UNITED STATES
NUCLEAR REGULATORY COMMISSION
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October 18, 2016

EA-14-094

Mr. Brian D. Boles
Site Vice President
FirstEnergy Nuclear Operating Company
c/o Davis-Besse NPS
Mail Stop A-DB-3080
5501 N. State Route 2
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SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 – REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO ADOPT NATIONAL FIRE PROTECTION ASSOCIATED STANDARD 805 (CAC NO. MF7190)

Dear Mr. Boles:

By application dated December 16, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15350A314), as supplemented by letters dated February 2, March 7, and July 28, 2016 (ADAMS Accession Nos. ML16033A085, ML16067A195, and ML16210A422, respectively), FirstEnergy Nuclear Operating Company (FENOC, the licensee) submitted a license amendment request for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). The proposed amendment would change the current fire protection program at DBNPS to one based on the National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, as incorporated into Title 10 of the *Code of Federal Regulations* Section 50.48(c).

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing the licensee's submittals and is performing an audit of bases documents and other documents referenced in the application by an online reference portal (ADAMS Accession No. ML16075A111). In addition, the staff completed an onsite audit September 12–15, 2016 (ADAMS Accession No. ML16201A017). Based on the review and audits, the NRC staff has determined that additional information is required to complete the review.

A draft of the enclosed request for additional information (RAI) was provided to FENOC, in sections, by e-mails dated August 10, August 31, and September 1, 2016 (ADAMS Accession Nos. ML16224A019, ML16256A005, and ML16250A030, respectively). The draft RAI was discussed with FENOC during calls on August 29 and September 7, 2016, and during the onsite audit. Based on these discussions, the following changes were made to the RAI: (1) safe shutdown analysis (SSA) RAI 12 was added; (2) fire protection engineering (FPE) RAI 01(g) was deleted, since it was determined that it was not needed; and (3) fire modeling RAIs 01(b) and 02; FPE RAIs 03 and 06(c); SSA RAIs 02(b), 4, and 10; and probabilistic risk assessment (PRA) RAIs 02(b), 02(e), 02(i), 03, 12, and 13 were revised to clarify the requests.

A response to the enclosed RAI is to be provided within 60 days from the date of this letter, except for the responses to FPE RAI 06 and PRA RAIs 02, 03, 11, and 12. Responses to FPE RAI 06 and PRA RAIs 02, 11, and 12 are to be provided within 90 days from the date of this letter. The due date for PRA RAI 03 will be provided after the NRC staff has reviewed the licensee's response to the other RAIs.

If you have any questions, please contact me at (301) 415-1380 or by e-mail at Blake.Purnell@nrc.gov.

Sincerely,

Blake A. Purnell, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosure:
Request for Additional Information

cc w/enclosure: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST TO ADOPT

NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

FIRSTENERGY NUCLEAR OPERATING COMPANY

DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1

DOCKET NO. 50-346

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The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing the licensee's submittals and is performing an audit of bases documents and other documents referenced in the application by an online reference portal (ADAMS Accession No. ML16075A111). In addition, the staff completed an onsite audit September 12–15, 2016 (ADAMS Accession No. ML16201A017). Based on the review and audits, the NRC staff has determined that additional information is required to complete the review.

Fire Modeling Request for Additional Information (RAI) 01

NFPA 805, Section 2.4.3.3, requires that the probabilistic risk assessment (PRA) approach, methods, and data shall be acceptable to the NRC. LAR, Section 4.5.1.2, "Fire PRA," states that, "Fire modeling was performed as part of the Fire PRA development (NFPA 805, Section 4.2.4.2)." LAR, Attachment J, "Fire Modeling V&V [Verification and Validation]," discusses the acceptability of the fire models used. Address the following questions regarding the information in LAR, Attachment J, Table J-2, "Technical Basis for Fire Modeling Approaches and Methodologies."

a. On page J-17, the LAR states that to calculate the burning area, the entire width of the cable tray was assumed to ignite and that the length of the tray assumed to initially ignite was determined by the length of the tray exposed to the fire.

   Explain how the initially ignited cable tray length was determined in the calculations of fire propagation in stacks of horizontal cable trays. Provide technical justification for the approach that was used.

Enclosure

b. On page J-17, the LAR states (emphasis added):

> NUREG/CR-6850, Appendix R[1] provides cable tray properties and guidance on determining the HRRPUA [heat release rate per unit area] and spread rate for both thermoset and thermoplastic cable trays. For most areas, DBNPS fire modeling analyses use the NUREG/CR-6850 spread rates and the most conservative NUREG/CR-6850 Table R-1 bench scale HRRPUAs (adjusted using the Lee correlation, **shown in the table below**) for each cable type in the fire growth analysis for cable trays. For some risk-significant fire scenarios, subsequent fire modeling refinements utilize the refined HRRPUAs recommended by NUREG/CR-7010.[2]

The referenced table was not provided. Provide the referenced table.

c. On page J-18, the LAR states that if fire propagation to non-cable secondary combustibles was possible, it was included in the ignition source fire growth analysis.

Explain how the time to ignition and subsequent fire propagation and heat release rate of non-cable secondary combustibles was determined.

d. On page J-19, the LAR describes the process for placing transient fires in each compartment in the fire PRA. However, the licensee did not describe how it determined the area and elevation of transient fires.

