR 50.90, as required by 10 CFR 50.48(c)(3)(i). Acceptance criteria for individual FREs are based on ensuring:

- The change in core damage frequency (ΔCDF) is acceptable, and
- The change in large early release frequency (ΔLERF) is acceptable, and
- Defense-in-depth and safety margins are maintained.

The change in CDF/LERF should be addressed individually (for each fire area) and cumulatively (for the entire plant). The defense-in-depth and safety margin treatment should be documented on an area basis. The results of this review, including a comprehensive assessment, should be documented. The results of the review should be used as input for determination of systems, features and program elements to be upgraded, as well as included in the Plant Monitoring Program.

If the FRE meets the acceptance criteria described below, this is confirmation that a success path effectively remains free of fire damage and that the performance-based approach is acceptable per Section 4.2.4.2 of NFPA 805.

Risk Acceptance Criteria

The total increase or decrease in risk associated with the implementation of NFPA 805 for the overall plant should be calculated by summing the risk increases and decreases for each fire area (including any risk increases resulting from previously approved recovery actions). The total risk increase should be consistent with the acceptance guidelines in RG 1.174 (See Table B-4).

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Note that the acceptance guidelines of RG 1.174 may require the total CDF, LERF, or both, to evaluate changes where the risk impact exceeds specific guidelines. If the additional risk associated with previously approved recovery actions is greater than the acceptance guidelines in RG 1.174, then the net change in total plant risk incurred by any proposed alternatives to the deterministic criteria in NFPA 805, Chapter 4 (other than the previously approved recovery actions), should be risk-neutral or represent a risk decrease.

If meeting the acceptance guidelines of RG 1.174 for transition change in risk requires the total CDF, LERF, or both, the total plant risk should be estimated and provided in the License Amendment Request.

If the licensee's application to transition to NFPA 805 includes risk increases from VFDRs, combined with risk decreases resulting from non-VFDR modifications, this may be considered a combined change request and subject to additional guidance from RG 1.174, Revision 2.

Additional information may be requested by the NRC during the review of the LAR/Transition Report to gain an understanding of the risk increases and offsetting risk decreases (by fire area and total).

Table B-4 - RG 1.174 Acceptance Criteria

Region	ΔCDF/yr	ΔLERF/yr	Status	Comments/Conditions
I	≥ 1.0E-05	≥ 1.0E-06	Unacceptable	Proposed changes in this region are not acceptable, regardless of baseline CDF and LERF.
II	< 1.0E-05 and ≥ 1.0E-06	< 1.0E-06 and ≥ 1.0E-07	Acceptable w/ conditions	Proposed changes in this region are acceptable provided the cumulative total CDF from all CDF initiators is less than 1.0E-04/yr and from all LERF initiators is <1E-5/yr. Cumulative effect of changes must be tracked and included in subsequent changes.
III	< 1.0E-06	< 1.0E-07	Acceptable w/ conditions	Proposed changes in this region are acceptable provided the cumulative total CDF from all initiators is less than 1.0E-03/yr and from all LERF initiators is <1E-4/yr. Cumulative effect of changes must be tracked and included in subsequent changes.

If the risk evaluation determines that ΔCDF and ΔLERF are acceptable and that defense-in-depth and safety margins are maintained, then document the results. This is confirmation that a success path effectively remains free of fire damage.

If the risk evaluation determines that either ΔCDF or ΔLERF are not acceptable, then document that the results are not acceptable and alternatives should be pursued until the quantitative acceptance criteria are met.

Defense-in-Depth Criteria

A review of the impact of the change on defense-in-depth should be performed, using the guidance below from NEI 04-02. NFPA 805 defines defense-in-depth as:

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- Preventing fires from starting
- Rapidly detecting fires and controlling and extinguishing promptly those fires that do occur, thereby limiting damage
- Providing adequate level of fire protection for structures, systems and components important to safety; so that a fire that is not promptly extinguished will not prevent essential plant safety functions from being performed.

In general, the defense-in-depth requirement is satisfied if the proposed change does not result in a substantial imbalance among these elements (or echelons).

The review of defense-in-depth is typically qualitative and should address each of the elements with respect to the proposed change. Defense-in-depth may be assessed at a compartment, fire scenario, or fire area basis if applicable to multiple changes.

Fire protection features and systems relied upon to ensure defense-in-depth should be clearly identified in the assessment (e.g., detection, suppression system).

Consistency with the defense-in-depth philosophy is maintained if the following acceptance guidelines, or their equivalent, are met:

- A reasonable balance is preserved among 10 CFR 50.48(c) defense-in-depth elements.

- Over-reliance and increased length of time or risk on performing programmatic activities to compensate for weaknesses in plant design is avoided.
- Pre-fire nuclear safety system redundancy, independence, and diversity are preserved commensurate with the expected frequency and consequences of challenges to the system and uncertainties (e.g., no risk outliers). (This should not be construed to mean that more than one safe shutdown/NSCA train must be maintained free of fire damage.)
- Independence of defense-in-depth elements is not degraded.
- Defenses against human errors are preserved.
- The intent of the General Design Criteria in Appendix A to 10 CFR Part 50 is maintained.

Safety Margin Criteria

A review of the impact of the change on safety margin should be performed. An acceptable set of guidelines for making that assessment is summarized below. Other equivalent acceptance guidelines may also be used.

- Codes and standards or their alternatives accepted for use by the NRC are met, and
- Safety analysis acceptance criteria in the licensing basis (e.g., FSAR, supporting analyses) are met, or provides sufficient margin to account for analysis and data uncertainty.

The requirements related to safety margins for the change analysis are described for each of the specific analysis types used in support of the FRE.

These analyses can be grouped into three categories. These categories are:

- Fire Modeling
- Plant System Performance
- PRA Logic Model

Additional information is contained in Section 5.3.5.3.

Table B-5 Unit X Fire Area Risk Summary

Fire Area	Area Description	NFPA 805 Basis	Fire Area CDF/LERF	VFDR (Yes/No)	RAs (Yes/No)	Fire Risk Eval Δ CDF/LERF	Additional Risk of RAs

B.2.2.5 Step 5 – Final Disposition

Once an acceptable performance-based evaluation has been completed for a fire area, the B-3 Table will be updated to summarize the final disposition of the VFDRs, including the documentation of the post-transition NFPA 805 Chapter 4 compliance basis. The performance based evaluation should contain all pertinent summary information to carry over to the B-3 Table so that the final disposition of the VFDR is clear.

For recovery action compliance strategies, ensure the manual action feasibility analysis of the required recovery actions is completed. If a recovery action cannot meet the feasibility guidance established in Section B.2.3, then alternate means of compliance should be considered.

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Document the post-transition regulatory basis for the fire area. In accordance with NFPA 805 Section 4.2.2 an approach (either deterministic or performance-based) must be selected. Statements should be high level, concise statements, examples include:

- NFPA 805 Section 4.2.3 Deterministic Approach (specify section)
- NFPA 805 Section 4.2.4.1 Performance-Based Approach – Fire Modeling
- NFPA 805 Section 4.2.4.2 Performance-Based Approach – Fire Risk Evaluation
- NFPA 805 Section 4.2.4.1 Performance-Based Approach – Fire Modeling with simplifying deterministic assumptions
- NFPA 805 Section 4.2.4.2 Performance-Based Approach – Fire Risk Evaluation with simplifying deterministic assumptions

B.2.2.6 Step 6 - Document Required Fire Protection Systems and Features

In accordance with 10 CFR 50.48(c) "Once a determination has been made that a fire protection system or feature is required to achieve the performance criteria of Section 1.5, its design and qualification shall meet the applicable requirement of Chapter 3".

Fire protection systems or features are required for NFPA 805 Chapter 4 compliance to achieve the performance criteria of Section 1.5 if they are required to meet:

- NFPA 805 Section 4.2.3, Deterministic Approach, or
- NFPA 805 Section 4.2.4, Performance-Based Approach

Review the NFPA 805 Section 4.2.3 compliance strategies (including fire area licensing actions and existing engineering evaluations) and the NFPA 805 Section 4.2.4 compliance strategies (including simplifying deterministic assumptions) to determine which fire protection systems and features form the basis for acceptability of the given compliance strategy. The required fire protection systems and features are then subject to the applicable requirements of NFPA 805 Chapter 3. The 'required' fire protection systems and features should be documented, with focus on systems and features within a fire area that have a Chapter 3 requirement. Examples of systems and features within a fire area that will be evaluated are:

- Fixed suppression systems
- Detection systems
- Electrical Raceway Fire Barrier Systems
- Fire Barriers, penetrations and through-penetration fire stops

The documentation of required fire protection systems and features in this step does not include the documentation of the fire area boundaries. Fire area boundaries should be known prior to the fire area reviews and are required. Any reviews and documentation of the fire area

boundaries should be performed as part of reviews of engineering evaluations, licensing action, or as part of the reviews of the NEI 04-02 Table B-1 process.

Fire Protection Systems and Features Required for Deterministic Compliance

If a fire protection system or feature is required to meet one of the following deterministic compliance strategies, then it is required to meet the nuclear safety performance criteria and therefore its design and qualification shall meet the appropriate sections of NFPA 805 Chapter 3:

1. Fire protection systems and features required for deterministic compliance in accordance with Section 4.2.3 of NFPA 805
2. Required by Existing Engineering Equivalency Evaluation (EEEE)

   As allowed by Section 2.2.7 of NFPA 805, "...the user shall be permitted to demonstrate compliance with specific deterministic fire protection design requirements in Chapter 4 for existing configurations with an engineering equivalency evaluation." These existing engineering equivalency evaluations include evaluations previously known as Generic Letter 86-10 evaluations, exemptions, and deviations. Fire Protection systems and features that form the bases for acceptability of these existing compliance strategies are required to meet the nuclear safety performance criteria.

Fire Protection Systems & Features Required for Performance-Based Compliance

Fire Modeling Approach

If a fire protection system or feature is included in the determination of the maximum expected and limiting fire scenarios, then it is required by Chapter 4 of NFPA 805 and is then subject to the applicable requirements of NFPA 805 Chapter 3.

Fire Risk Approach

In accordance with NFPA Section 4.2.4.2, the "...use of fire risk evaluation for the performance-based approach shall consist of an integrated assessment of the acceptability of risk, defense-in-depth, and safety margins." If the fire protection system or feature is required to demonstrate the acceptability of risk or defense-in-depth, then it is required by Chapter 4 and is then subject to the applicable requirements of NFPA 805 Chapter 3. The following method is used to determine if a fire protection feature or system is required for the acceptability of risk or defense-in-depth.

1. Acceptability of Risk

   A fire protection feature may be required for the 'acceptability of risk' in one of two ways:

   a. It is explicitly required to reduce risk in the NFPA 805 transition fire risk evaluation
   b. (Δ CDF / Δ LERF), or
   c. It is required to reduce the overall fire risk for the plant
2. Defense-in-Depth

   In accordance with NFPA 805 Section 2.4.4, Plant Change Evaluation, "...The evaluation process shall consist of an integrated assessment of the acceptability of risk, defense-in-depth, and safety margins." NFPA 805 Section 4.2.4.2 refers to the acceptance criteria in this section. Therefore, fire protection systems and features required to demonstrate an adequate balance of defense-in-depth are required by NFPA 805 Chapter 4.

The fire protection systems and features determined to be required should be added to the B-3 Table.

In addition, a summary of the results of this review should be assembled for inclusion in the LAR/Transition Report (e.g., Table 4-3 – Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features). An example of the presentation of the results of this review is provided in Table B-6 – Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features.

Table B-6 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Feature

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (E, R, D, S)	Required Detection System (E, R, D, S)	Required3Fire Protection Feature (E, R, D, S)	Required Fire Protection Feature and System Details
AB		Auxiliary Building	4.2.4.24				
AB	48	Unit 3 LPI & RB Spray Pumps			R	None	Detection – LPI/HPI areas
AB	49	Unit 3 LPI & RB Spray Pumps			R	None	Detection – LPI/HPI areas
AB	50	Unit 3 HPI Pump Area			R	None	Detection – LPI/HPI areas
ÁB	50A	Unit 3 HPI Pump, Spent Resin Transfer Pump Waste Tank			R	None	Detection – LPI/HPI areas

Legend:

E – EEEE/LA Criteria: Systems required for acceptability of Existing Engineering Equivalency Evaluations / NRC approved Exemptions/Deviations (NFPA 805 Section 2.2.7)

R – Risk Criteria: Systems required to meet the Risk Criteria for the Performance-Based Approach (NFPA 805 Section 4.2.4)

D – DID Criteria: Systems required to maintain adequate balance of Defense-in-Depth for a Performance-Based Approach (NFPA 805 Section 4.2.4)

S – Separation Criteria: Systems required to meet the Deterministic Separation Criteria (NFPA 805 Section 4.2.3)

Notes:

Refer to B-3 for each area for additional information

Modification Required

Fire Protection Features in this Table only refer to those features ‘installed in the Fire Area that have a corresponding Chapter 3 requirement’

Table B-2 Nuclear Safety Capability Assessment

Methodology Review

NFPA 805 Section: 2.4.2.1 Nuclear Safety Capability System and Equipment Selection

Aligns	The same systems used for post reactor trip inventory control will also be used for inventory control. Specifically, the CVCS system using the boric acid tank(s) and the RWST as sources of makeup water are used to maintain pressurizer level.	TP-E/ELEC-0001, Safe Shutdown in Case of Fire and Fire Hazards Analysis, Rev. 0, 6/2/2006	Sections B.2.2, B.4

NEI 00-01 Ref

3.1.2.4 Decay Heat Removal

NEI 00-01 Guidance

[BWR] Systems selected for the decay heat removal function(s) should be capable of:

- Removing sufficient decay heat from primary containment, to prevent containment over-pressurization and failure.
- Satisfying the net positive suction head requirements of any safe shutdown systems taking suction from the containment (suppression pool).
- Removing sufficient decay heat from the reactor to achieve cold shutdown.

[PWR] Systems selected for the decay heat removal function(s) should be capable of:

- Removing sufficient decay heat from the reactor to reach hot shutdown conditions. Typically, this entails utilizing natural circulation in lieu of forced circulation via the reactor coolant pumps and controlling steam release via the Atmospheric Dump valves.
- Removing sufficient decay heat from the reactor to reach cold shutdown conditions.

This does not restrict the use of other systems.

Applicability

Applicable

Comments

Alignment Statement	Alignment Basis	Comments	Unit	Reference Document	Doc. Details
Aligns	Test Plant uses the Auxiliary Feedwater System and Steam Generator PORVs to remove decay heat while in hot standby. Once temperature is reduced to about 350F, the RHR system is placed in service to complete the cooldown ot cold shutdown conditions.			TP-E/ELEC-0001, Safe Shutdown in Case of Fire and Fire Hazards Analysis, Rev. 0, 6/2/2006	Sections B.2.4, B.4

NEI 00-01 Ref

3.1.2.5 Process Monitoring

NEI 00-01 Guidance

The process monitoring function is provided for all safe shutdown paths. IN 84-09, Attachment 1, Section IX "Lessons Learned from NRC Inspections of Fire Protection Safe Shutdown Systems (10CFR50 Appendix R)" provides guidance on the instrumentation acceptable to and preferred by the NRC for meeting the process monitoring function. This instrumentation is that which monitors the process variables necessary to perform and control the functions specified in Appendix R Section III.L.1. Such instrumentation must be demonstrated to remain unaffected by the fire. The IN 84-09 list of process monitoring is applied to alternative shutdown (III.G.3). IN 84-09 did not identify specific instruments for process monitoring to be applied to redundant shutdown (III.G.1 and III.G.2). In general, process monitoring instruments similar to those listed below are needed to successfully use existing operating procedures (including Abnormal Operating Procedures).

BWR

- Reactor coolant level and pressure
- Suppression pool level and temperature
- Emergency or isolation condenser level
- Diagnostic instrumentation for safe shutdown systems

B.2.3 Recovery Actions

Background

NFPA 805 Section 1.6.52 Recovery Action defines a recovery action as:

> *Activities to achieve the nuclear safety performance criteria that take place outside the main control room or outside the primary control station(s) for the equipment being operated, including the replacement or modification of components.*

NFPA 805 Section 4.2.3.1 states:

> *One success path of required cables and equipment to achieve and maintain the nuclear safety performance criteria without the use of recovery actions shall be protected by the requirements specified in either 4.2.3.2, 4.2.3.3, or 4.2.3.4, as applicable. Use of recovery actions to demonstrate availability of a success path for the nuclear safety performance criteria automatically shall imply use of the performance-based approach as outlined in 4.2.4.*

NFPA 805 Section 4.2.4 Performance-Based Approach states:

> *When the use of recovery actions has resulted in the use of this approach, the additional risk presented by their use shall be evaluated.*

The following provides additional guidance with respect to recovery actions (formerly from RG 1.205, Revision 1):

- Previously approved OMAs that are required to demonstrate the availability of a success path for the nuclear safety performance criteria will require determination of additional risk but do not have to meet the acceptance criteria of RG 1.174. This additional risk will be part of the total risk change and may limit or preclude use of the fire risk evaluation performance-based method for VFDRs or recovery actions that were not previously approved.
- The additional risk associated with the use of a recovery action should be reported to the NRC as part of the LAR/Transition Report. See the LAR/Transition Report Template in Appendix H.
- There are two cases where operator actions taken outside the main control room may be considered as taking place at primary control station(s), as described below.

The discussion below provides the methodology used to determine recovery actions required for compliance (i.e., determining the population of post-transition recovery actions). The methodology consists of the following steps:

- Step 1: Clearly define the primary control station(s) and determine which pre-transition OMAs are taken at primary control station(s) (Activities that occur in the Main Control Room are not considered pre-transition OMAs). Activities that take place at primary control station(s) or in the Main Control Room are not recovery actions, by definition.
- Step 2: Determine the population of recovery actions that are required to resolve VFDRs (to meet the risk acceptance criteria or maintain a sufficient level of defense-in-depth).
- Step 3: Evaluate the additional risk presented by the use of recovery actions required to demonstrate the availability of a success path
- Step 4: Evaluate the feasibility of the recovery actions
- Step 5: Evaluate the reliability of the recovery actions

The details associated with these steps and the results of their implementation are provided below.

Step 1 - Clearly define the primary control station(s) and determine which pre-transition OMAs are taken at primary control station(s)

The first task in the process of determining the post-transition population of recovery actions is to apply the NFPA 805 definition of recovery action and the RG 1.205 definition of primary control station to determine those activities that are taken at primary control station(s).

Section 1.6.52 of NFPA 805 provides the following definition of recovery action:

> ***Recovery Action.*** *Activities to achieve the nuclear safety performance criteria that take place outside of the main control room or outside of the primary control station(s) for the equipment being operated, including the replacement or modification of components.*

Based on this definition, activities that take place inside the main control room or at primary control station(s) are not considered recovery actions. Also, based on this definition, actions in the main control room are not limited to actions at the main control boards. Actions taken at other locations in the main control room, such as other cabinets or panels, are also, by definition, not recovery actions. Primary control station(s) is defined as follows (as originally provided in RG 1.205, Revision 1, Section C.2.4):

There are two cases where operator actions taken outside the main control room may be considered as taking place at a primary control station. These two cases involve dedicated shutdown or alternative shutdown controls, which have been reviewed and approved by the NRC. In either case, the location or locations become primary when command and control is shifted from the main control room to these other locations[6]. For these two cases, the operator actions are not considered recovery actions, even if they are necessary to achieve the nuclear safety performance criteria.

a. The first case involves the controls for a system or component specifically installed to meet the "dedicated shutdown" option in Section III.G.3 of Appendix R. Operation of this equipment is considered as taking place at a primary control station. A system or component that has been specifically installed under the dedicated shutdown concept is a system or component that is operated from a location outside the control room and is fully separated from the fire area where its use is credited. These systems or components cannot be operated from the control room. Operation of dedicated shutdown equipment would not be considered a recovery action, since this would be the primary control station.

b. The second case involves controls for systems and components that have been modified to meet the "alternative shutdown" option in Section III.G.3 of Appendix R, to provide independence and electrical separation from the control room to address a fire-induced control room evacuation. These alternative shutdown controls may be considered the primary control station, provided that, once enabled, the systems and equipment controlled from the panel are independent and electrically separated from the fire area, and the additional criteria below are met.

[6] For example, use of a dedicated shutdown control would not be considered a recovery action following abandonment of the main control room, because that location may be considered a primary control station. Conversely, operation of dedicated or alternative shutdown controls while the main control room remains the command and control location would normally be considered a recovery action because, for such scenarios, the dedicated or alternative controls are not considered primary.

(1) The location should be considered the primary command and control center when the main control room can no longer be used. The control room team will evacuate to this location and use its alternative shutdown controls to safely shut down the plant.

(2) The location should have the requisite system and component controls, plant parameter indications, and communications so that the operator can adequately and safely monitor and control the plant using the alternative shutdown equipment.

(3) More than one component should be controlled from this location (a local control station provided to allow an individual component to be locally controlled, as in the local handwheel on a motor-operated valve, does not meet this definition)."

Figure B-6 provides an illustrative example. Note that the Main Control Room is shown on the figure, but, by definition, the Main Control Room, is not a Primary Control Station.

