UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 10, 2015

Mr. C. R. Pierce
Regulatory Affairs Director
Southern Nuclear Operating Company, Inc.
P. O. Box 1295 / Bin - 038
Birmingham, AL 35201-1295

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENT REGARDING TRANSITION TO A RISK-INFORMED, PERFORMANCE-BASED FIRE PROTECTION PROGRAM IN ACCORDANCE WITH 10 CFR 50.48(c) (TAC NOS. ME9741 AND ME9742)

Dear Mr. Pierce:

The Nuclear Regulatory Commission has issued the enclosed Amendment No.196 to Renewed Facility Operating License No. NPF-2 and Amendment No.192 to Renewed Facility Operating License No. NPF-8 for the Joseph M. Farley Nuclear Plant (FNP), Units 1 and 2, respectively. The amendment consists of changes to the license and Technical Specifications (TSs) in response to your application dated September 25, 2012; as supplemented on December 20, 2012; September 16, October 30, and November 12, 2013; April 23, May 23, July 3, August 11, August 29, and October 13, 2014; and January 16, 2015.

The amendment authorizes the transition of the FNP fire protection program to a risk-informed, performance-based program based on National Fire Protection Association (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). NFPA 805 allows the use of performance-based methods, such as fire modeling and fire risk evaluations, to demonstrate compliance with the nuclear safety performance criteria.

The amendments revise the fire protection license condition in each unit's license. As a result of placing the new license condition in each unit's license, the NRC is issuing additional license pages for each unit due to repagination of subsequent license pages. The only changes to the licenses are the changes to the fire protection license condition.

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's Biweekly *Federal Register* notice.

Sincerely,

Shawn Williams

Shawn Williams, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-348 and 50-364

Enclosures:
1. Amendment No. 196 to NPF-2
2. Amendment No. 192 to NPF-8
3. Safety Evaluation

cc w/encls: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

ALABAMA POWER COMPANY

DOCKET NO. 50-348

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 196
Renewed License No. NPF-2

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the Joseph M. Farley Nuclear Plant, Unit 1, Renewed Facility Operating Licenses No. NPF-2, filed by Southern Nuclear Operating Company, Inc. (the licensee), dated September 25, 2012; as supplemented by letters dated December 20, 2012; September 16, October 30, and November 12, 2013; April 23, May 23, July 3, August 11, August 29, and October 13, 2014; and January 16, 2015, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended as indicated in the attachment to this license amendment. Paragraph 2.C.(2) and Paragraph 2.C.(4) of Renewed Facility Operating License No. NPF-2, is hereby amended to read as follows:

2.C.(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 196, are hereby incorporated in the renewed facility operating license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

2.C.(4) Fire Protection

Southern Nuclear Operating Company 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 September 25, 2012, and supplements dated December 20, 2012; September 16, 2013; October 30, 2013; November 12, 2013; April 23, 2014; May 23, 2014; July 3, 2014; August 11, 2014; August 29, 2014; October 13, 2014; January 16, 2015, and as approved in the safety evaluation report dated March 10, 2015. 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.

a. 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.

1) 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.

2) 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.

b. 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 safety evaluation report dated March 10, 2015, to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection DID and safety margins are maintained when changes are made to the fire protection program.

c. 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 modifications to its facility, as described in Attachment S, Table S-2, "Plant Modifications Committed," of SNC letter NL-14-1273, dated August 29, 2014 to complete the transition to full compliance with 10 CFR 50.48(c) by November 6, 2017. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications.

3) The licensee shall implement the items as listed in Attachment S, Table S-3, "Implementation Items," of SNC letter NL-14-1273, dated August 29, 2014, within 180 days after NRC approval, except for items 30 and 32. Items 30 and 32 shall be implemented by February 6, 2018.

3. This license amendment is effective as of its date of issuance and shall be implemented by February 6, 2018.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: March 10, 2015

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

ALABAMA POWER COMPANY

DOCKET NO. 50-364

JOSEPH M. FARLEY NUCLEAR PLANT, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 192
Renewed License No. NPF-8

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment to the Joseph M. Farley Nuclear Plant, Unit 2, Renewed Facility Operating Licenses No. NPF-8, filed by Southern Nuclear Operating Company, Inc. (the licensee), dated September 25, 2012; as supplemented by letters dated December 20, 2012; September 16, October 30, and November 12, 2013; April 23, May 23, July 3, August 11, August 29, and October 13, 2014; and January 16, 2015, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended as indicated in the attachment to this license amendment. Paragraph 2.C.(2) and Paragraph 2.C.(6) of Renewed Facility Operating License No. NPF-8 is hereby amended to read as follows:

2.C.(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 192, are hereby incorporated in the renewed facility operating license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

2.C.(6) Fire Protection

Southern Nuclear Operating Company 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 September 25, 2012, and supplements dated December 20, 2012; September 16, 2013; October 30, 2013; November 12, 2013; April 23, 2014; May 23, 2014; July 3, 2014; August 11, 2014; August 29, 2014; October 13, 2014; January 16, 2015, and as approved in the safety evaluation report dated March 10, 2015. 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.

(a) 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.

1. 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.

2. 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.

(b) <u>Other Changes that May Be Made Without Prior NRC Approval</u>

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 safety evaluation report dated March 10, 2015, to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection DID and safety margins are maintained when changes are made to the fire protection program.

(c) <u>Transition License Conditions</u>

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 modifications to its facility, as described in Attachment S, Table S-2, "Plant Modifications Committed," of SNC letter NL-14-1273, dated August 29, 2014 to complete the transition to full compliance with 10 CFR 50.48(c) by November 6, 2017. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications.

3. The licensee shall implement the items as listed in Attachment S, Table S-3, "Implementation Items," of SNC letter NL-14-1273, dated August 29, 2014, within 180 days after NRC approval, except for items 30 and 32. Items 30 and 32 shall be implemented by February 6, 2018.

3. This license amendment is effective as of its date of issuance and shall be implemented by February 6, 2018.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical Specifications

Date of Issuance: March 10, 2015

ATTACHMENT TO

LICENSE AMENDMENT NO. 196

TO RENEWED FACILITY OPERATING LICENSE NO. NPF-2

DOCKET NO. 50-348

AND LICENSE AMENDMENT NO. 192

TO RENEWED FACILITY OPERATING LICENSE NO. NPF-8

DOCKET NO. 50-364

Replace the following pages of the Renewed Facility Operating License and Appendix "A" Technical Specifications (TSs) with the enclosed pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
License Pages	License Pages
NPF-2, pages 4 to 10	NPF-2, pages 4 to 12
NPF-8, pages 3 to 9	NPF-8, pages 3 to 11
TSs	TSs
5.4-1	5.4.1

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 196, are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Additional Conditions

The matters specified in the following conditions shall be completed to the satisfaction of the Commission within the stated time periods following the issuance of the renewed license or within the operational restrictions indicated. The removal of these conditions shall be made by an amendment to the renewed license supported by a favorable evaluation by the Commission.

a. Southern Nuclear shall not operate the reactor in Operational Modes 1 and 2 with less than three reactor coolant pumps in operation.

b. Deleted per Amendment 13

c. Deleted per Amendment 2

d. Deleted per Amendment 2

e. Deleted per Amendment 152

Deleted per Amendment 2

f. Deleted per Amendment 158

g. Southern Nuclear shall maintain a secondary water chemistry monitoring program to inhibit steam generator tube degradation. This program shall include:

1) Identification of a sampling schedule for the critical parameters and control points for these parameters;

2) Identification of the procedures used to quantify parameters that are critical to control points;

3) Identification of process sampling points;

4) A procedure for the recording and management of data;

5) Procedures defining corrective actions for off control point chemistry conditions; and

6) A procedure identifying the authority responsible for the interpretation of the data and the sequence and timing of administrative events required to initiate corrective action.

h. The Additional Conditions contained in Appendix C, as revised through Amendment No. 146, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the additional conditions.

i. Deleted per Amendment 152

(4) Fire Protection

Southern Nuclear Operating Company 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 September 25, 2012, and supplements dated December 20, 2012; September 16, 2013; October 30, 2013; November 12, 2013; April 23, 2014; May 23, 2014; July 3, 2014; August 11, 2014; August 29, 2014; October 13, 2014; January 16, 2015, and as approved in the safety evaluation report dated March 10, 2015. 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.

a. 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 Farley. 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.

1) 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.

2) 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.

b. <u>Other Changes that May Be Made Without Prior NRC Approval</u>

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:

- “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 NRC safety evaluation report dated March 10, 2015, 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.

c. <u>Transition License Conditions</u>

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 modifications to its facility, as described in Attachment S, Table S-2, “Plant Modifications Committed,” of SNC letter NL-14-1273, dated August 29, 2014, to complete the transition to full compliance with 10 CFR 50.48(c) by November 6, 2017. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications.

3) The licensee shall implement the items as listed in Attachment S, Table S-3, “Implementation Items,” of SNC letter NL-14-1273, dated August 29, 2014, within 180 days after NRC approval, except for items 30 and 32. Items 30 and 32 shall be implemented by February 6, 2018.

(5) Updated Final Safety Analysis Report Supplement

The Updated Final Safety Analysis Report supplement, as revised, shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4) following issuance of this renewed license. Until that update is complete, Southern Nuclear may make changes to the programs and activities described in the supplement without prior Commission approval, provided that Southern Nuclear evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements of that section.

The Southern Nuclear Updated Final Safety Analysis Report supplement, submitted pursuant to 10 CFR 54.21(d), describes certain future activities to be completed prior to the period of extended operation. Southern Nuclear shall complete these activities no later than June 25, 2017, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

(6) Reactor Vessel Material Surveillance Capsules

All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation. All capsules placed in storage must be maintained for future insertion.

D. Southern Nuclear shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The plan, which contains Safeguards Information protected under 10 CFR 73.21, is entitled: "Southern Nuclear Operating Company Security Plan, Training and Qualification Plan, and Safeguards Contingency Plan," and was submitted on May 15, 2006.

Southern Nuclear shall fully implement and maintain in effect all provisions of the Commission-approved cyber security (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The Southern Nuclear CSP was approved by License Amendment No. 186.

E. This renewed license is subject to the following additional conditions for the protection of the environment:

(1) Southern Nuclear shall operate the facility within applicable Federal and State air and water quality standards and the Environmental Protection Plan (Appendix B).

(2) Before engaging in an operational activity not evaluated by the Commission, Southern Nuclear will prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not evaluated, or that is significantly greater than evaluated in the Final Environmental Statement, Southern Nuclear shall provide a written evaluation of such activities and obtain prior approval of the Director, Office of Nuclear Reactor Regulation, for the activities.

F. Alabama Power Company shall meet the following antitrust conditions:

(1) Alabama Power Company shall recognize and accord to Alabama Electric Cooperative (AEC) the status of a competing electric utility in central and southern Alabama.

(2) Alabama Power Company shall offer to sell to AEC an undivided ownership interest in Units 1 and 2 of the Farley Nuclear Plant. The percentage of ownership interest to be so offered shall be an amount based on the relative sizes of the respective peak loads of AEC and the Alabama Power Company (excluding from the Alabama Power Company's peak load that amount imposed by members of AEC upon the electric system of Alabama Power Company) occurring in 1976. The price to be paid by AEC for its proportionate share of Units 1 and 2, determined in accordance with the foregoing formula, will be established by the parties through good faith negotiations. The price shall be sufficient to fairly reimburse Alabama Power Company for the proportionate share of its total costs related to the Units 1 and 2 including, but not limited to, all costs of construction, installation, ownership and licensing, as of a date, to be agreed to by the two parties, which fairly accommodates both their respective interests. The offer by Alabama Power Company to sell an undivided ownership interest in Units 1 and 2 may be conditioned, at Alabama Power Company's option, on the agreement by AEC to waive any right of partition of the Farley Plant and to avoid interference in the day-to-day operation of the plant.

(3) Alabama Power Company will provide, under contractual arrangements between Alabama Power Company and AEC, transmission services via its electric system (a) from AEC's electric system to AEC's off-system members; and (b) to AEC's electric system from electric systems other than Alabama Power Company's and from AEC's electric system to electric systems other than Alabama Power Company's. The contractual arrangements covering such transmission services shall embrace rates and charges reflecting conventional accounting and ratemaking concepts followed by the Federal Energy Regulatory Commission (or its successor in function) in testing the reasonableness of rates and charges for transmission services. Such contractual arrangements shall contain provisions protecting Alabama Power Company against economic detriment resulting from transmission line or transmission losses associated therewith.

(4) Alabama Power Company shall furnish such other bulk power supply services as are reasonably available from its system.

(5) Alabama Power Company shall enter into appropriate contractual arrangements amending the 1972 Interconnection Agreement as last amended to provide for a reserve sharing arrangement between Alabama Power Company and AEC under which Alabama Power Company will provide reserve generating capacity in accordance with practices applicable to its responsibility to the operating companies of the Southern Company System. AEC shall maintain a minimum level expressed as a percentage of coincident peak one-hour kilowatt load equal to the percent reserve level similarly expressed for Alabama Power Company as determined by the Southern Company System under its minimum reserve criterion then in effect. Alabama Power Company shall provide to AEC such data as needed from time to time to demonstrate the basis for the need for such minimum reserve level.

(6) Alabama Power Company shall refrain from taking any steps, including but not limited to, the adoption of restrictive provisions in rate filings or negotiated contracts for the sale of wholesale power, that serve to prevent any entity or group of entities engaged in the retail sale of firm electric power from fulfilling all or part of their bulk power requirements through self-generation or through purchases from some other source other than Alabama Power Company. Alabama Power Company shall further, upon request and subject to reasonable terms and conditions, sell partial requirements power to any such entity. Nothing in this paragraph shall be construed as preventing an applicant from taking reasonable steps, in accord with general practice in the industry, to ensure that the reliability of its system is not endangered by any action called for herein.

(7) Alabama Power Company shall engage in wheeling for and at the request of any municipally-owned distribution system:

a. of electric energy from delivery points of Alabama Power Company to said distribution system(s); and

b. of power generated by or available to a distribution system as a result of its ownership or entitlement[2] in generating facilities, to delivery points of Alabama Power Company designated by the distribution system.

Such wheeling services shall be available with respect to any unused capacity on the transmission lines of Alabama Power Company, the use of which will not jeopardize Alabama Power Company's system. The contractual arrangements covering such wheeling services shall be determined in accordance with the principles set forth in Condition (3) herein.

[2] "Entitlement" includes, but is not limited to, power made available to an entity pursuant to an exchange agreement.

Alabama Power Company shall make reasonable provisions for disclosed transmission requirements of any distribution system(s) in planning future transmission. "Disclosed" means the giving of reasonable advance notification of future requirements by said distribution system(s) utilizing wheeling services to be made available by Alabama Power Company.

(8) The foregoing conditions shall be implemented in a manner consistent with the provisions of the Federal Power Act and the Alabama Public Utility laws and regulations thereunder and all rates, charges, services or practices in connection therewith are to be subject to the approval of regulatory agencies having jurisdiction over them.

Southern Nuclear shall not market or broker power or energy from Joseph M. Farley Nuclear Plant, Units 1 and 2. Alabama Power Company shall continue to be responsible for compliance with the obligations imposed on it by the antitrust conditions contained in this paragraph 2.F. of the renewed license. Alabama Power Company shall be responsible and accountable for the actions of its agent, Southern Nuclear, to the extent said agent's actions may, in any way, contravene the antitrust conditions of this paragraph 2.F.

G. Mitigation Strategy License Condition

The licensee shall develop and maintain strategies for addressing large fires and explosions that include the following key areas:

(a) Fire fighting response strategy with the following elements:

1. Pre-defined coordinated fire response strategy and guidance
2. Assessment of mutual aid fire fighting assets
3. Designated staging areas for equipment and materials
4. Command and control
5. Training of response personnel

(b) Operations to mitigate fuel damage considering the following:

1. Protection and use of personnel assets
2. Communications
3. Minimizing fire spread
4. Procedures for implementing integrated fire response strategy
5. Identification of readily-available pre-staged equipment
6. Training on integrated fire response strategy

(c) Actions to minimize release to include consideration of:

1. Water spray scrubbing
2. Dose to onsite responders

H. In accordance with the requirement imposed by the October 8, 1976 order of the United States Court of Appeals for the District of Columbia Circuit in Natural Resources Defense Council vs. Nuclear Regulatory Commission, No. 74-1385 and 74-1586, that the Nuclear Regulatory Commission "shall make any licenses granted between July 21, 1976 and such time when the mandate is issued subject to the outcome of such proceeding herein," this renewed license shall be subject to the outcome of such proceedings.

I. This renewed operating license is effective as of the date of issuance and shall expire at midnight on June 25, 2037.

FOR THE NUCLEAR REGULATORY COMMISSION

JEDyer

J. E. Dyer,
Director
Office of Nuclear Reactor Regulation

Attachments:

1. Appendix A - Technical Specifications
2. Preoperational Tests, Startup Tests and Other Items Which Must Be Completed Prior to Proceeding to Succeeding Operational Modes
3. Appendix B - Environmental Protection Plan
4. Appendix C - Additional conditions

Date of Issuance: May 12, 2005

(2) Alabama Power Company, pursuant to Section 103 of the Act and 10 CFR Part 50, "Licensing of Production and Utilization Facilities," to possess but not operate the facility at the designated location in Houston County, Alabama in accordance with the procedures and limitations set forth in this renewed license.

(3) Southern Nuclear, pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(4) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(6) Southern Nuclear, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

Southern Nuclear is authorized to operate the facility at reactor core power levels not in excess of 2775 megawatts thermal.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 192 are hereby incorporated in the renewed license. Southern Nuclear shall operate the facility in accordance with the Technical Specifications.

(3) Deleted per Amendment 144

(4) Deleted per Amendment 149

(5) Deleted per Amendment 144

(6) Fire Protection

Southern Nuclear Operating Company 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 September 25, 2012, and supplements dated December 20, 2012; September 16, 2013; October 30, 2013; November 12, 2013; April 23, 2014; May 23, 2014; July 3, 2014; August 11, 2014; August 29, 2014; October 13, 2014; January 16, 2015, and as approved in the safety evaluation report dated March 10, 2015. 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.

(a) 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 Farley. 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.

1. 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.

2. 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.

(b) 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:

- "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 NRC safety evaluation report dated March 10, 2015.

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.

(c) 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 modifications to its facility, as described in Attachment S, Table S-2, "Plant Modifications Committed," of SNC letter NL-14-1273, dated August 29, 2014, to complete the transition to full compliance with 10 CFR 50.48(c) by November 6, 2017. The licensee shall maintain appropriate compensatory measures in place until completion of these modifications.

3. The licensee shall implement the items as listed in Attachment S, Table S-3, "Implementation Items," of SNC letter NL-14-1273, dated August 29, 2014, within 180 days after NRC approval, except for items 30 and 32. Items 30 and 32 shall be implemented by February 6, 2018.

(7) Deleted per Amendment 144
(8) Deleted per Amendment 144
(9) Deleted per Amendment 144
(10) Deleted per Amendment 144
(11) Deleted per Amendment 144
(12) Deleted per Amendment 144
(13) Deleted per Amendment 144
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(17) Deleted per Amendment 144
(18) Deleted per Amendment 144
(19) Deleted per Amendment 144
(20) Deleted per Amendment 144
(21) Deleted per Amendment 144

(22) Additional Conditions
The Additional conditions contained in Appendix C, as revised through Amendment No. 137, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the additional conditions.

(23) Updated Final Safety Analysis Report

The Updated Final Safety Analysis Report supplement shall be included in the next scheduled update to the Updated Final Safety Analysis Report required by 10 CFR 50.71(e)(4) following issuance of this renewed license. Until that update is complete, Southern Nuclear may make changes to the programs and activities described in the supplement without prior Commission approval, provided that Southern Nuclear evaluates each such change pursuant to the criteria set forth in 10 CFR 50.59 and otherwise complies with the requirements of that section.

The Southern Nuclear Updated Final Safety Analysis Report supplement, submitted pursuant to 10 CFR 54.21(d), describes certain future activities to be completed prior to the period of extended operation. Southern Nuclear shall complete these activities no later than June 25, 2017, and shall notify the NRC in writing when implementation of these activities is complete and can be verified by NRC inspection.

(24) Reactor Vessel Material Surveillance Capsules

All capsules in the reactor vessel that are removed and tested must meet the test procedures and reporting requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation. All capsules placed in storage must be maintained for future insertion.

D. Southern Nuclear shall fully implement and maintain in effect all provisions of the Commission-approved physical security, training and qualification, and safeguards contingency plans including amendments made pursuant to provisions of the Miscellaneous Amendments and Search Requirements revisions to 10 CFR 73.55 (51 FR 27817 and 27822) and to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The plan, which contain Safeguards Information protected under 10 CFR 73.21, is entitled: "Southern Nuclear Operating Company Security Plan, Training and Qualification Plan, and Safeguards Contingency Plan," and was submitted on May 15, 2006.

Southern Nuclear shall fully implement and maintain in effect all provisions of the Commission-approved cyber security (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The Southern Nuclear CSP was approved by License Amendment No. 181.

E. Deleted per Amendment 144

F. Alabama Power Company shall meet the following antitrust conditions:

(1) Alabama Power Company shall recognize and accord to Alabama Electric Cooperative (AEC) the status of a competing electric utility in central and southern Alabama.

(2) Alabama Power Company shall offer to sell to AEC an undivided ownership interest in Units 1 and 2 of the Farley Nuclear Plant. The percentage of ownership interest to be so offered shall be an amount based on the relative sizes of the respective peak loads of AEC and Alabama Power Company (excluding from the Alabama Power Company's peak load that amount imposed by members of AEC upon the electric system of Alabama Power Company) occurring in 1976. The price to be paid by AEC for its proportionate share of Units 1 and 2, determined in accordance with the foregoing formula, will be established by the parties through good faith negotiations. The price shall be sufficient to fairly reimburse Alabama Power Company for the proportionate share of its total costs related to the Units 1 and 2 including, but not limited to, all costs of construction, installation, ownership and licensing, as of a date, to be agreed to by the two parties, which fairly accommodates both their respective interests. The offer by Alabama Power Company to sell an undivided ownership interest in Units 1 and 2 may be conditioned, at Alabama Power Company's option, on the agreement by AEC to waive any right of partition of the Farley Plant and to avoid interference in the day-to-day operation of the plant.

(3) Alabama Power Company will provide, under contractual arrangements between Alabama Power Company and AEC, transmission services via its electric system (a) from AEC's electric system to AEC's off-system members; and (b) to AEC's electric system from electric systems other than Alabama Power Company's, and from AEC's electric system to electric systems other than Alabama Power Company's. The contractual arrangements covering such transmission services shall embrace rates and charges reflecting conventional accounting and ratemaking concepts followed by the Federal Energy Regulatory Commission (or its successor in function) in testing the reasonableness of rates and charges for transmission services. Such contractual arrangements shall contain provisions protecting Alabama Power Company against economic detriment resulting from transmission line or transmission losses associated therewith.

(4) Alabama Power Company shall furnish such other bulk power supply services as are reasonably available from its system.

(5) Alabama Power Company shall enter into appropriate contractual arrangements amending the 1972 Interconnection Agreement as last amended to provide for a reserve sharing arrangement between Alabama Power Company and AEC under which Alabama Power Company will provide reserve generating capacity in accordance with practices applicable to its responsibility to the operating companies of the Southern Company System. AEC shall maintain a minimum level expressed as a percentage of coincident peak one-hour kilowatt load equal to the percent reserve level similarly expressed for Alabama Power Company as determined by the Southern Company System under its minimum reserve criterion then in effect. Alabama Power Company shall provide to AEC such data as needed from time to time to demonstrate the basis for the need for such minimum reserve level.

(6) Alabama Power Company shall refrain from taking any steps, including but not limited, to the adoption of restrictive provisions in rate filings or negotiated contracts for the sale of wholesale power, that serve to prevent any entity or group of entities engaged in the retail sale of firm electric power from fulfilling all or part of their bulk power requirements through self-generation or through purchases from some other source other than Alabama Power Company. Alabama Power Company shall further, upon request and subject to reasonable terms and conditions, sell partial requirements power to any such entity. Nothing in this paragraph shall be construed as preventing an applicant from taking reasonable steps, in accord with general practice in the industry, to ensure that the reliability of its system is not endangered by any action called for herein.

(7) Alabama Power Company shall engage in wheeling for and at the request of any municipally-owned distribution system:

a. of electric energy from delivery points of Alabama Power Company to said distribution system(s); and

b. of power generated by or available to a distribution system as a result of its ownership or entitlement[2] in generating facilities, to delivery points of Alabama Power Company designated by the distribution system.

Such wheeling services shall be available with respect to any unused capacity on the transmission lines of Alabama Power Company, the use of which will not jeopardize Alabama Power Company's system. The contractual arrangements covering such wheeling services shall be determined in accordance with the principles set forth in Condition (3) herein.

Alabama Power Company shall make reasonable provisions for disclosed transmission requirements of any distribution system(s) in planning future transmission. "Disclosed" means the giving of reasonable advance notification of future requirements by said distribution system(s) utilizing wheeling services to be made available by Alabama Power Company.

[2] "Entitlement" includes, but is not limited to, power made available to an entity pursuant to an exchange agreement.

(8) The foregoing conditions shall be implemented in a manner consistent with the provisions of the Federal Power Act and the Alabama Public Utility laws and regulations thereunder and all rates, charges, services or practices in connection therewith are to be subject to the approval of regulatory agencies having jurisdiction over them.

Southern Nuclear shall not market or broker power or energy from Joseph M. Farley Nuclear Plant, Units 1 and 2. Alabama Power Company shall continue to be responsible for compliance with the obligations imposed on it by the antitrust conditions contained in this paragraph 2.F. of the renewed license. Alabama Power Company shall be responsible and accountable for the actions of its agent, Southern Nuclear, to the extent said agent's actions may, in any way, contravene the antitrust conditions of this paragraph 2.F.

G. The facility requires relief from certain requirements of 10 CFR 50.55a(g) and exemptions from Appendices G, H and J to 10 CFR Part 50. The relief and exemptions are described in the Office of Nuclear Reactor Regulation's Safety Evaluation Report, Supplement No. 5. They are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest. Therefore, the relief and exemptions are hereby granted. With the granting of these relief and exemptions, the facility will operate, to the extent authorized herein, in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission.

H. Southern Nuclear shall immediately notify the NRC of any accident at this facility which could result in an unplanned release of quantities of fission products in excess of allowable limits for normal operation established by the Commission.

I. <u>Mitigation Strategy License Condition</u>

The licensee shall develop and maintain strategies for addressing large fires and explosions that include the following key areas:

(a) Fire fighting response strategy with the following elements:
1. Pre-defined coordinated fire response strategy and guidance
2. Assessment of mutual aid fire fighting assets
3. Designated staging areas for equipment and materials
4. Command and control
5. Training of response personnel

(b) Operations to mitigate fuel damage considering the following:
1. Protection and use of personnel assets
2. Communications
3. Minimizing fire spread
4. Procedures for implementing integrated fire response strategy
5. Identification of readily-available pre-staged equipment
6. Training on integrated fire response strategy

(c) Actions to minimize release to include consideration of:
1. Water spray scrubbing
2. Dose to onsite responders

J. Alabama Power Company shall have and maintain financial protection of such type and in such amounts as the Commission shall require in accordance with Section 170 of the Atomic Energy Act of 1954, as amended, to cover public liability claims.

K. This renewed operating license is effective as of the date of issuance and shall expire at midnight on March 31, 2041.

FOR THE NUCLEAR REGULATORY COMMISSION

JEDyer

J. E. Dyer, Director
Office of Nuclear Reactor Regulation

Attachment:

1. Appendix A - Technical Specifications (NUREG-0697, as revised)
2. Appendix B - Environmental Protection Plan
3. Appendix C - Additional conditions

Date of Issuance: May 12, 2005

5.0 ADMINISTRATIVE CONTROLS

5.4 Procedures

5.4.1 Written procedures shall be established, implemented, and maintained covering the following activities:

a. The applicable procedures recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978;

b. Quality assurance for effluent and environmental monitoring, using the guidance in Regulatory Guide 4.15, February 1979; and

c. All programs specified in Specification 5.5.

ENCLOSURE 3

SAFETY EVALUATION BY THE

OFFICE OF NUCLEAR REACTOR REGULATION

TRANSITION TO A RISK-INFORMED, PERFORMANCE-BASED

FIRE PROTECTION PROGRAM IN ACCORDANCE WITH 10 CFR 50.48(c)

AMENDMENT NO. 196 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-2

AMENDMENT NO. 192 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-8

SOUTHERN NUCLEAR OPERATING COMPANY, INC.

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-348 AND 50-364

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ATTACHMENTS

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE

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JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-348 AND 50-364

1.0 INTRODUCTION

1.1 Background

The U.S. Nuclear Regulatory Commission (NRC) started developing fire protection requirements in the 1970s, and in 1976, the NRC published comprehensive fire protection guidelines in the form of Branch Technical Position (BTP) APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," (Reference 1) and Appendix A to BTP APCSB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976," (Reference 2). Subsequently, the NRC performed fire protection reviews for the operating reactors, and documented the results in safety evaluations (SEs) or supplements to SEs. In 1980, to resolve issues identified in those reports, the NRC amended its regulations for fire protection in operating nuclear power plants and published its Final Rule, Fire Protection Program for Operating Nuclear Power Plants, in the *Federal Register* (FR) on November 19, 1980 (45 FR 76602), adding Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48, "Fire Protection," and Appendix R to 10 CFR Part 50, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979." Section 50.48(a)(1) requires each holder of an operating license, and holders of a combined operating license issued under Part 52 to have a fire protection plan that satisfies General Design Criterion (GDC) 3 of Appendix A to 10 CFR Part 50 and states that the fire protection plan must describe the overall fire protection program; identify the positions responsible for the program and the authority delegated to those positions; outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage. Section 50.48(a)(2) states that the fire protection plan must describe the specific features necessary to implement the program described in paragraph (a)(1) including administrative controls and personnel requirements; automatic and manual fire detection and suppression systems; and the means to limit fire damage to structures, systems, and components (SSCs) to ensure the capability to safely shut down the plant. Section 50.48(a)(3) requires that the licensee retain the fire protection plan and each change to the plan as a record until the Commission terminates the license and that the licensee retain each superseded revision of the procedures for 3 years.

In the 1990s, the NRC worked with the National Fire Protection Association (NFPA) and industry to develop a risk-informed, performance-based (RI/PB), consensus standard for fire protection. In 2001, the NFPA Standards Council issued NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants" (Reference 3), which describes a methodology for establishing fundamental fire protection program (FPP) design requirements and elements, determining required fire protection systems and features, applying PB requirements, and administering fire protection for existing light water reactors during operation, decommissioning, and permanent shutdown. It provides for the establishment of a minimum set of fire protection requirements but allows PB or deterministic approaches to be used to meet performance criteria.

Regulatory Guide (RG) 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, (RG 1.205) (Reference 4), states:

> On March 26, 1998, the NRC staff sent to the Commission SECY-98-058, "Development of a Risk-Informed, Performance-Based Regulation for Fire Protection at Nuclear Power Plants" (Reference 5), in which it proposed to work with the NFPA and the industry to develop a risk-informed, performance-based [RI/PB] consensus standard for nuclear power plant fire protection. This consensus standard could be endorsed in a future rulemaking as an alternative set of fire protection requirements to the existing regulations in 10 CFR 50.48. In SECY-00-0009, "Rulemaking Plan, Reactor Fire Protection Risk-Informed, Performance-Based Rulemaking," dated January 13, 2000 (Reference 6), the NRC staff requested and received Commission approval to proceed with rulemaking to permit operating reactor licensees to adopt an NFPA standard as an alternative to existing fire protection requirements. On February 9, 2001, the NFPA Standards Council approved the 2001 edition of NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," as an American National Standard for performance-based fire protection for light-water nuclear power plants.

A licensee that elects to adopt NFPA 805 must meet the performance goals, objectives, and criteria that are itemized in Chapter 1 of NFPA 805 through the implementation of PB or deterministic approaches. The goals include ensuring that reactivity control, inventory and pressure control, decay heat removal, vital auxiliaries, and process monitoring are achieved and maintained. The licensee then must establish plant fire protection requirements using the methodology in Chapter 2 of NFPA 805 such that the minimum FPP elements and design criteria contained in Chapter 3 of NFPA 805 are satisfied. Next, a licensee identifies fire areas and fire hazards though a plant-wide analysis, and then applies either a PB or a deterministic approach to meet the performance criteria. As part of a PB approach, a licensee will use engineering evaluations, probabilistic safety assessments, and fire modeling calculations to show that the criteria are met. Chapter 4 of NFPA establishes the methodology to determine the fire protection systems and features required to achieve the performance criteria. It also specifies that at least one success path to achieve the nuclear safety performance criteria (NSPC) shall be maintained free of fire damage by a single fire.

RG 1.205 also states, in part, that:

> Effective July 16, 2004, the Commission amended its fire protection requirements in 10 CFR 50.48 to add 10 CFR 50.48(c), which incorporates by reference the 2001 Edition of NFPA 805, with certain exceptions, and allows licensees to apply for a license amendment to comply with the 2001 edition of NFPA 805 (69 FR 33536). NFPA has issued subsequent editions of NFPA 805, but the regulation does not endorse them.

Throughout this SE, where the NRC staff states that the licensee's FPP element is in compliance with (or meeting the requirements of) NFPA 805, the NRC staff is referring to the 2001 edition of NFPA 805, with the exceptions, modifications, and supplementation described in 10 CFR 50.48(c)(2).

RG 1.205 also states, in part, that:

> In parallel with the Commission's efforts to issue a rule incorporating the risk-informed, performance-based fire protection provisions of NFPA 805, NEI [the Nuclear Energy Institute] published implementing guidance for the specific provisions of NFPA 805 and 10 CFR 50.48(c) in NEI 04-02, ["Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 2].

RG 1.205 provides the NRC staffs position on NEI 04-02, Revision 2, (Reference 7), and offers additional information and guidance to supplement the NEI document and assist licensees in meeting the NRC's regulations in 10 CFR 50.48(c) related to adopting a RI/PB FPP. RG 1.205 endorses the guidance of NEI 04-02, Revision 2, subject to certain exceptions, as providing methods acceptable to the NRC staff for adopting an FPP consistent with the 2001 edition of NFPA 805 and complying with the regulations in 10 CFR 50.48(c).

Accordingly, Southern Nuclear Operating Company (SNC, the licensee), requested a license amendment to allow the licensee to maintain the Joseph M. Farley Nuclear Plant, Units 1 and 2, (FNP) FPP in accordance with 10 CFR 50.48(c), and change the license and technical specifications accordingly

1.2 Requested Licensing Action

By letter dated September 25, 2012 (Reference 8), as supplemented by letters dated: December 20, 2012, (Reference 9), September 16, 2013 (Reference 10), October 30, 2013 (Reference 11), November 12, 2013 (Reference 12), April 23, 2014 (Reference 13), May 23, 2014 (Reference 14), July 3, 2014 (Reference 15), August 11, 2014 (Reference 16), August 29, 2014 (Reference 17), October 13, 2014 (Reference 18), and January 16, 2015 (Reference 19), the licensee submitted an application for a license amendment to transition the FNP FPP from 10 CFR 50.48(b) to 10 CFR 50.48(c), "National Fire Protection Association Standard NFPA 805." The supplemental letters were in response to the NRC staff's requests for additional information (RAIs) dated July 8, 2013 (Reference 20), March 28, 2014 (Reference 21), and July 11, 2014 (Reference 22). The licensee's supplemental letters dated September 16, October 30, and November 12, 2013; and

April 23, May 23, July 3, August 11, August 29, October 13, 2014, and January 16, 2015 provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* (FR) on March 12, 2013 (78 FR 15750).

The licensee requested an amendment to the FNP renewed operating license and TSs to establish and maintain a RI/PB FPP in accordance with the requirements of 10 CFR 50.48(c).

Specifically, the licensee requested to transition from the existing deterministic fire protection licensing basis established in accordance with the Final Safety Analysis Report (FSAR) for FNP which implements the fire protection requirements of 10 CFR 50.48 and 10 CFR 50, Appendix R, to a RI/PB FPP in accordance with 10 CFR 50.48(c), that uses risk information, in part, to demonstrate compliance with the fire protection and nuclear safety goals, objectives, and performance criteria of NFPA 805. As such, the proposed FPP at FNP is referred to as RI/PB FPP throughout this SE.

In its license amendment request (LAR), the licensee provided a description of the revised FPP for which it is requesting NRC approval to implement, a description of the FPP that it will implement under 10 CFR 50.48(a) and (c), and the results of the evaluations and analyses required by NFPA 805.

This SE documents the NRC staff's evaluation of the licensee's LAR and the NRC staff's conclusion that:

1. The licensee has identified any orders, license conditions, and TSs that must be revised or superseded, and that any necessary revisions are adequate, as required by 10 CFR 50.48(c)(3)(i);

2. The licensee has completed its implementation of the methodology in Chapter 2, "Methodology," of NFPA 805 (including all required evaluations and analyses), and the NRC staff has approved the licensee's modified fire protection plan, which reflects the decision to comply with NFPA 805, as required by 10 CFR 50.48(a); and

3. The licensee will modify its FPP, as described in the LAR, in accordance with the implementation schedule set forth in this SE and the accompanying license condition, as required by 10 CFR 50.48(c)(3)(ii).

The licensee proposed a new fire protection license condition reflecting the new RI/PB FPP licensing basis, as well as revisions to the TS that address this change to the current FPP licensing basis. SE Sections 2.4.2 and 4.0 discuss in detail the license condition, and SE Section 2.4.3 discusses the TS changes.

2.0 REGULATORY EVALUATION

Section 50.48, "Fire protection" of 10 CFR provides the NRC requirements for nuclear power plant fire protection. Section 50.48 includes specific requirements for requesting approval for a RI/PB

FPP based on the provisions of NFPA 805 (Reference 3). Paragraph 50.48(c)(3)(i) of 10 CFR states, in part, that:

> A licensee may maintain a fire protection program that complies with NFPA 805 as an alternative to complying with paragraph (b) of this section [10 CFR 50.48(b)] for plants licensed to operate before January 1, 1979, or the fire protection license conditions for plants licensed to operate after January 1, 1979. The licensee shall submit a request to comply with NFPA 805 in the form of an application for license amendment under [10 CFR] 50.90. The application must identify any orders and license conditions that must be revised or superseded, and contain any necessary revisions to the plant's technical specifications and the bases thereof.

In addition, 10 CFR 50.48(c)(3)(ii) states that:

> The licensee shall complete its implementation of the methodology in Chapter 2 of NFPA 805 (including all required evaluations and analyses) and, upon completion, modify the fire protection plan required by paragraph (a) of this section to reflect the licensee's decision to comply with NFPA 805, before changing its fire protection program or nuclear power plant as permitted by NFPA 805.

The intent of 10 CFR 50.48(c)(3)(ii) is given in the statement of considerations for the Final Rule, Voluntary Fire Protection Requirements for Light Water Reactors; Adoption of NFPA 805 as a Risk-Informed, Performance-Based Alternative, (69 FR 33536, 33548; June 16, 2004), which states, in part, that:

> This paragraph requires licensees to complete all of the Chapter 2 methodology (including evaluations and analyses) and to modify their fire protection plan before making changes to the fire protection program or to the plant configuration. This process ensures that the transition to an NFPA 805 configuration is conducted in a complete, controlled, integrated, and organized manner. This requirement also precludes licensees from implementing NFPA 805 on a partial or selective basis (e.g., in some fire areas and not others, or truncating the methodology within a given fire area).

As stated in 10 CFR 50.48(c)(3)(i), the Director of the Office of Nuclear Reactor Regulation (NRR), or a designee of the Director, may approve the application if the Director or designee determines that the licensee has identified orders, license conditions, and the technical specifications that must be revised or superseded, and that any necessary revisions are adequate.

The regulations also allow for flexibility that was not included in the NFPA 805 standard. Licensees who choose to adopt 10 CFR 50.48(c), but wish to use the PB methods permitted elsewhere in the standard to meet the fire protection requirements of NFPA 805 Chapter 3, "Fundamental Fire Protection Program and Design Elements," must submit a LAR to obtain approval in accordance with 10 CFR 50.48(c)(2)(vii). This regulation further provides that:

> The Director of NRR, or a designee of the Director, may approve the application if the Director or designee determines that the performance-based approach;

(A) Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;

(B) Maintains safety margins; and

(C) Maintains fire protection defense-in-depth (DID) (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Alternatively, licensees may choose to use RI or PB alternatives to comply with NFPA 805 by submitting a LAR in accordance with 10 CFR 50.48(c)(4). This regulation further provides that:

> The Director of NRR, or designee, may approve the application if the Director or designee determines that the proposed alternatives:
>
> (i) Satisfy the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
>
> (ii) Maintain safety margins; and
>
> (iii) Maintain fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

In addition to the conditions outlined by the rule that require licensees to submit a LAR for NRC review and approval in order to adopt a RI/PB FPP, a licensee may also submit additional elements of its FPP for which it wishes to receive specific NRC review and approval, as set forth in Regulatory Position C.2.2.1 of RG 1.205. Inclusion of these elements in the NFPA 805 LAR is meant to alleviate uncertainty in portions of the current FPP licensing bases as a result of the lack of specific NRC approval of these elements. RGs are not substitutes for regulations, and compliance with them are not required. Methods and solutions that differ from those set forth in RGs will be deemed acceptable if they provide a basis for the findings required for the issuance or continuance of a permit or license by the Commission. Accordingly, any submittal addressing these additional FPP elements needs to include sufficient detail to allow the NRC staff to assess whether the licensee's treatment of these elements meets the 10 CFR 50.48(c) requirements.

The purpose of the FPP established by NFPA 805 is to provide assurance, through a DID philosophy, that the NRC's fire protection objectives are satisfied. NFPA 805 Section 1.2, "Defense-in-Depth," states that:

> Protecting the safety of the public, the environment, and plant personnel from a plant fire and its potential effect on safe reactor operations is paramount to this standard. The fire protection standard shall be 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 and controlling and extinguishing promptly those fires that do occur, thereby limiting fire damage; and

(3) Providing an adequate level of fire protection for SSCs important to safety, so that a fire that is not promptly extinguished will not prevent essential plant safety functions from being performed.

2.1 Other Applicable Regulations

The following regulations address fire protection:

- GDC 3, "Fire protection," to 10 CFR Part 50, Appendix A:

  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. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. 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. 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.

- GDC 5, "Sharing of structures, systems, and components," to 10 CFR Part 50, Appendix A:

  Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

- 10 CFR 50.48(a)(1) requires that each holder of an operating license have a fire protection plan that satisfies GDC 3 of Appendix A to 10 CFR Part 50.

- 10 CFR 50.48(c), incorporates NFPA 805 (2001 Edition) (Reference 3) by reference, with certain exceptions, modifications and supplementation. This regulation establishes the requirements for using a RI/PB FPP in conformance with NFPA 805 as an alternative to the requirements associated with 10 CFR 50.48(b) and Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," to 10 CFR Part 50, or the specific plant fire protection license condition for plants licensed to operate after January 1, 1979.

- 10 CFR Part 20, "Standards for Protection Against Radiation," establishes the radiation protection limits used as NFPA 805 radioactive release performance criteria, as specified in NFPA 805, Section 1.5.2, "Radioactive Release Performance Criteria."

2.2 Applicable Guidance

The NRC staff review also relied on the following additional codes, RGs, and standards:

- RG 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, issued December 2009 (Reference 4), which provides guidance for use in complying with the requirements that the NRC has promulgated for RI/PB FPPs that comply with 10 CFR 50.48 and the referenced 2001 Edition of the NFPA standard. It endorses portions of NEI 04-02, Revision 2 (Reference 7), where it has been found to provide methods acceptable to the NRC for implementing NFPA 805 and complying with 10 CFR 50.48(c). The regulatory positions in Section C of RG 1.205 include clarification of the guidance provided in NEI 04-02, as well as NRC exceptions to the guidance. RG 1.205 sets forth regulatory positions, emphasizes certain issues, clarifies the requirements of 10 CFR 50.48(c) and NFPA 805, clarifies the guidance in NEI 04-02, and modifies the NEI 04-02 guidance where required. Should a conflict occur between NEI 04-02 and this RG, the regulatory positions in RG 1.205 govern. This RG also indicates that Chapter 3 of NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 2, issued May 2009, when used in conjunction with NFPA 805 and the RG, provides an acceptable approach to circuit analysis for a plant implementing an FPP under 10 CFR 50.48(c).

- The 2001 edition of NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," (Reference 3), which specifies the minimum fire protection requirements for existing light water nuclear power plants during all phases of plant operations, including shutdown, degraded conditions, and decommissioning. NFPA 805 was developed to provide a comprehensive RI/PB standard for fire protection. The NFPA 805 Technical Committee on Nuclear Facilities is composed 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.

- NEI 04-02 "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," (Reference 7), which provides guidance for implementing the requirements of 10 CFR 50.48(c), and represents methods for implementing in whole or in part a RI/PB FPP. This implementing guidance for NFPA 805 has two primary purposes: (1) provide direction and clarification for adopting NFPA 805 as an acceptable approach to fire protection, consistent with 10 CFR 50.48(c); and (2) provide additional supplemental technical guidance and methods for using NFPA 805 and its appendices to demonstrate compliance with fire protection requirements. Although there is a significant amount of detail in NFPA 805 and its appendices, clarification and additional guidance for select issues help ensure consistency and effective utilization of the standard. The NEI 04-02 guidance focuses attention on the RI/PB FPP fire protection goals, objectives, and performance criteria contained in NFPA 805 and the RI/PB tools considered acceptable for demonstrating compliance. Revision 2 of NEI 04-02 incorporates guidance from RG 1.205 and approved Frequently Asked Questions (FAQs).