Describe and provide technical justification for the fire area and elevation that were assumed in the transient fire scenarios postulated in the fire PRA.

e. During the onsite audit, the NRC staff observed several electrical cabinets in the back panel area of the control room complex (fire compartment FF-01) that have plexiglass doors. Fires involving cabinets with plexiglass doors are not explicitly considered in the control room abandonment calculations, although these cabinets may have a higher heat release rate than otherwise identical cabinets with steel doors.

Provide technical justification for not explicitly considering fire scenarios that involve electrical cabinets with plexiglass doors in the control room abandonment calculations. Alternatively, confirm that the effect of these scenarios on the probability for control room abandonment and the associated core damage frequency (CDF), change in CDF (ΔCDF), large early release frequency (LERF),

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1 NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," Volumes 1 and 2, September 2005 (ADAMS Package Accession No. ML15167A396).

2 NUREG/CR-7010, "Cable Heat Release, Ignition, and Spread in Tray Installations during Fire (CHRISTIFIRE)," Volume 1: Horizontal Trays, July 2012 (ADAMS Accession No. ML12213A056).

and change in LERF (ΔLERF) will be included in the integrated analysis as part of the response to PRA RAI 03.

Fire Modeling RAI 02

LAR, Section 4.5.1, states, in part, that:

> In accordance with the guidance in [Regulatory Guide] RG 1.205,[3] a Fire PRA model was developed for DBNPS in compliance with the requirements of Part 4 "Requirements for Fires At Power PRA," of the American Society of Mechanical Engineers (ASME) and American Nuclear Society (ANS) combined PRA Standard, ASME/ANS RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Application," ...

Part 4 of ASME/ANS RA-Sa-2009 requires damage thresholds be established to support the fire PRA. Thermal impacts must be considered in determining the potential for thermal damage of structures, systems, and components, and appropriate temperature and critical heat flux criteria must be used in the analysis. The LAR does not address the potential failure of sensitive electronics immersed in the lower layer due to the combined effect of the elevated temperature of the lower layer and thermal radiation from the hot gas layer.

Describe the treatment of sensitive electronics throughout the plant where they are in the lower parts of a room when there is a hot gas layer in the upper part of a room. Provide technical justification for such treatment if it is assumed that the electronics do not fail.

Fire Protection Engineering (FPE) RAI 01

The licensee has proposed a license condition that would require implementation of the plant modifications listed in Table S-1, "Plant Modifications Committed," in LAR, Attachment S. In addition, the LAR states that the items listed in Table S-2, "Implementation Items," will be completed prior to implementation of the NFPA 805 fire protection program. The NRC staff identified several inconsistencies between information in other sections of the LAR and Attachment S. Revise Tables S-1 and S-2, as appropriate, or justify the following inconsistencies:

a. Table S-2 does not include the following open items identified in Table B-1: DB-0779, DB-1900, DB-0540, DB-1912, DB-1838, and DB-2041.

b. Table S-2, Implementation Item DB-1825, references Attachment Z, which does not exist.

c. Table B-3 states that modification DB-2033 will be tracked for implementation under LAR, Attachment S. This modification is not listed in Attachment S.

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[3] NRC Regulatory Guide 1.205, Revision 1, "Risk-Informed, Performance-Based Fire Protection for Existing Light Water Nuclear Power Plants," dated December 2009 (ADAMS Accession No. ML092730314).

d. Section 4.7.1 of the LAR states that the fire protection design-basis document and supporting documentation will be created as part of the transition to NFPA 805. This action is not listed as an implementation item in Table S-2.

e. Section 4.7.2 of the LAR discusses the configuration control process as it applies to the requirements in NFPA 805. Changes to the configuration control process are not listed as an implementation item in Table S-2.

f. In LAR, Attachment L, Approval Request 1, the licensee stated in the discussion of defense-in-depth echelon 1 that procedure changes ensure future cable installations above suspended ceilings will be listed for plenum use or enclosed per NFPA 805, Section 3.3.5.1. The approval request and Table S-2 do not identify these procedure changes as an implementation item.

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 in order to understand the effects of fire and fire suppressants on nuclear safety performance criteria (NSPC). Section 1.6.4.1, "Qualifications," of NRC Regulatory Guide (RG) 1.189, Revision 2, "Fire Protection for Nuclear Power Plants," September 2009 (ADAMS Accession No. ML092580550), states, in part, that:

> The brigade leader should be competent to assess the potential safety consequences of a fire and advise control room personnel. Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant systems.

In LAR, Attachment A (p. 67), the licensee stated that the fire brigade members are qualified through a training program that is maintained by the training organization. The licensee further stated that qualification requirements detailed in its plant procedures include knowledge of plant systems, layout, and general operation, as well as firefighting skills and attack strategy.

Describe the training that is provided to the fire brigade leader and members that ensures their ability to assess the effects of fire and fire suppressants on the NSPC.

FPE RAI 03

In LAR, Section 4.6.2, "Overview of Post-Transition NFPA 805 Monitoring Program," Phase 3, the licensee stated that the Electric Power Research Institute (EPRI) Technical Report 1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features," will be used as input for establishing reliability targets, action levels, and monitoring frequency for fire protection systems and features. The methodology in EPRI Technical Report 1006756 is a performance-based approach to determining acceptable surveillance frequencies for fire protection systems and features that are different than the surveillance frequencies described in the appropriate NFPA code or standard. This performance-based methodology is an alternative method to meeting the NFPA code or standard for the applicable NFPA 805, Chapter 3, requirements for the fire protection system and features. During the onsite audit, the licensee indicated that its current fire protection program revised the frequency of performing the inspection, testing, and maintenance of certain fire protection systems and features using a performance-based method and that some surveillance frequencies are different than the frequencies required by the appropriate NFPA codes and standards. However, the LAR does not appear to include an associated request for approval to use a performance-based method as required by 10 CFR 50.48(c)(2)(vii).

