NRR-PMDAPEm Resource

From: Beltz, Terry
Sent: Tuesday, May 27, 2014 2:37 PM
To: Millen, Michael (Michael.Millen@nexteraenergy.com)
Cc: Cross, William; 'Clark, Roger'; 'harv.hanneman@nexteraenergy.com'; Carlson, Robert; Fields, Leslie; Robinson, Jay; Wall, Scott
Subject: Point Beach Nuclear Plant, Units 1 and 2 – Final Requests for Additional Information re: License Amendment Request Associated with NFPA 805 (TAC Nos. MF2372 AND MF2373)
Attachments: Point Beach Nuclear Plant, Units 1 and 2 - NFPA 805 Final Requests for Additional Information (TAC Nos MF2372 and MF2373).docx; Point Beach Nuclear Plant, Units 1 and 2 - NFPA 805 Final RAI Response Times (TAC Nos MF2372 and MF2373).docx

Dear Mr. Millen:

By letter dated June 26, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML131820453), NextEra Energy Point Beach, LLC (NextEra) submitted a license amendment request for the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach). The proposed amendment request would transition the fire protection licensing basis at Point Beach to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.48(c), National Fire Protection Association Standard NFPA 805. In an e-mail dated September 9, 2013 (ADAMS Accession No. ML13256A197), the NRC staff informed NextEra that supplemental information was required to enable the staff to make an independent assessment regarding the acceptability of the proposed amendment request in terms of regulatory requirements and protection of public health and safety and the environment. In response to the NRC staff's request, NextEra provided supplemental information in a letter dated September 16, 2013 (ADAMS Accession No. ML13259A273). In a letter dated September 25, 2013 (ADAMS Accession No. ML13267A037), the NRC staff concluded that there was information in sufficient detail to enable the staff to begin its technical review and make an independent assessment regarding the acceptability of the proposed license amendment.

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 has determined that additional information is needed to complete its review. The NRC staff provided draft requests for additional information (RAIs) in an e-mail dated April 30, 2014. A teleconference was conducted on May 21, 2014, to provide clarification of the draft RAIs and discuss logistics of the June 9-12 site audit.

The final Point Beach NFPA 805 RAIs are attached. The NRC staff requests NextEra provide its RAI responses in accordance with the timeline (e.g., 60 days, 90 days, or 120 days) discussed during the teleconference. A table summarizing the RAIs with the corresponding response times is also attached. Please note that the response timeline clock commences from May 30, 2014.

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 TO ADOPT

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

NEXTERA ENERGY POINT BEACH, LLC

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-266 AND 50-301

Probabilistic Risk Assessment (PRA) RAI 01 - Fire PRA Facts and Observations (F&Os)

In Section 2.4.3.3 of National Fire Protection Association Standard 805, “Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition (NFPA 805), it states that the probabilistic safety assessment (PSA) (PSA and PRA are synonymous) approach, methods, and data shall be acceptable to the authority having jurisdiction (AHJ), which is the U.S. Nuclear Regulatory Commission (NRC).

Regulatory Guide (RG) 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," identifies NUREG/CR-6850, “EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities,” as documenting a methodology for conducting a fire PRA (FPRA) and endorses, with exceptions and clarifications, Nuclear Energy Institute (NEI) 04-02, “Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c),” Revision 2, as providing methods acceptable to the staff for adopting a fire protection program (FPP) consistent with NFPA 805.

RG 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities,” describes a peer review process utilizing an associated American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) standard (currently ASME/ANS-RA-Sa-2009, “Addenda to ASME/ANS RA-S-2008, Standard for Level 1 / Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications”) 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 is the F&Os recorded by the peer review and the subsequent resolution of these F&Os.

Clarify the following dispositions to fire F&Os and Supporting Requirement (SR) assessment identified in License Amendment Request (LAR) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13182A353) Attachment V that have the potential to impact the Fire PRA (FPRA) results and do not appear to be fully resolved:

a) CF-B1-01 (Not Met)

   For components for which information regarding cable housing and insulation was not readily available, the licensee’s analysis indicated that Option #2 from NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities,” Section 10.5.3.2 was used to quantify the likelihood of hot short-induced spurious operations. Based on its review, the NRC staff concludes that this approach does not provide an adequate

method for quantifying the likelihood of hot short-induced spurious operations for components for which information regarding cable housing and insulation was not readily available.

Replace this approach and provide an explanation of the approach used and the results in sufficient detail so the staff can make a conclusion regarding the use of the approach.

b) CS-C3-01 (Not Met)

This F&O suggested that the assumed cable routing for the turbine stop and steam dump valves was either not modeled or not documented. The disposition did not directly indicate that this would be done, rather circuitry would be modified (see LAR Attachment S, Table S-2, MOD-14).

Clarify how the modification resolves the concern identified in the F&O.

c) FQ-A4-01 (Not Met)

The disposition to F&Os FQ-A4-01, IGN-A10, and UNC-A1 indicate that integrated uncertainties were not performed since several of the key factors such as cable damage, zone of influence, and spurious short durations cannot be carried forward and estimated in the codes (UNCERT). The licensee concluded that because of this, the risk insights from available codes that can be gained to estimate mean CDF and LERF is minimal. SR FQ-A4-01 stipulates that HLR-QU-A SRs from Part 2 of the American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) PRA standard be applied to FPRA quantification. SR QU-A3 requires that the estimation of the mean core damage frequency (CDF) should account for the state of knowledge correlation (SOKC). The NRC staff noted that because parameter uncertainty was not propagated, the FPRA quantification did not account for the impact of the SOKC on the estimate of CDF and large early release frequency (LERF).

Explain how the disposition of these F&Os which indicates that integrated uncertainties have not been performed, account for SOKC in the risk estimates and address SOKC for component failure types, fire ignition frequency, circuit failure probability, and non-suppression probability.

d) FQ-F1-05 (Not Met)

The disposition to this F&O states that the success of instrument air was not credited in the model, except in cases where the assumption that air was failed provided a non-conservative input to the model. The staff notes that conservative system modeling can lead to calculation of non-conservative delta (Δ) CDF and Δ LERF if there are variances from deterministic requirements (VFDRs) associated with the system. LAR Attachment C indicates that instrument air is credited in the shutdown path and is associated with a VFDR (i.e., A32-22).

Explain whether conservative modeling of the compliant plant could underestimate Δ CDF or Δ LERF. If so, address this conservatism as part of the integrated analysis performed in response to PRA RAI 3.

e) FSS-A1-01 (Met)

The disposition to this F&O states that the basis for eliminating fire scenarios involving junction boxes has been documented. The licensee's analysis states that "Junction boxes are robustly secured and well-sealed, and therefore, are screened as non-damaging ignition sources." Based on its review, the NRC staff concludes that unlike electrical cabinets, there is no exclusion of a junction box from the count because it is robustly secured and well-sealed; therefore, junction boxes that route FPRA target cables that can contribute to fire risk should not be excluded as ignition sources.