- NEI 00-01, "Guidance for Post Fire Safe Shutdown Circuit Analysis," Revision 2 (Reference 23), which provides a deterministic methodology for performing post-fire safe shutdown analysis (SSA). In addition, NEI 00-01 includes information on RI methods (when allowed within a Plant's License Basis) that may be used in conjunction with the deterministic methods for resolving circuit failure issues related to Multiple Spurious Operations (MSOs). The RI method is intended for application by licensees to determine the risk significance of identified circuit failure issues related to MSOs. In RG 1.205, the NRC staff indicated that Chapter 3 of NEI 00-01, when used in conjunction with NFPA 805 and RG 1.205, provides an acceptable approach to circuit analysis for a plant implementing an FPP under 10 CFR 50.48(c).

- 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 (Reference 24), which provides the NRC staff's recommendations for using risk information in support of licensee-initiated licensing basis (LB) changes to a nuclear power plant that require such review and approval. The guidance provided does not preclude other approaches for requesting LB 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 LB and for assessing the impact of such proposed changes on the risk associated with plant design and operation.

- RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, issued March 2009 (Reference 25), which provides guidance to licensees for use in determining the technical adequacy of the base probabilistic risk assessment (PRA) used in a

RI regulatory activity, and endorses standards and industry peer review guidance. The RG provides guidance in four areas:

1. A definition of a technically acceptable PRA;

2. The NRC's position on PRA consensus standards and industry PRA peer review program documents;

3. Demonstration that the baseline PRA (in total or specific pieces) used in regulatory applications is technically adequate;

4. 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 decision-making processes.

- American Society of Mechanical Engineers/American Nuclear Society (ASME/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," (Reference 26), which provides guidance PRAs used to support RI 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 only hazards explicitly excluded from the scope are accidents resulting from purposeful human-induced security threats (e.g., sabotage). The standard applies to PRAs used to support applications of RI decision-making related to design, licensing, procurement, construction, operation, and maintenance.

- RG 1.189, "Fire Protection for Nuclear Power Plants," Revision 2, issued October 2009 (Reference 27), provides guidance to licensees on the proper content and quality of engineering equivalency evaluations used to support the FPP. The NRC staff developed the RG to provide a comprehensive fire protection guidance document and to identify the scope and depth of fire protection that the NRC staff would consider acceptable for nuclear power plants.

- NUREG-0800, Section 9.5.1.2, "Risk-Informed, Performance-Based Fire Protection Program," Revision 0, issued December 2009 (Reference 28), which provides guidance for the NRC staff for evaluation of LARs that seek to implement a RI/PB FPP in accordance with 10 CFR 50.48(c).

- NUREG-0800, Section 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 3, issued September 2012 (Reference 29), which provides guidance for the NRC staff for evaluation of the technical adequacy of a licensee's PRA results when used to request risk-informed changes to the licensing basis.

- NUREG-0800, Section 19.2, "Review of Risk Information Used to Support Permanent Plant-Specific Changes to the Licensing Basis: General Guidance," Revision 0, issued June 2007 (Reference 30), which provides guidance for the NRC staff for evaluation of the risk information used by a licensee to support permanent, risk-informed changes to the licensing basis for the plant.

- NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," Volumes 1 (Reference 31) and 2 (Reference 32), and Supplement 1 (Reference 33), which presents a compendium of methods, data and tools to perform a fire PRA (FPRA) and develop associated insights. In order to address the need for improved methods, the NRC Office of Nuclear Regulatory Research (RES) and Electric Power Research Institute (EPRI) embarked upon a program to develop state-of-art FPRA methodology. Both RES and EPRI have provided specialists in fire risk analysis, fire modeling, electrical engineering, human reliability analysis (HRA), and systems engineering for methods development. A formal technical issue resolution process was developed to direct the deliberative process between RES and EPRI. The process ensures that divergent technical views are fully considered, yet encourages consensus at many points during the deliberation. Significantly, the process provides that each party maintain its own point of view if consensus is not reached. Consensus was reached on all technical issues documented in NUREG/CR-6850. The methodology documented in this report reflects the current state-of-the-art in FPRA. These methods are expected to form a basis for RI analyses related to the plant FPP. 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 FPRA.

- Memorandum from Richard P. Correia, RES, to Joseph G. Giitter, NRR, titled "Interim Technical Guidance on Fire-Induced Circuit Failure Mode Likelihood Analysis," dated June 14, 2013, (Reference 34) notes that, based on new experimental information documented in NUREG/CR-6931 "Cable Response to Live Fire (CAROLFIRE)" issued April 2008 (Reference 35), and NUREG/CR- 7100 "Direct Current Electrical Shorting in Response to Exposure Fire {DESIREE-Fire): Test Results," issued April 2012 (Reference 36), the reduction in hot short probabilities for circuits provided with control power transformers identified in NUREG/CR-6850 cannot be repeated in experiments and, therefore, may be too high and should be reduced.

- NUREG-1805, "Fire Dynamics Tools (FDTs): Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program," (Reference 37) which provides quantitative methods, known as "Fire Dynamics Tools" (FDTs), to assist regional fire protection inspectors in performing fire hazard analysis. The FDTs are intended to assist fire protection inspectors in performing RI evaluations of credible fires that may cause critical damage to essential safe-shutdown equipment, as required by the new reactor oversight process defined in the NRC's inspection manual.

- NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications," Volumes 1 through 7 (Reference 38), which provide technical documentation regarding the predictive capabilities of a specific set of fire models for the analysis of fire hazards in nuclear power plant (NPP) scenarios. This report is the result of a collaborative program with the EPRI and the National Institute of Standards and Technology (NIST) The selected models are:

  1. FDTs developed by NRC (Volume 3);
  2. FIVE-Rev1 developed by EPRI (Volume 4);
  3. The zone model CFAST developed by NIST (Volume 5);
  4. The zone model MAGIC developed by Electricite de France (Volume 6); and
  5. The computational fluid dynamics model FDS developed by NIST (Volume 7).

  In addition to the fire model volumes, Volume 1 is the comprehensive main report and Volume 2 is a description of the experiments and associated experimental uncertainty used in developing this report.

- NUREG/CR-7010, "Cable Heat Release, Ignition, and Spread In Tray Installations during Fire (CHRISTIFIRE), Volume 1: Horizontal Trays," (Reference 39), which describes Phase 1 of the CHRISTIFIRE testing program conducted by NIST. The overall goal of this multiyear program is to quantify the burning characteristics of grouped electrical cables installed in cable trays. This first phase of the program focuses on horizontal tray configurations. CHRISTIFIRE addresses the burning behavior of a cable in a fire beyond the point of electrical failure. The data obtained from this project can be used for the development of fire models to calculate the heat release rate (HRR) and flame spread of a cable fire.

- NUREG-1855, Volume 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making," (Reference 40), which provides guidance on how to treat uncertainties associated with PRA in RI decision-making. The objectives of this guidance include fostering an understanding of the uncertainties associated with PRA and their impact on the results of PRA and providing a pragmatic approach to addressing these uncertainties in the context of the decision-making. To meet the objective of the NUREG, it is necessary to understand the role that PRA results play in the context of the decision process. To define this context, NUREG-1855 provides an overview of the RI decision-making process itself.

- NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines – Final Report," (Reference 41), which presents the state of the art in fire HRA practice. This report was developed jointly between RES and EPRI to develop the methodology and supporting guidelines for estimating human error probabilities for human failure events following the fire-induced initiating events of a FPRA. The report builds on existing HRA methods, and is intended primarily for practitioners conducting a fire HRA to support a FPRA.

- NUREG-1934, "Nuclear Power Plant Fire Modeling Analysis Guidelines (NPP FIRE MAG)" (Reference 42), describes the implications of the verification and validation (V&V) results from NUREG-1824 for fire model users. The features and limitations of the fire models documented in NUREG-1824 are discussed relative to their use to support nuclear power plant fire hazard analyses. The report also provides information to assist fire model users in applying this technology in the nuclear power plant environment.

- Generic Letter (GL) 2006-03. "Potentially Nonconforming Hemyc and MT Fire Barrier Configurations," (Reference 43), which requested that licensees evaluate their facilities to confirm compliance with the existing applicable regulatory requirements in light of the information provided in this GL and, if appropriate, take additional actions. Specifically, NRC testing revealed that, for the configurations tested, Hemyc and MT fire barriers failed to provide the protective function intended for compliance with existing regulations.

2.3 NFPA 805 Frequently Asked Questions

In the LAR, the licensee proposed to use a number of documents commonly known as NFPA 805 FAQs. The following table provides the set of FAQs the licensee used that the NRC staff referenced in the preparation of this SE, as well as the SE section(s) to which each FAQ was referenced.

Table 2.3-1: NFPA 805 Frequently Asked Questions

FAQ #	FAQ Title and Summary	Reference	SE Section
07-0030	"Establishing Recovery Actions" • This FAQ provides an acceptable process for determining the recovery actions (RAs) for NFPA 805 Chapter 4 compliance. The process includes: ▪ Differentiation between RAs and activities in the main control room or at primary control station(s). ▪ Determination of which RAs are required by the NFPA 805 FPP. ▪ Evaluate the additional risk presented by the use of RAs. ▪ Evaluate the feasibility of the identified RAs. ▪ Evaluate the reliability of the identified RAs.	(Reference 44)	3.2.5

FAQ #	FAQ Title and Summary	Reference	SE Section
07-0038	"Lessons Learned on Multiple Spurious Operations (MSOs)" • This FAQ reflects an acceptable process for the treatment of MSOs during transition to NFPA 805: ▪ Step 1 – Identify potential MSO combinations of concern. ▪ Step 2 – Expert panel assesses plant specific vulnerabilities and reviews MSOs of concern. ▪ Step 3 – Update the FPRA and Nuclear Safety Capability Assessment (NSCA) to include MSOs of concern. ▪ Step 4 – Evaluate for NFPA 805 compliance. ▪ Step 5 – Document the results.	(Reference 45)	3.2.4 3.2.6
07-0039	"Incorporation of Pilot Plant Lessons Learned – Table B-2" • This FAQ provides additional detail for the comparison of the licensee's SSD strategy to the endorsed industry guidance, NEI 00-01 "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 1 (Reference 23). In short, the process has the licensees: ▪ Assemble industry and plant-specific documentation; ▪ Determine which sections of the guidance are applicable; ▪ Compare the existing SSD methodology to the applicable guidance; and ▪ Document any discrepancies.	(Reference 46)	3.2.1
07-0040	"Non-Power Operations (NPO) Clarifications" • This FAQ clarifies an acceptable NFPA 805 NPO program. The process includes: ▪ Selecting NPO equipment and cabling. ▪ Evaluation of NPO Higher Risk Evolutions (HRE). ▪ Analyzing NPO key safety functions (KSF). ▪ Identifying plant areas to protect or "pinch points" during NPO HREs and actions to be taken if KSFs are lost.	(Reference 47)	3.5.3 3.5.3.1 3.5.3.3 3.5.4
08-0044	"Main Feedwater Pump Oil Spill Fires" • This FAQ provides revised guidance regarding the frequency and severity of main feedwater pump oil spill fires.	(Reference 48)	3.4.2
08-0048	"Revised Fire Ignition Frequencies" • This FAQ provides an acceptable method for using updated fire ignition frequencies in the licensee's FPRA. The method involves the use of sensitivity studies when the updated fire ignition frequencies are used.	(Reference 49)	3.4.7 3.4.8

FAQ #	FAQ Title and Summary	Reference	SE Section
08-0050	"Manual Non-Suppression Probability" • This FAQ updates the treatment of manual suppression and fire brigade response. The update includes a process to adjust the non-suppression analysis for scenario-specific fire brigade responses.	(Reference 50)	3.4.4
08-0052	"Transient Fires - Growth Rates and Control Room Non-Suppression" • This FAQ clarifies and updates the treatment of transient fires in terms of both manual suppression and time-dependent fire growth modeling.	(Reference 51)	3.4.2.3.2
08-0054	"Compliance with Chapter 4 of NFPA 805" • This FAQ provides an acceptable process to demonstrate Chapter 4 compliance for transition: ▪ Step 1 – Assemble documentation. ▪ Step 2 – Document Fulfillment of NSPC. ▪ Step 3 – VFDR Identification, Characterization, and Resolution Considerations. ▪ Step 4 – PB Evaluations. ▪ Step 5 – Final VFDR Evaluation. ▪ Step 6 – Document Required Fire Protection Systems and Features.	(Reference 52)	3.4.3 3.4.4 3.5.1.4
10-0059	"Monitoring Program" • This FAQ provides clarification regarding the implementation of an NFPA 805 monitoring program for transition. It includes: ▪ Monitoring program analysis units; ▪ Screening of low safety significant SSCs; ▪ Action level thresholds; and ▪ The use of existing monitoring programs.	(Reference 53)	3.7.1
12-0062	"Updated Final Safety Analysis Report (UFSAR) Content" • This FAQ provides the necessary level of detail for the transition of the fire protection sections within the UFSAR.	(Reference 54)	2.4.4

2.4 Orders, License Conditions and Technical Specifications

Paragraph 50.48(c)(3)(i) of 10 CFR states, in part, that the LAR "... must identify any orders and license conditions that must be revised or superseded, and contain any necessary revisions to the plant's technical specifications and the bases thereof."

2.4.1 Orders

The NRC staff reviewed LAR Section 5.2.3, "Orders and Exemptions" and LAR Attachment O, "Orders and Exemptions," with regard to NRC-issued orders that are being revised or superseded by the NFPA 805 transition process. The LAR stated that the licensee conducted a review of docketed correspondence to determine if there were any orders or exemptions that needed to be superseded or revised. The LAR also stated that the licensee conducted a review to ensure that compliance with the physical protection requirements, security orders, and adherence to those commitments are maintained. The licensee discussed the affected orders and exemptions in LAR Attachment O.

The licensee requested that 25 exemptions be rescinded, and determined that no orders need to be superseded or revised to implement a FPP at FNP that complies with 10 CFR 50.48(c).

The licensee's review included an assessment of docketed correspondence files and electronic searches, including the NRC's ADAMS. The review was performed to ensure that compliance with the physical protection requirements, security orders, and adherence to commitments applicable to FNP are maintained. The NRC staff accepts the licensee's determination that 25 exemptions should be rescinded as listed in LAR Attachment K, and that no orders need to be superseded or revised to implement NFPA 805 at FNP. See SE Section 2.5 for the NRC staff's detailed evaluation of the exemptions being rescinded.

The licensee also performed a specific review of the license amendment that incorporated the mitigation strategies required by 10 CFR 50.54(hh)(2) to ensure that any changes being made in order to comply with 10 CFR 50.48(c) do not invalidate existing commitments applicable to FNP. The licensee's review of this regulation and the related license amendment demonstrated that changes to the FPP during transition to NFPA 805 will not affect the mitigation measures required by 10 CFR 50.54(hh)(2) because the licensee will continue to have strategies that address large fires and explosions including a firefighting response strategy, operations to mitigate fuel damage, and actions to minimize release upon transition to NFPA 805. The NRC staff concludes that the licensee's determination in regard to 10 CFR 50.54(hh)(2) is acceptable.

2.4.2 License Conditions

The NRC staff reviewed LAR Section 5.2.1, "License Condition Changes," and LAR Attachment M, "License Condition Changes," as supplemented, regarding changes the licensee seeks to make to the FNP fire protection license condition in order to adopt NFPA 805, as required by 10 CFR 50.48(c)(3).

The NRC staff reviewed the revised license condition, which supersedes the current FNP fire protection license condition, for consistency with the format and content guidance in Regulatory Position C.3.1 of RG 1.205, Revision 1, and with the proposed plant modifications identified in the LAR.

The revised license condition provides a structure and detailed criteria to allow self-approval for RI/PB as well as other types of changes to the FPP. The structure and detailed criteria result in a process that meets the requirements in NFPA 805, Sections 2.4, "Engineering Analyses," 2.4.3, "Fire Risk Evaluations," and 2.4.4, "Plant Change Evaluation." These sections establish the requirements for the content and quality of the engineering evaluations to be used for approval of changes.

The revised license condition also defines the limitations imposed on the licensee during the transition phase of plant operations when the physical plant configuration does not fully match the configuration represented in the fire risk analysis. The limitations on self-approval are required because NFPA 805 requires that the risk analyses be based on the as-built, as-operated and maintained plant, and reflect the operating experience at the plant. Until the proposed implementation items and plant modifications are completed, the risk analysis is not based on the as-built, as-operated and maintained plant.

Overall, the licensee's revised license conditions provide structure and detailed criteria to allow self-approval for FPP changes that meet the requirements of NFPA 805 with regard to engineering analyses, fire risk evaluations (FREs), and plant change evaluations (PCEs). The NRC staff's evaluation of the self-approval process for FPP changes (post-transition) is contained in SE Section 2.6. The license conditions also reference the plant-specific modifications, and associated implementation schedules that must be accomplished at FNP to complete transition to NFPA 805 and comply with 10 CFR 50.48(c). In addition, the license conditions include a requirement that appropriate compensatory measures will remain in place until implementation of the specified plant modifications is completed. These modifications and implementation schedules are identical to those identified elsewhere in the LAR, as discussed in Sections 2.7.1 and 2.7.2, and explicitly reviewed in SE Section 3.0.

SE Section 4.0 provides the NRC staff's review of the proposed FNP FPP license conditions.

2.4.3 Technical Specifications

The NRC staff reviewed LAR Section 5.2.2, "Technical Specifications" and LAR Attachment N, "Technical Specification Changes," with regard to proposed changes to the FNP TSs that are being revised or superseded during the NFPA 805 transition process. According to the LAR, the licensee conducted a review of the FNP TSs to determine which, if any, TS sections will be impacted by the transition to a RI/PB FPP based on 10 CFR 50.48(c). The licensee identified a change to the TSs needed for FNP transition and provided applicable justification listed in LAR Attachment N.

The licensee identified one change that involved deleting TS 5.4.1.c which requires procedures be established, implemented, and maintained for FPP implementation. The licensee stated that deleting TS 5.4.1.c is acceptable for adoption of the new FPP licensing basis since the requirement for establishing, implementing, and maintaining fire protection procedures is embodied in 10 CFR 50.48(a) and 50.48(c) NFPA 805 Chapter 3, Section 3.2.2, "Procedures," which states that "Procedures shall be established for implementation of the fire protection program." The licensee further stated that removal of administrative controls technical specifications that are redundant to other regulatory requirements is consistent with established NRC guidance.

Based on the information provided by the licensee, the NRC staff concludes that the proposed deletion is acceptable because TS 5.4.1.c is an administrative control, would be redundant to the NFPA 805 requirement to establish FPP procedures, and failure by the licensee to not establish FPP procedures would result in regulatory non-compliance with 10 CFR 50.48(a) and 10 CFR 50.48(c)(1). Changes to fire protection administrative controls are controlled by the proposed fire protection license condition. See SE Section 4.0

2.4.4 Final Safety Analysis Report

The NRC staff reviewed LAR Section 5.4, "Revision to the FSAR," which states:

> In accordance with 10 CFR 50.71e, the FSAR will be revised. The format and content will be consistent with FAQ 12-0062.

Since the licensee's timeline to update the FSAR is in accordance with 10 CFR 50.71(e), and the content and format will be consistent with FAQ 12-0062, the NRC staff concludes that the licensee's method to update the FSAR is acceptable.

2.5 Rescission of Exemptions

Because FNP was licensed to before January 1, 1979, it must satisfy certain provisions of 10 CFR 50, Appendix R. The NRC staff reviewed LAR Section 5.2.3, "Orders and Exemptions," LAR Attachment O, "Orders and Exemptions," and LAR Attachment K, "Existing Licensing Action Transition," with regard to previously-approved exemptions to Appendix R to 10 CFR Part 50, which the transition to a FPP licensing basis in conformance with NFPA 805 will supersede. These exemptions will no longer be required since upon approval of the NFPA 805 RI/PB FPP, Appendix R will not be part of the licensing basis for FNP.

The licensee previously requested and received NRC approval for 25 exemptions from 10 CFR Part 50, Appendix R. These exemptions were discussed in detail in LAR Attachment K. The licensee stated that the exemptions are either: compliant with 10 CFR 50.48(c); no longer required because an FRE was performed and found that the fire area is compliant with the licensee's NSPC; or the configuration has been determined to be "adequate for hazard" based on existing engineering equivalency evaluation (EEEE). The licensee requested in accordance with the requirements of 10 CFR 50.48(c)(3)(i), that all the exemptions be rescinded.

Disposition of Appendix R exemptions may follow two different paths during NFPA 805 transition:

- The exemption was found to be unnecessary since the underlying condition has been evaluated using RI/PB FPP methods (fire modeling and/or FRE) and found to be acceptable and no further actions are necessary by the licensee.
- The exemption was found to be appropriate as a qualitative engineering evaluation that meets the deterministic requirements of NFPA 805 and is carried forward as part of the engineering analyses supporting NFPA 805 transition.

The following exemptions are rescinded as requested by the LAR and the underlying condition has been evaluated using RI/PB methods and found to be acceptable with no further actions because the philosophy of DID and sufficient safety margins are maintained:

- An exemption from the Appendix R, Section III.G.2.d requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles for specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, and installation of an automatic fire suppression system in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, and installation of fire detectors in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of automatic fire suppression in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.a requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.b requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 1-hour rating, and installation of automatic suppression in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, and installation of automatic suppression in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating for specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, and installation of fire detectors in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.a requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.a and III.G.2.c requirements for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating and enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, and installation of automatic suppression in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, in addition, installation of fire detectors and automatic suppression in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.a requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.a requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.a requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, and installation of automatic suppression in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, and installation of fire detectors in specified fire areas.

- An exemption from the Appendix R, Section III.G.2.b requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating, and installation of automatic suppression in the specified fire area.

- An exemption from the Appendix R, Section III.G.2.a requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating in specified fire areas.

- An exemption from the Appendix R, Section III.G.2 requirement for lack of structural steel supporting raceway fire barrier assemblies to be protected by a fireproofing material having a fire rating of 1-hour for the specified fire areas.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating, in addition, installation of automatic suppression in the specified fire area.

- An exemption from the Appendix R, Section III.G.2.b requirement for lack of separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating, and installation of automatic suppression in the specified fire area.

- An exemption from the Appendix R, Section III.G.2.c requirement for lack of enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating in the specified fire area.

2.6 Self-Approval Process for Fire Protection Program Changes (Post-Transition)

Upon completion of the implementation of the RI/PB FPP and issuance of the license condition discussed in SE Section 2.4.2, changes to the approved FPP must be evaluated by the licensee to ensure that they are acceptable.

NFPA 805 Section 2.2.9, "Plant Change Evaluation," 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 that adequate defense-in-depth and safety margins are maintained.

NFPA 805, Section 2.4.4, "Plant Change Evaluation," 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 the acceptability of risk, defense-in-depth, and safety margins.

2.6.1 Post-Implementation Plant Change Evaluation Process

The NRC staff reviewed LAR Section 4.7.2, "Compliance with Configuration Control Requirements in Section 2.7.2 and 2.2.9 of NFPA 805," for compliance with the NFPA 805 PCE process requirements to address potential changes to the NFPA 805 RI/PB FPP after implementation is completed. The licensee developed a change process that is based on the guidance provided in NEI 04-02, Section 5.3, "Plant Change Process," as well as Appendices B, I, and J, as modified by RG 1.205, Regulatory Positions 2.2.4, 3.1, 3.2, and 4.3.

LAR Section 4.7.2 states that the PCE process consists of four steps:

1. Defining the change;
2. Performing the preliminary risk screening;
3. Performing the risk evaluation; and
4. Evaluating the acceptance criteria.

In the LAR, the licensee stated that the PCE process begins by defining the change or altered condition to be examined and the baseline configuration. The baseline is defined by the design basis and licensing basis. The licensee also stated that the baseline is defined as that plant condition or configuration that is consistent with the design basis and licensing basis and that the changed or altered condition or configuration that is not consistent with the design basis and licensing basis is defined as the proposed alternative.

The licensee stated that once the definition of the change is established, a screening will then be performed to identify and resolve minor changes to the FPP and that the screening will be consistent with fire protection regulatory review processes currently in place at nuclear plants under traditional licensing bases. The licensee further stated that the screening process is modeled after NEI 02-03, "Guidance for Performing a Regulatory Review of Proposed Changes to the Approved Fire Protection Program," June 2003, (Reference 55), and that the process will address most administrative changes (e.g., changes to the combustible control program, organizational changes, etc.).

The licensee stated that once the screening process is completed, it will be followed by engineering evaluations that might include fire modeling and risk assessment techniques and that the results of these evaluations are then compared to the acceptance criteria. The licensee further stated that changes that satisfy the acceptance criteria of NFPA 805 Section 2.4.4 and the fire protection license condition (see LAR Attachment M) can be implemented within the framework provided by NFPA 805, and that changes that do not satisfy the acceptance criteria cannot be implemented within this framework. The licensee further stated that the acceptance criteria will require that the resultant change in core damage frequency (CDF) and LERF be consistent with the license condition, and that the acceptance criteria will also include consideration of DID and safety margin, which would typically be qualitative in nature.

The licensee stated that the risk evaluation will involve the application of fire modeling analyses and risk assessment techniques to obtain a measure of the changes in risk associated with the proposed change and that, 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.

The licensee stated that the PCEs are assessed for acceptability using the delta (Δ) CDF (change in CDF) and Δ LERF (change in LERF) criteria from the license conditions and that the proposed changes are also assessed to ensure they are consistent with the DID philosophy and that sufficient safety margins were maintained.

The licensee stated that its FPP configuration is defined by the program documentation and, to the greatest extent possible, the existing configuration control processes for modifications, calculations and analyses, and FPP license basis reviews will be utilized to maintain configuration control of the FPP documents. The licensee further stated that the configuration control procedures that govern the various FNP documents and databases that currently exist will be revised to reflect the new NFPA 805 licensing bases requirements. The licensee further stated that several NFPA 805 document types such as: NSCA supporting information, non-power mode NSCA treatment, etc., generally require new control procedures and processes to be developed since they are new documents and databases created as a result of the transition to NFPA 805. The licensee further stated that the new procedures will be modeled after the existing processes for similar types of documents and databases and that system level design basis documents will be revised to reflect the NFPA 805 role that the system components now play. In LAR Attachment S, Table S-3, Implementation Item 28, the licensee included the action to create "a fire protection design basis document as described in Section 2.7.1.2 of NFPA 805 and necessary supporting documentation as described in Section 2.7.1.3 of NFPA 805 as part of transition to 10 CFR 50.48(c) to ensure program implementation following receipt of the safety evaluation." The NRC staff considers this action acceptable because the action will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

The licensee stated that the process for capturing the impact of proposed changes to the plant on the FPP will continue to be a multiple step review and that the first step of the review will be an initial screening for process users to determine if there is a potential to impact the FPP as defined under NFPA 805 through a series of screening questions/checklists contained in one or more procedures depending upon the configuration control process being used. The licensee further stated that reviews that identify potential FPP impacts will be sent to qualified individuals (e.g., Fire Protection, SSD/NSCA, FPRA) to ascertain the program impacts, if any, and that if FPP impacts are determined to exist as a result of the proposed change, the issue would be resolved by one of the following:

- Deterministic Approach: Comply with NFPA 805 Chapter 3 and 4.2.3 requirements.

- Performance-Based Approach: Utilize the NFPA 805 change process developed in accordance with NEI 04-02, RG 1.205, and the NFPA 805 fire protection license condition to assess the acceptability of the proposed change. This process will be used to determine if the proposed change could be implemented "as-is" or whether prior NRC approval of the proposed change is required.

The licensee stated that this process follows the requirements in NFPA 805 and the guidance outlined in RG 1.174, (Reference 24), which requires the use of qualified individuals, procedures that require calculations be subject to independent review and verification, record retention, peer review, and a corrective action program that ensures appropriate actions are taken when errors are discovered.

Since NFPA 805 always requires the use of a PCE, regardless of what element requires the change, the NRC staff concludes that, in accordance with the requirements of NFPA 805, if FPP impacts are determined to exist as a result of the proposed change, the issue would be resolved by utilizing the NFPA 805 change process developed in accordance with NEI 04-02, RG 1.205, and the FNP NFPA 805 fire protection license condition to assess the acceptability of the proposed change. This process will be used to determine if prior NRC approval of the proposed change is required.

Based on the information provided by the licensee, the NRC staff concludes that the licensee's PCE process is acceptable because it meets the guidance in NEI 04-02, Revision 2, as well as RG 1.205, Revision 1, (Reference 4), and addresses attributes for using FREs in accordance with NFPA 805. NFPA 805, Section 2.4.4 requires that PCEs consist of an integrated assessment of risk, DID and safety margins. NFPA 805, Section 2.4.3.1 requires that the probabilistic safety assessment (PSA) use CDF and LERF as measures for risk. NFPA 805, Section 2.4.3.3 requires that the risk assessment approach, methods, and data shall be acceptable to the Authority Having Jurisdiction (AHJ) which is the NRC, and also requires that the PSA 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.

The licensee's PCE process includes the required delta risk calculations, uses risk assessment methods acceptable to the NRC, uses appropriate risk acceptance criteria in determining acceptability, involves the use of a FPRA of acceptable quality, and includes an integrated assessment of risk, DID, and safety margins as discussed above.

2.6.2 Requirements for the Self Approval Process Regarding Plant Changes

Risk assessments performed to evaluate PCEs must utilize methods that are acceptable to the NRC staff. Acceptable methods to assess the risk of the proposed plant change may include methods that have been used in developing the peer-reviewed FPRA model, methods that have been approved by the NRC via a plant-specific license amendment or through NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.

Based on the information provided by the licensee in the LAR, the process established to evaluate post-transition plant changes meets the guidance in NEI 04-02, Revision 2, (Reference 7), as well as RG 1.205, Revision 1, (Reference 4). The NRC staff concludes that the proposed PCE process at FNP, which includes defining the change, a preliminary risk screening, a risk evaluation, and an acceptability determination, as described in Section 2.6.1, is acceptable because it addresses the required delta risk calculations, uses risk assessment methods acceptable to the NRC, uses appropriate risk acceptance criteria in determining acceptability, involves the use of a FPRA of acceptable quality, and includes an integrated assessment of risk, DID, and safety margins.

However, before achieving full compliance with 10 CFR 50.48(c) by implementing the plant modifications listed in SE Section 2.7.1 (i.e.; during full implementation of the transition to NFPA 805), the proposed license condition provides that RI changes to the licensee's FPP may not be made without prior NRC review and approval unless the changes have been demonstrated to have no more than a minimal risk impact using the screening process discussed above because the risk analysis is not consistent with the as-built, as-operated and maintained plant since the modifications have not been completed. In addition, the condition requires the licensee to ensure that fire protection DID and safety margins are maintained during the transition process. The "Transition License Conditions" in the proposed NFPA 805 license condition include the appropriate acceptance criteria and other attributes to form an acceptable method for meeting Regulatory Position C.3.1 of RG 1.205, Revision 1, (Reference 4), with respect to the requirements for FPP changes during transition, and therefore demonstrate compliance with 10 CFR 50.48(c).

The proposed NFPA 805 license condition also includes a provision for self-approval of changes to the FPP that may be made on a qualitative, rather than quantitative basis. Specifically, the license conditions states that prior NRC review and approval are not required for changes to the NFPA 805 Chapter 3 fundamental FPP elements and design requirements for which an engineering evaluation demonstrates that the alternative to the NFPA 805 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 (i.e., has not impacted its contribution toward meeting the nuclear safety and radioactive release performance criteria), using a relevant technical requirement or standard.

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. NFPA 805 Section 1.7 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 authority having jurisdiction 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.

Alternatively, the licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805 Chapter 3 elements are acceptable because the changes are "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805 Chapter 3 listed below, 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 (with respect to the ability to meet the nuclear safety and radioactive release performance criteria), using a relevant technical requirement or standard. NFPA 805 Section 2.4 states that engineering analysis is an acceptable means of evaluating a FPP against performance criteria. Engineering analyses shall be permitted to be qualitative or quantitative. Use of qualitative engineering analyses by a qualified fire protection engineer to determine that a change has not affected the functionality of the component, system, procedure or physical arrangement is allowed by NFPA 805 Section 2.4.

The four sections of NFPA 805 Chapter 3 for which prior NRC review and approval are not required to implement alternatives that an engineering evaluation has demonstrated are adequate for the hazard are:

1. "Fire Alarm and Detection Systems" (Section 3.8);

2. "Automatic and Manual Water-Based Fire Suppression Systems" (Section 3.9);

3. "Gaseous Fire Suppression Systems" (Section 3.10); and,

4. “Passive Fire Protection Features” (Section 3.11).

The engineering evaluations described above (i.e., functionally equivalent and adequate for the hazard) are engineering analyses governed by the NFPA 805 guidelines. In particular, this means that the evaluations must meet the requirements of NFPA 805, Section 2.4, “Engineering Analyses,” and NFPA 805, Section 2.7, “Program Documentation, Configuration Control, and Quality.” Specifically, the effectiveness of the fire protection features under review must be evaluated and found acceptable 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 threshold for the plant being analyzed. The associated evaluations must also meet the documentation content (as outlined by NFPA 805, Section 2.7.1, “Content”) and quality requirements (as outlined by NFPA 805, Section 2.7.3, “Quality”) of the standard in order to be considered adequate. The NRC staff's review of the licensee's compliance with NFPA 805, Sections 2.7.1 and 2.7.3 is provided in SE Section 3.8.

According to the LAR, the licensee intends to use a FPRA to evaluate the risk of proposed future plant changes. Section 3.4.2, “Quality of the Fire Probabilistic Risk Assessment,” of this SE discusses the technical adequacy of the FPRA, including the licensee's process to ensure that the FPRA remains current. The NRC staff determined that the quality of the licensee's FPRA and associated administrative controls and processes for maintaining the quality of the PRA model is sufficient to support self-approval of future RI changes to the FPP under the proposed license condition, and therefore, the NRC staff concludes that the licensee's process for self-approving future FPP changes is acceptable.

The NRC staff also concludes that the FRE methods used at FNP to model the cause and effect relationship of associated changes as a means of assessing the risk of plant changes during transition to NFPA 805 may continue to be used after implementation of the RI/PB FPP, based on the licensee's administrative controls to ensure that the models remain current and to assure continued quality (see SE Section 3.4.2, “Quality of the Fire Probabilistic Risk Assessment”). Accordingly, these cause and effect relationship models may be used after transition to NFPA 805 as a part of the PCEs conducted to determine the change in risk associated with proposed plant changes.

2.7 Modifications and Implementation Items

Regulatory Position C.3.1 of RG 1.205, Revision 1, (Reference 4), says that a license condition included in a NFPA 805 LAR should include: (1) a list of modifications being made to bring the plant into compliance with 10 CFR 50.48(c); (2) a schedule detailing when these modifications will be completed; and (3) a statement that the licensee shall maintain appropriate compensatory measures in place until implementation of the modifications are completed.

The list of modifications and implementation items originally submitted in the LAR have been updated by the licensee with the final version of LAR Attachment S, "Plant Modifications and Items to be Completed during Implementation," provided in the licensee's letter dated August 29, 2014 (Reference 17).

2.7.1 Modifications

The NRC staff reviewed LAR Attachment S, "Plant Modifications and Items to be Completed During Implementation," which describes the plant modifications necessary to implement the NFPA 805 licensing basis, as proposed. These modifications are identified in the LAR as necessary to bring FNP into compliance with either the deterministic or PB requirements of NFPA 805. As described below, LAR Attachment S, Table S-2 provides a description of each of the proposed plant modifications, presents the problem statement explaining why the modification is needed, and identifies the compensatory actions required to be in place pending completion/implementation of the modification.

The NRC staff's review confirmed that the modifications identified in LAR Table S-2 are the same as those identified in LAR Table B-3, "Fire Area Transition," on a fire area basis, as the modifications being credited in the proposed NFPA 805 licensing basis. The NRC staff also confirmed that the LAR Attachment S, Table S-2 modifications, and associated completion schedule are the same as those provided in the proposed NFPA 805 license condition.

As depicted in LAR Attachment S, Table S-1, the licensee has completed 0 modifications as part of the NFPA 805 transition. LAR Attachment S, Table S-2 provides a detailed listing of the plant modifications that must be completed in order for FNP to be fully in accordance with NFPA 805, implement many of the attributes upon which this SE is based, and thereby meet the requirements of 10 CFR 50.48(c). The modifications will be completed in accordance with the schedule provided in the proposed NFPA 805 license condition, which states that all modifications will be in place by February 6, 2018. In addition, the licensee states that it will keep the appropriate compensatory measures in place until the modifications are complete.

2.7.2 Implementation Items

Implementation Items are items that the licensee has not fully completed or implemented as of the issuance date of the license amendment, but which will be completed during implementation of the license amendment to transition to NFPA 805 (e.g., procedure changes that are still in process, or NFPA 805 programs that have not been fully implemented). The licensee identified the implementation items in LAR Attachment S, Table S-3. For each implementation item, the licensee and the NRC staff have reached a satisfactory resolution involving the level of detail and main attributes that each remaining change will incorporate upon completion. Completion of these items in accordance with the schedule discussed in SE Section 2.7.3 does not change or impact the bases for the safety conclusions made by the NRC staff in the SE.

Each implementation item will be completed prior to the deadline for implementation of the RI/PB FPP based on NFPA 805, as specified in the license condition and the letter transmitting the amended license (i.e., implementation period) which states that the implementation items listed in LAR Attachment S, Table S-3, will be completed within 180 days after NRC approval except for items 30 and 32 which will be completed by February 6, 2018, which is after completion of the modifications scheduled to be completed by November 6, 2017.

The NRC staff, through an onsite audit or during a future fire protection inspection, may choose to examine the closure of the implementation items, with the expectation that any variations discovered during this review, or concerns with regard to adequate completion of the implementation item, would be tracked and dispositioned appropriately under the licensee's corrective action program. Any discrepancies identified during onsite audits or fire protection inspections examining dispositioning of the implementation items could be subject to appropriate NRC enforcement action as completion of the implementation would be required by the proposed license conditions.

2.7.3 Schedule

LAR Section 5.5 provides the overall schedule for completing the NFPA 805 transition at FNP. The licensee stated that it will complete the implementation of new NFPA 805 FPP, to include any procedure changes, process updates, and training to affected plant personnel within 180 days after NRC approval. The licensee submitted a revised schedule and indicated that all items will be completed within 180 days after NRC approval except for items 30 and 32 which will be completed by February 6, 2018, which is after completion of the modifications scheduled to be completed by November 6, 2017.

LAR Section 5.5 also states that modifications will be completed by November 6, 2017, and that appropriate compensatory measures will be maintained until modifications are complete.

3.0 TECHNICAL EVALUATION

The following sections evaluate the technical aspects of the requested license amendment to transition the FPP at FNP to one based on NFPA 805 (Reference 3) in accordance with 10 CFR 50.48(c). While performing the technical evaluation of the licensee's submittal, the NRC staff utilized the guidance provided in NUREG-0800, Section 9.5.1.2, "Risk-Informed, Performance-Based Fire Protection" (Reference 28), to determine whether the licensee had provided sufficient information in both scope and level of detail to adequately demonstrate compliance with the requirements of NFPA 805, as well as the other associated regulations and guidance documents discussed in SE Section 2.0. Specifically:

- Section 3.1 provides the results of the NRC staff review of the licensee's transition of the FPP from the existing deterministic guidance to that of NFPA 805 Chapter 3, "Fundamental Fire Protection Program and Design Elements."
- Section 3.2 provides the results of the NRC staff review of the methods used by the licensee to demonstrate the ability to meet the NSPC.
- Section 3.3 provides the results of the NRC staff review of the FM methods used by the licensee to demonstrate the ability to meet the NSPC using a FM PB approach.
- Section 3.4 provides the results of the NRC staff review of the fire risk assessments used to demonstrate the ability to meet the NSPC using a FRE PB approach.
- Section 3.5 provides the results of the NRC staff review of the licensee's NSCA results by fire area.

- Section 3.6 provides the results of the NRC staff review of the methods used by the licensee to demonstrate an ability to meet the radioactive release performance criteria.

- Section 3.7 provides the results of the NRC staff review of the NFPA 805 monitoring program developed as a part of the transition to a RI/PB FPP based on NFPA 805.

- Section 3.8 provides the results of the NRC staff review of the licensee's program documentation, configuration control, and quality assurance.

SE Attachments A and B provide additional detailed information that was evaluated by the NRC staff during its review of the licensee's request to transition to a RI/PB FPP in accordance with NFPA 805 (i.e., 10 CFR 50.48(c)). These attachments are discussed as appropriate in the associated SE sections.

3.1 NFPA 805 Fundamental Fire Protection Program and Design Elements

NFPA 805 (Reference 3), Chapter 3 contains the fundamental elements of the FPP and specifies the minimum design requirements for fire protection systems and features that are necessary to meet the standard. The fundamental FPP elements and minimum design requirements include necessary attributes pertaining to the fire protection plan and procedures, the fire prevention program and design controls, industrial fire brigades, and fire protection SSCs. However, 10 CFR 50.48(c) provides exceptions, modifications, and supplementations to certain aspects of NFPA 805, Chapter 3, as follows:

- 10 CFR 50.48(c)(2)(v) – *Existing cables.* In lieu of installing cables meeting flame propagation tests as required by Section 3.3.5.3 of NFPA 805, a flame-retardant coating may be applied to the electric cables, or an automatic fixed fire suppression system may be installed to provide an equivalent level of protection. In addition, the italicized exception to Section 3.3.5.3 of NFPA 805 is not endorsed.

- 10 CFR 50.48(c)(2)(vi) – *Water supply and distribution.* The italicized exception to Section 3.6.4 of NFPA 805 is not endorsed. Licensees who wish to use the exception to Section 3.6.4 of NFPA 805 must submit a request for a license amendment in accordance with 10 CFR 50.48(c)(2)(vii).

- 10 CFR 50.48(c)(2)(vii) – *Performance-based methods.* While Section 3.1 of NFPA 805 prohibits the use of PB methods to demonstrate compliance with the NFPA 805, Chapter 3 requirements, 10 CFR 50.48(c)(2)(vii) states that the FPP elements and minimum design requirements of NFPA 805 Chapter 3 may be subject to the PB methods permitted elsewhere in the standard, provided a license amendment is granted and the approach satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains safety margins; and maintains fire protection defense-in-depth.

Furthermore, NFPA 805 Section 3.1 specifically allows the use of alternatives to the NFPA 805, Chapter 3 fundamental FPP requirements that have been previously approved by the NRC (which is the authority having jurisdiction (AHJ), as denoted in NFPA 805 and Regulatory Guide (RG) 1.205), and are contained in the currently approved FPP for the facility.

3.1.1 Compliance with NFPA 805, Chapter 3 Requirements

The licensee used the systematic approach described in NEI 04-02, Revision 2 (Reference 7), as endorsed by the NRC in Regulatory Guide 1.205, Revision 1 (Reference 4), to assess the proposed FNP FPP against the NFPA 805, Chapter 3 requirements.

As part of this assessment, the licensee reviewed each section and subsection of NFPA 805, Chapter 3 against the existing FNP FPP and provided specific compliance statements for each NFPA 805, Chapter 3 attribute that contained applicable requirements. As discussed below, some subsections of NFPA 805, Chapter 3 do not contain requirements, or are otherwise not applicable to FNP, and others are provided with multiple compliance statements to fully document compliance with the element.

The methods used by FNP for achieving compliance with the fundamental FPP elements and minimum design requirements are as follows:

1. The existing FPP element directly complies with the requirement: noted in LAR Attachment A, "NEI 04-02 Table B-1, Transition of Fundamental Fire Protection Program and Design Elements," (LAR Table B-1), as "Complies." (see discussion in SE Section 3.1.1.1)

2. The existing FPP element complies though the use of an explanation or clarification: noted in the "Compliance Basis" in the LAR Table B-1 as "Complies with Clarification." (see discussion in SE Section 3.1.1.2)

3. The existing FPP element complies through the use of EEEEs whose bases remain valid and are of sufficient quality: noted in the LAR Table B-1 as "Complies via Engineering Evaluation." (see discussion in SE Section 3.1.1.3)

4. The existing FPP element complies with the requirement based on prior NRC approval of an alternative to the fundamental FPP attribute and the bases for the NRC approval remain valid: noted in the LAR Table B-1 as "Complies via Previous Approval." (see discussion in SE Section 3.1.1.4)

5. The existing FPP element does not comply with the requirement, but the licensee is requesting specific approval for a performance-based (PB) method in accordance with 10 CFR 50.48(c)(2)(vii): noted in the LAR Table B-1 as "Submit for NRC Approval." (see discussion in SE Section 3.1.1.5)

The NRC staff concludes that, taken together, these methods compose an acceptable approach for documenting compliance with the NFPA 805, Chapter 3 requirements, because the licensee has followed the compliance strategies identified in the endorsed NEI 04-02 guidance document. The process defined in the endorsed guidance provides an organized structure to document each attribute in NFPA 805, Chapter 3, allowing the licensee to provide significant detail in how the program meets the requirements. In addition to the basic strategy of "Complies," which itself makes the attribute both auditable and inspectable, additional strategies have been provided allowing for amplification of information, when necessary, regarding how or why the attribute is acceptable.

The licensee stated in LAR Section 4.2.2, "Existing Engineering Equivalency Evaluation Transition," as supplemented, that it evaluated the EEEEs used to demonstrate compliance with the NFPA 805 Chapter 3 requirements in order to ensure continued appropriateness, quality, and applicability to the current plant configuration. The licensee determined that no EEEEs used to support compliance with NFPA 805 required NRC approval.

