NRC Staff Comments on FAQ 12-0061, Revision 0 [CEM, HTB, SCD] {September 2012}

General Comments

1) What do you propose to do about changes to methods and changes to the PRA? 50.59 addresses this type of change. 50.59(c)(1)(viii) prohibits, "Results in a departure from a method…". 50.59(a)(2) defines "Departure from a method…" to include all approved methods.

2) There seems to be no discussion on using 4.2.4.1 Fire Modeling as a change evaluation tool.

3) There is a lot of repetition between 5 and Appendix J. Why repeat? If things are repeated they should be word for word since otherwise they can be construed to be acceptable alternatives. Can you read only (appendix J) to find everything or must you read both?

4) A number of processes (d-i-d, safety margins, and uncertainty) will have been developed and used in the transition phase and accepted by the NRC. These processes should be carried over into the post-transition phase but this document does not seem to emphasize that.

5) The cumulative change in risk in J.6.2 certainly seems to address this complex issue, but the current write-up seems to mix (changes in risk from a change) with (changes in risk following PRA updates). The proposal seems to be:– new changes addressed as they are developed without addressing cumulative, cumulative is addressed during the periodic PRA updates based on changes in fire area risk.

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]*

Comment [C1]: Align w/ 805 text.

Section 2.4.4 of NFPA 805 provides the criteria against which the change evaluations are evaluated. It states, in part, 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 Core Damage Frequency (CDF) and Large Early Release Frequency (LERF). The NRC already has established acceptable quantitative changes to the CDF and LERF in Regulatory Guide 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 Regulatory Guide 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.

Comment [S2]: Should point out that plant specific evaluations for these issues have been used to transition – and these same evaluations should be used after transition (unless changed – see general comment on changing methods)

- Note that the fire protection license condition allows self approval of "very small" (i.e., CDF increase of <E-06/rx. yr. and LERF increase of <E-07/rx. yr.) as defined by Regulatory Guide 1.174. Per Regulatory Guide 1.174, Rev. 2, Regulatory Position 2.4:

Comment [S3]: These numbers are wrong. The self-approval numbers are a factor of 10 lower.

Comment [S4]: This section does not refer to self-approval.

> ~~*When the calculated increase in CDF is very small, which is taken as being less than 10^{-6} per reactor year, the change will be considered regardless of whether there is a calculation of the total CDF (Region III). While there is no requirement to calculate the total CDF, if there is an indication that the CDF may be considerably higher than*~~

~~10^{-4} per reactor year, the focus should be on finding ways to decrease rather than increase it…~~.

There is also corresponding guidance for LERF. Implicit in this guidance is the presumption that total plant risk is acceptable to allow fire protection program changes per the license condition.

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

- 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.
- Processes and methods described in the NFPA 805 LAR and approved in the NFPA 805 SE.
- etc…

Comment [C5]: Why was the discussion of NFPA 805 section 1.7 removed from this section?

Comment [S6]: These are similar but a little different from RG 1.205 text on page J-2. Identical descriptions should be avoided but, if unavoidable, should have identical text (and be right)

Comment [C7]: I am sure there are other items that would not be allowed self-approval.

For those changes that 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.

5.3.1.2 Definitions

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, FSA, or DBD) that contains the changes to the NFPA 805 Fire Protection Program post-transition on a fire area basis. It includes an evaluation of risk, defense in depth and safety margins relative to these changes.

~~5.3.1.3~~ Process Overview

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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

Comment [S8]: Can fire modeling be used to determine no increase has occurred?

requirements of NFPA 805 for this evaluation of risk. This screening process will be used to 'screen' minimal increases in 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.

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

Comment [S9]: What is "minimal"? Suggest the 50-59 language that if unclear that it is and increase or decrease, it is minimal. 10-7/yr is **not** a definition of minimal since quantitative risk results are compared to this value.

- 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)