Replace this approach and provide an explanation of the approach used and the results in sufficient detail so the staff can make a conclusion regarding the use of the approach.

f) FSS-C5-01 (CC-II)

The disposition to this F&O states that this F&O will be resolved when FAQ 13-0004, "Clarifications on Treatment of Sensitive Electronics," is closed by NRC. FAQ 13-0004 was closed on December 3, 2013 (ADAMS Accession No. ML13322A085) after the LAR was submitted.

Since the FAQ is now closed, explain how the treatment of sensitive electronics performed for the FPRA is consistent with the guidance in FAQ 13-0004. Include in the response, how mounting sensitive electronic components on the surface of cabinets and also how the presence of louvers or other typical ventilation means were considered in the determination of damage conditions for sensitive electronic equipment enclosed in cabinets.

g) HRA-A2-01 (Not Met)

The F&O noted that some new fire-specific human failure events (HFEs) had not been assessed consistent with the supporting requirements. The NRC Staff recognizes that meeting the supporting requirements will not be possible until the procedures are completed, but some evaluation has been performed to quantify the PRA. Summarize how new HFEs including those as yet incomplete, have been evaluated by addressing:

i. How feasibility assessment of credited HFEs is determined

ii. How the operator response procedure (or draft procedure) used as the basis for the credited HFEs was evaluated for consistency with plant observations.

iii. How the plant response modeling in the FPRA associated with credited HFEs was reviewed with plant staff.

h) HRA-A3-01 (CC-1)

As noted in the F&O, the licensee's analysis provides only a list of annunciator procedures associated with the control boards of interest, and does not give any information associated with the automatic actuations resulting from the annunciator or the instruments of interest. SR HRA-A3 requires identification of undesired operator actions that might result from spurious indication of a single instrument. It is not clear

whether the licensee's analysis is for annunciators only, or also includes control indication (e.g., main control board (MCB) instrument indications). Explain the following:

i. How the analysis (i.e., use of the categories: proceduralized check/verify; multiple spurious indications on redundant channels/parameters; systems, structures, and components (SSCs) not credited; spare; and other) supports the conclusion that spurious indications on an instrument cannot lead to an undesired operator action.

ii. Whether all instruments used by the plant operators to inform actions were addressed in the analysis. If not, provide justification for the excluded instruments.

i) HRA-D2-01 (Met)

The disposition to this F&O states that since the peer review, a human reliability analysis (HRA) dependency analysis was performed and documented using a minimum joint human error probability (HEP) "floor" of 1E-6. Based on the NRC staff's review, the licensee has not provided sufficient justification for a floor less than 1E-5.

Provide justification for the 1E-6 minimum joint HEP for each HEP below this minimum value that is used in the FPRA.

PRA RAI 02 - Internal Events PRA F&Os

NFPA 805, Section 2.4.3.3 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. The primary result of a peer review is the F&Os recorded by the peer review and the subsequent resolution of these F&Os.

Clarify the following dispositions to fire F&Os and SRs assessment identified in LAR Attachment U that have the potential to impact the FPRA results and do not appear to be fully resolved:

a) HR-D1-01 (Not Met)

Screening values used to screen common-cause miscalibration errors (i.e., 1E-4 and 5E-4) are much lower than the pre-initiator and post initiator screening HEP values suggested in NUREG-1792, "Good Practices for Implementing Human Reliability Analysis."

Justify these screening values or provide an estimate of the impact on the Internal Events PRA (IEPRA) and FPRA results of not performing a detailed HRA of these miscalibration errors.

b) QU-F5-01 (Not Met)

Explain how the “flag file” setting process supporting quantification of CDF and LERF was documented to ensure accurate results in the FPRA particularly when “true” events are included.

c) QU-F5-01 (Not Met)

In the disposition to this F&O, the 2011 peer reviewer refers to Finding LE-G5-01, stating that it is not addressed by the response to QU-F5-01. This cited F&O (LE-G5-01) does not appear in LAR Attachment V.

If this is an F&O from the full or focused scope peer review of the IEPRA, then provide this F&O and the accompanying disposition.

d) LE-B1-01 (Met at CC-II)

It is not clear how the disposition to this F&O addresses the 2011 peer review request to justify any credited repair actions.

Identify and justify any repair actions credited in either the IEPRA or FPRA. (This appears to pertain to the requirement in SR LE-C3.)

e) LE-F3-01 (Not Met)

Sources of LERF modeling uncertainty (25 analysis assumptions) were identified but their potential impact on LERF was not characterized.

Describe the potential impact on the PRA model of the identified assumptions, and justify the use of this model for the FPRA.

f) QU-D7-01 (Not Met)

SR QU-D7 requires that the importance of components and basic events be reviewed “to determine that they make logical sense.” No response to this finding is provided in LAR Attachment U, Table U-1. The licensee’s analysis does not discuss a review of those results.

Explain what review of component and basic event importance was performed to demonstrate SR QU-D7 is met.

PRA RAI 03 – Integrated Analysis

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 further states that the change in public health risk arising from transition from the current FPP to an NFPA 805 based program, and all future plant changes to the program, shall be acceptable to the NRC. RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," provides quantitative guidelines on CDF and 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 review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates.

The PRA methods listed below have not been accepted by the NRC staff. Unless a method is eventually found to be acceptable by the NRC, that method needs to be replaced by an acceptable method. Alternatively it may be demonstrated that the FPRA results used to support transition do not exceed the change in risk acceptance guidelines if the acceptable method were used. The PRA methods currently under review in the LAR include the following:

- PRA RAI 1.a regarding removal of the Option #2 approach in assessment of circuit failure probabilities
- PRA RAI 1.c regarding the inclusion of SOKC for internal and fire event related factors
- PRA RAI 1.d and PRA RAI 12 regarding conservative modeling of Instrument Air
- PRA RAI 1.e regarding inclusion of junction boxes as damaging ignition sources
- PRA RAI 1.f regarding treatment of sensitive electronics
- PRA RAI 4 regarding removal of CPT credit in assessment of circuit failure probabilities
- PRA RAI 5 regarding Heat Release Rates lower than 317 kW for transient sources
- PRA RAI 6 regarding other disclosed deviations from acceptable PRA methods
- PRA RAI 9 regarding MCB fire ignition frequency
- PRA RAI 10 regarding main control room (MCR) abandonment modeling
- PRAI 12 on assumptions due to cable routing and the impact on ΔCDF, ΔLERF
- PRA RAI 13 regarding credit taken for the new RCP shutdown seals
- PRA RAI 15 regarding fire damage effects from the opposite unit

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) of replacing specific methods identified above with alternative methods which 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 expand depending on NRC's review of other RAIs in this document.

b) Explain how the FPRA model will be updated to incorporate acceptable methods before using the PRA to support self-approval. While analyses may show that methods addressed one-at-a-time have negligible impact on the change on risk for the post-transition plant, these methods may have a greater impact in future plant-change evaluations (PCEs) since post transition self-approval acceptance guidelines are smaller. Therefore these methods need to be replaced with acceptable methods.