Figure 2 Illustration of Primary Control Station for Defining Recovery Actions

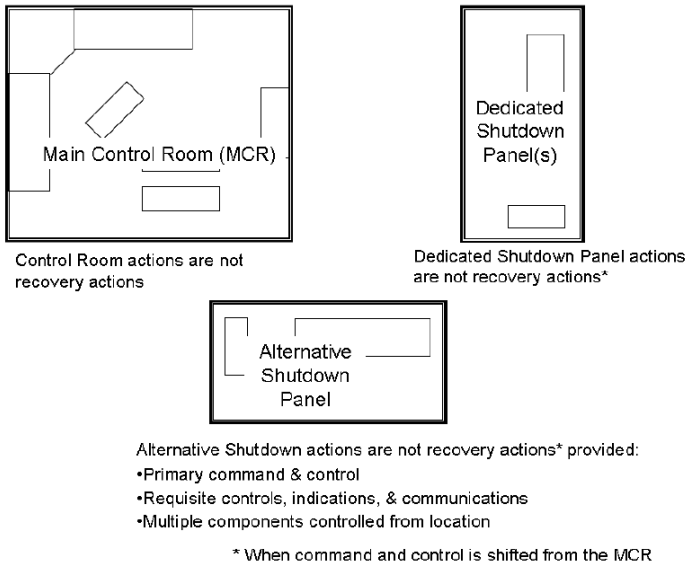

Figure B-6 Illustration of Primary Control Station for Defining Recovery Actions (from RG 1.205 Revision 1)

In addition to the above, actions that are necessary to activate or switch over to a primary control station(s) may be considered as taking place at primary control station(s) under the following conditions:

- The actions are limited to those necessary to activate, turn on, power up, transfer control or indication, or otherwise enable the primary control station(s) and make it capable of fulfilling its intended function following a fire. These actions should be related to the alternative/dedicated shutdown function and should take place in locations common to panels that perform the transfer of control. For example, switches that disable equipment in order to allow the alternative/dedicated shutdown location to function would

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be included as part of the primary control station. However, these actions should be in the same location(s) (panel or the local vicinity surrounding the panel) as the normal/isolation switches and may include de-energization of selected equipment and/or circuits (if such actions are similar to the use of isolation switches). This does not include additional actions in the plant that, while necessary to achieve the NSPC, are not part of enabling the primary control station(s) (e.g., controlling inventory by locally controlling valve(s)).

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- The actions are feasible and take place in sufficient time to allow the primary control station(s) to be used to perform the intended functions. The intended functions are defined as the original design criteria for the alternative/dedicated shutdown location(s) as provided in Generic Letter 86-10, Enclosure 2, Question 5.3.10 and Section 5.4.1 of RG 1.189, Revision 2.
- The switches or other equipment being operated to transfer control to the primary control station(s) are free from fire damage and the operators are able to travel from the main control room to the transfer location(s) and on to the primary control station(s) without being impeded by the fire.

The actions taken in the process of abandoning a control room and transferring to a primary control station(s) do not meet the definition of a recovery action subject to the conditions above since they are also considered as taking place at the primary control station(s). Conceptually, these actions are part of the primary control station(s) so the additional risk of their use does not need to be evaluated to demonstrate compliance with NFPA 805 Section 4.2.4.

Activities that occur in the main control room as a result of fire damage in the plant are compliant with NFPA 805 Section 4.2.3.1. Activities at the primary control station(s), including transition activities, are also compliant with NFPA 805 Section 4.2.3.1.

Dedicated or alternative shutdown strategy being considered as a primary control station(s) should be previously reviewed and approved by the NRC. Licensees may make modifications to their previously approved strategy or propose the use of a new primary control station(s) strategy that has not been previously approved.

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If the licensee proposes to make modifications to their previously approved strategy, the licensee should provide a detailed description of the modification to the dedicated or alternative shutdown strategy sufficient for the NRC to verify that the strategy meets the attributes provided above (electrical independence, command and control, instrumentation, actions necessary to enable (if required), etc.). In addition, provide sufficient design information to assure that connections/interconnections with safety-related plant systems will not cause a reduction in the capability, redundancy, diversity or design margin for those systems.

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If the licensee proposes the use of a new primary control station(s) strategy, there are two options for obtaining NRC staff approval of the new primary control station(s).

Option 1 is to design and install a primary control station(s) in accordance with the guidance and requirements of the pre-transition fire protection licensing basis (either Appendix R for a pre-1979 plant or NUREG-0800, Chapter 9.5.1, BTP 9.5-1 for post-1979 plants) and obtain NRC staff approval as part of the NFPA 805 license amendment (note that this process essentially makes a primary control station previously approved by the staff). In accordance with RG 1.205, Revision 1, no delta risk evaluation would be required since the NRC staff will have previously approved the primary control station(s) as part of the NFPA 805 license amendment.

Option 2 is to develop the design and analyze primary control station(s) using the performance-based approach and provide the necessary evaluation (e.g., fire modeling; fire risk evaluation).

If a licensee selects option 1, the following information should be provided to facilitate the NRC staff's review of the proposed primary control station(s):

(1) A complete description of the proposed primary control station(s):
   a. Including how primary control station(s) interfaces with existing plant systems, structures and components,
   b. Sufficient design drawings to fully describe proposed primary control station(s) (Plant layout drawings, electrical one-line and elementary drawings, and piping and instrumentation diagrams as necessary),
   c. In addition, provide sufficient design information to assure that connections/interconnections with safety-related plant systems will not cause a reduction in the capability, redundancy, diversity or design margin for those systems.

(2) A discussion of how proposed primary control station(s) meets the existing licensing basis requirements for Alternative/Dedicated Shutdown.

(3) A copy of the procedure(s) to be used to enable primary control station(s) as well as the procedure(s) used at the primary control station to control the plant.

(4) A discussion of how the fire area where primary control station(s) will be credited meets the NFPA 805 requirements for defense-in-depth and safety margins.

Results of Step 1:

Based on the definition, and the additional guidance above, the licensee should define those locations considered the primary control station(s) and provide the basis (i.e., show how the applicable criteria above are met). This information should be included in Attachment G of the LAR/Transition Report. For example

- List location(s) considered the primary control station(s). If multiple panels were previously approved for alternative/dedicated shutdown provide documentation.
- List location(s)/activities necessary to enable primary control station(s). As necessary, provide documentation of prior approval of activities required to enable the alternative/dedicated shutdown strategy.

Additionally, LAR/Transition Report Table G-2 - Recovery Actions and Activities Occurring at the Primary Control Station(s) should identify the activities that occur at the primary control station(s). Activities necessary to enable the primary control station(s) should also be identified in Table G-2 as primary control station(s) activities. These activities do not require the treatment of additional risk.

Step 2 - Determine the population of recovery actions that are required to resolve VFDRs (to meet the risk or defense-in-depth criteria)

On a fire area basis all VFDRs should be identified in the LAR/Transition Report B-3 Table (See Section B.2.2 of this document). Each VFDR not brought into compliance with the deterministic approach should be evaluated using the performance-based approach of NFPA 805 Section 4.2.4. The performance-based evaluations may result in the need for a recovery action to meet the acceptance criteria (risk acceptance criteria or the defense-in-depth acceptance criteria).

Results of Step 2:

The final set of recovery actions should be provided in the Transition Report in Table G-2 - Recovery Actions and Activities Occurring at the Primary Control Station(s).

Step 3: Evaluation of the Additional Risk of the Use of Recovery Actions

NFPA 805 Section 4.2.3.1 does not allow recovery actions when using the deterministic approach to meet the nuclear safety performance criteria. However, the use of recovery actions is allowed by NFPA 805 using a risk informed, performance-based, approach, provided that the additional risk presented by the recovery actions has been evaluated by the licensee in accordance with NFPA 805 Section 4.2.4.

Section 4.2.4 of NFPA 805 (2001) states:

> *4.2.4* Performance-Based Approach. This subsection shall provide for a performance-based alternative to the deterministic approach provided in 4.2.3. When the use of recovery actions has resulted in the use of this approach, the additional risk presented by their use shall be evaluated. When the fire modeling or other engineering analysis, including the use of recovery actions for nuclear safety analysis, is used, the approach described in 4.2.4.1 shall be used. When fire risk evaluation is used, the approach described in 4.2.4.2 shall be used.*

The explanatory material in Appendix A to NFPA 805 states:

> *A.4.2.4 Where recovery actions are the primary means to recover and re-establish any of the nuclear safety performance criteria (e.g., inventory and pressure control; decay heat removal), in lieu of meeting the deterministic approach as specified by 4.2.3, risk can be increased. The risk for the fire area and the risk presented by the implementation of recovery actions to recover the nuclear safety function should be compared to the risk associated with maintaining the function free of fire damage in accordance with the deterministic requirements specified in Chapter 4. Additional fire protection systems and features might have to be provided in the fire area to balance the risk.*

Use of recovery actions, as defined in NFPA 805, Section 1.6.52, to demonstrate the availability of a success path for the nuclear safety performance criteria, is not considered to meet the deterministic requirements in Section 4.2.3 of NFPA 805. Consequently, the licensee should address recovery actions, whether or not previously approved by the NRC, using the performance-based methods in Section 4.2.4, as required by NFPA 805, Section 4.2.3.1, and should evaluate the additional risk of their use according to NFPA 805, Section 4.2.4.

Commented [A23]: NRC: FAQ uses "must"

Commented [A24]: NRC: FAQ uses "must"

NFPA 805, Section 4.2.3.1, identifies recovery actions for which the additional risk must be evaluated, as required by NFPA 805, Section 4.2.4. These "success path" recovery actions are operator actions that, if not successful, would lead to the fire-induced failure of the "one success path of required cables and equipment to achieve and maintain the nuclear safety performance criteria." Other operator actions that do not involve the success path may be credited in plant procedures or the Fire PRA to overcome a combination of fire-induced and random failures may also be recovery actions, but licensees do not need to evaluate the additional risk of their use.

Based on NFPA 805 Sections 4.2.3.1 and 4.2.4 and clarification above, the additional risk presented by the use of recovery actions required to demonstrate the availability of a "success path" should be evaluated. These "success path" recovery actions are operator actions that, if not successful, would lead to the fire-induced failure of the "one success path of required cables and equipment to achieve and maintain the nuclear safety performance criteria." Therefore:

Commented [A25]: NRC: FAQ uses "shall"

- Activities that occur in the main control room as a result of fire damage in the plant are compliant with NFPA 805 Section 4.2.3.1 and do not require an evaluation of the additional risk of their use.
- Activities at primary control station(s), including activities to enable or activate the primary control station(s) meeting the criteria set forth in Step 1, are free of fire damage

from the primary control station are compliant with NFPA 805 Section 4.2.3.1 and do not require an evaluation of the additional risk of their use.

- Actions taking place outside the main control room that are modeled in the PRA but are not involved with demonstrating the availability of a success path to meet the Nuclear Safety Performance Criteria are not considered recovery actions requiring the evaluation of additional risk required by NFPA 805 Section 4.2.4.

The additional risk of a recovery action can be evaluated using one of the following processes:

- Calculate the CDF (LERF) associated with the VFDR that resulted in the need for the recovery action. Subtract the CDF (LERF) obtained by eliminating the VFDR in the PRA model to create a compliant case. This gives the ΔCDF and ΔLERF associated with VFDR and represents the additional risk associated with the use of recovery action in lieu of providing a deterministic resolution.
- Model the recovery action explicitly in the Fire PRA, with an appropriate human error probability and calculate the CDF (LERF). Subtract the CDF (LERF) obtained by eliminating the VFDR in the PRA model to create a compliant case. This gives the ΔCDF and ΔLERF associated with performing the action compared to providing a deterministic resolution.
- Report the applicable portion of the CDF/LERF (scenario or group of scenarios) for the fire area as a surrogate for the change in risk.
- Perform fire modeling in accordance with NFPA 805 Section 4.2.4.1 to demonstrate that the risk of the recovery action compared to deterministic compliance is negligible.

Additional Risk of Recovery Actions – Alternative or Dedicated Shutdown

The evaluation of the additional risk of recovery actions for fire areas that are associated with pre-transition alternative or dedicated shutdown capability may require special treatment. The following approach can be used to perform the FRE (i.e., determine the additional risk presented by the use of recovery actions) for areas that involve alternative or dedicated shutdown.

For the purposes of the transition to NFPA 805, the approach that should be used to assess this incremental risk is based on first identifying those fire initiating events that create/require a demand for implementation of alternative/dedicated shutdown strategies. If the cumulative CDF/LERF associated with these initiating events is very low, then a simple summation should be used to provide a bounding value. It is noted that a common risk treatment for these cases is to apply a surrogate conditional core damage probability (CCDP) that is intended to bound the human actions as well as the random equipment failures. In such cases, it may be necessary to specifically address the individual recovery actions and demonstrate that the related human error probability (HEP) is appropriately included in the surrogate CCDP that is used.

If this bounding treatment is judged to be overly conservative, then it will be necessary to further refine the Fire PRA so that those recovery actions are isolated and treated separately in the Fire PRA so that their specific risk contribution can be determined.

Additional Risk Results

The total increase or decrease in risk associated with recovery actions should be consistent with the guidelines of RG 1.174. The total increase or decrease in risk associated with the implementation of NFPA 805 for the overall plant should be calculated by summing the risk increases and decreases for each fire area (including any risk increases resulting from previously approved recovery actions). The total risk increase should be consistent with the acceptance guidelines in RG 1.174. Note that the acceptance guidelines of RG 1.174 may

require the total CDF, LERF, or both, to evaluate changes where the risk impact exceeds specific guidelines. If the additional risk associated with previously approved recovery actions is greater than the acceptance guidelines in RG 1.174, then the net change in total plant risk incurred by any proposed alternatives to the deterministic criteria in NFPA 805, Chapter 4 (other than the previously approved recovery actions), should be risk-neutral or represent a risk decrease.

Additional Risk of "Previously Approved" Recovery Actions

Information in this discussion is based on information previously provided in RG 1.205, Revision 1, Section C.2.2.4.1. In some cases, recovery actions that are proposed in lieu of deterministic requirements have been previously approved by the NRC. For these actions, the additional risk should be submitted with the transition License Amendment Request and can be deemed acceptable because of the previous approval. These previously approved alternatives to the deterministic requirements can be "carried over" into the NFPA 805 licensing basis. However, the additional risk of previously approved recovery actions is considered during transition when evaluating the acceptability of other risk increases resulting from the use of the fire risk evaluation approach.

Figure B-7 provides a convenient framework to focus the discussion of this concept. The flow chart in Figure B-7 starts with a given fire area to which the performance-based (PB) approach of NFPA 805, Section 4.2.4.2, is applied (block [1]). The additional risk of the previously approved recovery actions, compared to the NFPA 805 deterministic criteria, should be estimated and submitted in the transition License Amendment Request. If that additional risk (block [2]) is greater than the acceptance guidelines in RG 1.174, (i.e., in Region I of either Figure 4 or Figure 5 of RG 1.174, Revision 2), then the NRC staff will not normally approve any net increase in risk in that fire area (block [3]) from other variances from the deterministic requirements (VFDRs). Note that the acceptance guidelines of RG 1.174 may require the total CDF, LERF, or both, to evaluate changes where the risk impact exceeds specific guidelines. If there are additional VFDRs associated with that fire area (e.g., equipment or cables that do not meet the requirements; recovery actions that were not previously approved by the NRC), then those VFDRs would either have to be brought into deterministic compliance, or any additional risk associated with those VFDRs would have to be offset by an equal or greater reduction in risk for that fire area. The NRC staff may not approve net risk increases in fire areas where the previously approved recovery actions represent an additional risk above the acceptance guidelines in RG 1.174 (block [5]).

Block [4] represents the case in which the additional risk of previously approved recovery actions, compared to the NFPA 805 deterministic criteria, is less than the acceptance guidelines in RG 1.174. In this case, the NRC may be likely to approve risk increases in that fire area resulting from other alternatives to deterministic compliance, not previously approved, provided that the total risk increase for that fire area (i.e., from previously approved recovery actions and the other alternatives) meets the acceptance guidelines in RG 1.174. If this total risk increase exceeds the acceptance guidelines in RG 1.174, the NRC staff may not approve the proposed alternatives.

If there is no net risk increase in a fire area (block [3]) or the total additional risk from alternatives to deterministic criteria, both previously approved and not previously approved, is within the acceptance guidelines in RG 1.174 (block [4]), then the NRC staff may likely find that the additional risk associated with that fire area is acceptable for making the transition to NFPA 805 (block [6]).

Figure 1 Framework for Fire Risk Evaluations During Transition When Crediting Previously Approved Recovery Actions (RAs)

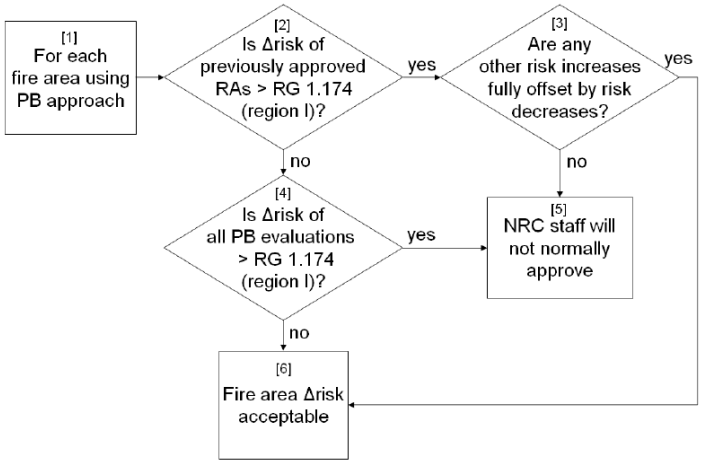

Figure B-7 Framework for Crediting Previously Approved Recovery Actions (based on RG 1.205 Revision 1 – Figure 1)

Additional risk of recovery actions determined to be required during the transition to NFPA 805 (new actions identified as part of transition or pre-transition OMAs that were not previously approved) becomes part of the transition risk.

Adverse Impact of Recovery Actions

In addition to the evaluation of risk presented by the use of recovery actions per Section 4.2.4 of NFPA 805, additional reviews should be performed to determine those activities that could have an adverse impact on plant risk. If activities (recovery actions or other actions in the post-fire operational guidance) are determined to have an adverse risk impact, they should be resolved during NFPA 805 implementation via an alternate strategy that eliminates the need for the action in the NSCA.

Results of Step 3:

The set of recovery actions that are necessary to demonstrate the availability of a success path for the nuclear safety performance criteria (See Table G-2) should be evaluated for additional risk using the process described above and compared against the guidelines of RG 1.174 and RG 1.205. The additional risk should be provided in Attachment W of the LAR/Transition Report.

A discussion of the results of the review of activities for an adverse impact on risk should be presented in Attachment G of the LAR/Transition Report.

Step 4: Evaluation of the Feasibility of Recovery Actions

Recovery actions should be evaluated against the feasibility criteria shown below in Table B-7. Note that since actions taken at the primary control station are not recovery actions their feasibility is evaluated in accordance with procedures for validation of off normal procedures.

Table B-7
Feasibility Criteria – Recovery Actions

1	**Demonstrations** The proposed recovery actions should be verified in the field to ensure the action can be physically performed under the conditions expected during and after the fire event.
2	**Systems and Indications** Consider availability of systems and indications essential to perform the recovery action.
3	**Communications** The communications system should be evaluated to determine the availability of communication, where required for coordination of recovery actions.
4	**Emergency Lighting** The lighting (fixed and/or portable) should be evaluated to ensure sufficient lighting is available to perform the intended action.
5	**Tools-Equipment** Any tools, equipment, or keys required for the action should be available and accessible. This includes consideration of SCBA and personal protective equipment if required. (This includes staged equipment for repairs).
6	**Procedures** Written procedures should be provided.
7	**Staffing** Walk-through of operations guidance (modified, as necessary, based on the analysis) should be conducted to determine if adequate resources are available to perform the potential recovery actions within the time constraints (before an unrecoverable condition is reached), based on the minimum shift staffing. The use of essential personnel to perform actions should not interfere with any collateral industrial fire brigade or control room duties.
8	**Actions in the Fire Area** When recovery actions are necessary in the fire area under consideration or require traversing through the fire area under consideration, the analysis should demonstrate that the area is tenable and that fire or fire suppressant damage will not prevent the recovery action from being performed.
9	**Time** Sufficient time to travel to each action location and perform the action should exist. The action should be capable of being identified and performed in the time required to support the associated shutdown function(s) such that an unrecoverable condition does not occur. Previous action locations should be considered when sequential actions are required.
10	**Training** Training should be provided on the post-fire procedures and implementation of the recovery actions.
11	**Drills** Periodic drills that simulate the conditions to the extent practical (e.g., communications between the control room and field actions, the use of SCBAs if credited, the appropriate use of operator aids).

Results of Step 4:

Each of the criteria in Table B-7 should be assessed for the recovery actions listed in Table G-2 of the LAR/Transition Report. The results of the feasibility review along with any items requiring closure during the implementation period should be documented in Attachment G and Attachment S of the LAR/Transition Report.

Step 5: Evaluation of the Reliability of Recovery Actions

The evaluation of the reliability of recovery actions depends upon its characterization.

- The reliability of recovery actions that are modeled specifically in the Fire PRA should be addressed using Fire PRA methods (i.e., HRA).
- The reliability of recovery actions not modeled specifically in the Fire PRA is bounded by the treatment of additional risk associated with the applicable VFDR. In calculating the additional risk of the VFDR, the compliant case recovers the fire-induced failure(s) as if the variant condition no longer exists. The resulting delta risk between the variant and compliant condition bounds any additional risk for the recovery action even if that recovery action were modeled.

Results of Step 5:

A discussion of the results of the reliability evaluation should be provided in Attachment G of the LAR/Transition Report.

