NRR-PMDAPEm Resource

From: Beltz, Terry
Sent: Monday, March 30, 2015 9:26 AM
To: 'Chesnutt, Samuel'
Cc: Vincent, Dale M.; gene.eckholt@xenuclear.com; murphy, (martin@xenuclear.com); Pelton, David; Hamzehee, Hossein; Klein, Alex; Miller, Barry; Fields, Leslie; Green, Kimberly
Subject: Prairie Island Nuclear Generating Plant, Units 1 and 2 - NFPA 805 Requests for Additional Information and Response Timeline (TAC Nos. ME9734 and ME9735)
Attachments: Prairie Island Nuclear Generating Plant Units 1 and 2 - NFPA 805 Final Requests for Additional Information (TAC Nos ME9734 and ME9735).docx

Dear Mr. Chestnutt:

By letter dated September 28, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12278A405), Northern States Power Company, a Minnesota corporation (NSPM, the licensee), doing business as Xcel Energy, submitted a license amendment request (LAR) to transition its fire protection licensing basis at the Prairie Island Nuclear Generating Plant (PINGP), Units 1 and 2, from paragraph 50.48(b) of Title 10 of the *Code of Federal Regulations* (10 CFR) to 10 CFR 50.48(c), National Fire Protection Association Standard NFPA 805 (NFPA 805).

By letters dated November 8, 2012, and December 18, 2012 (ADAMS Accession Nos. ML12314A144 and ML12354A464, respectively), NSPM provided supplemental information in support of its application. By letter dated January 2, 2013 (ADAMS Accession No. ML13002A209), the NRC staff concluded that there was information in sufficient detail to enable the staff to being its technical review and make an independent assessment regarding the acceptability of the proposed LAR.

Subsequent to the acceptance of the application, the NSPM staff verbally informed the NRC staff that, in preparation for the NRC Audit of the PINGP NFPA 805 LAR, it had identified a number of issues associated with the Fire Probabilistic Risk Assessment (PRA) that was determined to affect the risk values identified in the September 28, 2012, application, and the December 18, 2012, supplemental letter.

By letter dated May 3, 2013 (ADAMS Accession No. ML13126A115), NSPM informed the NRC that a revision to the PRA was necessary and provided a commitment to provide a supplement to its NFPA 805 LAR with revised Fire PRA results by May 1, 2014. NSPM submitted its revised PRA in a supplement dated April 30, 2014 (ADAMS Accession Nos. ML14125A106 and ML14125A149).

The NRC staff in the Fire Protection Branch (AFPB), PRA Licensing Branch (APLA), and PRA Operations & Human Factors Branch (ARCB) of the Office of Nuclear Reactor Regulation determined that additional information was needed to complete its review. The staff provided NSPM pre-audit draft requests for additional information (RAIs) in an e-mail dated March 3, 2015 (ADAMS Accession No. ML15062A150).

The NRC staff conducted an onsite audit in support of its NFPA 805 review during the week of March 23, 2015. As a result of the audit, the staff identified revisions to the aforementioned pre-audit draft RAIs, and the proposed revisions and a response timeline were discussed with NSPM prior to conclusion of the onsite audit.

The attached document includes the revised NFPA 805 RAIs and response timeline. The NRC staff requests that NSPM provide its RAI responses in accordance with the response timeline (e.g., 60 days, 90 days, or 120 days). Please note that the response timeline clock commenced from conclusion of the onsite audit, which was March 25, 2015.

Finally, please don’t hesitate to contact me if you have any additional questions or concerns.

Sincerely,

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REQUESTS FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST (LAR) TO ADOPT

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD (NFPA) 805

NORTHERN STATES POWER COMPANY – MINNESOTA (NSPM, THE LICENSEE)

PRAIRIE ISLAND NUCLEAR GENERATING PLANT (PINGP), UNITS 1 AND 2

DOCKET NOS. 50-282 AND 50-306

(TAC NOS. ME9734 AND ME9735)

Fire Protection Engineering (FPE) RAI 01

NFPA 805, Section 3.4.1(a), requires that a fully-staffed and qualified fire brigade comply with NFPA standards NFPA 600, NFPA 1500, and NFPA 1582, as applicable. In the Enclosure to your August 20, 2014, license amendment request (hereafter referred to as the LAR), Attachment A, Section 3.4.1(a), it states that the compliance strategy as "Complies via Previous Approval." However, the compliance basis does not provide excerpts from the past licensee submittal(s) and associated U.S. Nuclear Regulatory Commission (NRC) documentation that substantiates the previous approval. The NRC endorsed guidance in NEI 04-02, Appendix B, Section B-1, states that "When claiming previous approval, excerpts from the NRC documents that provided the formal approval shall be included in documentation, as well as appropriate excerpts from licensee's submittals." Additionally, Section B.1 states "for each reference document that is referenced as part of the transition review, provide sufficient documentation to provide traceability back to the original submittal and approval.

Please provide, as appropriate, information such as revision number, date, and section/page number in order to make the statements as clear as possible to facilitate reviews and long term configuration management."

Additionally,

a. The Technical Specification discussion in the Compliance Basis only addresses minimum staffing and does not address the fire brigade capabilities as addressed in the NFPA standards.

   Please provide additional details to substantiate the compliance strategy that the NRC has previously approved the fire brigade for PINGP.

b. The licensee has stated that the fire brigade has been reviewed against NFPA 600; however there is no statement of compliance with regard to the requirements of NFPA 600.

   Please provide a more detailed description of compliance with NFPA 600.

FPE RAI 02

NFPA 805, Section 3.4.1(c), requires that the fire brigade leader and at least two brigade members have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria.

As described in the Compliance Basis for Section 3.4.1(c) in Attachment A of the LAR, NSPM has incorporated the NFPA 805 requirement in its procedures; however, it does not summarize the training and knowledge level required of the non-licensed operators that are assigned to the fire brigade.

Please provide additional detail regarding the training that is provided to the fire brigade members that addresses their ability to assess the effects of fire and fire suppressants on nuclear safety performance criteria.

FPE RAI 03

NFPA 805, Section 3.10.1, requires that if an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the applicable NFPA codes. Attachment A, Section 3.10.1, of the LARidentifies an implementation item for code deviations that require a modification to resolve non-compliances associated with unprotected beam pockets and system supervision, and states that this modification is identified in Table S-2.

Please identify the specific plant modification item to which this applies.

FPE RAI 04

NFPA 805, Section 2.4.3.3, states that the use of the Fire Risk Evaluation performance-based approach requires that “The PSA [probabilistic safety assessment] approach, methods and data shall be acceptable to the AHJ [authority having jurisdiction, which is the NRC].”

Attachment S, Table S-2, Plant Modification Item 5, identifies the installation of a Very Early Warning Fire Detection System (VEWFDS) to monitor the conditions inside low voltage cabinets located in fire compartment FA 18 to reduce the likelihood of fire propagation outside the cabinets.

Please provide a more detailed description of the proposed modification including:

a. The NFPA code(s) of record, proposed installation configuration (inside cabinets or area-wide, common piping or individual cabinet piping), and the use of equipment manufacturers recommendations regarding design, installation, and piping.

b. The acceptance testing, sensitivity and setpoint control(s), alarm response procedures and training, and routine inspection, testing, and maintenance that will be implemented to credit the new incipient detection system.

c. The configuration and design control process that will control and maintain the setpoints for both alert and alarm functions from the VEWFDS.

d. The instructions that will be required of the first responders until the degrading component is repaired, the cabinet is de-energized, or the alarm is satisfactorily reset.

e. The credit taken in the Fire PRA [probabilistic risk assessment] for the VEWFDS in assessing the risk in the fire areas where the system is credited.

f. Whether this installation and the credit that will be taken will be in accordance with each of the method elements, limitations and criteria of NUREG/CR-6850, Supplement 1, "Fire Probabilistic Risk Assessment Methods Enhancements," Chapter 13, and Frequently Asked Question (FAQ) 08-0046, including the closeout memorandum.

g. Justification for any deviations from NUREG/CR-6850, Supplement 1, "Fire Probabilistic Risk Assessment Methods Enhancements," Chapter 13, and FAQ 08-0046, including the closeout memorandum.

FPE RAI 05

NFPA 805, Section 3.5.16, requires"The fire protection water supply system shall be dedicated for fire protection use only." In Attachment L of the LAR, Approval Request 1, the licensee identifies the fire protection water supply system at PINGP may periodically be utilized to supply water for non-fire protection purposes. The LAR states the fire water system can be aligned for screen wash system use and “emergency uses,” and as such it does not meet the requirement or allowed exceptions.

a. The Approval Request only addresses use of fire water for the screen wash in the “Basis for the Request,” and does not address the bases for aligning the fire water for “other emergency uses.”