PRA RAI 04 – Control Power Transformer (CPT) Credit for Circuit Failure Probabilities

NFPA 805 Section 2.4.3.3 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. 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 analysis regarding circuit failure mode likelihood appears to credit CPTs for a reduction factor of two. The NRC staff concludes that the effect of any CPT reduction to the hot short-induced spurious operation likelihood cannot be substantiated. The staff cannot complete its review based on the current analysis. Replace this analysis and provide an explanation of the method used and the results in sufficient detail so the staff can make a conclusion regarding the use of the method.

PRA RAI 05 – Transient Heat Release Rate (HRR)

NFPA 805 Section 2.4.3.3 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 FPRA and endorses, with exceptions and clarifications, NEI 04-02, Rev. 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.

LAR Attachment V, Section V.2 indicates that the transient fire for the cable spreading room (CSR) is characterized by a 142 kilowatt (kW) fire and the vital switchgear room is characterized by a 69 kW fire. Both reduced HRRs are stated to be justified because they are credited in designated enhanced transient combustible compartments. The staff determined that the justification provided in LAR Section V.2 is insufficient for the staff to complete its review. Discuss the key factors used to justify the credit for reduced transient fire HRRs below 317 kW including:

a) Identification of any other fire compartments for where reduced HRR transient fires are credited;

b) For each location where a reduced HRR is credited, a description of the administrative controls that justify the reduced HRR including how location-specific attributes and considerations are addressed. Provide a discussion of required maintenance for ignition sources in each location, and types/quantities of combustibles needed to perform that maintenance. Also discuss the personnel traffic that would be expected through each location;

c) The results of a review of records related to violations of the transient combustible and hot work controls; and,

d) A discussion of the impact on the analysis.

PRA RAI 06 - Use of Unacceptable Methods

NFPA 805 Section 2.4.3.3 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. Methods that have not been determined to be acceptable by the NRC Staff require additional justification to allow the NRC Staff to complete its review of the proposed method. LAR Attachment V, Section V.2 states that the "PBNP fire PRA did not use unreviewed analysis methods."

Indicate if any methods not yet accepted by NRC were used. If so, provide a summary of those methods in sufficient detail to enable the NRC staff to complete its review. Also, determine the impact on fire CDF, LERF, Δ CDF, and Δ LERF for those methods.

PRA RAI 07– Transient Fire Placement at Pinch Points

NFPA 805 Section 2.4.3.3 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 FPP consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC staff require additional justification to allow the NRC staff to complete its review of the proposed method.

The NRC staff could not determine how "pinch points" were modeled for transient fires. Transient fires should at a minimum be placed in locations within the plant physical analysis units (PAUs) where conditional core damage probabilities (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. Hot work should be assumed to occur in locations where hot work is a possibility, even if improbable, keeping in mind the same philosophy.

a) Clarify how "pinch points" were identified and modeled for transient fires.

b) Describe how transient and hot work fires are distributed within the PAUs. In particular, identify the criteria used to determine where such ignition sources are placed within the PAUs.

PRA RAI 08 – Main Control Board (MCB) Fire Modeling

NFPA 805 Section 2.4.3.3 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 FPP consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC Staff require additional justification to allow the NRC Staff to complete its review of the proposed method.

The licensee's analysis explains that the NUREG/CR-6850 Appendix L approach was used to model MCB fires for the FPRA. In addition, the licensee's analysis explains that "minimum target sets" were selected to achieve the bounding CCDPs/conditional large early release frequencies (CLERFs) associated with fire in the MCB panels, which result in eight MCB fire scenarios (across both unit MCRs). In addition, the licensee's analysis explains that the frequencies of these scenarios incorporate "probability of target damage" values based on minimum target distances for each scenario using NUREG/CR-6850 Appendix L guidance. The NRC staff noted that none of the eight scenarios appears to involve a fire originating in panel 1C02 and affecting panel 1C01 and 1C04, even though the analysis seems to indicate that this scenario was considered. The licensee's analysis presents relatively low CCDPs for the eight MCB fire scenarios and the staff notes that it is not clear how it was determined that the

scenarios selected (four per unit) bound the MCR fire risk. Explain how a "minimum target set' was identified within the MCB to determine these bounding scenarios. Given the large number of possible combinations of MCB controls that might be involved in a fire, discuss how the four scenarios chosen adequately represent or bound the risk from MCB fire.

PRA RAI 09 – Main Control Board Fire Ignition Frequency

NFPA 805 Section 2.4.3.3 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 FPP consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC Staff require additional justification to allow the NRC Staff to complete its review of the proposed method.

The licensee's analysis indicates that the total adjusted fire ignition frequency is 1.65E-03/year for the two units. In addition, the licensee's analysis explains that the MCB fires are divided into eleven scenarios, three of which are screened from quantification. The licensee's analysis indicates that the fire ignition frequencies applied to MCB fires is 1.50E-4/year (or the total adjusted fire ignition frequency of 1.65E-03/year divided by 11). Dividing the MCB frequency in this manner is different than NRC guidance.

When applying the NUREG/CR-6850 Appendix L method, the frequency of a scenario involving specific target damage in the MCB should be determined by multiplying the probability of target damage, such as defined by Figure L-1 of NUREG/CR-6850, by the entire MCB frequency. Partitions or segmentation cannot be used to justify subdividing the MCB fire frequency, unless accompanied by a recalculation of Appendix L, Figure L-1. Full partitions without openings or gaps might be used to preclude scenarios involving targets sets which extend across partitions.

The NRC staff cannot complete its review based on the current analysis. Replace this analysis and provide an explanation of the approach used and the results in sufficient detail so the staff can make a conclusion regarding the use of the approach.

PRA RAI 10 – Main Control Room Abandonment Modeling

NFPA 805 Section 2.4.3.3 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 FPP consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC Staff require additional justification to allow the NRC Staff to complete its review of the proposed method.

LAR Attachment W, Section W.2.1 indicates that the FPRA credits MCR abandonment for both habitability and non-habitability scenarios. The licensee's analysis appears to indicate that MCR abandonment cases are represented by a single cutset (with a CDF of 6.73E06/year for Unit 1 and 6.79E-06/year for Unit 2). The cutset frequencies presented in the analysis are the same as the scenario frequencies presented the MCR abandonment scenario in LAR Attachment W, Tables W-2 and W-3, indicating that the abandonment scenario consists of just a single cutset. The licensee's analysis explains that single CCDP values (i.e., 0.65 for Unit 1 and 0.66 for Unit 2) were determined for MCR abandonment scenarios by summing the six HEPs (per unit) associated with actions required for alternate shutdown. The analysis further explains that the contributions from random equipment failures were assumed to be dominated by the HEPs.

Also, given the discussion in the licensee's analysis, it is not clear why the cited CCDP values are not presented as contributors to the MCR abandonment cutset presented in the licensee's analysis.

Also, it is not clear whether the six HFEs (per unit) cited in the MCR analysis are adequate to represent the actions required to estimate the CCDP for the range of equipment failures for abandonment. LAR Attachment G, Table G-1 seems to indicate there are a number of other actions required for alternate shutdown (e.g., recovery actions associated with components 1LI-426, 1PI-420C, 1PI-438A, 1TI-451B, 1TI-451C, 2LI-426, 2LI-470A, 2NI-00040, 2PI-420C, 2TI-451B, and 2TI-451C).