Table B-8 (i.e., LAR/Transition Report Table G-2) Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS

B.3. Review of Existing Engineering Equivalency Evaluations

B.3.1 Types of Engineering Equivalency Evaluations

The term Engineering Equivalency Evaluation has been used in many different contexts. Types of Engineering Equivalency Evaluations that are recognized in Generic Letter 86-10 include:

- Fire Area Boundaries
- Structural Fire Barriers
- Fire Doors
- ERFBS
- ASD Fire Area, Room, Zone
- Coverage of Detection and Suppression Systems
- Intervening Combustibles between Redundant Trains
- NFPA Code Deviations
- Administrative Controls

B.3.2 Submittal of Existing Engineering Equivalency Evaluations in License Amendment Request

For the purposes of the transition, Existing Engineering Equivalency Evaluations should be reviewed to validate their quality level and their appropriate use. Those evaluations that demonstrate that a fire protection system or feature is rated or compliant will not be summarized in the licensee transition documentation (e.g., LAR/Transition Report), since they can be shown to meet the NFPA 805 Chapter 3 requirement. Consideration should be given to summarizing the methodology used for 'evaluating the rating/compliance' of the system and feature in the appropriate section of the NFPA 805 Chapter 3 comparison.

However, those evaluations that demonstrate a fire protection system or feature is adequate for the hazard should be summarized in the licensee transition documentation (e.g., LAR/Transition Report). (Note, since these evaluations are allowed under the current licensing basis, they do not require change evaluations) For example, if the evaluation takes into consideration combustible loading, other suppression/detection features, location of safe shutdown equipment, etc., and makes a claim that the feature is 'adequate for the hazard' then this evaluation should be summarized as part of the transition process.

B.3.3 Guidance for Reviewing Existing Engineering Equivalency Evaluations

NEI 02-03 (Revision 0, ML031780500), Appendix A, provides guidance for the preparation and development of engineering evaluations. The guidance may also be utilized to evaluate deviations from applicable NFPA codes. The guidance in NEI 02-03 is consistent with the information contained in Generic Letter 86-10. The evaluation criteria and technical considerations in Appendix A to NEI 02-03 should be utilized in the decision-making process regarding the adequacy of engineering evaluations for transition (Refer to Section B.3.4). These criteria and considerations should also be utilized in upgrading engineering evaluations or performing additional engineering evaluations prior to transition.

The following process should be used to determine if an existing engineering equivalency is adequate to transition:

- The engineering evaluation has been evaluated against the criteria in the pre-transition standard fire protection license condition, 10 CFR 50.59, or plant specific process used to determine the impact of the change/condition on the ability to achieve and maintain post-fire safe shutdown.

- The engineering evaluation should not be based solely on quantitative risk evaluations.
- The engineering evaluation should be an appropriate use of the engineering evaluation process (e.g., for a pre-1979 plant, judging that 15 feet of separation between redundant trains with suppression and detection meets 10 CFR 50, Appendix R, Section III.G.2.b is not appropriate, since an exemption would be required.)
- The engineering evaluations should be judged to be of acceptable quality. A recommended quality standard for engineering evaluations is based upon ASME NQA-1. ASME NQA-1 requires that design analyses meet minimum requirements. Design analyses shall be:
  - Legible and in a form suitable for reproduction, filing, and retrieving.
  - Provide analysis sufficiently detailed as to purpose, method, assumptions, design input, references and units, such that a person technically qualified in the subject can review and understand the analysis and verify the adequacy of the results without recourse to the originator.
  - ASME NQA-1 applies these requirements to safety-related and augmented quality design analyses. Fire Protection is typically "augmented quality", so engineering evaluations would be subject to these requirements.
- The engineering evaluation should reflect the current plant configuration or clearly bound changing plant conditions (e.g., evaluation assumed maximum/bounding combustible loading values in order to bound the plant configuration).

The engineering evaluation results will require judgment. The results of the transition evaluation should be formally documented as part of the transition submittals. This documentation should consist of a listing of each evaluation (document reference, revision no., related fire areas, etc.) and the results of the adequacy review. Existing engineering evaluations that will be transitioned to the new licensing basis and are determined to be inadequate can be resolved in the following manner:

- The condition requiring an engineering evaluation can be brought into literal compliance with the current fire protection licensing basis, thus eliminating the need for an evaluation.
- Updated to an acceptable level before transition and transitioned over to the new licensing basis.
- Evaluated during the transition process as part of the change evaluation process. (Note: Depending upon the significance of the adequacy determination, the item under consideration may need to be addressed via the corrective action process and/or may require compensatory measures.)

Note: Fire protection systems and features, as well as administrative controls, may be relied upon in the determination of acceptability for the engineering evaluations. These credited systems, features, and control should be included, as appropriate, into the plant configuration control processes (and potentially monitoring programs).

B.3.4 Evaluation Criteria and Technical Considerations from NEI 02-03, Appendix A, Guidance for Performing GL 86-10 Evaluations

The following excerpts are from NEI 02-03 Revision 0 Guidance for Performing a Regulatory Review of Proposed Changes to the Approved Fire Protection Program, June 2003 (ML031780500), Appendix A “Guidance for Performing GL 86-10 Evaluations”. This guidance provides the minimum evaluation criteria and technical considerations that should be included in existing engineering equivalency evaluations.

"When fire protection features are evaluated, the postulated fire in the Fire Hazard Analysis for the area, zone, or room affected by the change should be considered, and the overall protection scheme should be kept in perspective. The defense-in-depth principles of the fire protection program provide an adequate balance between the different features. Strengthening any one can compensate for weaknesses in others.

- Adequacy of Separation of Redundant Systems/Components Required for Post Fire Safe Shutdown

  When evaluating the adequacy of a fire barrier, the fire areas, zones, or rooms on each side of the barrier are to be individually analyzed for the impact of a fire on either side of the barrier on the redundant safe shutdown capability, including the likely spread of fire. The effectiveness of the barrier should be evaluated to demonstrate the adequacy of a barrier commensurate with the fire hazards in the area. A specific description of the fire protection features in the areas, zones, or rooms being analyzed is required to justify the change. Low fire loading alone is not a sufficient basis for the evaluation. If it is determined that each fire barrier of concern is capable of protecting the safe shutdown equipment/cables protected by the barrier (i.e., within and/or adjacent to the opposite side of the barrier), the analysis and justification for the acceptability of the fire barrier shall be documented.

  - If evaluating passive fire-rated components, the evaluation should determine, as a minimum, that:
    - The temperature on the unexposed side of the barrier is sufficiently below the ignition temperature of the penetrating items.
    - The continuity and thickness of the fire barrier material is maintained.
    - The nature of the support assembly is equivalent to the tested configuration.
    - The application or "end use" of the fire barrier is unchanged from the tested configuration. For example, the use of structural steel fire proofing to protect a cable tray assembly may not be acceptable.
  - If evaluating active fire rated components, then the evaluation should determine if the component provides an adequate level of separation considering the fire loading on both sides.
  - If evaluating the significance of combustible materials (e.g., type, quantity, distribution, etc.) located between redundant shutdown divisions that are not separated by rated fire barriers (i.e., intervening combustibles), then the evaluation should consider the following factors to determine whether circuits or components, including associated circuits required for safe shutdown, could be adversely affected or whether a new hazard / element is being introduced:
    - The horizontal spatial separation between redundant divisions.
    - Cable qualification (IEEE-383).
    - The presence of an automatic fire suppression system over the intervening combustible.
    - The likely fire propagation direction of burning intervening combustibles in relation to the location of the vulnerable shutdown division.
    - The availability of other active and passive compensating fire protection features provided.

  Note: For fire protection, "no intervening combustibles" means that there are not significant quantities of in-situ materials that will ignite and burn located between redundant shutdown systems. "Significant quantity" is a judgmental criterion, and the

judgment of whether or not intervening combustibles are significant should be made by a fire protection engineer and documented (for later NRC audit).

- Suppression and Detection System Coverage

  When evaluating the adequacy of partial suppression and/or detection coverage, the hazards in the fire areas, zones, or rooms of concern should be considered. The effectiveness of the system should be judged based on the location of the system components (i.e., detector, sprinklers, etc.) relative to the hazards, including the likely spread of fire, and should determine whether or not the system is commensurate with the fire hazards in the area. A specific description of the fire protection features in the areas, zones, or rooms being analyzed is required to justify the change. Low fire loading alone is not a sufficient basis for the evaluation.

- Manual Action Feasibility Evaluation Methodology

  Refer to NEI 04-02 Section B.2.2.4 Recovery Actions

- NFPA Code Deviations

  As a minimum, applicable NFPA code deviations should be evaluated and justified by a qualified fire protection engineer based on engineering judgment. Guidance, considerations, and criteria provided throughout this document may be utilized when determined to be applicable by the evaluating engineer.

- Administrative Controls
  - If changing a preventive maintenance or surveillance procedure method and/or frequency, the evaluation should ensure the change provides reasonable assurance that the associated system, feature, or component is maintained in full operating condition (and to indicate probable continuance of that condition until the next performance of that procedure). Vendor guidance, NFPA guidance, fire protection engineering judgment, and/or actual performance should be considered.
  - If changing a specified compensatory measure, then the evaluation should ensure the proposed compensatory measure provides reasonable assurance that post-fire safe shutdown capability is preserved when the compensatory measure is established."

C. FIRE PROTECTION PROGRAM DESIGN / LICENSING DOCUMENT POST TRANSITION

As part of the transition, the fire protection program must be adequately documented to support the transition to a new licensing basis, as discussed in Section 4 of this document.

Following the transition, a risk-informed, performance-based fire protection program must be supported by appropriate documentation, maintained under configuration control and quality assurance processes. Rather than create new, restrictive processes for program documentation the intent is to ensure that basic documentation, configuration control, quality requirements and practices that are part of a nuclear power plant are reflected in the fire protection program, and that any new analyses or program documents are covered by the existing programs.

Currently each nuclear power plant has a fire protection program that meets 10 CFR 50.48. This usually entails an upper level document that defines the personnel responsible for establishing and implementing the fire protection program and 2) the fire protection policy for the major fire protection program elements (procedures) and 3) the fire protection features (equipment) to which those elements are applied. The integration of the fire protection program, personnel requirements and procedures, which are then collectively applied to the facility, provide a defense-in-depth fire protection program. Figure C-1 is an example of pre-transition Fire Protection Program elements defined in a program plan document.

In addition to the upper level program document (or program plan), each nuclear power plant has a fire hazards analysis (assessment of fire hazards on a fire area basis) and an evaluation of their safe shutdown capability (on a fire area basis). These documents are supported by numerous evaluations, calculations, studies, etc. Figure C-2 and C-3 are examples of fire hazards analysis supporting documents and safe shutdown supporting documents.

Note that NFPA 805 is silent on the FP Quality Program. The NRC guidance for an acceptable Quality program for fire protection systems, previously given in Section C.4 of Branch Technical Position CMEB 9.5-1, Revision 2, dated July 1981, was generally used in the review and acceptance of approved fire protection programs for plants licensed after January 1, 1979. For plants licensed prior to January 1, 1979, similar guidance is specified in APCSB 9.5-1 and its Appendix A and in Generic Letter 77-02, "Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance." The existing FP Quality program should be transitioned as-is into the new NFPA 805 FP Program. Changes made to the FP Quality program will be controlled not only by post-transitional NFPA 805 Change Program, but also by the controls associated with changes to Technical Specifications (FP Audit Requirements), and changes to the Site Quality Program (to the extent that the FP Quality Program is incorporated into it).

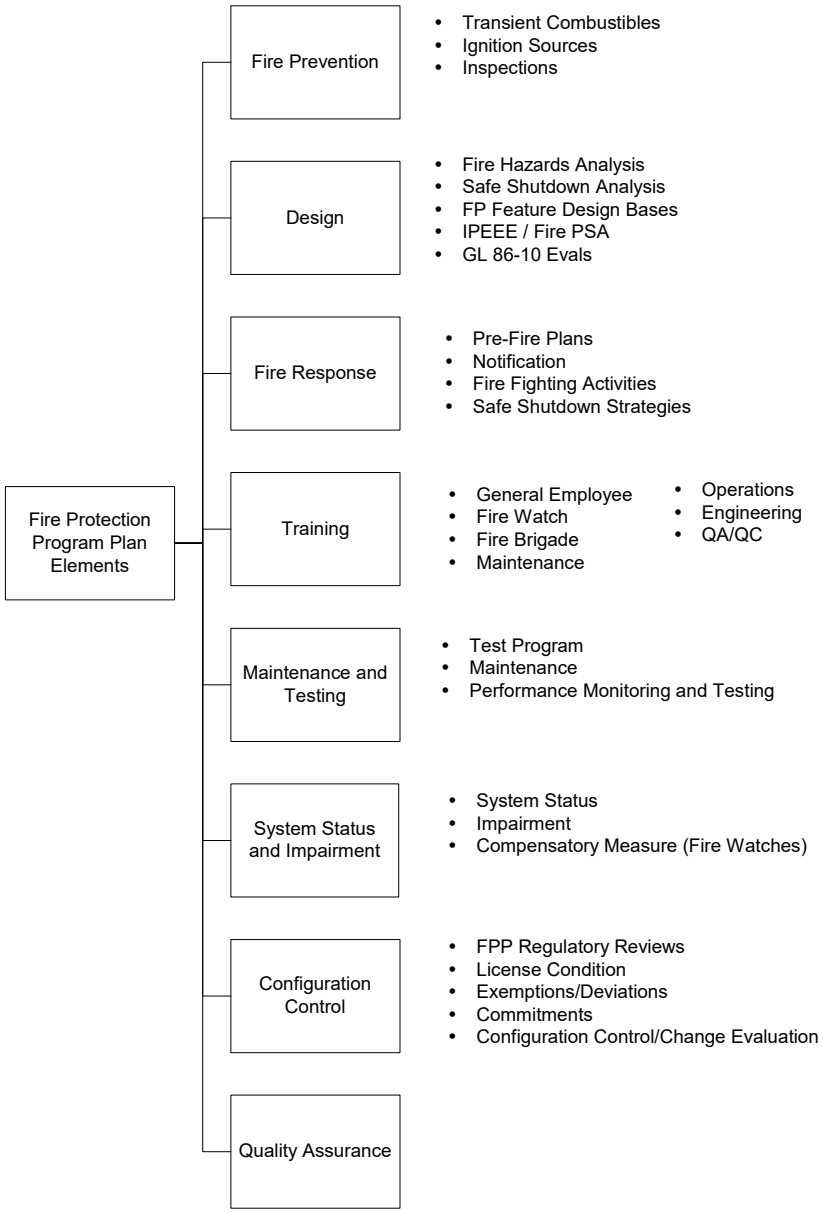

Figure C-1 – An Example of Pre-Transition Fire Protection Program Elements Defined in a Program Plan Document

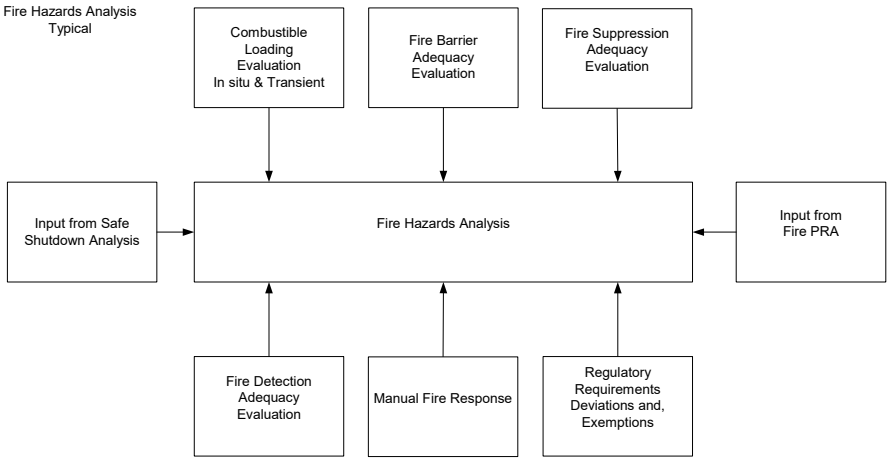

Figure C-2 An Example of Fire Hazards Analysis Supporting Documentation

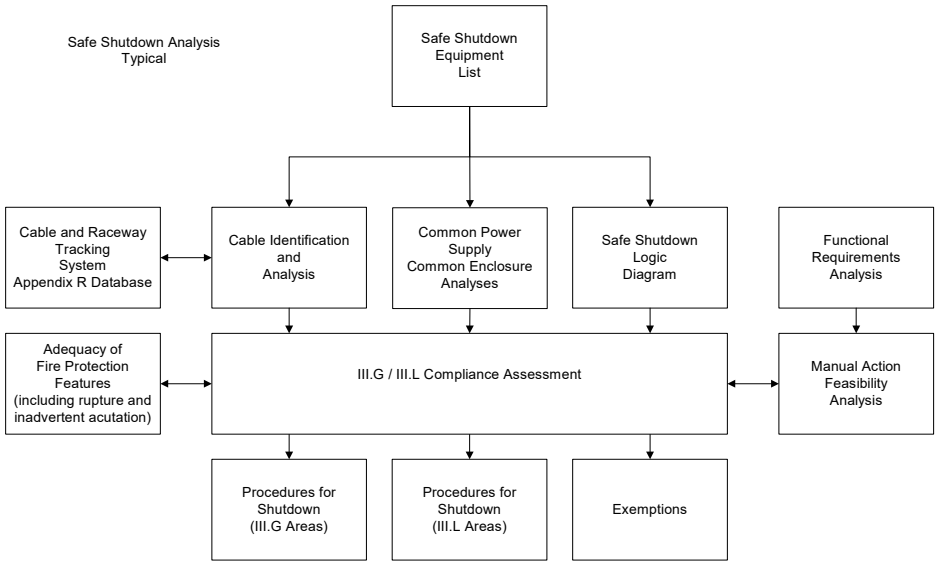

Figure C-3 An Example of Safe Shutdown Analysis Supporting Documentation

As part of the transition review, program documentation (both the programmatic (procedures) and technical) will be reviewed to ensure that the licensing and design basis meet the requirements for transition and that any outliers are addressed. These documents and how they support the NFPA 805 licensing basis will be documented in the Implementing Guide Worksheets and the Transition Report. This is addressed in Appendices B and H of this document.

While the NRC is processing the LAR/Transition Report, the licensee will update the pre-transition design/licensing documentation for long-term compliance. It is envisioned that this documentation will be the update of the two primary licensing/design basis documents: the Fire Protection Program Plan (administrative/organizational) and the Fire Hazards/Safe Shutdown Analysis.

One example of how NFPA 805 Design Basis Documents could be organized is depicted in Figure C-4.

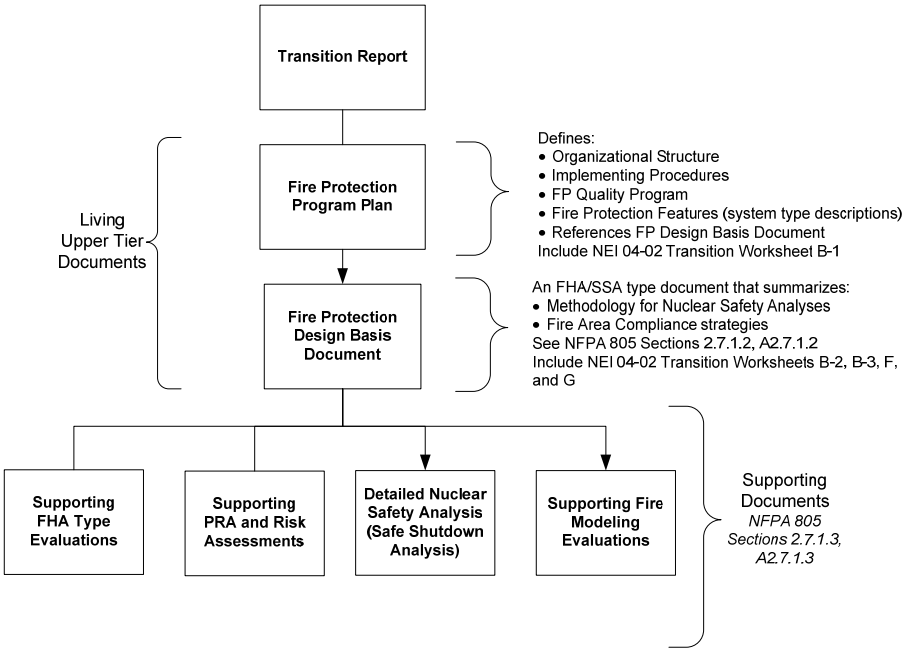

Figure C-4 An Example of Post-Transitional FP Documentation Hierarchy

The Fire Protection Program Plan document defines the personnel responsible for establishing and implementing the fire protection program and 2) the fire protection policy for the major fire protection program elements (procedures) and 3) the fire protection features (equipment) to which those elements are applied. This is the document that contains long-term compliance information for the Fundamental Elements and Minimum Design Requirements and the process portions (monitoring, change process, evaluation method procedures) of NFPA 805

The Fire Protection Design Basis Document will demonstrate compliance with the nuclear safety criteria of NFPA 805. This document will contain long-term compliance information for the Nuclear Safety Criteria portion of NFPA 805. It is essentially an update of the Fire Hazards/ Safe Shutdown Analyses. These existing Analyses will require revision as a result of the transition to the new NFPA 805 licensing basis.

The outline below identifies those sections that will require revision and guidance as to what that revision would entail.