Clarify whether the LAR is requesting NRC approval for the use of a performance-based method to determine or adjust fire protection surveillance frequencies in accordance with 10 CFR 50.48(c)(2)(vii) or explain why NRC approval is not needed. If NRC approval is requested, provide the information specified in RG 1.205, Section 2.2.2, "Performance-Based Methods for Fire Protection Program Elements and Minimum Design Requirements."

FPE RAI 04

NFPA 805, Section 3.3.5.3, requires that electric cable construction comply with a flame propagation test acceptable to the authority having jurisdiction. In LAR, Attachment A1, "Table B-1 Transition of Fundamental Fire Protection Program and Design Elements Worksheet," the licensee stated (p. 41) that it complies with NFPA 805, Section 3.3.5.3, by previous approval and referenced the NRC safety evaluation dated May 30, 1991 (ADAMS Accession No. ML033490026). The licensee indicated that the fire test used to qualify electric cable initially installed at the plant did not conform with the methodology in the Institute for Electrical and Electronics Engineers (IEEE) Standard No. 383, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices and Connections for Nuclear Power Generation Stations," but rather an alternative was used.

a. In the NRC safety evaluation, the NRC staff accepted the deviation based on the levels of fire protection (e.g., fire detection, fire suppression, and fire barriers) provided for safe shutdown systems and hazardous areas as described in Revision 1 of the licensee's fire area optimization report and in Revision 12 of the licensee's fire hazards analysis report. Describe that the fire protection systems and features credited in the NRC's previous approval of the cable tests.

b. In LAR, Attachment A1 (p. 41), the licensee stated that there are limited amounts of thermoplastic cables and they account for less than 10 percent of the cables in trays. The licensee requested approval of a performance-based method in LAR, Attachment L, Approval Request 2, for the installed thermoplastic cables. In its basis for maintaining the safety margin and defense-in-depth, the licensee stated that flame spread to adjacent cable trays in high density safety-related areas is reduced by the use of solid-bottom trays with a layer of ceramic fiber on top. The licensee further stated that the detailed fire models, as well as the PRA, identified and accounted for thermoplastic cable impacts. Identify the fire areas where this passive feature is credited in the fire risk evaluation to meet the NSPC.

FPE RAI 05

Section 2.3.2 of RG 1.205 provides guidance on using previously approved alternatives to meet NFPA 805 requirements. The guidance indicates that licensees can use existing exemptions or deviations to demonstrate compliance with NFPA 805, provided the licensee acceptably addresses the continued validity of any exemption or deviation in effect at the time of the NFPA 805 licensee amendment application. In LAR, Attachments A1 and A2, the licensee used previous NRC approval as the basis for complying with certain NFPA 805, Chapter 3, design elements. However, the LAR did not specify if the previous NRC approval remains valid for NFPA 805, Sections 3.3.5.1, 3.3.5.3, and 3.8.1.

Discuss why the previous NRC approval remains valid for NFPA 805, Sections 3.3.5.1, 3.3.5.3, and 3.8.1, and for any other NFPA 805 sections where the LAR does not clearly specify that the previous NRC approval remains valid.

FPE RAI 06

NFPA 805, Section 3.5.5, requires that each fire pump and its driver and controls be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers. In connection to this requirement, LAR, Attachment L, Approval Request 4, requests approval for the remote start circuit separation configuration of the remote control circuits to each fire pump. The following information is needed for the NRC staff to review this approval request:

a. Approval Request 4 only discusses the fire effects on control cables associated with the fire pumps, and does not appear to discuss the routing or consequences of damage to the power cable to the electric pump. In addition, the licensee indicated that a loss of offsite power to the electric fire pump could occur due to a fire in fire compartments FF-01 and DD-01, but the licensee did not discuss the fire effects of a loss of offsite power coincident with the loss of remote and local control of the diesel fire pump.

   Describe how at least one fire pump will remain available to supply the fire suppression systems, hydrants, and hose stations in the fire areas where the control cable for the diesel fire pump is affected by a fire, coincident with the loss of power to the electric fire pump.

b. Approval Request 4 states that in fire compartments BG-01 and DD-01, cables are routed independently in solid-bottom trays with a layer of ceramic fiber on top. Clarify if these passive fire protection features are credited to limit fire damage to both redundant fire pumps in fire compartments BG-01 and DD-01 to ensure that at least one fire pump will remain available to provide the required flow to credited fire suppression systems, yard hydrants, and hose stations.

c. In its discussion of impact on the NSPC, the licensee stated:

   > A fire in fire compartment BG-01, DD-01, or FF-01 that renders the starting circuits for both fire pumps inoperable would not affect the ability to supply the required fire water during a fire since the fire pumps are not relied upon for nuclear safety functions. In the event of damage to both fire pumps' starting circuits, it would not affect the ability to perform an emergency start of the pump. The plant is also provided with an alternate means of manual

suppression via fire extinguishers to contain the fire while the electric fire pump is being manually locally started.

In LAR, Table 4-3, the licensee identified the automatic suppression systems in fire area DD-01 to be required to meet the NSPC.