   Please provide a description of “other emergency uses” that may be in addition to screen wash purposes.

   For all non-fire use uses, in accordance with 10 DFR 50.48(c)(2)(vii), include a discussion on potential impacts to the nuclear safety and radiological release performance criteria. In addition, describe how safety margin is maintained and discuss how the three elements of defense-in-depth are met.

FPE RAI 06

NFPA 805, Section 3.6.1, Standpipe and Hose Stations, requires that "For all power block buildings, Class III Standpipe and hose stations shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe, Private Hydrants and Hose Systems."*

In Attachment A of the LAR, Section 3.6.1, Standpipe and Hose Stations, lists NFPA 14 code compliance evaluations. The summary statement in the LAR for the code compliance evaluations identifies the need to resolve one unacceptable deviation (NFPA 14-1986) and two

outstanding Action Requests (NFPA 14-1969) resulting from the NFPA 14 reviews. These open items listed in the LAR do not appear to have implementation items identified in Attachment S.

Please provide more detail with regard to the deviation and two outstanding items, including the identification of implementation items required for these items, as appropriate or necessary to meet NFPA 805. If implementation items for these code deviations are deemed unnecessary to meet NFPA 805, provide additional justification.

Safe Shutdown Analysis (SSA) RAI 01

NFPA 805, Section 2.4.2, Nuclear Safety Capability Assessment, requires licensees to perform a nuclear safety capability assessment (NSCA). Regulatory Guide (RG) 1.205,"Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," endorsed the guidance in NEI 00-01,"Guidance for Post-Fire Safe Shutdown Circuit Analysis,"Chapter 3, as one acceptable approach to perform an NSCA. In Attachment B of the LAR, the alignment basis for NEI 00-01, Attribute 3.1.1.4, is "Not in Alignment [but Prior NRC Approval]." The licensee stated that the Fire PRA employs the use of a hot shutdown (HSD) panel in conjunction with other controls when required to abandon the Control Room (CR) and that the HSD panels and controls do not meet the definition of a primary control station (PCS) as defined by RG 1.205. Additionally, the licensee stated that actions to enable the HSD panel and establish required controls are listed in the PRA Alternative Shutdown Notebook.

a. RG 1.205 Section C.2.4 describes two cases where operator actions taken outside the main control room may be considered as taking place in the PCS: (a) controls for a system or component specifically installed to meet the "dedicated shutdown" option in Section III.G. 3 of Appendix R and (b) controls for some systems and components that have been modified to meet the "alternative shutdown" option in Section III.G.3.

   Please provide a discussion of the HSD panel and what attributes of PINGP design and procedures do not meet the definition of PCS as defined in RG1.205.

b. As described in FAQ 07-0030, "Establishing Recovery Actions," Revision 5, if a licensee proposes to make modification(s) to their previously approved strategy, it may obtain NRC approval of a new PCS strategy. NRC approval of the new PCS strategy can be obtained by providing the information required in FAQ 07-0030 for either 1) Option 1,to design and install a primary control station(s) in accordance with the guidance and requirements of the existing Fire Protection licensing, or 2) Option 2,to develop the design and analyze the primary control station(s) using the performance-based approach and provide the necessary evaluation.

   If the actions to enable the HSD panel and establish the required controls are credited in the performance based analysis in the PRA Alternative shutdown notebook as PCS actions, then provide a detailed description of the modification to the dedicated or alternative shutdown strategy sufficient for the staff to verify that the strategy meets the attributes provided in Section C.2.4 [i.e., electrical independence, command and control, instrumentation, actions necessary to enable (if required), etc.].

c. For a fire requiring CR abandonment, please describe the actions necessary to enable the HSD panel and/or PCS to establish required controls, including required local/remote indications.

   Clarify if these actions are identified in LAR Attachment G.

d. When CR abandonment is necessary, please describe the command and control structure of the operating crew, including locations, communications and coordination required between the decision makers (SROs) and field operators performing recovery actions.

For those actions that are symptom-driven, discuss the instrumentation/indications used as cues to determine that the action is required.

e. In the alignment basis for Attribute 3.1.1.4 of NEI 00-01, the licensee stated that prior to abandoning the CR, action is taken on the control board to close the power-operated relief valves (PORVs), and additional actions are taken at a switch panel (to be installed as modification item 27 in Attachment S of the LAR) to isolate excess letdown, head vents, pressurizer vents, the pressurizer PORV, and pressurizer heaters.

   (i) Please clarify if the actions at the new switch panel are required to be successful in order to meet the nuclear safety performance criteria of Section 1.5.1(b) associated with RCS inventory and pressure control. If so, describe the methodology for ensuring that manual actuation of these switches is successful and discuss how the manual actuation aligns with Attribute 3.1.1.10 of NEI 00-01.

   (ii) Please provide a description of the switch design and location. Include in the discussion how the switch provides the desired electrical isolation for the subject components.

SSA RAI 02

The Executive Summary in the LAR states that the PINGP transition process was performed in accordance with RG1.205, Revision 1. Regulatory Position 2.3.2, *Previously NRC-Approved Alternatives to NFPA 805, Section 4.2.3, Deterministic Requirements*, in RG 1.205, Revision 1, states that in accordance with NFPA 805, Section 2.2.7, licensees may use existing exemptions … to demonstrate compliance with the specific deterministic fire protection design requirements in Chapter 4 of NFPA 805, provided the NRC staff determines that the licensee has acceptably addressed the continued validity of any exemption … in effect at the time of the NFPA 805 license amendment application and that the exemption … does not involve a recovery action as defined in NFPA 805, Section 1.6.52, that is used to demonstrate the availability of a success path for the nuclear safety performance criteria.

In Attachment K of the LAR, the licensee stated that the previously approved exemption to allow manual removal of fuses from the PORV control circuit in the event of a fire in the Control Room (CR) (Fire Area 13) will be transitioned in NFPA 805 as clarified in LAR Attachment T, to allow opening of disconnect switches installed subsequent to the exemption approval, in lieu of pulling fuses. Clarify which action, or both, is credited for disabling the PORV control circuits.

Please describe the procedural steps and the feasibility analysis performed for these actions.

SSA RAI 03

NFPA 805, Section 2.4.2, Nuclear Safety Capability Analysis, requires licensees to perform a nuclear safety capability analysis (NSCA). In RG 1.205, the NRC staff states that one acceptable approach to perform the NSCA is to follow the guidance in NEI 00-01, Chapter 3. Attribute 3.2.1.5 of NEI 00-01 states that instrument circuits (e.g., resistance temperature detectors, thermocouples, pressure transmitters, and flow transmitters) should be assumed to fail upscale, midscale, or downscale as a result of fire damage, whichever is worse, and that an instrument performing a control function is assumed to provide an undesired signal to the

control circuit. In Attachment B of the LAR, Section 3.2.1.5, the licensee stated that PINGP assumes that instrumentation circuits fail in their worst-case positions when damaged by the fire unless an analysis was performed to show that the failure mode is incredible.

Please describe the analysis method used to determine the failure mode is incredible and provide an example of the types of instruments that would be analyzed using this method.

SSA RAI 04

NFPA 805, Section 1.3.1, Nuclear Safety Goal, states:"The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition."

NFPA 805, Section 1.5.1(d),Vital Auxiliaries,states: "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."

In Section 4.2.1.2 of the LAR, the licensee stated that CR temperature will remain below equipment limits for up to 36 hours with actions taken only within the CR itself. A portable fan may be used to maintain temperatures below equipment limits indefinitely. If required, the portable fan will be powered by a designated welding receptacle or a 480-VAC [volts alternating current] portable generator located outside the building.

Please provide the following additional information:

a. Describe the steps taken to maintain CR temperature below equipment limits for 36 hours.

b. Clarify if the use of the portable fan and the associated welding receptacle or portable generator is credited for achieving and maintaining safe and stable conditions. If so, provide the justification for excluding this recovery action in Attachment G of the LAR.

c. Provide additional details on the storage and usage locations of the 480-VAC portable generator and its potential impact, if any, on the NSCA structures, systems, and components (SSCs) that are in the vicinity of these locations.

d. Describe the type and quantity of fuel associated with the portable generator and the availability and location(s) of sufficient fuel sources to support maintaining safe and stable conditions for the time period required.

e. Justification that refueling the portable generator does not present a fire exposure hazard to NSCA SSCs.

f. A summary of the procedure guidance for the use of the portable generator to power the portable fan, and how this action aligns with each of the feasibility criteria of FAQ 07-0030 (i.e., training, procedures, drills, etc.).

SSA RAI 05

NFPA 805, Section 1.3.1, Nuclear Safety Goal, states:“The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.”

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

In Section 4.3.2 and Attachment D of the LAR, the licensee provided the results of the evaluation process for Non-Power Operations (NPO) analysis.