LAR Attachment W, Section W.2 also presents nine MCR abandonment failures used to help calculate the CCDP of the compliant plant for "non-habitability" cases in Fire Areas A24, A30, and A31. It is not clear whether these failures are the same or related to the abandonment HFEs discussed in the licensee's analysis. Abandonment actions appear not be credited for Fire Area 24 (4 kV switchgear room) or for Fire Area A30 (CSR) because there is no abandonment scenario presented for these fire areas in the corresponding analysis. Therefore, it appears, though it is not clear, that abandonment actions were credited in the compliant case but not the post transition case.

Accordingly, it is not completely clear from the documentation how MCR abandonment was treated in the FPRA, how the scenario frequency for MCR abandonment was determined, or how potential fire-induced failures resulting from fires leading to MCR abandonment were addressed. It appears that single CCDP/CLERP values were used to represent a range of potential MCR abandonment scenarios. In light of the observations, provide the following:

a) 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. Also, include an explanation of how the CCDPs and CLERPs are estimated for fires that lead to MCR abandonment.

b) Explain how the CCDPs and CLERPs estimated for fires that lead to abandonment due to loss of habitability address various possible fire-induced failures. Specifically include in this explanation, 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) Explain how the abandonment scenario frequency due to loss of habitability was determined. Include explanation of how the fire ignition frequencies contributing to this scenario and non-suppression probabilities were addressed.

d) Explain whether MCR abandonment is being credited for non-habitability cases (i.e., loss of control in the MCR). Based on LAR Attachment W, Section W.2.1, it appears to be credited only in the compliant case.

Indicate if abandonment due to loss of control is credited for the post transition case. If abandonment due to loss of control is being credited in the post transition case then describe the scenarios to which this applies. Address parts a) and c), above, for abandonment due to loss of control. Also describe the cues used by operators to abandon the MCR and how the timing of these cues is determined and modeled. Include an explanation of how the combinations of different functions that can be lost due to different fire-induced failures are addressed in the FPRA modeling. Note that absent an acceptable analysis for abandonment due to loss of control, the staff will not accept the credit for this particular type of recovery.

Also, referring to the questions asked for the post transition case, describe the scenarios and analysis which apply to the compliant case.

PRA RAI 11 - Command and Control of MCR Abandonment Actions

NFPA 805 Section 2.4.3.3 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 FPP consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC Staff require additional justification to allow the NRC Staff to complete its review of the proposed method.

LAR Attachment G states that PBNP does not have any locations considered to be Primary Control Stations (PCSs). It is not clear where or how centralized command, control, and communication are performed for MCR abandonment actions. Explain how the feasibility of command and control, and communication and coordination of actions related to MCR abandonment was determined and is factored into the FPRA.

PRA RAI 12 - Use of Assumed Cable Routing

a) NFPA 805 Section 2.4.3.3 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. 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 licensee's analysis states that "Systems without cable tracing are failed unless further analysis was performed to assure systems are not compromised by the transient or fire (credit by exception)."

i. Explain how "credit by exception" was performed for untraced cables.

ii. Also, identify the functions and systems (including loss of instrumentation and control functions) which are assumed to be failed because of lack of information

about cable routing. Describe how these assumed failures impact the calculated risk values in the post-transition and the compliant PRA models. Include explanation of whether they impact the post-transition and compliant models differently, and the implications of those differences on the change in risk estimates.

b) The NRC staff is concerned with regards to conservative PRA assumptions in the case where the change in plant risk due to a modification can be significantly overestimated. The NRC staff notes, for example, that failure to trace cable and credit the unaffected train in the compliant plant can overestimate the risk of the compliant plant and consequently, the risk benefit from a plant modification, such as the addition of a train for injection/decay heat removal redundant or diverse to the assumed failed train, can be significantly overestimated.

   i. Indicate whether additional basic events credited in the PRA could change dominant conservative scenarios in the complaint plant to negligible contributors in the post transition plant.

   ii. If cases are identified where credit for a plant modification is overestimated from the stated concern, provide a discussion of the realism associated with the risk reduction for the particular plant modification.

PRA RAI 13 - Fire PRA Credit for Westinghouse RCP Seals

NFPA 805 Section 2.4.3.3 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 AHJ. RG 1.174 provides quantitative guidelines on core damage frequency, large early release frequency, 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 staffs review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates:

LAR Attachment S, Table S-2 presents a modification (i.e., MOD-3) to upgrade the reactor coolant pump (RCP) seals. The LAR indicates that credit is taken in the FPRA for this modification. Given recent concerns about the operation of the new Westinghouse RCP shutdown seals, the risk reduction credit that might be taken in this application for upgraded RCP seals may be optimistic. Describe the RCP seal upgrade and discuss the credit taken in the FPRA for the upgrade.

PRA RAI 14 – Use of Incipient Detection

NFPA 805 Section 2.4.3.3 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.

LAR Attachment H, Table H-1 indicates that FAQ 08-0046, "Incipient Fire Detection Systems", (ADAMS Accession No. ML093220426) was utilized in the submittal, yet there is no additional

evidence that incipient detection was credited in the FPRA. If incipient detection was credited in the FPRA, identify the type of incipient system (in cabinet or area-wide), where it is installed, and a discussion of the credit.

PRA RAI 15 – PRA Treatment of Dependencies between Units 1 and 2

NFPA 805 Section 2.4.3.3 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. 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.

Several references are made in the LAR to cross-ties and shared systems, including the disposition to F&O AS-B1-01 in the LAR which also states that the PBNP IEPRA is modeled using duplicate logic in Units 1 and 2 to capture shared systems. LAR Attachment W, Tables W-6 and W-7 show contribution by fire area to CDF, LERF, Δ CDF, and Δ LERF, but do not appear to show how the risk contribution from fires originating in one unit is incorporated into the risk for the other unit given the possible physical proximity of fire zones and the existence of shared systems. Explain how the risk contribution of fires in one unit is addressed for the other unit due to the physical layout of the units and shared systems. Include identification of locations where fire in one unit can affect components in the other unit, and description of the extent to which systems are shared. If the contribution of fires originating in one unit is not addressed for the other unit, perform this assessment and include as part of the integrated analysis requested for PRA RAI 3.