Discuss how the delay in fire pump availability due to a manual local start will affect the results of the nuclear safety capability assessment (NSCA) for fire compartment DD-01. Describe how the fire protection defense-in-depth will be maintained if the fire pump availability is delayed to the sprinkler systems, hydrants, and hose stations.

FPE RAI 07

NFPA 805, Section 3.11.2, requires that fire barriers required by Chapter 4 include a specific fire resistance rating and be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire tests. In LAR, Attachment A2, for various compartments and rooms (e.g., fire compartment V-01 room 405, fire compartment DG-01 room 402), the licensee stated that it will comply with previous approval for structural steel that could not be adequately fireproofed. The licensee stated that overhead sprinklers have been provided rather than applying the fireproof coating. In LAR, Table 4-3, the licensee identified fire protection systems and features that are credited to meet the NSPC required by NFPA 805, Chapter 4. The automatic sprinkler system in several rooms (e.g., rooms 402 and 405) were not identified as a system required for the previously approved licensing action. Clarify whether the sprinkler system in room 402, room 405, and other rooms identified in the previous approval are required systems credited to meet the NSPC.

FPE RAI 08

NFPA 805, Section 3.3.7.2, requires outdoor high-pressure flammable-gas storage containers be located so that the long axis is not pointed at buildings. In LAR, Attachment A1 (p. 46), the licensee stated that the hydrogen and propane storage tanks are oriented with the long axis toward buildings. The licensee stated that it complies with NFPA 805, Section 3.3.7.2, using an existing engineering equivalency evaluation. The licensee stated that outdoor flammable-gas storage orientation was evaluated for compliance with NFPA 50A-1973, "Standard for Gaseous Hydrogen Systems at Consumer Sites," and NFPA 58-2004, "Liquid Petroleum Gas Code," and concluded that the orientation of the tanks is acceptable. However, NFPA 805, Section 3.3.7.2, is not associated with compliance with other codes.

The information provided in the LAR is not sufficient to support the licensee's statement that it complies with NFPA 805, Section 3.3.7.2, by use of an existing engineering equivalency evaluation. The NRC staff reviewed the evaluation as part of its audit of licensee documents (see ADAMS Accession No. ML16075A111), and it appears that the evaluation included use of an unapproved risk-informed, performance-based method.

a. Provide a summary of the methods used in the evaluation, including any risk-informed, performance-based methods. For each risk-informed, performance-based method, clarify whether the LAR is requesting NRC approval in accordance with 10 CFR 50.48(c)(2)(vii) or explain why NRC approval is not needed. If NRC approval is requested, provide the information specified in RG 1.205, Section 2.2.2.

b. Verify that the outdoor high-pressure flammable-gas storage configurations meet the distance requirements in the code of record. Demonstrate that structures, systems, and components important to nuclear safety will not be adversely impacted by a failure of the outdoor high-pressure flammable-gas storage containers.

FPE RAI 09

NFPA 805, Section 3.3.7.1, requires that storage of flammable gas be located outdoors, or in separate detached buildings, so that a fire or explosion will not adversely impact systems, equipment, or components important to nuclear safety. This section also requires NFPA 50A be followed for hydrogen storage. In LAR, Attachment A1 (p. 45), the licensee stated it complies in that flammable-gas storage is "located outdoors, or in separate detached buildings." The licensee also stated that it complies by previous NRC approval and included an excerpt from the NRC safety evaluation dated May 30, 1991.

The LAR does not clearly distinguish between the parts of NFPA 805, Section 3.3.7.1, that DBNPS complies with and the parts where previous NRC approval is credited. The LAR also does not sufficiently describe the specific NFPA code conformance analysis.

Identify the parts of NFPA 805, Section 3.3.7.1, that DBNPS complies with and the parts where previous NRC approval is credited. Describe the applicability of the previous NRC approval to compliance with NFPA 805, Section 3.3.7.1, that clearly connects the approval with the criteria in this element. Where previous NRC approval is credited to demonstrate compliance, address why the approval remain valid. In addition, clarify whether the flammable-gas storage is located outdoors or is in one or more separate attached buildings.

Safe Shutdown Analysis (SSA) RAI 01

NFPA 805, Section 4.2.1, requires that the effects of fire suppression activities on the ability to achieve the NSPC be evaluated. In LAR, Attachment C (p. 308), the licensee stated that for fire compartment OS (outside areas), impacts to equipment due to activation of the automatic suppression located in OS-02, rooms 001 and 002, are beyond the scope of the detailed fire model analysis and are to be treated as an uncertainty. Clarify the basis for the statement and describe if the fire suppression activities in these rooms will adversely affect the ability to achieve the NSPC.

SSA RAI 02

As described in NFPA 805, Chapter 1, the standard applies to plants during all phases of plant operations, including shutdown. In LAR, Section 4.3.2, the licensee summarized the results of the evaluation process for non-power operations (NPO). Provide the following information pertaining to NPO discussions provided in the results discussion in LAR, Section 4.3, and LAR, Attachment D.

a. LAR, Section 4.3.2, states that for those components which had not been previously analyzed in support of the at-power analysis or whose functional requirements may have been different for the NPO analysis, cable selection was performed in accordance with the project procedures. Provide a general description of components that are different for the NPO analysis.

b. LAR, Attachment D, states the licensee followed the guidance of Frequently Asked Question (FAQ) 07-0040, "Non-Power Operations Clarifications," dated August 11, 2008 (ADAMS Accession No. ML082200528). In LAR, Attachment D, the licensee stated that 46 fire compartments were found to have pinch points resulting in the potential loss of one or more key safety function success paths. For fire compartments with pinch points that result in a complete loss of any key safety function, describe the methods that will be used to ensure that the NSPC are achieved and maintained.

c. During NPO modes, spurious actuation of valves can have a significant impact on the ability to maintain a key safety function. Provide a description of any actions (e.g., pre-fire rack-out, actuation of pinning valves, and isolation of air supplies) 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.

d. The description of the NPO review in the LAR does not identify locations where key safety functions are achieved by recovery actions (RAs) or for which instrumentation not already included in the at-power analysis is needed to support RAs required to maintain safe and stable conditions. Identify those RAs and instrumentation relied upon in the NPO, and describe how RA feasibility is evaluated. Include in the description whether these variables have been or will be factored into operator procedures supporting these actions.