C.1. Identification of Performance Criteria

The identification of criteria in NFPA 805 is straightforward. However, they are different from the current performance criteria and need to be revised

- Nuclear Safety
- Fire Protection Systems and Features
- Non-Power Operational Modes
- Radioactive Release

C.2. Identification of Fire Hazards

The identification of fire hazards in NFPA 805 is straightforward and comprehensive. However, the existing method of identifying fire hazards within a fire area will need to be modified for those fire areas that employ a risk-informed, performance-based compliance strategy. The following items should be revised for those areas:

- Level of detail commensurate with the evaluation performed (rigorous detail regarding combustibles, fire hazards, propagation,).
- Items to consider when identifying fire hazards, given that information may/will be used in fire modeling and may be subject to additional configuration controls (i.e., monitoring) if explicitly modeled.

C.3. Identification of Applicable SSCs

For those areas that employ a risk-informed, performance-based analysis, the identification of SSCs in the area should be revised. The revised FHA should focus on the identification of “targets” that were evaluated against the nuclear safety performance criteria.

C.4 Radioactive Release

A new section should be added to the FHA for Radioactive Release. This section should address the results of the evaluation performed during the transition.

C.5 Other modes of operation

A new section should be added to the FHA for Other Mode of Operation. This section should address the results of the evaluation performed during the transition.

D. FIRE MODELING

This appendix has been removed with Revision 3 of NEI 04-02.

E. MONITORING

The monitoring process consists of four major phases:

- Phase 1 – Scoping
- Phase 2 – Screening Using Risk Criteria
- Phase 3 – Risk Target Value Determination
- Phase 4 – Monitoring Implementation

A documented evaluation is used to:

- Determine the scope of fire protection, radioactive release, and NSCA SSCs and programmatic elements to monitor.
- Establish initial levels of availability, reliability, or other criteria for those elements that require monitoring.

A suggested methodology is outlined below. Figure E-1 provides an overview of the Monitoring Process, while Figure E-2 provides detail on a process for Phases 1 and 2.

Phase 1 – Scoping

In order to meet the NFPA 805 requirements for monitoring, the following categories of SSCs and programmatic elements should be included in the NFPA 805 monitoring program:

- Structures, Systems, and Components required to comply with NFPA 805, specifically:
  - Fire protection systems and features
    - Required by the Nuclear Safety Capability Assessment
    - Modeled in the Fire PRA
    - Required by Chapter 3 of NFPA 805
  - Nuclear Safety Capability Assessment equipment*
    - Nuclear safety equipment
    - Fire PRA equipment
    - NPO equipment
  - SSCs relied upon to meet radioactive release criteria
- Fire Protection Programmatic Elements

*For the purposes of the NFPA 805 Monitoring, “NSCA equipment” is intended to include Nuclear Safety Equipment, Fire PRA equipment, and NPO equipment.

Phase 2 – Screening Using Risk Criteria

The equipment from Phase 1 scoping will be screened to determine the appropriate level of NFPA 805 monitoring. As a minimum, the SSCs identified in Phase 1 should be part of an inspection and test program and system/program health program. If not in the current program, the SSCs should be added in order to assure that the criteria can be met reliably.

The following screening process is suggested to determine those SSCs that may require additional monitoring beyond normal surveillance activities.

1. Fire Protection Systems and Features

Those fire protection systems and features identified in Phase 1 would be candidates for additional monitoring in the NFPA 805 program commensurate with risk significance.

Risk significance may be accomplished at the component, programmatic element, and/or functional level. Since risk is evaluated at the compartment level or fire area level, criteria must be developed to determine those analysis units for which the fire protection SSCs contained within the area are considered risk significant. Screening compartments and fire areas should also include considerations for design/operation/maintenance limitations. For instance, fire detection should not subdivide systems beyond the system/train/channel level used in normal operation/maintenance.

The Fire PRA is the primary tool used to establish the risk significance criteria and performance bounding guidelines. Screening thresholds used to determine risk significant analysis units are those that meet the following criteria:

Risk Achievement Worth (RAW) of the monitored parameter ≥ 2.0

(AND) either

Core Damage Frequency (CDF) x (RAW) ≥ 1.0E-7 per year

(OR)

Large Early Release Frequency (LERF) x (RAW) ≥ 1.0E-8 per year

CDF, LERF, and $RAW_{(monitored\ parameter)}$ are calculated for each fire area. The 'monitored parameter' will be established by licensee at a level commensurate with the amenability of the parameter to risk measurement (e.g., a fire barrier may be more conducive to risk measurement than an individual barrier penetration). If compartments are used that are smaller than fire areas, sufficient basis should be documented.

The monitoring program will include the appropriate fire protection program SSCs based on the criteria above. The licensee may also screen in additional fire protection program SSCs based on plant-specific considerations. Additionally, licensees may submit criteria that are different than above for review and approval in the NFPA 805 LAR/Transition Report.

2. Nuclear Safety Capability Assessment Equipment*

NSCA equipment may already be appropriately monitored by the Maintenance Rule. A comparison of NSCA equipment to the SSCs that are monitored in the Maintenance Rule program should be performed to determine what equipment may require additional NFPA 805 Monitoring. For NSCAs SSCs not monitored by the Maintenance Rule, the basis for inclusion or exclusion of the SSCs in the NFPA 805 monitoring program should be documented.

The Fire PRA should be used to identify high-safety-significant (HSS) NSCA SSCs that require monitoring. The Maintenance Rule guidelines differentiating HSS from low-safety-significant (LSS) SSCs should be used. HSS NSCA SSCs not currently monitored in Maintenance Rule should be included in either the Maintenance Rule or the NFPA 805 monitoring program. If the Fire PRA and Maintenance Rule are not used to identify HSS NSCA SSCs that require monitoring, the licensee should fully describe the process used. All NSCA SSCs that are not HSS should be considered LSS and need not be included in the monitoring program.

For fires originating during non-power operational modes, the qualitative use of fire prevention to manage fire risk during Higher Risk Evolutions does not lend itself to quantitative risk measurement. Therefore, fire risk management effectiveness is monitored programmatically similar to combustible material controls and other fire prevention programs. Additional monitoring beyond inspection and test programs and system/program health programs is not considered necessary.

3. SSCs Relied upon for Radioactive Release Criteria

The evaluations performed to meet the radioactive release performance criteria are qualitative in nature. The SSCs relied upon to meet the radioactive release performance criteria are not amenable to quantitative risk measurement. Additionally, since 10 CFR Part 20 limits (which are lower than releases due to core damage and containment breach) for radiological effluents are not being exceeded, equipment relied upon to meet the radioactive release performance criteria is considered inherently low risk. Therefore, additional monitoring beyond inspection and test programs and system/program health programs is not considered necessary.

4. Monitoring of Fire Protection Programmatic Elements

Monitoring of programmatic elements is required in order to "assess the performance of the fire protection program in meeting the performance criteria". Programmatic aspects include:

- Transient Combustible Control; Transient Exclusion Zones
- Hot Work Control; Administrative Controls
- Fire Watch Programs; Program compliance and effectiveness
- Fire Brigade Effectiveness

Fire protection health reports, self-assessments, regulator and insurance company reports provide inputs to the monitoring program. The monitoring of programmatic elements and program effectiveness may be performed as part of the management of engineering programs. This monitoring is more qualitative in nature since the programs do not lend themselves to the numerical methods of reliability and availability. These programs form the bases for many of the analytical assumptions used to evaluate compliance with NFPA 805 requirements

Phase 3 – Risk Target Value Determination

Phase 3 consists of using the Fire PRA, or other processes as appropriate, to determine target values of reliability and availability for the HSS fire protection/NSCA SSCs and programmatic elements established in Phase 2 as requiring additional monitoring beyond inspection and test programs and system/program health programs.

Failure criteria are established by an expert panel or evaluation based on the required fire protection and nuclear safety capability SSCs and programmatic elements assumed level of performance in the supporting analyses. Action levels are established for the SSCs at the component level, program level, or functionally through the use of the pseudo system or 'performance monitoring group' concept. Action level should be developed for the NSCA SSCs that are included in a monitoring program.

If HSS SSCs have been identified using the Maintenance Rule guidelines, the associated SSC specific performance criteria may be established as in the Maintenance Rule, provided the criteria are consistent with Fire PRA assumptions. The actual action level is determined based on the number of component, program or functional failures within a sufficiently bounding time period (~2-3 operating cycles). Adverse trends and unacceptable levels of availability, reliability, and performance will be reviewed against established action levels. The Monitoring Program failure criteria and action level targets should be documented.

Phase 4 – Monitoring Implementation

Phase 4 is the implementation of the monitoring program, once the monitoring scope and criteria are established. Monitoring should consist of periodically gathering, trending, and evaluating information pertinent to the performance, and/or availability of the SSCs and comparing the results with the established goals and performance criteria to verify that the goals are being met. Results of monitoring activities should be analyzed in timely manner to assure

that appropriate action is taken. The corrective action process will be used to address performance of fire protection and nuclear safety SSCs that do not meet performance criteria.

For fire protection and NSCA SSCs that are monitored, unacceptable levels of availability, reliability, and performance will be reviewed against the established action levels. If an action level is triggered, corrective action should be initiated to identify the negative trend. A corrective action plan will then be developed using the appropriate licensee process. Once the plan has been implemented, improved performance should return the SSC back to below the established action level.

A periodic assessment should be performed (e.g., at a frequency of approximately every two to three operating cycles), taking into account, where practical, industry wide operating experience. This may be conducted as part of other established assessment activities. Issues that should be addressed include:

- Review systems with performance criteria. Do performance criteria still effectively monitor the functions of the system? Do the criteria still monitor the effectiveness of the fire protection and nuclear safety capability assessment systems?
- Have the supporting analyses been revised such that the performance criteria are no longer applicable or new fire protection and nuclear safety capability assessment SSCs, programmatic elements and/ or functions need to be in scope?
- Based on the performance during the assessment period, are there any trends in system performance that should be addressed that are not being addressed?

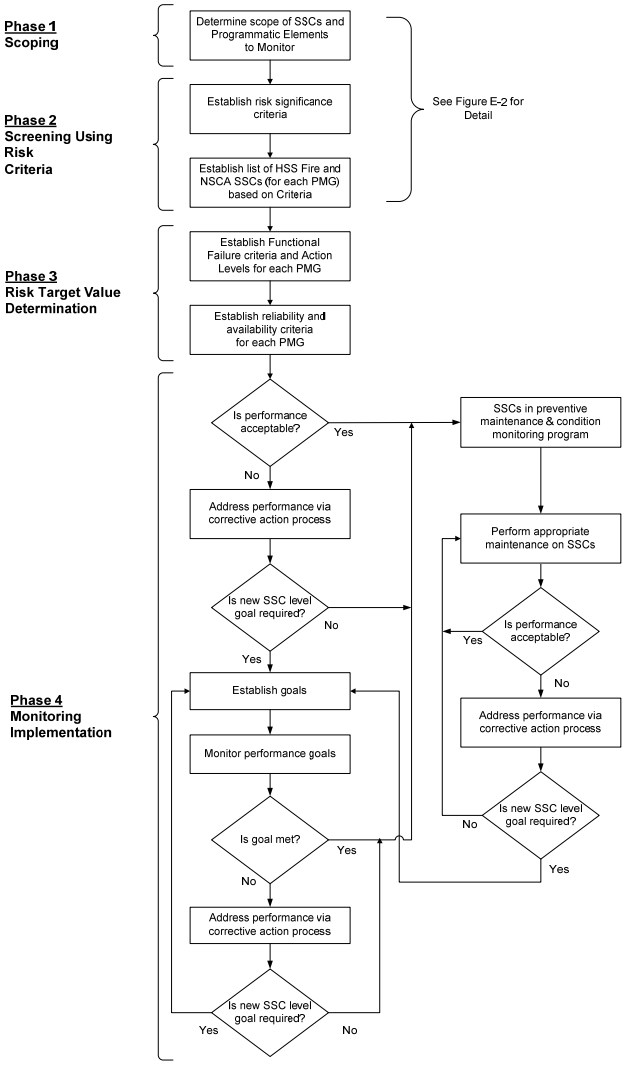

Figure E-1 – NFPA 805 Monitoring Process

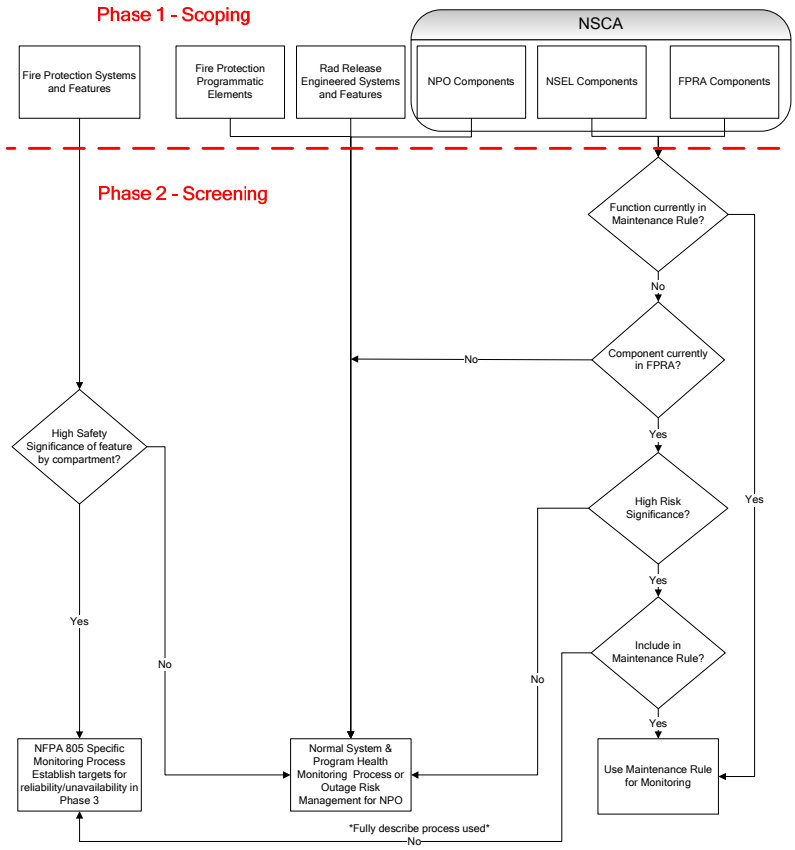

Figure E-2 – NFPA 805 Monitoring – Scoping and Screening

F. CONSIDERATIONS FOR NON-POWER OPERATIONAL MODES

The strategy for controls/protection of equipment during Non-Power Operational (NPO) modes, for plants adopting NFPA 805, will be a combination of the normal fire protection program defense-in-depth actions and additional risk-informed steps based on the availability of systems and equipment needed to support Key Safety Functions (KSFs) and whether or not the plant is in a Higher Risk Evolution (HRE). The goal (as depicted in Figure F-2) is to ensure that contingency plans are established when the plant is in a HRE, and there is the possibility of losing a KSF due to fire. Additional controls/measures will be evaluated during a NPO mode where the risk is intrinsically high[7]; during low risk periods normal risk management controls and fire prevention / protection processes and procedures will be utilized.[8] These additional control/measures are discussed in Section F.4.

Commented [A26]: NRC: Edited the footnote to reflect the language in FAQ

The process to demonstrate that the nuclear safety performance criteria are met during non-power modes of operations involves the following steps:

1. Review existing Outage Management Processes
2. Identify Components/Cables
3. Review plant systems to determine success paths that support each of the defense-in-depth KSFs, and then
4. Identify cables required for the selected components and then determine their routing
5. Perform Fire Area Assessments (identify pinch points)
6. Manage risk associated with fire-induced vulnerabilities during the outage

These steps are described in sections F.1 through F.4 below and the process is depicted on Figures F-1 and F-2. Implementation of the process should be documented in Table F-1.

F.1. Review existing Outage Management Processes

To begin the process of assessing the fire protection plan for non-power modes of operation, discussions should be held between the Probabilistic Risk Assessment (PRA) Staff, the Fire Protection, and the Outage Management staff to determine the best way to integrate NFPA 805 fire protection aspects into existing Outage Management Processes.

Included in this review should be a definition of what will be considered an HRE, if not already defined in plant outage management procedures. The HRE definition should consider the following:

- Time to boil
- Reactor coolant system and fuel pool inventory

[7] According to Section 1.3.1, "Nuclear Safety Goal," of NFPA 805, "[t]he nuclear safety goal shall be to provide *reasonable assurance* that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition." As stated, this does not mandate a fire risk evaluation comparable to what would be expected during full power. Therefore, it is recognized that, for non-power operations, a "risk-informed" approach has been developed which addresses what is believed to be (and evidenced through the referenced studies) the most risk-significant POSs during non-power operations when including considerations of fire effects, namely total loss of a KSF. As such, these are expected to account for most, if not all, POSs that can be considered "~~intrinsically high~~higher risk evolutions" when considering fire effects. This approach, while compliant with 10 CFR 50.48(c), does not constitute a complete surrogate for a non-power risk evaluation since, under plant-specific conditions (believed to be relatively rare), there may be non-power POSs where less than total loss of a KSF (e.g., a reduction in the availability of credited paths ["redundancy decrease"] such that at least one path still remains), including consideration of fire effects, could result in a risk-significant contribution.

[8] If an HRE is in progress additional controls/measures should be evaluated.

- Decay heat removal capability

In accordance with NUMARC 91-06

- Activities that may impact KSFs should be limited and strictly controlled during HREs or infrequently performed evolutions.[9]

F.2. Identify Components and Cables

The identification of systems and components to be included in this NPO Review begins with the identification of the plant operational states (POSs) that need to be considered. The following discussion identifies the various operational states that a plant goes through during NPO, and which ones are the most risk significant. The definitions of the following simplified POSs are contained in NRC Inspection Manual IM0609, Appendix G, Attachment 2, Phase 2 Significance Determination Process Template for PWR During Shutdown, and are included here for use in reading Tables F-2 and F-3.

Pressurized Water Reactor (PWR) [IM0609, Appendix G Attachment 2]

POS 1 - This POS starts when the RHR system is put into service. The RCS is closed such that a steam generator could be used for decay heat removal, if the secondary side of a steam generator is filled. The RCS may have a bubble in the pressurizer. This POS ends when the RCS is vented such that the steam generators cannot sustain core heat removal. This POS typically includes Mode 4 (hot shutdown) and portions of Mode 5 (cold shutdown).

POS 2 - This POS starts when the RCS is vented such that: (1) the steam generators cannot sustain core heat removal and (2) a sufficient vent path exists for feed and bleed. This POS includes portions of Mode 5 (cold shutdown) and Mode 6 (refueling). Reduced inventory operations and midloop operations with a vented RCS are subsets of this POS.

POS 3 - This POS represents the shutdown condition when the refueling cavity water level is at or above the minimum level required for movement of irradiated fuel assemblies within containment as defined by Technical Specifications. This POS occurs during Mode 6.

Boiling Water Reactor (BWR) [IM0609, Appendix G Attachment 3]

POS 1 - This POS starts when the RHR system is put into service. The vessel head is on and the RCS is closed such that an extended loss of the DHR function without operator intervention could result in a RCS re-pressurization above the shutoff head for the RHR pumps.

POS 2 - This POS represents the shutdown condition when (1) the vessel head is removed and reactor pressure vessel water level is less than the minimum level required for movement of irradiated fuel assemblies within the reactor pressure vessel as defined by Technical Specifications OR (2) a sufficient RCS vent path exists for decay heat removal.

[9] According to Section 1.3.1, "Nuclear Safety Goal," of NFPA 805, "[t]he nuclear safety goal shall be to provide *reasonable assurance* that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition." As stated, this does not mandate a fire risk evaluation comparable to what would be expected during full power. Therefore, it is recognized that, for non-power operations, a "risk-informed" approach has been developed which addresses what is believed to be (and evidenced through the referenced studies) the most risk-significant POSs during non-power operations when including considerations of fire effects, namely total loss of a KSF. As such, these are expected to account for most, if not all, POSs that can be considered "higher risk evolutions" when considering fire effects. This approach, while compliant with 10 CFR 50.48(c), does not constitute a complete surrogate for a non-power risk evaluation since, under plant-specific conditions (believed to be relatively rare), there may be non-power POSs where less than total loss of a KSF (e.g., a reduction in the availability of credited paths ["redundancy decrease"] such that at least one path still remains), including consideration of fire effects, could result in a risk-significant contribution.

POS 3 - This POS represents the shutdown condition when the reactor pressure vessel water level is equal or greater than the minimum level required for movement of irradiated fuel assemblies within the reactor pressure vessel as define by Technical Specifications. This POS occurs during Mode 5.

Disposition of the POSs (to determine which POSs require the identification of systems and components to support KSF) are provided in Tables F-2 and F-3. For other non-power conditions (e.g., PWR Mode 3, BWR Startup Mode 2), it is recommended that the normal fire protection program controls, processes and procedures be used.

Table F-2 - PWR POS Disposition For Equipment Selection

POS / Configuration	Disposition	Discussion
POS 1 with SG Heat Removal Available	No additional reviews required under NEI 04-02, Section 4.3.3 based upon previous risk reviews. Provide appropriate fire protection /prevention	In this POS, if SGs are available in addition to RHR, significant redundancy and diversity exists for heat removal. Just having inventory in the SGs can provide substantial passive heat removal, providing additional time to recover other heat removal methods. Inventory control is not generally challenged during this POS.
POS 1 with SG Heat Removal Unavailable [Consider limiting to configurations where time to boil is less than 2 hours and/or RCS level is being changed]	Perform actions per NEI 04-02, Section 4.3.3	Without SG Heat Removal capability, heat removal is limited to RHR and potentially bleed and feed. RCS pressurization on loss of heat removal could render RHR unavailable due to high pressure. Activities in this POS often involve changing RCS level. During RCS level changes, the likelihood of loss of inventory control is higher, challenging the inventory control safety function.
POS 2	Perform actions per NEI 04-02, Section 4.3.3.	This is the generally the highest risk configuration/POS for a PWR. Due to low inventory, times to core boil are low, typically on the order of 2 hours or less.
POS 3	Evaluate potential RCS drain paths that could be affected by fire	During this POS, substantial inventory exists to cope with an extended loss of active heat removal. Times to boil are often on the order of 16 or more hours. However, fire induced RCS draindown events can reduce margins substantially.