EEEEs (previously known as Generic Letter 86-10 evaluations) are performed for fire protection design variances such as fire protection system designs and fire barrier component deviations from the specific fire protection deterministic requirements. Once a licensee transitions to NFPA 805, future equivalency evaluations are to be conducted using a PB approach. The evaluation should demonstrate that the specific plant configuration meets the performance criteria in the standard.

Additionally, the licensee stated in LAR Section 4.2.3, "Licensing Action Transition," that the existing licensing action review was performed in accordance with NEI 04-02 and that the methodology included a determination of the bases for acceptability of the licensing action and a determination that these bases for acceptability are still valid and required for NFPA 805. The results of the licensing action review are provided in LAR Attachment K.

LAR Attachment A, (the NEI 04-02 Table B-1) provides further details regarding the licensee's compliance strategy for specific NFPA 805 Chapter 3 requirements, including references to where compliance is documented.

3.1.1.1 Compliance Strategy -- Complies

For the majority of the NFPA 805, Chapter 3 requirements, as modified by 10 CFR 50.48(c)(2), the licensee determined that the RI/PB FPP complies directly with the fundamental FPP element using the existing FPP element. In these instances, based on the information provided by the licensee in the LAR, as supplemented, and during the on-site audit (Reference 56) (that is, the documents reviewed, discussions held with the licensee and the plant tours performed), the NRC staff concludes that the licensee's statements of compliance are acceptable.

The following NFPA 805 Sections, identified in LAR B-1 Table as complying via this method, and the applicable NFPA 805, Chapter 3 implementation items in LAR Attachment S, Table S-3, required additional review by the NRC staff:

- 3.2.3(1)
- 3.2.3(3)
- 3.3.1.1(3)
- 3.3.1.3.4
- 3.3.4
- 3.3.5.1
- 3.3.5.2
- 3.3.5.3
- 3.3.7
- 3.3.9
- 3.3.10
- 3.4.1(b)
- 3.4.1(d)
- 3.4.2
- 3.4.2.1
- 3.4.2.2
- 3.4.4
- 3.8.1.2
- 3.10.8

NFPA 805, Section 3.2.3(1) requires that procedures be established for inspection, testing, and maintenance for fire protection systems. In LAR Attachment A, Table B-1, the licensee stated in the compliance basis that surveillance frequencies may be modified in accordance with the methodology in EPRI Technical Report No. TR1006756, "Fire Protection Equipment Surveillance Optimization and Maintenance Guide," (Reference 57). In FPE RAI 02, (Reference 20), the NRC staff requested that the licensee submit a request for approval to use the EPRI methods, in accordance with 10 CFR 50.48 (c)(2)(vii). In its response to FPE RAI 02 (Reference 10), the licensee provided an approval request and an action which is included in LAR Attachment S, Table S-3, Implementation Item 1. The NRC staff review of this request is documented in SE Section 3.1.4.1.

NFPA 805, Section 3.2.3(3), requires procedures to be established for performing reviews of the FPPs performance and trends. The licensee indicated that revisions will be made to plant documents to monitor and trend the FPP, that an NFPA 805 monitoring program evaluation will be developed to document the results of the scoping, screening, and risk target value determination, and that station procedures for fire protection impairments will be revised to reflect the results of the scoping and screening tasks. These actions are included in LAR Attachment S, Table S-3, Implementation Item 2. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3, and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.1.1(3), requires administrative controls to address the review of plant modifications and maintenance to ensure fire hazards and the impact on plant fire protection systems are minimized. In LAR Attachment A, Table B-1, the licensee identified the procedures used to meet this requirement. The licensee also identified an action to update plant documentation to ensure maintenance work packages are reviewed to ensure fire hazards and impact to all fire protection systems and features are minimized. This action is included in LAR Attachment S, Table S-3, Implementation Item 3. The NRC staff concludes that the licensee's statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3, and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.1.3.4, requires procedures to be established for controlling the use of portable electrical heaters in the plant, as well as the restriction of portable fuel-fired heaters in plant areas containing equipment important to nuclear safety. In LAR Attachment A, Table B-1, the licensee stated that procedures will be revised to "restrict portable fuel fired heaters from plant areas containing equipment important to nuclear safety." In FPE RAI 09 (Reference 20), the NRC staff requested that the licensee provide a description of how the procedural restrictions will meet the prohibition of fuel-fired equipment in plant areas containing equipment important to nuclear safety. In its response to FPE RAI 09 (Reference 10), the licensee stated that during the implementation phase of transition, the appropriate procedure(s) will be revised to include guidance that will clearly outline the requirements that will result in compliance with this NFPA 805 element. The licensee further stated that it does not currently use portable fuel fired heaters inside plant areas, so the exact wording of the procedural guidance will be determined during implementation and that Implementation Item 4 in LAR Attachment S, Table S-3 addresses this item. The NRC staff concludes that the licensee's response to the RAI and statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3, and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.4 requires that insulation materials be noncombustible. Insulation material includes thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials. In LAR Attachment A, Table B-1, the licensee identified the plant documents that ensure thermal insulation, temporary shielding, and duct insulation materials meet the requirements of the section. The licensee also identified an action to update plant documentation to address this design requirement for permanent shielding material or sound proofing materials (other than acoustical duct insulation). This action is included in LAR Attachment S, Table S-3, Implementation Item 5. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3, and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.5.1 requires wiring above suspended ceilings to be kept to a minimum and listed for plenum use, routed in armored cable, metallic conduit or cable trays with solid metal top and bottom covers. In LAR Attachment A, Table B-1, the licensee identified a LAR Attachment L request for approval of existing wiring above suspended ceilings. This approval request is discussed in detail in Section 3.1.4.2 of this SE. The licensee also identified an action to revise plant documentation to incorporate the requirements for electrical wiring above suspended ceilings for all future installations. This action is included in LAR Attachment S, Table S-3, Implementation Item 6. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3, and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.5.2 requires that metal tray and metal conduits be used for electrical raceways. The section also prohibits thin wall metallic tubing from being used for power, instrumentation or control cables, and flexible metallic conduit only be used in short lengths. In LAR Attachment A, Table B-1, the licensee stated that plant documentation requires either aluminum or galvanized steel materials for all exposed conduits, but the use of thin wall metallic tubing is not specifically prohibited. The licensee identified an action to revise plant documentation to specifically prohibit the use of thin wall tubing for electrical raceways, and require flexible metal conduit to only be used in short lengths to connect components. This action is included in LAR Attachment S, Table S-3, Implementation Item 7. The NRC staff concludes that the statement of compliance is acceptable because the licensee has plant documentation that specifies the use of metal conduits and the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.5.3 requires electrical cable construction to comply with a flame propagation test as acceptable to the AHJ. In LAR Attachment A, Table B-1, the licensee stated that cables purchased prior to the issuance of Institute of Electrical and Electronics Engineers (IEEE)-383 (Reference 58), were purchased under the requirements of the applicable Insulated Cable Engineers Association (ICEA) standard and an additional prototype flame test. In FPE RAI 07, (Reference 20), the NRC staff requested that the licensee provide the technical basis for the acceptability of the ICEA cables. In its response to FPE RAI 07, (Reference 10), the licensee stated that original cable purchased prior to the issuance of IEEE-383, was purchased under the requirements of ICEA S-19-81 (Reference 59) and an additional prototype flame test. The licensee further stated that it evaluated the tests performed and determined the existing design of cable at the time met the intent and requirements of IEEE-383 (which is to limit the combustibility of electric cables), and was therefore equivalent to meeting the guidance of BTP APCSB 9.5-1 (Reference 60). The licensee stated that:

> The Farley justification for the ICEA S-19-81 and the additional prototype flame test equivalency to IEEE-383 is documented in the Farley Fire Protection Program Reevaluation (FPPR) performed (with amendments) between 1977 and 1982. The NRC reviewed the FPPR and Amendments 1 through 4 as part of the Fire Protection Safety Evaluation Report (SER) dated February 12, 1979. The SER states that the staff reviewed the FPPR, which was submitted in response to the NRC request for Farley to compare its existing FPP against the guidance of Appendix A to BTP APCSB 9.5-1. The staff concluded in the SER that the FNP FPP meets the guidelines contained in Appendix A to BTP APCSB 9.5-1.

The licensee further stated that new and replacement cable is required to meet the IEEE-383 (1974) flame resistance test standard. The NRC staff concludes that the licensee's response to the RAI and statement of compliance are acceptable because the licensee provided an appropriate technical basis for the acceptability of the ICEA cables.

NFPA 805, Section 3.3.7 requires bulk compressed or cryogenic flammable gas storage to not be permitted inside structures housing systems, equipment, or components important to nuclear safety. In LAR Attachment A, Table B-1, the licensee identified the procedure that limits the storage of compressed gas cylinders to designated areas. The licensee also identified an action to update plant documentation to include wording to prevent bulk compressed or cryogenic flammable gas storage inside structures housing systems, equipment, or components important to nuclear safety. This action is included in LAR Attachment S, Table S-3, Implementation Item 8. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.9 requires the periodic inspection of transformer oil collection basins and drain paths. In LAR Attachment A, Table B-1, the licensee stated that transformers are provided with concrete curb dikes that drain to the open oil collection pit. The licensee identified an action to revise existing procedures to include inspection of oil collection basins and drain paths. This action is included in LAR Attachment S, Table S-3, Implementation Item 9. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.3.10 requires combustible liquids be kept from coming in contact with hot pipes and surfaces including insulated pipes. Administrative controls to require the prompt cleanup of oil on insulation is also required. In LAR Attachment A, Table B-1, the licensee stated that all spills of any kind are required to be cleaned up as soon as possible. The licensee also identified an action to update plant documentation to require prompt cleanup of oil on insulation. This action is included in LAR Attachment S, Table S-3, Implementation Item 10. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.1(b) requires that fire brigade members have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency. In LAR Attachment A, Table B-1, the licensee stated that plant documents "require a brigade on duty each shift", "but there is no discussion of the priority of the brigade's activities in comparison to their normal work day activities". The licensee identified an action to revise its fire brigade program documentation to clarify that fire brigade members shall have no other assigned normal plant duties that would prevent immediate response in the event of a plant fire or other emergency. This action is included in LAR Attachment S, Table S-3, Implementation Item 11. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.1(d) requires immediate notification of the fire brigade upon verification of a fire. In LAR Attachment A, Table B-1, the licensee stated that plant procedures direct an operator to notify the brigade after verification of a significant fire. To clarify this, the licensee identified an action to revise its procedures to define "significant fire", and ensure procedural alignment. This action is included in LAR Attachment S, Table S-3, Implementation Item 12. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.2 requires that current and detailed pre-fire plans be available for all areas in which a fire could jeopardize the ability to meet the performance criteria described in NFPA 805, Section 1.5. In LAR Attachment A, Table B-1, the licensee stated that plant documents provide an area drawing that shows fire barriers, hose stations, doors, and access points. The licensee also identified an action to create pre-fire plans that provide written text on a fire area basis and key safety-related equipment concerns for ventilation and heat or smoke sensitive equipment, to meet the requirements of NFPA 600 and NFPA 805, Section 1.5.2. This action is included in LAR Attachment S, Table S-3, Implementation Item 13. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.2.1 requires that pre-fire plans provide details including the fire area configuration and fire hazards along with any nuclear safety components and fire protection systems and features. In LAR Attachment A, Table B-1, the licensee stated that plant documents provide an area drawing that shows fire barriers, hose stations, doors and access points. The licensee also identified an action to review and update pre-fire plans to reflect the PB program. This includes review/inclusion of components necessary to achieve the NSPC which require entry to the affected area, and the equipment and portions of the fire affected area where RI/PB analysis rely on assumptions that could be affected by fire brigade performance. This action is included in LAR Attachment S, Table S-3, Implementation Item 14. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.2.2 requires pre-fire plans to be reviewed and updated as necessary. In LAR Attachment A, Table B-1, the licensee stated that fire area data sheets are tracked and updated, however there is no procedural requirement that they be reviewed and updated periodically. The licensee identified an action to update documentation to require that the fire area data sheets and drawings be tracked and updated. This action is included in LAR Attachment S, Table S-3, Implementation Item 15. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.4.4 requires that fire-fighting equipment be provided for the brigade and that the equipment conform to the applicable NFPA standards. In LAR Attachment A, Table B-1, the licensee stated that fire-fighting equipment is provided and complies with the appropriate standards at the time of manufacture. The licensee identified an action to revise existing procedures for the procurement of firefighting equipment to require that this equipment be procured and conform to the applicable NFPA standards. This action is included in LAR Attachment S, Table S-3, Implementation Item 16. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.8.1.2 requires that means to promptly notify the general site population, the fire brigade, other emergency responders, and off-site emergency response agencies of any fire emergencies in a way to allow them to determine an appropriate response. In LAR Attachment A, Table B-1, the licensee identified site procedures that describe the process to notify persons of a fire emergency. The licensee also identified an action to revise the implementing procedures to require two independent means of notifying the offsite fire emergency response agencies. This action is included in LAR Attachment S, Table S-3, Implementation Item 17. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

NFPA 805, Section 3.10.8 requires positive mechanical means to lock out total flooding carbon dioxide systems during work in the protected space. In LAR Attachment A, Table B-1, the licensee identified areas of the plant provided with total flooding systems. The licensee identified an action to enhance the procedures for tag-out of equipment to mechanically lock out a total flooding carbon dioxide system during work in the protected space. This action is included in LAR Attachment S, Table S-3, Implementation Item 18. The NRC staff concludes that the statement of compliance is acceptable because the licensee identified a required action that will incorporate the provisions of NFPA 805, Chapter 3 and included the action as an implementation item in LAR Attachment S, which would be required by the proposed license condition.

The NRC staff concludes that the licensee's statements of compliance are acceptable because the associated actions as described in LAR Attachment A and listed in LAR Attachment S, for the individual attributes described above, as well as the statements that these items will be completed prior to implementation, are acceptable because completion of the implementation items will bring these attributes into compliance with the requirements of NFPA 805 and would be required by the proposed license condition.

3.1.1.2 Compliance Strategy -- Complies with Clarification

For NFPA 805 Chapter 3 Sections 3.4.2.4 and 3.11.3(3), the licensee provided additional clarification when describing its means of compliance with the fundamental FPP element. The NRC staff reviewed the additional clarifications and concludes that the licensee will meet the underlying requirement for the FPP element as clarified.

3.1.1.3 Compliance Strategy -- Complies with Use of EEEEs

For certain NFPA 805, Chapter 3 requirements, the licensee demonstrated compliance with the fundamental FPP element through the use of existing EEEEs. The NRC staff reviewed the licensee's statement of continued validity for the EEEEs and the statement on the quality and appropriateness of the evaluations, and concludes that the licensee's statements of compliance are acceptable because the licensee provided an appropriate technical basis for the means of compliance.

The following NFPA 805 section identified in LAR Attachment A, Table B-1 as complying via this method required additional review by the NRC staff:

- 3.11.2

NFPA 805 Section 3.11.2 provides requirements for fire barriers. The compliance statement for this attribute does not address how physical boundaries meet the requirements for fire barriers. In FPE RAI 08 (Reference 20), the NRC staff requested that the licensee provide a description of how the requirements for fire barriers are met. In its response to FPE RAI 08 (Reference 10), the licensee stated that fire barriers required for fire area separation are either three-hour rated barriers or evaluated as adequate for the hazard. The licensee further stated that this information, including the rating of each barrier, is documented in the plant calculation used to define the physical boundary units of fire areas, fire zones, and/or rooms to support the NFPA 805 transition and FPRA development. The NRC staff concludes the licensee's response to the RAI and statements of compliance are acceptable because physical boundaries, which define fire areas, fire zones and/or rooms, are separated by barriers that have specific fire resistance ratings, in accordance with NFPA 805 Section 3.11.2 or have been determined to be adequate for the hazard based on an EEEE, and are documented in plant calculations.

3.1.1.4 Compliance Strategy -- Complies via Previous NRC Approval

Certain NFPA 805, Chapter 3 requirements were supplanted by an alternative that was previously approved by the NRC. The approval was documented in the original 1979 FPP Safety Evaluation Report (Reference 61).

The licensee evaluated the basis for the original NRC approval and determined that in all cases the bases are still valid. The NRC staff reviewed the information provided by the licensee and concludes that previous NRC approval had been demonstrated using suitable documentation that meets the approved guidance contained in RG 1.205, Revision 1 (Reference 4). Based on the licensee's justification for the continued validity of the previously approved alternatives to the NFPA 805, Chapter 3 requirements, the NRC staff concludes that the licensee's statements of compliance in these instances are acceptable because the licensee provided an appropriate technical basis for the means of compliance.

3.1.1.5 Compliance Strategy -- Submit for NRC Approval

The licensee also requested approval for the use of PB methods to demonstrate compliance with fundamental FPP elements. In accordance with 10 CFR 50.48(c)(2)(vii), the licensee requested specific approvals be included in the license amendment approving the transition to NFPA 805. The NFPA 805 sections identified in LAR Attachment A, Table B-1, as complying via this method are as follows:

- NFPA 805, Section 3.2.3(1), which concerns establishing procedures for PB inspection, testing, and maintenance for fire protection systems and features. The licensee requested the use of EPRI Technical Report TR1006756, "Fire Protection Equipment Surveillance Optimization and Maintenance Guide," to modify fire protection system surveillance frequencies. This approval request was added by the licensee in response to FPE RAI 02. See SE Section 3.1.4.1.

- NFPA 805, Section 3.3.5.1, which concerns wiring above suspended ceilings, and the requirement that this wiring be listed for plenum use, routed in armored cable, routed in metallic conduit or routed in cable trays with solid metal top and bottom covers. The licensee requested approval to use PB methods to demonstrate an equivalent level of fire protection for the existence of wiring which does not meet the criteria of NFPA 805, Section 3.3.5.1. See SE Section 3.1.4.2.

- NFPA 805, Section 3.3.5.2, which concerns the use of metal tray and metal conduit for electrical raceways. The licensee requested approval for the use of plastic embedded conduit installations. See SE Section 3.1.4.3.

- NFPA 805, Section 3.3.12(1), which concerns the lubricating oil collection system for reactor coolant pumps. The licensee requested approval to not include oil misting in the scope of this requirement. See SE Section 3.1.4.4.

- NFPA 805, Section 3.5.15, which concerns hydrant and hose house spacing. The licensee requested approval to use PB methods to demonstrate an equivalent level of fire protection for the hydrant spacing that does not meet the criteria of NFPA 805 Section 3.5.15. See SE Section 3.1.4.5.

- NFPA 805 Section 3.5.16, which concerns the dedication of fire protection water supply for fire protection use only. The licensee requested approval for the use of fire protection system water for plant evolutions other than fire protection. See SE Section 3.1.4.6.

As discussed in SE Section 3.1.4 below, the NRC staff concludes that the use of PB methods to demonstrate compliance with these fundamental FPP elements is acceptable.

3.1.1.6 Compliance Strategy -- Multiple Strategies

In certain compliance statements of the NFPA 805, Chapter 3 requirements, the licensee used more than one of the above strategies to demonstrate compliance with aspects of the fundamental elements.

In each of these cases, the NRC staff concludes that the individual compliance statements are acceptable, that the combination of compliance strategies is acceptable, and that holistic compliance with the NFPA 805 Chapter 3 fundamental FPP elements and minimum design requirements is assured.

The following NFPA 805 sections identified in LAR Attachment A, Table B-1 as complying via this method required additional review by the NRC staff:

- 3.3.5.2

NFPA 805, Section 3.3.5.2 contains the requirements for electrical raceway construction (i.e., metal trays and conduits). In LAR Attachment A, Table B-1, the compliance basis indicates compliance as well as a request for formal approval of a PB method for existing embedded conduit configurations. In FPE RAI 03 (Reference 20) the NRC staff requested that the licensee describe how the requirements of NFPA 805, Section 3.3.5.2 for non-embedded configurations are met. In its response to FPE RAI 03 (Reference 10) the licensee stated that the compliance basis for current and future installations, both embedded and non-embedded configurations, is "complies", since the FNP conduit details require either aluminum or galvanized steel for all exposed/non-embedded electrical raceways. The licensee further stated that the FNP conduit details require embedded conduit to be galvanized steel or PVC. The approval request is specifically for the application of PVC conduit in embedded configurations. The NRC staff concludes that the licensee's response to the RAI and statement of compliance is acceptable because the licensee uses metal, either aluminum or galvanized steel for electrical raceway construction which meets the requirement of NFPA 805, Section 3.3.5.2. The approval request for the use of PVC Conduit in embedded configurations is discussed in SE Section 3.1.4.3.

3.1.1.7 Chapter 3 Sections Not Reviewed

Some NFPA 805, Chapter 3 sections either do not apply to the transition to a RI/PB FPP or have no technical requirements. Accordingly, the NRC staff did not review these sections for acceptability. The sections that were not reviewed fall into one of the following categories:

- Sections that do not contain any technical requirements. (e.g., NFPA 805 Sections 3.4.5 and 3.11).
- Sections that are not applicable because of the following:
  - The licensee stated that they do not have systems of this type installed (NFPA 805, Section 3.3.8 which applies to bulk storage of flammable and combustible liquids) and Section 3.10.1(3) which applies to clean agent fire extinguishing systems).
  - The type of system, while installed, is not required under the RI/PB FPP (NFPA 805 Section 3.10.4 which applies to areas that are required to be protected by both primary and backup gaseous fire suppression systems).
  - The requirements are structured with an applicability statement (e.g., NFPA 805 Section 3.3.12, which applies to reactor coolant pumps in non-inerted containments, or Sections 3.4.1(a)(2) and 3.4.1(a)(3), which applies to the fire brigade standards used since they depend on the type of brigade specified in the FPP).

3.1.1.8 Compliance with Chapter 3 Requirements Conclusion

As discussed above, the NRC staff evaluated the results of the licensee's assessment of the proposed RI/PB FPP against the NFPA 805, Chapter 3, fundamental FPP elements and minimum design requirements, as modified by the exceptions, modifications, and supplementations in 10 CFR 50.48(c)(2). Based on this review of the licensee's submittal, as supplemented, the NRC staff concludes that the RI/PB FPP is acceptable with respect to the fundamental FPP elements and minimum design requirements of NFPA 805, Chapter 3, as modified by 10 CFR 50.48(c)(2), because the licensee:

- Used an overall process consistent with NRC staff approved guidance to determine the state of compliance with each of the applicable NFPA 805, Chapter 3 requirements.

- Provided appropriate documentation of the state of compliance with the NFPA 805, Chapter 3 requirements, which adequately demonstrated compliance in that the licensee was able to substantiate that it complied:
  - With the requirement directly, or with the requirement directly after the completion of an implementation item.
  - With the intent of the requirement (or element) and adequate justification was provided.
  - Via previous NRC staff approval of an alternative to the requirement.
  - Through the use of an EEEE.
  - Through the use of a combination of the above methods.
  - Through the use of a PB method that the NRC staff has specifically approved in accordance with 10 CFR 50.48(c)(2)(vii).

3.1.2 Identification of Power Block

The NRC staff reviewed the licensee's structures identified in LAR Attachment I, Table I-1 "Definition of Power Block" as comprising the "power block." The plant structures listed are established as part of the power block for the purpose of denoting the structures and equipment included in the RI/PB FPP that have additional requirements in accordance with 10 CFR 50.48(c) and NFPA 805. As stated in LAR, Section 4.1.3, power block and plant refer to structures that have equipment required for nuclear plant operations, such as containment, auxiliary building, service building, control building, fuel building, radioactive waste, water treatment, turbine building, and intake structures or structures that are identified in the facility's pre-transition licensing basis. The NRC staff concludes that the licensee evaluated the structures and equipment to adequately document the list of those structures that fall under the definition of "power block" in NFPA 805.

3.1.3 Closure of GL 2006-03, "Potentially Nonconforming Hemyc and MT Fire Barrier Configurations"

GL 2006-03 requested that licensees evaluate their facilities to confirm compliance with existing applicable regulatory requirements in light of the results of NRC testing that determined that both Hemyc and MT fire barriers failed to provide the protective function intended for compliance with existing regulations, for the configurations tested using the NRC's thermal acceptance criteria. In a letter dated June 9, 2006 (Reference 62), the licensee stated that FNP does not have any Hemyc or MT fire barrier material installed on site. Since Hemyc and MT electrical raceway fire barrier systems (ERFBS) are not used, the NRC staff concludes that the generic issue (GL 2006-03) (Reference 43), related to the use of these ERFBS is not applicable.

3.1.4 Performance-Based Methods for NFPA 805, Chapter 3 Elements

In accordance with 10 CFR 50.48(c)(2)(vii), a licensee may request NRC approval for use of the PB methods permitted elsewhere in the standard as a means of demonstrating compliance with the prescriptive NFPA 805, Chapter 3, fundamental FPP elements and minimum design requirements. Paragraph 50.48(c)(2)(vii) of 10 CFR requires that an acceptable PB approach accomplish the following:

(A) Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;

(B) Maintains safety margins; and

(C) Maintains fire protection DID (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

NFPA 805, Section 1.3.1 "Nuclear Safety Goal," states that:

> 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.

NFPA 805, Section 1.3.2 "Radioactive Release Goal," states that:

> The radioactive release goal is to provide reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment.

NFPA 805, Section 1.4.1, "Nuclear Safety Objectives," states that:

> In the event of a fire during any operational mode and plant configuration, the plant shall be as follows:
>
> (1) *Reactivity Control.* Capable of rapidly achieving and maintaining subcritical conditions.
>
> (2) *Fuel Cooling.* Capable of achieving and maintaining decay heat removal and inventory control functions.
>
> (3) *Fission Product Boundary.* Capable of preventing fuel clad damage so that the primary containment boundary is not challenged.

NFPA 805, Section 1.4.2 "Radioactive Release Objective," states that:

> Either of the following objectives shall be met during all operational modes and plant configurations.
>
> (1) Containment integrity is capable of being maintained.

(2) The source term is capable of being limited.

NFPA 805, Section 1.5.1 "Nuclear Safety Performance Criteria," states 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. 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) *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 for a PWR and 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.

NFPA 805, Section 1.5.2 "Radioactive Release Performance Criteria," states that:

> 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.

In LAR Attachment L, "NFPA 805, Chapter 3 Requirements for Approval (10 CFR 50.48(c)(2)(vii)," the licensee requested NRC staff review and approval of PB methods to demonstrate an equivalent level of fire protection for the requirement of the elements identified in SE Section 3.1.1.5. The NRC staff evaluation of these proposed methods is provided below.

3.1.4.1 NFPA 805, Section 3.2.3(1) – Inspection Testing and Maintenance Procedures

NFPA 805 Section 3.2.3(1) requires that procedures be implemented for inspection, testing, and maintenance of fire protection systems and features credited by the FPP. In response to FPE RAI 02 (Reference 10), the licensee requested to use a PB method to establish inspection, testing, and maintenance frequencies for fire protection systems and features required by NFPA 805.

The licensee stated that PB inspection, testing, and maintenance frequencies will be established as described in EPRI Technical Report TR1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features," Final Report, July 2003 (Reference 57). The licensee also stated that fire protection surveillance, test or inspection frequencies will not be revised until after transitioning to NFPA 805; that existing fire protection surveillance, test and inspection will remain consistent with applicable FSAR, Insurer, and NFPA code requirements; and, that EPRI TR1006756 will be used in the future as opportunities arise. The licensee included an action in LAR Attachment S, Table S-3, Implementation Item 1 to update the appropriate fire protection program documents to provide a requirement that if it elects to implement the methodologies in EPRI Report TR1006756, that they will be implemented in their entirety as they pertain to the fire protection systems or features being evaluated. The licensee included this action in LAR Attachment S, Table S-3, Implementation Item 1 and the NRC staff considers this acceptable because the action will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

The licensee stated that this request is specific to the use of EPRI TR1006756 to establish the appropriate inspection, testing, and maintenance frequencies for fire protection systems and features credited by the FPP. The licensee further stated that this request does not include the use of EPRI TR1006756 to establish the scope of those activities as that is determined by the required systems review identified in LAR Attachment C, Table 4-3.

The licensee stated that the target inspections, tests, and maintenance will be those activities for the NFPA 805 required fire protection systems and features and that the reliability and frequency goals will be established to ensure the assumptions in the NFPA 805 engineering analysis remain valid. The licensee further stated that the failure criterion will be established based on the required credited functions and will ensure those functions are maintained and that the failure probability and confidence level will be determined based on EPRI TR1006756 guidance and a 95 percent confidence level will be utilized. The licensee further stated that performance monitoring will be performed in conjunction with the monitoring program required by NFPA 805 Section 2.6 and it will ensure site-specific operating experience is considered in the monitoring process.

The licensee stated that the use of PB test frequencies established per EPRI TR1006756 methods combined with NFPA 805 Section 2.6, Monitoring Program, will ensure that the availability and reliability of the fire protection systems and features are maintained to the levels assumed in the NFPA 805 engineering analysis and therefore, there is no adverse impact to NSPC.

The licensee stated that the radiological release performance criteria are satisfied based on the determination of limiting radioactive release and that fire protection systems and features may be credited as part of that evaluation. The licensee further stated that use of PB test frequencies established per the EPRI TR1006756 methods combined with NFPA 805, Section 2.6, Monitoring Program, will ensure that the availability and reliability of the fire protection systems and features are maintained to the levels assumed in the NFPA 805 engineering analysis which includes those assumptions credited to meet the radioactive release performance criteria, and therefore, there is no adverse impact to the radioactive release performance criteria.

The licensee stated that the use of PB test frequencies established per EPRI TR1006756 methods combined with NFPA 805, Section 2.6, Monitoring Program, will ensure that the availability and reliability of the fire protection systems and features are maintained to the levels assumed in the NFPA 805 engineering analysis which includes those assumptions credited in the FRE safety margin discussions. Further, the use of these methods in no way invalidates the inherent safety margins contained in the codes and standards used for design and maintenance of fire protection systems and features and therefore, the safety margin inherent and credited in the analysis has been preserved.

The licensee stated that the three echelons of DID are 1) to prevent fires from starting (combustible/hot work controls), 2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans), and 3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that echelon 1 is not affected by the use of the EPRI TR1006756 methods and that the use of PB test frequencies combined with NFPA 805 Section 2.6, Monitoring Program, will ensure that the availability and reliability of the fire protection systems and features credited for DID are maintained to the levels assumed in the NFPA 805 engineering analysis and therefore, there is no adverse impact to echelons 2 and 3 for DID.

Based on its review of the LAR, as supplemented, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.2.3(1) requirement because it satisfies the performance goals, objectives, and criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains sufficient safety margin, and maintains adequate DID.

3.1.4.2 NFPA 805, Section 3.3.5.1 – Wiring Above Suspended Ceilings

In LAR Attachment L, Approval Request 1 the licensee identified wiring above suspended ceilings in the Auxiliary Building office areas and the Control Room, including associated offices that may not comply with the requirements of NFPA 805, Section 3.3.5.1, regarding cable jacket insulation.

NFPA 805 Section 3.3.5.1 requires that, where wiring is installed above suspended ceilings the electrical wiring be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers. The licensee requested approval of a PB method to justify the use of limited quantities of wiring/cabling which do not meet the criteria of NFPA 805, Section 3.3.5.1. The licensee stated that wiring exists above suspended ceilings in the control room and associated offices, the Technical Support Center (TSC), Auxiliary Building corridors and office areas; and Unit 1 and 2 Computer Rooms.

The licensee stated that the Auxiliary Building corridors and office areas have pre-action sprinkler systems installed above and below the suspended ceilings where power cables are installed in trays without solid metal covering. Further, areas not protected with a pre-action sprinkler system, contain only low voltage control and instrumentation cables, or power cables routed in metallic conduit and that the potential for a cable short developing and providing an ignition source is low. The licensee further stated that power and control cabling is also installed above the suspended ceilings in the Control Room and associated offices and that only low power level circuits and circuits required to support Control Room systems are routed in the Control Room. Heavy power circuits are routed entirely in rigid conduit and that this design, in conjunction with the absence of other significant sources of ignition, further reduces the potential of a Control Room fire. The licensee further stated that the areas outside the Control Room, such as the kitchen as well as surrounding rooms and the technical support center, contain minimal power cables above the suspended ceiling, but due to the proximity to the continuously occupied Control Room spaces, it is unlikely that a fire could develop undetected. The majority of cables installed in the computer rooms are control and instrumentation cables, with a few 120V power cables installed. The licensee also stated that the computer rooms have total flooding Halon systems installed in the areas with suspended ceilings which ensure that the area is protected in the unlikely event that a fire develops.

The licensee stated that the wiring above suspended ceilings does not affect nuclear safety and that power and control cables comply, or comply with the intent of NSPC (which is that fire protection features provide reasonable assurance that in the event of a fire, the plant is not placed in an unrecoverable condition). The licensee further stated that other wiring, while it may not be in armored cable, in metallic conduit, or plenum rated, is low voltage cable not susceptible to shorts that would result in a fire and, therefore, there is no impact on NSPC.

The licensee stated that the location of cables above suspended ceilings has no impact on the radiological release performance criteria and that the radiological review was performed based on the potential location of radiological concerns and is not dependent on the type of cables or locations of suspended ceilings. The licensee further stated that the cables do not change the results of the radiological release evaluation performed that concluded that potentially contaminated water is contained and smoke is monitored and that the cables do not add additional radiological materials to the area or challenge systems boundaries.

The licensee stated that power and control cables meet the requirements or the intent of safety margin and DID; and that other wiring, while it may not be in armored cable, in metallic conduit, or plenum rated, is low voltage cable not susceptible to shorts that would result in a fire and that the areas and the cables have been analyzed in their current configuration, and therefore, the inherent safety margin and conservatisms in these analysis remain unchanged.

The licensee stated that the three echelons of DID are 1) to prevent fires from starting (combustible/hot work controls), 2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans), and 3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that echelon 1 is maintained by the cable installation procedures documenting the requirements of NFPA 805, Section 3.3.5.1. The licensee further stated that the cables routed above suspended ceilings, do not result in compromising the automatic fire suppression functions, the manual fire suppression functions, or the post-fire SSD capability, and that the introduction of cables above suspended ceilings does not affect echelons 2 and 3.

Based on its review of the LAR, as supplemented, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.5.1 requirement because it satisfies the performance goals, objectives, and criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains sufficient safety margin, and maintains adequate DID.

3.1.4.3 NFPA 805, Section 3.3.5.2 – Metal Tray and Metal Conduit for Electrical Raceways

In LAR Attachment L, Approval Request 2, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirement of NFPA 805, Section 3.3.5.2.
NFPA 805 Section 3.3.5.2 requires that only metal tray and metal conduit be used for electrical raceways. The licensee requested approval of a PB method to justify the use of plastic conduits for embedded installations.

The licensee stated that plastic conduits for embedded installations are required to be of a type suitable for the intended use, and access points are required to be either aluminum or galvanized steel materials. The licensee further stated that while a combustible material, the plastic conduits, when embedded in concrete, are protected from mechanical damage and from damage resulting from either an exposure fire or from a fire within the conduit impacting other targets.

The licensee stated that the use of plastic conduit in embedded locations does not affect nuclear safety as the material in which conduits are run within an embedded location are not subject to the failure mechanisms that potentially result in circuit damage or damage to external targets, and therefore, there is no impact on NSPC.

The licensee stated that the use of plastic conduit in embedded installations has no impact on the radiological release performance criteria and that the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials and is not dependent on the type of conduit material. The licensee further stated that the conduit material does not change the radiological release evaluation, which concluded that potentially contaminated water is contained and smoke is monitored and that the conduits do not add additional radiological materials to the area or challenge system boundaries.

The licensee stated that the plastic conduit material is embedded in non-combustible configurations and the material is protected when embedded from mechanical damage and from damage resulting from either an exposure fire or from a fire within the conduit impacting other targets. The licensee further stated that the areas with plastic conduit have been analyzed in their current configuration and that the precautions and limitations on the use of these materials do not impact the analysis of the fire event and therefore, the inherent safety margin and conservatisms in these methods remain unchanged.

The licensee stated that the three echelons of DID are 1) to prevent fires from starting (combustible/hot work controls), 2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans), and 3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that the plastic conduit is embedded in non-combustible installations therefore echelon 1 is not impacted. The licensee further stated that the plastic conduit does not directly result in compromising automatic or manual fire suppression, or post-fire safe shutdown (SSD) capability, and therefore echelons 2 and 3 are not impacted.

Based on its review of the LAR, as supplemented, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.5.2 requirement because it satisfies the performance goals, objectives, and criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains sufficient safety margin, and maintains adequate DID.

3.1.4.4 NFPA 805, Section 3.3.12(1) – Reactor Coolant Pumps

In LAR Attachment L, Approval Request 3, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirement of NFPA 805, Section 3.3.12(1) regarding the oil collection system for each reactor coolant pump.

NFPA 805 Section 3.3.12(1) requires the oil collection system for reactor coolant pumps (RCPs) be designed and installed such that leakage from the oil system is safely contained for off normal conditions such as accident conditions or earthquakes. The licensee requested approval for the potential of oil misting from the RCPs due to normal motor operation. The oil collection system was designed and reviewed in accordance with 10 CFR 50, Appendix R, Section III.O, to collect leakage from credible pressurized and non-pressurized leakage sites in the RCP system, which may not include collection of oil mist.

The licensee stated that oil misting is not leakage due to equipment failure, but inherent in the operation of large open motors and that it is normal for large motors to lose some oil through seals and the oil to potentially become 'atomized' by ventilation air flow. The licensee further stated that this atomized oil mist can then collect on surfaces in the vicinity of the RCP as the pump design is not completely sealed to permit airflow for cooling. The licensee further stated that the oil mist resulting from normal operation will not adversely impact the ability of a plant to achieve and maintain SSD even if ignition occurred. The licensee further stated that each primary coolant loop has a single RCP and they are not required to achieve and maintain SSD.

The licensee stated that Generic Letter (GL) 86-10, dated April 24, 1986, response to industry question no. 6.2 discussed oil dripping and that the response concluded that there was no concern with oil consumption (which is an oil misting phenomenon), but the concern was with an oil fire started from a pressurized leakage point and/or spilled oil.

The licensee stated that the oil mist resultant from normal operations will not adversely impact nuclear safety and that the reactor coolant pumps are not required to achieve or maintain post-fire SSD, and therefore, there is no impact on NSPC.

The licensee stated that the potential for oil mist from the reactor coolant pumps has no impact on the radiological release performance criteria. The licensee further stated that the radiological release review was performed based on the manual fire suppression activities in areas containing or potentially containing radioactive materials and that the entire Reactor Building in which the reactor coolant pumps are located is an environmentally sealed radiological area. The licensee further stated that oil mist does not add additional radiological materials to the area or challenge system boundaries.

The licensee stated that oil mist resultant from normal operation will not adversely impact the ability of the plant to achieve and maintain post-fire SSD even if ignition occurred, and that the reactor coolant pumps are not required to achieve and maintain fire SSD. Further, the reactor building has been analyzed in the current configuration and the precautions and limitations on potential oil misting do not impact the analysis of fire events and therefore, the inherent safety margin and conservatism in the analysis methods remain unchanged.

The licensee stated that the three echelons of DID are 1) to prevent fires from starting (combustible/hot work controls), 2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans), and 3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that the potential for oil mist from RCPs does not impact fire protection DID and that echelon 1 is maintained by the oil collection system and RCP design. The licensee further stated that introduction of small amounts of oil misting does not affect echelons 2 and 3 and that the potential for oil mist from the RCPs does not result in compromising manual fire suppression functions, or post-fire SSD capability.

Based on its review of the LAR, as supplemented, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.3.12(1) requirement because it satisfies the performance goals, objectives, and criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains sufficient safety margin, and maintains adequate DID.

3.1.4.5 NFPA 805, Section 3.5.15 – Hydrant Spacing

In LAR Attachment L, Approval Request 4, the licensee requested NRC staff review and approval of a PB method to demonstrate an equivalent level of fire protection for the requirements of NFPA 805, Section 3.5.15 regarding hydrant installation and separation.

NFPA 805 Section 3.5.15 requires that hydrants be installed approximately every 250 ft. apart on the yard main system. The licensee requested PB hydrant installation in intervals separated by approximately 250 to 300 ft.

The licensee stated that the yard fire main loop completely encircles the power block and the cooling towers and that sufficient water is supplied (i.e., flow, pressure and duration) to meet the largest suppression system demand including an allowance for hose streams. In addition, fire hoses, nozzles and auxiliary equipment are available in the hydrant houses or furnished on the mobile fire equipment trailer that may be used at any fire hydrant that is accessible. The licensee further stated that the physical locations of fire hydrants are near each major plant structure, and are spaced to provide a minimum of two hose streams capable of reaching the power block structures. Further, the fire hydrants and associated equipment are furnished in sufficient numbers and locations to enable water flow to be delivered to all exterior sides of important structures on the plant site.

In FPE RAI 04 (Reference 20) the NRC staff requested that the licensee demonstrate that manual fire-fighting capability is adequate where hydrants are spaced greater than 250 ft. apart. In response to FPE RAI 04 (Reference 10), the licensee stated that the addition of 50 ft. of distance between hydrants, (250 to 300 ft.) does not impact manual fire-fighting capabilities because the fire brigade is highly trained and equipped with the appropriate equipment. The licensee further stated that hose houses and a fire brigade van are stocked with support equipment including 250 ft. of 2-1/2 in. hose in the hose house and an additional 500 ft. of 2-1/2 in. hose in the van, that together provide adequate fire hose to overcome yard spacing. Further, the connection of an additional 50 ft. of 2-1/2 in. fire hose to overcome the hydrant spacing does not degrade the ability to provide an effective hose stream. The licensee stated that the friction loss through an additional 50 ft. of hose providing 250 gpm is approximately 6.25 psi and that typical firefighting hose stream demands do not exceed 100 psi and 250 gpm. The licensee further stated that its fire water system is capable of providing 2,500 gpm at 125 psi from the fire pump and that if a hose stream is required from a water source where the hydrant spacing is up to 300 feet (and an additional length of fire hose is required), adequate pressure and flow is available to provide effective hose streams. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated the ability to provide adequate manual firefighting capability where hydrants are spaced greater than 250 ft. apart.

The licensee stated the spacing of yard fire hydrants at an interval of approximately 250 to 300 ft. does not result in a loss of coverage for the yard fire hydrant system. In addition, the licensee further stated that the as-installed spacing of the fire hydrants is such that manual firefighting efforts will be successful when needed and therefore, there is no impact on NSPC.

The licensee stated that the radiological review was performed based on fire suppression activities in areas containing or potentially containing radioactive materials. The licensee further stated that the spacing of the fire hydrants does not change the radiological release evaluation performed that concluded that potentially contaminated water is contained and smoke is monitored and therefore, the radiological release performance criteria are satisfied based on the determination of limiting radioactive release.

The licensee stated that the evaluation demonstrates that the spacing of fire hydrants at intervals of approximately 250 to 300 ft. has no impact on the ability of the yard hydrant system to support manual firefighting activities when needed and that the yard hydrants do not perform a nuclear safety function, and therefore, the safety margin inherent in the analysis for a fire event has been preserved.

The licensee stated that the three levels of DID are 1) to prevent fires from starting (combustible/hot work controls), 2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic and manual fire suppression, and pre-fire plans), and 3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that sufficient coverage is provided by the yard hydrant system to support manual firefighting activities and therefore the spacing of hydrants does not adversely impact echelons 1, 2, or 3 of fire protection DID.

Based on its review of the LAR, as supplemented, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.5.15 requirement because it satisfies the performance goals, objectives, and criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains sufficient safety margin, and maintains adequate DID.

3.1.4.6 NFPA 805, Section 3.5.16 – Dedicated Use of Fire Protection Water Supply

In LAR Attachment L, Approval Request 5, the licensee requested NRC staff review and approve a PB method to demonstrate an equivalent level of fire protection for the requirements of NFPA 805, Section 3.5.16 regarding the dedication of fire protection water supply for fire protection use only.

NFPA 805, Section 3.5.16 requires that the fire protection water supply be dedicated for fire protection use only. The licensee requested approval for the use of the fire protection water supply and distribution system as an alternate cooling water source if there is no other available cooling source for the charging pumps, and for manual wash down and flushing of the Circulating Water System components.

The licensee stated that the use of the fire protection system to provide an emergency supply of cooling water to the charging pumps oil cooler is controlled by the loss of Component Cooling Water (CCW) Abnormal Operating Procedure and is desirable to decrease the CDF from a seal loss-of-coolant accident (LOCA) due to the loss of CCW. The licensee stated that this action ensures continued availability of at least one charging pump if CCW cooling is lost and cannot be recovered. The licensee further stated that this potential use of fire protection water supply has been previously acknowledged by the NRC staff in the memorandum dated February 26, 1996, "Staff Review of the Individual Plant Examination (IPE) Submittal for Internal Events and Floods for the Joseph M. Farley Nuclear Plants, Units 1 and 2 (TAC Nos. M74408 and M74409)." Further, this use of the fire protection system would only be required in an emergency situation involving the loss of CCW and is procedurally controlled and implemented by the Shift Manager. The licensee also stated that the flow required by the CCW pump oil coolers is not significant compared to the 2500 gal/min capacity of the fire protection water supply, which is designed with 259 gal/min margin above the most hydraulically demanding scenario and therefore, this emergency use of the fire protection water system will not adversely impact the ability of the water supply system to perform its design function.