Please provide additional details as follows:

a. During NPO modes, spurious actuation of valves can have a significant impact on the ability to maintain decay heat removal and inventory control.

   Provide a description of any actions being credited to minimize the impact of fire-induced spurious actuations on power operated valves (e.g., air-operated valves and motor-operated valves) during NPO (e.g., pre-fire rack-out, actuation of/or pinning of valves, and isolation of air supplies).

b. During normal outage evolutions, certain credited NPO equipment will have to be removed from service.

   Describe the types of compensatory actions that will be used during such equipment down-time and how are they determined to be adequate.

c. In Attachment D of the LAR, the licensee states that operator actions taken to mitigate the loss of a Key Safety function (KSF) are credited in the NPO analysis contained within PINGP Engineering Evaluation EC-20612, “Non-Power/NSCA Operations Review for NFPA 805.”

   Describe the operator actions credited to maintain KSF and the feasibility analysis performed for these actions.

SSA RAI 06

NFPA 805, Section 1.3.1, Nuclear Safety Goal, states:"The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition."

In Section 4.2.1.2 of the LAR, the licensee stated that the determination of the final state of the safe and stable conditions will be based upon the extent of the fire damage, the inventory remaining in the Refueling Water Storage Tank (RWST), the ability to provide makeup to the RWST, and the ability to re-establish inventory in the Condensate Storage Tank (CST) or realignment of Auxiliary Feedwater (AFW) to its alternate source (cooling water system).

Please provide the additional information to support the review of the NFPA 805 licensing bases for maintaining the fuel safe and stable:

a. The licensee stated that the PINGP thermal-hydraulic analysis was performed for a mission time of 24 hours to assure that safe and table conditions can be achieved within that time period.

   Provide a qualitative risk assessment for extending the mission time beyond 24 hours and implementing operator actions to establish makeup to the RWST, the CST and/or realignment of AFW to its alternate source.
b. The licensee also stated that operator actions are performed to align makeup/alternate water sources to the RWST beyond 38 hours, and to the CST or AFW pumps beyond 20 hours.
   Provide the details of the makeup sources and the process for aligning these sources, including a discussion of the feasibility analysis performed for these actions.

SSA RAI 07

NFPA 805, Section 2.4.3.3, states that the PSA (Fire Risk Evaluation) approach, methods, and data shall be acceptable to the AHJ (NRC). 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.

In Attachment C of the LAR, the fire risk evaluation for Fire Areas 13 and 18 credited various recovery actions and modifications to resolve VFDR [Variances from Deterministic Requirements]-013-1-02 and VFDR-018-1-02 for Unit 1, and VFDR-013-2-02 andVFDR-018-2-02 for Unit 2.

Please provide the following clarifications related to these VFDRs:

a. For VFDR-18-2-02 in Attachment C, the licensee discusses its evaluation of recovery actions to remove power and manually close MV-32178 and MV-32179. Attachment G of the LAR includes credited recovery actions to de-energize Sump B motor-operated valves (MV-32075, MV-32076, MV-32077, MV-32078, MV-32178, MV-32179, MV-32180 and MV-32181) at their respective motor control centers (MCC). However, Attachment G does not include any specific action(s) to verify the valve position locally or to realign these valves locally if needed.

Please discuss the consequences of circuit failure due to open circuits, hot shorts and shorts-to-ground, and describe how the credited recovery actions to only de-energize the valves address the consequences of potential spurious operation to meet the risk evaluation criteria.

b. Attachment C of the LAR did not discuss the modifications listed in Attachment S of the LAR to address IN 92-18 related to the above VFDRs (e.g., modification to MV-32085 and MV-32188).

   Please provide justification for not including these modifications in Attachment C, or revise Attachment C accordingly.

c. The recovery actions and modifications to address IN 92-18 only appear to address one of the redundant supplies from the RWST to the Residual Heat Removal (RHR) pumps (MV-32085 for Unit 1 and MV-32188 for Unit 2), and do not addressMV-32084 for Unit 1 or MV-32187 for Unit 2.

   Please provide a justification for only needing to address the recovery actions and modifications for valves MV-32085 and MV-32188, and not for their redundant counterparts MV-32084 and MV-32187.

d. Attachment G of the LAR includes a recovery action to de-energize MV-32085 from two different power supplies: MCC 1K2 (VFDR-013-1-02 and VFDR-018-1-02) and MCC 2K2 (VFDR-013-2-02 and VFDR-018-2-02). It appears that the entry for MCC 2K2 has a typographical error– it refers to MV-32085 as the valve number for "RWST TO 22 RHR PUMP ISOL VLV MV-32085," but the next recovery action identifies the RWST valve to 22 RHR PUMP as MV-32188.

   Please revise Attachment G, as needed, to resolve this conflict.

SSA RAI 08

NFPA 805, Section 4.2.2, requires that "For each fire area either a deterministic or performance-based approach shall be selected in accordance with Figure 4.2.2. The performance-based approach shall be permitted to utilize deterministic methods for simplifying assumptions within the fire area."

In Attachment C of the LAR, Table B-3, the licensee indicated that the regulatory basis for Fire Area 71 is the deterministic approach as described in NFPA 805, Section 4.2.3. However, in the table titled "Required Fire Protection Systems and Features", an Electrical Raceway Fire Barrier System (ERFBS) was identified as being required for risk. This implies that the ERFBS was evaluated using the performance-based approach using the Fire Risk Evaluation approach in accordance with NFPA 805, Section 4.2.4.2. If the Fire Area 71 regulatory basis is the deterministic approach, to maintain compliance with NFPA 805, Section 4.2.3, the ERFBS should meet the requirements of NFPA 805, Section 3.11.5, and be identified as being required for separation.

Please clarify if the ERFBS is credited to protect a nuclear safety performance function, and if Fire Area 71 was evaluated using deterministic or performance-based approach.

SSA RAI 09

NFPA 805, Section 2.4.3.3, states that when performing Fire Risk Evaluations, "The PSA approach, methods, and data shall be acceptable to the AHJ" (which is the NRC).

NFPA 805, Section 3.11.2, Fire Barriers, states that "Fire barriers required by Chapter 4 shall include a specific fire-resistance rating. Fire barriers shall be designed and installed to meet the specific resistance rating using assemblies qualified by fire tests. The qualification fire tests shall be in accordance with NFPA 251, *Standard Methods of Tests of Fire Endurance of Building Construction and Materials,* or ASTM E 119, *Standard Test Methods for Fire Tests of Building Construction and Materials."*

In Attachment C of the LAR, the licensee stated that radiant energy shields are credited for risk in Fire Area 1 to protect raceway 1CV-T421 and in Fire Area 32 to protect raceway 1SG-LB22.

Please provide specific details of the nuclear safety functions that credit these radiant energy shields and discuss the extent of how the radiant energy shields are credited in the fire risk evaluations. In your discussion include how the fire resistance rating claimed in the risk analysis has been established through fire testing.

SSA RAI 10

NFPA 805, Section 2.4.2.4, requires "An engineering analysis shall be performed in accordance with the requirements of Section [2.4] 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." RG 1.205, Revision 1, endorsed NEI 04-02, Revision 2, as one acceptable approach to performing and documenting the engineering analyses required to transition to a risk-informed, performance-based fire protection program in accordance with 10 CFR 50.48(c) and NFPA 805. On a fire area basis, NEI 04-02 requires that the licensee document how the nuclear safety performance criteria are met. The guidance in NEI 04-02 recommends that this information be presented in Table B-3, Fire Area Transition. In the LAR, Section 4.2.4, Overview of the Evaluation Process, Step 5 - Disposition, the licensee states that the final disposition of VFDRs should be documented in Attachment C (NEI 03-02 Table B-3).

a. Attachment S of the LAR, Table S-2, Modification Items #34 and #35 involve protecting cables from fire damage in Fire Areas 32 and 58 to ensure electrical power availability to support the nuclear safety performance criteria (NSPC). However, Attachment C of the LAR does not describe the need for these modifications in the fire area assessment for Fire Areas 32 and 58.

   Please discuss how these modifications support the appropriate NSPC and explain why these modifications are not identified in LAR Attachment C for Fire Area 32 and 58.

b. In Table S-2 of Attachment S of the LAR, the licensee describes several modifications that specify “protecting cables or circuits” (e.g., modification #6, #14, etc.).

   Please describe the protection schemes that may be used for “protecting” cables.

Fire Modeling (FM) RAI 01

NFPA 805, Section 2.4.3.3, states that the PRA approach, methods, and data shall be acceptable to the NRC. The NRC staff noted that FM comprised the following:

- The algebraic equations implemented in FDTs [Fire Dynamics Tools] and Fire-Induced Vulnerability Evaluation, Revision 1 (FIVE), were used to characterize flame height, plume temperature, ceiling jet temperature, flame radiation (heat flux), and hot gas layer (HGL) temperature.