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

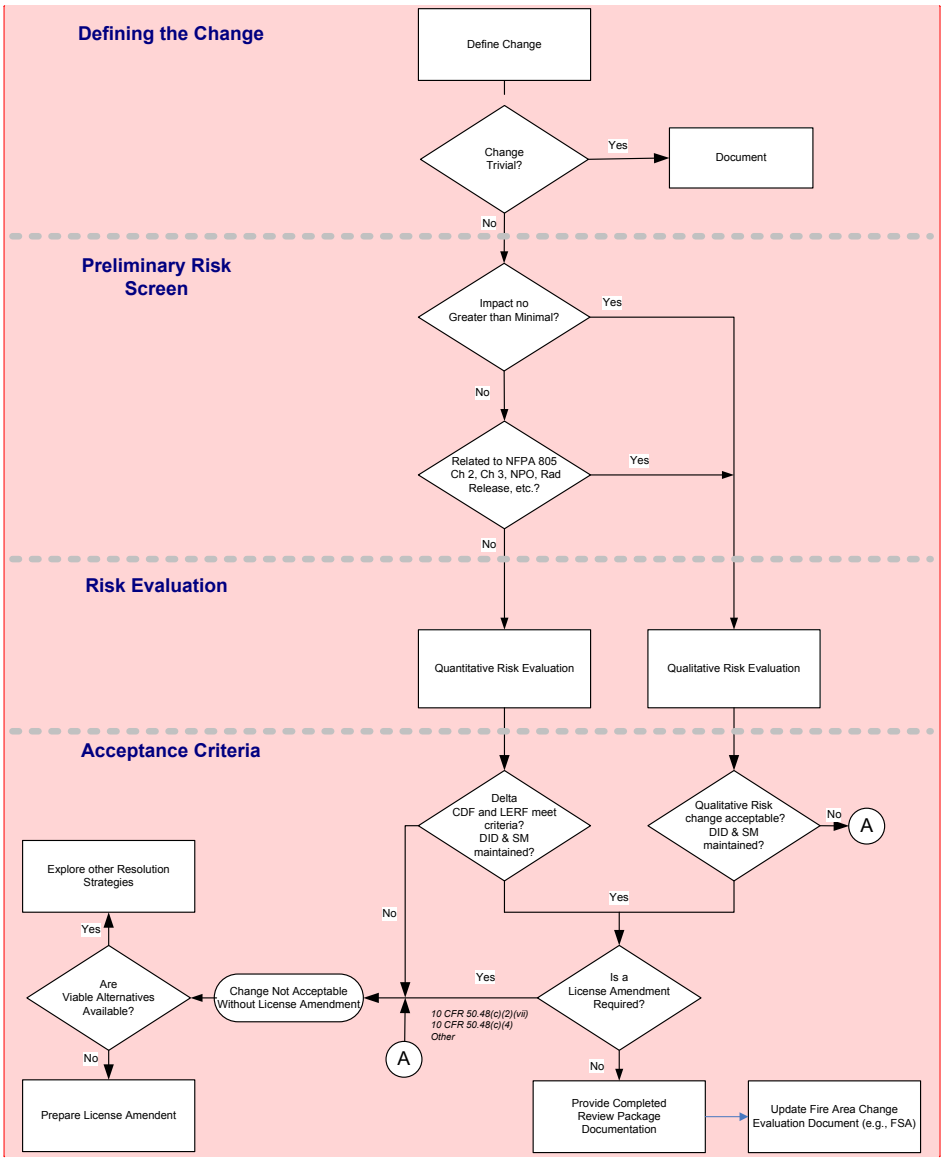

Figure 5-1 – Fire Protection Change Impact Review Process

Comment [C10]: The staff notes that the "Is a license amendment required?" diamond is doing a lot of work here that should be more clearly explained.

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

Comment [S11]: Same bullets on page J-1

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

Certain types of changes to the fire protection may not be conducive to quantitative risk-informed, performance-based treatment. These types of changes include:

Comment [S12]: If conducive, do you need to risk inform or can you risk inform?

- 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

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 mixture of:

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

Comment [S13]: Both these seem to look at changes to the FPP to see how the general method and requirements are affected. How about evaluating changes to the general method and requirements which might flow back into the FPP?

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. Types of changes related to NFPA 805 Chapter 2 are not likely to be the types of changes that can be measured in terms of change in risk or maintaining defense-in-depth and

safety margins. Changes, however, should be reviewed to determine acceptability and need to obtain approval from the NRC.

See Attachment J for guidance on the treatment of changes related to methodology and requirements in NFPA 805 Chapter 2.

Comment [S14]: Attachment J only adds acceptance guidelines, why do that in Appendix J and not here?

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

Guidance on the NFPA 805 Chapter 3, Fundamental Fire Protection Program Elements and Design Requirements, is provided in RG 1.205 Rev. 1, Regulatory Position 3.1. 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, 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.

Comment [C15]: What about the population of changes that can be? For example changing the responsiveness of a detection or suppression system or a passive barrier?

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.). Outstanding changes to the approved fire protection program ~~documents~~ are addressed on a cumulative basis as discussed in Attachment J, Section J.2.6.

Comment [S16]: No J.2.6, J.6.2 is cumulative PRA risk – did you mean that?

See Attachment 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 ~~is~~may be~~is~~ 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.). Outstanding changes to the approved fire protection program ~~documents~~ are addressed on a cumulative basis as discussed in Attachment J, Section J.2.6.

Comment [S17]: No J.2.6, J.6.2 is cumulative PRA risk – did you mean that?

See Attachment J for guidance on the treatment of changes related to fires originating in non-power operational modes.

Radioactive Release Performance Criteria

Changes may be made to the plant fire protection program as it relates to meeting the radioactive release performance criteria, within limits. The change in risk associated with fire protection changes is performed qualitatively, rather than quantitatively, with respect to radioactive release.

Comment [S18]: ?

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 s 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.). Outstanding changes to the approved fire protection program ~~documents~~ are addressed on a cumulative basis as discussed in Attachment J, Section J.2.6.

Comment [S19]: No J.2.6, J.6.2 is cumulative PRA risk – did you mean that?

See Attachment J for guidance on the treatment of fire protection program changes related the radioactive release performance criteria.

5.3.2.3 Trivial Changes

Trivial Changes - Minor 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 ~~then~~ performed to identify and resolve minor changes to the fire protection program. 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.

Comment [S20]: Should define minimal. If it cannot be determined whether risk increases or decreases the change is minimal.

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. For routine minor changes, this is the step where engineering judgment would be applied and the need for formal engineering analyses would be determined.

Comment [S21]: These are "routine minor changes" that do not screen out as less than minimal?

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).