Table F-3 - BWR POS Disposition For Equipment Selection

POS / Configuration	Disposition	Discussion
POS 1	Perform actions per NEI 04-02, Section 4.3.3.	Inventory control is not generally challenged during this POS. However, loss of RHR could lead to a re-pressurized condition and there could be situations where the unavailability of high pressure injections systems from service could limit the mitigation capabilities.
POS 2	Perform actions per NEI 04-02, Section 4.3.3.	This is generally a period of relatively high risk in a BWR especially early in the outage when the decay heat is still relatively high.

Table F-3 - BWR POS Disposition For Equipment Selection

POS / Configuration	Disposition	Discussion
POS 3	Evaluate potential RV drain paths that could be affected by fire	During this POS, substantial inventory exists to cope with an extended loss of active heat removal. Times to boil are often on the order of 16 or more hours. However, induced RV draindown events can reduce margins substantially.

After identifying the POSs that require additional equipment evaluation for inclusion in the NPO review:

- Review existing plant outage processes (outage management and outage risk assessments) to determine KSFs that support the POSs of concern.
- Determine equipment relied upon to provide KSFs, including support functions, during the POSs to be evaluated. Each outage evolution identifies the diverse and/or redundant methods of achieving the KSF. For example, to achieve the Decay Heat Removal KSF a plant may credit Decay Heat Removal/Residual Heat Removal Train A, Decay Heat Removal/Residual Heat Removal Train B, Charging/High Pressure Injection Train A, Charging/High Pressure Injection Train B, and Gravity Feed and Chemical and Volume Control.
- Compare the equipment credited for achieving these KSFs against the equipment credited for nuclear safety. Note the position/function for the component. For example, the existing nuclear safety capability assessment (i.e., safe shutdown analysis for demonstrating compliance with 10 CFR 50, Appendix R/NUREG-0800) may credit the valve in the closed position however; the valve may be required open for shutdown modes of operation.
- For those components not already credited (or credited in a different way e.g., on versus off, open versus closed, etc.) analyze the circuits in accordance with the nuclear safety methodology. Identify cables that need to be included in the NPO review.
- For cables that are not already credited in the nuclear safety capability assessment, determine the routing for these cables.

F.3. Perform Fire Area Assessments (Identify pinch points)

Identify locations where:

1. Fires may cause damage to the equipment (and cabling) credited above, or
2. KSFs are achieved solely by crediting recovery actions, e.g., alignment of gravity feed.

Fire modeling may be used to determine if postulated fires in a fire area are expected to damage equipment (and cabling) thereby eliminating a pinch point.

To implement this guidance, perform the following Tasks:

- Determine if a single fire in the area can cause a loss of success paths for a KSF.
  - Conservatively, assume the entire contents of a fire area are lost. Document the loss of success paths. Specifically identify those areas that cause the loss of all success paths for a KSF.
  - If fire modeling is used to limit the damage in a fire area, document that fire modeling is credited and ensure the basis for acceptability of that model (location, type, and quantity of combustible, etc.) is documented. These critical design inputs should be maintained during outage modes. Fire modeling treatment should include a

treatment of safety margin to account for uncertainties/accuracy of the fire model used.

F.4. Manage risk associated with fire-induced vulnerabilities during the outage

The management of risk associated with fire-induced vulnerabilities during NPO varies based on whether or not the plant is in a Higher Risk Evolution as follows:

- During those NPO evolutions where risk is relatively low.

  The normal fire protection program defense-in-depth actions are credited for addressing the risk impact of those fires that potentially impact one or more trains of equipment that provide a KSF required during non-power operations, but would not be expected to cause the total loss of that KSF. The following actions are considered to be adequate to address minor losses of system capability or redundancy:

  - Control of Ignition Sources
    - Hot Work (cutting, welding and/or grinding)
    - Temporary Electrical Installations
    - Electric portable space heaters
  - Control of Combustibles
    - Transient fire hazards
    - Modifications
    - Flammable and Combustible liquids and gases
  - Compensatory Actions for fire protection system impairments
    - Openings in fire barriers
    - Inoperable fire detectors or detection systems
    - Inoperable fire suppression systems
  - Housekeeping

  Ensure that the normal fire protection defense-in-depth features are applicable during NPO modes.

- During those NPO evolutions that are defined as HREs

  Additional fire protection defense-in-depth measures will be taken during HREs by:

  - Managing risk in fire areas that contain known pinch points (all success paths for a KSF subject to damage by a fire).
  - Managing risk in fire areas where pinch points may arise because of equipment taken out of service

  NUMARC 91-06 discusses the development of outage plans and schedules. A key element of that process is to ensure the KSFs perform as needed during the various outage evolutions. During outage planning, the NPO Fire Area Assessment should be reviewed to identify areas of single-point KSF vulnerability during higher risk evolutions to develop any needed contingency plans/actions. For those areas consider combinations of the following options to reduce fire risk, depending upon the significance of the potential damage:

  - Prohibition or limitation of hot work in fire areas during periods of increased vulnerability
  - Verification of operable detection and /or suppression in the vulnerable areas.

- Prohibition or limitation of combustible materials in fire areas during periods of increased vulnerability
- Plant configuration changes (e.g., removing power from equipment once it is placed in its desired position)
- Provision of additional fire patrols at periodic intervals or other appropriate compensatory measures (such as surveillance cameras) during increased vulnerability
- Use of recovery actions to mitigate potential losses of key safety functions.
- Identification and monitoring in-situ ignition sources for “fire precursors” (e.g., equipment temperatures).
- Reschedule the work to a period with lower risk or higher DID

In addition, for KSF Equipment removed from service during the HREs the impact should be evaluated based on KSF equipment status and the NPO Fire Area Assessment to develop needed contingency plans/actions.

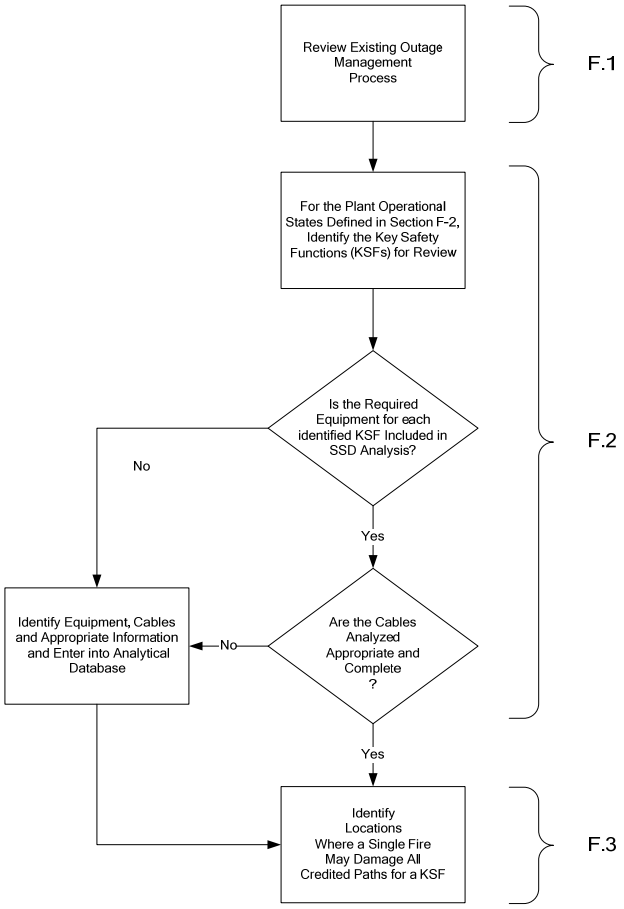

Figure F-1 Review POSs, KSFs, Components, Cables, and Identify Pinch Points

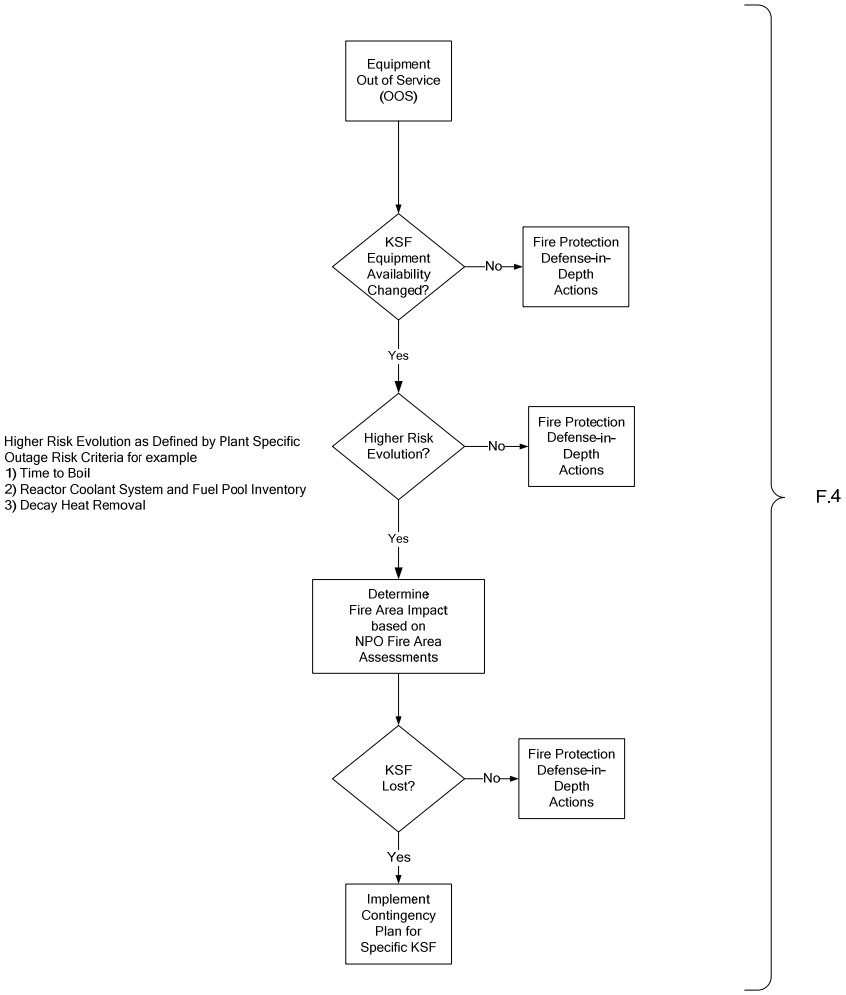

Figure F-2 Manage Risks

Table F-1
NFPA 805 – Non-Power Operational Guidance

NFPA 805 Requirements	Implementing Guidance	Process and Results
The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.	F.1 Review existing Outage Management Processes ▪ Define Higher Risk Evolutions (HREs), if not already defined in plant outage management procedures. The HRE definition should consider the following: o Time to boil o Reactor coolant system and fuel pool inventory o Decay heat removal capability	▪ Define HREs
	F.2 Identify Components and Cables The identification of systems and components to be included in this NPO Review begins with the identification of the plant operational states (POSs) that need to be considered Identify the various operational states that a plant goes through during NPO, and which ones are the most risk significant.	After identifying POSs that require additional equipment evaluation for inclusion in the NPO review: ▪ Review existing plant outage processes (outage management and outage risk assessments) to determine Key Safety Functions (KSFs) that support the POSs of concern. ▪ Determine equipment relied upon to provide KSFs, including support functions, during the POSs to be evaluated. ▪ Compare the equipment credited for achieving these KSFs against the equipment credited for nuclear safety. Note the position/function for the component ▪ For those components not already credited (or credited in a different way e.g., on versus off, open versus closed, etc.) analyze the circuits in accordance with the nuclear safety methodology. Identify cables that need to be included in the NPO review. ▪ For cables that are not already credited in the nuclear safety capability assessment, determine the routing for these cables.
	F.3 Perform Fire Area Assessments (Identify pinch points) Identify locations where: ▪ Fires may cause damage to the equipment (and cabling) credited above, or	▪ Determine if a single fire in the area can cause a loss of success paths for a KSF. o Conservatively, assume the entire contents of a fire area are lost. Document the loss of success paths. Specifically identify those areas that cause the loss of all success paths for a KSF.

Table F-1
NFPA 805 – Non-Power Operational Guidance

NFPA 805 Requirements	Implementing Guidance	Process and Results
	▪ KSFs are achieved solely by crediting recovery actions, e.g., alignment of gravity feed Fire modeling may be used to determine if postulated fires in a fire area are expected to damage equipment (and cabling) thereby eliminating a pinch point. Fire modeling should include a treatment of safety margin (MEFS/LFS or other treatment) to account for uncertainties/accuracy of the fire model used	o If fire modeling is used to limit the damage in a fire area, document that fire modeling is credited and ensure the basis for acceptability of that model (location, type, and quantity of combustible, etc.) is documented. These critical design inputs should be maintained during outage modes.
	F.4 Manage risks associated with fire-induced vulnerabilities during the outage ▪ During those NPO evolutions where risk is relatively low. The normal fire protection program defense-in-depth actions are credited for addressing the risk impact of those fires that potentially impact one or more trains of equipment that provide a KSF required during non-power operations, but would not be expected to cause the total loss of that KSF. The following actions are considered to be adequate to address minor losses of system capability or redundancy: o Control of Ignition Sources - Hot Work (cutting, welding and/or grinding) - Temporary Electrical Installations - Electric portable space heaters o Control of Combustibles - Transient fire hazards - Modifications - Flammable and Combustible liquids and gases o Compensatory Actions for fire protection system impairments - Openings in fire barriers - Inoperable fire detectors or detection systems	▪ Ensure that the normal fire protection defense-in-depth features are applicable during NPO modes.

Table F-1
NFPA 805 – Non-Power Operational Guidance

NFPA 805 Requirements	Implementing Guidance	Process and Results
	- Inoperable fire suppression systems o Housekeeping	
	▪ During those NPO evolutions that are defined as HREs Additional fire protection defense-in-depth measures will be taken during HREs by: o Managing risk in fire areas that contain known pinch points. o Managing risk in fire areas where pinch points may arise because of equipment taken out of service NUMARC 91-06 discusses the development of outage plans and schedules. A key element of that process is to ensure the KSFs perform as needed during the various outage evolutions. During outage planning, the NPO Fire Area Assessment should be reviewed to identify areas of single-point KSF vulnerability during higher risk evolutions to develop any needed contingency plans/actions. For those areas consider combinations of the following options to reduce fire risk depending upon the significance of the potential damage: o Prohibition or limitation of hot work in fire areas during periods of increased vulnerability o Verification of operable detection and /or suppression in the vulnerable areas. o Prohibition or limitation of combustible materials in fire areas during periods of increased vulnerability o Plant lineup modifications (removing power from equipment once it is placed in its desired position) o Provision of additional fire patrols at periodic intervals or other appropriate compensatory measures (such as surveillance cameras) during increased vulnerability	▪ Integrate the results of the analysis performed above into the plant's outage management process. ▪ To the extent practical pre-plan the options for achieving the KSF.

Table F-1 NFPA 805 – Non-Power Operational Guidance		
NFPA 805 Requirements	**Implementing Guidance**	**Process and Results**
	○ Use of recovery actions to mitigate potential losses of key safety functions. ○ Identification and monitoring in-situ ignition sources for “fire precursors” (e.g., equipment temperatures). ○ Reschedule the work to a period with lower risk or higher DID. In addition, for KSF Equipment removed from service during the HREs the impact should be evaluated based on KSF equipment status and the NPO Fire Area Assessment to develop needed contingency plans/actions.	

G. CONSIDERATIONS FOR RADIOACTIVE RELEASE

To demonstrate compliance with the radioactive release goals, objectives, and performance criteria, the following tasks should be performed:

- **Determine radioactive release analysis compartmentation.** If the radioactive release reviews are to be performed other than on a fire area basis, provide a justification for this approach.
- **Review pre-fire plans.** Ensure for locations that have the potential for contamination that specific steps are included for containment and monitoring of potentially contaminated gaseous and liquid effluents (typically smoke and suppression water). This review should cover all plant operating modes (including full power and non-power conditions). Update pre-fire plans as necessary. Summarize how the radioactive release goals, objectives and performance criteria are met for each area. Provide the details of any changes to pre-fire plans made to address radioactive release goals, objectives and performance criteria. For fire pre-plans that are not revised at the time of the LAR/Transition Report provide a summary of planned changes and provide a schedule for implementation as part of the overall NFPA 805 implementation schedule.
- **Review fire brigade training materials.** Ensure that training materials deal specifically with the containment and monitoring of potentially contaminated gaseous and liquid effluents (typically smoke and suppression water). Update training materials as necessary. Provide the details of any changes to training materials made to address radioactive release goals, objectives and performance criteria. For materials not completed by the time of the LAR/Transition Report provide a summary of the planned changes and provide a schedule for implementation as part of the overall NFPA 805 implementation schedule.
- **Review engineering controls for gaseous effluents.** Ensure for locations that have the potential for contamination that gaseous effluents (for example contaminated smoke and related particulates) are contained within the station boundaries. One example might be to demonstrate that such effluents would be contained within the area's ventilation envelope, leading to a monitored, filtered, and elevated release. This review should cover all plant operating modes (including full power and non-power conditions). Otherwise, provide a bounding analysis, quantitative analysis, or other analysis that demonstrates that the limitations for the instantaneous release of gaseous radioactive effluents specified in the unit's Technical Specifications are met. An example of these limitations is section 5.5.4.g of the Standard Technical Specifications.
- **Review engineering controls for liquid effluents.** Ensure for locations that have the potential for contamination that liquid effluents (for example automatic or manual fire-fighting water) are contained within the station boundaries. One example might be to demonstrate that such effluents would be contained within the area's floor drain system, which leads to a monitored storage tank system that is sized for the expected volume of runoff. This review should cover all plant operating modes (including full power and non-power conditions). Otherwise, provide a bounding analysis, quantitative analysis, or other analysis that demonstrates that the limitations for instantaneous release of liquid radioactive effluents specified in the unit's Technical Specifications are met. An example of these limitations is section 5.5.4.b of the Standard Technical Specifications.
- **Document results.**

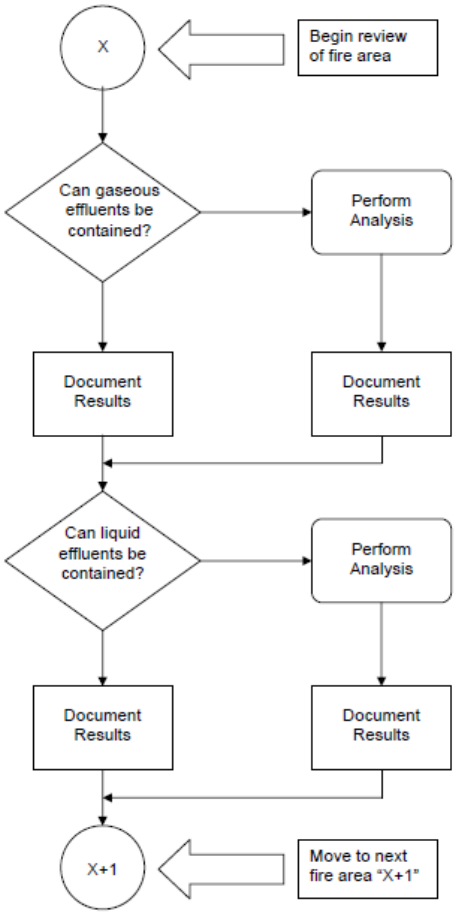

Figure G-1 – Radioactive Release Review Process

Table G-1
NFPA 805 – Radioactive Release Transition Review Guidance

Part 1

Description and justification of radioactive release analysis compartmentation. [Non-Table Format Content]

Part 2a

Fire Pre-Plan	Fire Area	Screened Out	Evaluation	Conclusion
Identification/name of the pre-plan being considered.	Identification/name of the compartments being covered by the pre-plan. Consider second column if required to define the exact compartment under consideration.	Provide information that this pre-plan is screened in (affects radioactive release) or screened out (cannot affect radioactive release). This can be a yes/no column provided the process to determine this is presented elsewhere.	Describe how the pre-fire plan supports the containment and monitoring of potentially contaminated gaseous and liquid effluents.	

Part 2b:

Fire Pre-Plan	Fire Area	Screened Out	Evaluation	Conclusion
Identification/name of the pre-plan being considered.	Identification/name of the compartments being covered by the pre-plan. Consider second column if required to define the exact compartment under consideration.	Provide information that this pre-plan is screened in (affects radioactive release) or screened out (cannot affect radioactive release). This can be a yes/no column provided the process to determine this is presented elsewhere.	Describe any changes to the pre-fire plan made to address radioactive release goals, objectives and performance criteria.	

Part 3

Description of changes to training materials made to address radioactive release goals, objectives and performance criteria. [Non-Table Format Content]

Part 4

		Engineered Controls		
Fire Area	Screened Out	Gaseous Effluents	Liquid Effluents	Conclusion
Identification/name of the compartment being considered. Consider second column if required to define the exact compartment under consideration.	Provide information that this compartment is screened in (affects radioactive release) or screened out (cannot affect radioactive release). This can be a yes/no column provided the process to determine this is presented elsewhere.	Describe how gaseous effluents are contained within the station boundaries. This should cover all plant operating modes. Otherwise, provide a reference to an analysis, detailed elsewhere, that demonstrates that the limitations for radioactive effluent release specified in the unit's Technical Specifications are met.	Describe how liquid effluents are contained within the station boundaries. This should cover all plant operating modes. Otherwise, provide a reference to an analysis, detailed elsewhere, that demonstrates that the limitations for radioactive effluent release specified in the unit's Technical Specifications are met.	