PRA RAI 16 - Calculation of VFDR ΔCDF and ΔLERF

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 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. RG 1.174 provides quantitative guidelines on core damage frequency, large early release frequency, 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 review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates:

LAR Attachment W, Section W.2.1 provides a high-level description of how the ΔCDF and ΔLERF for the VFDRs and the additional risk of recovery actions for each of the fire areas were determined, which does not provide enough detail to make the approach completely understood. Provide further description of the methods used to determine the change in risk values reported in LAR Attachment W, Tables W-6 and W-7 that addresses the following:

a) A detailed definition of both the post-transition and compliant plant models used to calculate the reported changes in risk and additional risk of recovery actions, including any special calculations for the MCR. (It is recognized that PRA RAI 10 already asks questions about MCR abandonment, but this question subpart is different in that it focuses on how delta CDF and LERF are calculated). This discussion should include

explanation of how VFDR and non-VFDRs modifications are addressed for both the post-transition and compliant case;

b) A description of how the reported changes in risk and additional risk of recovery actions were calculated, including any special calculations performed for the MCR. Also, include a description of PRA modeling logic and mechanisms, such as adding events or logic, and using surrogate events;

c) A clarification of whether FAQ 08-0054 (ADAMS Accession No. ML110140183) guidance was applied, and identification of the use of PRA modeling, data, or methods, added after the FPRA peer review; and,

d) LAR Attachment C, Table C-1, states that VFDRs associated with overcurrent trip concerns were not modeled in the Fire PRA. Also, numerous process monitoring instruments were not modeled in the FPRA (e.g., hot and cold leg temperatures, steam generator (SG) pressure, condensate storage tank (CST) level, etc.), yet these fire areas have been transitioned using risk-informed, performance-based analyses in accordance with NFPA 805, Section 4.2.4.2. NFPA 805 Nuclear Safety Performance Criteria (NSPC) includes process monitoring as a requirement.

   Provide a description of the type of VFDRs identified, and discuss whether the VFDRs identified but not modeled in the FPRA impact the risk estimates.

   Provide a discussion of whether the loss of the process monitoring instruments will prevent meeting the NSPC. The NRC staff notes that while loss of a single instrument in the Internal Events PRA may have negligible risk, a common mode failure of numerous instruments as a result of fire may be risk significant but this would not be identified in the FPRA if the instruments were not modeled.

PRA RAI 17 – Clarification of Recovery Action Listing

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 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. RG 1.174 provides quantitative guidelines on core damage frequency, large early release frequency, 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 review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates:

For the fires areas in LAR Attachment C that credit recovery actions, the fire risk summary concludes that "with the implementation of recovery actions in Attachment G the applicable risk, defense-in-depth, and safety margin were satisfied." LAR Attachment G, however, does not indicate whether any or which recovery actions are credited only for defense-in-depth. LAR Attachment C, Table C-3 lists a number of VFDRs "associated with main control room abandonment actions" that LAR Attachment G, foes not identify an associated recovery action (i.e., VFDR A31-08, A31-11, A31-22, A31-25, A31-26, and A31-27). In light of these observations:

a) Identify which recovery actions listed in LAR Attachment G are identified only for "defense-in-depth" and which are credited explicitly in the FPRA for risk reduction.

b) Since there are no PCSs (aside from the MCR), discuss whether all the actions credited in the FPRA required outside the MCR were considered recovery actions per NFPA 805, the guidance described in RG 1.205, "Risk-Informed, Performance-Based Fire Protection For Existing Light-Water Nuclear Power Plants," and are listed in LAR Attachment G.

PRA RAI 18 – Large Reduction Credit for Modifications

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 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. RG 1.174 provides quantitative guidelines on core damage frequency, large early release frequency, 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 staffs review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates:

LAR Attachment W, Tables W-6 and W-7 report a total Δ CDF of -3.95E-06/year for Unit 1 and -3.33E-4/year for Unit 2, respectively. LAR Attachment W, Section W.2 identifies a set of risk reduction modifications credited in the FPRA that are unrelated to VFDRs, and explains that the risk reduction from these modifications results in higher risk for the compliant plant than for the variant plant risk in some instances. The large negative total Δ CDF reported in LAR Attachment W, Table W-7 for Unit 2 implies that the CDF for the compliant plant for Unit 2 is very high (~4E-4/year). Regarding risk reduction modifications that do not address VFDRs, Section 3.2.5 of RG 1.205, provides guidance that risk decreases may be combined with risk increases for the purposes of evaluating combined changes in accordance with regulatory positions presented in Sections 1.1 and 1.2 of RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Rev. 2. Given that an overly conservative calculation of the compliant plant CDF and LERF can lead to a non-conservative calculation of the Δ CDF and Δ LERF, the contribution of conservative modeling of the compliant plant risk to the Δ CDF and Δ LERF should be evaluated in detail. In light of the above, provide the following:

a) Identification of the modifications in LAR Attachment S, Table S-2 that are being implemented to remove VFDRs, opposed to those being implemented solely to reduce risk (i.e., non-VFDR modifications);

b) The total unit increase in the Δ CDF and Δ LERF from accepting the unresolved VFDRs and the total unit decrease in the Δ CDF and Δ LERF from implementing the non-VFDR related modifications. In these calculations the only variation between the post-transition and the compliant plant PRAs should be how they model the retained VFDRs or non-VFDR modifications;

c) A summary of the risk significant scenarios for fire areas in the compliant case, including risk significant scenarios for Fire Area A23N reported in LAR Attachment W, Table W-7 as having a Δ CDF of -3.08E-04/year for Unit 2; and,

d) A discussion of the contribution of fire-induced failures to those scenarios and the impact of any assumptions made that significantly contribute to the variant and the compliant case risk.

PRA RAI 19 – Sensitivity Analysis on FAQ 08-0048 Fire Bin Frequencies

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 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. RG 1.174 provides quantitative guidelines on core damage frequency, large early release frequency, 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 review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates:

The licensee's analysis indicates that the updated fire bin frequencies provided in NUREG/CR-6850, Supplement 1 (i.e., FAQ-08-0048, ADAMS Accession No. ML092190457) were used in the FPRA. The guidance in FAQ-08-0048 states that a sensitivity study should be performed using the mean fire frequency for those bins in Section 6 of NUREG/CR-6850 with an alpha value less than or equal to one. Indicate if the acceptance guidelines of RG 1.174 may be exceeded when this sensitivity study is applied to the integrated study of PRA RAI 3. If these guidelines may be exceeded, provide a description of fire protection, or related, measures that can be taken to provide additional defense in depth, as discussed in FAQ 08-0048.

PRA RAI 20 – Defense in Depth and Safety Margin

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 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. RG 1.174 provides quantitative guidelines on core damage frequency, large early release frequency, 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 review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates:

LAR Section 4.5.2.2 provides a description of how the reviews of the impacts on defense-in-depth and safety margin were conducted. Provide further explanation of the method used to determine when a substantial imbalance between defense-in-depth echelons existed in the Fire Risk Evaluations (FREs), and identify the types of plant improvements made in response to this assessment. Also, provide further discussion of the approach in applying the Nuclear Energy Institute (NEI) 04-02, "Guidance for Implementing A Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," criteria for assessing safety margin in the FREs.

PRA RAI 21 - Implementation Item Impact on Risk Estimates

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 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. RG 1.174 provides quantitative guidelines on core damage frequency, large early release frequency, 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 review of the information in the LAR has identified the following information that is required to fully characterize the risk estimates:

Implementation item IMP-142 in LAR Attachment S, Table S-3 states that FPRA model will be updated after modifications are complete, however, it does not indicate that an update to the FPRA will occur following completion of other implementation items and does not identify a plan of action if RG 1.174 guidelines are exceeded. Describe how the FPRA model will be updated after all implementation items are complete, and if RG 1.174 guidelines are exceeded.