SSA RAI 03

In LAR, Section 4.2.1.1, the licensee indicated that the method used to perform the NSCA either meets the NRC-endorsed guidance in Chapter 3 of Nuclear Energy Institute (NEI) 00-01, Revision 2, "Guidance for Post-Fire Safe Shutdown Circuit Analysis" (ADAMS Accession No. ML091770265), or meets the intent of the endorsed guidance with adequate justification. NEI 00-01, Section 3.5.1.1, states that for ungrounded direct-current circuits, multiple shorts-to-ground are to be evaluated for their impact and a single hot short from the same power source is assumed to occur unless it can be demonstrated that the occurrence of a same source short is not possible in the affected fire area. In LAR, Attachment B, "Table B-2 Nuclear Safety Capability Assessment, Methodology Review," the licensee stated that it aligns with the intent of the NEI 00-01 guidance. However, in its discussion relative to multiple high-impedance faults, the licensee stated that existing circuit analyses relied on ungrounded direct-current circuits of the proper polarity not faulting in some cases. Provide the technical basis for the assumption that ungrounded direct-current circuits of the proper polarity will not fault and discuss how this methodology meets the intent of the guidance in NEI 00-01 with respect to circuit failures for ungrounded direct-current circuits.

SSA RAI 04

In LAR, Section 4.2.1.1, the licensee indicated that the method used to perform the NSCA either meets the NRC-endorsed guidance in Chapter 3 of NEI 00-01, Revision 2, or meets the intent of the endorsed guidance with adequate justification.

NEI 00-01, Section 3.5.1.2, describes the spurious operation criteria to address the effect of multiple spurious operations. In LAR, Attachment B (p. 92), the licensee stated that it is, "Not in Alignment, but no Adverse Consequences," with the NEI 00-01 guidance. However, in the alignment basis, the licensee stated that emergent industry issues related to multiple spurious operations are being addressed during the transition to NFPA 805, and that the issues were reviewed and analyzed per the guidance provided in NEI 00-01 and NEI 04-02, Revision 2, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)" (ADAMS Accession No. ML081130188). In LAR, Attachment F, the licensee stated it conducted the review of multiple spurious operations in accordance with NEI 04-02, Revision 1, and RG 1.205, Revision 0, as supplemented by FAQ 07-0038, "Lessons Learned on Multiple Spurious Operations" (ADAMS Accession No. ML110140242).

Describe the specific methodology that is not in alignment with NEI 00-01, and either provide justification for deviating from the NEI guidance or discuss how the NSCA methodology will align with the guidance in NEI 00-01, Revision 2.

SSA RAI 05

NFPA 805, Section 4.1, requires that once a determination has been made that a fire protection system or feature is required to achieve the performance criteria of Section 1.5, its design and qualification shall meet the applicable requirement of Chapter 3. In LAR, Table 4-3, the licensee identified that 1-hour fire rated electrical raceway fire barrier systems (ERFBS) are credited in fire compartment A-08, for example, to protect cables that are required to achieve and maintain the NSPC. In LAR, Table 4-3, under the heading "Other," the licensee also identified that 1-hour fire rated ERFBS and cable tray systems that are protected on three sides by metal covers and on top by ceramic fiber (e.g., Kaowool) are credited to protect selected cables for risk reduction.

Clarify the basis for differentiating these "other" types of fire barrier features from the fire barriers credited as an ERFBS, and clarify whether these "other" types of fire barriers systems will meet NFPA 805, Section 3.11.5, or the appropriate Chapter 3 requirement. For those types of fire barrier systems that do not meet NFPA 805, Section 3.11.5, describe and justify how the risk reduction credit will be determined.

SSA RAI 06

NFPA 805, Section 4.3.2, allows the use of RAs to demonstrate availability of a success path for the NSPC. Feasibility of the RA can be demonstrated by applying the feasibility criteria and guidance in FAQ 07-0030, "Establishing Recovery Actions" (see ADAMS Accession Nos. ML103090602 and ML110070485). One of the criteria in FAQ 07-0030 is to perform periodic drills that simulate the conditions to the extent practical. In LAR, Attachment G, "Recovery Actions Transition," the licensee stated that it will update the fire brigade drills after completion of the procedures and training, and identified this as an Implementation Item DB-1941 in LAR, Attachment S, Table S-2. The activities performed by the fire brigade are generally focused on fire fighting and suppression of a fire in the plant. Discuss the proposed changes to the fire brigade drills and address whether any fire brigade members are credited to perform any RAs required to meet the NSPC.