H. REGULATORY SUBMITTAL & TRANSITION DOCUMENTATION

H.1. Template: Letter of Intent to Adopt NFPA 805 as a Risk-Informed, Performance-Based Alternative for Fire Protection Requirements

[Date]

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: [Facility Name]

[Facility Docket numbers]
Adoption of NFPA 805 (Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants, 2001 Edition)

This letter serves to inform you of **[Facility Name]** intent to adopt NFPA 805 (Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants, 2001 Edition) in accordance with 10 CFR 50.48(c).

The transition to the performance-based standard for fire protection is expected to commence in **[month/quarter, year]** and take **[total estimated time (in months)]** to fully implement. The activities that need to be performed in order to support this transition include:

[Outline the activities that are needed to support the transition. Also include a timetable with the anticipated completion date for transition milestones and implementation phase activities.]

In accordance with the interim enforcement policy, enforcement discretion is requested for NRC unresolved items (URIs) and [**Licensee Name]** identified non-compliances related to fire protection. [**Licensee Name]** understands that this letter of intent initiates a period of enforcement discretion during which no enforcement actions will be taken for non-compliances (which meet the enforcement policy guidelines) discovered as a result of evaluations to support this licensing basis transition.

This schedule is subject to change depending on the extent to which the plant determines that it needs to make either physical modifications or changes to the fire protection program to comply with NFPA 805. An updated schedule will accompany the License Amendment Request required under 10 CFR 50.48(c)(3)(i)

H.2. Template: License Amendment Request Transmittal Letter

[Date]

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: [Facility Name]

[Facility Docket numbers]
License Amendment Request to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants, 2001 Edition)

Pursuant to Title, Code of Federal Regulations (CFR), Part 50, Section 90 (10 CFR 50.90), **[Facility Name]** proposes to amend Appendix A, Technical Specifications, for Facility Operating Licenses **[License Numbers]** for **[Facility Name]**. **[Identify the Technical Specifications that need to be amended (including changes to the bases).]** This amendment is needed to support the adoption of NFPA 805 Performance-Based Standard for Fire Protection, 2001 Edition in accordance with 10 CFR 50.48(c).

The proposed License Amendment Request (LAR) requests Nuclear Regulatory Commission (NRC) approval for adoption of a new fire protection licensing basis which complies with the requirements in 10 CFR 50.48(a), 10 CFR 50.48(c), and the guidance in Regulatory Guide (RG) 1.205, Revision **[Current Revision],** Risk-Informed, Performance Based Fire Protection for Existing Light-Water Nuclear Power Plants. This amendment request also follows the guidance in Nuclear Energy Institute (NEI) 04-02, **[Current Revision]**, Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c). Upon approval, the fire protection program will transition to a new Risk- Informed, Performance-Based (RI-PB) alternative in accordance with 10 CFR 50.48(c), which incorporates by reference NFPA 805. The NFPA 805 fire protection program will supersede the current fire protection program licensing basis in accordance with **[Current Fire Protection Licensing Basis]**.

The transition to the proposed new fire protection licensing basis includes the following high level activities: a new fire safe shutdown analysis, a new Fire Probabilistic Risk Analysis (PRA), and completion of activities required for transitioning the licensing basis to 10 CFR 50.48(c).

Implementation of these changes will not result in an undue risk to the health and safety of the public.

Information associated with the transition is provided in the enclosed Transition Report, including the technical and regulatory justifications required to support this LAR.

The following schedule for transitioning to the new fire protection licensing basis requires NRC approval of the LAR in accordance with the following schedule:

- Implementation of the new NFPA 805 fire protection program to include procedure changes, process updates, and training to affected plant personnel. This will occur **[Schedule for completion of implementation items]**.
- Modifications will be completed by **[Schedule for completion of implementation items]**. Appropriate compensatory measures will be maintained until modifications are complete.

Enclosure:
Transition Report

H.3. LAR/Transition Report Template

Note: In the 2009-2010 timeframe, a number of public meetings and interactions occurred between NEI and the NRC regarding the content of an NFPA 805 LAR/Transition Report and NFPA 805 Safety Evaluation (e.g., ML102170205). The templates were adjusted during non-pilot review processes to incorporate lessons learned (e.g., ML122350232). Although the templates were not formally approved or endorsed, they served as valuable tools for consistent content of submittals and Safety Evaluations.

The following pages contain the NEI NFPA 805 Task Force LAR/Transition Report Template Revision 1Q from February 2014 (the latest template at the time of NEI 04-02 Revision 3 preparation).

LAR/Transition Report Template file (to be included with pdf of final document, pages H-4 to H-125):

LAR Template Rev. 1Q

I. PLANT CHANGE EVALUATION FORM

This Appendix was eliminated with FAQ 12-0061 Revision 3 (ML13162A106), as approved in the Closure Memo dated April 15, 2015 (ML15002A054).

J. PLANT CHANGE EVALUATIONS

This Appendix supplements information contained in Sections 4.4 and 5.3. Refer to Figure 5-1. This Appendix provides:

- Supplemental information on the overall Fire Protection Change Impact Review process (Section J.1)
- Additional guidance on selected NFPA 805 topics (Sections J.2 through J.6)
- NFPA 805 Chapter 2 Methodology Changes (J.2)
- NFPA 805 Chapter 3 Changes (J.3)
- NPO Changes (J.4)
- Radioactive Release Changes (J.5)
- Fire PRA Related Changes (J.6)

J.1. Plant Change Process and Regulatory Guidance

Placeholder for additional guidance. At the time of the FAQ approval and NEI 04-02 Revision 3, there were not sufficient lessons learned. Additional information will be added at a future date, if necessary.

J.2. NFPA 805 Chapter 2 – Methodology/Process Changes

Placeholder for additional guidance. At the time of the FAQ approval and NEI 04-02 Revision 3, there were not sufficient lessons learned. Additional information will be added at a future date, if necessary.

J.3. NFPA 805 Chapter 3 – Fundamental Fire Protection Program and Design Elements

Placeholder for additional guidance. At the time of the FAQ approval and NEI 04-02 Revision 3, there were not sufficient lessons learned. Additional information will be added at a future date, if necessary.

J.4. Non-Power Operational (NPO) Modes

Placeholder for additional guidance. At the time of the FAQ approval and NEI 04-02 Revision 3, there were not sufficient lessons learned. Additional information will be added at a future date, if necessary.

J.5. Radioactive Release Performance Criteria

Placeholder for additional guidance. At the time of the FAQ approval and NEI 04-02 Revision 3, there were not sufficient lessons learned. Additional information will be added at a future date, if necessary.

J.6. Fire PRA Related Changes

Additional clarification is provided on the following topics related to Fire PRA and the change evaluation process:

1. Fire PRA updates (J.6.1)
2. Cumulative Risk (J.6.2)
3. Technical Adequacy (J.6.3)

J.6.1 Fire PRA Update Impact on Fire Protection Program

NFPA 805 is a risk-informed performance-based standard for implementing fire protection at nuclear power plants. As such, the Fire PRA is an integral tool. Because the Fire PRA is

expected to reflect the as-built, as-operated plant, it will need to be updated periodically, consistent with the plant. These Fire PRA updates should not pose any unique challenges to the fire protection program, since the plant changes themselves must be evaluated for their impact on fire risk. However, Fire PRAs can also be updated due to new or improved data, and other modeling refinements. Requirements and guidance for PRA Updates, covering both Maintenance and Upgrades, are included in the PRA Standard (requirements) and RG 1.200 (guidance).

Fire PRA methods used in modeling refinements should be reviewed for Technical Adequacy per the guidance in Section J.6.3.

Most PRAs go through a periodic update cycle, where the appropriate elements of the PRA are revised and the models are re-quantified to produce updated CDF, LERF, and other results. Based on these results, the various risk-informed applications are evaluated as needed to reflect the updated PRA. The specific needs will vary by application. Some examples:

- Maintenance Rule: Update performance criteria if the system's safety significance changes
- AOV/MOV: Add or remove valves from program based on risk importance
- MSPI: Re-evaluate system status and performance thresholds

Some risk-informed applications do not require any specific evaluations due to periodic PRA updates. These might include one time, or even permanent AOT changes.

The Fire PRA has two primary regulatory functions under NFPA 805. First, during transition of the plant to NFPA 805, the Fire PRA is used to assess the risk significance of the variance from the deterministic requirements (VFDRs) to determine if the risks are acceptable to allow transition. After transition, the Fire PRA is used as needed to assess the risk of changes to the fire protection program. Changes in risk above a defined threshold will require regulatory approval to implement. The Fire Protection Change Impact Review process is used to identify if self-approval is allowed under NFPA 805. Most of these reviews are qualitative. The most current Fire PRA should be used as the baseline to measure the risk impact of the changes (see Section 5.3.4.1).

In addition to the formal uses noted above, the Fire PRA insights are used in a number of areas of the plant's Fire Protection program.

Reviews after Fire PRA Update (Maintenance and/or Upgrade)

It is not expected that previously accepted changes (e.g., transition VFDRs or plant impact reviews) are re-evaluated every time the Fire PRA is updated, however, because the Fire PRA is an integral part of the fire protection program, certain attributes should be evaluated for general risk insights. Examples of these attributes include:

- Ignition source Rankings
- Physical Analysis Unit (PAU)/NFPA 805 Fire Area Rankings
- Importance rankings of fire protection features
- Importance rankings of recovery actions

Changes in these rankings should be reviewed for impact on the fire protection program. Addressing these insights after PRA updates should help ensure the overall health of the fire protection program. Example impacts on the fire protection program include:

- Potential changes to the scope of the monitoring program
- Potential changes to risk-informed compensatory measures

- Potential changes to defense-in-depth for performance-based fire areas

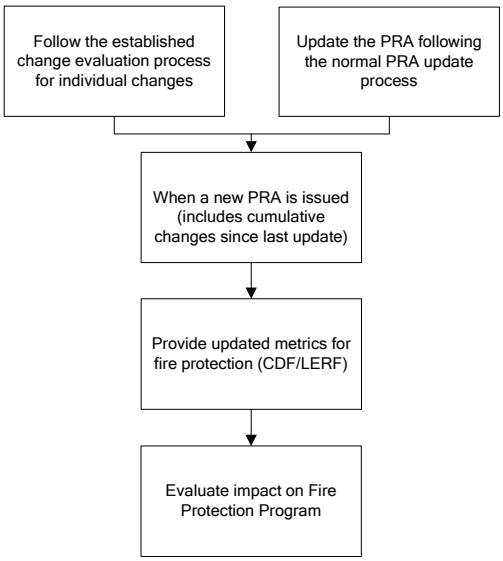

Figure J-1 – Fire PRA Update Impact on Fire Protection Program

J.6.2 Fire PRA – Treatment of Cumulative Fire Protection Program 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. Licensees should evaluate the cumulative risk in accordance with Regulatory Position 6.3.2 of RG 1.174, Revision 2.

After the transition to NFPA 805, the cumulative risk of subsequent fire protection program changes is the change in risk compared to the post-transition baseline risk. Also, after the transition to NFPA 805, licensees should only include changes associated with the fire protection program in cumulative risk evaluations. In the sample license condition in Appendix O, the NRC chose risk acceptance criteria low enough to provide reasonable assurance that the effect of self-approved changes on cumulative risk would be acceptable. However, when licensees request fire protection program changes that they may not self-approve after the transition to NFPA 805, their License Amendment Requests should address the cumulative impact of all previous fire protection program changes since adopting NFPA 805.

Section 2.4.4.1 of NFPA 805 further states that, if more than one plant change is combined into a group for the purpose of evaluating acceptable risk, each individual change shall be evaluated, along with the evaluation of the combined change. Any risk increases may be combined with risk decreases when estimating the total risk change. Licensees should address combined changes in accordance with the guidance in Regulatory Positions 1.1 and 1.2 of RG 1.174, Revision 2.

The evaluation of cumulative risk is required when licensees request fire protection program changes that they may not self-approve after the transition to NFPA 805. When needed to support a License Amendment Request, determine the cumulative delta risk due to those fire protection changes using the cumulative impact of previous individual changes. This cumulative estimate may be modified and augmented as appropriate by changes to the risk profile caused by the PRA maintenance and upgrade process. If cumulative impact plus the change being requested is less than the established threshold (RG 1.174), no further action is required. If cumulative impact plus the additional risk of the change being requested exceeds the threshold (RG 1.174), determine viable options for reducing the risk to within acceptable levels prior to submittal.

Figure J-2 depicts the process to evaluate cumulative impact of changes to the Fire Protection Program to support, as necessary, the submittal of a post-transition License Amendment Request.

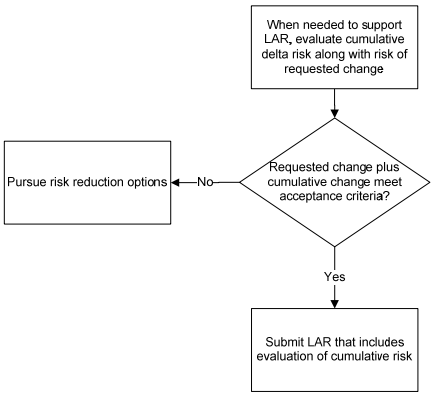

Figure J-2 – Fire PRA Treatment of Cumulative Risk

J.6.3 Technical Adequacy

Section 2.4.3.3 of NFPA 805, which applies to the Fire PRA used during NFPA 805 transition in performing fire risk evaluations and post-transition in performing Change Evaluations, includes, in part, the following:

The PSA approach, methods, and data shall be acceptable to the AHJ.

Guidance is provided below on technical adequacy of the base Fire PRA model and what constitutes “acceptable to the AHJ”.

Base Fire PRA Model

Additionally, the first aspect, technical adequacy of the base Fire PRA model, implies that (1) the Fire PRA model, or those parts of the model required to support the application, represent the as-built and as-operated plant, which, in turn, implies that the Fire PRA is up to date and reflects the current design and operating practices, (2) the Fire PRA logic model has been developed in a manner consistent with industry good practice and that it correctly reflects the dependencies of systems and components on one another and on operator actions, and (3) the probabilities and frequencies used are estimated consistently with the definitions of the corresponding events of the logic model.

Administrative controls and processes should be used to maintain the Fire PRA model current with plant changes and to evaluate any outstanding changes not yet incorporated into the Fire PRA model for potential risk impact as a part of the routine change evaluation process. Further, the licensee should have a program for ensuring that developers and users of fire models are appropriately trained and qualified. This ensures that the Fire PRA is adequate to support risk-informed decision making with respect to the plant change evaluation process.

The types of questions that should be confirmed when using the Fire PRA to support a change evaluation include:

- Is the Fire PRA current and does it reflect the as-built, as operated plant?
- If there are outstanding changes to the Fire PRA, has the impact of the outstanding changes been considered?
- Are the peer reviews on the Fire PRA for sections that could impact the NFPA 805 Change Evaluation Document or the Fire Protection Change Impact Review up to date, with findings satisfactorily resolved to support the change evaluation? Are Fire PRA supporting requirements related to the NFPA 805 Change Evaluation Document Capability Category II or greater, or justified as adequate to support the change evaluation?
- Does the peer-reviewed model support the quantification of change for the change under review?
- Have the sources of uncertainty that could affect the results of the change evaluation been adequately considered?

Guidance on "Acceptable to the AHJ"

The following list provides examples of Fire PRA methods, which, if followed appropriately, should constitute methods "acceptable to the AHJ" and satisfy that particular requirement of Section 2.4.4.3 of NFPA 805:

- Fire PRA methods using the guidance in NUREG/CR-6850
- Fire PRA methods using the guidance in NUREG/CR-6850 Supplement 1
- Fire PRA Methods approved by EPRI Fire PRA Review Panel (old process), as accepted by the NRC in writing
- Other methods accepted by the NRC (NUREGs/RGs, plant-specific Safety Evaluations, etc.)
- Fire PRA methods using the guidance in approved NFPA 805 FAQs
- Fire PRA methods approved using the guidance in approved Fire PRA FAQs
- Fire PRA methods approved by the Fire PRA Methods Development Panel), as accepted by the NRC in writing.

K. NFPA 805 CHAPTER 3 CLARIFICATIONS

While recognizing that RG 1.205 and NEI 04-02 do not provide interpretations to the standard NFPA 805, there are instances where implementation of the standard does require further specific clarification as to what is an acceptable method or process to the AHJ. These instances are collectively presented in this Appendix, and referenced to the FAQ in which they were originally presented during the pilot plant process and subsequent non-pilot transition processes.

K.1. NFPA 805 Chapter 3 "Applicable NFPA Standards" (FAQ 06-0020)

Where used in NFPA 805, Chapter 3, the term, "applicable NFPA Standards" is considered to be equivalent to those NFPA standards identified in the current license basis (CLB) for procedures and systems in the Fire Protection Program that are transitioning to NFPA 805. New Fire Protection Systems would be subject to the most current code or standard.

K.2. NFPA 805 Chapter 3 "Power Block or Plant" (FAQ 06-0019)

Where used in Chapter 3, "power block" and "plant" refers to structures that have equipment required for nuclear plant operations, such as Containment, auxiliary building, service building, control building, fuel building, radiological waste, water treatment, turbine building, and intake structure, or structures that are identified in the facility's current license basis (CLB). Applicable structures will be identified in the 10CFR50.48(c) License Amendment Request.

K.3. NFPA 805 Section 3.3.1.1 (FAQ 06-0028)

Where used in section 3.3.1.1, the term, "familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms", should be considered to be acceptable when it includes the minimum following training objectives:

- Location and use of plant fire prevention procedures.
- Individual responsibilities regarding fire barriers such as fire dampers, doors, and seals.
- Actions an individual is required to take upon discovery of a fire.
- Individual responsibilities regarding the control of transient combustibles (wood, solvents, oil) and the disposal of flammable and combustible materials.
- Examples of the types of hot work requiring a permit.
- Recognition of and response to a station fire alarm.
- Other plant specific fire prevention activities.

This familiarization may be included as part of the plant's General Employee Training (GET) program.

K.4. NFPA 805 Section 3.3.5.2 (FAQ 06-0021)

In addition, where used "cable air drops of limited length (~3 feet), are considered acceptable.

K.5. NFPA 805 Section 3.3.11 (FAQ 06-0024)

When used in Chapter 3, the term "Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment" is the clear space around equipment provided to ensure an acceptable level of fire prevention for Structures, Systems or Components (SSCs) necessary to ensure the Nuclear Safety Performance Criteria. This clear space or distance is maintained such that combustible material does not reside in an area where transient fuel packages have been shown to adversely affect "energized electrical equipment" needed to meet the nuclear safety performance criteria for the fire zone/area, either as an ignition source or target set.

K.6. NFPA 805 Section 3.4 (FAQ 06-0007)

Information associated with FAQ 06-0007 (from NEI 04-02 Revision 2) has been integrated with information from FAQ 13-0069 into Section K.10.

K.7. NFPA 805 Section 3.7 (FAQ 06-0027)

Specific clarification for NFPA 805 section 3.7, from FAQ 06-0027;

Where used in section 3.7, the term, “where provided”, shall be those locations where portable extinguishers exist at present as part of the approved plant design, or as documented through an approved Code Compliance review document, or lacking same, as provided should be considered to be in accordance with NFPA 10, Standard for Portable Fire Extinguishers.

K.8. NFPA 805 Section 3.3.5.3 (FAQ 06-0022 and FAQ 14-0071)

Purpose

The purpose of this section is to compare currently recognized flame propagation tests to the IEEE 383-1974 Standard, the NRC minimum test standard and acceptance criteria for cable flame propagation tests.

Discussion & Analysis

Several NRC documents cited in this section include the requirements for flame propagation for existing or new electrical cables. In general, these documents refer to the IEEE 383-1974 and/or IEEE 1202-1991 flame tests as the NRC accepted test standards for flame propagation. Below is a list of NRC related documents that cite IEEE 383-1974 test as minimum acceptance requirements for flame propagation. Even though these documents may apply to Nuclear Power Plants constructed during different time periods, the standard flame propagation tests accepted to the NRC are still basically the same.

NFPA 805, 2001 Edition, Section 3.3.5.3 states that:

> *… electric cable construction shall comply with a flame propagation test as acceptable to the AHJ (Authority Having Jurisdiction)*

which in the US Nuclear Industry is the NRC.

Below are the NRC documents which refer to the flame propagation test acceptable to the AHJ.