PRA RAI 22 - Model Changes and Focused Scope Reviews after the Full Peer Review

NFPA 805 Section 2.4.3.3 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.

The disposition to F&O HRA-D2-01 states that a dependency analysis for fire event HFEs did not exist at the time of the FPRA peer review, but was performed after the peer review and is documented in the licensee's analysis. It does not appear to the NRC staff that a peer review was performed on this model upgrade.

a) Identify any changes made to the IEPRA or FPRA since the last full-scope peer review of each of these PRA models that are consistent with the definition of a "PRA upgrade" in ASME/ANS-RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency for Nuclear Power Plant Applications," as endorsed by RG 1.200, "An Approach For Determining The Technical Adequacy Of Probabilistic Risk Assessment Results For Risk-Informed Activities."

b) If any changes are characterized as a PRA upgrade, indicate if a focused-scope peer review was performed for these changes consistent with the guidance in ASME/ANS-RA-Sa-2009, as endorsed by RG 1.200, and describe any findings from that focused-scope peer review and the resolution of these findings.

c) If a focused-scope peer review has not been performed for changes characterized as a PRA upgrade, describe what actions will be implemented to address this issue.

PRA RAI 23 – Modification Credit in Internal Events PRA

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. NFPA 805 Section 2.4.4.1 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. RG 1.174 provides quantitative guidelines on core damage frequency, large early release

frequency, 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 the following information that is required to fully characterize the risk estimates:

LAR Attachment W, Table W-1 reports low CDFs (3.1E-6/year for each unit) for the internal events hazard. Clarify whether this CDF reflects the risk reduction due to non-VFDR modifications identified as credited in the FPRA in LAR Attachment S, Tables S-1 and S-2.

PRA RAI 24 – Smoke Damage

NFPA 805 Section 2.4.3.3 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, Rev. 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 in guidance documents require additional justification to allow the NRC staff to complete its review of the proposed method.

The licensee's analysis indicates that, although qualitative analyses are performed of smoke damage, no fire modeling for smoke effects is performed. It is not clear how smoke effects were addressed in the FPRA. Explain how effects of smoke on equipment were evaluated using applicable guidance (i.e., Appendix T of NUREG/CR-6850) or some other method.

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 fire modeling comprised the following:

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

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

- The Consolidated Model of Fire and Smoke Transport (CFAST) was used in the HGL calculations in fire zone 552, and for the temperature sensitive equipment HGL study.

- Fire Dynamics Simulator (FDS) was used to assess MCR habitability, to calculate the plume temperature in fire zone 158, and in the plume/HGL interaction and temperature sensitive equipment zone of influence (ZOI) studies.

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

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

a) Identify whether any fire modeling tools and methods have been used in the development of the LAR that are not discussed in LAR Attachment J. One example would be a methodology used to convert damage times for targets in Appendix H of NUREG/CR-6850 to percent damage as a function of heat flux and time.

b) Provide information on how non-cable intervening combustibles were identified and accounted for in the fire modeling analyses.

c) Describe how cable trays with covers and fire-resistive wraps 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 HRR of electrical cabinets throughout the plant appears to be based on the assumption that they are either Case 3 (fire limited to a single bundle of unqualified cable) or Case 4 (closed doors and fire involving multiple bundles of unqualified cable) as described in Table E-1 of NUREG/CR-6850, Vol. 2. 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. 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 were treated in the fire modeling analysis.

e) 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 tray covers and fire-resistant wraps on HEAF-induced cable tray ignition and subsequent fire propagation.

f) Specifically regarding the use of the algebraic models:

   i. Explain how horizontal vents, and vents at or near the ceiling of the compartment were treated in the Method of Mccaffrey, Quintiere, And Harkleroad (MQH) calculations; and

   ii. Describe in detail how the time to sprinkler activation and the time to heat and smoke detector actuation was calculated.

g) Specifically regarding the CFAST analysis in compartment 552GRP, discuss whether the potential damage was assessed for targets in the lower gas layer (LGL) due to the combined radiant heat flux from the HGL, heated surfaces and the flame. Describe the results of this assessment, and the damage thresholds that were used in this assessment. If a damage assessment based on radiative heat flux (or combined radiative and convective thermal exposure) was not performed, provide technical justification for the assumption that the LGL temperature damage threshold is bounding.

h) Specifically regarding the use of FDS in the MCR abandonment calculations:

   i. Explain what value was used for the heat of combustion of cables in the MCR (either explicitly or implicitly through the specified fuel composition), and discuss the results of using this value in terms of conservatism of the soot generation rate;

   ii. FDS simulations were performed with cabinet and transient fires located at four different locations. Describe the technical basis that was used for choosing these locations;

   iii. Provide technical justification for assuming that transient fires in the MCR reach peak HRR in 8 min;

   iv. The FDS sensitivity study indicates that placing the transient combustible outside the horseshoe against a wall or in a corner does not adversely affect control room habitability (compared to the baseline scenarios with the transient combustible remote from a wall or corner). Discuss whether this conclusion is also valid for transient wall and corner fires in the area below the acoustic tile ceiling; and,

   v. FDS “devices” (temperature, heat flux, and optical density) were placed at different locations around the MCR. Describe the basis for choosing these locations.

i) Specifically regarding the multi-compartment analysis (MCA):

   i. Describe the criteria that were used to screen multi-compartment scenarios based on the size of the exposing and exposed compartments;

ii. Explain how the methods described in Chapter 2 of NUREG-1805, “Fire Dynamics Tools (FDTs),” (MQH and Beyler) were used in the calculations to screen an ignition source based on insufficient HRR to generate a HGL condition in the exposing compartment;

iii. Explain how the size of the vents in the exposing compartments used in the MQH HGL calculations was determined, and up to what extent these vent sizes are representative of conditions in the plant; and,

iv. Explain how the possibility of damaging hot gases spreading to a third compartment was considered.

FM RAI 02

ASME/ANS Standard RA-Sa-2009, “Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications,” Part 4, requires damage thresholds be established to support the FPRA. 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) 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) It appears that, for covered trays, a damage delay time is assumed based on NUREG/CR-6850, Vol. 2, Appendix Q, Section Q.2.2. However, the delay time recommended in this section of NUREG/CR-6850 should only be used for qualified cable.

   Confirm that all cables for which the delay time was assumed are qualified.

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.

LAR Section 4.5.1.2 states that fire modeling was performed as part of the FPRA development (NFPA 805, Section 4.2.4.2). Reference is made to LAR Attachment J, for a discussion of the verification and validation (V&V) of the fire models that were used. Furthermore LAR Section 4.7.3 states that "calculational models and numerical methods used in support of compliance with 10 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) LAR Attachment J states that the smoke detection actuation correlation (Method of Heskestad and Delichatsios) has been applied within the validated range reported in NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications." However the latter reports a validation range only for Alpert’s ceiling jet temperatures correlation. Provide technical details to demonstrate that the temperature to smoke density correlation has been applied within the validated range, or

to justify the application of the correlation outside the validated range reported in the V&V basis documents.