In FPE RAI 05 (Reference 20), the NRC staff requested that the licensee describe the hydraulic demand required for the non-fire suppression activity and also discuss any administrative controls used to ensure the fire water system is available to perform its design function when needed. In its response to FPE RAI 05 (Reference 10), the licensee stated that the use of the fire protection water system for manual wash down and flushing of CWS components is not an essential plant function that requires performance during a fire event and that termination of non-fire protection uses permits hydraulic demands for the fire event to be met. The licensee also stated that there is no documented procedural guidance on the use of fire water for manual wash down and flushing of the CWS components and that it will generate guidance as part of NFPA 805 implementation. The licensee included the action to develop procedural guidance on the use of the fire protection system for non-fire protection purposes in LAR Attachment S, Table S-3, Implementation Item 35.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee explained that non-fire protection use of the system will be terminated during a fire event permitting the hydraulic demands of the system to be met for firefighting, and because the licensee included an action that will incorporate the provisions of NFPA 805 in the FPP and the action would be required by the proposed license condition.

The licensee stated that the use of the fire protection water supply and distribution system as a water supply for the manual wash down and flushing of the Circulating Water System components is acceptable because Control Room personnel have the ability to secure this non-fire protection water demand by directing usage to be terminated should a fire occur. The licensee further stated that a design margin of 259 gal/min exists between the system design capability and the demand of the most hydraulically challenging fire scenario which exceeds the flow required for the manual wash down of the Circulating Water System Components and therefore, flow will be available for any fire suppression water demands when needed.

The licensee stated that the non-fire use of the fire protection water system requires Shift Manager review and concurrence and that due to the design margins built in to the system, there is minimal impact on the ability of the fire protection water supply system to immediately respond to a fire suppression demand. The licensee further stated that the ability to isolate the non-fire protection flows ensures there is no impact on the fire protection water supply to perform its design function of supplying water for both automatic and manual suppression activities and therefore, there is no impact on NSPC.

The licensee stated that the radiological review was performed based on fire suppression activities in areas containing or potentially containing radioactive materials and that the scenarios involved with these non-fire uses of the fire water system do not contain or potentially contain radioactive materials. Further, the use of the fire water system for purposes other than fire protection water supply does not change the radiological release evaluation performed that concluded that potentially contaminated water is contained and smoke is monitored and therefore, the radiological release performance criteria are satisfied based on the determination of limiting radioactive release.

The licensee stated that the three levels of DID are 1) to prevent fires from starting (combustible/hot work controls), 2) rapidly detect, control and extinguish fires that do occur thereby limiting damage (fire detection systems, automatic and manual fire suppression, and pre-fire plans), and 3) provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, RAs). The licensee stated that both automatic and manual fire suppression functions are not adversely impacted and will be available when needed and therefore, the non-fire uses of the fire water system do not adversely impact fire protection safety margin and DID.

Based on its review of the LAR, as supplemented, and in accordance with 10 CFR 50.48(c)(2)(vii), the NRC staff concludes that the proposed PB method is an acceptable alternative to the corresponding NFPA 805, Section 3.5.16 requirement because it satisfies the performance goals, objectives, and criteria specified in NFPA 805 related to nuclear safety and radiological release, maintains sufficient safety margin, and maintains adequate DID.

3.2 Nuclear Safety Capability Assessment (NSCA) Methods

NFPA 805 (Reference 3) is a RI/PB standard that allows engineering analyses to be used to show that FPP features and systems provide sufficient capability to meet the requirements of 10 CFR 50.48(c).

NFPA 805, Section 2.4, "Engineering Analyses," states that:

> 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... 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 threshold defined in Section [2.5] for the plant area being analyzed.

Chapter 1 of the standard defines the goals, objectives and performance criteria that the FPP must meet in order to be in accordance with NFPA 805.

NFPA 805, Section 1.3.1 "Nuclear Safety Goal," states that:

> 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.

NFPA 805, Section 1.4.1 "Nuclear Safety Objectives," states that:

> In the event of a fire during any operational mode and plant configuration, the plant shall be as follows:
>
> (1) *Reactivity Control.* Capable of rapidly achieving and maintaining subcritical conditions;
>
> (2) *Fuel Cooling.* Capable of achieving and maintaining decay heat removal and inventory control functions; and
>
> (3) *Fission Product Boundary.* Capable of preventing fuel clad damage so that the primary containment boundary is not challenged.

NFPA 805, Section 1.5.1 "Nuclear Safety Performance Criteria," states 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. 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) *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 sub-cooling is maintained for a PWR [pressurized water reactor] and shall be capable of maintaining or rapidly

restoring reactor water level above top of active fuel for a BWR [boiling water reactor] 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; and

(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.

3.2.1 Compliance with NFPA 805 Nuclear Safety Capability Assessment Methods

NFPA 805, Section 2.4.2, "Nuclear Safety Capability Assessment," states that:

The purpose of this section is to define the methodology for performing a nuclear safety capability assessment. The following steps shall be performed:

(1) Selection of systems and equipment and their interrelationships necessary to achieve the nuclear safety performance criteria in Chapter 1;

(2) Selection of cables necessary to achieve the nuclear safety performance criteria in Chapter 1;

(3) Identification of the location of nuclear safety equipment and cables; and

(4) Assessment of the ability to achieve the nuclear safety performance criteria given a fire in each fire area.

This SE section evaluates the first three of the topics listed above. Section 3.5 addresses the assessment of the fourth topic.

Regulatory Guide 1.205, Revision 1 (Reference 4), endorses NEI 04-02, Revision 2 (Reference 7), and Chapter 3 of NEI 00-01, Revision 2, (Reference 23), and promulgates the method outlined in NEI 04-02 for conducting a NSCA. This NRC-endorsed guidance (i.e., NEI 04-02 Table B-2, "Nuclear Safety Capability Assessment – Methodology Review" and NEI 00-01, Chapter 3) has been determined to address the related requirements of NFPA 805, Section 2.4.2. The NRC staff reviewed LAR Section 4.2.1, "Nuclear Safety Capability Assessment Methodology," and LAR Attachment B, "NEI 04-02 Table B-2 – Nuclear Safety Capability Assessment – Methodology Review," against these guidelines.

The endorsed guidance provided in NEI 00-01, Revision 2 provides a framework to evaluate the impact of fires on the ability to maintain post-fire SSD. It provides detailed guidance for:

- Selecting systems and components required to meet the nuclear safety performance criteria;
- Selecting the cables necessary to achieve the nuclear safety performance criteria;
- Identifying the location of nuclear safety equipment and cables; and
- Using appropriately conservative assumptions in the performance of the NSCA.

The licensee developed the LAR based on the three guidance documents cited above. Although RG 1.205, Revision 1, endorses NEI 00-01, Revision 2, the licensee's review was based on the guidance in NEI 00-01, Revision 1 (Reference 63). In addition, a review of NEI 00-01, Revision 2 (Reference 23), Chapter 3, was conducted by the licensee to identify the substantive changes from NEI 00-01, Revision 1 that are applicable to the FPP. The NRC staff concludes that based on the information provided in the licensee's submittal, as supplemented, that the licensee used a systematic process to evaluate the post-fire SSA against the requirements of NFPA 805, Section 2.4.2; and the licensee used subsections (1), (2), and (3), which meets the methodology outlined in the latest NRC-endorsed industry guidance.

FAQ 07-0039 (Reference 46), provides one acceptable method for documenting the comparison of the SSA against the NFPA 805 requirements. This method first maps the existing SSA to the NEI 00-01, Chapter 3 methodology, which in turn, is mapped to the NFPA 805 Section 2.4.2 requirements.

The licensee performed this evaluation by comparing its SSA against the NFPA 805 NSCA requirements using the NRC endorsed process in Chapter 3 of NEI 00-01, Revision 1, and documenting the results of the review in LAR Attachment B, "NEI 04-02 Table B-2 – Nuclear Safety Capability Assessment – Methodology Review," in accordance with NEI 04-02, Revision 2.

The categories used to describe alignment with the NEI 00-01, Chapter 3, attributes are as follows:

(1) The SSA directly aligns with the attribute: noted in LAR Table B-2 as "Aligns." (see discussion in SE Section 3.2.1.1)

(2) The SSA aligns with the intent of the attribute: noted in LAR Table B-2 as "Aligns with Intent." (see discussion in SE Section 3.2.1.2)

(3) The SSA does not align with the attribute, but there is a prior NRC approval of an alternative to the attribute, and the bases for the NRC approval remain valid: noted in LAR Table B-2 as "Not in Alignment, but Prior NRC Approval." (see discussion in SE Section 3.2.1.3)

(4) The SSA does not align with the attribute, but there are no adverse consequences because of the non-alignment: noted in LAR Table B-2 as "Not in Alignment, but No Adverse Consequences." (see discussion in SE Section 3.2.1.4)

(5) The SSA does not align with the attribute: noted in LAR Table B-2 as "Not in Alignment." (see discussion in SE Section 3.2.1.5)

Finally, some attributes may not be applicable to the SSA (for example, the attribute may be applicable only to boiling water reactors or pressurized water reactors). These are noted in the LAR Table B-2 as "N/A."

As stated above, the licensee performed a review of the nuclear safety capabilities assessment using the guidance in NEI 00-01, Revision 1, and conducted a gap analysis of changes in NEI 00-01, Revision 2. In LAR Section 4.2.1.1, the licensee stated that a gap analysis was performed. The licensee further stated in the gap analysis that, based on its review against the endorsed criteria of the guidance provided in NEI 00-01, Revision 2, there were no substantive changes that required modification to existing alignment, basis statements, or references. On the basis of the licensee's description of the gap analysis and the statements in the LAR that no impacts were identified in the gap analysis to NEI 00-01, Revision 2, the NRC staff concludes the licensee has reviewed FNP SSD analysis against the methods endorsed in RG 1.205.

3.2.1.1 Attribute Alignment -- Aligns

For the majority of the NEI 00-01, Chapter 3 attributes, the licensee determined that the SSA aligns directly with the attribute. In these instances, based on the information provided by the licensee in the LAR, as supplemented, and the information provided during the NFPA 805 site audit (that is, the documents reviewed, discussions held with the licensee and the plant tours performed), the NRC staff concludes that the licensee's statements of alignment are acceptable because the analyses are consistent with regulatory guidance for selecting the systems and equipment and their interrelationships necessary to achieve the NSPC, selection of the cables necessary to achieve the NSPC, and the identification of the location of nuclear safety equipment and cables.

The following attribute identified in LAR Attachment B, Table B-2 as aligning via this method required additional review by the NRC staff:

- 3.1.2.6.2 [B] – Cooling Systems. Determine if heating, ventilation and air conditioning (HVAC) systems are needed and available to support SSD system operation.

  In SSA RAI 02 (Reference 20), the NRC staff requested that the licensee provide additional information to determine whether the licensee had properly analyzed the need for HVAC in supporting operator actions at the primary control stations (PCS). In its response to SSA RAI 02 (Reference 12), the licensee stated that during alternate shutdown requiring evacuation of the Main Control Room, hot shutdown panels (HSPs) in the Communication Rooms (rooms 202 and 2202) and the HSP Rooms (rooms 254 and 2254) serve as the PCS for unit shutdown. The licensee further stated that the HVAC support for these two areas, however, is not required for post-fire SSD. The licensee further stated that for the Communication Rooms, there is negligible heat generation in these rooms except for the Computer Room HVAC system blowers, however, if these blowers are running, cooling is maintained for the Communication Rooms. The licensee further stated that for the

HSP Rooms, heat generation is negligible, and should HVAC be lost, other credited Auxiliary Building HVAC systems will maintain the areas surrounding the HSP Rooms at or near normal temperature, and therefore, heat transfer into the HSP Rooms is negligible. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that it addressed the requirements of attribute 3.1.2.6.2 [B].

3.2.1.2 Attribute Alignment -- Aligns with Intent

In several of the NEI 00-01, Chapter 3, attributes, the licensee determined that the post-fire SSA aligns with the intent of the attribute, and provided additional clarification when describing its means of alignment. The attributes identified in LAR Attachment B, Table B-2 as having this condition are as follows:

- Section 3.1 [A, Intro] - Discuss the method for identification of systems available and necessary to perform the required SSD functions;
- Section 3.1.3.3 – Define Combinations of Systems for Each Safe Shutdown Path – Identify systems and components that made up a SSD path;
- Section 3.1.3.4 – Assign Shutdown Paths to Each Combination of Systems – Assign path designations to document credited SSD systems in each fire area;
- Section 3.2.1.1 [Primary Secondary Components] – Categorize equipment to be included in the Safe Shutdown Equipment List (SSEL);
- Section 3.2.2.3 – Develop a List of Safe Shutdown Equipment and Assign the Corresponding System and Safe Shutdown Path(s) Designation to Each – Prepare a table listing the equipment identified for each system and the shutdown path that it supports.

In LAR Attachment B, Table B-2, the alignment basis statements for the above attributes indicated that the licensee developed a computer-aided fault tree analysis (CAFTA) SSD fault tree using data from the Plant Database Management System (PDMS) and utilized the ARCPlus™ software suite to identify the combination of components and systems required to achieve and maintain post-fire SSD functions for each plant fire area. All required equipment, including support equipment, are treated equally and are neither assigned to a specific SSD path nor categorized as primary or secondary components, as described in the licensee's Nuclear Safety Equipment List (NSEL). Based on the above, the NRC staff concludes that the licensee's NSCA methodology adequately identified and documented the components and systems required to support the SSD functions to achieve and maintain post-fire safe and stable conditions.

In SSA RAI 01 the NRC staff requested that the licensee provide additional information regarding the licensee's use of databases and software that integrate FPP structure, system, and component data, fire modeling results, and PRA analysis. In its response to SSA RAI 01, (Reference 11), the licensee stated that all database and software are subject to the quality assurance (QA) requirements appropriate to end users and are maintained using existing plant configuration control procedures and processes. The licensee included actions in LAR Attachment S, Table S-3, Implementation Items 29 and 34, to develop/revise plant procedures to ensure that integration database and software analyses will be updated and conducted by persons properly trained and experienced in its use, and that it will continue to perform work in accordance with the quality requirements of Section 2.7.3 of NFPA 805. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee identified required actions that will incorporate the provisions of NFPA 805, and included the actions as implementation items in LAR Attachment S, which would be required by the proposed license condition. The NRC staff also concludes that the NSCA methodology meets the intent of the NEI 00-01, Chapter 3, attributes identified above, which is to ensure that the post-fire safe shutdown analysis addresses the requirements of NFPA 805, Section 2.4.2.

- SE Section 3.1 [C, Spurious Operations] – Evaluate of potential impacts on SSD capability due to spurious equipment operation;
- SE Section 3.1.1.7 [Offsite Power] – If credited, demonstrate offsite power to be free of fire damage. Offsite power should be assumed to remain available where its availability may adversely impact safety;
- SE Section 3.5.1.3 [Duration of Circuit Failure] – Assume circuit failures are not cleared until action has been taken to isolate the fault; and
- SE Section 3.5.1.5 [B, Cable Failure Modes] – For multiple spurious operation (MSO), analyze cable damage consistent with the current knowledge of fire-induced cable failures modes.

In LAR Attachment B, Table B-2, the alignment basis statements for the above attributes indicated that spurious components which could spuriously operate and adversely affect the NSCA functional requirements or performance goals are identified using the ARCPlus™ software. The component and cable circuit analysis considered spurious operation due to three types of associated circuits which includes common power supplies, high/low pressure interface components, and common enclosures. Cable selection considered all potential fault consequences due to any combination of any and all hot shorts, regardless of whether these hot shorts are inter-cable or intra-cable. No restriction was placed on the number of cables or hot shorts required to fail the component/circuit. For multiple conductor cables, all potential fault consequences due to any combination of hot shorts (inter-cable or intra-cable), shorts to ground, or open circuits are considered. Postulated circuit failures are mitigated by approved compliance strategies, including operator actions when necessary. No credit is taken for fault clearing on any component and then that component being operable. In addition, credit is not taken for off-site power in a specific fire area unless an analysis is performed to demonstrate the availability of off-site power in the area in which all cables in the area are assumed damaged. Conversely, it cannot be assumed that a loss of offsite power will occur and cause components to fail to their SSD position. The NRC staff concludes that the NSCA methodology adequately meets the intent of the NEI 00-01, Chapter 3, attributes identified above, which is to ensure that the post-fire safe shutdown analysis addresses the requirements of NFPA 805, Section 2.4.2.

- SE Section 3.1.1.9 [72 Hour Coping] – Demonstrate a 72-hour coping period starting with reactor scram/trip and repair at least one train of SSD within 72 hours to achieve cold shutdown;
- SE Section 3.4.1.5 [Repairs] – To achieve and maintain cold shutdown within 72 hours, use repairs to equipment as required in support of post-fire shutdown.

NFPA 805 does not specifically require a 72-hour coping period and that cold shutdown be completed within 72 hours. The NSCA demonstrates that the plant can be placed in a safe and stable condition for a postulated fire in any fire areas as required by NFPA 805. The potential fire effects on systems and components required to achieve and maintain cold shutdown is addressed in the licensee's non-power operation (NPO) analysis. The NRC staff evaluation of the NPO analysis is discussed in SE Section 3.5. The NRC staff concludes that the NSCA methodology adequately meets the intent of the NEI 00-01, Chapter 3, attributes identified above, which is to ensure that the post-fire safe shutdown analysis addresses the requirements of NFPA 805, Section 2.4.2.

- SE Section 3.1.2.2 – Pressure Control System – Discuss the method and systems used for pressure control;
- SE Section 3.1.2.4 – Decay Heat Removal – Discuss the sufficiency of the methods and systems selected for decay heat removal functions.

In LAR Attachment B, Table B-2, the alignment basis statements for the above attributes indicated that Reactor Coolant System (RCS) pressure is maintained by a combination of charging pump operation, plant cooldown, operation of pressurizer auxiliary spray, and (if necessary) the pressurizer power-operated relief valves. Although pressurizer heaters are not required for SSD, they are analyzed as a spurious concern and included in the NSEL. In hot standby, decay heat is removed by operation of the steam generator atmospheric relief valves (ARVs). If the ARVs are not immediately available, the mechanical steam generator safety valves will be available. The auxiliary feedwater (AFW) system is credited to feed the steam generators. The potential fire effects on systems and components required to achieve and maintain cold shutdown is addressed in the NPO analysis and include the ability to reduce plant pressure and place the RHR system in service. The NRC staff concludes that the NSCA methodology adequately meets the intent of the NEI 00-01, Chapter 3, attributes identified above, which is to ensure that the post-fire safe shutdown analysis addresses the requirements of NFPA 805, Section 2.4.2.

3.2.1.3 Attribute Alignment -- Not in Alignment, but Prior NRC Approval

The licensee did not identify any attributes in this category.

3.2.1.4 Attribute Alignment -- Not in Alignment, but No Adverse Consequences

The licensee did not identify any attributes in this category.

3.2.1.5 Attribute Alignment -- Not in Alignment

The licensee did not identify any attributes in this category.

3.2.1.6 NFPA 805 Nuclear Safety Capability Assessment Methods Conclusion

The NRC staff reviewed the documentation provided by the licensee describing the process used to perform the NSCA required by NFPA 805, Section 2.4.2. The licensee performed this evaluation by comparing the SSA against the NFPA 805 NSCA requirements using NEI 00-01, Revision 1, and also conducted a gap analysis between Revisions 1 and 2 of NEI 00-01 to determine if any discrepancies existed. The licensee documented the results of its review in LAR Attachment B, Table B-2, in accordance with NEI 04-02, Revision 2.

Based on the information provided in the licensee's submittal, as supplemented, the NRC staff accepts the method the licensee used to perform the NSCA with respect to the selection of systems and equipment, selection of cables, and identification of the location of nuclear safety equipment and cables, as required by NFPA 805, Section 2.4.2. The NRC staff accepts the licensee's method because it either:

- Meets the NRC-endorsed guidance directly; or
- Meets the intent of the endorsed guidance and adequate justification was provided.

3.2.2 Maintaining Fuel in a Safe and Stable Condition

The nuclear safety goals, objectives and performance criteria of NFPA 805 allow more flexibility than the previous deterministic FPPs based on Appendix R to 10 CFR 50 and NUREG-0800, Section 9.5.1 (Reference 64), since NFPA 805 only requires the licensee to maintain the fuel in a safe and stable condition rather than achieve and maintain cold shutdown in 72 hours. In LAR Section 4.2.1.2, the licensee stated that the NFPA 805 licensing basis is for the plant to be taken subcritical and maintained in any one of the modes of hot standby, hot shutdown, cold shutdown, or refueling conditions as defined in the FNP Technical Specifications (TSs) following any fire occurring prior to establishing cold shutdown.

The licensee stated that following the reactor trip, the plant will be placed in a known safe and stable condition and that with the plant safe and stable in hot standby, a natural circulation cooldown resulting from a loss of offsite power will be initiated to transition to the next safe and stable mode of hot shutdown. The licensee further stated that assuming complete loss of offsite power is regarded as the most conservative method and limits the scope of analysis to those SSCs powered from the diesel generators and batteries. The licensee further stated that at this point in time, the analysis for safe and stable in non-power operational modes also begins and is enveloped by the cooldown from at power and that emergency feedwater operation continues and steam is released from one or more steam generators to remove decay heat. The licensee further stated that charging continues to account for RCS shrinkage and expected losses and utilizes borated water to maintain reactivity shutdown margins and that pressure is reduced via operation of the pressurizer auxiliary spray valve or the pressurizer Power Operated Relief Valves (PORVs).

The licensee stated that when plant temperature is less than approximately 350° F and pressure is less than approximately 425 psig, the Residual Heat Removal (RHR) system will be placed in service and that this utilizes an RHR pump to circulate RCS water to the RHR heat exchanger, where the decay heat is transferred to the component cooling water system. The licensee further stated that the plant will continue to cool down and the component cooling water system transfers the heat to the service water system and that in this manner, plant temperature will be reduced below 200°F and cold shutdown.

The licensee stated that depending upon the location and extent of the fire, the unit may be maintained in any one of the safe and stable modes described above for an extended period of time until the readiness of the systems necessary for the next safe and stable mode on the cooldown timeline can be verified to be operational. The licensee further stated that the ability to maintain safe and stable conditions at a particular mode for extended periods (generally regarded as greater than 24 hours) may require additional actions such as replenishment of diesel fuel oil, replenishment of borated injection water, or replenishment of condensate supplies and can be performed by the Site's Emergency Response Organization.

In SSA RAI 12 (Reference 20) the NRC staff requested that the licensee describe the NFPA 805 safe and stable condition and the additional resources and actions, if any, that are credited for maintaining this condition. In its response to SSA RAI 12 (Reference 11), the licensee stated that the Condensate Storage Tank (CST) needs to be replenished in approximately 24 hours to ensure a continuous supply of water to the AFW system. The licensee further stated that the NSCA included equipment required to directly supply water to both motor-driven and turbine-driven AFW pumps from pond water, which is designed for 30 days of operation without makeup. The Refueling Water Storage Tank (RWST) has sufficient capacity to maintain adequate primary inventory for an extended period of time, including cooldown to the transition point for RHR initiation, and inventory replacement is not anticipated to be necessary for over a week. Emergency diesel generators (EDGs) are equipped with a day tank which provides over 3 hours of fuel without makeup. Makeup to the EDG day tank is via automatically controlled transfer pump with suction from the associated underground Fuel Oil Storage Tank with a capacity of greater than 3 days of EDG operation. No stored capacity air systems are credited to support long-term hot standby. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that safe and stable conditions can be maintained through relatively low risk evolutions that are related to simplicity, equipment availability, and the routine nature of replenishing commodities.

Based on a review of the licensee's analysis as described in the LAR, as supplemented, the NRC staff concludes that the licensee has provided reasonable assurance that the fuel can be maintained in a safe and stable condition, post-fire, for an extended period of time.

3.2.3 Applicability of Feed and Bleed

10 CFR 50.48(c)(2)(iii) limits the use of feed and bleed and states that:

> In demonstrating compliance with the performance criteria of Sections 1.5.1(b) and (c), a high-pressure charging/injection pump coupled with the pressurizer power-operated relief valves (PORVs) as the sole fire-protected safe shutdown path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability (i.e., feed-and-bleed) for pressurized-water reactors (PWRs) is not permitted.

The NRC staff reviewed LAR Table 5-3, "10 CFR 50.48(c) – Applicability/Compliance References," and LAR Attachment C, "NEI 04-02 Table B-3 – Fire Area Transition," to evaluate whether FNP meets the feed and bleed requirements. In LAR Table 5-3, the licensee stated that feed and bleed is not utilized as the sole fire-protected SSD methodology for any scenario. The NRC staff confirmed this by reviewing the SSD methods of accomplishment listed in LAR Attachment C for each fire area. The NRC staff confirmed that all fire areas analyses include the SSD equipment necessary to provide decay heat removal without relying on feed and bleed. In addition, the NRC staff confirmed that all fire areas either met the deterministic requirements of NFPA 805, Section 4.2.3, or the PB evaluation performed in accordance with NFPA 805, Section

4.2.4, and demonstrated that the integrated assessment of risk, DID, and safety margins for the fire area was acceptable. The NRC staff concludes that, based on the information provided in LAR Table 5-3 as well as the fire area analyses documented in LAR Attachment C, the licensee meets the requirements of 10 CFR 50.48(c)(2)(iii) because feed and bleed is not utilized as the sole fire-protected SSD method.

3.2.4 Assessment of Multiple Spurious Operations

NFPA 805 Section 2.4.2.2.1, "Circuits Required in Nuclear Safety Functions," states, in part, that:

> Circuits required for the nuclear safety functions shall be identified. This includes circuits that are required for operation, that could prevent the operation, or that result in the maloperation of the equipment identified in 2.4.2.1. ["Nuclear Safety Capability Systems and Equipment Selection"] This evaluation shall consider fire-induced failure modes such as hot shorts (external and internal), open circuits, and shorts to ground, to identify circuits that are required to support the proper operation of components required to achieve the nuclear safety performance criteria, including spurious operation and signals.

In addition, NFPA 805, Section 2.4.3.2, states that the PSA evaluation shall address the risk contribution associated with all potentially risk-significant fire scenarios. Because the RI/PB approach taken used FREs in accordance with NFPA 805 Section 4.2.4.2, "Use of Fire Risk Evaluation," adequately identifying and including potential multiple spurious operation (MSO) combinations is required to ensure that all potentially risk-significant fire scenarios have been evaluated.

The NRC staff reviewed LAR Section 4.2.1.4, "Evaluation of Multiple Spurious Operations," and LAR Attachment F, "Fire-Induced Multiple Spurious Operations Resolution," to determine whether the licensee adequately addressed MSO concerns. As described in the LAR, as supplemented, the licensee's process for identification and evaluation of MSOs used an expert panel and followed the guidance of NEI 04-02, RG 1.205, and FAQ 07-0038. The licensee stated that expert panel consisted of its representatives (and its' contractors) with experience in fire protection, post-fire SSD, circuit analysis, system engineering, plant operations and PRA. The licensee further stated that members of Strategic Alliance for NFPA 805 Transition (Strategic Alliance) with diverse backgrounds, with industry and FNP specific experience, also participated in the panel.

In LAR Attachment F, the licensee stated that the MSO expert panel convened in February 2009 using the guidance in NEI 00-01, Revision 1 and that an additional meeting was conducted in May 2012 to discuss how open items from the original expert panel report would be addressed. The licensee further stated that prior to the initial review, the panel was provided with training that included probabilistic risk analysis and SSA discussion as well as key points of the analysis. The licensee further stated that the expert panel sources for information and identifying MSOs included plant piping and instrumentation diagrams, procedures, SSA, training diagrams, FPRA insights, internal events PRA, and Pressurized-Water Reactor owners Group (PWROG) generic MSOs list. The licensee further stated that a "brainstorming" review was also conducted by the Expert Panel to identify additional plant-specific scenarios and general system pinchpoints that may not exist on the generic list and that consensus was achieved in the expert panel process by discussing individual scenarios, reaching a conclusion, and asking for any dissenting opinions.

LAR Attachment F describes the process the licensee utilized to address MSOs. That process included the 5 steps described below:

1. Identify potential MSOs of concern;

2. Conduct an expert panel to assess plant-specific vulnerabilities;

3. Update the FPRA model and NSCA to include the MSOs of concern;

4. Evaluate for NFPA 805 Compliance; and

5. Document Results.

In LAR Attachment F, under the results for Steps 3, 4, and 5, the licensee stated that the MSOs identified in Steps 1 and 2 were incorporated in the FPRA model and evaluated for inclusion in the NSCA. The licensee further stated that variances from deterministic requirements (VFDRs) were created where MSO combinations did not meet the deterministic requirements of NFPA 805, Section 4.2.3, and these VFDRs were addressed using the PB approach of NFPA 805, Section 4.2.4. The licensee further stated that based on the evaluations, components associated with the MSOs were added to the NSCA equipment list and logics, and cable tracing and circuit analysis was performed, that the FPRA quantified the fire-induced risk model containing the MSO pathways and that the MSO contribution is included in the FPRA results, including those associated with VFDRs in the FREs.

The licensee stated that the NSCA and FPRA were updated to reflect the treatment of applicable MSO scenarios which included the identification of equipment, cables, and cable routing by plant locations. The licensee further stated that the MSO combination components of concern were also evaluated as part of the NSCA and that for cases where the pre-transition MSO combination components did not meet the deterministic compliance, the MSO combination components were added to the scope of the FREs.

The NRC staff reviewed LAR Section 4.2.1.4, "Evaluation of Multiple Spurious Operations," LAR Attachment F, "Fire-Induced Multiple Spurious Operations Resolution," and the licensee's expert panel process for identifying circuits susceptible to multiple spurious operations as described above and concludes that the licensee adopted a systematic and comprehensive process for identifying multiple spurious operations to be analyzed using available industry guidance. The NRC staff also concludes that the process used provides reasonable assurance that the FREs appropriately identified and included risk significant multiple spurious operation combinations.

3.2.5 Establishing Recovery Actions

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 that:

> 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 that:

> 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 NRC staff reviewed LAR Section 4.2.1.3, "Establishing Recovery Actions," and LAR Attachment G, "Recovery Actions Transition," to evaluate whether the licensee meets the associated requirements for the use of RAs per NFPA 805.

In LAR Attachment G, the licensee stated that in accordance with the guidance provided in NEI 04-02, FAQ 07-0030, and RG 1.205, the methodology used to determine RAs required for compliance consisted of the following steps:

> Step 1 - Define the PCS(s) and determine which pre-transition operator manual actions (OMAs) are taken at PCS(s). The licensee identified the FNP Unit 1 PCS as the HSP A, B, D, E, and G located in Fire Area 1-012, Room 254, and HSP C and F located in Fire Area 1-015, Room 202. For FNP Unit 2 PCS, the licensee identified the HSP A, B, D, E and G located in Fire Area 2-015, Room 2202, and the HSP C and F located in Fire Area 2-012, Room 2254.
>
> Step 2 - Determine the population of RAs that are required to resolve VFDRs (to meet the risk reduction criteria and DID criteria). On a fire area basis, the licensee identified all VFDRs in LAR Attachment C, Table B-3. For each VFDR not brought into compliance with the deterministic approach, the licensee conducted an evaluation using the PB approach of NFPA 805 Section 4.2.4. Some PB evaluations resulted in the need for RAs to meet the risk acceptance criteria or to maintain a sufficient level of DID. The final set of required RAs are provided in the LAR Attachment G, Table G-1, "Recovery Actions and Activities Occurring at the Primary Control Station(s)".
>
> Step 3: Evaluate the Additional Risk of the Use of Recovery Actions. The licensee evaluated the set of RAs that are necessary to demonstrate the availability of a success path for the NSPC for additional risk using the process described in NEI 04-02, FAQ 07-0030, and RG 1.205 and compared the risk against the guidelines of RG 1.174 and RG 1.205. The additional risk is provided in LAR Attachment W. The licensee stated that if RAs were determined to have an adverse risk impact, they were resolved via alternate strategies that eliminated the need for the RA in the NSCA and therefore, none of the RAs have an adverse impact on the FPRA.
>
> Step 4: Evaluate the feasibility of the recovery actions. The licensee evaluated all RAs in LAR Attachment G against the feasibility criteria provided in the NEI 04-02, FAQ 07-0030, and RG 1.205. The licensee stated that since actions taken at the PCS are not RAs, their

feasibility is evaluated in accordance with procedures for validation of off normal procedures. The licensee developed actions to stage a ladder in the south hallway of the diesel building and to formally incorporate the criteria of drills into its FPP. These actions are included in LAR Attachment S, Table S-3, Implementation Items 25 and 26 and the NRC staff concludes that these actions are acceptable because they will incorporate the provisions of NFPA 805 in the FPP and because they would be required by the proposed license condition.

Step 5: Evaluate the reliability of the recovery actions. The licensee stated that the reliability of the specific RAs added to the FPRA is addressed in the FPRA Human Failure Evaluation Report and that the bounding reliability treatment results are found in LAR Attachment W.

Based on the above considerations, the NRC staff concludes that the licensee has followed the endorsed guidance of NEI 04-02 and RG 1.205 to identify and evaluate RAs in accordance with NFPA 805, and therefore, there is reasonable assurance of meeting the regulatory requirements of 10 CFR 50.48(c). The NRC staff also concludes that the feasibility criteria applied to RAs are acceptable based on conformance with the endorsed guidance contained in NEI 04-02 and subject to completion of implementation items 25 and 26 in LAR Attachment S, Table S-3, which will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

3.2.6 Conclusion for Section 3.2

The NRC staff reviewed the licensee's LAR, as supplemented, for conformity with the requirements contained in NFPA 805, Section 2.4.2, regarding the process used to perform the NSCA. The NRC staff concludes that the declared safe and stable condition proposed is acceptable because the licensee's analysis process adequately and appropriately identified and located the systems, equipment, and cables, required to provide reasonable assurance of achieving and maintaining the fuel in a safe and stable condition, as well as to meet the NFPA 805 NSPC.

In accordance with 10 CFR 50.48(c)(2)(iii), the NRC staff confirmed, through review of the documentation provided in the LAR, that feed and bleed was not the sole fire-protected SSD path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability.

The NRC staff also reviewed the licensee's process to identify and analyze MSOs. Based on the LAR, as supplemented, the process used to identify and analyze MSOs is considered comprehensive and thorough. Through the use of an expert panel process, in accordance with the guidance of RG 1.205, NEI 04-02, and FAQ 07-0038, potential MSO combinations were identified and included as necessary in the NSCA, as well as the applicable FREs. The NRC staff also considers the approach the licensee uses for assessing the potential for MSO combinations acceptable, because it was performed in accordance with NRC endorsed guidance.

The NRC staff concludes that, based on the information provided in the LAR, as supplemented, and the information obtained during the NFPA 805 site audit (documents reviewed and discussions with the licensee's staff) that the process used by the licensee to review, categorize and address RAs during the transition from the existing deterministic fire protection licensing basis to a RI/PB FPP is consistent with the NRC-endorsed guidance contained in NEI 04-02 and RG 1.205 regarding the identification of RAs. Provided the licensee completes implementation items 25 and 26 as described in LAR Attachment S, Table S-3, the NRC staff concludes that there is reasonable assurance that the regulatory requirements of 10 CFR 50.48(c) and NFPA 805 for NSCA methods are met.

3.3 Fire Modeling

NFPA 805 (Reference 3) allows both Fire Modeling and FREs as PB alternatives to the deterministic approach outlined in the standard. These two PB approaches are described in NFPA 805, Sections 4.2.4.1 and 4.2.4.2, respectively. Although fire modeling and FREs are presented as two different approaches for PB compliance, the FRE approach generally involves some degree of fire modeling to support engineering analyses and fire scenario development. NFPA 805, Section 1.6.18, defines a fire model as a "mathematical prediction of fire growth, environmental conditions, and potential effects on SSCs based on the conservation equations or empirical data."

The NRC staff reviewed LAR (Reference 8) Section 4.5.2, "Performance-Based Approaches," which describes how the licensee used fire modeling as part of the transition to NFPA 805 at FNP, and LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," which describes how the licensee performed fire modeling calculations in compliance with the NFPA 805 PB evaluation quality requirements for fire protection systems and features at FNP, to determine whether the fire modeling used to support transition to NFPA 805 is acceptable.

In LAR Section 4.5.2.1, the licensee stated that the fire modeling approach was not utilized for demonstrating compliance with NFPA 805. The licensee used the FRE PB approach (i.e., FPRA) with input from fire modeling analyses. Therefore, the NRC staff reviewed the technical adequacy of the FREs, including the supporting fire modeling analyses, as documented in SE Section 3.4.2, to evaluate compliance with the NSPC.

The licensee did not propose any fire modeling methods to support PB evaluations in accordance with NFPA 805, Section 4.2.4.1, as the sole means for demonstrating compliance with the NSPC. Therefore, the NRC staff concludes that there are no plant-specific fire modeling methods acceptable for use to support compliance with NFPA 805, Section 4.2.4.1, and the transition to NFPA 805.

3.4 Fire Risk Assessments

This section addresses the licensee's FRE PB method, which is based on NFPA 805, Section 4.2.4.2. The fire modeling (FM) PB method of NFPA 805, Section 4.2.4.1 was not used for this application.

NFPA 805, Section 4.2.4.2, "Use of Fire Risk Evaluation," states that:

> 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.

> The evaluation process shall compare the risk associated with implementation of the deterministic requirements with the proposed alternative. The difference in risk between the two approaches shall meet the risk acceptance criteria described in 2.4.4.1. The fire risk shall be calculated using the approach described in 2.4.3.

3.4.1 Maintaining Defense-in-Depth and Safety Margins

NFPA 805, Section 4.2.4.2, requires that the "use of fire risk evaluation for the PB approach shall consist of an integrated assessment of the acceptability of risk, defense-in-depth, and safety margins."

3.4.1.1 Defense-in-Depth

As a supplement to the definition of DID provided in NFPA 805, Section 1.2, the NRC-endorsed guidance in NEI 04-02 (Reference 7), Section 5.3.5.2, states that:

> 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 do occur, thereby limiting fire 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.

The NRC staff reviewed LAR Section 4.8.1, "Results of the Fire Area Review," and LAR Table 4-3, "NFPA 805 Required Fire Protection Systems and Features," as well as the associated supplemental information, in order to determine whether the principles of DID were maintained in regard to the planned transition to NFPA 805.

When implementing the PB approach, the licensee followed the guidance contained in NEI 04-02, Section 5.3, "Plant Change Process," which includes a detailed consideration of DID as part of the change process. The licensee documented the method used to meet the DID requirements of NFPA 805 in LAR Table 4-3 and LAR Attachment C, Table B-3. For each of the major fire protection DID attributes, the licensee provided several examples of how that attribute was addressed, along with a discussion of the considerations used in evaluating that element.
In PRA RAI 04 (Reference 20), the NRC staff requested that the licensee provide a description of how DID was evaluated. In its response to PRA RAI 04 (Reference 10), the licensee stated that:

> <u>DID Process</u>
>
> Each Fire Area was evaluated for the adequacy of DID. 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, DID, 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 DID are required by NFPA 805 Chapter 4. The VFDRs and the associated Fire Area risk (CDF) and scenario consequences (CCDP values) were evaluated to identify general DID echelon imbalances. Potential methods to balance the DID features were identified ensuring an adequate balance of DID features is maintained for the Fire Area...
>
> Defense-in-Depth -Recovery Action Considerations
>
> Reliance on Recovery Actions in lieu of protection is considered part of the third echelon of DID. Per NFPA 805, recovery actions are defined as: "Activities to achieve the nuclear safety performance criteria that take place outside of the main control room or outside of the primary control(s) station for the equipment being operated, including the replacement or modification of components." If the VFDR is characterized as a "Separation Issue", and the change in risk (ΔCDF and ΔLERF) is acceptable, a recovery action can be considered as a means to provide an adequate level of DID. The "additional risk presented by the use of the recovery action", if relied upon for DID, would be characterized as the calculated change in risk of the "Separation Issue".

LAR Table 4-3 and LAR Attachment C, Table B-3, document the results of the licensee's review of required fire protection systems and features at FNP. Based on the information provided by the licensee in the LAR and the licensee's response to PRA RAI 04, the NRC staff concludes that the transition process included a detailed review of fire protection DID. The NRC staff concludes that the evaluation of DID is acceptable because the licensee's process and results follow the endorsed guidance in NEI 04-02, and are consistent with the guidance in RG 1.205 (Reference 4).

3.4.1.2 Safety Margins

Although not a part of the requirements of NFPA 805, and thus not required under 10 CFR 50.48(c), NFPA 805, Appendix A, Section A.2.4.4.3, provides the following background related to the meaning of the term "safety margins":

> An example of maintaining sufficient safety margins occurs when the existing calculated margin between the analysis and the performance criteria compensates for the uncertainties associated with the analysis and data. Another way that safety margins are maintained is through the application of codes and standards. Consensus codes and standards are typically designed to ensure such margins exist.

NEI 04-02, Section 5.3.5.3, "Safety Margins," lists two specific criteria that should be addressed when considering the impact of plant changes on safety margins:

- 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, etc.) are met, or provides sufficient margin to account for analysis and data uncertainty.

LAR Section 4.5.2, "Performance-Based Approaches," states that safety margins were considered as part of the transition process. Section 4.5 states that the licensee evaluated each VFDR against the safety margin criteria contained in NEI 04-02 and RG 1.205.

In PRA RAI 04 (Reference 20), the NRC staff requested that the licensee provide a description of how safety margins are evaluated. In its response to PRA RAI 04 (Reference 10), the licensee stated that:

> Safety Margin Assessment
>
> A review of the impact of the change on safety margin was performed. An acceptable set of guidelines for making that assessment are summarized below. Other equivalent acceptance guidelines may also be used. These guidelines are:
>
> - 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 is described for each of the specific analysis types used in support of the FRE. These analyses can be grouped into two categories. These categories are:
>
> - Fire modeling
>
> - Plant system performance
>
> The following guidance on these topics is provided.
>
> Fire Modeling
>
> For fire modeling used in support of the FRE (i.e., as part of the Fire PRA), the results were documented as part of the qualitative safety margin review.
>
> Plant System Performance
>
> This review documented that the Safety Margin inherent in the analyses for the plant design basis events was preserved in the analysis for the fire event and satisfied the requirements...

Based on the statements provided in LAR Section 4.5.2 and confirmed by NRC staff observations during the audit, the NRC staff concludes that the licensee either used appropriate codes and standards (or alternatives accepted for use by the NRC), met the safety analyses acceptance criteria in the licensing basis (e.g., FSAR, supporting analyses, etc.), or provided sufficient margin to account for analysis and data uncertainty.

The NRC staff concludes that the evaluation of safety margins is acceptable because the licensee's process and results follow the endorsed guidance in NEI 04-02, and are consistent with the guidance in RG 1.205.

3.4.1.3 Defense-in-Depth and Safety Margin Conclusion

The licensee's FRE process included a detailed review of fire protection DID and safety margins. The individual FREs, LAR Table 4-3, and LAR Attachment C, Table B-3, document the results of the DID and safety margin review. The NRC staff concludes that the licensee's evaluation related to DID and safety margins is acceptable because the licensee's process and results followed the endorsed guidance in NEI 04-02, and are consistent with the NRC staff guidance in RG 1.205 and RG 1.174 (Reference 24).

3.4.2 Quality of the Fire Probabilistic Risk Assessment

In reviewing a risk-informed (RI) LAR, the NRC staff evaluates the plant-specific PRA models and their application as proposed in the LAR. The objective of the PRA quality review is to determine whether the plant-specific PRA used in evaluating the proposed LAR is of sufficient scope, level of detail, and technical adequacy for the application. The NRC staff evaluated the PRA quality information provided by the licensee in its LAR, as supplemented, including industry peer review results and self-assessments performed by the licensee. The NRC staff reviewed LAR Section 4.5.1, "Fire PRA Development and Assessment," LAR Section 4.7, "Program Documentation, Configuration Control, and Quality Assurance," LAR Attachment C, "NEI 04-02 Table B-3 – Fire Area Transition," LAR Attachment S, "Plant Modifications and Items to be Completed During Implementation," LAR Attachment U, "Internal Events PRA Quality," LAR Attachment V, "Fire PRA Quality," and LAR Attachment W, "Fire PRA Insights."

The licensee developed its FPRA model by modifying its internal events PRA (IEPRA) model to capture the effects of fire, both as the initiator of an event and to characterize the subsequent potential failure modes for affected circuits or individual plant SSCs (targets). The licensee developed its FPRA model using the guidance of NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities" (Reference 31), (Reference 32), and (Reference 33). The model addresses both Level 1 (CDF) and partial Level 2 (i.e., LERF only) PRA during at-power conditions.

The licensee did not identify any (1) known outstanding plant changes that would require a change to the FPRA model, or (2) any planned plant changes that would significantly impact the FPRA model, beyond those identified and scheduled to be implemented as part of the transition to a FPP based on NFPA 805. Therefore, the NRC staff concludes that the FPRA model represents the as-built, as-operated, and maintained plant as it will be configured after full implementation of

NFPA 805 and is therefore capable of being adapted to model both the post-transition and the compliant plant as needed.

The licensee identified administrative controls and processes used to maintain the FPRA model current with plant changes, and to evaluate any outstanding changes not yet identified, into the FPRA model for potential risk impact as a part of the routine change evaluation process. Further, as described in SE Section 3.8.3, the licensee has a program for ensuring that developers and users of these models are appropriately trained and qualified.