- The Consolidated Model of Fire and Smoke Transport (CFAST)was used in the multi-compartment analysis (MCA) and the Relay Room analysis.

- Fire Dynamics Simulator (FDS) was used to assess MCR habitability.

- The FLASH-CAT model was used to calculate the fire propagation in a vertical stack of horizontal cable trays.

Section 4.5.1.2 of the LAR, "Fire PRA," states that FM was performed as part of Fire PRA development (NFPA 805 Section 4.2.4.2). Reference is made to Attachment J, "Fire Modeling V&V [Verification and Validation]," of the LAR for a discussion of the acceptability of the fire models that were used.

Regarding the acceptability of the PRA approach, methods, and data:

a. Please identify whether any fire modeling tools and methods have been used in the development of the LAR that are not discussed in Attachment J, and describe their application.

b. Please provide information on how non-cable secondary combustibles were identified and accounted for in the fire modeling analyses.

c. Please describe how cable trays with covers, fire-resistive wraps and FR coated cables were treated in the fire modeling calculations in terms of ignition and fire propagation, and how the presence of holes in cable tray covers was accounted for.

d. The heat release rate (HRR) of electrical cabinets throughout the plant appears to be based on the assumption that they are Case 2 (closed doors and fire involving multiple bundles of qualified cable) as described in Table E-1 of NUREG/CR-6850, Volume 2, even though some cabinets may contain a mix of qualified and non-qualified cables. The NRC staff notes that typically, during maintenance or measurement activities in the plant, electrical cabinet doors are opened for a certain period of time.

   Please explain what administrative controls are in place to minimize the likelihood of fires involving such a cabinet, and describe how cabinets with temporary open doors containing non-qualified cables were treated in the fire modeling analysis.

e. Please provide justification for the assumed fire areas and elevations that were used in the transient fire modeling analyses. Explain how the model assumptions in terms of location and HRR of transient combustibles in a fire area or zone will not be violated during and post-transition.

Specifically regarding the detailed FM conducted in single compartments at PINGP:

f. Please describe how Transient Zones (including those in the Relay Room and selected areas in the Turbine Building) were created and analyzed. In addition, explain how it was ensured that targets on the border of a Transient Zone were not missed in the analysis.

g. Target mapping is based on the conservative assumption that the zone of influence (ZOI) for each ignition source is 10-foot by 10-foot, regardless of the HRR of the ignition source.

   Please explain why this assumption is conservative for fires that involve secondary combustibles or liquid pool fires.

h. According to Table J-1 in Attachment J to the LAR three methods were used for the HGL calculations: MQH, Beyler, and FPA.

   Please describe the basis for selecting the method that was used in each individual compartment. Provide technical justification for the vent area of 1 m^2 [square meter] that was assumed in the HGL calculations using the MQH method.

i. The licensee assumed that, if no automatic detection or fire watch is present, a challenging fire will generally be detected within 10 minutes due to either personnel in the plant and/or indications of failed components or alarm conditions in the control room.

   Please provide additional technical justification for this assumption.

j. The cable tray fire growth model assumes that the burning region of cable trays is confined within the fire diameter of the ignition source plus any horizontal expansion beyond the fire diameter created by the 35° fire propagation up through the tray stack.

   Provide technical justification for not considering horizontal flame spread beyond the35° expansion cone.

k. Please describe the criteria that were used to decide whether a cable tray in the vicinity of an electrical cabinet will ignite following a high energy arcing fault (HEAF) event in the cabinet.

   Explain how the ignited area was determined and subsequent fire propagation was calculated.

   Describe the effect of cable tray covers, fire-resistant wraps and FR cable coatings on HEAF-induced cable tray ignition and subsequent fire propagation.

Specifically regarding the detailed fire modeling conducted in the Relay Room at PINGP:

l. Wall and corner fires seem to be treated differently in the Relay Room fire modeling analysis, as compared to the Turbine Building or Single Compartment analysis.

Please describe in more detail how wall and corner fires were accounted for in the different parts of the Relay Room analysis (e.g., plume temperature, HGL, and detector actuation calculations).

m. Regarding fire propagation in cable trays in the Relay Room:

(i) The flame spread in cable trays with a mixture of thermoset and thermoplastic cables is calculated using a mass-weighted average approach.

Please provide technical justification for this approach.

(ii) The percentage split assumed for the entire compartment is 65 percent thermoset and 35 percent thermoplastic, which is said to represent TRA-14 (transient zone 14).

Since there are 18 transient zones in this fire area, please provide additional information concerning the thermoset/thermoplastic percentage split in the remainder of this fire area and confirm that the values used in theanalysis are representative or bounding.

n. Please provide the technical basis for the material properties that were specified in CFAST for the combustibles in the Relay Room. Provide confirmation that the assumed soot yield and heat of combustion values lead to conservative estimates of the soot generation rate with respect to smoke detection.Explain how the CFAST smoke concentration bias reported in Table 4-1 of NUREG-1934 was accounted for in the smoke detector actuation calculations, or provide technical justification for ignoring this bias.

o. Please provide technical justification for consolidating the cable tray and ignition source fires in the CFAST analysis.

p. The results of the analysis show that in several cases, the oxygen is depleted in the Relay Room, such that the HRR and HGL temperature plateaus or decreases. The licensee stated that this room has re-circulating ventilation.

Please provide additional information concerning the ventilation in the Relay Room and justify the prescribed ventilation input parameters used in the CFAST analysis.

q. The Relay Room has very complex geometry, which includes beam pockets as well as a significant amount of obstructions in the form of cable raceways.

Please provide technical justification for the use of CFAST in this fire area.

Specifically regarding the detailed fire modeling conducted in the Turbine Building at PINGP:

r. Please describe how flame spread to secondary combustibles was performed in these fire areas. Explain whether the same approach was used as in the Relay Room, or if the approach described in the single compartment analysis was used.

s. Please explain how the HGL damage state was screened based on the sensitivity analysis.

Specifically regarding facts and observations (F&O) FSS-D6-01 in Attachment V of the LAR:

t. This F&O requested that the licensee provide justification for the underlying assumptions used in the HGL calculations, and states that additional work should be undertaken to address bias in the results of the HGL calculations due to the assumed input parameters. In addition, a possible resolution is provided which involves sensitivity calculations with varying size vent openings in the FDTs. The disposition provided a discussion of the revised analysis, but, did not specifically address the issue of vent size or any sensitivity calculations.

   Please provide further justification for the underlying assumptions used in the HGL calculations in the context of this F&O and the provided possible resolution.

With regard to the use of FDS in the MCR abandonment calculations:

u. The HVAC [heating, ventilation and air conditioning] system in the MCR operates in one of two modes. In normal mode flow rates are 10,000 cubic feet per minute (cfm) in recirculation mode and 2,000 cfm in fresh air mode. In emergency mode, the control room goes to 100 percent recirculation.

   Please explain what assumptions were made concerning the HVAC status in the MCR abandonment calculations.

v. Please explain what value was used for the soot yield and heat of combustion of cables in the MCR (the latter either explicitly or implicitly through the specified fuel composition), and discuss the results of using this value in terms of conservatism of the calculated soot generation rate.

w. Fires were placed based on “their ability to create an uninhabitable condition within the MCR”.

   Please describe the approach that was used to assess the ability of an ignition source to create an uninhabitable condition in the MCR.

x. FDS “devices” (heat flux and optical density) were placed at different locations around the MCR.

   Please describe the basis for choosing these locations. Explain how the output from the devices was used to assess control room habitability.

FM RAI 02

In the LAR, Section 4.5.1, Fire PRA Development and Assessment, the licensee states that the PINGP Fire PRA was developed in compliance with the requirements of Part 4 of ASME/ANS Standard RA-Sa-2009, “Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications.”

Part 4 of ASME/ANS Standard RA-Sa-2009, requires damage thresholds be established to support the Fire PRA. Thermal impact(s) must be considered in determining the potential for thermal damage of SSCs and appropriate temperature and critical heat flux criteria must be used in the analysis.

a) Please describe how the installed cabling in the power block was characterized, specifically with regard to the critical damage threshold temperatures and critical heat fluxes for thermoset and thermoplastic cables as described in NUREG/CR-6850.

b) Please describe how cable trays with covers, fire-resistive wraps and FR coated cables were treated in the fire modeling calculations in terms of damage, and how the presence of holes in cable tray covers was accounted for.

c) Please explain how the damage thresholds for non-cable components (i.e., pumps, valves, electrical cabinets, etc.) were determined. Identify any non-cable components that were assigned damage thresholds different from those for thermoset and thermoplastic cables, and provide a technical justification for these damage thresholds.

d) Please describe the damage criteria that were used for exposed temperature-sensitive electronic equipment. Explain how temperature-sensitive equipment inside an enclosure was treated, and provide a technical justification for the assumed damage criteria.