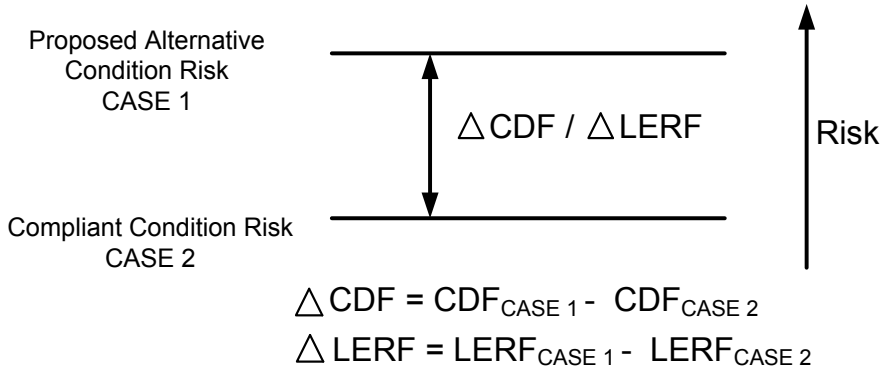

Figure 5-2 – Compliant versus Changed/Altered Conditions (for an example risk increase)

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.6.2, Treatment of Cumulative Program Changes.

Technical Adequacy

In order to perform a quantitative change 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.

5.3.5 Review of Acceptance Criteria

5.3.5.1 Quantitative Risk Evaluations

Quantitative Risk Acceptance Criteria

Regulatory Guide 1.205 includes the following for risk acceptance guidance acceptable to the AHJ: These guideline values are expected to be applicable to all plants.

Self approval

Delta CDF less than 10-7/yr

Delta LERF less than 10-8/yr

If the self approval guidelines are not met, an 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 FPP, or credited for the FPP, after transition to NFPA-805.

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

The NRC intends to provide this flexibility to make certain changes without prior NRC review and approval in a license condition for licensees that make the transition to 10 CFR 50.48(c). A sample license condition, which includes acceptance criteria for making changes to the licensee's FPP without prior NRC review and approval, is shown below. The application of these risk acceptance criteria requires that the plant have an acceptable fire PRA that is in accordance with the guidance in Regulatory Position 4.3; refer also to Regulatory Position 3.2.4.

(Name of Licensee) shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated _____ (and supplements dated _____) and as approved in the safety evaluation report dated _____ (and supplements dated _____). 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 the plant. 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.

~~*(b) Prior NRC review and approval is not required for individual changes that result in a risk increase less than 1×10-7/year (yr) for CDF and less than 1×10-8/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).*~~

~~*(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 safety evaluation report dated _____ 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) below, risk-informed changes to the licensee's 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 following modifications to its facility to complete the transition to full compliance with 10 CFR 50.48(c) by {date}. {Include a plant-specific list of any modifications identified by the licensee as necessary to complete the transition to its new fire protection license basis.}*~~

~~*(3) The licensee shall maintain appropriate compensatory measures in place until completion of the modifications delineated above.*~~

Comment [S22]: This is unnecessary and could be misleading when a plant specific license condition differs.

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
- 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 FPP was developed and applied during the transition to NFPA-805. This process must be applied to changes to the FPP following transition. ~~Consistent with the guidance in NEI 00-01, the following guidance should be used with respect to maintaining defense-in-depth:~~

Comment [S23]: Simply repeating other documents is of little use.

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

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~~*1. A reasonable balance is preserved among 10 CFR 50 Appendix R DID elements.*~~

~~*2. Over-reliance on, and permitting increased length of time or risk when performing programmatic activities to compensate for weaknesses in plant design is avoided.*~~

~~*3. 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 train must be maintained free of fire damage.)*~~

~~*4. Independence of defense-in-depth elements is not degraded.*~~

~~*5. Defenses against human errors are preserved.*~~

~~*6. The intent of the General Design Criteria in Appendix A to 10 CFR Part 50 is maintained.*~~

~~*It should be noted that all elements of fire protection DID may not exist for beyond design basis fire scenarios. For example, a CCDP of 1.0 is possible if enough fire barriers are breached. Such beyond design basis scenarios, however, should be demonstrated to be a very low risk significance, with certainty. A very low risk scenario with all elements of DID, and a CDF of 9E-08/year would be treated differently than a scenario with a CCDP of 1.0, and a CDF of 9E-08/year which may rely solely on a low ignition-initiating frequency for its very low risk. In the end, the balance results in consideration of all aspects of the component combination, including the risk, DID, SM, uncertainty, and other relevant issues.*~~

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 FPP was developed and applied during the transition to NFPA-805. This process must be applied to changes to the FPP 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 four categories. These categories are:

Comment [S24]: Where does this come from?

1. Fire Modeling
2. Plant System Performance
3. PRA Logic Model
4. Miscellaneous

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 shall be within its limitations for use. Users should be qualified to use the models.

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.

Comment [S25]: Is this a review of the PRA success criteria?

Comment [S26]: Using MAAP to develop timing will automatically lead to reducing the safety margins in the design basis

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 PRA model is preserved.

Comment [S27]: What does this mean?

Miscellaneous

This category is intended to address any other analyses that may have been performed that have not been addressed by the prior categories. Since the types of analyses in this category are varied, specific analysis guidance cannot be provided. Instead, the general requirements related to codes and standards, and acceptance criteria stated earlier must be addressed in the analysis documentation.

Uncertainty Considerations

Comment [S28]: This section says nothing

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.

Comment [S29]: And how is the analysis of uncertainties accomplished?

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. These evaluations should be used to review post-transition.

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.

I. PLANT CHANGE EVALUATION FORM

This attachment no longer used.

Comment [C30]: The staff does not understand why Attachment I was deleted. What about FAQ 2?