3.4.2.1 Internal Events PRA Model

In the LAR (Reference 8), the licensee evaluated the technical adequacy of the portions of its IEPRA model used to support development of the FPRA model using the American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) RA-Sa-2009, "Standard for Level 1/LERF PRA for Nuclear Power Plant Applications" (ASME/ANS PRA Standard) (Reference 26), and RG 1.200, as discussed below:

> The Farley Nuclear Plant (FNP) Internal Events PRA has undergone a RG 1.200, Revision 2, Peer Review against the ASME PRA standard requirements by a team of knowledgeable industry (vendor and utility) personnel. The Peer review was performed during the week of March 22, 2010.... In the course of this review, seventy eight new Facts and Observations (F&Os) were prepared, including three "Best Practices", thirty-five "Suggestions" and forty "Findings". Most of the findings pertained to documentation issues. However, there were some key findings addressed in the peer review report [for which the licensee concluded that]... "No impact on the fire PRA and NFPA 805 submittal is expected..."
>
> During the disposition of Internal Events PRA findings for NFPA 805 submittal, sensitivity analysis was performed for two cases to see change of internal event base risk, CDF.
>
> > Modeling of Service Water Pond Dam Failure...
> > Change of Success Criterion for Medium LOCA...
>
> The sensitivity analysis results shows internal event CDF increase of 17% and 21% for Unit 1 and Unit 2, respectively and it is expected that the risk changes would not impact the Fire Risk Evaluations Acceptance Criteria. Furthermore, these internal events PRA related findings are not applicable to the fire PRA since fire-induced dam failure is unlikely to occur and change of the success criterion is not necessary for the fire induced spurious opening of two PORVs. Therefore, no impact on the fire PRA and NFPA 805 LAR submittal is expected ....

In PRA RAIs 11 and 26 dated July 8, 2013 (Reference 20), the NRC staff requested that the licensee (1) confirm that the IEPRA considered the clarifications and qualifications from RG 1.200, Revision 2, to ASME/ANS PRA Standard; and (2) address five specific findings from the IE peer review. In its responses to PRA RAI 11 and 26 (Reference 10) and (Reference 11), the licensee (1) confirmed that the peer review considered the RG-1.200, Rev. 2, clarification and qualifications; and (2) provided the requested information that enabled the NRC staff to conclude that each of the five findings had been properly addressed such that their resolutions are acceptable. In each case, the licensee had updated the IEPRA to close out the finding, applied a technically acceptable approach, or indicated no effect on the FPRA, all acceptable responses.

The licensee identified the resolution of the findings from the IEPRA peer review in LAR Attachment U. The NRC staff's review and conclusion for the licensee resolution of each of the F&Os is summarized in the NRC's Record of Review (Reference 65). In its response to PRA RAI 11 (Reference 10), the licensee confirmed that the IEPRA peer review was performed consistent with RG 1.200, Revision 2. The NRC staff concludes that the licensee dispositions for all IEPRA peer review findings are acceptable as summarized in the Record of Review.

3.4.2.2 Fire PRA Model

The licensee evaluated the technical adequacy of the FPRA model by conducting a peer review of the FPRA model using Part 4 of the ASME/ANS PRA Standard and RG 1.200, Revision 2, as discussed in its LAR.

> The FNP Fire PRA has undergone a RG 1.200, Revision 2, Peer Review against the ASME PRA Supporting Requirements (SRs) by a team of knowledgeable industry (vendor and utility) personnel. The review was conducted by the Westinghouse Owners Group in October 2011 under LTR-RAM-II-12-007, "Fire PRA Peer Review against the Fire PRA Standard Supporting Requirements from Section 4 of the ASME/ANS PRA Standard for the Farley Nuclear Plant Fire Probabilistic Risk Assessment" in accordance with NEI 07-12 as endorsed by RG 1.200 Rev 2. The conclusion of the review was that the FNP methodologies being used were appropriate and sufficient to satisfy the ASME/ANS PRA Standard RA-Sa-2009. The review team also determined that NUREG/CR-6850 methodologies were applied correctly....
>
> The Westinghouse Peer Group concluded that the Farley Fire PRA is consistent with the ASME/ANS PRA Standard and supports risk-informed applications. As a result of the peer review and the fire risk evaluation process the FNP Fire PRA has undergone additional model refinements. These refinements were made consistent with the methodologies that were reviewed during the FNP Peer Review.

In PRA RAI 11 (Reference 20), the NRC staff requested that the licensee confirm that the FPRA peer review considered the clarifications and qualifications from RG 1.200, Revision 2, to ASME/ANS PRA Standard. In its response to PRA RAI 11 (Reference 10), the licensee confirmed that the peer review considered the RG-1.200, Rev. 2, clarification and qualifications. Since the licensee verified that the clarifications and qualification of RG 1.200, Revision 2, were considered during the peer review, the NRC staff concludes that the licensee's response to the RAI is acceptable.

In PRA RAI 29 (Reference 20), the NRC staff requested that the licensee confirm that the list of Supporting Requirements (SRs) from the ASME/ANS PRA Standard that fail to be categorized as at least Capability Category (CC) II in LAR Attachment V was complete and to identify and discuss why meeting a capability category less than CC-II is acceptable for the NFPA 805 transition for each SR. In its response to PRA RAI 29 (Reference 10), the licensee indicated that there were 22 SRs assigned a capability category less than CC-II listed in LAR Attachment V. In its RAI response, the licensee indicated how each F&O was addressed but did not provide the basis for concluding why meeting a capability category less than CC-II was acceptable. In PRA RAI 29.01 (Reference 21), the NRC staff requested that LAR Attachment V, Table V-2 be expanded to provide the requested bases why less than CC-II was acceptable. In its response to PRA RAI 29.01 (Reference 13), the licensee provided a partial version of the requested LAR Attachment V, Table V-2, discussing three of the 22 SRs that were not closed prior to the LAR submittal that remain at CC-I. The justifications for these three SRs remaining at CC-I and not impacting the transition were provided. Additionally, the licensee clarified that the remaining 19 SRs had been closed after the peer review and recategorized as CC-II and referred the NRC staff back to LAR Attachment V, Table V-1 for the explanations.

The NRC staff determined that the individual responses to 13 of the F&Os described were acceptable. However, for six of the SRs, the NRC could not reach a determination and requested additional information in PRA RAIs 28.a and .c through .g (Reference 20). In its response to PRA RAI 28.a (Reference 10), the licensee explained that the FPRA had been updated to employ a more realistic conditional containment failure probability for fire compared to the value that was used for IEs. The NRC staff confirmed the comparison and concluded that the revised value was acceptable. In its response to PRA RAI 28.c (Reference 10), which requested additional information regarding the use of a "generic" fire modeling treatment method to simplify crediting of suppression in fire scenario analyses, the licensee explained that its use of the "generic" method employed a more conservative approach than what would result from more detailed fire modeling using zonal or dynamic simulation computer codes. As this results in higher risk and delta-risk estimates, which are conservative, the NRC staff concludes that the simplification is acceptable.

In its response to PRA RAI 28.d (Reference 11), the license confirmed no outlier behavior associated with a credited in-cabinet carbon dioxide (CO_2) suppression system had ever occurred at FNP. The NRC staff concludes that this verification by the licensee enables the associated SR to be considered as satisfying CC-II. In its response to PRA RAI 28(e) (Reference 11), the license stated that the generic method used encompasses potential horizontal (as well as vertical) fire spread along secondary combustibles. Further, the licensee has initiated additional walk-downs to identify any additional targets resulting from this horizontal spread, an approach which satisfies CC-II.

In its response to PRA RAIs 28.f and .g (Reference 12), which requested additional information regarding whether any of the guidance from NUREG-1824, "Verification and Validation of Selected Fire Models" (Reference 38), or NUREG-1934, "Fire Modeling Analysis Guidelines" (Reference 42), had been followed, the licensee referenced the responses to related FM RAIs 06(a) through (c) dated November 12, 2013 (Reference 12). In its responses, the licensee discussed both sensitivity and uncertainty analyses performed in connection with fire phenomenological modeling in addition to modeling conservatisms. Guidance from NUREG-1934 is cited specifically for the zone of influence (ZOI) tabulations and model completeness uncertainty. Since the licensee provided explanation of sensitivity and uncertainty analyses, in addition to conservatisms applied in fire phenomenological modeling, the NRC staff finds the licensee's response acceptable. The NRC staff conclusions regarding the disposition of all the findings are summarized in the Record of Review.

In the LAR, as supplemented (Reference 9), the licensee identified the use in the FPRA of an electrical cabinet severity factor that has not been endorsed by the NRC and provided the results of a sensitivity analysis removing credit for this factor. In PRA RAI 36 (Reference 22), the NRC staff requested that the licensee remove credit for this electrical cabinet factor in an integrated analysis of this and other changes to the FPRA made in response to other NRC staff RAIs. In its response to PRA RAI 36 (Reference 17), the licensee removed credit in the FPRA for this electrical cabinet severity factor in an integrated analysis incorporating this and other PRA model changes and provided an updated LAR Attachment W. Since credit for the electrical cabinet severity factor was removed in the integrated analysis and the updated LAR Attachment W risk results, the NRC staff concludes this issue is resolved.

The NRC staff observed that in the sensitivity study in Enclosure 6 to the supplement dated December 20, 2012 (Reference 9), and contrary to expectations, removal of the electrical cabinet factor and removal of credit for the main control room (MCR) VEWFDS resulted in a decrease in both the total and delta CDF compared to LAR Attachment W. The NRC staff requested additional information regarding this reduction in CDF and in its response to PRA RAI 01 (Reference 10), the licensee identified additional changes to the PRA that resulted in the reduction of the risk estimates. In addition to removing credit for the VEWFDS in the MCR, the licensee included the following additional refinements: (1) refined main control board (MCB) fire scenarios (via NUREG/CR-6850, Appendix L); (2) more realistic probabilities for hot gas layers; (3) refined circuit analysis for selected fire scenarios; (4) correction to anomalies in fire ignition frequencies for selected fire scenarios. As a result, the CDF and delta CDF increases were actually less than prior to removal of the VEWFDS credit. According to its response in PRA RAI 36 (Reference 17), the modification to the PRA described in its response to PRA RAI 01 have been applied to the PRA model; therefore, the PRA model to be used for future self-approval in NFPA 805 has been updated to reflect these changes.

In PRA RAI 05, the NRC staff requested that the licensee evaluate quantitatively or qualitatively the risk associated with the failure of actions and equipment necessary to extend safe and stable beyond 24 (48, 72) hours given the post-fire scenarios during which they may be required. In its response to PRA RAI 05 (Reference 12), the licensee explained that "[s]ustaining hot standby conditions (once achieved) for a prolonged time frame is accomplished by (1) ensuring a continuous source of water to at least one steam generator in support of natural circulation decay heat removal, (2) ensuring a source of inventory for makeup to the RCS, (3) ensuring positive RCS pressure control, and (4) ensuring continuous operation of at least one emergency diesel generator or availability of off-site power to supply AC power to the electrical distribution system."

The licensee discussed each system or piece of equipment that requires replenishment to support long-term hot standby conditions, including: Condensate Storage Tank (CST), Refueling Water Storage Tank (RWST), Emergency Diesel Generator (EDG) Tanks (Day and Storage), and Reactor Coolant System (RCS) Pressure Control. Also, the licensee identified human actions that might be necessary to support long-term hot standby conditions, including: replenishment of the CST within 24 hours, replenishment of the RWST within 7 days, and replenishment of the EDG Storage Tank within 3 days. All actions are cited as not being time critical, accomplishable by on-shift personnel if necessary (although there likely would be additional support staff available in the longer term).

The licensee identified specific capabilities to support performance criteria beyond the 24-hour mission time assumed for the FPRA, including Emergency Operating Procedures and the Emergency Response Organization. Since the licensee identified specific systems/equipment needed for longer term maintenance of hot standby conditions, including capacities and abilities to replenish as needed, as well as other procedures already in place, the NRC staff concludes that the licensee's response to the RAI is acceptable.

In PRA RAI 07 (Reference 20), the NRC staff requested that the licensee provide a discussion regarding the feasibility assessment performed for human failure events (HFEs) associated with MCR abandonment, including the use of maximum scoping value of 0.1 for conditional core damage probability (CCDP) (and 0.01 for conditional large early release probability [CLERP]). In its response to PRA RAI 07 (Reference 12), the licensee explained that feasibility of MCR abandonment actions were specifically addressed by development of the human error probability (HEP) for the action itself. Abandonment due to loss of other than MCR habitability (e.g., loss of function/control) is not considered, since the licensee assumes the operators will remain in the MCR for command and control. However, development of a hot gas layer (HGL) in the Cable Spreading Room (CSR) has been assumed to result in MCR abandonment with no credit for recovery. For the LAR, MCR abandonment due to loss of habitability originally used a screening CCDP of 0.1. However, as discussed in its response to PRA RAI 33.c (Reference 12), discussed below, this has been re-assessed by the licensee. The NRC staff concludes that the licensee's response to the RAI regarding determination of feasibility is acceptable since the licensee indicates it is part of the HEP calculation, such that it is quantified. With respect to the use of the screening CCDP of 0.1, this is subsumed in the licensee's responses to PRA RAIs 33.c (Reference 12) and 33.c.01 (Reference 14), discussed below.

In PRA RAI 07.a through 07.e (Reference 20), the NRC staff requested that the licensee re-evaluate the impact on the risk and delta-risk metrics if the criteria in NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines" (Reference 41), were used instead of the chosen maximum of 0.1 (CCDP) (and 0.01 [CLERP]). In its response to PRA RAI 07(e) (Reference 12), the licensee provided the results from a sensitivity evaluation based on its responses to PRA RAIs 33.c (Reference 12), and 33.c.01 (Reference 14), discussed below. For both units, the delta-risk values were assumed to be equal to the total risks for MCR abandonment if the MCR is abandoned, a conservative approach. The increases for both units were slight (less than 3 percent), which are acceptable, conditional upon the re-analysis associated with related PRA RAIs 33.c and 33.c.01, as discussed below.

In PRA RAI 08.a (Reference 20), the NRC staff requested that the licensee provide the results of a sensitivity analysis without crediting reduced "hot short" probabilities when control power transformers (CPTs) are present. In its response to PRA RAI 08.a (Reference 12), the licensee provided the requested sensitivity analysis. Subsequently, in the licensee's letter dated July 3, 2014 (Reference 15), the licensee updated its LAR to reflect use of the NRC guidance on this topic in NRC letter dated April 23, 2014, "Supplemental Interim Technical Guidance on Fire-Induced Circuit Failure Mode Likelihood Analysis," (Reference 66). All "hot short" probabilities were revised to incorporate the values from this guidance. Furthermore, the licensee incorporated this revised treatment of hot short probabilities in the integrated analysis reported in its response to PRA RAI 36 and updated LAR Attachment W risk results (Reference 17). The NRC staff concludes that this issue is resolved because the licensee is now using acceptable methods.

In PRA RAIs 16.a through .c (Reference 20), the NRC staff requested that the licensee enhance its explanation of the use of three simplifying assumptions for its MCR abandonment analysis: (1) Limiting fires in the MCR and equipment rooms to within one electrical panel due to rapid fire detection and suppression by operations personnel; (2) conservatism in assuming only half the MCB panels involve multiple cable bundles; and (3) use of the same MCR non-suppression probability curves for two "distinct" areas, the MCR "front panel" and the MCR "back panel"/equipment area based on sharing of the same HVAC system.

In its response to PRA RAI 16.a (Reference 11), the licensee partially addresses some of the criteria for assuming damage within MCB panels will be limited to the initiating panel, namely the presence of no openings and a double wall with an air gap. However, NUREG/CR-6850, Appendix S, also indicates that there should be no sensitive electrical equipment in the adjacent cabinet (or else such equipment to have already been "qualified" above 82 degrees Celsius), even with the double wall with air gap. Otherwise damage to such equipment should be postulated.

In PRA RAI 16.a.01 (Reference 21), the NRC staff requested that the licensee explain how damage is modeled or, if not, the basis for assuming no damage, especially in light of the response to PRA RAI 33.a (Reference 11), that all MCB panels are physically open to one another. In its response to PRA RAI 16.a.01 (Reference 14), supplemented by its response to PRA RAI 35 (Reference 15), and confirmed in its response to PRA RAI 16.a.02 dated August 11, 2014 (Reference 16), the licensee explained that the non-MCB panels are separated by double-steel walls with air gaps and no openings between them, which satisfies the NUREG/CR-6850, Appendix S criterion, to assume no damage to sensitive electronics for the first 10 minutes. In addition, the licensee credits the continuous occupation of the MCR as enhancing the likelihood of controlling an MCB panel fire and cooling the cabinet to prevent damage to sensitive electronics within this 10-minute window, citing enhancement of operations guidance "to emphasize the need to evaluate the initial fire and to open the panel doors if the potential exists for damage/overheating in an adjacent panel." The licensee further stated that Appendix S states that open panel doors have not been shown to exacerbate fire growth in electrical panels. Additional discussion of the timing and temperatures associated with the MCR abandonment analysis is cited in the licensees response to PRA 33.a.01 (Reference 14). The NRC staff concludes that the licensee's response to PRA RAI 16.a.01, in conjunction with its response for PRA 33.a.01,[1] is acceptable because the basis for considering the criteria regarding fire spread and damage to sensitive electronics in the MCB panels from NUREG/CR-6850, Appendix S, is provided, with justification for timing and temperature assumptions and an action for procedural enhancement to ensure prompt operator action within the required 10-minute time window.

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1 Specifically, in the response to PRA RAI 16.a.01, dated May 23, 2014 (Reference 14), the licensee provided timing and temperature considerations from the MCR abandonment analysis. Specifically, the 98th percentile HRR leads to abandonment times from 13 to 17 minutes, during which time the hot gas layer (HGL) reaches ~60°C, below the damage threshold for sensitive electronics of 65°C cited in Appendix H of NUREG/CR-6850. This ensures sufficient time for operator action within the required 10 minutes to prevent damage to sensitive electronics in adjacent cabinets to that where the fire starts (for which the 60 vs. 65°C comparison is appropriate). Eventually an HGL temperature of 80-90°C is estimated, comparable to the damage threshold of 82°C from Appendix S for sensitive electronics in adjacent panels to where the fire starts. However, by this time the MCR will have been abandoned and command and control transferred ex-MCR.

In its response to PRA RAI 16.b (Reference 12), the licensee indicated that the original, potentially non-conservative assumption has been replaced with the conservative assumption that all panels in the MCB are assumed to experience fires in multiple, not single, cable bundles. The NRC staff concludes that this conservative approach is acceptable. In its response to PRA RAI 16.c (Reference 12), the licensee indicated that the MCR non-suppression curves are no longer assumed for the "back panel" area, but now assume fires in this area to be subject to the electrical fire non-suppression probabilities. The NRC staff concludes that the use of the more conservative electrical fire non-suppression probabilities for cabinets in the "back panel" area of the MCR is acceptable.

In PRA RAI 17.b (Reference 20), the NRC staff requested that the licensee provide additional discussion regarding the licensee's claim that its assumption that extending the ZOI associated solely with the ignition source all the way to the ceiling would conservatively bound the characteristic 35-degree "cone of damage" discussed in NUREG/CR-6850, Appendix R. In addition, the NRC staff requested that the licensee discuss whether this also bounds any expansion beyond the "cone" due to horizontal fire spread along cables until the fire is suppressed. In its response to PRA RAI 17.b (Reference 12), the licensee stated the following response to FM RAI 01.i (Reference 12):

> The secondary combustible (cable tray) configurations ... involve one or two stacks of one through seven cable trays located above the ignition source. The method used to develop the ZOI dimensions includes the vertical cable tray stack propagation model described in NUREG/CR-6850, Appendix R, the FLASH-CAT calculation method described in NUREG/CR-7010, Volume 1, and the radiant heat flux calculation methodology described in the GFMT [Generic Fire Modeling Treatments]. Because the method for determining the heat release rate development ... is consistent with applicable NUREG guidance, the approach is considered reasonably conservative and bounding.
>
> Supplemental plant walkdowns were conducted as part of this RAI response to identify ignition sources that involve secondary combustibles and to document the additional target sets that should be included for these ignition sources. The target sets for the ignition sources that involve secondary combustibles have been updated to reflect the heat release rate contribution from the ignition source secondary combustible configurations.

The licensee is applying acceptable methods, namely NUREG/CR-6850, Appendix R, and the "FLASH-CAT" model for horizontal fire spread along cables from NUREG/CR-7010, "Cable Heat Release, Ignition, and Spread in Tray Installations During Fire," Volume 1 (Reference 39), to address fire spread to secondary combustibles, confirming that the "generic" fire modeling approach bounds the results of this enhancement. In addition, supplemental walk-downs were conducted to identify additional targets that may be impacted by the increased ZOIs. Because these approaches are consistent with NRC guidance and accepted methods, the NRC staff concludes that the licensee's response is acceptable.

In PRA RAI 17.d (Reference 20), the NRC staff requested that the licensee assess the sensitivity of the risk results presented in the LAR for the turbine building collapse scenarios to the updated NRC guidance (Reference 67), on pump oil fires with regard to the assignment of likelihoods to postulated sizes of oil spills. In its response to PRA RAI 17.d (Reference 12), the licensee did not identify any bin 21 pump oil fires that would cause collapse or structural failure of the turbine building. However, the licensee did determine that turbine building collapse could be caused by main feedwater (MFW) pump oil fires (bin 32) in addition to a turbine-generator oil fire (bin 35) already postulated in the FPRA. The licensee provided the results of a sensitivity analysis that included turbine building collapse scenarios caused by MFW pump oil fires, using the guidance in FAQ 08-0044 (Reference 48), and by turbine-generator oil files, using the guidance in NUREG/CR-6850, Appendix O. Further, the licensee incorporated this revised modeling of turbine building collapse scenarios in the integrated analysis reported in the response to PRA RAI 36 and updated LAR Attachment W risk results (Reference 17). The NRC staff concludes that this issue is resolved because the licensee is using methods consistent with NRC guidance.

In PRA RAI 21.a (Reference 20), the NRC staff requested that the licensee clarify the source of three severity factors, $5.02x10^{-4}$, $4.84x10^{-4}$ and 0.00158, assumed for the abandonment cases after fires in the MCR, as these do not seem to derive from NUREG/CR-6850, Appendix L. In its response to PRA RAI 21.a (Reference 10), the licensee confirmed that the three severity factors do not derive from NUREG/CR-6850, Figure L-1, but are specifically calculated based on the type of ignition source, scenario location and abandonment time for the MCR abandonment analysis. The three severity factors correspond to the abandonment probabilities for transient ignition sources, equipment room fixed ignition sources and MCR fixed ignition sources, respectively.

In PRA RAI 21.a.01 (Reference 21), the NRC staff requested that the licensee provide a discussion of the derivation of these factors, including their bases. In its response to PRA RAI 21.a.01 (Reference 14), the licensee explained that the MCR abandonment analysis from which these cited severity factors derived has been updated, such that they are no longer used. The update estimates 13 new severity factors associated with combinations of (a) and (b), where (a) involves HRRs for multiple qualified (thermoset) cable bundles in closed electrical panels (with potential fire propagation to adjacent panels after 10 minutes and two additional panels after 20 minutes) or transient fires in open locations, wall configurations or corner configurations; and (b) addresses HVAC configuration where HVAC is not operating, operating normally or operating in purge mode. Additionally, the analysis assumes that the MCR will be ventilated by opening at least one door within 15 minutes, given an expected fire brigade response within 15 minutes. The 13 new severity factors now include five for the MCB panel area and eight for the Unit 1 and 2 equipment rooms and outlying areas within Fire Area 044. The NRC staff concludes that the licensee's description of the updated approach to calculating severity factors is acceptable because it considers only multiple cable bundles, includes propagation to adjacent MCB panels, and considers all HVAC configurations.

The NRC staff observed that the assumed functional failure temperature after 24 hours of exposure in a room for FNP is assumed to be 150°F, noticeably higher than typical, especially given implications of lower failure temperatures under equivalent conditions of 125°F for the service water intake structure and 104°F in the Battery Charger Room. In its response to PRA RAI 23.a (Reference 10), the licensee provided the basis and justification for applying the screening criteria for loss of room cooling, as developed for the Vogtle PRA, to the FNP FPRA, including a supplementary conference paper explaining the detail. The licensee also summarized the insights used to justify this application, as follows:

a. Use of operating ambient temperatures as screening limits may introduce excessive conservatism as these limits assume continuous operation over long periods of time, rather than the relatively short PRA mission times.

b. Screening criteria were developed using phenomenological models (e.g., Arrhenius model), experimental results (e.g., accelerated aging), operability studies at elevated temperatures and manufacturer manuals for operating temperature limits. As a result, the following two screening criteria were developed: (1) loss of room cooling may be dismissed if the temperature does not exceeded 65.6° C during the 24-hr mission time following its loss; (2) if criterion (1) is not met, loss of room cooling may be dismissed if all of the following occur: (i) at least 8 hr after loss of cooling is required to reach 65.6 °C; (ii) the temperature rise is stabilized so as not to "far" exceed 71.1°C after 24 hr; (iii) recovery from loss of cooling is a simple as opening door(s). When all three are met, the failure probability for operator recovery of room cooling is negligible due to ample time available and ease of the action.

c. Even if neither (a) nor (b) is satisfied and, therefore, loss of room cooling is modeled, credit may still be taken for operator recovery if the actions are feasible.

The licensee described the use of phenomenological models, experimental studies and manufacturer recommendations to develop a set of screening criteria. The details of these analyses are provided as an attached conference paper to the licensee's response. Successive screening criteria are used to ensure room cooling is not dismissed without firm justification. Based on the analysis and process summarized by the licensee, the NRC staff concludes that the licensee's approach is acceptable.

In PRA RAI 23.c (Reference 20), the NRC staff requested that the licensee justify its assumption that there would be no increase in the failure probability of the Start-up Transformer even if run above its non-emergency rating for extended periods of time, specifically the 24-hour mission time typically assumed for PRA. In its response to PRA RAI 23.c (Reference 11), the licensee stated that:

> ... [T]he Farley Fire PRA credits self-cooling for the Start-up Transformers (SUTs), but does not model forced transformer cooling. Based on review and discussions among transformer design engineering, system engineering, operations, and the Farley Fire PRA team, it was concluded that forced cooling is not needed to meet PRA success criteria during the PRA mission time ... [Based on the basic ratings for the SUTs under self-cooling, forced-cooling stage 1, and forced-cooling Stages 1 and 2 conditions,] ... in the self-cooling mode of operation, there is a possibility of overloading up to 9%, but that either forced-cooling mode would be more than adequate given that the forced-cooling value is much greater than the anticipated worse case of 9% overloading. While it is not expected that the self-cooling rating would be exceeded for very long even in the most extreme conditions (normally inconsequential loads would trip off), but if it does exceed these conditions it would be only at 9% which for the mission time of the Fire PRA (24 hours), is not expected to challenge the SUT given operating experience and practice as mentioned in IEEE C57.119.

> The failure probability is not increased because the self-cooling (oil-insulated air-cooled) mode relies on natural circulation and is not expected to fail. In order for the self-cooling mode to fail, some other initiating event would have to be introduced (i.e., some kind of puncture causing a leak). Since the SUT is not expected to be challenged in forced-cooling mode and the failure mode would rely on an outside initiating event, cooling of the SUT is not modeled and the probability of SUT failure is not increased. The point of transition between a mechanical concern and thermal concern cannot be precisely determined, but mechanical effects tend to have a more prominent role in larger kilovolt ampere ratings, because the mechanical stresses are higher. For the range of discussion, it is expected that this results in long term degradation should there be any impact for such a short duration and minimal increase over nameplate rating, but not immediate failure.

The NRC staff concludes that the licensee adequately justified its assumption that the failure probability for cooling of the SUT need not be increased due to the above discussion of the different types of cooling, and concludes that the licensee's response is acceptable.

In PRA RAI 33.c (Reference 20), the NRC staff requested that the licensee provide the quantitative basis for assuming that a CCDP/CLERP = 0.1 bounds all operator actions for alternate shutdown. In its response (Reference 12), the licensee indicated an intent to revise its MCR abandonment calculation as follows:

> The scenarios that do not result in abandonment were evaluated considering only equipment failures in the source panel and adjacent panels were open to the source panel. Scenarios that do not result in abandonment were evaluated in the Fire PRA and contribute to the calculated CDF and LERF contribution for the area.
>
> The CCDP for the abandonment scenario is based on failure of all actions in the control room. ... [A] conservative basis was used for determining the abandonment CCDP based on the calculated CCDP associated with panel damage and failure of the MCR actions. The intent of these criteria is to ensure that the abandonment CCDP is an appropriate bounding value given that shutting down the plant from outside the control room has an inherently higher risk associated with it.

These criteria are presented as (1) using CCDP = 0.1 if the Fire Risk Analysis Code (FRANC) calculates a CCDP < 0.001, (2) using CCDP = 0.2 if FRANC calculates a CCDP between 0.001 and 0.1, and (3) using CCDP = 1.0 if FRANC calculates a CCDP > 0.1. These FRANC-calculated CCDPs are based on both MCB panel damage and failure of human actions in the MCR. In PRA RAI 33.c.01 (Reference 21), the NRC staff requested that the licensee clarify how these human actions were quantified, including any detrimental effects (increased failure probabilities) due to fire effects in the MCR, and if screening or other bounding values were used, to specify the bases, (e.g., screening/scoping approach from NUREG-1921).

In its response to PRA RAI 33.c.01 (Reference 14), the licensee confirmed that it had implemented the above process for assigning CCDPs for MCR abandonment. Initially, a characteristic CCDP for each of the approximately 100 abandonment scenarios is estimated using the "TRUE" feature of FRANC, ignoring the effect of the shift of command and control ex-MCR. Based on the estimated value, the FRANC-based CCDP is reset manually to 0.1, 0.2 or

1.0 depending upon whether its calculated value is <0.001 (then set to 0.1), between 0.001 and 0.1 (then set to 0.2), or > 0.1 (then set to 1.0). No credit for human actions within the MCR is taken. No credit is taken for primary bleed and feed and any system not affected by fire is assumed to operate. The licensee included scoping analyses related to NUREG-1921, Figure 5-5 and Table 5-5. However, use of the scoping approach from NUREG-1921 would involve both Figures 5-4 and 5-5 and associated Tables 5-4 and 5-5, where Figure 5-4 and associated Table 5-4 refers to ex-MCR actions needed to transfer control to the remote shutdown panel, and demonstrate a combined HEP/CCDP < 0.1 only under very restrictive circumstances. Although the NRC staff concludes that the licensee's process is not consistent with NUREG-1921, given the inherent conservatisms in the FRANC-based approach (which takes no credit for human actions in the MCR), the NRC staff concludes that use of the three bounding HEP/CCDPs is acceptable. The licensee incorporated this revised modeling of MCR abandonment scenarios in the integrated analysis reported in its response to PRA RAI 36 and updated LAR Attachment W risk results (Reference 17). The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee used acceptable methods.

In PRA RAI 35 (Reference 21), the NRC staff requested that the licensee provide its justification for crediting the future installation of the Westinghouse Shutdown Seal (SDS), Generation III, for its RCPs as a risk reduction for both the risk and delta-risk given an earlier version of the SDS was unable to meet the operational and reliability goals previously assumed by Westinghouse. In its response to PRA RAI 35.01.a (Reference 16), the licensee cited the following bases for taking this credit:

> Farley plans to install Westinghouse's redesigned SDS, referred to as Generation III, as a replacement for the previous SDSs, in Unit 2 during the 2014 Fall refueling outage followed by installation in Unit 1 in 2015. The Generation III seal addresses vulnerabilities identified in previous designs. The basis for the confidence in the Generation III seals being able to perform as designed is described in TR-FSE-14-1-P, Revision 1, "Use of Westinghouse SHIELD Passive Shutdown Seal for FLEX Strategies," dated March 2014 (Reference 68). The nonproprietary version of the technical report is available in ADAMS at Accession number ML14084A495. The report was reviewed by the NRC and was endorsed by letter to Westinghouse dated May 28, 2014 (Reference 69). Therefore, consistent with the current state-of-the-practice PRA modeling, SNC will model the Generation III SDS in the Farley Fire PRA logic model using the leakage flow rates and failure probabilities in the Generation III consensus PRA model developed by Westinghouse for the Pressurized Water Reactor Owners Group (PWROG). This model is described in Topical Report (TR) PWROG-14001-P, Revision 1, "PRA Model for the Generation III Westinghouse Shutdown Seal," dated July 2014 (Reference 70). The PWROG submitted this report to the NRC Staff for review on July 3, 2014 (Reference 71). Additionally, based on the Farley Internal Events PRA, with credit for Generation III SDS modeled as described in PWROG-14001-P, Revision 1, the risk reduction benefit of the Generation III SDS in the Farley Fire PRA is expected to be consistent with analyses results with the previous SDS.

As described in the May 28, 2014 (Reference 69), letter from the NRC to Westinghouse, the NRC staff concluded that TR-FSE-14-1-P and supplemental information supports the justification that the SHIELD seal will limit the RCP seal leakage to less than one gallon per minute after activation during an extended loss of alternating current power with some limitations and conditions. Based on this evaluation and conclusion, the NRC staff concludes that the use of FNPs quantitative analysis for estimating the transition risk is acceptable. The current SDS model was incorporated in the integrated study in the licensee's response to PRA RAI 36 and incorporated into the updated LAR Attachment W. However, according to implementation item 32 in LAR Attachment S, Table S-3, the licensee will verify the reported change in risk estimates after the SDS seal modification is complete and the NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

The licensee identified resolution of the findings from the FPRA peer review in LAR Attachment V and the results of the NRC staff's review of the disposition of the findings is summarized in the NRC's Record of Review (Reference 65). The licensee confirmed that the FPRA peer review was performed consistent with RG 1.200. As a result of this review and the supplemental information provided, the NRC staff concludes that the FNP FPRA's quantitative results, considered together with the sensitivity study results, can be used to demonstrate that the change in risk due to the transition to NFPA 805 meets the acceptance guidelines in RG 1.174. As stated in the proposed license condition, the licensee will verify the validity of the reported change-in-risk estimates on the as-built conditions. Upon conclusion of the modification and verification of PRA model and the change-in-risk estimates, the NRC staff concludes that the FNP FPRA's quantitative results, supported by any required qualitative evaluations, can be used to demonstrate the change in risk meets or exceeds the change in risk acceptance guidelines for self-approval of FPP changes.

3.4.2.3 Fire Modeling in Support of the Development of the Fire Risk Evaluations

The NRC staff performed detailed reviews of the fire modeling used to support the FREs to gain further assurance that the methods and approaches used for the application to transition to NFPA 805 (Reference 3) were technically adequate. NFPA 805 has the following requirements that pertain to fire modeling used in support of the development of the FREs:

NFPA 805, Section 2.4.3.3, states, in part that:

> The PSA [probabilistic safety assessment] approach, methods, and data shall be acceptable to the AHJ [authority having jurisdiction].

NFPA 805, Section 2.7.3.2, "Verification and Validation," states that:

> Each calculational model or numerical method used shall be verified and validated through comparison to test results or comparison to other acceptable models.

NFPA 805, Section 2.7.3.3, "Limitations of Use," states that:

> Acceptable engineering methods and numerical models shall only be used for applications to the extent these methods have been subject to verification and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method.

NFPA 805, Section 2.7.3.4, "Qualification of Users," states that:

> Cognizant 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.

NFPA 805, Section 2.7.3.5, "Uncertainty Analysis," states that:

> An uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met.

The following Sections discuss the results of the NRC staff's reviews of the acceptability of the fire modeling (first requirement). The results of the NRC staff's reviews of compliance with the remaining requirements are discussed in SE Sections 3.8.3.2 through 3.8.3.5.

3.4.2.3.1 Overview of Fire Models Used to Support the Fire Risk Evaluations

The ZOI around ignition sources was determined based on information in the GFMTs approach. The GFMTs approach provides the horizontal and vertical dimensions of the ZOI for various ignition sources (transient fuel packages, small liquid fuel fires, open cabinets and cable trays) and different types of targets, (i.e., thermoplastic and thermoset cables as defined in NUREG/CR-6850, and Class A combustibles). The GFMTs approach includes a set of tables that are used to determine if and when the HGL temperature exceeds the damage threshold of specified targets depending on fire size, room volume, and ventilation conditions. The GFMTs approach was used as a basis for the scoping or screening evaluation as part of the fire modeling to support FREs.

The GFMTs approach also includes a set of tables that are used to determine if and when the HGL temperature or radiant heat flux exceeds the damage threshold of specified targets depending on fire size, room volume and ventilation conditions.

The ZOI tables in the GFMTs document and its supplement were obtained by using a collection of algebraic models and correlations. The primary algebraic fire models and correlations that were used for this purpose are as follows:

- Heskestad Flame Height Correlation;
- Heskestad Plume Temperature Correlation; and
- Shokri and Beyler Solid Flame Radiation Model (Reference 72).

These algebraic models are described in NUREG-1805, "Fire Dynamics Tools (FDT^s): Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program" (Reference 37). Validation and Verification (V&V) of these algebraic models is documented in NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications," Volume 3 (Reference 38). The V&V of the fire models that were used to support the FPRA is discussed in SE Section 3.8.3.2.

The Consolidated Model of Fire and Smoke Transport (CFAST), Version 6 (Reference 73) was used to generate the HGL tables in the GFMTs approach. The FPRA used these calculations to further screen ignition sources, scenarios, and compartments that would not be expected to generate an HGL, and to identify the ignition sources that have the potential to generate an HGL for further analysis. CFAST was also used for the control room abandonment time calculations. The V&V of CFAST is documented in NUREG-1824, Volume 5 (Reference 38).

The licensee also identified the use of the following empirical models that are not addressed in NUREG-1824, in the development of the GFMTs document and its supplements.

- Mudan flame radiation model (Reference 74);
- Plume heat flux correlation by Wakamatsu *et al.,* (Reference 75);
- Yokoi plume centerline temperature correlation (Reference 76) and (Reference 77);
- Hydrocarbon spill fire size correlation (Reference 78);
- Flame extension correlation (Reference 79);
- Delichatsios line source flame height model (Reference 80);
- Corner flame height correlation (Reference 79);
- Kawagoe natural vent flow equation (Reference 81);
- Yuan and Cox line fire flame height and plume temperature correlations (Reference 82);
- Lee's cable fire model (Reference 83); and
- Babrauskas method to determine ventilation-limited fire size (Reference 84).

In revised ZOI and HGL calculations for fires that involve secondary combustibles (cable trays) the licensee used the following model to calculate fire propagation in and the corresponding HRR of cable trays:

- Correlation for Flame Spread over Horizontal Cable Trays, FLASH-CAT, described in NUREG/CR-7010, Section 9 (Reference 39).

The V&V of these fire models is discussed in SE Section 3.8.3.2.

Plant-specific ZOI calculations were performed for four motor-generator sets based on Heskestad's plume temperature correlation and the point source radiation model using the spreadsheets in NUREG-1805 (Reference 37) and FIVE-Rev1 (Reference 85). In addition, Beyler's method for closed compartments was used to evaluate HGL effects in the compartments where the motor-generator sets are located. Plant-specific model calculations were performed in lieu of using the GFMTs approach because they allow for a more realistic representation of the fire scenarios involving these motor-generator sets.

The licensee's ZOI approach was used as a screening tool to distinguish between fire scenarios that required further evaluation and those that did not. The licensee stated that qualified personnel performed a plant walk-down to identify ignition sources, surrounding targets and SSCs in compartments and applied the empirical correlation screening tool to assess whether the SSCs were within the ZOI of the ignition source. Based on the fire hazard present in the fire areas, these generalized ZOIs were used to screen from further consideration those plant-specific ignition sources that did not adversely affect the operation of credited SSCs, or targets, following a fire. The licensee's screening was based on the 98th percentile fire HRR from the NUREG/CR-6850 methodology.

3.4.2.3.2 RAIs Pertaining to Fire Modeling in Support of the FNP Fire PRA

By letters dated July 8, 2013 (Reference 20) and March 28, 2014 (Reference 21), the NRC staff requested additional information concerning the fire modeling conducted to support the FPRA. By letters dated September 16, 2013 (Reference 10), October 30, 2013 (Reference 11), November 12, 2013 (Reference 12) and April 23, 2014 (Reference 13), the licensee responded to these RAIs.

- In FM RAI 01.a (Reference 20), the NRC staff requested that the licensee describe the uncertainty associated with assuming a 15-minute fire brigade arrival time in the MCR, and to explain the adverse effects of not meeting this assumption on the results of the FPRA. In its response to FM RAI 01.a (Reference 11), the licensee explained that there are no fire brigade response time data available from fire drills specifically for the control room. The licensee further stated that fire brigade response times to various plant areas (including spaces near the control room as well as outlying areas) from drills conducted between November 22, 2011 and September 5, 2013 range from 11 to 19 minutes, with an average of 14.2 minutes. The licensee further stated that these drill times are conservative because they are based on the arrival of the last fire brigade team member.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee's assumption concerning the fire brigade arrival time in the MCR abandonment time calculations can be reasonably estimated based on the results of actual fire brigade drills in other plant areas and near the MCR.

- In FM RAI 01.b (Reference 20), the NRC staff requested that the licensee provide technical justification for using transient fire growth rates in the MCR abandonment time calculations that are different from those specified in FAQ 08-0052 (Reference 51), and discuss the effect of these deviations on fire risk and delta risk. In its response to FM RAI 01.b (Reference 10), the licensee stated that the medium t^2 fire growth rate used leads to shorter calculated abandonment times for bins 1-5, and that, for the remaining bins, the fire growth rate in FAQ 08-0052 results in shorter MCR abandonment times. The licensee further stated that, in terms of probability for abandonment, the latter outweighs the former. The licensee recalculated the MCR abandonment times with the transient fire growth rates recommended in FAQ 08-0052 and achieved conservative results for transient fire scenarios in the control room and electrical panel areas.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate technical justification for the transient fire growth rate postulated in the MCR abandonment study.

- In FM RAI 01.c (Reference 20), the NRC staff requested that the licensee provide technical justification for using tabulated oxygen bomb calorimeter heat of combustion values for Teflon and Tefzel in the MCR abandonment calculations, instead of the effective heat of combustion values provided in Society of Fire Protection Engineers (SFPE) Handbook for cables insulated with these materials. In its response to FM RAI 01.c (Reference 10), the licensee indicated that the bomb calorimeter values used are consistent with the high heat of gasification values for these polymers, and representative of the high HRRs for electrical cabinets in NUREG/CR-6850. The licensee revised and updated the MCR abandonment time calculations for panel fire scenarios using SFPE Handbook values.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee revised the heat of combustion values of cables used in the MCR abandonment calculations to the heat of combustion values provided in the SFPE handbook.

- In FM RAI 01.d (Reference 20), the NRC staff requested that the licensee provide assurance that fire scenarios involving large trash cans that were observed during the onsite audit walkdowns are bounded by the fire scenarios that were considered in the MCR abandonment analysis. In its response to FM RAI 01.d (Reference 10), the licensee stated that the NUREG/CR-6850 transient fires bound the scenarios involving trash cans in the open, however, that may not be the case for trash cans against a wall or in a corner. The licensee updated the MCR abandonment analysis to include wall and corner effects for transient fires, and as part of the sensitivity analysis, the licensee performed additional MCR abandonment time calculations for 'severe' transient fires that bound trash can fires. The licensee developed an action to modify procedures to limit combustibles in the MCR, and included that action in LAR Attachment S, Table S-3, Implementation Item 33.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee updated the MCR abandonment analysis to include wall and corner effects, performed additional MCR abandonment time calculations for severe transient fires that bound trash can fires, and included an action to revise procedures to limit combustibles in the MCR as described in LAR Attachment S, Table S-3 which will incorporate the provisions of NFPA 805 in the FPP and the action would be required by the proposed license condition.

- In FM RAI 01.e (Reference 20), the NRC staff requested that the licensee explain how the results of the sensitivity analysis in the MCR abandonment time study were used in the FPRA. In its response to FM RAI 01.e (Reference 10), the licensee explained that the sensitivity analysis provides an indication of the parameter selections that could lead to significant variations in the results and to identify baseline scenarios that may need to be adjusted. The licensee further stated that a baseline fire scenario was considered to be non-conservatively biased if the change in the total probability of control room abandonment exceeds 15 percent and that only one sensitivity parameter (initial control room ambient temperature) out of sixteen considered is non-conservatively biased. The licensee further stated that since the elevated control room temperature corresponding to a 15 percent increase in the probability for abandonment is outside accepted operating conditions, no baseline scenarios were adjusted.

  In FM RAI 01.06 (Reference 21), the NRC staff requested that the licensee provide technical justification for the 15 percent limit criterion. In its response to FM RAI 01.06 (Reference 13), the licensee explained that the effect of the uncertainty of the input parameters on the output is resolved to a level comparable to that of the HRR, which is the primary input parameter and has an observed uncertainty among test facilities of 17-23 percent. The licensee stated that a ±15 percent variation in the probability for abandonment is well within the range of probabilities corresponding to the uncertainty of the suppression rate parameter (λ), for fires in the MCR.

  The NRC staff concludes that the licensee's response to FM RAI 01.06 is acceptable because the licensee justified the use of the ±15 percent variation in the probability for abandonment by showing that it is well within the range of probabilities corresponding to the uncertainty of the suppression rate parameter for fires in the MCR. The NRC staff also concludes that the licensee's response to FM RAI 01.e is acceptable because for nearly 90 percent of the sensitivity cases, the abandonment time is about the same or longer than in corresponding baseline case, and in the three sensitivity cases for which the probability for abandonment increases by more than 10 percent, the decrease of the abandonment time is minimal and ranges from 0 to 0.72 minutes (min.)

- In FM RAI 01.g (Reference 20), the NRC staff requested that the licensee explain how the modification to the critical heat flux for a target that is immersed in a hot gas environment described in in the GFMTs approach was used in the ZOI determination. In its response to FM RAI 01.g (Reference 10), the licensee explained that the modified heat flux is used in the HGL calculations to account for radiative heating of targets outside the radial ZOI of the ignition source, and described the resulting two-tiered approach that is used. The licensee stated that in this approach, the ZOI tables in the GFMTs approach are applied without any adjustments for HGL temperatures of 80°C or less and that full room burnout is assumed when the HGL temperature is higher than 80°C.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee justified using the modified heat flux calculations to account for combined convective-radiative heating of targets in the HGL calculations.