FM RAI 03

NFPA 805, Section 2.7.3.2, 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.

In the LAR, Section 4.5.1.2 states that fire modeling was performed as part of the Fire PRA development (NFPA 805, Section 4.2.4.2). Reference is made to Attachment J of the LAR for a discussion of the verification and validation (V&V) of the fire models that were used. Furthermore, Section 4.7.3 of the LAR states that "Calculational models and numerical methods used in support of compliance with10 CFR 50.48(c) were verified and validated as required by Section 2.7.3.2 of NFPA 805.”

Regarding the V&V of fire models:

a. For any tool or method identified in the response to FM RAI 01(a) above, please provide the V&V basis if not already explicitly provided in the LAR (e.g., in LAR Attachment J).

b. Please explain how the cable tray fire propagation calculations based on the models described in Appendix R of NUREG/CR-6850 and Chapter 9 of NUREG/CR-7010 were verified.

c. Please provide the validation basis for the optical density threshold (0.14 OD/m) used in the Relay Room CFAST analysis to estimate smoke detector actuation.

FM RAI 04

NFPA 805, Section 2.7.3.3, 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.

In Section 4.7.3 of the LAR, the licensee states that engineering methods and numerical models used in support of compliance with 10 CFR 50.48(c) are used and were used appropriately as required by Section 2.7.3.3 of NFPA 805.

Regarding the limitations of use:

a. The NRC staff notes that algebraic models cannot be used outside the range of conditions covered by the experiments on which the model is based. NUREG-1805 includes a section on assumptions and limitations that provides guidance to the user in terms of proper and improper application for each FDT.

   Please explain how it was ensured that algebraic models were not used outside their limits of applicability as described in NUREG-1805.

b. It is stated on page J-8 in Table J-1 of Attachment J of the LAR that the V&V of Alpert's ceiling jet temperature correlation is documented in NUREG-1824. It is also stated that the V&V demonstrates that the ceiling jet correlation is implemented correctly and in all cases provides conservative bounding estimates.

   Please provide technical justification for the second statement, because the fact that a model receives V&V does not prevent its use outside the model's limitations.

c. It is stated on page J-9 in Table J-1 of Attachment J of the LAR that "[FDS] is used within the limits of its range of applicability as documented in FPRA-PI-MCR." It is further stated that "For relevant scenarios where the input parameters are outside of the limits, control room abandonment conditions are still predicted." The two statements appear to be contradictory.

   Please provide technical justification for the application of FDS with input parameters outside the allowable range, and for using the corresponding calculated abandonment times in the Fire PRA.

FM RAI 05

NFPA 805, Section 2.7.3.4 states that personnel who use and apply engineering analysis and numerical methods 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.

In Section 4.5.1.2 of the LAR, the licensee states that fire modeling was performed as part of the Fire PRA development (NFPA 805, Section 4.2.4.2). The NRC staff notes that this requires that qualified fire modeling and PRA personnel work together. Furthermore, in Section 4.7.3 of the LAR, the licensee states that "For personnel performing fire modeling or Fire PRA development and evaluation, NSPM 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."

Regarding qualifications of users of engineering analyses and numerical models (i.e., fire modeling techniques):

a. Please describe the requirements to qualify personnel for performing fire modeling calculations in the NFPA 805 transition.

b. Please describe the process for ensuring that fire modeling personnel have the appropriate qualifications, not only before the transition but also during and following the transition.

c. When fire modeling is performed in support of the Fire PRA, please describe how proper communication between the fire modeling and Fire PRA personnel is ensured.

FM RAI 06

NFPA 805, Section 2.7.3.5 states that an uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met.

In Section 4.7.3 of the LAR, the licensee states that "Uncertainty analyses were performed as required by 2.7.3.5 of NFPA 805 and the results were considered in the context of the application. This is of particular interest in fire modeling and Fire PRA development."

Regarding the uncertainty analysis for fire modeling:

a. Please describe how the uncertainty associated with the fire model input parameters was accounted for in the fire modeling analyses.

b. Please describe how the "model" and "completeness" uncertainty was accounted for in the fire modeling analyses.

Radioactive Release RAI 01

NFPA 805, Section 1.5.2 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.”

Attachment E of the LAR does not identify use of outside yard areas to store radioactive materials.

Please discuss if there are any outside yard areas where radioactive materials are stored (e.g. in sealand type containers.) Since outside yard areas are open to the atmosphere, if radioactive material is stored outside, provide an analysis for a fire occurring in outside yard areas that demonstrates that the gaseous and liquid effluent releases will result in doses that are less than the 10 CFR 20 annual dose limits to a member of the public.

Radioactive Release RAI 02

NFPA 805, Section 1.5.2 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.”

Attachment E of the LAR identified Fire Area 4, the Fuel Handling Area, and Fire Area 61A, the Auxiliary Building Hatch Area, as not having ventilation where the potential transfer of contaminated smoke to the exterior can occur. Attachment E indicates that revised fire strategies will incorporate mitigating actions to monitor and filter potentially contaminated smoke based on radiological conditions identified during the conduct of firefighting activities.

Please provide information on how this will be accomplished.

Radioactive Release RAI 03

NFPA 805, Section 1.5.2 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.”

Attachment E of the LAR identified Fire Area 93, the Low Level Rad Waste Area, as not having ventilation where the potential transfer of contaminated smoke to the exterior can occur. Attachment E states that a combination of containerization and administrative controls will limit the amount of exposed contaminated combustible materials, and that revised fire strategies will incorporate mitigating actions to filter potentially contaminated smoke.

Please describe what administrative controls (e.g. limits on activity, etc.) and types of containers will be used in this area that will be used to meet the applicable 10 CFR 20 requirements?

Furthermore, Table S-3, Implementation Item 15, provides a container with booms, portable filtered ventilation and other appropriate equipment to contain effluent releases in the Low Level Rad Waste Area.

Please clarify if this container be staged in this building to be used in case of a fire?

Probabilistic Risk Assessment (PRA) RAI 01 – Fire Event Facts and Observations

Section 2.4.3.3 of NFPA 805 states that the probabilistic safety assessment (PSA) (PSA is also referred to as PRA) approach, methods, and data shall be acceptable to the authority having jurisdiction (AHJ), which is the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a fire PRA (FPRA) and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. The RG 1.200 describes a peer review process utilizing an associated ASME/ANS standard (currently ASME/ANS-RA-Sa-2009) as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established for evaluations that could influence the regulatory decision. The primary result of a peer review are the facts and observations (F&Os) recorded by the peer review and the subsequent resolution of these F&Os.

Please clarify the following dispositions to fire F&Os and Supporting Requirement (SR) assessments identified in Attachment V of the LAR that have the potential to impact the FPRA results and do not appear to be fully resolved:

a. ES-C1-01: This F&O cites incomplete treatment of instrumentation needed to support fire response operator actions; however, Appendix D of FPRA-PI-ES, Revision 1, appears to only address instrumentation required for credited internal events actions.

   Please describe how fire-induced instrument failure is addressed by the FPRA human reliability analysis (HRA) for both internal events and fire response operator actions. Include a description of how instrumentation that is relied on for credited operator actions was identified and verified as available to a level of detail commensurate with the risk importance and quantification of human error probabilities (HEPs).

b. CS-A10-01: The disposition to this F&O states that cables are routed by fire area in the cable database, and according to FPRA-PI-SCA, Revision 1, this database lacks unique conduit identifiers.

   As a result, please clarify the FPRA's treatment of conduits with unknown routing and include justification of the process used to map such conduits to fire compartments.

c. PRM-A1-02: The disposition to this F&O indicates that due to the presence of piping with soldered joints, the instrument air system is only credited for a limited number of fire scenarios within the Relay Room (Fire Area 18).

   Please justify the criteria (e.g., damage threshold, system response, etc.) used to determine those fire scenarios that do not lead to failure of the instrument air system.

d. FSS-B2-01: The licensee's analysis (Section 6.0 of FPRA-PI-MCR) indicates that there are "a large number of cable raceways, particularly cable trays," located under the raised floor within the main control room (MCR); however, it appears that these raceways are excluded from the MCR scenario development, both as ignition sources (i.e., self-ignited cable fires) and potential targets of other ignition sources (i.e., transient fires, transient fires due to welding and cutting, and cable fires due to welding and cutting).

   Please justify this exclusion.

e. FSS-B2-01: As discussed in the licensee's analysis (FPRA-PI-MCR), the approach used to develop and quantify scenarios associated with main control board (MCB) fires appears to deviate from accepted methods and approaches in NUREG/CR-6850, Appendix L.