J. PLANT CHANGE PROCESS

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)
  - PRA Related Changes (J.6)

J.1. Plant Change Process and Regulatory Guidance

J.1.1 Definition of a Change

RG 1.205, Revision 1, Regulatory Position 3.2.1, provides the following definition of a change:

Comment [C31]: It seems problematic to include quoted text from revision 1 of RG 1.205 when this version of 04-02 will be endorsed by revision 2 of the RG which may have different text, or differently numbered text.

> ~~*3.2.1 Definition of a Change*~~
>
> ~~*NFPA 805 includes provisions for licensees to make changes to their approved FPPs, once the transition to a 10 CFR 50.48(c) license is complete. Sections 2.2.9 and 2.4.4 of NFPA 805 require a "plant change evaluation" for any change to a previously approved FPP element. In the context of an NFPA 805 FPP that complies with 10 CFR 50.48(c), a change may be any of the following:*~~
>
> *(1) a physical plant modification that affects the FPP;*
>
> *(2) a programmatic change (e.g., change to a procedure, assumption, or analysis) that affects the FPP; or*
>
> *(3) an in-situ condition (physical or programmatic) that is not in compliance with the plant's FPP.*
>
> *For changes that involve acceptance of an existing unapproved condition (i.e., a noncompliance), appropriate compensatory measures should be established and should remain in place until either the plant is modified to achieve compliance or the condition is found acceptable. Acceptance of the as-found condition may be the result of either the NRC's review and approval or the self-approval process, according to the licensee's fire protection license condition.*

J.1.2 Plant Change Evaluations

RG 1.205, Revision 1, Regulatory Position 3.2.2, provides the following on plant change evaluations:

> ~~*3.2.2 Plant Change Evaluations*~~
>
> ~~*The licensee should perform an engineering evaluation to demonstrate acceptability of the change in terms of the plant change evaluation criteria and compliance with the fire*~~

~~*protection requirements of 10 CFR 50.48(a). The plant change evaluation process includes an integrated assessment of the acceptability of the change in risk, defense in depth, and safety margins, regardless of the methods or approaches used to evaluate the change. Regulatory Guide 1.174 (Ref. 8) provides acceptance guidance applicable to NFPA 805 plant change evaluations.*~~

~~*NFPA 805, Section 2.4.4.2, "Defense-in-Depth," states that the defense-in-depth concept should be maintained as it relates to fire protection and nuclear safety. Under NFPA 805, Section 1.2, fire protection defense in depth is achieved when an adequate balance of each of the following elements is provided:*~~

Comment [S32]: Whi is D-i-D called out here and nothing else?

~~*(1) preventing fires from starting;*~~

~~*(2) rapidly detecting fires and controlling and extinguishing promptly those fires that do occur, thereby limiting fire damage; and*~~

~~*(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.*~~

~~*The philosophy of nuclear safety defense in depth is maintained when a reasonable balance is preserved among prevention of core damage, prevention of containment failure, and mitigation of consequences. Regulatory Guide 1.174 provides guidance on maintaining the philosophy of nuclear safety defense in depth that is acceptable for NFPA 805 plant change evaluations.*~~

Comment [S33]: Simply repeating other documents is of little use.

J.1.3 NRC Approval of Fire Protection Program Changes

RG 1.205, Revision 1, Regulatory Position 3.2.3, provides the following on NRC approval of fire protection program changes:

3.2.3 NRC Approval of Fire Protection Program Changes

The following are examples of FPP changes that licensees must submit for NRC review and approval through a license amendment request before implementation:

(1) changes that do not meet the acceptance criteria of the approved license condition;

(2) changes to the fundamental FPP elements and design requirements of Chapter 3 of NFPA 805, which use performance-based methods, unless specified in the fire protection license condition for the plant;

(3) changes that have been evaluated using risk-informed or performance-based alternatives to compliance with NFPA 805, where the alternatives have not been approved for use by a license amendment, as required by 10 CFR 50.48(c)(4); and

(4) combined changes where any individual change would not meet the risk acceptance criteria of the approved license condition.

Comment [S34]: Simply repeating other documents is of little use.

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.

Comment [S35]: Are licensees going to request this after transition? At a minimum, should go into J.3.

J.1.4 Plant Changes Without Prior NRC Approval

RG 1.205, Revision 1, Regulatory Position 3.2.4, provides the following on plant changes without prior NRC approval:

3.2.4 Plant Changes Without Prior NRC Approval

The sample standard license condition in Regulatory Position 3.1 sets forth criteria for making changes to the approved NFPA 805 FPP without prior NRC approval. The risk acceptance criteria for plant changes provided in this sample standard license condition are acceptable to the NRC.

Where permitted by the approved fire protection license condition, licensees of plants that have a fire PRA that is in accordance with Regulatory Position 4.3 may make risk-informed changes without prior NRC review and approval. The types of plant changes that may be implemented without prior NRC review and approval will be limited to those for which the risk assessment methods are adequate to demonstrate that any increase in risk will continue to meet the risk acceptance criteria.

Licensees must also maintain appropriate levels of defense in depth and adequate safety margins.

The licensee should document each plant change evaluation consistent with Section 4 of Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," issued March 2009 (Ref. 11), and retain the documentation in accordance with the requirements of NFPA 805, Section 2.7.

Comment [S36]: Simply repeating other documents is of little use.

J.2. 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 mixture of:

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

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 meets the approved fire protection program as defined in the NFPA 805 SE.
- The change is considered to be editorial or trivial in nature and clearly has no adverse impact on the fire protection program.

Additional considerations are given to the plant specific licensing basis as defined in the NFPA 805 SE.