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

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 verifications and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method.

LAR Section 4.7.3 states that engineering methods and numerical models used in support of compliance with 10 CFR 50.48(c) are used and were applied 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 use for each FDT. There is general discussion of the limitations of use for the algebraic equations that has been utilized for hand calculations. It is not clear, however, how these limitations were applied on the individual fire areas or for the MCA. Provide a description of how the limit of applicability was determined for each fire area.

b) Identify uses, if any, of CFAST outside the limits of applicability of the model and for those cases, explain how the use of CFAST was justified.

c) Identify uses, if any, of FDS outside the limits of applicability of the model and for those cases, explain how the use of FDS was justified.

FM RAI 05

LAR Section 4.5.1.2 states that fire modeling was performed as part of the FPRA 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, LAR Section 4.7.3 states that post transition, for personnel performing fire modeling or Fire PRA development and evaluation, NextEra 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) Describe the requirements to qualify personnel for performing fire modeling calculations in the NFPA 805 transition.

b) 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 FPRA, describe how proper communication between the fire modeling and FPRA personnel is ensured.

FM RAI 06

LAR Section 4.7.3, 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) Describe how the uncertainty associated with the fire model input parameters (compartment geometry, radiative fraction, thermophysical properties, etc.) was addressed for this application and accounted for in the analyses.

b) The NRC staff notes that cabinets and cable trays reduce the effective volume of a compartment, but also act as a heat sink and that it is not clear how ignoring these contents affects the HGL temperature.

   Explain how the corresponding uncertainties were accounted for and discuss the HGL temperatures resulting from ignoring the compartment contents and whether they are conservative.

Safe Shutdown Analysis (SSA) RAI 01

The NRC staff noted that some implementation items and modifications are referenced in the LAR, but not in sufficient detail to determine what particular implementation item or modification relates to the proposed change. For the items listed below, provide the following:

a) Identify the specific modifications in LAR Attachment S that correlate with elements 3.5.2.4 and 3.5.2.5 of LAR Attachment B, Table B-2. The alignment basis in LAR Attachment B, Table B-2, for elements 3.5.2.4 and 3.5.2.5 refer to LAR Attachment S, Table S-2 for modifications associated with circuit coordination and common enclosure criteria. There are several modifications in LAR Attachment S associated with circuits, breakers, and fuses.

b) Identify the implementation item(s) that address the revision to the training program and drill procedures to incorporate the feasibility evaluation results. LAR Attachment G, under the heading, "Results of Step 4," describes implementation items resulting from the feasibility evaluation including revision to the training program and revision to the drill development procedure and states these items are included in LAR Attachment S.

c) In LAR Attachment C, the Fire Risk Summary for Fire Areas A01-B/46, A23N, and A36, states, in part, that with the proposed cable protection in Attachment S, the applicable risk, defense-in-depth, and safety margin criteria were satisfied. There were no VFDR dispositions identified in these fire areas that describe modifications.

    i. Confirm the modifications referenced in the Fire Risk Summary for the individual fire areas are not associated with a VFDR disposition.

    ii. Identify the specific modification(s) item in LAR Attachment S that is/are associated with the risk summaries in Attachment C for these areas.

SSA RAI 02

LAR Attachment C, for Fire Area A31, contains generic VFDR resolutions that state, in part, "This VFDR is associated with main control room abandonment actions as listed in Fire Risk Evaluation…" With the exception of VFDRs A31-08, -11, -22, and -25, each of the VFDRs associated with this fire area have a corresponding recovery action in LAR Attachment G, Table G-1. The licensee stated that recovery action review results are documented in R2167-1012-02, "Recovery Actions Transition Report." Upon further review, the staff noted that the licensee's analysis indicates that recovery actions A31-11 and A31-22 are required.

Explain why the actions for VFDR A31-11 and A31-22 are not included in LAR Attachment G, Table G-1.

SSA RAI 03

For those fire areas that credit electrical raceway fire barrier system (ERFBS) as described in LAR Attachment C:

a) Identify the VFDRs, if any, that credit the ERFBS for disposition.

b) If credited for dispositioning a VFDR, provide a discussion of the analysis or basis for the acceptability of the ERFBS in resolving the VFDR.

SSA RAI 04

LAR Attachment S, Table S-2, includes several modifications associated with "protecting" cables.

If these modifications involve installation of ERFBS to protect the cable, and the modification resolves a VFDR, then identify the VFDR associated with the specific modification and specify which deterministic requirement the ERFBS is meeting (1-hour or 3-hour).

SSA RAI 05

Numerous VFDRs describe a situation where fire damage can cause overcurrent trip (OCT) concerns that could result in a secondary fire. The VFDR disposition states that the condition has not been modeled in the FPRA. The VFDRs state that a qualitative analysis, R2168-1003c-01 att. 7, addresses this concern. However, the staff noted that the licensee's analysis recommends numerous modifications in order to preserve overcurrent trip capability. It appears that some of those modifications have been included in LAR Attachment S, Table S-2.

a) Describe whether all OCT concerns identified in the analysis (R2168-1003c-01 as referenced in the LAR) have been resolved by a proposed modification.

b) Although the licensee's analysis may have recommended addressing the issue with modifications, LAR Attachment C only references the calculation. For those VFDRs that will be resolved through modifications, provide the specific modification listed in LAR Attachment S to accomplish this.

c) The modifications described in LAR Attachment S in many cases do not reference the appropriate VFDR or provide the breaker/circuit number. For each modification that resolves a VFDR, describe the specific VFDR the proposed modification refers to.

d) For those VFDRs that will not be resolved through modifications, provide a discussion explaining how the qualitative risk analyses performed, justifies the presence of secondary fires if the condition has not been modeled in the FPRA.

Fire Protection Engineering (FPE) RAI 01

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. LAR Attachment A states that fire brigade members are plant operators and "qualifications of individuals in the fire protection organization are administratively controlled to ensure qualification of the individual commensurate with the position being held and activities being performed." Based on the staffs review, the LAR does not provide sufficient information for the staff to determine whether the brigade leader qualifications demonstrate the competence to assess the potential safety consequences of a fire and advise control room personnel.

Provide additional description of how the fire brigade leader and members have sufficient training and knowledge of nuclear safety systems and understand the effects of fire and fire suppression on nuclear safety performance criteria.

FPE RAI 02

NFPA 805 Section 3.3.5.2 requires that only metal trays and metal conduits be used for electrical raceways. In LAR Attachment A, the compliance basis states that in limited circumstances, exposed conduits have thin plastic coating and clarifies that these plastic coated metal conduits are considered as complying with this section of NFPA 805 because the base material is metal. The staff notes that metal trays and metal conduit do not contribute to fire propagation.

a) Provide additional justification that demonstrates this conduit is equivalent to metal conduit in fire propagation behavior or request approval using a performance-based method in accordance with 10 CFR 50.48(c)(2)(vii).

b) Discuss the extent of condition of the use of thin plastic coated conduits (i.e., further describe the “limited circumstances” of use).

c) Describe whether these conduits present an exposure hazard to other safe shutdown circuits or if the conduit could propagate fire to locations containing safe shutdown circuits.

d) Describe whether the fire propagation/exposure potential of these conduits are considered in the assessment of fire damage.