SSA RAI 07

The nuclear safety goal described in NFPA 805, Section 1.3.1, requires that reasonable assurance be provided such 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 LAR, Section 4.2.1.2, the licensee described the methods used to maintain safe and stable hot standby conditions. The licensee stated that inventory makeup to the reactor coolant system (RCS) will be required to account for nominal RCS leakage and RCS shrinkage due to cooldown, as well as reactor coolant pump (RCP) seal injection. In LAR, Attachment G, the licensee identified a number of RAs associated with variances from deterministic requirements (VFDRs) that involve a loss of RCP seal cooling via the seal injection flow path (e.g., VFDRs DB-1029, DB-1381, DB-1383). The licensee stated that within 8 hours, the RA will involve manually aligning seal injection flow to all the RCP seals, manually align component cooling water to the RCP thermal barrier, or cooling down the RCS to place the plant between 280 degrees Fahrenheit (°F) and 350 °F. The first two options reestablish RCP seal cooling to prevent a loss-of-coolant accident through the seal.

Discuss how maintaining the RCS temperature between 280 °F and 350 °F is sufficient to prevent RCP seal failure. Clarify if the operator activities to cool down the plant to an RCS temperature between 280 °F and 350 °F are required to maintain safe and stable conditions. Describe the specific RAs required to be performed, if any, to achieve and maintain this condition.

SSA RAI 08

NFPA 805, Section 4.2.4, requires that when the use of RAs has resulted in the use of a performance-based approach, the additional risk presented by their use is to be evaluated. In LAR, Attachment G (p. G-51), the licensee identified an RA required for risk reduction in fire compartment G-02, which is associated with tripping auxiliary feed pump 1 and its solenoid control valve, and the licensee indicated that this RA is associated with VFDR DB-1184. However, this VFDR is not identified in the NSCA summary for fire compartment G-02 in LAR, Attachment C.

Clarify whether VFDR DB-1184 is applicable to fire compartment G-02. If so, confirm that the RA identified for fire compartment G-02 is required and that the additional risk presented by its use was evaluated in this fire compartment.

SSA RAI 09

NFPA 805, Section 4.2.4, requires that when the use of RAs results in the use of a performance-based approach, the additional risk presented by their use be evaluated. In LAR, Attachment C, the licensee identified RAs as required to meet the risk, safety margin, and defense-in-depth acceptance criteria in the resolution of VFDR DB-1923 in fire compartment II-01 and VFDRs DB-1227 and DB-1268 in fire compartment V-01. However, the licensee did not identify the RAs in LAR, Attachment G. Provide any additions to LAR, Attachment G, as appropriate, and address the following:

a. Clarify whether the RAs are required for risk or defense-in-depth to resolve VFDRs DB-1923, DB-1227, and DB-1268. If so, verify that the RA is feasible, and verify that the additional risk of their use has been included in the fire area risk reported in LAR, Attachment W.

b. Confirm that there are no other VFDRs in the NSCA that credit RAs to meet the NSPC that are not identified in LAR, Attachment G. Identify any discrepancies, clarify whether the RA is required to meet the NSPC, and verify that the RA is feasible.

SSA RAI 10

NFPA 805, Section 4.2.1, requires that one success path necessary to achieve and maintain the NSPC be maintained free of fire damage by a single fire. In LAR, Attachment C, for all fire compartments, the licensee referenced VFDR DB-2012, which states:

> Fire damage to installed makeup pumps could result in loss of ability to maintain RCS Inventory and Pressure. This could challenge the NSPC for Inventory and Pressure. This is a separation issue.

The LAR states that this VFDR will be corrected by plant modification ECP 13-0463, which installed additional RCS charging pumps, connections, and associated auxiliaries. The LAR further indicates that these modifications are associated with the development of diverse and flexible coping strategies (FLEX). However, the LAR does not provided sufficient information on how the disposition of this VFDR meets the NSPC. Provide the following information related to the disposition of VFDR DB-2012:

a. Discuss the extent to which fire damage to installed makeup pumps and other systems and components would affect RCS inventory and pressure control (e.g., spurious operations that involve RCS inventory loss, shrinkage due to fire-induced secondary system cooldown).

b. Describe the modifications associated with ECP 13-0463. Describe the RAs that will be required to use the additional RCS charging pumps. Explain how the modifications and RAs will adequately meet the NSPC associated with RCS inventory and pressure control.

c. Confirm that the RAs associated with the RCS charging pumps, connections, and associated auxiliaries are determined feasible in accordance with FAQ 07-0030, "Establishing Recovery Actions," in every fire compartment where these modifications are credited. Describe the thermal-hydraulic analysis used to establish the feasibility of the RAs, including assumptions.

SSA RAI 11

NFPA 805, Section 4.1, requires that once a determination has been made, a fire protection system or feature is required to achieve the performance criteria of Section 1.5, and its design and qualification shall meet the applicable requirements of Chapter 3. In LAR, Table 4-3, the licensee identified that "other" fire protection features are credited in a licensing action and identified Licensing Action 8, "Manhole MH3001 Cable Separation," in LAR, Attachment C, as required to meet the NSPC. However, LAR, Attachment K, does not identify any fire protection system or feature required for the basis of the previous approval of Licensing Action 8.

Clarify whether fire protection systems and features are required in Licensing Action 8 to meet the NFPA 805, Chapter 4, requirements, and verify that it meets the applicable NFPA 805, Chapter 3, requirements.

SSA RAI 12

The regulations in 10 CFR 50.48(c)(2)(vii) permit licensees to request NRC approval to use performance-based methods for the fire protection program elements and minimum design requirements in NFPA 805, Chapter 3.