   Please provide justification that the overall PINGP approach for evaluating MCB fires bounds the results (i.e., CDF, LERF, ΔCDF and ΔLERF) that would be obtained had the guidance in Appendix L of NUREG/CR-6850 been applied using a set of scenarios representative of MCB risk. Note that Appendix L applies the full MCB ignition frequency to each postulated MCB scenario, and may be bounding for the PINGP approach depending on the number and target sets of scenarios modeled.

f. FSS-C5-01: The disposition to this F&O states that self-ignited cable fires are screened from consideration for all locations on the basis that all cables are either qualified or routed through conduit, as concluded in Engineering Change (EC) 20695. However, the licensee's analysis indicates that not all cable trays identified as targets are listed in EC 20695 (Section 3.1 of FPRA-PI-RRA); there are significant amounts of thermoplastic cabling located within cable trays in Fire Area 18, a risk significant area based on risk results in Attachment W of the LAR (Section 5.1.3 of FPRA-PI-RRA); and that a differing conclusion of EC 20695 may exist (Section F.3 of FPRA-PI-SCA).

   Given these discrepancies, please provide justification for the exclusion of self-ignited cable fires from the FPRA. If such fires are excluded on the basis of cable voltage, provide a technical basis for doing so. Alternatively, provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03, treating such fires consistent with accepted guidance (e.g., FAQ 13-0005).

g. FSS-D7-02: The disposition to this F&O indicates that the total failure probability of credited detection and suppression systems is the sum of the generic unreliability values given in NUREG/CR-6850 and an unavailability estimate developed through a plant-specific data review. However, Section 7.6 of FPRA-PI-TBA appears to indicate that this approach was not used for all analyses supporting the FPRA, e.g., the turbine building analysis.

   Please clarify this discrepancy.

h. IGN-A1-01: The disposition to this F&O appears to indicate that generic fire ignition frequencies were based upon those provided in Supplement 1 to NUREG/CR-6850. Chapter 10 of this supplement, however, states that a sensitivity analysis should be performed when using the fire ignition frequencies in the supplement instead of those provided in Table 6-1 of NUREG/CR-6850., provide the results (i.e., CDF, LERF, ΔCDF and ΔLERF) of a sensitivity analysis that evaluates the impact of using the supplement frequencies, consistent with Chapter 10 of Supplement 1 to NUREG/CR-6850 using the FPRA developed in response to RAI 03.

   If RG 1.174 risk acceptance guidelines are exceeded, then please (1) discuss which are exceeded; (2) describe the fire protection, or related, measures that will be taken to provide additional defense-in-depth; and (3) discuss conservatisms in the analysis and the risk significance of these conservatisms.

PRA RAI 02 – Internal Event F&Os

Section 2.4.3.3 of NFPA 805 statesthat the PRA approach, methods, and data shall beacceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the staff for adopting a fire protection program consistent with NFPA 805. The RG 1.200 describes a peer review process utilizing an associated ASME/ANS standard (currently ASME/ANS-RA-Sa-2009) as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established. The primary results of a peer review are the F&Os recorded by the peer review and the subsequent resolution of these F&Os.

Please provide clarification to the following dispositions to Internal Events F&Os and SR assessments identified in Attachment U of the LAR that have the potential to impact the FPRA results and do not appear to be fully resolved:

a. QU-C2: This F&O indicates that a minimum for joint human error probabilities (HEPs) was not originally specified for the internal events PRA (IEPRA). NUREG-1921 indicates and NUREG-1792 (Table 2-1) states that joint HEP values should not be below 1.0E-05.

   Please confirm that each joint HEP value used in the FPRA below 1.0E-05 includes its own justification that demonstrates the inapplicability of the NUREG-1792 lower value guideline. Provide an estimate of the number of these joint HEPs below 1.0E-05 and at least two different types of justification.

b. SY-A8: The disposition to this F&O states that in evaluating the extent of the inconsistency highlighted by the peer review, similar modeling inconsistencies related to instrumentation and control components were identified yet,“the current model is considered conservative and adequate for the risk-informed NFPA-805 application”.

   Please summarize how this conclusion was reached.

c. SY-B14: The disposition to this F&O does not address the issue associated with loss of pump net positive suction head (NPSH) identified by the peer review.

   Please clarify whether and how the PRA assesses the impact of not crediting containment fan cooler units or containment spray on NPSH for recirculation.

PRA RAI 03 – Integrated Analysis

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. The RG 1.174 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant’s licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff’s review of the information in the LAR identified additional information that is required to fully characterize the risk estimates.

The PRA methods currently under review in the LAR include the following:

- PRA RAI 01.a, regarding fire-induced instrument failure
- PRA RAI 01.b, regarding conduits with unknown routing
- PRA RAI 01.c, regarding instrument air piping in the Relay Room
- PRA RAI 01.d, regarding cable raceways under the raised floor within the MCR
- PRA RAI 01.e, regarding main control board fire scenarios
- PRA RAI 01.f, regarding self-ignited cable fires
- PRA RAI 01.g, regarding detection and suppression system failure probabilities
- PRA RAI 02.a, regarding minimum for joint human error probabilities
- PRA RAI 02.b, regarding instrumentation and control modeling inconsistencies
- PRA RAI 02.c, regarding the loss of pump net positive suction head
- PRA RAI 04, regarding placement of transient fires
- PRA RAI 05, regarding cable fires caused by welding and cutting
- PRA RAI 06, regarding junction boxes
- PRA RAI 07, regarding sensitive electronics
- PRA RAI 08, regarding circuit failure probabilities
- PRA RAI 09, regarding Bin 15 electrical cabinets
- PRA RAI 10, regarding high energy arcing faults
- PRA RAI 11, regarding the time to delayed detection
- PRA RAI 12, regarding MCR abandonment
- PRA RAI 13, regarding ΔCDF, ΔLERF and additional risk of recovery actions
- PRA RAI 16, regarding incipient detection
- PRA RAI 18, regarding deviations from acceptable methods

Please provide the following:

a. Results of an aggregate analysis that provides the integrated impact on the fire risk (i.e., the total transition CDF, LERF, ΔCDF, ΔLERF and additional risk of recovery actions) of replacing specific methods identified above with alternative methods that are acceptable to the NRC. In this aggregate analysis, for those cases where the individual issues have a synergistic impact on the results, a simultaneous analysis must be performed. For those cases where no synergy exists, a one-at-a-time analysis may be done. For those cases that have a negligible impact, a qualitative evaluation may be done. It should be noted that this list may change depending on NRC's review of the responses to other RAIs in this document.

b. For each method (i.e., each bullet) above, explain how the issue will be addressed in1) the final aggregate analysis results provided in support of the LAR, and 2) the PRA that will be used at the beginning of the self-approval of post-transition changes. In addition, provide a process to ensure that all changes will be made, that a focused-scope peer review will be performed on changes that are PRA upgrades as defined in the PRA standard, and that any findings will be resolved before self-approval of post-transition changes.

c. In the response, explain how the RG 1.205 risk acceptance guidelines are satisfied for the aggregate analysis. Additionally, discuss the likelihood that the risk increase in any individual fire area would exceed the acceptance guidelines, and if so, why exceeding the guidelines should be acceptable. If applicable, include a description of any new

modifications or operator actions being credited to reduce delta risk as well as a discussion of the associated impacts to the fire protection program.

d. If any unacceptable methods identified above will be retained in the PRA and will be used to estimate the change in risk of post-transition changes to support self-approval, explain how the quantification results for each future change will account for the use of these methods.

PRA RAI 04 – Transient Fire Placement at Pinch Points

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the staff for adopting a fire protection program consistent with NFPA 805.Methods that have not been determined to be acceptable by the NRC staff, or acceptable methods that appear to have been applied differently than described, require additional justification to allow the NRC staff to complete its review of the proposed method.

The NRC staff could not identify in the LAR a description of how "pinch points" for transient fires were treated in the FPRA. Per NUREG/CR-6850 Section 11.5.1.6, transient fires should at a minimum be placed in locations within the plant PAUs where CCDPs are highest for that PAU, i.e., at "pinch points." Pinch points include locations of redundant trains or the vicinity of other potentially risk-relevant equipment. Cable congestion is typical for areas like the Cable Spreading Room (CSR), and so placement of transient fire at pinch points in those locations is important. Hot work should be assumed to occur in locations where hot work is possible, even if improbable, keeping in mind the same philosophy.

a. Please clarify how "pinch points" were identified and modeled for general transient fires and transient fires due to hot work.

b. Please describe how general transient fires and transient fires due to hot work are distributed within the PAUs at Prairie Island. In particular, identify the criteria used to determine where such ignition sources are placed within the PAUs.

PRA RAI 05 – Cable Fires Caused by Welding and Cutting

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. In a letter dated July 12, 2006, to NEI (ADAMS Accession No. ML061660105), the NRC established the ongoing FAQ process where official agency positions regarding acceptable methods can be documented until they can be included in revisions to RG 1.205 or NEI 04-02.