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

Guidance allowed to the NFPA 805 Chapter 3, Fundamental Fire Protection Program Elements and Design Requirements, is provided in RG 1.205 Rev. 1, Regulatory Position 3.1:

> *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).*

Comment [S37]: Simply repeating other documents is of little use.

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 Plant 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).

J.4. 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 is performed qualitatively, rather than quantitatively.

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 meets the approved fire protection program as defined in the NFPA 805 SE.
- 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 and accepted by the NRC and the results meets the appropriate acceptance guidelines.

J.5. Radioactive Release Performance Criteria

Changes may be made to the plant fire protection program as it relates to meeting the radioactive release performance criteria, within limits. The change in risk associated with fire protection changes is performed qualitatively, rather than quantitatively, with respect to radioactive release.

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, Section4.3.
- The change meets the approved fire protection program as defined in the NFPA 805 SE.
- The change is considered to be editorial or trivial in nature and clearly has no adverse impact on the fire protection program.

J.6. 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)
4. Fire PRA Methods (J.6.4)

J.6.1 Fire PRA Updates

RG 1.205, Revision 1, Regulatory Position 2.2.4.3, provides the following on baseline risk for plant change evaluations:

> *2.2.4.3 Baseline Risk for Plant Change Evaluations*
>
> *Upon completing the transition to an NFPA 805 licensing basis, the posttransition baseline risk for use in evaluating the effect of subsequent plant changes on cumulative risk will be the risk of the plant at the point of full implementation of NFPA 805 (i.e.,*

after completing all plant modifications and changes that the licensee has committed to make during the transition).

NFPA 805 is a risk-informed performance-based standard for implementing fire protection at nuclear power plants. As such, fire PRA is an integral tool. Because the PRA is expected to reflect the as-built, as-operated plant, it will need to be updated periodically, consistent with the plant. These PRA updates should not pose any unique challenges to the fire protection program, since the plant changes themselves must be evaluated for their impact fire risk ~~on the fire protection program~~. However, PRAs can also be updated due to new or improved data, and other modeling refinements.

Comment [S38]: FPP is not evaluated in PRA, only fire risk.

Comment [S39]: When modeling refinements are really new methods they should be treated under PRA quality.

Most PRAs go through a periodic update cycle. Typically every one or two refueling cycles, the appropriate elements of the PRA are revised and the models are re-quantified to produce a new CDF 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 importances
- 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 PRA has two primary functions under NFPA 805. First, during transition of the plant to NFPA 805, the 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 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).

It is not expected that previously accepted changes are re-evaluated every time the PRA is updated, however, because the PRA is an integral part of the fire protection program, certain attributes should be evaluated for general risk insights. These attributes would include:

Comment [S40]: Does this mean that, if the importance measures change substantially, all post-transition previously accepted changes will need to be re-evaluated?

Comment [S41]: What are these and what do you do with them?

- 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 may indicate the need to make changes to the fire protection program based on indirect impacts caused by equipment reliability or procedures, or environmental impacts. Addressing these issues should help ensure the overall health of the fire protection program, without the need to re-assess all previous plant or programmatic changes since transition to NFPA 805

Comment [S42]: Why? Because the re-evaluated previously approved changes now exceed the cumulative acceptance guidelines?

Comment [S43]: What does this mean? How do you "address" what "issues"?

J.6.2 Fire PRA – Treatment of Cumulative Fire Protection Program Changes

The purpose of this section is to define a method in which cumulative risk can be addressed with respect to the post-transition fire protection program. It uses the Fire PRA model update process as an opportunity to assess cumulative risk on a fire area/compartment basis. The process is using the most current model to evaluate cumulative risk. The process uses the ~~RG 1.205~~ criteria in the license condition. A key consideration in this process is that that risk increases due only to fire protection changes above acceptance criteria would be submitted to the NRC for approval (i.e., non-fire protection changes / model changes would not.)

Comment [S44]: Is this to be done instead of re-evaluating all previously accepted post transition changes for each new change?

Guidance on combined changes and cumulative risk of changes is provided in RG 1.205, Rev. 1, Regulatory Position 3.2.5:

> *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 Section 3.3.2 of Regulatory Guide 1.174 (Ref. 8).*
>
> *After the transition to NFPA 805, the cumulative risk of subsequent FPP changes is the change in risk compared to the posttransition baseline risk (see Regulatory Position 2.2.4). Also, after the transition to NFPA 805, licensees should only include changes associated with the FPP in cumulative risk evaluations. In the sample license condition in Regulatory Position 3.1, 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 FPP 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 FPP 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 2.1.1 and 2.1.2 of Regulatory Guide 1.174.*

Figure J-1 depicts the process to evaluate cumulative impact of changes to the Fire Protection Program.

- Step 1 - Follow the established Fire Protection Change Impact Review process for individual changes using the Fire PRA of record.
- Step 2 - Maintain and update the Fire PRA following the normal Fire PRA update process
- Step 3 - When a new PRA is issued (which includes the cumulative impact of changes since last update in addition to the impact of all the plant changes in previous updates)
  - Provide updated metrics for fire protection (CDF/LERF by area).
  - Determine if the fire area risk increases by less than 1E-07 CDF/yr and 1E-08 LERF/yr. If risk is lower than threshold, cumulative risk change is satisfactory. These are conservative change in risk threshold values consistent with the license condition values from Regulatory Guide 1.205, Revision 1.

Comment [S45]: What is the relationship between Step 1 and Step 2, they are normally independent.