- In FM RAI 01.h (Reference 20), the NRC staff requested that the licensee provide technical justification to demonstrate that the GFMTs approach as used to determine the ZOI of fires that involve multiple burning items is conservative and bounding. In its response to FM RAI 01.h (Reference 12), the licensee stated that the ZOI determined according to the GMFTs approach may not be conservative for fires that involve secondary combustibles. The licensee developed new ZOI tables for fires that involve an ignition source and secondary combustibles (cable trays). The licensee stated that the FLASH-CAT model was used in the development of these tables to determine the contribution to the HRR from cable trays and that additional ZOI calculations were performed for wall and corner fires. The licensee stated that walkdowns were performed to locate ignition sources that are affected, and to identify additional damage targets based on the new ZOI tables.

  The NRC staff's review of the response revealed that the cable tray fire propagation calculations performed to develop the new ZOI tables are based on the assumption that the lowest tray in a stack located above an ignition source will not ignite unless the tray is located below the flame tip of the ignition source fire which appears to deviate from the FLASH-CAT model assumptions. In FM RAI 09 (Reference 21), the NRC staff requested that the licensee provide technical justification for this assumption, and to conduct a sensitivity analysis to demonstrate that the conservatism of the ZOI and HGL calculations for fires that involve cable trays as secondary combustibles is not adversely affected by the ignition criterion that was used (compared to the ignition criteria in NUREG/CR-6850 and NUREG/CR-7010, Volume 1). In its response to FM RAI 09 (Reference 13), the licensee demonstrated, based on full-scale cable tray fire test data and Heskestad's flame height and plume centerline temperature correlations, that thermoplastic cables are not expected to ignite unless they are heated by a flame. The licensee further stated that based on Cone Calorimeter data reported in NUREG/CR-7010, Volume 1 (Reference 39), that thermoset cables are not expected to ignite at heat fluxes below that at the flame tip and that the bottom tray is assumed to ignite one minute after the ignition source starts to release heat, provided it is at or below the flame tip.

  The NRC staff concludes that the licensee's responses to the RAIs are acceptable because the licensee demonstrated that its assumptions concerning the ignition of cable trays are conservative.

- In FM RAI 01.i (Reference 20), the NRC staff requested that the licensee describe how the flame spread and fire propagation in cable trays and the corresponding HRR of cables was determined, and to explain how these calculations affect the HGL temperature calculations. In its response to FM RAI 01.i (Reference 12), the licensee explained that new HGL tables were developed for fires that involve secondary combustibles (cable trays) and that these tables were used to determine the HGL potential for fire scenarios that involve secondary combustibles. The licensee further stated that the new tables were developed based on the same approach for calculating fire propagation in cable trays that was used in the development of the new ZOI tables discussed in the response to FM RAI 01.h.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee developed new HGL tables for fires that involve secondary combustibles and demonstrated that its assumptions are conservative (see discussion for FM RAI 01.h).

- In FM RAI 01.j (Reference 20), the NRC staff requested that the licensee describe how transient combustibles in an actual plant setting are characterized in terms of the three fuel package groupings in the GFMTs approach to identify areas where the NUREG/CR-6850 transient combustible HRR characterization may not encompass typical plant configurations, and to explain if any administrative action will be used to control the type of transients in a fire area. In its response to FM RAI 01.j (Reference 10), the licensee explained that transient combustibles are categorized as miscellaneous materials that do not contain combustible liquids (Group 3 and Group 4 in the GFMTs approach). The licensee stated that it does not differ in any significant manner from other plants with respect to its transient combustible controls to warrant a significant increase or decrease of the 98^{th} percentile HRR of 317 kilowatt (kW) recommended in NUREG/CR-6850. The licensee stated that to address the potential for violations, a 69 kW HRR fire was applied in areas where transient combustibles are prohibited.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated an appropriate approach to categorize transient combustibles in the fire modeling analysis, which is consistent with NUREG/CR-6850.

- In FM RAI 01.k (Reference 20), the NRC staff requested that the licensee confirm that fires involving plastic trash cans observed throughout the plant during the onsite audit walkdowns are bounded by the transient fire scenarios that were considered in the fire modeling analysis. In its response to FM RAI 01.k (Reference 10), the licensee explained that location factors (2 and 4 for wall and corner fires, respectively) were applied in the analysis of fire scenarios that involve transient combustibles and that this bounds fires involving the observed trash cans, since in most cases the 98^{th} percentile HRR was used.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that fires involving the observed trash cans are bounded by the transient fire scenarios that were considered in the fire modeling analysis.

- In FM RAI 01.l (Reference 20), the NRC staff requested that the licensee explain how non-cable intervening combustibles were identified and accounted for in the fire modeling analysis. In its response to FM RAI 01.l (Reference 12), the licensee explained that additional walkdowns were performed to identify the fire zones and areas where non-cable intervening combustibles are located, and that none were found that would adversely impact the fire modeling analysis or affect the scenario quantification. The licensee further stated that the intervening combustibles would be incorporated into the analysis in conjunction with the impact of the secondary cable combustibles addressed in its response to PRA RAI 17.b.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee conducted walkdowns and determined that no non-cable intervening combustibles were found that would adversely impact the fire modeling analysis.

- In FM RAI 01.07 (Reference 21), the NRC staff requested that the licensee confirm that the findings from the remaining walkdowns did not change the response to FM RAI 01(l). In its response to FM RAI 01.07 (Reference 13), the licensee stated that it's walkdowns did not identify any fixed non-cable intervening combustibles of a significant quantity/size that were within the zone of influence of an ignition source (the zone of influence for cable damage was used as a conservative zone of influence for ignition of non-cable intervening combustibles). The non-cable intervening combustibles did not impact any existing scenarios or warrant creation of new scenarios, therefore, the non-cable intervening combustibles did not impact the Fire PRA risk.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that there are no non-cable intervening combustibles of a significant quantity/size that are within the zone of influence of an ignition source and because the non-cable intervening conbustibles do not impact fire PRA risk.

- In FM RAI 01.m (Reference 20), the NRC staff requested that the licensee describe the criteria for selecting 69 kW over the NUREG/CR-6850 98th percentile of 317 kW for transient combustibles in selected areas. In its response to FM RAI 01.m (Reference 12), the licensee explained that 69 kW was postulated in areas where, based on the relationship between physical size and maximum HRR of transient fires in the GFMTs approach, there is insufficient space to accommodate a transient combustible that can sustain a 317 kW fire.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that there is insufficient space to accommodate transient combustibles that can sustain a 317 kW fire.

- In FM RAI 01.02 (Reference 21), the NRC staff requested that the licensee identify all areas where 69 kW transient fires were postulated and to provide technical justification for not using a 317 kW transient fire in each of these areas. In its response to FM RAI 01.02 (Reference 13), the licensee identified the 18 compartments where a 69 kW transient fire was postulated. The licensee further explained that the HRR per unit area (source strength) in the tests on which the

NUREG/CR-6850 transient HRR guidelines are based was less than 400 kW/m^2, as discussed in the GFMTs approach, consequently, a 317 kW fire would require a transient combustible with a floor area of 0.8 m^2 (approximately 9 ft^2) which is too large to fit in the identified compartments. The licensee further stated that it is not considered credible to store transient combustibles with an area exceeding 0.14 m^2 (approximately 1.5 ft^2), and therefore not considered credible to store transients with a HRR exceeding 69 kW in any of the 18 identified compartments.
The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for postulating a 69 kW transient fire instead of a 317 kW transient fire in the identified areas.

- In FM RAI 01.n (Reference 20), the NRC staff requested that the licensee explain why vertical fire propagation in stacks of horizontal trays with thermoset, IEEE-383 qualified cables was not modeled. In its response to FM RAI 01.n (Reference 12), the licensee explained that vertical fire propagation was not modeled in the initial analysis because targets above an ignition source and within the horizontal ZOI dimension were assumed to be damaged if at least one cable tray was within the vertical ZOI dimension. The licensee further stated that the ZOI and HGL tables have been revised as discussed in the responses to FM RAIs 01(h) and 01(i) and that the effect of vertical fire propagation in cable trays on the ZOI dimensions and the HGL calculations was included in the development of the revised tables.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee revised the ZOI and HGL tables and accounted for the effect of vertical fire propagation in cable trays.

- In FM RAI 01.o (Reference 20), the NRC staff requested that the licensee describe how it accounted for location effects for combustible liquid and electrical cabinet fires in close proximity of a wall or corner. In its response to FM RAI 01.o (Reference 12), the licensee explained that the impact of wall and corner effects on the ZOI was addressed in conjunction with the walkdowns discussed in its response to FM RAI 01.l and PRA RAI 17.b. The licensee further stated that the primary impact is related to electrical cabinet fires and that the evaluation of this impact on the FPRA is discussed in its response to PRA RAI 17.b.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee conducted walkdowns to evaluate the impacts of secondary combustibles and updated its analysis of cable tray combustible impact on the ZOI based on wall and corner effects for combustible liquid and electrical cabinet fires.

- During the onsite audit, the NRC staff observed transformers filled with approximately 300 gallons of oil in several areas of the plant. The NRC staff found that for the fire scenarios that involve these transformers, they are assumed to be dry. In FM RAI 01.p (Reference 20), the NRC staff requested that the licensee provide justification for not treating the transformers as oil-filled, which according to NUREG/CR-6850, have a higher HRR. In its response to FM RAI 01.p (Reference 12), the licensee explained that the transformers cited in the RAI are filled with

Dow Corning 561 transformer fluid, which has a fire hazard potential that is substantially lower than mineral oil. The licensee further stated that Dow Corning 561 is classified as a "Less-Flammable" fluid by Underwriters Laboratories with a flash point over 300°C (572°F) and a fire point over 340°C (644°F). The licensee further stated that the fluid has a HRR per American Society of Testing and Materials (ASTM) E-1354 that is an order of magnitude lower than that of mineral oil and referred to a series of comparative large-scale pool fire tests at Underwriters Laboratories, which further demonstrate the vastly superior fire performance of Dow Corning 561 over mineral oil transformer fluid.

Sections of NUREG/CR-6850 indicate that the severity factor of a motor fire can be used to characterize a dry transformer. However, if the area of the spill is large enough, the HRR due to fire from these transformers could be larger than a motor fire. In FM RAI 01.03 (Reference 21), the NRC staff requested that the licensee provide technical justification for the HRR and assumed fire source area that were used to characterize transformers filled with Dow Corning 561 transformer fluid. In its response to FM RAI 01.03 (Reference 13), the licensee re-iterated the reduced flammability characteristics of Dow Corning 561 over mineral oil. The licensee further referred to a precedent for crediting the reduced fire hazard potential for indoor transformers filled with silicone oil at a commercial nuclear power plant (Reference 86) (Reference 87). The licensee further stated that a fire at the silicone liquid filled transformers would be generally confined to the transformer itself, which is a comparable event to a dry transformer fire. The licensee further referred to fire protection guidance for silicone liquid transformers in Factory Mutual Global Property Loss Prevention Data Sheet 5-4 (Reference 88) and International Standard IEC 60695-1-40 (Reference 89) to further justify the assumption that fires involving any of the transformers containing the Dow Corning 561 silicone fluid are expected to be confined to the transformer itself rather than result in a spreading pool fire.

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for treating the transformers cooled with Dow Corning 561 transformer fluid as dry.

- In FM RAI 08 (Reference 21), the NRC staff requested that the licensee explain how high energy arcing fault (HEAF) initiated fires were addressed in the HGL calculations and to provide technical justification for the approach that was used to calculate HGL development timing. In its response to FM RAI 08 (Reference 13), the licensee explained that the guidance in NUREG/CR-6850, Appendix M was followed to determine the ZOI associated with a HEAF in an electrical cabinet. The licensee further stated that the HRR used in the HGL calculations and multi-compartment analysis (MCA) is based on that of a medium voltage switchgear or load center, as applicable, in conjunction with the HRR of any secondary combustibles in the ZOI. The licensee indicated that the fire modeling analysis initially assumed a 12 minute time to peak HRR for the electrical cabinet fire and was subsequently revised by assuming that the peak HRR is reached immediately following a HEAF, in accordance with the guidance in of NUREG/CR-6850, Appendix M. The licensee stated that the results of the revised analysis and corresponding impact on the risk are discussed in its response to RAI PRA 35 (Reference 13).

The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee revised its analysis by assuming that the peak HRR is reached immediately following a HEAF which is in accordance with NRC endorsed guidance.

- In FM RAI 02.a (Reference 20), the NRC staff requested that the licensee describe how the installed cabling in the power block was characterized, specifically with regard to the critical damage threshold temperatures and critical heat flux for thermoset and thermoplastic cables as described in NUREG/CR-6850. In its response to FM RAI 02.a (Reference 10), the licensee stated that the installed cabling in the power block was considered to be thermoset, since only 6 percent (approximately) of the cabling was characterized as thermoplastic and the thermoplastic cables are instrumentation cables at lower elevations (less important).

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for characterizing the power block cabling as thermoset.

- During the onsite audit, the NRC staff identified some potential confusion in the terminology used to identify cables as thermoplastic/thermoset and non-IEEE-383 qualified/IEEE-383 qualified. In FM RAI 02.b (Reference 20), the NRC staff requested that the licensee confirm that the cables in the plant are indeed thermoset, and not just IEEE-383 qualified. In its response to FM RAI 02.b (Reference 12), the licensee stated that approximately 6 percent of cables installed in the plant are considered to be thermoplastic and that given the low percentage of cables considered to be thermoplastic, the analysis was built using thermoset damage criteria.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee justified the use of the thermoset damage criteria in its analysis as the majority of cables in the plant are thermoset.

- In FM RAI 02.c (Reference 20), the NRC staff requested that the licensee explain how electrical raceways with a mixture of thermoset and thermoplastic cables were treated in terms of damage thresholds. In its response to FM RAI 02.c (Reference 10), the licensee explained that thermoset damage criteria were used for raceways with a mixture of thermoplastic and thermoset cables.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for assigning thermoset damage criteria to raceways with a mixture of cables since only 6 percent of the cables are thermoplastic and those cables are of low importance in the FPRA.

- In FM RAI 02.d (Reference 20), the NRC staff requested that the licensee explain how the damage thresholds for non-cable components were determined. In its response to FM RAI 02.d (Reference 12), the licensee stated that thermoset damage thresholds were used for all non-cable components.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for assigning thermoset damage thresholds to non-cable components since the licensee exclusively uses thermoset damage thresholds for all cabling in the power block and because assigning thermoset damage thresholds to non-cable components with thermoset cables supporting the component is consistent with NRC endorsed guidance provided in NUREG/CR-6850, Section H.2.

- In FM RAI 02.f (Reference 20), the NRC staff requested that the licensee provide technical justification for using thermoset cable damage thresholds for temperature sensitive equipment inside cabinets. In its response to FM RAI 02.f (Reference 12), the licensee referred to FAQ 13-0004 (Reference 90) to justify the use of thermoset damage thresholds for temperature sensitive equipment. The licensee further explained that walkdowns and an evaluation are in progress to identify sensitive electronic equipment credited for post fire shutdown and located outside enclosures, and to assess potential damage of the equipment by nearby ignition sources using the applicable criteria in NUREG/CR-6850, Appendix H.

  In FM RAI 02.01 (Reference 21), the NRC staff requested that the licensee confirm that the limitations in FAQ 13-0004 were considered in the damage assessment of sensitive electronic equipment enclosed in cabinets. In its response to FM RAI 02.01 (Reference 13), the licensee stated that walkdowns were performed for identification of sensitive electronics mounted outside of electrical cabinets and explained that sensitive electronics mounted on an electrical cabinet wall or door are not considered to be exposed directly to convective and radiative heat if they are provided with a cover or face plate. The licensee further explained that all targets throughout the compartment, including sensitive electronics, are assumed to fail when the HGL temperature reaches 80°C (176 °F), but that sensitive electronics inside an enclosure are not considered to be damaged at or below that HGL temperature because they are protected and likely to be located below the HGL.

  The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for the approach used to assess damage to temperature sensitive equipment inside and outside cabinets.

- In FM RAI 02.g (Reference 20), the NRC staff requested that the licensee provide the technical basis for the assumption that all sensitive electronics are contained within "sealed" cabinets. In its response to FM RAI 02.g (Reference 12), the licensee explained that sensitive electronics are typically not located outside enclosures to protect the electronics from dusts and other external contaminants and that the final damage assessment of sensitive electronics will be made after the walk-downs discussed in the response to FM RAI 02.f are completed.

In FM RAI 02.02 (Reference 21), the NRC staff requested that the licensee provide the results of the additional walkdowns and confirm that the findings have been incorporated into the fire modeling and FPRA. In its response to FM RAI 02.02 (Reference 13), the licensee confirmed that during the walkdowns no exposed sensitive electronics associated with equipment credited in the FPRA were found.

The NRC staff concludes that the licensee's responses to the RAIs are acceptable because the licensee provided adequate justification for the assumption that all sensitive electronics are contained within "sealed" cabinets.

3.4.2.3.3 Conclusion for Section 3.4.2.3

Based on the licensee's description in the LAR, as supplemented, of the process for performing fire modeling in support of the FREs, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805, Section 2.4.3.3 is acceptable.

3.4.2.4 Conclusions Regarding Fire PRA Quality

The NRC staff concludes that the technical adequacy and quality of the FNP PRA is sufficient for the FREs that support the proposed license amendment because (1) the PRA models conform to the applicable industry PRA standards for internal events and fires at an appropriate capability category, considering the acceptable disposition of the review findings; (2) the fire modeling used to support the development of the FNP FPRA has been confirmed as appropriate and acceptable; and (3) the PRA models adequately represents the current, as built, as operated and maintained plant as it will be configured after full implementation of NFPA 805, and is therefore capable of being adapted to model both the post-transition and compliant plant as needed.

In addition, the licensee's PRA satisfies the guidance in RG 1.174, Sections 2.3 and 5, regarding quality of the PRA analysis and quality assurance; RG 1.205 Section 4.3, regarding FPRA; and NUREG-0800, Section 19.2 (Reference 30), regarding the review of risk information used to support permanent plant-specific changes to the licensing basis, which further supports the NRC staff's conclusion that the FNP PRA is technically adequate and of sufficient quality to allow transition to NFPA 805.

Finally, based on the licensee's administrative controls to maintain the PRA models current and assure continued quality, using only qualified staff and contractors, as described in SE Section 3.8.3, the NRC staff concludes that the quality of the FNP PRA is sufficient to support self-approval of future risk-informed changes to the FPP under the NFPA 805 license condition following completion of the PRA-related implementation items identified in LAR Attachment S, Table S-3.

3.4.3 Fire Risk Evaluations

The NRC staff reviewed the following information during its evaluation of FNPs FREs:

- LAR Section 4.5.1, "Fire PRA Development and Assessment"
- LAR Section 4.5.2, "Performance Based Approaches"
- LAR Attachment U, "Internal Events PRA Quality"
- LAR Attachment V, "Fire PRA Quality"
- LAR Attachment W, "Fire PRA Risk Insights"

For those fire areas for which the licensee used a PB approach to meet the NSPC, the licensee used FREs in accordance with NFPA 805, Section 4.2.4.2 to demonstrate the acceptability of the plant configuration. Plant configurations that did not meet the deterministic requirements of NFPA 805, Section 4.2.3.1 were considered VFDRs.

After identifying VFDRs, the licensee provided an estimate of the change in risk (CDF and LERF) associated with retaining the VFDR relative to a deterministically compliant plant. In PRA RAI 09.a (Reference 20), the NRC staff requested that the licensee describe the calculational technique for calculating the delta-risks associated with VFDRs, including discussion of the determination of both the "variant" (i.e., post-transition) and "complaint" cases used in the calculation. In its response to PRA RAI 09.a (Reference 11), the licensee provided a description of the steps to identify and perform the fire risk evaluation. If the total area risk was less than the screening criteria, then the fire area CDF/LERF was typically considered as a surrogate for the delta CDF/LERF. For fire areas with higher total area risk, additional analysis was performed. For each such area, targets that were failed in the FPRA model were reviewed, along with scenarios where the VFDR targets(s) were damaged. The licensee stated that if no scenarios for a given fire area included damaged VFDR targets, then the delta risk between the complaint and the variant case is zero.

For scenarios that were determined to damage VFDR targets, the variant case was modified to reflect a deterministically compliant case for each scenario. This compliant case provided the fire risk if the plant configuration was modified to reroute or otherwise protect all components and cables associated with all VFDRs. The quantification of this case was performed by setting the basic events in the compliant case FPRA model that are associated with the VFDRs to their nominal random failure probability. The change in risk is the variant minus the complaint case risk.

The NRC staff concludes that the FRE process is consistent with the approach described in FAQ 08-0054 (Reference 52) and RG 1.174, and therefore, acceptable.

3.4.4 Additional Risk Presented by Recovery Actions

The NRC staff reviewed LAR Attachment C, "[Nuclear Energy Institute] NEI 04-02 Table B-3 – Transition," LAR Attachment G, "Recovery Actions Transition," and LAR Attachment K, "Existing Licensing Action Transition," during its evaluation of the additional risk presented by the NFPA 805 RAs. SE Section 3.2.5 describes the identification and evaluation of RAs.

For those fire areas for which the licensee used a risk-informed (RI) approach to meet the NSPC, the licensee used FREs in accordance with NFPA 805, Section 4.2.4.2 to demonstrate the acceptability of the plant configuration. Plant configurations that did not meet the separation requirements of NFPA 805, Section 4.2.3.1 were considered VFDRs. The licensee evaluated each VFDR for risk impact by comparing it to a compliant plant configuration, and the additional risk was summed for each fire area and compared to the acceptance criteria contained in RG 1.174. The process used to derive the difference between the variant and compliant plant is the same as described in the previous section, but now limited only to those VFDRs resolved via RAs.

The licensee identified fire areas that used a previously approved alternative shutdown strategy and identified the PCS and operator actions used to implement the alternative strategy. Consistent with RG 1.205, any action(s) required to transfer control to, or operate equipment from the PCS, are not considered RAs per the RG 1.205 guidance. Conversely, any operator actions required to be performed outside the CR and not at the PCS are RAs.

The licensee addressed the additional risk of the RAs associated with an approved alternate shutdown, which takes place in response to loss of habitability of the MCR due to fire effects in that location. This is a two-step process. First, the licensee calculated the frequency of damaging fires affecting critical targets in each MCB panel, using the technique of NUREG/CR-6850, Appendix L. This yields the maximum CCDP. Next the licensee calculated the frequency of abandoning the MCR due to loss of habitability from the fire effects, including heat, smoke and toxic gas, using the CFAST FM code. Credit for suppression is based on FAQ 08-0050 (Reference 50) and NUREG/CR-6850, Supplement 1. The maximum CCDP from the first step may be used as a conservative estimate of the additional risk of RA, or the credit from the second step that can be taken for recovery using the alternate shutdown panel is taken to reduce the CCDP from the first step. Either method is consistent with the change in risk estimates in FAQ 08-0054 and therefore acceptable.

The additional risk associated with RAs performed as a result of postulated fire damage in the MCR was determined as the sum of the products of the fire ignition frequency, propagation probability, non-suppression probability, evacuation probability, and human failure probability to successfully operate the alternate shutdown panel, and conditional CCDP for each MCB panel fire scenario and any postulated fires from transient combustibles.

The licensee reported the additional risk of RAs as 9.42×10^{-6}/year and 6.47×10^{-7}/year for Unit 1 CDF and LERF respectively. For Unit 2 the reported additional risk estimates are 8.26×10^{-6}/year and 6.68×10^{-7}/year for CDF and LERF respectively. The NRC staff concludes that the approaches applied are acceptable because the approach conservatively estimates the risk increases, which remain within the RG 1.174 risk acceptance guidelines of 1×10^{-5}/year (ΔCDF) and 1×10^{-6}/year (ΔLERF) for small changes.

3.4.5 Risk-Informed or Performance-Based Alternatives to NFPA 805

The licensee did not use any RI or PB alternatives to compliance with NFPA 805 which fall under the requirements of 10 CFR 50.48(c)(4).

3.4.6 Cumulative Risk and Combined Changes

In LAR Attachment S, Table S-2, as supplemented (Reference 17), the licensee identified planned NFPA 805 transition modifications that decrease risk and for which the licensee takes credit during the assessment of the cumulative risk impact of the transition to NFPA 805. The licensee included modifications that did not result in bringing the facility into compliance with the deterministic requirements of NFPA 805. The licensee credited the risk reduction from certain of these modifications by applying it as a risk offset to the total plant transition risk (i.e., by not including certain risk-reduction modifications in the compliant plant configuration). Therefore, the NRC staff considers the licensee's application to transition to a RI/PB FPP a combined change request as described in RG 1.174, Revision 2, Sections 1.1 and 1.2.

The licensee reported in the LAR, as supplemented, the total CDF and total LERF, which were estimated by adding the risk assessment results for internal events, fire and seismic. In its response to PRA RAI 36 (Reference 17), the licensee identified a number of changes to PRA methods, as discussed in this SE, and provided a revised estimate of total fire and seismic CDF and LERF for both units in an update to LAR Attachment W, Table W-1. The updated seismic risk estimates reflect the licensee's response to PRA RAI 15.a (Reference 10). The seismic CDF estimate for each unit is an average of three different seismic CDF estimates developed by the NRC staff in support of Generic Issue 199 using the 2008 U.S. Geological Survey (USGS) seismic hazard estimates (Reference 91). Since the NRC staff estimates of the seismic CDF for FNP are the most current estimates available, the NRC staff concludes that the licensee's seismic CDF estimates are acceptable for this application. The CDF and LERF results from the licensee's response to PRA RAI 36 (Reference 17) are summarized in SE Table 3.4.6.

Table 3.4.6: CDF and LERF for FNP after Transition to NFPA 805

Hazard Group	Unit 1		Unit 2	
	CDF (/year)	LERF (/year)	CDF (/year)	LERF (/year)
Internal Events	1.06×10^{-5}	1.24×10^{-7}	7.98×10^{-6}	1.20×10^{-7}
Fires	6.61×10^{-5}	4.83×10^{-6}	7.33×10^{-5}	7.11×10^{-6}
Seismic	1.73×10^{-5}	2.02×10^{-7}	1.73×10^{-5}	2.60×10^{-7}
Other External Risks (high winds, external floods and transportation, and nearby facilities)	Insignificant (Based on the Individual Plant Examination for External Events [IPEEE])			
TOTAL	9.40×10^{-5}	5.16×10^{-6}	9.86×10^{-5}	7.49×10^{-6}

The total CDF after implementation of NFPA 805 remains below 1×10^{-4}/yr, and the total LERF remains below 1×10^{-5}/year, and, therefore, increases in CDF up to 1×10^{-5}/yr and increases in LERF up to 1×10^{-6}/year are generally considered acceptable according to the risk acceptance guidelines of RG 1.174.

A combined change request should report the risk increase and risk decrease values separately. The licensee reported the final risk estimates in the supplement to LAR Attachment W (Reference 17). The licensee reported that the risks associated with retained (non-resolved) VFDRs are 2.01×10^{-5}/year and 1.71×10^{-6}/year for ΔCDF and ΔLERF respectively. The corresponding values for Unit 2 ΔCDF and ΔLERF are 2.58×10^{-5}/year and 3.98×10^{-6}/year respectively. The values correspond to an "increase" in risk associated with retaining the VFDRs. For Unit 1, the license reported a risk decrease from the risk-reduction modifications of -4.77×10^{-5}/year and -1.30×10^{-5}/year for ΔCDF and ΔLERF respectively. The corresponding values for Unit 2 are -2.54×10^{-5}/year and -8.39×10^{-6}/year for ΔCDF and ΔLERF respectively.

The total change-in-risk values is the net change where the risk increase and decrease are summed. Based on the above values, the net changes for Unit 1 are -2.76×10^{-5}/year and -1.13×10^{-5}/year for ΔCDF and ΔLERF respectively. The corresponding values for Unit 2 are 4.00×10^{-7}/year and -4.41×10^{-7}/year for ΔCDF and ΔLERF respectively. The risk results for each unit satisfies the RG 1.174 acceptance guidelines and the NRC staff considers them acceptable because the total increase in CDF and LERF for each Unit are below 1×10^{-5}/year and 1×10^{-6}/year, respectively. Review of LAR Attachment W indicates that all change in risk estimates for each fire area are also less than the acceptance guidelines with the exception of the increase in LERF in two fire areas in Unit 2. The maximum increase is reported to be 2.10×10^{-6} /year which exceeds the acceptance guideline of 10^{-6} /year for ΔLERF. However, the total increases are less than the acceptance guidelines and the combined change request allows individual contributing values to exceed the guidelines and therefore the NRC staff concludes that the change-in-risk in these areas is acceptable.

The NRC staff concludes that the change in risk associated with the proposed alternative to compliance with the deterministic criteria of NFPA 805 is acceptable in accordance with NFPA 805, Section 2.4.4.1 because the change in risk satisfies the acceptance criteria and guidance in RG 1.174, Sections 2.4 and 2.5, and NUREG-0800, Section 19.2.

3.4.7 Uncertainty and Sensitivity Analyses

For the most part, the licensee employed accepted methods to perform the risk analyses which support its LAR to transition to NFPA 805, following the guidance in NUREG/CR-6850. Where deviations were employed, the licensee either clarified the assumptions used and/or performed additional sensitivity analyses to confirm minimal effect. These issues are discussed in SE Section 3.4.2.2.

With regard to the FAQ 08-0048 (Reference 49), fire frequencies, the licensee updated the analysis in LAR Attachment V, Section V.2.2 (Reference 17), for its final PRA results after the integrated study in the response to PRA RAI 36 for fire frequency bins with an alpha less than or equal to one, and confirmed that for Unit 1, RG 1.174 acceptance guidelines continue to be met since ΔCDF and ΔLERF with risk reduction modifications are negative and represent risk decreases. In particular, since the total CDF is $1.45X10^{-4}$ and the ΔCDF is less than $1X10^{-6}$, and the total LERF is $8.52X10^{-6}$ and the ΔLERF is less than $1X10^{-6}$, the risk metrics meet R.G. 1.174 guidelines. The licensee indicated that similar risk insights are expected for Unit 2. Thus the NRC staff concludes that the analysis of those FAQ 08-0048 bins with alpha less than or equal to one, are acceptable.

3.4.8 Conclusion for Section 3.4

Based on the information provided by the licensee in the LAR, as supplemented, regarding the fire risk assessment methods, tools, and assumptions used to support transition to NFPA 805 at FNP, the NRC staff concludes that:

- The licensee's PRA used to perform the risk assessments in accordance with NFPA 805, Section 2.4.4 (PCEs) and Section 4.2.4.2 (FREs), is of sufficient quality to develop risk results that, supplemented by the sensitivity study required by FAQ 08-0048, support the application to transition the FNP FPP to NFPA 805 as proposed in the LAR. Therefore, the NRC staff concludes that the PRA approach, methods, tools and data are acceptable in accordance with NFPA 805, Section 2.4.3.3

- LAR Attachment S, Table S-3, Implementation items 30 and 32 direct that, upon completion of all modifications in LAR Attachment S, Table S-2, the as-built modifications be incorporated into the FPRA and the validity of the reported change in risk estimates be verified. The licensee will verify that the risk results represent the as-built plant when it transitions to NFPA 805.

- The licensee's transition process included a detailed review of fire protection DID and safety margins as required by NFPA 805. The NRC staff concludes that the licensee's evaluation of DID and safety margins is acceptable. The licensee's process followed the NRC endorsed guidance in NEI 04-02, and is consistent with the approved NRC staff guidance in RG 1.205, which provides an acceptable approach for meeting the requirements of 10 CFR 50.48(c).

- The changes in risk (i.e., ΔCDF and ΔLERF) associated with the proposed alternatives to compliance with the deterministic criteria of NFPA 805 (FREs) are acceptable and the licensee satisfied the guidance contained in RG 1.205, Revision 1; RG 1.174, Revision 2, Sections 2.4 and 2.5; and NUREG-0800, Section 19.2, regarding acceptable risk. By meeting the guidance contained in these documents, the changes in risk have been found to be acceptable to the NRC staff, and therefore meet the requirements of NFPA 805.

- The risk presented by the use of the RAs was determined by the licensee and provided in accordance with the guidance in RG 1.205 and NFPA 805, Section 4.2.4.

- The licensee did not use any RI or PB alternatives to compliance with NFPA 805, which fall under the requirements of 10 CFR 50.48(c)(4).

- The licensee's application to transition to NFPA 805 is a combined change, as defined by RG 1.205, which includes risk increases identified in the FREs with risk decreases resulting from modifications that include reductions in risk associated with the IEPRA. Based on the combination of these risk values, the changes associated with NFPA 805 meet the guidance contained in RG 1.205, Regulatory Position 3.2.5, related to meeting the requirements for cumulative risk and combined plant changes.

3.5 Nuclear Safety Capability Assessment Results

NFPA 805, Section 2.2.3, "Evaluating Performance Criteria," states that:

> To determine whether plant design will satisfy the appropriate performance criteria, an analysis shall be performed on a fire area basis, given the potential fire exposures and damage thresholds, using either a deterministic or performance-based approach.

NFPA 805, Section 2.2.4, "Performance Criteria," states that:

> The performance criteria for nuclear safety, radioactive release, life safety, and property damage/business interruption covered by this standard are listed in Section 1.5 and shall be examined on a fire area basis.

NFPA 805, Section 2.2.7, "Existing Engineering Equivalency Evaluations," states that:

> When applying a deterministic approach, 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 evaluations shall clearly demonstrate an equivalent level of fire protection compared to the deterministic requirements.

3.5.1 Nuclear Safety Capability Assessment Results by Fire Area

NFPA 805, Section 2.4.2, "Nuclear Safety Capability Assessment," states that:

> The purpose of this section is to define the methodology for performing a nuclear safety capability assessment. The following steps shall be performed:
>
> (1) Selection of systems and equipment and their interrelationships necessary to achieve the nuclear safety performance criteria in Chapter 1;
>
> (2) Selection of cables necessary to achieve the nuclear safety performance criteria in Chapter 1;
>
> (3) Identification of the location of nuclear safety equipment and cables; and
>
> (4) Assessment of the ability to achieve the nuclear safety performance criteria given a fire in each fire area.

This SE section addresses the last topic regarding the ability of each fire area to meet the NSPC of NFPA 805. SE Section 3.2.1 addresses the first three topics.

NFPA 805, Section 2.4.2.4," Fire Area Assessment," states that:

> An engineering analysis shall be performed in accordance with the requirements of Section 2.3 for each fire area to determine the effects of fire or fire suppression activities on the ability to achieve the nuclear safety performance criteria of Section 1.5.

In accordance with the above, the process defined in NFPA 805, Chapter 4, provides a framework to select either a deterministic or a PB approach to meet the NSPC. Within each of these approaches, additional requirements and guidance provide the information necessary for the licensee to perform the engineering analyses necessary to determine which fire protection systems and features are required to meet the NSPC of NFPA 805.

NFPA 805, Section 4.2.2, "Selection of Approach," states that:

> For each fire area either a deterministic or performance-based approach shall be selected in accordance with Figure 4.2.2. Either approach shall be deemed to satisfy the nuclear safety performance criteria. The performance-based approach shall be permitted to utilize deterministic methods for simplifying assumptions within the fire area.

This SE section evaluates the approach used to meet the NSPC on a fire area basis, as well as what fire protection features and systems are required to meet the NSPC.

The NRC staff reviewed LAR Section 4.2.4, "Fire Area Transition," LAR Section 4.8.1, "Results of the Fire Area Review," LAR Attachment C, "NEI 04-02 Table B-3 – Fire Area Transition," LAR Attachment G, "Recovery Actions Transition," LAR Attachment S, "Plant Modifications and

Implementation Items," and LAR Attachment W, "Fire PRA Insights," during its evaluation of the ability of each fire area to meet the NSPC of NFPA 805.

FNP is a dual unit PWR with 272 individual fire areas including the Yard (Yard areas in the Main Power Block and in the vicinity of the Service Water Intake Structure), and each fire area is composed of one or more fire zones. Based on the information provided by the licensee in the LAR, as supplemented, the licensee performed the NSCA on a fire area basis. LAR Attachment C provides the results of these analyses on a fire area basis and also identified the fire zones within the fire areas.

SE Table 3.5.1 identifies those fire areas that were analyzed using either the deterministic or PB approach in accordance with NFPA 805 Chapter 4 based on the information provided in LAR Attachment C, Table B-3, "Fire Area Transition."

Table 3.5-1 Fire Area and Compliance Strategy Summary

Fire Area	Area Description	Compliance Basis
044-U1	Control Room Complex & TSC	Performance-Based
044-U2	Control Room Complex & TSC - Unit 1	Deterministic
044-U2	Control Room Complex & TSC - Unit 2	Performance-Based
051-U1	Control Room HVAC Equipment Rooms	Performance-Based
051-U2	Control Room HVAC Equipment Rooms	Performance-Based
056A-U1	DG Building Switchgear Room Train A	Performance-Based
056A-U2	DG Building Switchgear Room Train A	Performance-Based
056B-U1	DG Building Switchgear Room Train B & Foyer	Performance-Based
056B-U2	DG Building Switchgear Room Train B & Foyer	Performance-Based
057-U1	Diesel Generator Room 2C	Performance-Based
057-U2	Diesel Generator Room 2C	Performance-Based
058-U1	Diesel Generator Room 1B	Performance-Based
058-U2	Diesel Generator Room 1B	Performance-Based
059-U1	Diesel Generator Room 2B	Performance-Based
059-U2	Diesel Generator Room 2B	Performance-Based
060-U1	Diesel Generator Room 1C	Performance-Based
060-U2	Diesel Generator Room 1C	Performance-Based
061-U1	Diesel Generator Room 1-2A	Performance-Based
061-U2	Diesel Generator Room 1-2A	Performance-Based
062	Day Fuel Tank Room 2C	Deterministic
063	Day Fuel Tank Room 1B	Deterministic
064	Day Fuel Tank Room 2B	Deterministic
065	Day Fuel Tank Room 1C	Deterministic
066	Day Fuel Tank Room 1-2A	Deterministic
067	RWIS Pump Room B	Deterministic
068	RWIS Pump Room A	Deterministic
069	RWIS Switchgear Room-Train B	Deterministic
070	RWIS Switchgear Room-Train A, Unit 1	Performance-Based
070	RWIS Switchgear Room-Train A, Unit 2	Deterministic
071	DG Building Corridor	Deterministic
072-U1	Service Water Pump Room	Performance-Based

072-U2	Service Water Pump Room	Performance-Based
073	SWIS Battery Room-Train B	Deterministic
074	SWIS Battery Room-Train A	Deterministic
075-U1	SWIS 5 kV Switchgear Room B & West Stairs	Performance-Based
075-U2	SWIS 5 kV Switchgear Room B & West Stairs	Performance-Based
076-U1	SWIS 5 kV Switchgear Room A & East Stairs	Performance-Based
076-U2	SWIS 5 kV Switchgear Room A & East Stairs	Performance-Based
093	Aux Building	Deterministic
1-001	Aux Building, Unit 1	Performance-Based
1-001	Aux Building, Unit 2	Deterministic
1-004-U1	Aux Building	Performance-Based
1-004-U2	Aux Building	Performance-Based
1-005	Aux Building, Unit 1	Performance-Based
1-005	Aux Building, Unit 2	Deterministic
1-006	Aux Building, Unit 1	Performance-Based
1-006	Aux Building, Unit 2	Deterministic
1-008-U1	Aux Building Cable Chase, Room 116	Performance-Based
1-008-U2	Aux Building Cable Chase, Room 116	Performance-Based
1-009-U1	Aux Building Cable Chase, Room 117 & 246	Performance-Based
1-009-U2	Aux Building Cable Chase, Room 117 & 246	Performance-Based
1-012	Hallway & Local Hot Shutdown Panel Room, Unit 1	Performance-Based
1-012	Hallway & Local Hot Shutdown Panel Room, Unit 2	Deterministic
1-013-U1	Aux Building Cable Chase, Rooms 227, 300, 465, 466 & 500	Performance-Based
1-013-U2	Aux Building Cable Chase, Rooms 227, 300, 465, 466 & 500	Performance-Based
1-014	Computer Room & Duct Chase, Unit 1	Performance-Based
1-014	Computer Room & Duct Chase, Unit 2	Deterministic
1-015	Communication Room, Unit 1	Performance-Based
1-015	Communication Room, Unit 2	Deterministic
1-016	Aux Building Battery Room	Deterministic
1-017	Aux Building Battery Room	Deterministic
1-018	Aux Building DC Switchgear Room	Performance-Based
1-019	Aux Building DC Switchgear Room, Unit 1	Performance-Based
1-019	Aux Building DC Switchgear Room, Unit 2	Deterministic
1-020	Aux Building, Unit 1	Performance-Based
1-020	Aux Building, Unit 2	Deterministic
1-021-U1	Aux Building Switchgear Rooms	Performance-Based
1-021-U2	Aux Building Switchgear Rooms	Performance-Based
1-023-U1	Aux Building Switchgear Room	Performance-Based
1-023-U2	Aux Building Switchgear Room	Performance-Based
1-030-U1	Aux Building Cable Chase, Rooms 249 & 252	Performance-Based
1-030-U2	Aux Building Cable Chase, Rooms 249 & 252	Performance-Based
1-031-U1	Aux Building Cable Chase, Rooms 250 & 251	Performance-Based
1-031-U2	Aux Building Cable Chase, Rooms 250 & 251	Performance-Based
1-034	Train B Electrical Pen Room & Filtration System, Unit 1	Performance-Based
1-034	Train B Electrical Pen Room & Filtration System, Unit 2	Deterministic
1-035	Train A Electrical Pen Room, Unit 1	Performance-Based
1-035	Train A Electrical Pen Room, Unit 2	Deterministic
1-039	Fuel Storage & Storage Rack Pits, Unit 1	Performance-Based
1-039	Fuel Storage & Storage Rack Pits, Unit 2	Deterministic
1-040-U1	Cable Spreading Room	Performance-Based

1-040-U2	Cable Spreading Room	Performance-Based
1-041-U1	Train A Switchgear & Load Center Rooms	Performance-Based
1-041-U2	Train A Switchgear & Load Center Rooms	Performance-Based
1-042-U1	Aux Building Hallway & Corridor	Performance-Based
1-042-U2	Aux Building Hallway & Corridor	Performance-Based
1-053	Aux Building Elevator Machine Room No. 2	Deterministic
1-054	Aux Bldg Elev Mach Rm No. 1/ Elev No. 1 Shaft, Unit 1	Performance-Based
1-054	Aux Bldg Elev Mach Rm No. 1/ Elev No. 1 Shaft, Unit 2	Deterministic
1-055	Containment, Unit 1	Performance-Based
1-055	Containment, Unit 2	Deterministic
1-075-U1	Unit 1 Cable Tunnel - Train A	Performance-Based
1-075-U2	Unit 1 Cable Tunnel - Train A	Performance-Based
1-076-U1	Unit 1 Cable Tunnel - Train B	Performance-Based
1-076-U2	Unit 1 Cable Tunnel - Train B	Performance-Based
1-077	Condensate Storage Tank	Deterministic
1-078	Reactor Makeup Storage Tank	Deterministic
1-079	Refueling Water Storage Tank, Unit 1	Performance-Based
1-079	Refueling Water Storage Tank, Unit 2	Deterministic
1-080	Low Voltage Switchyard - Unit 1	Deterministic
1-081-U1	Turbine Building Battery Room	Performance-Based
1-081-U2	Turbine Building Battery Room	Performance-Based
1-082	Turbine Building Lube Oil Storage Room	Deterministic
1-083	Turbine Building Oil Storage Room	Deterministic
1-086	Turbine Building Auxiliary Steam Generator	Deterministic
1-090	Aux Building Combustible Storage & Filter Unit Room	Deterministic
1-092	Drumming Station & Storage & Combustible Storage Room	Deterministic
1-094	Aux Building Combustible Storage Room, Unit 1	Performance-Based
1-094	Aux Building Combustible Storage Room, Unit 2	Deterministic
1-095	Aux Building Storage Room	Deterministic
1-096	Aux Building Combustible Storage Room	Deterministic
1-097	Filter Hatch Room & Combustible Storage Area	Deterministic
1-098	Caskwash Storage & Combustible Storage Area	Deterministic
1-DU-DGRWIS-A	Diesel Building to RWIS Ductbank, Unit 1, Train A	Deterministic
1-DU-DGRWIS-B	Diesel Building to RWIS Ductbank, Unit 1, Train B	Deterministic
1-DU-DGSWIS-A-U1	Diesel Building to SWIS Ductbank, Unit 1, Train A	Performance-Based
1-DU-DGSWIS-A-U2	Diesel Building to SWIS Ductbank, Unit 1, Train A	Performance-Based
1-DU-DGSWIS-B-U1	Diesel Building to SWIS Ductbank, Unit 1, Train B	Performance-Based
1-DU-DGSWIS-B-U2	Diesel Building to SWIS Ductbank, Unit 1, Train B	Performance-Based
1-DU-DGVB-A	Diesel Building to Valve Box Ductbanks, Train A, Unit 1	Performance-Based
1-DU-DGVB-A	Diesel Building to Valve Box Ductbanks, Train A, Unit 2	Deterministic
1-DU-DGVB-B	Diesel Building to Valve Box Ductbanks, Train B, Unit 1	Performance-Based
1-DU-DGVB-B	Diesel Building to Valve Box Ductbanks, Train B, Unit 2	Deterministic
1-EMBED-AB	Aux Building Embedded Conduit	Deterministic
1-S01	Stairwell No. 1, Unit 1	Performance-Based