Appendix H of the LAR does not indicate that FAQ 13-0005, "Cable Fires Special Cases: Self-Ignited and Caused by Welding and Cutting," dated June 26, 2013, was used in preparation of the FPRA.

Please explain whether the treatment of cable fires caused by welding and cutting is consistent with FAQ 13-0005, and if not, provide justification. If justification cannot be provided, then provide treatment of such fires consistent with NRC guidance in the integrated analysis provided in response to PRA RAI 03.

PRA RAI 06 – Junction Boxes

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. In letter to NEI dated July 12, 2006 (ADAMS Accession No. ML061660105), the NRC established the ongoing FAQ process where official agency positions regarding acceptable methods can be documented until they can be included in revisions to RG 1.205 or NEI 04-02.

Appendix H of the LAR does not indicate that FAQ 13-0006, "Modeling Junction Box Scenarios in a FPRA," dated May 6, 2013, was used in preparation of the FPRA.

Please explain whether the treatment of junction box fires is consistent with FAQ 13-0006, and if not, provide justification. If justification cannot be provided, then provide treatment of junction box fires consistent with NRC guidance in the integrated analysis provided in response to PRA RAI 03.

PRA RAI 07 – Sensitive Electronics

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. Methods that have not been determined to be acceptable by the NRC staff, or acceptable methods that appear to have been applied differently than described, require additional justification to allow the NRC staff to complete its review of the proposed method.

Appendix H of the LAR does not cite FAQ 13-0004, "Clarifications on Treatment of Sensitive Electronics," dated December 3, 2013 (ADAMS Accession No. ML13322A085), as one of the FAQ guidance documents used to support the FPRA.

Please describe the treatment of sensitive electronics for the FPRA, and explain whether it is consistent with the guidance in FAQ 13-0004, including the caveats about configurations that can invalidate the approach (i.e., sensitive electronic mounted on the surface of cabinets and the presence of louvers or vents). If the approach is not consistent with FAQ 13-0004, justify the approach, or replace the current approach with an acceptable approach in the integrated analysis performed in response to PRA RAI 03.

PRA RAI 08 – Conditional Probabilities of Spurious Operations

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. The RG 1.174 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

New guidance on using conditional probabilities of spurious operation for control circuits was issued in a letter from the NRC to NEI, "Supplemental Interim Technical Guidance on Fire-induced Circuit Failure Mode Likelihood Analysis" (ADAMS Accession Nos. ML14086A165 and ML14017A135) and in NUREG/CR-7150, Volume 2. This guidance included: a) replacement of the conditional hot short probability tables in NUREG/CR-6850 for Option #1 (including removal of credit for Control Power Transformers (CPTs) and conduit) with new circuit failure probabilities for single break and double break control circuits; b) Option #2 in NUREG/CR-6850 is no longer an adequate method and should not be used; c) replacement of the probability of spurious operation duration figure in FAQ 08-0051 (NUREG/CR-6850 Supplement 1) for AC control circuits and additional guidance to address duration for DC control circuits; d) aggregate-values for circuit failure probabilities should be used unless it is demonstrated that a cable is only susceptible to a single failure mode; e) incorporation of the uncertainty values for the circuit failure probabilities and spurious operation duration in the state-of-knowledge correlation (SOKC) for developing the mean CDF/LERF; and f) recommendations on the hot short probabilities to use for other cable configurations, including panel wiring, trunk cables, and instrument cables.

Please provide an assessment of the assumptions used in the FPRA relative to the updated guidance specifically addressing each of these items. If the FPRA assumptions are not bounded by the new guidance, provide justification for each difference or provide updated risk results as part of the integrated analysis requested in PRA RAI 03, utilizing the guidance in NUREG/CR-7150, Volume 2.

PRA RAI 09 – Counting and Treatment of Bin 15 Electrical Cabinets

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. Methods that have not been determined to be acceptable by the NRC staff, or acceptable methods that appear to have been applied differently than described, require additional justification to allow the NRC staff to complete its review of the proposed method.

The NRC staff could not identify in the LAR or the licensee's analysis how the licensee counted and treated Bin 15 Electrical Cabinets. In light of this, address the following:

a. Per Section 6.5.6 of NUREG/CR-6850, fires originating from within "well-sealed electrical cabinets that have robustly secured doors (and/or access panels) and that house only circuits below 440V" do not meet the definition of potentially challenging fires and, therefore, should be excluded from the counting process for Bin 15. By counting these cabinets as ignition sources within Bin 15, the frequencies applied to other cabinets may be inappropriately reduced.

   Please clarify that this guidance is being applied. If not, then address the impact as part of the integrated analysis performed in response to PRA RAI 03.

b. Please clarify if the criteria used to evaluate whether electrical cabinets below 440V are "well sealed" are consistent with guidance in Chapter 8 of Supplement 1 of NUREG/CR-6850. If not, then address the impact as part of the integrated analysis performed in response to PRA RAI 03.

c. All cabinets having circuits of 440V or greater should be counted for purposes of Bin 15 frequency apportionment based on the guidance in Section 6.5.6 of NUREG/CR-6850.

   Please clarify that this guidance is being applied. If not, then address the impact as part of the integrated analysis performed in response to PRA RAI 03.

d. For those cabinets that house circuits of 440V or greater, propagation of fire outside the ignition source should be evaluated based on guidance in Chapter 6 of NUREG/CR-6850, which states that "an arcing fault could compromise panel integrity (an arcing fault could burn through the panel sides, but this should not be confused with the high energy arcing fault type fires)."

   Please describe how fire propagation outside of well-sealed cabinets greater than 440 V is evaluated. If propagation is not evaluated, then address the impact as part of the integrated analysis performed in response to PRA RAI 03.

PRA RAI 10 – High Energy Arcing Faults (HEAF)

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. Methods that have not been determined to be acceptable by the NRC staff, or acceptable methods that appear to have been applied differently than described, require additional justification to allow the NRC staff to complete its review of the proposed method.

The NRC staff could not identify in the LAR or licensee's analysis a description of how HEAFs were modeled. Per Appendix P of NUREG/CR-6850, HEAF events and other types of fires have different non-suppression probability (NSP) curves. In addition, the NRC staff's interpretation of the NUREG/CR-6850 guidance is that the growth of a fire subsequent to a HEAF event, unlike other types of fires, instantaneously starts at a non-zero HRR because of the intensity of the initial heat release from the HEAF.

Please confirm that HEAF events have been modelled using the acceptable HEAF evaluation methods. If alternative methods have been used, provide a justification of the FPRA's treatment of HEAF events and the ensuing fire that includes a discussion of conservatisms and non-conservatisms relative to the accepted methods and assesses the associated impacts on the fire total and delta risk results. Alternatively, replace the current approach with an acceptable approach in the integrated analysis performed in response to PRA RAI 03. Note that the response should address the treatment of all HEAF scenarios, including in the hot gas layer and multi-compartment analyses.

PRA RAI 11 – Time to Delayed Detection

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. The RG 1.174 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

The licensee's analysis (Section 3.0 of FPRA-PI-SCA) appears to indicate that regardless of location, the FPRA assumes a time to delayed detection of 10 minutes instead of the 15 minutes used in Appendix P of NUREG/CR-6850 for fire scenarios should automatic detection be unavailable or a fire watch not be present.

Please use the generic 15 minutes or provide justification for using 10 minutes.

PRA RAI 12 – MCR Abandonment

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. The RG 1.174 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

Although it appears from the scenario insights presented in Attachment W of the LAR that MCR abandonment is credited for scenarios in the MCR and Relay Room, the NRC staff could not identify in the LAR or licensee's analysis a description of how MCR abandonment was modeled for either loss of habitability or loss of control. In light of this observation, provide the following:

a. Please describe how MCR abandonment was modeled for loss of habitability. Include identification of the actions required to execute safe alternate shutdown and how they are modeled in the FPRA, including actions that must be performed before leaving the MCR.

b. Please explain how the CCDPs/CLERPs are estimated for fires that lead to abandonment due to loss of habitability and how they address various possible fire-induced failures. Specifically include in this explanation, a discussion of how the following scenarios are addressed:

   (i) Scenarios where fire fails only a few functions aside from forcing MCR abandonment and successful alternate shutdown is straightforward;

   (ii) Scenarios where fire could cause some recoverable functional failures or spurious operations that complicate the shutdown, but successful alternate shutdown is likely; and,

   (iii) Scenarios where the fire-induced failures cause great difficulty for shutdown by failing multiple functions and/or complex spurious operations that make successful shutdown unlikely.

c. Please explain the timing considerations (i.e., total time available, time until cues are reached, manipulation time, and time for decision-making) made to characterize scenarios in Part (b). Include in the explanation the basis for any assumptions made about timing.

d. If MCR abandonment is credited for loss of control (i.e., non-habitability cases), then

   (i) Please describe when MCR abandonment on loss of control is credited and how it was modeled.Include justification of the criteria used by the FPRA to govern whether a scenario results in MCR abandonment on loss of control, including how these criteria are representative of the cues used by operators in making the determination to abandon the MCR. Explain how the cognitive component associated with the decision to abandon the MCR is assessed.