- Step 4 – When fire area risk exceeds the threshold in Step 3, determine the fire protection changes made that impact the fire risk in that NFPA 805 Fire Area since the last NRC approved submittal (e.g., NFPA 805 transition Safety Evaluation or subsequent approval document). Other items such as internal events model changes, component failure rates, HEP values, etc. are not considered fire protection program changes although their change in value could affect calculated risk numbers. Alternatively, fire protection program changes that affect ignition frequencies, fire growth and propagation, suppression, etc., would be considered fire protection program changes.
  - Determine the cumulative delta risk due to those fire protection changes using the PRA model from Step 3 above. Use of the current Fire PRA model ensures the most accurate and appropriate measure of risk and change in risk.
    - If cumulative impact is less than the threshold in step 3, no further action is required.
    - If cumulative impact still exceeds the threshold, determine if viable options for reducing the cumulative risk to within acceptable levels are available.

      Note: This condition should be documented in the plant corrective action program and appropriate compensatory measures implemented. Note that if the process is utilized as intended, this condition is not reportable as it is part of the process to check for impacts of cumulative changes within the same Fire Area.
  - If risk reduction not successful and the permission is desired for the current plant configuration, then treat this condition as a plant change and seek NRC approval for cumulative risk change.

Comment [S46]: To be done in addition to the change process calculations?

Comment [S47]: This is to be done independently and in lieu of any specific change request?

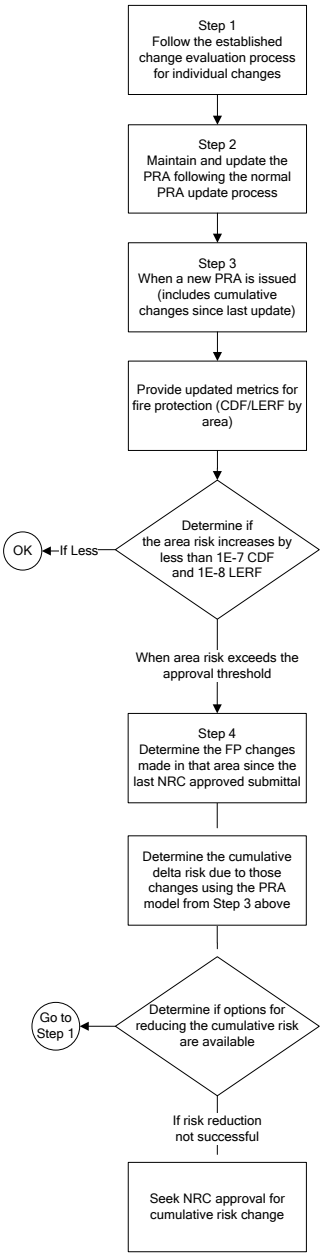

Figure J-1 – Fire PRA Treatment of Cumulative Risk

J.6.3 Technical Adequacy

There are two aspects to demonstrating the technical adequacy of the parts of the PRA to support an application. The first aspect is the assurance that the parts of the PRA used in the application have been performed in a technically correct manner, and the second aspect is the assurance that the assumptions and approximations used in developing the PRA are appropriate. Additionally, the first aspect implies that (1) the 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 PRA is up to date and reflects the current design and operating practices, (2) the 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.

Comment [S48]: Where is this second aspect addressed below?

Comment [S49]: The rule requires that the PRA approach, methods, and data shall be acceptable to the AHJ.

An acceptable approach that can be used to ensure technical adequacy is to perform a peer review of the PRA in accordance with RG 1.200. A peer review process can be used to identify the strengths and weaknesses in the PRA and their importance to the confidence in the PRA results. Additionally, self-assessments provide additional rigor in assessing the technical adequacy of the fire protection program and Fire PRA.

Comment [S50]: The peer review itself satisfies RG 1.200, appropriate technical adequacy itself is initially measured by the results of the peer review.

Comment [S51]: Not sure where this comes from and what it means

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 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 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 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 Plant 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 (also see discussion on "Fire PRA Methods")
- Have the sources of uncertainty that could affect the results of the change evaluation been adequately considered?

Comment [S52]: What sections are these?

Comment [S53]: How are these identified?

J.6.4 Fire PRA Methods

The overall Fire Protection Plant Change Impact Review process involves a graded and potentially iterative process. The intent of the graded approach is to provide analysis flexibility to address a wide range of issues and conditions. It also provides the mechanism to recognize and incorporate the diverse set of plant fire risk analyses in the industry. In general, the

evaluation process focuses on performing those Engineering and Risk Analyses needed to establish the acceptability of the change.

The scope of evaluations that could be performed within the limitations of the applicable License Condition is potentially extensive. In order to provide meaningful guidance for the performance of evaluations in this Appendix, the scope of changes is grouped into broad categories. A summary discussion for each of these categories is provided to characterize the cause-effect relationship in the context of a risk assessment that then leads to a recommended treatment approach. This information is presented in the following table.

Comment [S54]: So the NRC needs to review and accept these methods during the review of this FAQ?

It is anticipated that the majority of the plant physical or Fire Protection Program changes that occur within the limitations of the License Condition can be described in the context of the categories provided in the following Table. These categories, the related cause/effect relationship and recommended treatment approach can be aligned with the basic elements of a Fire PRA. In all cases, it is expected that the specifics of the treatment will have already been applied as part of the base plant fire risk assessment development or are otherwise acceptability addressed by one or more Supporting Requirements (SRs) from the PRA Standard as endorsed by Regulatory Guide 1.200. In cases where a particular treatment or approach had not been previously applied in the base plant fire risk assessment, the successful completion of a related Evaluation would require that the base model be updated to reflect the in-situ configuration. That update/upgrade of the base fire risk assessment model may require a focused-scope Peer Review to evaluate the technical acceptability of that treatment. The existing provisions and requirements of Regulatory Guide 1.200 are therefore relied upon for establishing the acceptability of the specific treatment as incorporated into the base fire risk assessment.