1-S01	Stairwell No. 1, Unit 2	Deterministic
1-S02	Stairwell No. 2, Unit 1	Performance-Based
1-S02	Stairwell No. 2, Unit 2	Deterministic
1-S08	Stairwell No. 8	Deterministic
1-S10	Stairwell No. 10, Unit 1	Performance-Based
1-S10	Stairwell No. 10, Unit 2	Deterministic
1-SVB1-A	Service Water Valve Box, 1-SVB1, Train A, Unit 1	Performance-Based
1-SVB1-A	Service Water Valve Box, 1-SVB1, Train A, Unit 2	Deterministic
1-SVB1-B	Service Water Valve Box, 1-SVB1, Train B, Unit 1	Performance-Based
1-SVB1-B	Service Water Valve Box, 1-SVB1, Train B, Unit 2	Deterministic
1-SVB2-A	Service Water Valve Box, 1-SVB2, Train A, Unit 1	Performance-Based
1-SVB2-A	Service Water Valve Box, 1-SVB2, Train A, Unit 2	Deterministic
1-SVB2-B	Service Water Valve Box, 1-SVB2, Train B, Unit 1	Performance-Based
1-SVB2-B	Service Water Valve Box, 1-SVB2, Train B, Unit 2	Deterministic
1-SVB3-A	Service Water Valve Box, 1-SVB3, Train A	Deterministic
1-SVB3-B	Service Water Valve Box, 1-SVB3, Train B	Deterministic
1-SVB4-A	Service Water Valve Box, 1-SVB4, Train A, Unit 1	Performance-Based
1-SVB4-A	Service Water Valve Box, 1-SVB4, Train A, Unit 2	Deterministic
1-SVB4-B	Service Water Valve Box, 1-SVB4, Train B, Unit 1	Performance-Based
1-SVB4-B	Service Water Valve Box, 1-SVB4, Train B, Unit 2	Deterministic
1-TB-U1	Turbine Building General Area	Performance-Based
1-TB-U2	Turbine Building General Area	Performance-Based
2-0001	Aux Building	Performance-Based
2-004-U1	Aux Building, Unit 1	Performance-Based
2-004-U1	Aux Building, Unit 2	Deterministic
2-004-U2	Aux Building	Performance-Based
2-005	Aux Building, Unit 2	Performance-Based
2-005	Aux Building, Unit 1	Deterministic
2-006	Aux Building, Unit 2	Performance-Based
2-006	Aux Building, Unit 1	Deterministic
2-008-U1	Aux Building Cable Chase, Room 2116	Performance-Based
2-008-U2	Aux Building Cable Chase, Room 2116	Performance-Based
2-009-U1	Aux Building Cable Chase, Rooms 2117 & 2246	Performance-Based
2-009-U2	Aux Building Cable Chase, Rooms 2117 & 2246	Performance-Based
2-012	Hallway & Local Hot shutdown Panel Room, Unit 2	Performance-Based
2-012	Hallway & Local Hot shutdown Panel Room, Unit 1	Deterministic
2-013-U1	Aux Building Cable Chase, Rooms 2227, 2300, 2466 & 2500	Deterministic
2-013-U2	Aux Building Cable Chase, Rooms 2227, 2300, 2466 & 2500	Performance-Based
2-014	Computer Room, Unit 2	Performance-Based
2-014	Computer Room, Unit 1	Deterministic
2-015	Communication Room, Unit 2	Performance-Based
2-015	Communication Room, Unit 1	Deterministic
2-016	Aux Building Battery Room	Deterministic
2-017	Aux Building Battery Room, Unit 2	Performance-Based
2-017	Aux Building Battery Room, Unit 1	Deterministic
2-018	Aux Building DC Switchgear Room, Unit 2	Performance-Based
2-018	Aux Building DC Switchgear Room, Unit 1	Deterministic
2-019	Aux Building DC Switchgear Room, Unit 2	Performance-Based
2-019	Aux Building DC Switchgear Room, Unit 1	Deterministic
2-020	Aux Building, Unit 2	Performance-Based

2-020	Aux Building, Unit 1	Deterministic
2-021-U1	Aux Building Switchgear Rooms	Performance-Based
2-021-U2	Aux Building Switchgear Rooms	Performance-Based
2-023-U1	Aux Building Switchgear Rooms	Performance-Based
2-023-U2	Aux Building Switchgear Rooms	Performance-Based
2-030-U1	Aux Building Cable Chase, Rooms 2249 & 2252	Performance-Based
2-030-U2	Aux Building Cable Chase, Rooms 2249 & 2252	Performance-Based
2-031-U1	Aux Building Cable Chase, Rooms 2250 & 2251	Performance-Based
2-031-U2	Aux Building Cable Chase, Rooms 2250 & 2251	Performance-Based
2-034	Train B Electrical Pen Room & Filtration System, Unit 2	Performance-Based
2-034	Train B Electrical Pen Room & Filtration System, Unit 1	Deterministic
2-035	Train A Electrical Pen Rooms, Unit 2	Performance-Based
2-035	Train A Electrical Pen Rooms, Unit 1	Deterministic
2-039	Fuel Storage & Storage Rack Pits, Unit 2	Performance-Based
2-039	Fuel Storage & Storage Rack Pits, Unit 1	Deterministic
2-040-U1	Cable Spreading Room	Performance-Based
2-040-U2	Cable Spreading Room	Performance-Based
2-041-U1	Train A Switchgear & Load Center Rooms	Performance-Based
2-041-U2	Train A Switchgear & Load Center Rooms	Performance-Based
2-042-U1	Aux Building Hallway & Corridor	Performance-Based
2-042-U2	Aux Building Hallway & Corridor	Performance-Based
2-043-U1	Aux Building	Performance-Based
2-043-U2	Aux Building	Performance-Based
2-054	Aux Bldg Elev Mach Rm No. 4/ Elev No. 1 Shaft, Unit 2	Performance-Based
2-054	Aux Bldg Elev Mach Rm No. 4/ Elev No. 1 Shaft, Unit 1	Deterministic
2-055	Containment, Unit 2	Performance-Based
2-055	Containment, Unit 1	Deterministic
2-075-U1	Unit 2 Cable Tunnel - Train A	Performance-Based
2-075-U2	Unit 2 Cable Tunnel - Train A	Performance-Based
2-076-U1	Unit 2 Cable Tunnel - Train B	Performance-Based
2-076-U2	Unit 2 Cable Tunnel - Train B	Performance-Based
2-077	Condensate Storage Tank	Deterministic
2-078	Reactor Makeup Storage Tank	Deterministic
2-079	Refueling Water Storage Tank, Unit 2	Performance-Based
2-079	Refueling Water Storage Tank, Unit 1	Deterministic
2-080	Low Voltage Switchyard - Unit 2	Deterministic
2-081	Turbine Building Battery Room, Unit 2	Performance-Based
2-081	Turbine Building Battery Room, Unit 1	Deterministic
2-089	Lube Oil & Combustible Storage Room	Deterministic
2-090	Aux Building Combustible Storage & Filter Unit Room	Deterministic
2-092	Drumming Station & Storage & Combustible Storage Room	Deterministic
2-094	Aux Building Combustible Storage Room	Deterministic
2-096	Aux Building Combustible Storage Room	Deterministic
2-097	Filter Hatch Room & Combustible Storage Area	Deterministic
2-098	Caskwash Storage & Combustible Storage Area	Deterministic
2-DU-ABVB-A	Aux Building to Valve Box Ductbanks, Train A, Unit 2	Performance-Based
2-DU-ABVB-A	Aux Building to Valve Box Ductbanks, Train A, Unit 1	Deterministic
2-DU-ABVB-B	Aux Building to Valve Box Ductbanks, Train B, Unit 2	Performance-Based
2-DU-ABVB-B	Aux Building to Valve Box Ductbanks, Train B, Unit 1	Deterministic
2-DU-DGRWIS-	Diesel Building to RWIS Ductbank, Unit 2, Train A	Deterministic

A		
2-DU-DGRWIS-B	Diesel Building to RWIS Ductbank, Unit 2, Train B	Deterministic
2-DU-DGSWIS-A	Diesel Building to SWIS Ductbank, Unit 2, Train A, Unit 2	Performance-Based
2-DU-DGSWIS-A	Diesel Building to SWIS Ductbank, Unit 2, Train A, Unit 1	Deterministic
2-DU-DGSWIS-B	Diesel Building to SWIS Ductbank, Unit 2, Train B, Unit 2	Performance-Based
2-DU-DGSWIS-B	Diesel Building to SWIS Ductbank, Unit 2, Train B, Unit 1	Deterministic
2-EMBED-AB	Aux Building Embedded Conduit	Deterministic
2-S01	Stairwell No. 1, Unit 2	Performance-Based
2-S01	Stairwell No. 1, Unit 1	Deterministic
2-S02	Stairwell No. 2, Unit 2	Performance-Based
2-S02	Stairwell No. 2, Unit 1	Deterministic
2-S08	Stairwell No. 8	Deterministic
2-S10	Stairwell No. 10	Deterministic
2-SVB1-A	Service Water Valve Box, 2-SVB1, Train A, Unit 2	Performance-Based
2-SVB1-A	Service Water Valve Box, 2-SVB1, Train A, Unit 1	Deterministic
2-SVB1-B	Service Water Valve Box, 2-SVB1, Train B, Unit 2	Performance-Based
2-SVB1-B	Service Water Valve Box, 2-SVB1, Train B, Unit 1	Deterministic
2-SVB2-A	Service Water Valve Box, 2-SVB2, Train A, Unit 2	Performance-Based
2-SVB2-A	Service Water Valve Box, 2-SVB2, Train A, Unit 1	Deterministic
2-SVB2-B	Service Water Valve Box, 2-SVB2, Train B, Unit 2	Performance-Based
2-SVB2-B	Service Water Valve Box, 2-SVB2, Train B, Unit 1	Deterministic
2-SVB3-A	Service Water Valve Box, 2-SVB3, Train A, Unit 2	Performance-Based
2-SVB3-A	Service Water Valve Box, 2-SVB3, Train A, Unit 1	Deterministic
2-SVB3-B	Service Water Valve Box, 2-SVB3, Train B, Unit 2	Performance-Based
2-SVB3-B	Service Water Valve Box, 2-SVB3, Train B, Unit 1	Deterministic
2-SVB4-A	Service Water Valve Box, 2-SVB4, Train A	Deterministic
2-SVB4-B	Service Water Valve Box, 2-SVB4, Train B	Deterministic
2-TB	Turbine Building General Area, Unit 2	Performance-Based
2-TB	Turbine Building General Area, Unit 1	Deterministic
ABRF-U1	Control Room Air Conditioner, Unit 1 & 2	Performance-Based
ABRF-U2	Control Room Air Conditioner, Unit 1 & 2	Performance-Based
DU-DGFOST-A	Diesel Fuel Oil Storage Tank Ductbank, Train A	Deterministic
DU-DGFOST-B	Diesel Fuel Oil Storage Tank Ductbank, Train B	Deterministic
DU-SWISVB-A-U1	SWIS to Valve Box Ductbank, Train A	Performance-Based
DU-SWISVB-A-U2	SWIS to Valve Box Ductbank, Train A	Performance-Based
DU-SWISVB-B-U1	SWIS to Valve Box Ductbank, Train B	Performance-Based
DU-SWISVB-B-U2	SWIS to Valve Box Ductbank, Train B	Performance-Based
EMBED-DGB-U 1	Diesel Generator Building Embedded Conduit	Deterministic
EMBED-DGB-U 2	Diesel Generator Building Embedded Conduit	Deterministic
SWWPVB-A-U1	Service Water Valve Box Return to Wet Pit, Train A	Performance-Based

SWWPVB-A-U2	Service Water Valve Box Return to Wet Pit, Train A	Performance-Based
SWWPVB-B-U1	Service Water Valve Box Return to Wet Pit, Train B	Performance-Based
SWWPVB-B-U2	Service Water Valve Box Return to Wet Pit, Train B	Performance-Based
TBRF	Turbine Building Roof HVAC Room, Units 1 & 2	Deterministic
YARD-SWIS-U1	Yard Area in Vicinity of SWIS	Performance-Based
YARD-SWIS-U2	Yard Area in Vicinity of SWIS	Performance-Based
YARD-U1	Yard Area in Main Power Block	Performance-Based
YARD-U2	Yard Area in Main Power Block	Performance-Based

LAR Attachment C provides the results of these analyses on a fire area basis. For each fire area, the licensee documented:

- The approach used in accordance with NFPA 805 (i.e., the deterministic approach in accordance with NFPA 805, Section 4.2.3, or the PB approach in accordance with NFPA 805, Section 4.2.4);
- The SSCs required in order to meet the NSPC;
- Fire detection and suppression systems required to meet the NSPC;
- An evaluation of the effects of fire suppression activities on the ability to achieve the NSPC; and
- The disposition of each VFDR using either modifications (completed or committed) or the performance of a FRE in accordance with NFPA 805, Section 4.2.4.2.

3.5.1.1 Fire Detection and Suppression Systems Required to Meet the Nuclear Safety Performance Criteria

A primary purpose of NFPA 805 Chapter 4 is to determine, by analysis, what fire protection features and systems need to be credited to meet the NSPC. Four sections of NFPA 805 Chapter 3 have requirements dependent upon the results of the engineering analyses performed in accordance with NFPA 805 Chapter 4: (1) fire detection systems, in accordance with NFPA 805 Section 3.8.2; (2) automatic water-based fire suppression systems, in accordance with NFPA 805 Section 3.9.1; (3) gaseous fire suppression systems, in accordance with NFPA 805 Section 3.10.1; and (4) passive fire protection features, in accordance with NFPA 805 Section 3.11. The features/systems addressed in these sections are only required when the analyses performed in accordance with NFPA 805 Chapter 4 indicate the features and systems are required to meet the NSPC.

The licensee performed a detailed analysis of fire protection features and identified the fire suppression and detection systems required to meet the NSPC for each fire area. LAR Table 4-3, "NFPA 805 Required Fire Protection Systems and Features" lists the fire areas, and identifies if the required fire protection systems and features installed in these areas are required to meet criteria for separation, DID, risk, licensing actions, or EEEEs.

The NRC staff reviewed LAR Attachment C for each fire area to ensure fire detection and suppression met the principles of DID in regard to the planned transition to NFPA 805. Based on the statements provided in LAR Attachment C, as supplemented, the NRC staff concludes that the licensee used appropriate methods to evaluate nuclear safety, DID, and safety margins, and adequately identified the fire detection and suppression systems required to meet the NFPA 805 NSPC on a fire area basis.

3.5.1.2 Evaluation of Fire Suppression Effects on Nuclear Safety Performance Criteria

Each fire area of LAR Attachment C includes a discussion of how the licensee met the requirement to evaluate the fire suppression effects on the ability to meet the NSPC.

The licensee stated that damage to plant areas and equipment from the accumulation of water discharged from manual and automatic fire protection systems and the discharge of manual suppression water to adjacent compartments is controlled. Therefore, fire suppression activities will not adversely affect achievement of the NSPC.

The NRC staff concludes that the licensee's evaluation of the suppression effects on the NSPC is acceptable because the licensee evaluated the fire suppression effects on meeting the NSPC and determined that fire suppression activities will not adversely affect achievement of the NSPC.

3.5.1.3 Licensing Actions

Based on the information provided in the LAR Section 4.2.3, as supplemented, the licensee identified exemptions from the deterministic licensing basis for each fire area that were previously approved by the NRC. Each of these exemptions is further detailed in LAR Attachment K, "Existing Licensing Action Transition." However, the licensee stated in LAR Section 4.2.3 and indicated in LAR Attachment C that no licensing actions will be transitioned into the NFPA 805 FPP as previously approved, since each are no longer required because a FRE has either found that the fire area is compliant with NFPA 805 Section 4.2.4, or demonstrated the installed fire protection features to be adequate for the hazard in EEEEs.

Since the fire areas are either compliant with 10 CFR 50.48(c) or the exemptions are no longer necessary, the licensee requested that the exemptions listed in LAR Attachment K be rescinded as part of the LAR process. The rescinded exemptions are documented in LAR Attachment O, "Orders and Exemptions." See SE Section 2.5 for further discussion.

The licensee does not have any elements of the current FPP for which NRC clarification is needed; therefore, LAR Attachment T did not contain any requested clarifications (see SE Section 3.5.2).

3.5.1.4 Existing Engineering Equivalency Evaluations

The EEEEs that support compliance with NFPA 805 Chapter 4 were reviewed by the licensee using the methodology contained in NEI 04-02. The methodology for performing the EEEE review included the following determinations:

- The EEEE is not based solely on quantitative risk evaluations;

- The EEEE is an appropriate use of an engineering equivalency evaluation;
- The EEEE is of appropriate quality;
- The standard license condition is met;
- The EEEE is technically adequate;
- The EEEE reflects the plant as-built condition; and
- The basis for acceptability of the EEEE remains valid.

In LAR Section 4.2.2 "Existing Engineering Equivalency Evaluation Transition", the licensee stated that the guidance in RG 1.205, Regulatory Position 2.3.2, and FAQ 08-0054 (Reference 52) was followed. EEEEs that demonstrate that a fire protection system or feature is "adequate for the hazard" are to be addressed in the LAR as follows:

- If not requesting specific approval for an "adequate for the hazard" EEEE, then the EEEE is referenced where required and a brief description of the evaluated condition is provided.
- If requesting specific NRC approval for an "adequate for the hazard" EEEE, then the EEEE is referenced where required to demonstrate compliance and is included in LAR Attachment L for NRC review and approval.

The licensee identified and summarized the EEEEs for each fire area in LAR Attachment C, as applicable. The licensee did not request that the NRC staff review and approve any of these EEEEs.

Based on the NRC staff's review of the licensee's methodology for review of EEEE's and identification of the applicable EEEEs in LAR Attachment C, the NRC staff concludes that the use of EEEEs is acceptable because they meet the guidance provided in RG 1.205 and FAQ 08-0054, and the requirements of NFPA 805.

3.5.1.5 Variances from Deterministic Requirements

For those fire areas where deterministic criteria were not met, the licensee identified and evaluated VFDRs using PB methods. VFDR identification, characterization, and resolutions are identified and summarized in LAR Attachment C for each fire area. Documented variances are all represented as separation issues. The licensee used the following strategies in resolving the VFDRs:

- A FRE determined that applicable risk, DID, and safety margin criteria were satisfied without further action;
- A FRE determined that applicable risk, DID, and safety margin criteria were satisfied with a credited RA; and

- A FRE determined that applicable risk, DID, and safety margin criteria were satisfied with a plant modification(s), as identified in LAR Attachment C, as well as LAR Attachment S, Table S-1 "Plant Modifications Completed," and Table S-2 "Plant Modifications Committed," as supplemented.

For all fire areas where the licensee used the PB approach to meet the NSPC, the licensee described each VFDR and the associated resolution in LAR Attachment C. The NRC staff concludes that the licensee's identification and resolution of the VFDRs is acceptable because the licensee's analysis was performed in accordance with the criteria in NEI 04-02 (Reference 7), as endorsed by RG 1.205 (Reference 4).

3.5.1.6 Recovery Actions

The NRC staff reviewed LAR Section 4.2.1.3, "Establishing Recovery Actions," and LAR Attachment G, "Recovery Actions Transition," to evaluate whether the licensee meets the associated requirements for the use RAs per NFPA 805. The details of the NRC staff review for RAs are described in SE Section 3.2.5 "Establishing Recovery Actions." The NRC staff's evaluation of the additional risk of RAs credited to meet the risk acceptance guidelines is provided in SE Section 3.4.4.

For each Fire Area in LAR Attachment C that utilizes RAs as a VFDR resolution, an entry is added to LAR Attachment G. In reviewing LAR Attachment G, the NRC staff identified equipment required for the alignment of instrument air, the emergency air system, and nitrogen supply to support their credited post-fire functions; however, the NRC staff could not determine if these pneumatic systems were analyzed to be available post-fire. In SSA RAI 06 (Reference 20), the NRC staff requested that the licensee describe the analysis or justification that demonstrates the emergency air compressor and associated tubing remain free from fire damage. In its response to SSA RAI 06 (Reference 10), the licensee stated that plant walkdowns were completed for both the instrument air and nitrogen piping system and that in the case of the emergency air compressor; the associated power supply and support systems were also included. The licensee further stated that all failure modes (random and fire-induced) were modeled in the fault tree analysis to verify that the credited pneumatic systems will be operational. The licensee further stated that a separate review was completed to confirm that there were no instances where more valve fitting failures would occur in a fire than the system capacity was designed to support and therefore, the compressor would provide enough pressure for the available air–operated valves to operate. The NRC staff concludes that the licensee response to the RAI is acceptable because the licensee demonstrated that the pneumatic systems were analyzed to be available post-fire.

In SSA RAI 08 (Reference 20) the NRC staff requested that the licensee describe how alternate cooling is achieved for the battery charger room. In its response to SSA RAI 08 (Reference 12), the licensee stated that alternate cooling is achieved by opening a door to provide natural ventilation into the room and the adequacy of this action is supported by a heat up analysis. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for the alternate cooling method.

3.5.1.7 Plant Fire Barriers and Separations

With the exception of ERFBS, passive fire protection features include the fire barriers used to form fire area boundaries (and barriers separating SSD trains) that were established in accordance with the plant's pre-NFPA 805 deterministic FPP. For the transition to NFPA 805, the licensee decided to retain the previously established fire area boundaries as part of the RI/PB FPP.

Fire area boundaries are established for those areas described in LAR Attachment C, as modified by applicable EEEEs that determine the barriers are adequate for the hazard or otherwise disposition differences in barrier design and performance from applicable criteria. The acceptability of fire barriers and separations is also evaluated as part of the NRC staff's review of LAR Attachment A, Table B-1 and as such are addressed in SE Section 3.1.

3.5.1.8 Electrical Raceway Fire Barrier Systems

The licensee stated that the ERFBS used meet the deterministic requirements of NFPA 805, Chapter 3. Each fire area using ERFBS is identified in LAR Attachment C. In fire areas with deterministic compliance, the ERFBS meet the requirements of NFPA 805, Section 4.2.3. In fire areas with PB compliance, the ERFBS were analyzed using the PB approach in accordance with NFPA 805 Section 4.2.4. Each PB fire area utilizing ERFBS, as identified in LAR Attachment C, included a discussion of any VFDR analysis used to evaluate the acceptability of this feature.

3.5.1.9 Conclusion for Section 3.5.1

As documented in LAR Attachment C, for those fire areas that used a deterministic approach in accordance with NFPA 805, Section 4.2.3, the NRC staff concludes that each of the fire areas analyzed using the deterministic approach meet the associated criteria of NFPA 805, Section 4.2.3. This conclusion is based on:

- The licensee's documented compliance with NFPA 805, Section 4.2.3;
- The licensee's assertion that the success path will be free of fire damage without reliance on RAs;
- The licensee's assessment that the suppression systems in the fire area will have no impact on the ability to meet the NSPC; and
- The licensee's appropriate determination of the automatic fire suppression and detection systems required to meet the NSPC.

For those fire areas that used the PB approach in accordance with NFPA 805, Section 4.2.4, the NRC staff concludes that each fire area has been properly analyzed, and that compliance with the NFPA 805 requirements demonstrated as follows:

- VFDRs were evaluated and either found to be acceptable based on an integrated assessment of risk, DID, and safety margins, or RAs were identified (see SE Section 3.5.1.5);

- RAs used to demonstrate the availability of a success path to achieve the NSPC were evaluated and the additional risk of their use determined, reported, and found to be acceptable. The licensee's analysis appropriately identified the fire protection SSCs required to meet the NSPC, including fire suppression and detection systems (see SE Section 3.5.1.6);

- Fire area boundaries (ceilings, walls, and floors), such as fire barriers, fire barrier penetrations, and through penetration fire stops were found to be acceptable (see SE Section 3.5.1.7; and

- ERFBS credited were documented on a fire area basis, verified to be installed consistent with tested configurations and rated accordingly, and evaluated using a FRE that demonstrated the ability to meet the applicable acceptance criteria for risk, DID, and safety margins (see SE Section 3.5.1.8).

Accordingly, the NRC staff concludes that each fire area utilizing the deterministic or PB approach meets the applicable requirements of NFPA 805 Section 4.2.

3.5.2 Clarification of Prior NRC Approvals

As stated in LAR Attachment T, there are no elements of the current FPP for which NRC clarification is needed.

3.5.3 Fire Protection during Non-Power Operational Modes

NFPA 805, Section 1.1 "Scope," states that:

> This standard specifies the minimum fire protection requirements for existing light water nuclear power plants during all phases of plant operation, including shutdown, degraded conditions, and decommissioning.

NFPA 805, Section 1.3.1, "Nuclear Safety Goal," states that:

> 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.

The NRC staff reviewed LAR Section 4.3, "Non-Power Operational Modes" and LAR Attachment D, "NEI 04-02 Table F-1 Non-Power Operational Modes Transition," to evaluate the licensee's treatment of potential fire impacts during NPOs. The NRC staff concludes that the licensee used the process described in NEI 04-02, as modified by FAQ 07-0040 (Reference 47), for demonstrating that the NSPC are met for HREs during NPO modes.

3.5.3.1 NPO Strategy and Plant Operating States

In LAR Section 4.3 and LAR Attachment D, the licensee stated that it implemented the process outlined in NEI 04-02 and FAQ 07-0040. In LAR Attachment D, the licensee stated that its procedure outlines the use of the DID concept to minimize shutdown risk and maximize the availability of critical components and station systems that ensure nuclear safety during shutdown conditions. The licensee further stated that HREs are outage activities, plant configurations, or conditions during shutdown where the plant is more susceptible to an event causing the loss of a KSF. The strategy contains specific actions to address reduced inventory conditions that consider short time to boil, limited methods for decay heat removal, and low RCS inventory.

The licensee stated that the NPO review begins with the identification of the plant operational states (POS) that need to be considered and the various operational states that the plant goes through during NPO and which ones are the most risk significant. The licensee stated that based on FAQ 07-0040 and those POSs considered HREs, the NPO modes review would evaluate systems used to satisfy the KSFs and document equipment necessary to accomplish the KSFs using a methodology consistent with that identified for the At-Power Analysis, including identification of components that could spuriously operate and impair the KSF path. The licensee further stated that in cases where a component has a different functional requirement during NPO modes, and was not appropriately addressed in the SSD model, additional circuit analysis and routing were performed.

Following identification of KSF components and cables, the licensee performed an analysis on a fire area basis to identify redundant equipment and cables credited for a given KSF which might fail due to fire damage (i.e., pinch-points). The licensee stated that fire modeling was not used to eliminate KFS pinch-points.

The NRC staff concludes that the NPO process described and documented by the licensee in LAR Section 4.3 and LAR Attachment D is acceptable because it is consistent with FAQ 07-0040, which clarifies the guidance on providing reasonable assurance that a fire during non-power operations will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

3.5.3.2 NPO Analysis Process

The licensee stated that its goal is to ensure that contingency plans are established when the plant is in an HRE and that it is possible to lose a KSF due to fire. LAR Section 4.3 discusses these additional controls and measures, however, the licensee further stated that during low-risk periods, normal risk management controls, as well as fire prevention/protection processes and procedures will be used.

The NRC staff concludes that the licensee's process for the selection and treatment of components and cables is consistent with the methodology in the NSCA and that the process included the assignment of NPO specific functional states for each component. For those components not already in ARCPlus™ or those with a functional state for non-power operations differing from that in the At-power Analysis, the licensee performed circuit analysis and routing as described in the NSCA. The licensee then generated POS-specific fault trees for NPO and uploaded into ARCPlus™. The licensee generated fire area analyses comprising of the KSF pinch point, along with recommendations for changes to fire risk and outage management procedures, and other administrative controls.

3.5.3.3 NPO Key Safety Functions and SSCs Used to Achieve Performance

LAR Attachment D defines the KSFs, the success paths to achieve the KSFs, and the components required for the success paths. In accordance with the guidance in FAQ 07-0040, any evaluated fire area in which all of the credited success paths for a given KSF are lost is considered a KSF pinch point. Typically, this involves close vertical proximity of cables which support redundant components or trains of a system such that all such cables can be damaged by just one fire scenario. The licensee stated that fire modeling was not used to eliminate KSF pinch points within a fire zone.

In SSA RAI 13 (Reference 20), the NRC staff requested that the licensee describe how non-power operation pinch points were evaluated and resolved for each fire area. In its response to SSA RAI 13 (Reference 10), the licensee stated that no RAs are required to be performed by operators during NPO and no pre-emptive component alignments (pre-fire conditioning) are being considered. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that non-power operation pinch points were properly evaluated and resolved for each fire area.

Based on its review of the information provided in the LAR, as supplemented, the NRC staff concludes that the licensee used acceptable methods consistent with the guidance provided in RG 1.205 and FAQ 07-0040 to identify the equipment required to achieve and maintain the fuel in a safe and stable condition during NPO modes. Furthermore, the NRC staff concludes that the licensee has a process in place to ensure that fire protection DID measures will be implemented to achieve the KSFs during plant outages and that any required actions will be completed as described in LAR Attachment S, Table S-3, Implementation Item 20, which will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

3.5.3.4 NPO Pinch Point Resolutions and Program Implementation

In LAR Section 4.3 the licensee discussed non-power operational modes and included a discussion of the process it used to demonstrate that the nuclear safety performance criteria are met during NPO modes. One of the steps in this process included the management of pinch-points associated with fire-induced vulnerabilities during an outage. In LAR Figure 4-6, the licensee depicted its process for managing pinch points. The licensee provided additional discussion regarding pinch points in LAR Attachment D, "NEI 04-02 Non-Power Operational Modes Transition."

The licensee identified power-operated components needed to support an NPO KSF that were not included in the post-fire SSD equipment list and required additional circuit analysis. The process for the selection and treatment of NPO components and cables was consistent with the methodology in the NSCA.

NFPA 805 requires that the NSPC be met during any operational mode or condition, including NPO. As described above, the licensee has performed the following engineering analyses to demonstrate that it meets this requirement:

- Identified the KSFs required to support the NSPC during NPOs;
- Identified the plant operating states where further analysis is necessary during NPOs;
- Identified the SSCs required to meet the KSFs during the plant operating states analyzed;
- Identified the location of these SSCs and their associated cables;
- Performed analyses on a fire area basis to identify pinch points were one or more KSF could be lost as a direct result of fire-induced damage; and
- Planned/implemented modifications to appropriate procedures in order to employ a fire protection strategy for reducing risk at these pinch points during HREs.

Based on the information provided in the LAR, as supplemented, the NRC staff concludes that the licensee has provided reasonable assurance that the NSPC are met during NPO modes and HREs.

3.5.4 Conclusion for Section 3.5

The NRC staff reviewed the licensee's RI/PB FPP, as described in the LAR and its supplements, to evaluate the NSCA results. The licensee used a combination of the deterministic approach and the PB approach, in accordance with NFPA 805, Sections 4.2.3 and 4.2.4.

For those fire areas that utilized a deterministic approach, the NRC staff confirmed the following:

- The EEEEs from the existing FPP were evaluated and found to be valid and acceptable for meeting the requirements of NFPA 805, as allowed by NFPA 805, Section 2.2.7;
- Fire suppression effects were evaluated and found to have no adverse impact on the ability to achieve and maintain the NSPC for each fire area; and
- The required automatic fire suppression and automatic fire detection systems were appropriately documented for each fire area.

Accordingly, the NRC staff concludes that there is reasonable assurance that each fire area utilizing the deterministic approach meets NFPA 805, Section 4.2.3.

For those fire areas that utilized a PB approach, the NRC staff confirmed the following:

- The EEEEs from the existing FPP were evaluated and found to be valid and acceptable for meeting the requirements of NFPA 805, as allowed by NFPA 805, Section 2.2.7;

- Fire suppression effects were evaluated and found to have no adverse impact on the ability to achieve and maintain the NSPC for each fire area;

- Variances from deterministic requirements were evaluated using the FRE PB approach (in accordance with NFPA 805, Section 4.2.4.2) to address risk impact, DID, and safety margin, and found to be acceptable;

- RAs necessary to demonstrate the availability of a success path were evaluated with respect to the additional risk presented by their use and found to be acceptable in accordance with NFPA 805, Section 4.2.4; and

- The required automatic fire suppression and automatic fire detection systems were appropriately documented for each fire area.

Accordingly, the NRC staff concludes that there is reasonable assurance that each fire area utilizing the PB approach, meets NFPA 805, Section 4.2.4.

The NRC staff concludes that the licensee's analysis and outage management process during NPO provides reasonable assurance that the NSPC will be met during NPO modes and HREs, and that the licensee used methods consistent with the guidance provided in RG 1.205 and FAQ 07-0040. The NRC staff also concludes that no RAs are required during NPO modes, and that the overall approach for fire protection during NPO modes is acceptable because the requirements for risk, DID, and safety margin are met.

3.6 Radioactive Release Performance Criteria

3.6.1 Method of Review

NFPA 805 (Reference 3) Chapter 1 defines the radioactive release goals, objectives, and performance criteria that must be met by the FPP in the event of a fire at a nuclear power plant in any plant operational mode as follows:

NFPA 805, Section 1.3.2, "Radioactive Release Goal," states that:

> The radioactive release goal is to provide reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment.

NFPA 805, Section 1.4.2, "Radioactive Release Objective," states that:

> Either of the following objectives shall be met during all operational modes and plant configurations.
>
> (1) Containment integrity is capable of being maintained.
>
> (2) The source term is capable of being limited.

NFPA 805, Section 1.5.2, "Radioactive Release Performance Criteria," states that:

> 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.

The NRC staff reviewed the licensee's assessment provided in the LAR in order to determine if the existing FPP with its planned modifications, would meet the radioactive release performance criteria requirements of a RI/PB FPP, in accordance with 10 CFR 50.48(a) and (c) using the guidance in RG 1.205 and NUREG-0800, Section 9.5.1.2.

The NRC staff also performed an audit of the licensee's evaluation to determine whether the FPP and its planned modifications would be capable of meeting the NFPA radioactive release goals, objectives, and performance criteria. The results of the NRC staff evaluation and audit are provided below.

3.6.2 Scope of Review

The licensee's evaluation of the capability of the FPP to meet the goals, objectives, and performance criteria of NFPA 805 was performed for all plant areas and all plant operating modes (including power and non-power operations). In LAR Section 4.4.2, the licensee stated that its radioactive release review determined the FPP will comply with the guidance in NEI 04-02 and RG 1.205 and the requirements of NFPA 805 upon completion of the implementation items in LAR Attachment S, Table S-3. The licensee's review found that the fire suppression activities, as defined in the pre-fire plans and fire brigade firefighting instruction operating guidelines, were written and valid for any plant operating mode. The NRC staff concludes that the scope of the licensee's assessment was adequate because the review included all modes of plant operation and all plant areas.

3.6.3 Identification of Plant Areas Containing Radioactive Materials

The licensee performed a screening of plant fire areas to determine where radioactive materials were present and where there was a potential for generating radioactive effluents during fire suppression activities (i.e., fighting operations). The screening review was performed in FNP calculation entitled, "NFPA 805 Radiological Release Calculation SM-C051326701-010." The fire areas where there was no possibility of radioactive materials being present were identified and eliminated from further review. Each fire area that had the potential for generation of radioactive effluents created by firefighting activities was identified for further evaluation. The results of the screening review are documented in the LAR Attachment E, "NEI 04-02, Radioactive Release Transition."

The screened-in areas included those areas where most of the radioactive materials were present such as in the Auxiliary Building, Reactor Containment, Low Level Radwaste Building, Solidification/Dewatering Facility, and Yard Area-RCA. The licensee's review also identified the existing engineering controls that were present and sufficient to contain gaseous and liquid effluent. The review found that the Auxiliary Building and the Reactor Containment areas had adequate engineered controls for containment of liquid and gaseous effluent. These engineering controls credited are identified and documented in the LAR Attachment E.

The licensee's review also identified other plant areas where radioactive materials were present where there were limited engineered controls for containment of effluents (e.g., gaseous effluent exhaust fans that could be shut off, but without filters). These areas included the Low Level Radwaste Building and the Solidification/Dewatering Facility. Other areas were identified (e.g., Yard-RCA) where there were no engineering controls.

The licensee included the following four actions related to radiological release in LAR Attachment S, Table S-3:

> Implementation Item 21: FNP does not have pre-fire plans as defined by 10 CFR 50 Appendix R or Section 3.4.2 of NFPA 805. Pre-fire plans will be developed as part of the NFPA 805 Transition.
>
> Implementation Item 22: The fire brigade training materials were reviewed to ensure they are consistent with the pre-fire plans in terms of containment and monitoring of potentially contaminated smoke and fire suppression water. A fire in the RCA was identified, but no specific objectives have been established to control radiological releases. The training program requires enhancement to establish specific objectives to control radiological releases.
>
> Implementation Item 23: For Radiation Control Areas outside of hardened structures that do not have means to retain effluent, administrative controls will be developed to keep contamination within secured metal containers or verification that the contamination level is low enough that an uncontrolled immediate release would not exceed 10 CFR 20 limits.
>
> Implementation Item 24: Fire brigade personnel will be appropriately trained on the revised objectives to control radiological releases.

The NRC staff concludes that the actions described above are acceptable because they will result in compliance with NFPA 805 and because they would be required by the proposed license condition.

The NRC staff's review of the licensee's assessment concludes that the licensee's evaluating and screening of plant areas was an adequate identification of the potentially affected areas because the review incorporated all plant areas.

3.6.4 Fire Pre-plans (Fire Zone Data Sheets)

The licensee's evaluation reviewed the existing FPP to determine whether the FPP was adequate to ensure that gaseous and liquid radioactive effluents generated as a direct result of fire suppression activities would be contained and monitored before release to unrestricted areas. The results of the licensee's review are documented in the LAR Table E. This review included the following steps:

- Identification of applicable documentation, including Fire Zone Data Sheets, procedures, and support drawings. FNP does not have pre-fire plans as defined by 10 CFR 50 Appendix R nor NFPA 805 Section 3.4.2. Instead, FNP currently uses Fire Zone Data Sheets. These data sheets are drawings consistent with what is routinely used as part of the pre-fire plan. However, the licensee will develop pre-fire plans as part of the NFPA 805 Transition;

- Review of current documentation to identify whether the current documents describe the ability of plant equipment to adequately contain and monitor potential radioactive release as a result of fire suppression activities;

- Review of engineering controls for gaseous effluents to identify which areas of the plant and equipment that are used to contain gaseous effluents;

- Review of engineering controls for liquid effluents to identify which areas of the plant and equipment available that are used to contain liquid effluents; and

- An identification of plant modifications, procedure changes, process updates, and training improvements needing revision such as to provide for containment and control of radioactive release during fire suppression such as to meet the Radioactive Release Goals, Objectives, and Performance Criteria of NFPA 805.

The NRC staff's review concludes that the licensee's evaluation of the Fire Pre-Plans (Fire Zone Data Sheets) was adequate because the review was comprehensive and was performed in accordance with the guidance in NEI 04-02, Appendix G, as endorsed by RG 1.205.

3.6.5 Gaseous Effluent Controls

The licensee identified those plant areas where adequate engineering controls exist for the containment, filtering, and monitoring of gaseous effluent. The NRC staff review concludes that the gaseous effluent controls are adequate because the effluent is either contained, or filtered to remove radioactive materials and subsequently monitored prior to discharge.

The licensee identified other plant areas with limited engineering controls to contain the gaseous effluent. For these areas, the licensee will modify the FPP to establish compensatory actions for the fire brigade and radiation protection personnel to manually establish containment and perform monitoring of radioactive effluent. Where possible, the firefighting activities will route the radioactive gaseous effluent back into the plant ventilation system for filtering and monitoring of the effluent prior to discharge. For these plant areas with limited engineering controls, the NRC staff concludes that a combination of limited engineered controls and compensatory actions taken by the fire brigade and radiation protection personnel radioactive release will be adequate to contain a radioactive release to within the NFPA 805 radioactive release goals, objectives, and performance criteria.

In other plant areas without engineered controls for containment of radioactive effluents (such as for the Yard-RCA), the licensee will establish administrative controls using procedures to perform smoke scrubbing, use of portable fans, and establish limits on the amount of contaminated materials that may be stored in metal containers.

The NRC staff reviewed the licensee's assessment of potential gaseous effluent controls, and concludes that the licensee's approach is acceptable because the methods used are consistent with the qualitative assessment methodology in NEI 04-02 for providing methods acceptable to the NRC staff for establishing a FPP consistent with NFPA 805 and 10 CFR 50.48(c) in RG 1.205. The NRC staff also concludes that subject to completion of the implementation items, the licensee is able to contain a potential radiological gaseous effluent release during fire suppression activities in a manner sufficient to not exceed the radiological release performance criteria of NFPA 805 and the public dose limits of 10 CFR 20.

3.6.6 Liquid Effluent Controls

The licensee identified those plant areas where engineering controls exist for the containment of liquid effluents (e.g., floor drains routed to sumps and tanks). The NRC staff reviewed those engineering controls and concludes that those controls provided adequate containment because the effluent is collected, stored, processed and monitored in the Radwaste building prior to discharge.

The licensee's review also identified those plant areas where there were not sufficient engineered controls to adequately contain potential liquid effluents released during firefighting activities, such as in the Yard-RCA. In these areas, the licensee identified the potential for discharge of radioactive liquid effluent into storm drains or to seep into the ground. To mitigate this potential liquid effluent release, the licensee will revise the FPP procedures and training programs to have the fire brigade and radiation protection staff trained and instructed to install (as necessary) temporary containment materials (e.g., storm drain covers, diversion equipment or other means to prevent water runoff).

The NRC staff reviewed the licensee methods of limiting potential liquid effluent releases and concludes that the licensee's approach is acceptable because the methods will be able to contain potential liquid effluent from fire suppression activities. The NRC staff also concludes that subject to completion of the implementation items, the licensee is able to contain a potential radiological liquid effluent release such as to not exceed the radiological release performance criteria of NFPA 805 and the public dose limits of 10 CFR 20.

3.6.7 Fire Brigade Training Materials

The licensee reviewed the existing fire brigade training materials to determine whether the training materials were sufficient to train staff on the use of pre-fire plans in terms of installing temporary containment and to provide monitoring of potentially contaminated smoke and fire suppression water. The training materials were found to contain information on the potential for a fire with radioactive release, but no specific training objectives had been established to monitor and control radiological releases. Therefore, the licensee will enhance its training program to establish specific objectives to control radiological releases and included the action to do so in LAR Attachment S, Table S-3, Implementation Item 22.

The NRC staff reviewed the licensee's evaluation of training materials and concludes that upon completion of the implementation item, the training materials will be adequate to instruct the licensee's staff to implement effluent control measures, because plant staff will be informed and capable of taking actions to limit effluent releases to within the radiological release performance criteria of NFPA 805 and therefore within the public dose limits.

3.6.8 Conclusions

The NRC staff's evaluation is based on:

1. Information and analyses provided in the LAR;
2. Use of installed and manual engineered controls to contain potential releases;
3. Use of fire pre-plans;
4. Use of revised fire brigade response procedures and training procedures; and
5. A limitation on the amount of radioactive contamination in areas where containment of effluent is not provided.

Based on these factors, the NRC staff concludes that, subject to completion of the implementation items, the licensee's RI/PB FPP provides reasonable assurance that radiation releases to any unrestricted area resulting from the direct effects of fire suppression activities are as low as reasonably achievable and are not likely to exceed the radiological release performance criteria of NFPA 805 and the radiological dose limits in 10 CFR Part 20. The NRC staff therefore concludes that the licensee's approach is acceptable and that the FPP will comply with the requirements specified in NFPA 805, Sections 1.3.2, 1.4.2, and 1.5.2.

3.7 <u>NFPA 805 Monitoring Program</u>

3.7.1 Monitoring Program

For this SE section, the following requirements from NFPA 805 Section 2.6, are applicable to the NRC staff's review of the LAR:

NFPA 805 Section 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.

NFPA 805 Section 2.6.1: "Availability, Reliability, and Performance Levels";

> Acceptable levels of availability, reliability, and performance shall be established.

NFPA 805 Section 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.

NFPA 805 Section 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.

The NRC staff reviewed LAR Section 4.6, "Monitoring Program," that the licensee developed to monitor availability, reliability, and performance of the FNP FPP systems and features after transition to NFPA 805. The focus of the NRC staff review was on critical elements related to the monitoring program, including the selection of FPP systems and features to be included in the program, the attributes of those systems and features that will be monitored, and the methods for monitoring those attributes. Implementation of the monitoring program will occur on the same schedule as the NFPA 805 RI/PB FPP implementation, which the NRC staff concludes is acceptable.

The licensee stated that it will develop an NFPA 805 monitoring program consistent with FAQ 10-0059 (Reference 53). Development of the monitoring program will include a review of existing surveillance, inspection, testing, compensatory measures, and oversight processes for adequacy. The review will examine adequacy of the scope of SSCs within the existing plant programs, performance criteria for availability and reliability of SSCs, and the adequacy of the plant corrective action program. The monitoring program will incorporate phases for scoping, screening using risk criteria, risk target value determination, and monitoring implementation. The scope of the program will include fire protection systems and features, NSCA equipment, SSCs relied upon to meet radioactive release criteria, and fire protection programmatic elements.

As described above, NFPA 805 Section 2.6, requires that a monitoring program be established in order to ensure that the availability and reliability of fire protection systems and features are maintained, as well as to assess the overall effectiveness of the FPP in meeting the performance criteria. Monitoring should ensure that the assumptions in the associated engineering analysis remain valid.