   (ii) Please discuss the bases for the timing assumed in the HRA performed for MCR abandonment scenarios on loss of control, including the results of thermal-hydraulics analyses. Include discussion of the cues to abandon the MCR, the timing associated with those cues, and the basis for time available to complete required actions. Include explanation of how fire-induced impacts including spurious operations are accounted for in determining the timing associated with the cue to abandon and the time available to perform operator actions.

   (iii) If the timing of the cues to abandon the MCR and the available time for performing operator actions does not take into account fire-induced impacts, then justify the current approach or replace this approach with an acceptable approach in the integrated analysis provided in response to RAI 03.

e. Please explain how the abandonment scenario frequencies due to loss of habitability and/or loss of control were determined. Include explanation of how the fire ignition frequencies contributing to these scenarios and non-suppression probabilities were determined.

PRA RAI 13 – Calculation of ΔCDF, ΔLERF and Additional Risk of Recovery Actions

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. The RG 1.174 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

Section W.2 of the LAR provides some description of how the change-in-risk and the additional risk of recovery actions associated with variances from deterministic requirements (VFDRs) is determined but not enough detail to make the approach completely understood. As a result, please provide the following:

a. A summary of how the change in risk was determined for fire areas that credit MCR abandonment due to loss of habitability and due to loss of control (e.g., Relay Room). Include a discussion of how the CCDPs/CLERPs were determined for both the variant plant and the compliant plant models for these areas.

b. A description of how the reported additional risk of recovery actions was calculated, including any special calculations performed for the MCR and other abandonment areas (if applicable). Note that it is unclear why the discussion provided in Section W.2.2 of the LAR states that "the additional risk of recovery actions is calculated separately by comparing the fire area CDF and LERF of the variant and compliant plant" when the additional risk of recovery actions is not equivalent to the delta risk for all fire areas.

c. A summary of the types of VFDRs that were identified but not modeled in the FPRA. Include any qualitative rationale for excluding these from the change-in-risk calculations.

PRA RAI 14 – Attachment W Inconsistencies

Inconsistencies were noted within Attachment W for particular fire areas. In light of this,

a. Provide clarification on the following inconsistencies, and discuss their significance to the risk results reported in Tables W-6 and W-7.

   (i) In Table W-6, Unit 1 Fire Area 84 is indicated as having VFDRs (i.e., there is a "Yes'" under the "VFDR" column); however, there is an "N/A" in the column for ΔCDF/ΔLERF.

   (ii) In Table W-7, Unit 2 Fire Areas 1 and 20 are indicated as having no VFDRs (i.e., there is a "No" under the "VFDR" column); however, there is an "ε," or epsilon in the column for ΔCDF/ΔLERF.

b. Describe what is meant by the use of "ε," or epsilon, in columns for Fire Area ΔCDF/ΔLERF and additional risk of RAs. Address if epsilon is defined by a specific cut-off value(s).

c. Describe what is meant by the use of "N/A" in columns for Fire Area CDF/LERF, ΔCDF/ΔLERF and additional risk of RAs.

PRA RAI 15 – Implementation Item Impact on Risk Estimates

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. The RG 1.174 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

Implementation Item 20 in Table S-3 of the LAR commits to updating the FPRA and verifying the risk results after Table S-2 plant modifications have been incorporated. However, Table S-3 includes a number of procedural modifications that may affect the as-built and as-operated plant risk models.

a. Please update Implementation Item 20 to include incorporation of all risk relevant modifications in Tables S-1, S-2,and S-3 into the FPRA before the final risk result verification.

b. Implementation Item 20 states, "If the revised Fire PRA indicates an increase in risk metrics such that the RG 1.205 acceptance guidelines are not met, the configuration control process described in LAR Section 4.7.2 will be implemented."

   Please clarify this statement.

c. Tables S-1 and S-2 include the new RCP seals for which no acceptable PRA model exists yet and the time until an acceptable model exists is difficult to determine.

   Please clarify how transition to NFPA-805 could be achieved with the current implementation items if an acceptable RCP seal model is delayed for an extended time.

PRA RAI 16 – Use of Incipient Detection

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a fire PRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the staff for adopting a fire protection program consistent with NFPA-805. In letter dated July 12, 2006, to NEI (ADAMS Accession No. ML061660105), the NRC established the ongoing FAQ process where official agency positions regarding acceptable methods can be documented until they can be included in revisions to RG 1.205 or NEI 04-02.

Attachment S, Table S-2, of the LAR indicates that incipient detection systems (i.e., Very Early Warning Fire Detection System) are credited in the Fire PRA and will be installed in Relay

Room cabinets. Though LAR Attachment S, Table S-2 provides some comments about how incipient detection was modeled in the FPRA more explanation is needed to fully understand how incipient detection was credited.

Please explain and justify how incipient detection is credited in the FPRA, describing any departures from guidance in FAQ 08-0046. If incipient detection is credited beyond what is allowed by FAQ 08-0046, then remove this credit,and incorporate acceptable credit as part of the integrated analysis performed in response to PRA RAI 03.

PRA RAI 17 – RCP Seal PRA Modeling

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC.The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. The RG 1.200 describes a peer review process utilizing an associated ASME/ANS standard (currently ASME/ANS-RA-Sa-2009) as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established.

Attachment S of the LAR indicates that a Flowserve N-9000 abeyance RCP seal package has been installed for Unit 2 and will be installed for Unit 1. Additionally, Attachment U states that a Flowserve RCP seal PRA model has been developed for the package and peer reviewed in May of 2014, i.e., after the LAR was submitted.

a. Please provide a summary of the technical basis and any available test information that supports the PINGP RCP seal PRA modeling.

b. Please clarify whether the F&Os generated from the May 2014 peer review performed on the RCP seal PRA modeling have been adequately addressed and incorporated into the FPRA

PRA RAI 18 – Deviations from Acceptable Methods

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a fire PRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the staff for adopting a fire protection program consistent with NFPA-805. RG 1.200 describes a peer review process utilizing an associated ASME/ANS standard (currently ASME/ANS-RA-Sa-2009) as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established.

Please indicate if any other methods were employed that deviate from other NRC-accepted guidance (e.g., subsequent clarifications documented in FAQs, interim guidance documents, etc.). If so, describe and justify any proposed method that deviates from NRC guidance, or replace the proposed method with an accepted method. Also, include the proposed method as a method “currently under review” as part of the integrated analysis in the response to PRA RAI 03.

PRA RAI 19 – Defense-in-Depth and Safety Margin

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. The RG 1.174 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

Section 4.5.2.2 of the LAR provides a high-level description of how the impact of transition to NFPA 805 impacts defense-in-depth (DID) and safety margin was reviewed, including using the criteria from Section 5.3.5 of NEI 04-02 and from RG 1.205. However, no explanation is provided of how specifically the criteria in these documents were utilized and/or applied in these assessments.

a. Please provide further explanation of the method(s) or criteria used to determine when a substantial imbalance between DID echelons existed in the Fire Risk Evaluations (FREs), and identify the types of plant improvements made in response to this assessment.

b. Please provide further discussion of the approach in applying the criteria for assessing safety margin in the FREs as described in NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 2, dated April 2008 (ADAMS Accession No. ML081130188).

Requests for Additional Information Response Timeline

Request for Additional Information	Response Date
FPE01, 02, 04, 05, 06 **SSA** 01, 02, 03, 04, 05, 06, 08, 09, 10 **FM**04, 05, 06 **RR**01, 02, 03 **PRA** 01.a, 01.b, 01.c, 01.d, 01.f, 02.b, 02.c, 04, 05, 06, 09, 10, 11, 13, 14, 15, 19	05/29/2015 (60 days*)
FPE 03 **SSA** 07 **FM** 01, 02, 03 **PRA** 01.e, 01.g, 02.a, 07, 08, 12, 16, 17, 18	06/26/2015 (90 days*)
PRA 01.h#, 03#	07/24/2015 (120 days*)

***** From conclusion of audit on March 25, 2015

Responses to PRA RAIs 01.h and 03 are dependent upon the acceptable resolution of other PRA RAIs; therefore, these responses could exceed the 07/24/2015 date as the dependent RAIs are resolved.

Abbreviation Key:

FPE – Fire Protection Engineering
SSA – Safe Shutdown Analysis
FM – Fire Modeling
PRA – Probabilistic Risk Assessment
RR – Radioactive Release