Comment [S55]: Treatment is method?

Comment [S56]: Anything other than "not-met" could be considered a SR that is endorsed by RG 1.200

Comment [S57]: How is the in-situ configuration related to treatment (method)?

Comment [S58]: Focused scope Peer review that determines the licensee has appropriately applied an acceptable method should suffice.

The following information is provided in the table below:

- No. – Item number
- Type of Change – Brief description of the type of change that could occur in a plant with potential to impact the fire protection program.
- Treatment Discussion – Discussion of how changes may impact the Fire PRA treatment.
- Treatment Method / Approach – Specific treatment in the Fire PRA when evaluating the particular change (if any) and the relationship of that treatment to the base Fire PRA.

Table J-1 Associated Cause-Effect Relationship and Treatment Method

No.	Type of Change	Treatment Discussion	Treatment Method / Approach
1	Unprotected Cable	The presence of an unprotected cable due to new discovery or plant modification results in the altering of the scope of cables affected by postulated fire events.	**Target Scope Change** – the quantification of the risk impact is performed using the same methods applied for the base Fire PRA.

Table J-1 Associated Cause-Effect Relationship and Treatment Method

No.	Type of Change	Treatment Discussion	Treatment Method / Approach
2	ERFBS Barrier Worth	The altering of an ERFBS 'protection worth' can be treated in a Fire PRA in at least three ways. Both approaches assume that engineering evaluations are unable to demonstrate adequacy of the barrier. A bounding approach can be used in which case the treatment is the same as item 1. The evaluated 'worth' of the barrier is translated to an available time for fire suppression. The crediting of the suppression credit is applied consistent with existing methods used for the base Fire PRA.	Target Scope Change – see No. 1 OR Change Suppression Credit - use existing methods from the base Fire PRA.
3	Passive FP Features (dikes, curbs, etc.)	Changes to fire protection features such as dikes and curbs can affect the spread of combustible fluid fires. As such, the treatment of such events is performed using methods consistent with that applied in the base Fire PRA. In general, the related fire modeling analyses should be updated using methods consistent with that already applied in the base Fire PRA. In this case, the target scope for the postulated fire events is altered to change the scope of fire affected cables. In this case, the treatment is the same as item 1. In the case where features are added, the treatment would result in no change in CDF/LERF or a reduction in which case a quantitative treatment is not required.	Target Scope Change – see No. 1
4	Embedded Conduit	The treatment assumes that engineering evaluations are unable to demonstrate adequacy of the embedment. In this case, the treatment is the same as item 1.	Target Scope Change – see No. 1
5	Floor Drains	The treatment of floor drains should be addressed in the same manner is item 7.	Target Scope Change – see No. 1

Comment [C59]: Three ways and both? This is confusing.

Comment [C60]: How is a floor drain like detection?

Table J-1 Associated Cause-Effect Relationship and Treatment Method

No.	Type of Change	Treatment Discussion	Treatment Method / Approach
6	Suppression	Changes to suppression can involve the addition or altering by some means. The scope of potential changes is extensive, but for the purposes of this discussion, does not include the removal of suppression systems or address manual suppression. It also does not include changes that improve the performance of a system as such a change would either have no measure impact on previously approved change or would result in a risk reduction. Automatic System – altering of a system such that its performance is impacted can be addressed in at least three ways. A bounding approach can be used such that the 'target' that was protected would be assumed to be damaged by the fire event. In this case the treatment is the same as item 1. An updated fire modeling analyses can be performed using methods consistent with that already applied in the base Fire PRA. In this case, the target scope for the postulated fire events is altered to change the scope of fire affected cables. In this case, the treatment is the same as item 1. A change may only affect the reliability of the suppression system. In this case, the numerical treatment (failure probability) can be changed in the risk calculation. This would have a direct proportional change in the associated CDF/LERF results.	Target Scope Change – see No. 1 OR Change Suppression Credit – see No. 4
7	Detection	The altering of plant fire detection features has an effect on manual fire suppression reliability. The addition of such a system would increase the reliability of manual suppression as the time available for those actions would be longer than previously available. The removal or degradation of such a system would have the opposite effect. The specific treatment of manual suppression reliability is performed using method consistent with the base Fire PRA.	Detection Credit – detection is addressed via the manual fire suppression credit applied in the Fire PRA.
8	Incipient Detection	The addition of an incipient detection system inherently has the effect of reducing the fire risk for all hazards except HEAFs. Treatment of incipient is per accepted practices. Changes to the plant treated similar to changes in other detection types.	Detection Credit – see item 12
9	NSCA Equipment and Cables	Changes to NSCA equipment and cables has the effect of altering the scope of predicted damage for existing fire initiating events or creating new fire initiating events. In either case, the basic approach uses methods that are consistent with that applied for the base Fire PRA.	Target Scope Change – see No. 1 AND/OR Initiating Event Frequency – see No. 5

Comment [C61]: Which points to No. 1; and is not about suppression anyway.

Comment [C63]: Do you mean 7? Additionally, incipient detection has approved models specfically for these systems.

Comment [C62]: This is a bit strong.