Section 2.3.2 of RG 1.205 provides guidance on using previously approved alternatives to meet NFPA 805 requirements. The guidance indicates that licensees can use existing exemptions or deviations to demonstrate compliance with NFPA 805, provided the licensee acceptably addresses the continued validity of any exemption or deviation in effect at the time of the NFPA 805 licensee amendment application.

Licensing Action 2 of LAR, Attachment K, states that an existing exemption to the separation requirements for the component cooling water pumps located in fire compartment T-01 will be transitioned to NFPA 805. The LAR states that transition of this exemption requires NRC approval and is included in LAR, Attachment L, as Approval Request 8. The LAR indicates that the approval requests in Attachment L are being requested in accordance with 10 CFR 50.48(c)(2)(vii). However, Approval Request 8 is associated with a deviation from deterministic separation requirements in NFPA 805, Chapter 4. Thus, Approval Request 8 cannot be approved under 10 CFR 50.48(c)(2)(vii) since this regulation applies only to NFPA 805, Chapter 3, requirements.

Revise the LAR to withdraw Approval Request 8. Describe how the component cooling water pump separation issue in fire compartment T-01 will meet the requirements of NFPA 805, Chapter 4. Alternatively, describe any associated plant modifications that will be used meet the NFPA 805, Chapter 4, requirements, and provide the necessary implementation items for LAR, Attachment S.

PRA RAI 01 – Internal Events PRA Gap Findings and Facts and Observations

Attachment U, "Internal Events PRA Quality," of the LAR provides information regarding the peer review of the DBNPS internal events PRA. The following questions relate to disposition of the internal events gap assessment findings and facts and observations (F&Os) associated with this peer review.

a. Gap Finding for Supporting Requirement HR-A1 – Pre-Initiators

The gap assessment finding associated with supporting requirement HR-A1 states that the licensee's modeling of pre-initiator human failure events (HFEs) was limited to events identified as "potentially important." The gap assessment finding observed that the risk significance of a pre-initiator can be sensitive to the configuration modeled in the PRA. The LAR does not define the quantitative criteria used to screen pre-initiators and does not explain how risk-significant pre-initiators, which were previously screened, will be considered in future updates to the PRA to reflect changes in plant configuration.

i. Describe the approach of screening potential pre-initiator HFEs based on risk significance. Include a discussion of the criteria used to justify that the excluded events are insignificant to the NFPA 805 application. Alternatively, confirm that these events will be included in the integrated analysis provided in response to PRA RAI 03.

ii. Provide an implementation item for LAR, Table S-2, to update the risk significance determination of pre-initiators as part of the PRA maintenance and upgrade process, or justify why it is not necessary. The justification should explain how DBNPS will ensure that risk-significant pre-initiator HFEs will not be excluded in post-transition updates to the PRA.

b. F&O LE-E4-01 – Circular Logic

F&O LE-E4-01 states that it was difficult to determine if circular logic was appropriately modeled, and the LAR does not provide additional details on how circular logic was modeled. Describe how circular logic loops were modeled. Provide the bases (e.g., timing associated with the particular equipment) for breaking the circular logic and justify that the treatment does not exclude important risk contributors, such as dependent failures.

PRA RAI 02 – Fire Events PRA F&Os

Attachment V, "Fire PRA Quality," of the LAR provides information regarding the peer review of the fire PRA. The following questions relate to the disposition of the associated F&Os and supporting requirement assessments related to this peer review.

a. F&O PP-C3-01 – Spatial Separation and Active Barriers

F&O PP-C3-01 cites a lack of documented justification for non-rated fire barriers and refers to use of spatial separation and active fire barriers for which there are specific considerations that need to be addressed to credit them in the fire PRA. The disposition to the F&O does not explain whether or how spatial separation or active fire barriers were credited in the fire PRA.

i. If spatial separation is credited in the fire PRA, describe the physical characteristics that justify use of spatial separation and explain how the approach is consistent with the guidance in NUREG/CR-6850. Include a description of the distance used to define spatial separation, and describe the basis for justifying that this space is absent of combustibles and fire ignition sources. If the approach is not consistent with the guidance in NUREG/CR-6850, justify the approach, or confirm that an acceptable approach will be included in the integrated analysis provided in response to PRA RAI 03.

ii. If active fire barriers are credited in the fire PRA, describe these systems and explain how the approach is consistent with guidance in NUREG/CR-6850. Include a discussion of possible fire impact on any cables associated with the active system or fire impacts on other parts of the system that could defeat the barrier. If the approach is not consistent with guidance in NUREG/CR-6850, justify the approach, or confirm that an acceptable approach will be included in the integrated analysis provided in response to PRA RAI 03.

b. F&O CS-B1-02 – Modeling Inadequate Circuits

The disposition to F&O CS-B1-02 identifies calculations that, "include some cases where protective device coordination is not confirmed," and describes specific instances of inadequate breaker fuse coordination. The disposition explains that, "[i]n these cases, the components and busses were identified as failed (assigned to UNL [unlocated] in the Fire PRA)." Based on this, it is not clear how the inadequate circuits were modeled in the fire PRA.

i. Explain how inadequate breaker/fuse coordination was modeled in the fire PRA and justify that this treatment addresses the failures that could occur as a result of the identified potential circuit inadequacies.

ii. Identify the failure modes addressed and discussion of how they were modeled in the fire PRA. Describe and justify the assumptions made in the fire PRA about how fire-induced faults associated with the inadequately coordinated circuits would impact components upstream and downstream from the fault.