NUREG-0800, Revision 4, Oct 2003, states that:

> *Electrical cables should meet flame test criteria of IEEE 383 or 1202, or be provided with alternative protection as allowed by the specific plant licensing and/or design basis (See Regulatory Guide 1.189).*

Appendix A to Branch Technical Position (BTP) APCSB 9.5-1 states that:

> *electric cable constructions should, as a minimum, pass the flame test in the current IEEE 383.*

It also states that:

> *for cable installation in operating plants and plants under construction that do not meet the IEEE 383 flame test requirements, all cables must be covered with an approved flame retardant coating and properly derated.*

Regulatory Guide 1.189, Revision 1, March 2007, states that:

> *Electric cable construction should pass the flame test in IEEE Standard 383, “IEEE Standard for Type Test of Class IE Electric Cables, Field Splices, and Connections for*

Nuclear Power Generating Stations" (Ref. 109), or IEEE Standard 1202, "IEEE Standard for Flame Testing of Cables for Use in Cable Trays in Industrial and Commercial Occupancies" (Ref. 110). (This does not imply that cables passing either test will not require additional fire protection.) For cable installations in operating plants and plants under construction before July 1, 1976 that do not meet the IEEE Standard 383 flame test requirements, all cables should be covered with an approved flame-retardant coating and properly derated or be protected by automatic suppression. Although cable coatings have been shown to reduce flame spread, coated cables are considered intervening combustibles when determining the protection requirements of Section III.G.2 of Appendix R to 10 CFR Part 50. Coated cables do not have higher damage thresholds and, therefore, are not equivalent to IEEE 383 or IEEE 1202 cables. In addition, coated cables can and do ignite in fires.

The data and discussion presented in this report on flame propagation tests compare theoretical burner heat output, heat exposure time, and pass/fail criteria to determine the relative severity of the test standards. Each test was reviewed and compared to the vertical flame propagation test in the IEEE 383-1974 as a baseline to determine if testing conditions and/or passing criteria are comparable. Tests with lower burner heat outputs than the IEEE 383-1974 standard are very difficult to compare due to the difference in test sample size. These low heat exposure tests will be discussed but will not be directly compared to IEEE 383-1974. Below is a brief discussion of each flame test starting with the IEEE 383-1974 Flame Propagation Test (Baseline test) and followed by flame spread tests ranked in decreasing order of severity.

Note: A flame propagation test procedure in one Standard could be included or referenced in another standard. This does not mean the two standards are the same; it means that the standard uses the same testing procedure for flame propagation testing. A standard might have other sections which have nothing to do with flame propagation like smoke and aging test procedures, materials of construction, markings, or other procedures and requirements. For this reason, the data was organized in terms of flame tests instead of individual Standards.

Test Ranking and Description

IEEE 383-1974 is the baseline test to which the other tests will be compared. It is a 20 kW (70000 BTU/hr) heat exposure, vertical test considered the minimum requirement of the NRC to pass flame propagation criteria. As in all the 20 kW (70000 BTU/hr) tests discussed below, it has a 20 minute exposure time. This test requires cables to self-extinguish before reaching top of the tray (8 ft, 2.44 m) to pass the test.

One of the most severe flame tests is the FT-6 Horizontal Flame Test included in the NFPA 262 and CSA C22.2 No. 0.3 standards. It is a horizontal flame test used for cables in plenum applications and uses a burner heat output of 86 kW (294000 BTU/hr). This test has one of the lowest acceptable damage lengths, the second highest heat output, and uses high air flow in its chamber during testing to increase flame spread. This combination of variables makes it one of the most rigorous tests for a sample to pass. This is currently considered the most severe flame test.

The UL1666 Fire Riser Test is another of the more severe flame tests. It is a vertical test used for cables in riser shaft applications. It has the highest heat output of all the tests (154.5 kW, 527500 Btu/hr), second highest exposure time (30 minutes) and high air flow in its chamber during testing. This test has an acceptable cable damage length of 12 ft (3.66 m). Even though the damage criteria is less severe than the IEEE 383-1974 (12 ft vs. 8 ft), the higher exposed heat and time makes this test more severe.

The FT-4/Vertical Flame Test, included in standards IEEE 1202-1991, CSA C22.2 No. 0.3, UL 1685, and referenced in UL 1581, UL 44, and UL 83, is the most rigorous of the 20 kW (70000

BTU/hr) tests. The testing conditions and equipment in all of the 20 kW (70000 BTU/hr) tests are essentially the same. What makes this test the most difficult to pass of the 20 kW (70000 BTU/hr) tests is its low acceptable damage length of 4.9 ft (1.5 m).

The IEEE 383-2003 standard Flame Test qualification cites:

> *Cable shall be flame retardant in accordance with the requirements of IEEE Std 1202-1991 or NFPA 262-2002. Switchboard cables, coaxial, twinaxial, and triaxial cables shall as a minimum pass the UL VW-1 flame test."*

This citation is the only direction the IEEE 383-2003 standard gives on cable flame propagation testing. The IEEE organization superseded the IEEE 383-1974 standard with IEEE 383-2003 in 2003. Still, the NRC standards on flame propagation tests are IEEE 383-1974 or IEEE 1202-1991 as cited on the NRC documents previously discussed.

The ICEA T-29-520 standard is essentially the same as the 20 kW (70000 BTU/hr) IEEE 383-1974 tests except with a burner heat output of 62kW. In this test the distance acceptance criteria is the same as IEEE 383-1974: 8 ft (2.44 m). Cables tested using this test will meet or exceed performance of IEEE 383-1974 tested cables, and could have similar cable performance to tests like the FT-4/Vertical Flame Test.

The Vertical Flame Spread test (IEC 60332-3-21, IEC 60332-3-22 and IEC 60332-3-23) uses a burner of 20 kW (70000 BTU/hr) heat output. In these tests, the recommended acceptance length of damage is 10.2 ft (3.1 m) which is less rigorous than the 8 ft (2.44 m) of acceptable damage of the IEEE 383-1974 standard, but the heat exposure time is 40 minutes which is twice the time exposed in IEEE 383-1974. In order to compare the severity of these IEC's tests with the IEEE 383-1974 test, the maximum average damage length (adl) per heat exposed time (het) was calculated. Assuming most of the damage will occur during flame application times, an average adl/het was calculated of 0.4 ft of damage/minute during the 20 minutes of flame application for the IEEE 383-1974 test and an average adl/het of 0.255 ft of damage/minute during the 40 minutes of flame application for the IEC tests. If these two values are compared, any sample which has an average adl/het during flame application greater than the calculated should fail the test. In this case, the IEC test will be more rigorous than the IEEE 383-1974.

The Vertical Tray Flame Test (UL 1581, 1685, 83, and 44) and Vertical Cable Tray Flame Test (ICEA T-30-520) both use a burner with a 20 kW (70000 BTU/hr) heat output. These two tests are very similar to the IEEE 383-1974. The three have the same acceptable damage length of 8 ft (2.44 m) and require cables to self-extinguish before reaching the top of the tray. Also, the heat exposure time is 20 minutes. These tests have minor variations in procedure and equipment used. IEEE 817-1993 Flame Test is mainly used to determine whether cables need to be coated or not and does not have pass/fail criteria. If cable damage reaches the top of the tray, the cable is recommended to be coated.

The IEC 60332-3-24 standard is very similar to IEEE 383-1974 but has less strict acceptance criteria. This test has the same burner heat output and exposure time as IEEE 383-1974, but has an acceptable damage length of 10.2 ft (3.1 m) making the test less severe.

Note that the IEC 60332-3-10 standard is the description of the apparatus used in the IEC 60332-3-21, IEC 60332-3-22, IEC 60332-3-23, and IEC 60332-3-24 standards discussed above and is not an actual test.

Low Intensity Test Methods

The tests discussed below have burner heat outputs equal to or lower than 1 kW (3400 BTU/hr). A comparison of these methods to IEEE 383-1974 is not prudent due to the vast difference in test samples and burner heat outputs. These low heat exposure tests will be discussed for

completeness of this report, but will not be directly compared to the IEEE 383-1974 baseline Standard.

Vertical Flame Propagation Tests (IEC 60332-1-2 and IEC 60332-1-3) are both 1 kW (3400 BTU/hr) of heat exposure Burner Heat Output tests. Both exposure times vary from 1-8 minutes depending on the sample diameter. IEC 60332-1-2 requires more than 50 mm (1.97 in) of distance between the lower edge of the top support and the onset of charring and less than 540 mm (21.26 in) from the lower edge to the top support. IEC 60332-1-3 requires that the filter paper used as indicator does not ignite during the test.

The four 500 W (1700 BTU/hr) tests are very similar in terms of heat exposure time and passing criteria. These tests are the VW-1 Vertical Wire Flame Test (UL 1581 and CSA C22.2 No. 0.3, and referenced in UL 83 and UL 44), the FT-1 Vertical Flame Test (UL 1581 and CSA 22.2 No. 0.3 and referenced in UL 83 and UL 44), Flame Test (ICEA S-61-402), and the FT-2 Horizontal Flame Test (UL 1581, CSA 22.2 No. 0.3, and referenced in UL 83 and UL 44). The first three are vertical flame tests and have exposure times of 75 seconds total with different time intervals between heat applications. These three are very similar and require that samples do not burn more than 60 seconds or burn less than 25% of the indicator and/or cotton batting. The FT-2 test is a horizontal test with a heat exposure time of 30 seconds and requires that the cable self-extinguishes and that no flaming particles ignite cotton under specimen.

The ASTM D5537-03, Standard Test Method for Flame Spread, is used to determine the heat release rate by measuring gas concentrations and flow. It also measures Flame Propagation by blistering and char length. This test does not have acceptance criteria.

The FM 3972, Test Standard for Cable Fire Propagation, is used to calculate a Fire Propagation Index to classify cable fire propagation characteristics. In the test procedure, a pilot flame is used to ignite the cables. After that, the flame is extinguished and heaters are used until the cable self-extinguishes. Measurements of the combustion gas concentrations and flow, time and heat release rate are used to calculate the Fire Propagation Index. This test does not have acceptance criteria.

Summary of Results

Tables K-1 and K-2 below provide a summary of the testing methods that are more severe than IEEE 1202-1991 (Table 1) or more severe than IEEE 383-1974 (Table 2). Note that all test standards in Table 1 are also included in Table 2, since IEEE 1202-1991 is a more rigorous test method than IEEE 383-1974.

Table K-1
More Severe Tests (Standards) than IEEE 1202-1991

Test Name (Test Type)	Cable Standard
FT-6/Flame Travel Test (horizontal)	NFPA 262 CSA 22.2 No. 0.3
Fire Test} (riser/vertical)	UL 1666

Table K-1
More Severe Tests (Standards) than IEEE 1202-1991

Test Name (Test Type)	Cable Standard
FT-4/Vertical Flame Test (vertical)	UL 1581 UL 1685 UL 83 UL 44 CSA22.2 No. 0/3 IEEE 1202-1991
Flame test Qualification (vertical)	IEEE 383-2003

Table K-2
More Severe Tests (Standards) than IEEE 383-1974

Test Name (Test Type)	Cable Standard
FT-6/Flame Travel Test (horizontal)	NFPA 262 CSA 22.2 No. 0.3
Fire Test (riser/vertical)	UL 1666
FT-4/Vertical Flame Test (vertical)	UL 1581 UL 1685 UL 83 UL 44 CSA 22.2 No. 0.3 IEEE 1202-1991
Flame Test Qualification (vertical)	IEEE 383-2003
Vertical Cable Tray Flame Test (vertical)	ICEA T-29-520
Vertical Flame Spread (vertical)	IEC 60332-3-21 IEC 60332-3-22 IEC 60332-3-23
Vertical Tray Flame Test (vertical)	UL 1581 UL 1685 UL 83 UL 44
Vertical Cable Tray Flame Test (vertical)	ICEA T-30-520
Flame Test (vertical)	IEEE 383-1974

Conclusion

Electrical cables tested in accordance with the flame propagation acceptance criteria of one or more of the Test Standards listed in Table 2 should be considered to perform equal to or better than if they were tested to IEEE 383-1974. Low burner heat output tests discussed in this report are not recommended to be accepted due to the impractical nature of comparing these small scale screening test requirements (e.g., low thermal exposure, sample size, time exposure and acceptance criteria) to the NRC minimum accepted test methods and acceptance criteria of larger scale IEEE 383-1974.

FAQ 14-0071 Clarification

Specific clarification for NFPA 805 Section 3.3.5.3, from FAQ 14-0071;

To comply with the requirement “Electrical cable construction shall comply with a flame propagation test as acceptable to the AHJ” where used in section 3.3.5.3, one acceptable application is as follows:

Cables that are specifically designed and constructed for crane applications (e.g., high flexibility) and are not qualified to IEEE Std 383 or equivalent. Where the use of these cables is required for crane applications and an IEEE Std 383 or equivalent cable cannot be used, the use of these cables is permissible, provided that the cable has been identified as having fire retardant properties by meeting a low intensity flame test such as the ones discussed in FAQ 06-0022 or similar, and their use does not have an adverse impact on the Approved Fire Protection Program, Safe Shutdown, and the Fire PRA. This clarification applies only to crane cable applications.

K.9. NFPA 805 Section 3.3.9 (FAQ 12-0067)

Specific clarification for NFPA 805 section 3.3.1, from FAQ 12-0067;

Where used in section 3.3.9, the term, “where provided”, shall mean those locations ~~where~~ provided for a transformer that are installed in active or stand-by service. This requirement does not apply to spare transformers. Spare transformers are defined as transformers whose coils are not electrically connected and energized in a manner to transfer electrical voltage and that cannot be switched into service in their current location. A swing transformer should not be considered a spare transformer in this context.

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K.10. NFPA 805 Section 3.4 (FAQ 06-0007, FAQ 12-0063, and FAQ 13-0069)

FAQ 06-0007 Clarification

The NFPA standards divide fire brigades into two types, based on organization and duties: “Industrial Fire Brigades” and “Industrial Fire Departments.” Practically, this means that a fire-fighting organization at a nuclear power plant must comply with either NFPA 600 (for an Industrial Fire Brigade) or both NFPA 1500 and NFPA 1582 (for an Industrial Fire Department)

Reference in section 3.4.1(a)(1), to “(interior structural fire-fighting)” indicates that for interior fire-fighting, at a minimum, the licensee shall meet the requirements noted in NFPA 600, Chapter 5, Industrial Fire Brigades That Perform Interior Structural Fire Fighting Only. For exterior fire that could jeopardize the ability to meet the performance criteria described in NFPA 805, Section 1.5.1 the licensee shall be able to demonstrate their ability to control and extinguish those fires.

FAQ 12-0063 Clarification

NFPA 805 Section 3.4 states in part the following:

3.4.1 On-Site Fire-Fighting Capability. *All of the following requirements shall apply.*

(a) A fully staffed, trained, and equipped fire-fighting force shall be available at all times to control and extinguish all fires on site. This force shall have a minimum complement of five persons on duty and shall conform with the following NFPA standards as applicable:

(1) NFPA 600, Standard on Industrial Fire Brigades (interior structural fire fighting)

(2) NFPA 1500, Standard on Fire Department Occupational Safety and Health Program

(3) NFPA 1582, Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians

*(b)*Industrial fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required.*

(c) During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria.

Exception to (c): Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support.

A.3.4.1(b)Immediate response as listed in these sections is considered to be achieved if nominal actions are taken to put associated equipment in a safe condition.

Where used, the fire brigade make-up described under NFPA 805 Section 3.4.1, is intended to include a five-person fire-fighting team in which all five members are trained and equipped to extinguish fires. In light of recent changes to 10 CFR 50 Emergency Plan requirements with regards to on-shift staffing and duty assignment, and in concert with the existing requirements of NFPA 805 Section 3.4.1(b), the five assigned fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required. This would exclude the fire brigade members from assignment to on-shift Emergency Response Organization (ERO) positions (other than fire brigade). Further, the licensed Reactor Operator / Senior Reactor Operator (RO/SRO) positions, and the Shift Technical Advisor (STA) position assigned to the on-shift ERO, would likewise not be assigned to the fire brigade.

Where NFPA 805, section 3.4.1(c), Exception to (c), allows for “sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support”. The operations advisor, in addition to the five-person fire brigade, will have no other on-shift ERO assignment that would prevent immediate response to a fire or other emergency as required. The use of the operations advisor position, when utilized, must not overburden the on-shift staffing. Steps shall be taken to ensure that all ERO operational functions are met.

In addition, licensees should consider conditions where the fire brigade complement may be less than the minimum requirement for a period of time, in order to accommodate unexpected absence of on-duty shift members.

Licensees may claim prior approval if their current technical specifications or fire protection Safety Evaluation address the issue.

If prior approval has not been granted, the licensee should seek NRC approval in the NFPA 805 LAR/Transition Report.

The following is typical wording found in existing fire protection programs

The Shift Fire Brigade Team may be one less than the minimum requirement for a period of time not to exceed 2 hours, in order to accommodate unexpected absence of on-duty shift

members provided immediate action is taken to restore the shift complement to within the minimum requirements.

FAQ 13-0069 Clarification

The brigade leader and at least two brigade members should have sufficient training in or knowledge of plant systems to understand the effects of fire and fire suppressants on safe shutdown capability. The brigade leader should be competent to assess the potential safety consequences of a fire and advise control room personnel. Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant systems.

At least two additional brigade members should have sufficient training in or knowledge of plant systems to understand the effects of fire and fire suppressants on safe shutdown capability. Training at the level of a Non-Licensed Operator (NLO) is a means to demonstrate that a sufficient level of training and knowledge of nuclear safety systems is achieved for members not acting as brigade leader. The NLO training should cover portions of the plant with concentrations of NSCA equipment.

Another available option is to invoke NFPA 805 Section 3.1 for prior AHJ approval of the fire brigade member qualifications.

K.11. NFPA 805 Section 3.3.1.2(1) (FAQ 14-0070)

Specific clarification for NFPA 805 Chapter 3, NFPA 805 - Section 3.3.1.2(1) does not apply to, that is it does not prohibit, the use of non-fire treated wood when an approved program exists for the control of the wood. Added clarifying guidance for some but not all types of non-treated wood is listed as follows, where used in section 3.3.1.2(1), one acceptable method is as follows:

Use of wood inside the Power Block may be permitted when suitable noncombustible substitutes are not available. All wood smaller than 152 millimeters (mm)×152 mm (6 inch (in.) x 6 in., nominal) used in power block during maintenance, modification, or refueling operations (such as ramps, lay-down blocks or scaffolding) shall be treated with a fire-retardant application. Non-fire retardant treated wood may be allowed in the Power Block when a fire retardant alternative is not readily available, and appropriate administrative controls are in place (transient permits, fire watches, etc.). Examples include equipment or supplies shipped in untreated combustible packing containers, wood pallets, cable spools, truck/trailer/cargo container bed floors, etc.

Application with respect to Section 3.3.1.2(3) would apply to non-fire treated wood in the waste, debris, scrap, and packing materials, which shall continue to be removed from an area immediately following the completion of work or at the end of the shift, whichever comes first. Storage or staging areas that would currently comply with section 3.3.1.2(4) may be designated to allow storage of untreated wood, provided that the designated area is sufficiently separated from equipment, cables, and components required to support nuclear safety performance criteria (i.e., maintained free of fire damage). The determination of "sufficiently separated" shall be made by a qualified fire protection engineer.

In addition, plant maintenance and operational activities will at times require untreated wood in the form of small hand tools, maintenance equipment and temporary material/equipment transport (e.g., pallets or equipment crates) that the transient /combustible control program address the deviation from Chapter 3 requirements and will identify the limits, controls and compensatory measures for these conditions when necessary.

The aforementioned examples and guidance would be included in the site's procedural guidance for administrative control and limitations for transient combustibles.

L. ALTERNATE METHOD FOR ENGINEERING ANALYSES

L.1. Background

Prior to the completion of transition, those licensees that have adopted the standard fire protection license condition are allowed to make certain types of changes without prior NRC approval as long as the changes do not adversely affect the plant's ability to safely shutdown in the event of a fire. The method used to perform these changes was originally described in Generic Letter 86-10. The method has been referred to using several different names: Generic Letter 86-10 Evaluation, Fire Protection Engineering Evaluation, Fire Protection Engineering Equivalency Evaluation, etc. For the purposes of making minor changes to fire protection program attributes post-transition, these evaluations will be called Fire Protection Engineering Evaluations.

L.2. Fire Protection Engineering Evaluations

For use in evaluating changes to the fire protection program post-transition, Fire Protection Engineering Evaluations (FPEEs) will be broken down into three categories. The first is essentially an engineering equivalency evaluation that demonstrates that a given situation (component, system, procedure, physical arrangement, etc.) is functionally equivalent to the corresponding code/listing requirement and is therefore considered to be "code compliant". The second demonstrates that a given situation (component, system, procedure, physical arrangement, etc.) is "adequate for the hazard." The third is called the "bounding analysis approach."

L.3. Functional Equivalency

Under NFPA 805 rules, FPEEs of the first type may continue to be used to demonstrate compliance to the fundamental program and design elements of NFPA 805 Chapter 3 and the requirements of NFPA 805 Chapter 4 (utilizing the deterministic approach of Section 4.2.3 or the performance-based approach of Section 4.2.4) since they demonstrate that a given situation meets the requirements of the governing fire protection code/listing.

The use of this approach does not fall under NFPA 805, Section 1.7, Equivalency, because the condition can be shown to meet the NFPA 805 Chapter 3 requirement. Section 1.7 of NFPA 805 is a standard format used throughout NFPA standards. It is intended to allow owner/operators to use the latest state of the art fire protection features, systems, and equipment, provided the alternatives are of equal or superior quality, strength, fire resistance, durability, and safety. However, the intent is to require approval from the AHJ because not all of these state of the art features are in current use or have relevant operating experience. This is a different situation than the use of functional equivalency since functional equivalency demonstrates that the condition meets the NFPA 805 code requirement.

L.4. Adequate for the Hazard

FPEEs of the second type may also be used, with specific limitations, to demonstrate compliance to the requirements of NFPA 805.