Based on the information provided in the LAR, as supplemented, the NRC staff concludes that the licensee's NFPA 805 monitoring program development and implementation process, is acceptable and assures that the licensee will implement an effective program for monitoring risk significant fires because it:

- Establishes the appropriate performance monitoring groups to be monitored;
- Utilizes an acceptable screening process for determining the SSCs to be included in the performance monitoring groups;
- Establishes availability, reliability, and performance criteria for the SSCs being monitored; and
- Requires corrective actions when SSC availability, reliability, or performance criteria targets are exceeded to bring performance back within the required range.

However, since the final values for availability and reliability, as well as the performance criteria for the SSCs being monitored, have not been established for the monitoring program as of the date of this SE, completion of the licensee's NFPA 805 Monitoring Program is an implementation item, as described in LAR Attachment S, Table S-3, Implementation Item 27.

The NRC staff concludes that completion of the monitoring program on the same schedule as the implementation of NFPA 805 is acceptable because the monitoring program will be completed with the other implementation items (except items 30 and 32), as described in LAR Attachment S, Table S-3, within 180 days after NRC approval.

3.7.2 Conclusion for Section 3.7

The NRC staff reviewed the licensee's RI/PB FPP and concludes that the licensee's approach for meeting the requirements of NFPA 805, Sections 2.6, regarding the monitoring program is acceptable and that there is reasonable assurance that the licensee will develop a monitoring program that meets the requirements specified in NFPA 805 Sections 2.6.1, 2.6.2 and 2.6.3, because the licensee identified an action to implement the monitoring program as part of the FPP transition to NFPA 805, and included that action as an implementation item which will incorporate the provisions of NFPA 805 in the FPP and would be required by the proposed license condition.

3.8 <u>Program Documentation, Configuration Control, and Quality Assurance</u>

For this SE section, the requirements from NFPA 805 Section 2.7, "Program Documentation, Configuration Control and Quality," are applicable to the NRC staff's review of the LAR in regard to the appropriate content, configuration control, and quality of the documentation used to support the FNP FPP transition to NFPA 805.

NFPA 805, Section 2.7.1.1, "General," states that::

> The analyses performed to demonstrate compliance with this standard shall be documented for each nuclear power plant (NPP). 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 entire analyses. Documentation shall be maintained for the life of the plant and be organized carefully so that it can be checked for adequacy and accuracy either by an independent reviewer or by the AHJ.

NFPA 805, Section 2.7.1.2, "Fire Protection Program Design Basis Document," states that:

> A fire protection program design basis document shall be established based on those documents, analyses, engineering evaluations, calculations, and so forth that define the fire protection design basis for the plant. As a minimum, this document shall 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 Chapter 1.

NFPA 805, Section 2.7.1.3, "Supporting Documentation," states that:

> Detailed information used to develop and support the principal document shall be referenced as separate documents if not included in the principal document.

NFPA 805, Section 2.7.2.1, "Design Basis Document," 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.

NFPA 805, Section 2.7.2.2, "Supporting Documentation," states that:

> Detailed supporting information shall be retrievable records. Records shall be revised as needed to maintain the principal documentation up-to-date.

NFPA 805, Section 2.7.3.1, "Review," states that:

> Each analysis, calculation, or evaluation performed shall be independently reviewed.

NFPA 805, Section 2.7.3.2*, "Verification and Validations" states that:

> Each calculational model or numerical method used shall be verified and validated through comparison to test results or comparison to other acceptable models.

NFPA 805, Section 2.7.3.3, "Limitations of Use," states that:

> Acceptable engineering methods and numerical models shall only be used for applications to the extent these methods have been subject to verification and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method.

NFPA 805, Section 2.7.3.4, "Qualification of Users," states that:

> Cognizant 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.

NFPA 805, Section 2.7.3.5, "Uncertainty Analysis" states that:

> An uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met.

3.8.1 Documentation

The NRC staff reviewed LAR Section 4.7.1, "Compliance with Documentation Requirements in Section 2.7.1 of NFPA 805," to evaluate the FNP FPP design basis document and supporting documentation.

The FNP FPP design basis is a compilation of multiple documents (i.e., fire safety analyses, calculations, engineering evaluations, NSCAs, etc.), databases, and drawings which are identified in LAR Figure 4-9, "NFPA 805 Planned Post-Transition Documentation Relationships." The licensee stated that the analyses conducted to support the NFPA 805 transition were performed in accordance with FNP processes which meet or exceed the requirements for documentation outlined in NFPA 805, Section 2.7.1.

Specifically, the licensee stated that the design analysis and calculation procedure provides the methods and requirements to ensure that design inputs and assumptions are clearly defined, results are easily understood by being clearly and consistently described, and that sufficient detail is provided to allow future review of the entire analysis. The licensee further stated that the process includes provisions for appropriate design and engineering review and approval and that the approved analyses are considered controlled documents, and are accessible via FNP's document control system, and that being analyses, they are also subject to review and revision consistent with the other plant calculations and analyses, as required by the plant design change process.

The LAR also stated that the documentation associated with the FPP will be maintained for the life of the plant and organized in such a way to facilitate review for accuracy and adequacy.

Based on the LAR description, as supplemented, of the content of the FPP design basis and supporting documentation, and taking into account the licensee's plans to maintain this documentation throughout the life of the plant, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805, Sections 2.7.1.1, 2.7.1.2, and 2.7.1.3, regarding adequate development and maintenance of the FPP design basis documentation, is acceptable.

3.8.2 Configuration Control

The NRC staff reviewed LAR Section 4.7.2, "Compliance with Configuration Control Requirements in Sections 2.7.2 and 2.2.9 of NFPA 805," in order to evaluate the FNP configuration control process for the new NFPA 805 FPP.

To support the many other technical, engineering and licensing programs at FNP, the licensee has existing configuration control processes and procedures for establishing, revising, or utilizing program documentation. Accordingly, the licensee is integrating the new FPP design basis and supporting documentation into these existing configuration control processes and procedures. These processes and procedures require that all plant changes be reviewed for potential impact on the various FNP licensing programs, including the FPP.

The LAR stated that the configuration control process includes provisions for appropriate design, engineering reviews and approvals, and that approved analyses are considered controlled documents available through the FNP document control system. The LAR also stated that analyses based on the PRA program, which includes the FREs, are issued as formal analyses subject to these same configuration control processes, and are additionally subjected to the PRA peer review process specified in the ASME/ANS PRA standard (Reference 26).

Configuration control of the existing FPP during the transition period is maintained by the FNP change evaluation process, as defined in existing FNP configuration management and configuration control procedures.

The NRC staff reviewed the licensee's process for updating and maintaining the FPRA in order to reflect plant changes made after completion of the transition to NFPA 805 in SE Section 3.4.

Based on the LAR description of the FNP configuration control process, which indicates that the new FPP design basis and supporting documentation will be controlled documents and that plant changes will be reviewed for impact on the FPP, the NRC staff concludes that the licensee has a configuration control process that provides reasonable assurance that the requirements of NFPA 805 Sections 2.7.2.1 and 2.7.2.2 are met.

3.8.3 Quality

The NRC staff reviewed LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805," to evaluate the quality of the engineering analyses used to support transition of the FNP FPP to NFPA 805 based on the requirements outlined above. The individual sections of this SE provide the NRC staff's evaluation of the application of the NFPA 805 quality requirements to the licensee's FPP, as appropriate.

3.8.3.1 Review

NFPA 805, Section 2.7.3.1 requires that each analysis, calculation, or evaluation performed be independently reviewed. The licensee stated that its procedures require independent review of analyses, calculations, and evaluations, including those performed in support of compliance with 10 CFR 50.48(c). The LAR also stated that the transition to NFPA 805 was independently reviewed, and that analyses, calculations, and evaluations to be performed post-transition will be independently reviewed, as required by the existing FNP procedures.

The NRC staff concludes that the licensee's approach for meeting the Quality requirements of NFPA 805, Section 2.7.3.1, is acceptable because the licensee provided a description of the process for performing independent reviews of analyses, calculations, and evaluations for review.

3.8.3.2 Verification and Validation

NFPA 805, Section 2.7.3.2 requires that each calculational model or numerical method used be V&V through comparison to test results or other acceptable models. The licensee stated that the calculational models and numerical methods used in support of the transition to NFPA 805 were V&V, and that the calculational models and numerical methods used post-transition will be similarly V&V. As an example, the licensee provided extensive information related to the V&V of fire models used to support the development of the FNP FREs. The NRC staff's evaluation of this information is discussed below.

3.8.3.2.1 General

NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications", Volumes 1-7 (Reference 38), documents the V&V of five selected fire models commonly used to support applications of RI/PB fire protection at nuclear power plants. The seven volumes of this NUREG-series report provide technical documentation concerning the predictive capabilities of a specific set of fire dynamics calculation tools and fire phenomenological models that may be used for the analysis of fire hazards in postulated nuclear power plant scenarios. When used within the limitations of the fire models and considering the identified uncertainties, these models may be employed to demonstrate compliance with the requirements of 10 CFR 50.48(c).

Accordingly, for those fire modeling elements performed by the licensee using the V&V applications contained in NUREG-1824 to support the transition to NFPA 805, the NRC staff concludes that the use of these models is acceptable, provided that the intended application is within the appropriate limitations, as identified in NUREG-1824.

In LAR Attachment J, the licensee identified the use of empirical correlations that are not addressed in NUREG-1824. The NRC staff reviewed these correlations, as well as the related material provided in the LAR, in order to determine whether the licensee adequately demonstrated alignment with specific portions of the applicable NUREG-1824 guidance.

Table 3.8-1, "V&V Basis for Fire Modeling Correlations Used at FNP," in SE Attachment A and Table 3.8-2, "V&V Basis for Other Fire Models and Related Calculations Used at FNP," in SE Attachment B identify these empirical correlations and algebraic models, respectively, as well as a staff disposition for each.

The NRC staff concludes that the theoretical bases of the models and empirical correlations used in the fire modeling calculations that were not addressed in NUREG-1824 were identified and described in authoritative publications, peer reviewed journal articles, or national research laboratory reports (References 72 to 84). SE Table 3.8-1 summarizes the additional fire models, and the NRC staff's evaluation of the acceptability of each model.

The fire modeling employed by the licensee in the development of the FNP FREs used empirical correlations that provide bounding solutions for the ZOI and conservative input parameters, which produced conservative results for the fire modeling analysis. See SE Section 3.4.2.3.1 for further discussion of the licensee's fire modeling method.

Based on the above, the NRC staff concludes that this approach provides reasonable assurance that the fire modeling used in the development of the fire scenarios for the FNP FPRA is appropriate, and thus acceptable for use in this application (i.e., transition to NFPA 805) because the licensee's V&V of empirical correlations is consistent with the guidance in NUREG-1824, or consistent with authoritative publications, peer reviewed journal articles, or national research laboratory reports.

3.8.3.2.2 Discussion of RAIs

By letters dated July 8, 2013 (Reference 20) and March 28, 2014 (Reference 21), the NRC staff requested additional information concerning the fire modeling conducted to support the FNP FPRA. By letters dated September 16, 2013 (Reference 10), October 30, 2013 (Reference 11), November 12, 2013 (Reference 12) and April 23, 2014 (Reference 13), the licensee responded to these RAIs.

- In FM RAI 03.a (Reference 20), the NRC staff requested that the licensee confirm that the Froude number was within the NUREG-1824 validated range for the fire scenarios that were modeled with CFAST, or to provide technical justification for the use of CFAST with a Froude number outside the validated range. In its response to FM RAI 03.a (Reference 10), the licensee discussed the Froude numbers calculated for the different types of ignition sources that were specified in the CFAST runs, (i.e., open electrical panels, closed electrical panels, cable trays and transient ignition sources). The licensee explained that for open electrical panels there is no meaningful way to define the area of the fire and, therefore, no meaningful way to calculate the Froude number since combustion occurs inside the panel. The licensee further stated that closed electrical panel fires are modeled as open source fires with a Froude number that is within the validated range. The licensee's calculations show that the Froude number is below the validated range for cable tray fires and for nearly all transient fire bins. The licensee provided information to show that the cases with low Froude numbers produce results that are more conservative than comparable cases with a Froude number that falls within the NUREG-1824 validated range. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for the use of CFAST to model fire scenarios with a Froude number outside the NUREG-1824 validated range.

- In FM RAI 03.b (Reference 20), the NRC staff requested that the licensee identify cases where CFAST was used to model fires with flames that impinge on the ceiling, and to provide technical justification for applying CFAST in these cases. In its response to FM RAI 03.b (Reference 10), the licensee explained that the flame height to ceiling height ratio is a measure of the degree to which flames impinge on the ceiling surface and has a significant effect on the ceiling jet temperature, the heat transfer to the ceiling surface, and the radiant heat flux at a specific target location. The licensee further stated that the CFAST models used by the FPRA do not use the heat transfer model between the ceiling jet and an adjacent space and therefore conservatively bound the HGL temperature relative to a case in which the additional boundary heat losses are included. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee provided adequate justification for use of CFAST to model fires with flames that impinge on the ceiling.

3.8.3.2.3 Post-Transition

The licensee also stated that it will revise the appropriate processes and procedures to include NFPA 805 quality requirements for use during the performance of post-transition FPP changes, including those for V&V. Revision of the applicable post-transition processes and procedures to include NFPA 805 requirements for V&V are identified in LAR Attachment S, Table S-3, Implementation Item 34. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP, and because it would be required by the proposed license condition.

3.8.3.2.4 Conclusion for Section 3.8.3.2

Based on the licensee's description of the FNP process for V&V of calculational models and numerical methods and its continued use post-transition, the NRC staff concludes that the licensee's approach to meeting the requirements of NFPA 805 Section 2.7.3.2 is acceptable because the models are consistent with approved uses in NRC guidance or other authoritative publications and because the licensee identified an action that will result in compliance with NFPA 805 and would be required by the proposed license condition.

The NRC staff concludes that the licensee's approach provides reasonable assurance that the fire modeling used in the development of the fire scenarios for the FNP FPRA is appropriate, and thus acceptable for use in transition to NFPA 805 because the V&V of the empirical correlations used by the licensee were consistent with either NUREG-1824, authoritative publications, peer reviewed journal articles, or national research laboratory reports.

3.8.3.3 Limitations of Use

NFPA 805, Section 2.7.3.3 requires that acceptable engineering methods and numerical models be used for applications only to the extent that these methods have been subject to V&V and that they are applied within the scope, limitations, and assumptions prescribed for that method. The LAR stated that the engineering methods and numerical models used in support of the transition to NFPA 805 were subject to the limitations of use outlined in NFPA 805, Section 2.7.3.3, and that the engineering methods and numerical models used post-transition will be subject to these same limitations of use.

3.8.3.3.1 General

The NRC staff assessed the acceptability of each empirical correlation or other fire model in terms of the limits of its use. Table 3.8-1 in SE Attachment A and Table 3.8-2 in SE Attachment B, summarize the fire models used, how each was applied in the FNP FREs, the V&V basis for each, and the NRC staff evaluation for each.

3.8.3.3.2 Discussion of RAIs

By letters dated July 8, 2013 (Reference 20) and March 28, 2014 (Reference 21), the NRC staff requested additional information concerning the fire modeling conducted to support the FNP FPRA. By letters dated September 16, 2013 (Reference 10), October 30, 2013 (Reference 11), November 12, 2013 (Reference 12) and April 23, 2014 (Reference 13), the licensee responded to these RAIs.

- In FM RAI 04 (Reference 20), the NRC staff requested that the licensee identify any uses of the GFMTs approach outside the limits of applicability, and to explain for those cases how the use of the GFMTs approach was justified. In its response to FM RAI 04 (Reference 10), the licensee explained that the application of the GFMTs approach resulted in the development of supplements and enhancements to address several, but not all, of its limitations. The licensee explained that to address the additional non-conservative limitations identified to date, fire scenarios will be updated and incorporated into the baseline model. This update will be performed in conjunction with the update of the baseline FPRA to eliminate the credit for panel factors and will be reported in conjunction with the associated RAIs. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the GFMTs approach was either used within its limits of applicability, or that uses outside the limitations have been identified and the applicable fire scenarios updated and incorporated into the baseline PRA model.

3.8.3.3.3 Post-Transition

The licensee also stated that it will revise the appropriate processes and procedures to include the NFPA 805 quality requirements for use during the performance of post-transition FPP changes, including those for limitations of use. Revision of the applicable post-transition processes and procedures to include NFPA 805 requirements for limitations of use is identified in LAR Attachment S, Table S-3, Implementation Item 34. The NRC staff concludes that this action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

3.8.3.3.4 Conclusion for Section 3.8.3.3

Based on the licensee's statements that the fire models used to support development of the FREs were used within their limitations, and the description of the FNP process for placing limitations on the use of engineering methods and numerical models, the NRC staff concludes that the licensee's approach to meeting the requirements of NFPA 805 Section 2.7.3.3 is acceptable because the models are consistent with approved uses in NRC guidance or other authoritative publications and the licensee identified an action that will result in compliance with NFPA 805 and the action would be required by the proposed license condition.

3.8.3.4 Qualification of Users

NFPA 805, Section 2.7.3.4 requires that personnel performing engineering analyses and applying numerical methods (e.g., fire modeling) 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. The licensee's procedures require that cognizant personnel who use and apply engineering analyses and numerical models be competent in the field of application and experienced in the application of the methods, including those personnel performing analyses in support of compliance with 10 CFR 50.48(c).

Specifically, these requirements are being addressed through the implementation of an engineering qualification process at FNP. The licensee has developed procedures that require that cognizant personnel who use and apply engineering analyses and numerical models be competent in the field of application and experienced in the application of the methods, including those personnel performing analyses in support of compliance with 10 CFR 50.48(c). These requirements are being addressed through the implementation of an engineering qualification process and the licensee will develop qualification or training requirements for personnel performing engineering analyses and numerical methods. The licensee included this action in LAR Attachment S, Table S-3, Implementation Item 29. The NRC staff concludes that this action is acceptable because the action will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

The NRC staff requested that the licensee provide additional information pertaining to qualifications of the personnel who supported the FNP fire modeling. Applicable RAIs and responses are discussed below:

- In FM RAI 05.a (Reference 20), the NRC staff requested that the licensee describe the necessary qualifications of the engineers performing the fire modeling. In its response to FM RAI 05.a (Reference 10), the licensee explained that the qualification requirements for the technical leads are consistent with and often exceed those described in NEI 07-12 (Reference 92) for qualification of peer reviewers. The licensee further stated that the GFMTs and MCR abandonment time calculations were performed by an engineer, a member of SFPE with undergraduate and graduate degrees in fire protection engineering. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the personnel performing the fire modeling are appropriately qualified.

- In FM RAI 05.b (Reference 20), the NRC staff requested that the licensee describe the process and procedures for ensuring that the qualifications of the engineers and personnel performing the fire modeling are adequate. In its response to FM RAI 05.b (Reference 10), the licensee explained that for the specific case of fire modeling, acknowledged industry experts were utilized for the task. The licensee further stated that the main FPRA contractor requires that individuals are knowledgeable and experienced in performing the applicable FPRA tasks per its certification guides and that they have an internal training process in place to qualify those developing FPRAs. The licensee further stated that the technical lead for the project is qualified to each certification guide and supervised all tasks, including the integration of the GFMTs into the FPRA model. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the personnel performing the fire modeling are appropriately qualified.

- In FM RAI 05.c (Reference 20), the NRC staff requested that the licensee describe who performed the walkdowns of the MCR and the remaining fire areas in the plant and whether the same people who performed the walkdowns conducted the fire modeling analysis. In its response to FM RAI 05.c (Reference 10), the licensee explained that the contractor's senior fire protection engineer who performed the abandonment calculations, was in charge of the MCR walkdown. The licensee further stated that walkdowns conducted in other plant areas were performed by experienced engineers from SNC and a senior engineer from the main FPRA contractor. The licensee further stated that part of the fire modeling was performed as part of training of SNC staff, which included both plant walkdowns and class room instruction provided by industry experts with undergraduate and graduate degrees in fire protection engineering and that each person who performed fire modeling was involved with the associated walkdown. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that the personnel performing the fire modeling were the same ones who conducted the walkdowns.

- In FM RAI 05.d (Reference 20), the NRC staff requested that the licensee explain the communication process between the fire modeling analysts and PRA personnel and any measures taken to assure the fire modeling was performed adequately and will continue to be performed adequately during post-transition. In its response to FM RAI 05.d (Reference 10), the licensee stated that the coordination of technical activities between the fire analysis individuals and the risk modeling individuals was facilitated by the availability of a detailed GFMTs analysis, which, in many cases, provided a standardized solution. The licensee further explained that the fire modeling analyst and the risk modeling individuals were integrated into a single project team which further facilitated and streamlined the communication and exchange of information and that informal communication was used throughout the project when clarification was required to address specific fire modeling concerns. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated an adequate communication process between the fire modeling analysts and the PRA personnel.

- In FM RAI 05.e (Reference 20), the NRC staff requested that the licensee explain the communication process between the consulting engineers and FNP personnel and any measures taken to assure the fire modeling was performed adequately and will continue to be performed adequately during post-transition. In its response to FM RAI 05.e (Reference 10), the licensee stated that the communication process between the consulting engineers and the FNP staff consisted of onsite and call-in project meetings that were held during the course of the NFPA 805 transition and of reviews of draft deliverables, as applicable. The licensee further stated that walkdowns were often performed with both SNC personnel and consulting staff together and that consulting engineers, SNC corporate staff, and Site Operations met face to face for approximately one full week each month for the last six months of the project development. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated an adequate communication process between the consulting engineering and FNP personnel.

The NRC staff concludes that competent and experienced personnel developed the FNP FREs, including the supporting fire modeling calculations and including the additional documentation for models and empirical correlations not identified in previous NRC approved V&V documents.

Further, LAR Section 4.7.3, "Compliance with Quality Requirements in Section 2.7.3 of NFPA 805 Fire Protection Quality," states that:

> ...Post-transition, for personnel performing fire modeling or fire PRA development and evaluation, SNC will develop and maintain qualification requirements for individuals assigned various tasks. Position Specific Guides will be developed to identify and document required training and mentoring to ensure individuals are appropriately qualified per the requirements of NFPA 805 Section 2.7.3.4 to perform assigned work...

The post-transition qualification training program will be implemented to include NFPA 805 requirements for qualification of users as described in LAR Attachment S, Table S-3, Implementation Item 29. The NRC staff considers this action acceptable because it will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition

In addition, based on the licensee's description of the procedures for ensuring personnel who use and apply engineering analyses and numerical methods are competent and experienced, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805, Section 2.7.3.4, is acceptable.

3.8.3.5 Uncertainty Analysis

NFPA 805, Section 2.7.3.5 requires that an uncertainty analysis be performed to provide reasonable assurance that the performance criteria have been met. (10 CFR 50.48(c)(2)(iv) states that an uncertainty analysis performed in accordance with NFPA 805, Section 2.7.3.5, is not required to support calculations used in conjunction with a deterministic approach.) The licensee stated that an uncertainty analysis was performed for the analyses used in support of the transition to NFPA 805, and that an uncertainty analysis will be performed for post-transition analyses.

3.8.3.5.1 General

The industry consensus standard for PRA development, (i.e., the ASME/ANS PRA standard), (Reference 26) includes requirements to address uncertainty. Accordingly, the licensee addressed uncertainty as a part of the development of the FNP FPRA. The NRC staff's evaluation of the licensee's treatment of these uncertainties is discussed in SE Section 3.4.7 above.

According to NUREG-1855, Volume 1, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making," (Reference 40) there are three types of uncertainty associated with fire modeling calculations:

(1) Parameter Uncertainty: Input parameters are often chosen from statistical distributions or estimated from generic reference data. In either case, the uncertainty of these input parameters affects the uncertainty of the results of the fire modeling analysis.

(2) Model Uncertainty: Idealizations of physical phenomena lead to simplifying assumptions in the formulation of the model equations. In addition, the numerical solution of equations that have no analytical solution can lead to inexact results.

Model uncertainty is estimated via the processes of V&V. An extensive discussion of quantifying model uncertainty can be found in NUREG-1934, "Nuclear Power Plant Fire Modeling Application Guide (NPP FIRE MAG)." (Reference 42)

(3) Completeness Uncertainty: This refers to the fact that a model is not a complete description of the phenomena it is designed to simulate. Some consider this a form of model uncertainty because most fire models neglect certain physical phenomena that are not considered important for a given application. Completeness uncertainty is addressed by the description of the algorithms found in the model documentation. It is addressed, indirectly, by the same process used to address the Model Uncertainty.

3.8.3.5.2 Discussion of RAIs

By letters dated July 8, 2013 (Reference 20) and March 28, 2014 (Reference 21), the NRC staff requested additional information concerning the fire modeling conducted to support the FNP FPRA. By letters dated September 16, 2013 (Reference 10), October 30, 2013 (Reference 11), November 12, 2013 (Reference 12) and April 23, 2014 (Reference 13), the licensee responded to these RAIs.

- In FM RAI 06.a (Reference 20), the NRC staff requested that the licensee explain how the uncertainty associated with the fire model input parameters was accounted for in the fire modeling analyses. In its response to FM RAI 06.a (Reference 12), the licensee stated that the uncertainty associated with the fire model input parameters was implicitly accounted for through the use of a conservative and bounding analysis. The licensee provided a detailed discussion of the approach for the four primary fire modeling activities at FNP where parameter uncertainty is applicable, (i.e., the MCR abandonment analysis, the ZOI tabulations, the HGL tabulations, and plant specific detailed fire modeling analyses). The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that fire modeling parameter uncertainty is properly accounted for through the use of a conservative and bounding analysis.

- In FM RAI 06.b (Reference 20), the NRC staff requested that the licensee explain how the "model" uncertainty was accounted for in the fire modeling analyses. In its response to FM RAI 06.b (Reference 12), the licensee provided a detailed discussion to show that the model uncertainty in the MCR abandonment analysis either does not contribute to the risk uncertainty or is bounded by the conservatisms in the analysis. The licensee further explained that fire model uncertainty in the ZOI and HGL tabulations and the plant-specific detailed fire modeling is also bounded by the conservatisms in the analyses. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that model uncertainty is properly accounted for because it either does not contribute to the risk uncertainty or is bounded by the conservatisms in the analysis.

- In FM RAI 06.c (Reference 20), the NRC staff requested that the licensee explain how the "completeness" uncertainty was accounted for in the fire modeling analyses. In its response to FM RAI 06.c (Reference 12), the licensee explained that, according to NUREG-1934 (Reference 42), the "model" uncertainty and the "completeness" uncertainty are related and may be combined. The licensee further stated that fire model "completeness" uncertainty and the "model" uncertainty were therefore addressed as a single source of uncertainty. The NRC staff concludes that the licensee's response to the RAI is acceptable because the licensee demonstrated that completeness uncertainty is properly accounted for because it was combined with the model uncertainty in accordance with NUREG-1934.

3.8.3.5.3 Post-Transition

The licensee also stated that it will revise the appropriate processes and procedures to include the NFPA 805 quality requirements for use during the performance of post-transition FPP changes, including those regarding uncertainty analysis. Revision of the applicable post-transition processes and procedures to include NFPA 805 requirements regarding uncertainty analysis is included in LAR Attachment S, Table S-3, Implementation Item 34 and the NRC staff considers this action acceptable because it will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

3.8.3.5.4 Conclusion for Section 3.8.3.5

Based on the licensee's description of the FNP process for performing an uncertainty analysis, the NRC staff concludes that the licensee's approach for meeting the requirements of NFPA 805 Section 2.7.3.5 is acceptable.

3.8.3.6 Conclusion for Section 3.8.3

Based on the above discussions, the NRC staff concludes that subject to completion of the implementation items, the FNP RI/PB fire protection quality assurance program will meet each of the requirements of NFPA 805, Section 2.7.3, which include conducting independent reviews, performing V&V, limiting the application of acceptable methods and models to within prescribed boundaries, ensuring that personnel applying acceptable methods and models are qualified, and performing uncertainty analyses.

3.8.4 Fire Protection Quality Assurance Program

GDC 1 of Appendix A to 10 CFR Part 50 requires that:

> Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed.

The guidance in Appendix C to NEI 04-02 (Reference 7), suggests that the LAR include a description of how the existing fire protection quality assurance program will be transitioned to the new NFPA 805 RI/PB FPP, as discussed below.

The LAR stated that the existing fire protection QA program will be maintained and that the licensee has and will continue to perform work in accordance with the quality requirements of NFPA 805, Section 2.7.3. The LAR described how the fire protection QA program meets the applicable requirements of NFPA 805 Sections 2.7.3.1 through 2.7.3.5, but indicated that the QA program would be updated to meet the applicable requirements of NFPA 805 Section 2.7.3.4. The licensee included an action to develop position specific guides to identify and document required training and mentoring to ensure individuals are appropriately qualified in accordance with NFPA 805, Section 2.7.3.4 in LAR Attachment S, Table S-3, Implementation Item 29. The NRC staff concludes that this is action is acceptable because it will incorporate the provisions of NFPA 805 in the FPP and because it would be required by the proposed license condition.

Based on its review and the above explanation, the NRC staff concludes that the licensee's fire protection QA program is acceptable, subject to completion of the implementation item, because it provides reasonable assurance that the requirements of NFPA 805, Section 2.7.3.1 through 2.7.3.5 are met.

3.8.5 Conclusion for Section 3.8

The NRC staff reviewed the licensee's RI/PB FPP as described in the LAR, as supplemented, to evaluate the NFPA 805 program documentation content, the associated configuration control process, and the appropriate quality assurance requirements. The NRC staff concludes that subject to completion of the implementation items described in LAR Attachment S as would be required by the proposed license condition, the licensee's approach for meeting the requirements specified in NFPA 805 Section 2.7 is acceptable.

4.0 FIRE PROTECTION LICENSE CONDITION

The licensee proposed a fire protection program license condition regarding transition to an risk-informed, performance-based fire protection program under NFPA 805, in accordance with 10 CFR 50.48(c)(3)(i). The new license condition adopts the guidelines of the standard fire protection license condition promulgated in RG 1.205, Revision 1, Regulatory Position C.3.1, as issued on December 18, 2009 (74 FR 67253). Plant-specific changes were made to the sample license condition; however, the proposed plant-specific fire protection program license condition is consistent with the standard fire protection license condition, incorporates all of the relevant features of the transition to NFPA 805 at Farley Nuclear Plant and is, therefore, acceptable.

The following license condition is included in the revised license for the Farley Nuclear Plant Units 1 and 2, and will replace Operating License No. NPF-2 and NPF-8, Condition 2.C.(4) and 2.C.(6):

> <u>Fire Protection Program</u>
>
> Southern Nuclear Operating Company 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 9/25/12 and supplements dated 12/20/12, 9/16/13, 10/30/13, 11/12/13, 4/23/14, 5/23/14, 7/3/14, 8/11/14, 8/29/14, 10/13/14, and 1/16/15) and as approved in the safety evaluation dated 3/10/15). 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.

(a) 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 FNP. 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.

1. 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 DID philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

2. 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 DID philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

(b) 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 safety evaluation report dated March 10, 2015, to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection DID and safety margins are maintained when changes are made to the fire protection program.

(c) Transition License Conditions

1. Before achieving full compliance with 10 CFR 50.48(c), as specified by 2. below, risk-informed changes to SNC'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 modifications to its facility, as described in Attachment S, Table S-2, "Plant Modifications Committed," of SNC letter NL-14-1273, dated August 29, 2014 to complete the transition to full compliance with 10 CFR 50.48(c) by November 6, 2017. The licensee shall maintain appropriate

compensatory measures in place until completion of these modifications.

3. The licensee shall implement the items as listed in Attachment S, Table S-3, "Implementation Items," of SNC letter NL-14-1273, dated August 29, 2014, within 180 days after NRC approval, except for items 30 and 32. Items 30 and 32 shall be implemented by February 6, 2018.

5.0 SUMMARY

The NRC staff reviewed the licensee's application, as supplemented by various letters, to transition to a RI/PB FPP in accordance with the requirements established by NFPA 805. The NRC staff concludes that, subject to implementation of items in LAR, Attachment S, the applicant's approach, methods, and data are acceptable to establish, implement and maintain an RI/PB FPP in accordance with 10 CFR 50.48(c).

Accordingly, implementation of the RI/PB FPP under 10 CFR 50.48(c) must be in accordance with the new fire protection license condition, which identifies the list of implementation items that must be completed in order to support the conclusions made in this SE, and establishes a date by which full compliance with 10 CFR 50.48(c) must be achieved. Before the licensee is able to fully implement the transition to a fire protection program based on NFPA 805 and apply the new fire protection license condition, to its full extent, the implementation items must be completed within the timeframe specified.

6.0 STATE CONSULTATION

In accordance with the Commission's regulations, on January 21, 2015, the State of Alabama official was notified of the proposed issuance of the amendments. The State official had no comments.

7.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts and no significant change in the types of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on March 12, 2013 (78 FR 15750). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

8.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner; (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations; and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

9.0 REFERENCES

1 Branch Technical Position (BTP) APCSB 9.5-1, “Guidelines for Fire Protection for Nuclear Power Plants” (ADAMS Accession No. ML070660461).

2 Appendix A to BTP APCSB 9.5-1, “Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976” (ADAMS Accession No. ML070660458).

3 National Fire Protection Association, NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, Quincy, Massachusetts.

4 U.S. Nuclear Regulatory Commission, Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, December 2009 (ADAMS Accession No. ML092730314).

5 U.S. Nuclear Regulatory Commission, SECY-98-058, "Development of a Risk-Informed, Performance-Based Regulation for Fire Protection at Nuclear Power Plants," March 1998 (ADAMS Accession No. ML992910106).

6 U.S. Nuclear Regulatory Commission, SECY-00-0009, "Rulemaking Plan, Reactor Fire Protection Risk-Informed, Performance-Based Rulemaking," January 2000 (ADAMS Accession No. ML003671923).

7 Nuclear Energy Institute, NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Washington, DC, Revision 2, April 2008 (ADAMS Accession No. ML081130188).

8 Ajluni, M. J., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Josephy M. Farley Nuclear Plant License Amendment to Adopt NFPA-805 Performance Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants (2001 Edition)," dated September 25, 2012, (ADAMS Accession No ML12279A235).

9 Ajluni, M. J., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant Supplemental Information Regarding License Amendment Request For Transition to 10 CFR 50.48(c) - NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition)," dated December 20, 2012, (ADAMS Accession Nos ML12359A050 and ML12359A051).

10 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) -NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated September 16, 2013, (ADAMS Accession Nos. ML14038A019 and ML14038A037).

11 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) -NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated October 30, 2013, (ADAMs Accession Nos. ML13305A105).

12 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) -NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated November 12, 2013, (ADAMs Accession No. ML13318A027).

13 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) -NFPA 805 Performance Based Standard for Fire Protection for Light1Water Reactor Generating Plants," dated April 23, 2014, (ADAMs Accession No. ML14114A550).

14 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant, Response to Request for Additional Information Regarding License Amendment Request for Transition to 10CFR50.48(c) - NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated May 23, 2014, (ADAMS Accession No. ML14147A368).

15 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant, Response to Request for Additional Information Regarding License Amendment Request for Transition to 10CFR50.48(c) - NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated July 3, 2014, (ADAMS Accession No. ML14189A144).

16 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant, Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) - NFPA 805 Performance Based Standard for Fire Protection for Lioht Water Reactor Generating Plants," dated August 11, 2014, (ADAMS Accession No. ML14223A646).

17 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) - NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated August 29, 2014 (ADAMS Accession No. ML14246A523).

18 Pierce, Charles R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant Response to Request for Additional Infomiation Regarding License Amendment Request for Transition to 10 CFR 50.48(c) - NFPA 805 Perfonnance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated October 13, 2014 (ADAMS Accession No. ML14288A671).

19 Pierce, C.R., Southern Nuclear Operating Company, letter to U.S. Nuclear Regulatory Commission, "Joseph M. Farley Nuclear Plant, Response to Request for Additional Information Regarding License Amendment Request for Transition to 10 CFR 50.48(c) - NFPA 805 Performance Based Standard for Fire Protection for Light Water Reactor Generating Plants," dated January 16, 2015 (ADAMS Accession No. ML15016A199).

20 Brown, Eva A, U.S. Nuclear Regulatory Commission, letter to C. R. Pierce, Southern Nuclear Operating Company, "Joseph M. Farley Nuclear Plant, Units 1 And 2 - Request for Additional Information Concerning Voluntary Fire Protection Risk Initiative Request (TAC Nos. ME9741 And ME9742)," dated July 8, 2013, (ADAMS Accession No. ML13176A093).

21 Williams, Shawn, U.S. Nuclear Regulatory Commission, letter to C. R. Pierce, Southern Nuclear Operating Company, "Joseph M. Farley Nuclear Plant, Unit Nos. 1 And 2 - Request for Additional Information Concerning Voluntary Fire Protection Risk Initiative Request (TAC Nos. ME9741 And ME9742)," dated March 28, 2014 (ADAMS Accession No. ML14073A053).

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Date: March 10, 2015

Attachments:
A. Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at FNP
B. Table 3.8-2, V&V Basis for Other Fire Models and Related Calculations Used at FNP
C. Abbreviations and Acronyms

Attachment A: Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at FNP

Correlation	Application at FNP	V&V Basis	NRC Staff Evaluation of Acceptability
Heskestad flame height correlation	Development of ZOI tables in GFMTs approach	NUREG-1805 (Reference 37) NUREG-1824 (Reference 38) SFPE Handbook (Reference 93)	• The correlation is validated in NUREG-1824 and an authoritative publication. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Heskestad plume temperature correlation	Development of ZOI tables in GFMTs approach	NUREG-1805 (Reference 37) NUREG-1824 (Reference 38) SFPE Handbook (Reference 93)	• The correlation is validated in NUREG-1824 and an authoritative publication. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Modak point source radiation model	Development of ZOI tables in GFMTs approach	NUREG-1805 (Reference 37) NUREG-1824 (Reference 38) SFPE Handbook (Reference 94)	• The correlation is validated in NUREG-1824 and an authoritative publication. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Shokri and Beyler flame radiation model	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 72)	• The correlation is validated in a peer reviewed journal article. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.

Attachment A: Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at FNP

Correlation	Application at FNP	V&V Basis	NRC Staff Evaluation of Acceptability
Mudan flame radiation model	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 74)	• The correlation is validated in a peer reviewed journal article. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Plume heat flux correlation by Wakamatsu et al.	Development of ZOI tables in GFMTs approach	Peer-reviewed conference paper (Reference 75)	• The correlation is validated in a peer reviewed conference paper. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Yokoi plume centerline temperature correlation	Development of ZOI tables in GFMTs approach	National research laboratory report (Reference 76) Peer-reviewed journal article (Reference 77)	• The correlation is validated in a national research laboratory report and a peer reviewed journal article. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Hydrocarbon spill fire size correlation	Development of ZOI tables in GFMTs approach	SFPE Handbook (Reference 78)	• The correlation is validated in an authoritative publication. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Flame extension correlation	Development of ZOI tables in GFMTs approach	SFPE Handbook (Reference 79)	• The correlation is validated in an authoritative publication. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Delichatsios line source flame height model	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 80)	• The correlation is validated in a peer reviewed journal article. Based its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.

Attachment A: Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at FNP

Correlation	Application at FNP	V&V Basis	NRC Staff Evaluation of Acceptability
Corner flame height correlation	Development of ZOI tables in GFMTs approach	SFPE Handbook (Reference 79)	• The correlation is validated in an authoritative publication. Based its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Kawagoe natural vent flow equation	Development of ZOI tables in GFMTs approach	National research laboratory report (Reference 81)	• The correlation is validated in a national research laboratory report. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Yuan and Cox line fire flame height and plume temperature correlations	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 82)	• The correlation is validated in a peer reviewed journal article. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Lee cable fire model	Development of ZOI tables in GFMTs approach	NBSIR 85-3196 (Reference 83)	• The correlation is validated in a national research laboratory report. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.
Babrauskas method to determine ventilation-limited fire size	Development of ZOI tables in GFMTs approach	Peer-reviewed journal article (Reference 84)	• The correlation is validated in a peer reviewed journal article. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.

Attachment A: Table 3.8-1, V&V Basis for Fire Modeling Correlations Used at FNP

Correlation	Application at FNP	V&V Basis	NRC Staff Evaluation of Acceptability
Correlation for Flame Spread over Horizontal Cable Trays (FLASH-CAT)	The FLASH-CAT method was used to calculate the growth and spread of a fire within a vertical stack of horizontal cable trays	NUREG/CR-7010 (Reference 39)	• The modeling technique is validated in NUREG/CR-7010. Based on its review and evaluation, the NRC staff concludes that the use of this correlation in the FNP application is acceptable.

Attachment B: Table 3.8-2, V&V Basis for Other Fire Models and Related Calculations Used at FNP

Model	Application at FNP	V&V Basis	NRC Staff Evaluation of Acceptability
CFAST (Version 6)	Development of HGL tables, and MCR abandonment time calculations	NUREG-1824 (Reference 38) NIST Special Publication 1086 (Reference 95)	• The modeling technique is validated in NUREG-1824 and a national research laboratory report. Based on its review and evaluation, the NRC staff concludes that the use of this model in the FNP application is acceptable.

Attachment C: Abbreviations and Acronyms

ADAMS	Agencywide Documents Access and Management System
AFW	auxiliary feedwater
AHJ	authority having jurisdiction
ANS	American Nuclear Society
ARVs	atmospheric relief valves
ASME	American Society of Mechanical Engineers
BTP	Branch Technical Position
BWR	boiling-water reactor
CAFTA	computer-aided fault tree analysis
CAROLFIRE	Cable Response to Live Fire
CC	Capability Category
CCDP	conditional core damage probability
CCW	component cooling water
CDF	core damage frequency
CFAST	consolidated model of fire and smoke transport
CFR	Code of Federal Regulations
CHRISTIFIRE	Cable Heat Release, Ignition, and Spread in Tray Installations During Fire
CLERP	conditional large early release probability
CO_2	carbon dioxide
CPTs	control power transformers
CSR	Cable spreading room
CST	Condensate Storage Tank
DESIREE-Fire	Direct Current Electrical Shorting in Response to Exposure Fire
DID RA	defense-in-depth recovery action
DID	defense-in-depth
EDG	emergency diesel generator
EEEE	existing engineering equivalency evaluation
EPRI	Electric Power Research Institute
ERFBS	electrical raceway fire barrier system
F&O	facts and observations
FAQ	frequently asked question
FDS	fire dynamics simulator
FDT	fire dynamics tool
FM	fire modeling
FNP	Joseph M. Farley Nuclear Plant
FPE	fire protection engineering
FPP	fire protection program
FPPR	Fire Protection Program Reevaluation
FPRA	fire probabilistic risk assessment
FR	Federal Register
FRANC	Fire Risk Analysis Code
FRE	fire risk evaluation
FSAR	final safety analysis report
GDC	general design criteria
GFMT	generic fire modeling treatments
GL	generic letter

Gpm	gallons per minute
HEAF	high energy arching fault
HEP	human error probability
HFEs	human failure events
HGL	hot gas layer
HRA	human reliability analysis
HRE	high(er) risk evolution
HRR	heat release rate
HSPs	hot shutdown panels
HVAC	heating, ventilation, and air conditioning
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IEPRA	internal events probabilistic risk assessment
IPE	Individual Plant Evaluation
KSF	key safety function
kV	kilovolt
kW	kilowatt
LAR	license amendment request
LB	licensing basis
LER	license event report
LERF	large early release frequency
MCA	multi-compartment analysis
MCB	main control board
MCR	main control room
min	minute(s)
MFW	main feedwater
MSO	multiple spurious operation
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NLO	Non-licensed operator
No.	number
NPO	non-power operation
NPP	nuclear power plant
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSCA	nuclear safety capability assessment
NSEL	Nuclear Safety Equipment List
NSPC	nuclear safety performance criteria
OMA	operator manual action
PAU	physical analysis unit
PB	performance-based
PCE	plant change evaluation
PCS	primary control station
PDMS	Plant Database Management System
PORVs	Power Operated Relief Valves
PRA	probabilistic risk assessment
PRS	plant operational states

PSA	probabilistic safety assessment
PWR	pressurized-water reactor
QA	quality assurance
RA	recovery action
RAI	request for additional information
RB	reactor building
RCS	reactor coolant system
RCPs	reactor coolant pumps
RES	Office of Nuclear Regulatory Research
RG	Regulatory Guide
RHR	residual heat removal
RI	risk-informed
RI/PB	risk-informed, performance-based
RWST	Refueling Water Storage Tank
SDS	shutdown seal
SE	safety evaluation
SER	safety evaluation report
SFPE	Society of Fire Protection Engineers
SNC	Southern Nuclear Operating Company, Inc.
SR	supporting requirement
SSA	safe shutdown analysis
SSC	structures, systems, and components
SSD	safe shutdown
SUTs	Start-up Transformers
TS	Technical Specification
TSC	Technical Support Center
UFSAR	updated final safety analysis report
USGS	U.S. Geological Survey
V	Volt
V&V	verification and validation
VEWFDS	very early warning fire detectors
VFDR	variance from deterministic requirements
yr	year
ZOI	zone of influence

A copy of the related Safety Evaluation is enclosed. A Notice of Issuance will be included in the Commission's Biweekly *Federal Register* notice.

Sincerely,

/RA/

Shawn Williams, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-348 and 50-364

Enclosures:
1. Amendment No. 196 to NPF-2
2. Amendment No. 192 to NPF-8
3. Safety Evaluation

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NAME	RElliott	MYoung (NLO)	RPascarelli	SWilliams	
DATE	01/22/15	02/11/16	03/10/15	03/10/15	

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