FPE RAI 03

In LAR Attachment A, the compliance statement for elements 3.6.1, 3.9.1(2), and 3.10.1(2) is “Complies with Clarification.” However, in the “Compliance Basis,” reference is made to documentation that provides justification for deviations from the NFPA codes associated with these elements, which appears to be an engineering evaluation per NFPA 805.

Provide an explanation why the compliance statement is not characterized as “Complies with use of EEEEs?”

FPE RAI 04

The exception to NFPA 805 Section 3.11.4(b) requires conduit with inside openings of 4-inches or less in diameter to be sealed at the fire barrier unless the conduit extends greater than 5-feet on each side of the wall, in which case the opening must be provided with a smoke and hot gas seal. In LAR Attachment A, for this element, clarification is provided that states that small conduits provided for items such as lighting circuits, are embedded in the concrete construction, are not considered paths for the spread of fire, and have not been sealed. NFPA 805 Section 3.11.4(b) does not specify an exception for small conduit. Based on the NRC staffs review, the LAR does not provide sufficient information for the staff to determine whether the described configuration is acceptable.

Describe how compliance with NFPA 805 Section 3.11.4(b) will be achieved for these small conduits.

FPE RAI 05

LAR Section 4.1.2.3 and LAR Attachment A identify that NRC approval is requested per 10 CFR 50.48(c)(2)(vii) for a deviation to NFPA 805 Section 3.5.6. LAR Attachment A indicates this request is addressed in LAR Attachment L, Approval Request 6. Approval Request 6 appears to address the short circuit rating of the circuit breaker as required by NFPA 20. With regard to start and stop controls for fire pumps, Approval Request 6 only contains the citation of the NFPA 805 requirement but does not provide the basis for approval, or the acceptance criteria evaluation for this element of NFPA 805.

To address the remote start and stop capability of the fire pump, provide the necessary basis for approval and evaluation of the impact on nuclear safety performance criteria, radioactive release criteria, safety margin and defense-in-depth as required by 50.48(c)(2)(vii).

FPE RAI 06

NFPA 805 Section 3.3.5.3 requires that electric cable construction comply with a flame propagation test acceptable to the AHJ (i.e., NRC). LAR Attachment A provides the basis for previous NRC approval, which includes a statement (from the August 2, 1979 NRC SER) that a qualified flame retardant coating or material will be used wherever there is a concern for rapid flame propagation from an electrical fire that could compromise redundant safety-related divisions. This element in LAR Attachment A also identifies Implementation Item, IMP-136, from LAR Attachment S, Table S-3, to incorporate this original SER requirement into plant design guidelines.

Since there is reliance on the original 1979 SER approval as the basis for compliance with this element, explain how existing configuration control mechanisms have maintained compliance to the original SER.

FPE RAI 07

LAR Attachment L, Approval Request 5, addresses deviations from NFPA 805 Section 3.3.7.1 with regard to code required separation between the hydrogen storage and the adjacent turbine building (TB). Provide the following:

a) A set of diagrams depicting the layout and cross sections of the hydrogen storage facility and the TB wall with sufficient detail to understand the separation distances, openings and any protective features being credited.

b) An explanation of the apparent discrepancy between the 20.7 feet and 35 feet distances from the hydrogen storage system and the TB east wall. Under the heading, "Hydrogen System Configuration," the horizontal distance between the hydrogen storage system and the east TB wall is cited as 20.7 feet. Under the heading, "Code Requirements Summary," second bullet, the last sentence states, "The Turbine Building east wall and openings located at grade are approximately 35 feet away from the hydrogen system."

c) A description of how the openings above the hydrogen storage system meet the separation requirements. The second bullet under "Code Requirements Summary" states, "Table 2 also specifies that the Turbine Building wall openings, such as the doors and louver located at grade, be separated from the hydrogen system by a minimum 10 feet when the openings are not above any part of the hydrogen system." The description of the hydrogen system configuration identifies louvers below the roof-line and roll-up doors in east wall of the TB "above the hydrogen storage location".

FPE RAI 08

LAR Attachment A, Section 3.11.3, describes the compliance basis for fire barrier penetrations and identifies "Compliance by Previous Approval" for installed water curtains that protect door-less entrances through fire separations in various locations. Water curtains are also described in LAR Table 4-3 as required fire protection features in several areas. The approval basis is cited as exemption request dated July 3, 1985. LAR Attachment K does not indicate that this licensing action (i.e., exemption request) is being transitioned in support of NFPA 805 compliance.

Describe whether this approval basis is being transitioned in support of NFPA 805 and the reasoning for the decision.

FPE RAI 09

LAR Attachment A, Section 3.11.5, describes installed ERFBS. In the "Compliance Basis" associated with "Complies with Required Action," the LAR states, in part, "The ERFBS used at PBNP is 1-hour rated with the exception of that installed in containment, which is qualified as radiant energy shielding." In the paragraphs that follow, the LAR identifies a number of locations with 3-hour wrap. Provide the following:

a) Describe whether the 1-hour and 3-hour ERFBS described in LAR Attachment A is currently installed or planned to be installed.

b) Describe whether the ERFBS described in this section is associated with the cable protection modifications described in LAR Attachment S, Table S-1. If so, identify the modifications listed in Attachment S and associated with this compliance statement.

c) With regard to the LAR Attachment S modifications that state that a given cable will be "protected," describe what is meant by "protected" (i.e., cable will be protected by ERFBS for risk reduction, compliance with deterministic 1-hour requirement, or compliance with deterministic 3-hour requirement).

Programmatic (PROG) RAI 01

Based on the NRC staff's review of the LAR and associated documentation, it was determined that the LAR did not provide the information needed for the NRC staff to evaluate what changes will be made to the site QA program to incorporate NFPA 805 requirements.

a) Describe the changes that are anticipated that would modify the PBNP QA program to ensure NFPA 805 fire protection requirements are incorporated into existing processes and programs.

b) Discuss how NFPA 805 Section 2.7.3 requirements are included within and implemented by the existing PBNP QA program and any planned modifications.

REQUEST FOR ADDITIONAL INFORMATION RESPONSE TIMES

LICENSE AMENDMENT REQUEST TO ADOPT

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

NEXTERA ENERGY POINT BEACH, LLC

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-266 AND 50-301

Request for Additional Information	**Response Time (Days) ***
PRA RAI 05, 06, 07, 10, 11, 12, 13, 14, 15, 17, 20, 21, 22, 23, 24 FM RAI 02, 03, 05, 06 SSA RAI 01, 02, 03, 05 FPE RAI 01, 02, 03, 04, 05, 06, 07, 08 PROG RAI 01	60
PRA RAI 02, 08 FM RAI 01, 04,	90
PRA RAI 01, 03, 04, 09, 16, 18, 19 SSA RAI 04 FPE RAI 09	120

*** Commencing from May 30, 2014**