Certain fire protection systems and features have requirements that are conditional upon the results of analyses performed in accordance with NFPA 805 Chapters 1, 2 and 4 to demonstrate the ability to meet the nuclear safety performance criteria. These systems and features are:

- Fire Alarm and Detection Systems [NFPA 805 Section 3.8]
- Automatic and Manual Water-Based Fire Suppression Systems [NFPA 805 Section 3.9]

- Gaseous Fire Suppression Systems [NFPA 805 Section 3.10]
- Passive Fire Protection Features [NFPA 805 Section 3.11]

When using the performance-based approach in accordance with NFPA 805 Section 4.2.4, the performance requirements that these systems and features must meet are established by the analyses performed in accordance with NFPA 805 Chapters 1, 2 and 4 to demonstrate the ability to meet the nuclear safety performance criteria. FPEEs may be used to establish the performance requirements that these systems and features must meet (e.g., coverage of a detection / suppression system, ability of fire barriers to withstand expected fire hazards for a specific duration, etc.).

NFPA 805 Section 2.4 states:

> *Engineering analysis is an acceptable means of evaluating a fire protection program against performance criteria. Engineering analyses shall be permitted to be qualitative or quantitative in accordance with Figure 2.4. The effectiveness of the fire protection features shall be evaluated in relation to their ability to detect, control, suppress, and extinguish a fire and provide passive protection to achieve the performance criteria and not exceed the damage thresholds defined in Section 2.5 for the plant area being analyzed.*

The NFPA 805 committee has provided guidance on the intended use of FPEEs once NFPA 805 is adopted for a facility. Section A.2.2.7 states:

> *Once NFPA 805 is adopted for a facility, future equivalency evaluations (previously known as Generic Letter 86-10 evaluations) are to be conducted using a performance-based approach. The evaluation should demonstrate that the specific plant configuration meets the performance criteria in the standard.*

Licensees transitioning to NFPA 805 with an acceptable Fire Protection Program (including a Fire PRA that is of acceptable quality) who adopt the fire protection license condition proposed in RG 1.205 will be allowed to self-approve risk-informed, performance-based changes to the approved fire protection program. Some engineering evaluations use a qualified engineer's informed judgment (informed with respect to a technical requirement or a standard) as the basis for meeting the regulatory requirement. To the extent a qualified fire protection engineer has concluded a minor change has not affected the adequacy for the hazard using a relevant technical requirement, the licensee continues to meet 10 CFR 50.48(c). Therefore, minor changes to the four Chapter 3 elements whose need or capability is governed by licensees' analysis in Chapter 4 that have been successfully evaluated using a FPEE to show that the system or feature remains adequate for the hazard do not need prior NRC approval.

L.5. Bounding Analysis Approach

In the "bounding analysis approach," FPEEs may be used to justify performance requirements for a specific NFPA 805 Chapter 3 attribute, through the use of a bounding engineering analysis that clearly demonstrates that the fire protection attribute continues to provide the required protection when evaluated against the required technical and/or performance criteria and the bounding assumptions are acceptable with respect to risk, fire protection defense-in-depth and safety margins. The use of the bounding analysis approach requires the licensee to obtain prior NRC approval through the submittal of a License Amendment Request in accordance with 10 CFR 50.48(c)(2)(vii) and the addition of a section to the Fire Protection license condition addressing the change. Upon NRC approval, the licensee can make changes to the plant using FPEEs within the approved envelope for the bounding analysis performed to support the License Amendment Request.

Fire Protection License Condition Change

An additional paragraph must be added to the Fire Protection license condition proposed in RG 1.205 to address the implementation of the "bounding analysis approach." The additional license condition discussion addresses the process for establishing the bounding analysis, the need to submit a description of the bounding analysis process and results and the requirement that the bounding analysis approach be approved for use through a License Amendment Request. Upon approval of the License Amendment Request for the specific bounding analysis application, the licensee may self-approve implementation of plant changes within the constraints of the bounding analysis through the use of FPEEs. To implement this approach, the licensee would add the following paragraph to the Fire Protection license condition:

> *In addition to the risk-informed changes described above, the licensee may also make changes to the Approved Fire Protection Program using the bounding analysis method described in License Amendment Request dated _____ and as approved in the Safety Evaluation dated _____ (and supplement dated _____).*

Example Applications of the Bounding Approach

Example 1 A licensee desires the ability to utilize a new type of covering that can be used on floors and walls to greatly improve the ability to remove radioactive surface contamination. The licensee establishes the worst case expected configuration for the use of the covering with respect to fire and assumes that configuration is used throughout the plant in the Fire PRA and other associated performance-based analyses. The results of those analyses are used in a License Amendment Request to obtain NRC approval under 10 CFR 50.48(c)(2)(vii) for the bounding configuration with the floor and wall covering being used throughout the plant. The analyses demonstrate that the configuration is acceptable from a risk standpoint and that fire protection defense-in-depth and safety margins are maintained. Upon NRC approval, the licensee may self-approve use of the floor/wall covering that has been successfully evaluated using a FPEE, within the bounds of the analyses performed.

Example 2 A licensee desires the ability to self-approve changes to the combustible control program during outages. A specific process that needs to be performed (maintenance on safety related equipment) requires the use of a flammable solvent. The solvent only comes in 12 gallon cans, which is larger than those allowed by the code of record (NFPA 30, 1985). Based on an analysis of the process involved, the engineering team at the licensee postulates that the safest way to address the process and the handling of the solvent is to allow the larger cans in the plant. The licensee takes the worst case configuration required and uses that as the basis for the necessary calculations (Fire PRA, radioactive release, fire modeling, etc.). The results of those analyses are used in a License Amendment Request to obtain NRC approval under 10 CFR 50.48(c)(2)(vii) for the bounding configuration using the larger can. The analyses demonstrate that the configuration is acceptable from a risk standpoint and that fire protection defense-in-depth and safety margins are maintained. Upon NRC approval, the licensee may make changes to the fire protection program (e.g., combustible control procedure), evaluate those changes using a FPEE, and then self-approve the change as necessary throughout the plant, within the bounds of the analyses performed.

L.6. Conclusion

Fire Protection Engineering Evaluations (FPEEs) may be used to demonstrate compliance to NFPA 805 requirements using the three different types of FPEEs (functional equivalency, adequate for the hazard, and bounding approach) within the bounds defined in this document. Two of these approaches are allowable under the existing framework of NFPA 805 and do not require a submittal or prior NRC staff approval (functional equivalency evaluations and

adequate for the hazard). The other approach does require prior NRC staff approval (bounding analysis approach). However, it is not intended to preclude licensees from temporality addressing issues with other aspects of their fire protection program, such as interim compensatory measures and those controls implemented to address fires in non-power operational modes. Using the bounding analysis approach, the licensee performs bounding performance-based analyses, demonstrates that the bounding configuration is acceptable, and upon NRC staff approval, may use FPEEs to justify changes to the plant within the bounds of the approved analyses.

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M. FIRE PRA AND NUREG/CR-6850 CLARIFICATIONS

Subsequent to Revision 2 of NEI 04-02, a number of NFPA 805 FAQs related to Fire PRA and Fire PRA FAQs were developed and approved. Since the content of these FAQs is related to Fire PRA, NEI 04-02, Revision 3 does not include the content of these FAQs. The NFPA 805 FAQs related to Fire PRA and Fire PRA FAQs, and their respective closure memos, are provided below:

FAQ	Rev	Subject	Closure Memo
06-0016	1	Ignition Source counting guidance for Electrical Cabinets (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 3)	ML072700475
06-0017	2	Ignition Source counting guidance for High Energy Arcing Faults (HEAF) (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 4)	ML072500300
06-0018	1	Ignition Source counting guidance for Main Control Board (MCB) (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 5)	ML072500273
07-0031	0	Miscellaneous Binning Issues (later removed and incorporated into NUREG/CR-6850 Supplement 1, Chapter 6)	ML072840658
07-0035	2	Bus duct counting guidance for high energy arcing faults (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 7)	ML091620572
08-0042	0	Fire propagation from electrical cabinets (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 8)	ML092110537
08-0043	1	Cabinet fire location (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 12)	ML092120448
08-0044	0	Large spill oil fire size (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 9)	ML092110516
08-0046	0	Incipient Fire Detection Systems (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 13)	ML093220426
08-0047	1	Spurious Operation Probability (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 15)	ML082950750
08-0048	0	Fire Ignition Frequency (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 10)	ML092190457
08-0049	0	Cable Tray Fires (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 11)	ML092100274
08-0050	0	Non Suppression Probability (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 14)	ML092190555
08-0051	0	Hot Short Duration (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 15)	ML100900052
08-0052	0	Transient Fire Size (Incorporated into NUREG/CR-6850 Supplement 1, Chapter 17)	ML092120501
08-0053	0	Kerite Cable (Not incorporated into NUREG/CR-6850 Supplement 1)	ML120060267 ML121440155
12-0064	1	Ignition Frequency Apportionment (Not incorporated into NUREG/CR-6850 Supplement 1)	ML12346A488

Commented [A29]: Under consideration for retirement August 2016.

Commented [A30R29]: NRC: Issue for discussion

FAQ	Rev	Subject	Closure Memo
FPRA 13-0004	1	Clarifications on Treatment of Sensitive Electronics (Approved under Fire PRA FAQ process)	ML13322A085
FPRA 13-0005	5	Cable Fires Special Cases: Self Ignited and Caused by Welding and Cutting (Approved under Fire PRA FAQ process)	ML13319B181
FPRA 13-0006	0	Modeling Junction Box Scenarios in a Fire PRA (Approved under Fire PRA FAQ process)	ML13331B213
FPRA 14-0008	1	Main Control Board Treatment (Approved under Fire PRA FAQ process)	ML14190B307
FPRA 14-0009	I	Treatment of Well-Sealed MCC Electrical Panels Greater than 440V (Approved under Fire PRA FAQ process)	ML15114A441

N. EXAMPLE UFSAR TEXT

9.5.1 Fire Protection

The fire protection program is based on the NRC requirements and guidelines, Nuclear Electric Insurance Limited (NEIL) Property Loss Prevention Standards and related industry standards. With regard to NRC criteria, the fire protection program meets the requirements of 10 CFR 50.48(c), which endorses, with exceptions, the National Fire Protection Association's (NFPA) 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants – 2001 Edition. **[ENTER PLANT]** has further used the guidance of NEI 04-02, Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c) as endorsed by RG 1.205, Risk-Informed, Performance Fire Protection for Existing Light-Water Nuclear Power Plants.

Adoption of NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition in accordance with 10 CFR 50.48(c) serves as the method of satisfying 10 CFR 50.48(a) and General Design Criterion 3. Prior to adoption of NFPA 805, General Design Criterion 3, "Fire Protection" of Appendix A, General Design Criteria for Nuclear Power Plants, to 10 CFR Part 50, Licensing of Production and Utilization Facilities, was followed in the design of safety and non-safety related structures, systems, and components, as required by 10 CFR 50.48(a).

NFPA 805 does not supersede the requirements of GDC 3, 10 CFR 50.48(a), or 10 CFR 50.48(f). Those regulatory requirements continue to apply. However, under NFPA 805, the means by which GDC 3 or 10 CFR 50.48(a) requirements are met may be different than under 10 CFR 50.48(b). Specifically, whereas GDC 3 refers to SSCs important to safety, NFPA 805 identifies fire protection systems and features required to meet the Chapter 1 performance criteria through the methodology in Chapter 4 of NFPA 805. Also, under NFPA 805, the 10 CFR 50.48(a)(2)(iii) requirement to limit fire damage to SSCs important to safety so that the capability to safely shut down the plant is satisfied by meeting the performance criteria in Section 1.5.1 of NFPA 805.

A Safety Evaluation was issued on **[ENTER DATE]** by the NRC, that transitioned the existing fire protection program to a risk-informed, performance-based program based on NFPA 805, in accordance with 10 CFR 50.48(c).

9.5.1.1 Design Basis Summary

9.5.1.1.1 Defense-in-Depth

The fire protection program is focused on protecting the safety of the public, the environment, and plant personnel from a plant fire and its potential effect on safe reactor operations. The fire protection program is based on the concept of defense-in-depth. Defense-in-depth shall be achieved when an adequate balance of each of the following elements is provided:

(1) Preventing fires from starting,

(2) Rapidly detecting fires and controlling and extinguishing promptly those fires that do occur, thereby limiting fire damage,

(3) Providing an adequate level of fire protection for structures, systems, and components important to safety, so that a fire that is not promptly extinguished will not prevent essential plant safety functions from being performed.

9.5.1.1.2 NFPA 805 Performance Criteria

The design basis for the fire protection program is based on the following nuclear safety and radiological release performance criteria contained in Section 1.5 of NFPA 805:

- Nuclear Safety Performance Criteria. Fire protection features shall be capable of providing reasonable assurance that, in the event of a fire, the plant is not placed in an unrecoverable condition. To demonstrate this, the following performance criteria shall be met.
  a) Reactivity Control. Reactivity control shall be capable of inserting negative reactivity to achieve and maintain subcritical conditions. Negative reactivity inserting shall occur rapidly enough such that fuel design limits are not exceeded.
  b) Select Appropriate performance criteria:
     - Inventory and Pressure Control. With fuel in the reactor vessel, head on and tensioned, inventory and pressure control shall be capable of controlling coolant level such that subcooling is maintained such that fuel clad damage as a result of a fire is prevented for a PWR.
     - Inventory and Pressure Control. With fuel in the reactor vessel, head on and tensioned, inventory and pressure control shall be capable of maintaining or rapidly restoring reactor water level above top of active fuel for a BWR such that fuel clad damage as a result of a fire is prevented.
  c) Decay Heat Removal. Decay heat removal shall be capable of removing sufficient heat from the reactor core or spent fuel such that fuel is maintained in a safe and stable condition.
  d) Vital Auxiliaries. Vital auxiliaries shall be capable of providing the necessary auxiliary support equipment and systems to assure that the systems required under (a), (b), (c), and (e) are capable of performing their required nuclear safety function.
  e) Process Monitoring. Process monitoring shall be capable of providing the necessary indication to assure the criteria addressed in (a) through (d) have been achieved and are being maintained.
- Radioactive Release Performance Criteria. Radiation release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) shall be as low as reasonably achievable and shall not exceed applicable 10 CFR, Part 20, Limits.

Chapter 2 of NFPA 805 establishes the process for demonstrating compliance with NFPA 805.

Chapter 3 of NFPA 805 contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features.

Chapter 4 of NFPA 805 establishes the methodology to determine the fire protection systems and features required to achieve the nuclear safety performance criteria outlined above. The methodology shall be permitted to be either deterministic or performance-based. Deterministic requirements shall be “deemed to satisfy” the performance criteria, defense-in-depth, and safety margin and require no further engineering analysis. Once a determination has been made that a fire protection system or feature is required to achieve the nuclear safety performance criteria of Section 1.5, its design and qualification shall meet the applicable requirement of Chapter 3.

9.5.1.1.2 Codes of Record

The codes, standards and guidelines used for the design and installation of plant fire protection systems are as follows: (for specific applications and evaluations of codes refer to [Enter appropriate upper tier document(s)])

[List appropriate codes, standards, and guidelines]

9.5.1.2 System Description

9.5.1.2.1 Required Systems

Nuclear Safety Capability Systems, Equipment, and Cables

Section 2.4.2 of NFPA 805 defines the methodology for performing the nuclear safety capability assessment. The systems equipment and cables required for the nuclear safety capability assessment are contained in **[ENTER appropriate upper tier reference]**.

Fire Protection Systems and Features

Chapter 3 of NFPA 805 contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. Compliance with Chapter 3 is documented in **[ENTER appropriate upper tier reference]**.

Chapter 4 of NFPA 805 establishes the methodology and criteria to determine the fire protection systems and features required to achieve the nuclear safety performance criteria of Section 1.5 of NFPA 805. These fire protection systems and features shall meet the applicable requirements of NFPA 805 Chapter 3. These fire protection systems and features are documented in **[ENTER appropriate upper tier reference]**.

Radioactive Release

Structures, systems, and components relied upon to meet the radioactive release criteria are documented in **[ENTER appropriate upper tier reference]**.

9.5.1.2.2 Definition of "Power Block" Structures

Where used in NFPA 805 Chapter 3 the terms "Power Block" and "Plant" refer to structures that have equipment required for nuclear plant operations. For the purposes of establishing the structures included in the fire protection program in accordance with 10 CFR 50.48(c) and NFPA 805, the plant structures listed in Table 9.5.1-1 are considered to be part of the 'power block'.

9.5.1.3 Safety Evaluation

The **[ENTER appropriate document name]** documents the achievement of the nuclear safety and radioactive release performance criteria of NFPA 805 as required by 10 CFR 50.48(c). This document fulfills the requirements of Section 2.7.1.2 "Fire Protection Program Design Basis Document" of NFPA 805. The document contains the following:

- Identification of significant fire hazards in the fire area. This is based on NFPA 805 approach to analyze the plant from an ignition source and fuel package perspective.
- Summary of the Nuclear Safety Capability Assessment (at power and non-power) compliance strategies.
  - Deterministic compliance strategies
  - Performance-based compliance strategies (including defense-in-depth and safety margin)
- Summary of the Non-Power Operations Modes compliance strategies.
- Summary of the Radioactive Release compliance strategies.
- Summary of the Fire Probabilistic Risk Assessments.
- Key analysis assumptions to be included in the NFPA 805 monitoring program.

9.5.1.4 Fire Protection Program Documentation, Configuration Control and Quality Assurance

In accordance with Chapter 3 of NFPA 805 a fire protection plan documented in **[ENTER appropriate document]** defines the management policy and program direction and defines the responsibilities of those individuals responsible for the plan's implementation. The **[ENTER appropriate document]**:

- Designates the senior management position with immediate authority and responsibility for the fire protection program.
- Designates a position responsible for the daily administration and coordination of the fire protection program and its implementation.
- Defines the fire protection interfaces with other organizations and assigns responsibilities for the coordination of activities. In addition, the **[ENTER appropriate document]** identifies the various plant positions having the authority for implementing the various areas of the fire protection program.
- Identifies the appropriate authority having jurisdiction for the various areas of the fire protection program.
- Identifies the procedures established for the implementation of the fire protection program, including the post-transition change process and the fire protection monitoring program.
- Identifies the qualifications required for various fire protection program personnel.
- Identifies the quality requirements of Chapter 2 of NFPA 805.

Detailed compliance with the programmatic requirements of Chapters 2 and 3 of NFPA 805 are contained in **[ENTER appropriate document].**

Table 9.5.1-1 Power Block Buildings

O. EXAMPLE LICENSE CONDITION

The following is a sample license condition, based on RG 1.205, Revision 1, with additional insights gained during the pilot and non-pilot NFPA 805 Transition Process. It is an example only and does not reflect plant specific commitments or adjustments made by the licensee in the application process.

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Fire Protection Program

(Name of Licensee) shall implement and maintain in effect all provisions of the approved fire protection program that complies with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated **(date of LAR),** as supplemented by letters dated (dates of supplements and submittals), and as approved in the SE dated **(date of SE).** Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, 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) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

Risk-Informed Changes that May Be Made Without Prior NRC Approval

A risk assessment of the change must demonstrate that the acceptance criteria below are met. The risk assessment approach, methods, and data shall be acceptable to the NRC and shall be appropriate for the nature and scope of the change being evaluated; be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at **(facility name)**. Acceptable methods to assess the risk of the change may include methods that have been used in the peer-reviewed Fire PRA model, methods that have been approved by NRC through a plant specific license amendment or NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.

a) Prior NRC review and approval is not required for changes that clearly result in a decrease in risk. 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 plant change evaluation; and

b) Prior NRC review and approval is not required for individual changes that result in a risk increase less than 1X10-7/year (yr) for CDF and less than 1X10-8/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 plant change evaluation.

Other Changes that May Be Made Without Prior NRC Approval

1) Changes to NFPA 805, Chapter 3, Fundamental Fire Protection Program

Prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3, fundamental fire protection program elements and design requirements for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to an NFPA 805, Chapter 3, element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the

component, system, procedure, or physical arrangement, using a relevant technical requirement or standard.

The licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3, elements are acceptable because the alternative is "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

- "Fire Alarm and Detection Systems" (Section 3.8);
- "Automatic and Manual Water-Based Fire Suppression Systems" (Section 3.9);
- "Gaseous Fire Suppression Systems" (Section 3.10); and
- "Passive Fire Protection Features" (Section 3.11).

This License Condition does not apply to any demonstration of equivalency under Section 1.7 of NFPA 805.

2) Fire Protection Program Changes that Have No More than Minimal Risk Impact

Prior NRC review and approval are not required for changes to the licensee's fire protection program that have been demonstrated to have no more than a minimal risk impact. The licensee may use its screening process as approved in the NRC SE dated **(date of SE)** to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection defense-in-depth and safety margins are maintained when changes are made to the fire protection program.

Transition License Conditions

1) Before achieving full compliance with 10 CFR 50.48(c), as specified by 2) and 3) below, risk informed changes to **(Name of licensee)** fire protection program may not be made without prior NRC review and approval unless the change has been demonstrated to have no more than a minimal risk impact, as described in 2) above;
2) The licensee shall implement the modifications to its facility, as described in Table S-1, “Plant Modifications Committed,” Attachment S, of **(Licensee letter transmitting final list of committed modifications and date)**, to complete the transition to full compliance with 10 CFR 50.48(c) prior to **(agreed upon date or timeframe relative to plant outage(s))** after issuance of the SE. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications; and
3) The licensee shall implement the items listed in Attachment S, Table S-2, “Implementation Items,” of **(Licensee letter transmitting final list of committed implementation items and date)**, with the exception of **(any implementation items that cannot be completed due to predecessor modifications or other situations)**, within **(agreed upon timeframe)** after NRC approval unless **(any exceptions related to plant outages or predecessor modifications)**.