Comment [C64]: Floor drains?

Table J-1 Associated Cause-Effect Relationship and Treatment Method

No.	Type of Change	Treatment Discussion	Treatment Method / Approach
10	Recovery Actions	The inclusion of a feasible recovery action provides the opportunity to mitigate the scope of a component's fire induced failure/maloperation. The crediting of such an action should develop a human error probability (HEP) using a method consistent with the base Fire PRA and internal Events PRA as applicable. If a recovery action is removed (or otherwise not credited), then its assigned credit in the base Fire PRA should be eliminated.	PRA Model Change – A variety of changes can occur that require altering one or more elements of the PRA model or quantification process. Such changes would be performed using methods consistent with that applied for the base Fire PRA.
11	Emergency Lighting Units	The presence or lack thereof the Emergency Lighting Units can have an effect on credited human actions. Those impacts should be addressed using methods consistent with those applied for the base Fire PRA and internal Events PRA as applicable. As an alternative, a bounding approach could be applied where any credit for the associated human action is eliminated from the analysis.	PRA Model Change – see item 10
12	Ventilation	Changes to plant ventilation features addressed here is limited to those changes that are unique to the Fire PRA. All other changes will be addressed using well established processes and methods for update of the internal events PRA model. Changes that are unique to the Fire PRA are limited to those that are associated with smoke removal and as such, will be addressed using methods consistent with that already applied for the base Fire PRA. The altering of the smoke removal capability has the effect of altering of the consequences of fire events that are not addressed via the target damage set.	PRA Model Change – see item 10

Comment [S65]: This shows up in most of these models.

Comment [C66]: Changes in ventilation may also have effects on fire scenarios and target vulnerabilities. Changes to ventilation parameters should be reflected in appropriate changes to fire modeling scenarios, and the change in risk due to the changed scenarios calculated.

Plus radioactive release considerations.

Table J-1 Associated Cause-Effect Relationship and Treatment Method

No.	Type of Change	Treatment Discussion	Treatment Method / Approach
13	Fire Area Boundaries	Changes to Fire Area boundaries can involve performance degradation, addition of new boundaries, or removal of boundaries. The addition or removal of a boundary is directly addressed in the NUREG/CR-6850 Task 1 treatment. The degradation of a boundary can be treated in at least two ways. Both approaches assume that engineering evaluations are unable to demonstrate adequacy of the barrier. A degradation of a barrier can be evaluated using fire modeling analyses consistent with that already applied in the base Fire PRA. This treatment would assume the specific localized degradation has no barrier worth (equivalent to a through hole). In this case the treatment is the same as item 1. A bounding approach can be used that assumes the entire barrier is 'virtually' removed. In this case the treatment is the same as item 1.	**Target Scope Change** – see No. 1 OR **Partitioning** – changes to plant partitioning is performed using the same methods applied for the base Fire PRA.
14	Ignition Source	These changes can affect the calculated fire ignition frequencies for the plant locations. Such changes would be evaluated using methods consistent with that used for the base Fire PRA.	Initiating Event Frequency – the calculation of fire ignition frequencies are performed using the same methods as the base Fire PRA.
15	Transients	Anticipated changes are associated with plant administrative controls. Such changes can affect the calculated fire ignition frequencies for the plant locations. Such changes would be evaluated using methods consistent with that used for the base Fire PRA.	Initiating Event Frequency – the calculation of fire ignition frequencies are performed using the same methods as the base Fire PRA.
15	Fire Brigade	Fire Brigade changes have the effect of altering the manual suppression reliability. Since the available data for this treatment is based on industry historical experience changes that negatively affect brigade performance can only be addressed in a bounding fashion. Such a bounding treatment would be required to removal all credit for manual suppression from the Fire PRA – this includes both quantitative credit reflected in the CDF and LERF as well as qualitative credit that may have been used to eliminate certain initiating events and sequences.	No specific treatment proposed

Comment [C67]: Caution should be exercised when making actual changes to "Chapter 3" FPP elements as opposed to changes in the way that the PRA takes credit for the element. For example, a licensee is not able to self aprove changing the fire brigade from 5 member to 4, but may be able to approve a change to reduce the credit taken for manual suppression in the PRA.

Table J-1 Associated Cause-Effect Relationship and Treatment Method

No.	Type of Change	Treatment Discussion	Treatment Method / Approach
16	Fire Watch	The presence of a fire watch has the practical function of an early fire alarm system. As such, it would tend to reduce the fire CDF/LERF. The firewatch also serves as a measure to prevent conditions that are susceptible to a fire from accumulating; thus, from a qualitative perspective, reducing the frequency and/or consequence of a fire.	No specific treatment proposed

The categories listed in the table are not intended to represent a limitation of the scope of Change Evaluations addressed by this Appendix. Instead, it is intended to reflect the treatment framework described in this Appendix. This framework provides the rigor to satisfy the requirements of 10 CFR 50.48(c) while providing the flexibility to accommodate a range of potential changes without requiring an exhaustive listing of possible plant physical and Fire Protection Program changes.

Comment [S68]: Method?

If unique situations arise where treatment in the Fire PRA does not have an agreed upon technical basis, the treatment should be addressed with industry groups that typically assist in resolving generic topics (e.g., NEI, EPRI~~).~~. For change evaluations using methods that cannot be addressed using methods acceptable as part of a base Fire PRA and the peer review process, concurrence from the NRC should be obtained, and potentially, a LAR submitted.

Comment [S69]: This is not sufficient.