iii. If demonstration of breaker/fuse coordination relies on cable length (such a case is cited in the F&O), then justify that assumptions made for cables evaluated as part the fire PRA relying on cable length are consistent with guidance in NUREG/CR-6850. Guidance in NUREG/CR-6850 states that although commonly employed for Appendix R coordination, the use of cable length does not generically apply to fire PRA analysis, since compartment-level and scenario-level reviews are conducted. Alternatively, confirm that modeling of inadequate circuits associated with these cables will be included in the integrated analysis provided in response to PRA RAI 03.

iv. Confirm that the circuit protection is adequate for (1) cables associated with components modeled in the fire PRA, (2) cables in a common enclosure with cables associated with fire PRA components, and (3) cables that could produce a secondary fire or high energy arc fault that impacts cables associated with components modeled in the fire PRA.

c. F&O PRM-B7-01 – Exclusion of Pilot-Operated Relief Valve (PORV) Failure Mode

F&O PRM-B7-01 states that a thermal hydraulic analysis is needed to support the assumption made in the fire PRA regarding a failure of the PORV to reclose following closure of main steam isolation valves (MSIVs) or loss of main feedwater. The F&O further state that PRAs for similar plant designs have included this failure mode and have found it to be a measureable contributor to core damage. The disposition to F&O PRM-B7-01 states, in part, that:

> ... a simulator evaluation was run, which proved the PORV set point is higher than the pressure limits reached following closure of the MSIVs. Therefore, the PORV will not open, and a failure of the PORV to reclose was not added to the model.

The applicability of a simulator run as the basis for establishing success criteria for the fire PRA is not clear. Justify how a simulator run constitutes a thermal hydraulic analysis and provides an adequate basis to support exclusion of the cited PORV failure mode. Alternatively, provide a basis that does not rely on a simulator run or confirm that this failure mode will be included in the integrated analysis provided in response to PRA RAI 03.

d. F&O PRM-B7-02 – Update of the Fire PRA After Modifications are Complete

The disposition to F&O PRM-B7-02 indicates that the PRA model management procedure requires that the fire PRA be updated when modifications are implemented. Implementation Item DB-1695, "Revise PRA for Plant Modifications," in LAR, Attachment S, Table S-2, does not indicate which PRA is to be updated (i.e., the internal events PRA, fire PRA, or both) and does not specify a plan in the event that updated fire PRA results do not meet risk acceptance guidelines in RG 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," May 2011 (ADAMS Accession No. ML100910006). Also, Implementation Item DB-1695 does not indicate that updates to the fire PRA should include changes needed as a result of completing other implementation items such as an update of fire procedures.

Revise Implementation Item DB-1695 to include (1) updating the fire PRA following completion of modifications and other implementation items, and (2) a plan of action if the updated, as-built, as-operated fire PRA results in risk estimates that exceed RG 1.174, Revision 2, risk acceptance guidelines. The plan of action should include implementing additional modifications or refining the analytic estimates. Alternatively, justify why these revisions are not needed.

e. F&O PRM-B9-01 – Fire PRA Modeling of FLEX Equipment

The disposition to F&O PRM-B9-01 states that modeling of FLEX equipment credited in the fire PRA was expanded from a point estimate of 1E-2 into a system fault tree model. Implementation Item DB-1983 in LAR, Attachment S, Table S-1, identifies a modification consisting of two FLEX RCS charging pumps that are credited in the fire PRA model. LAR, Attachment G, Table G-1 (pp. G-8 to G-10), identifies deployment of a 480 volt alternating-current generator and manual alignment of a FLEX RCS charging pump as part of the RA. However, the generator is not listed in Table S-1. It is not clear what FLEX equipment is being credited in the fire PRA, what failures were modeled, or how potential fire impacts on credited FLEX equipment were addressed.

i. Describe the FLEX equipment and operator actions credited in the fire PRA. Clarify whether or not the generator mentioned above is FLEX equipment. Include discussion of whether the equipment currently exists, where it is located, and whether the equipment needs to be relocated and installed before using.

ii. Describe the procedures and guidance that will be used to install and operate the FLEX equipment for fire scenarios. Include a discussion of the specific actions and instructions for the use of FLEX equipment in fire scenarios that are or will be included in these procedures and guidance. Confirm that the development of these procedures and guidance has been completed. Otherwise, provide an implementation item for LAR, Table S-2, to complete the relevant procedures or justify why it is not needed.

iii. Confirm that the modeling of fire HFEs and a feasibility study of operator actions for the use of FLEX equipment in fire scenarios were performed, consistent with guidance in NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines - Final Report," July 2012 (ADAMS Accession No. ML12216A104). Otherwise, justify the basis for the human reliability analysis, or confirm that the human reliability analysis will be updated to be consistent with guidance in NUREG-1921 and included in the integrated analysis provided in response to PRA RAI 03.

iv. Explain how the fire scenario timeline for operator actions that implement FLEX actions was established. Describe the cues or indications operators will use to initiate use of FLEX equipment credited for fire scenarios and how the time available and time required to complete operator actions were estimated.

v. Explain how the failure rates/probabilities of hardware failures (e.g., random failures, unavailability due to testing and maintenance) associated with setup and operation of the FLEX equipment in fire scenarios was estimated. Explain how, after transition, the failure rates/probabilities for FLEX equipment will reflect actual equipment performance. Include a description of how plant-specific failure data associated with FLEX equipment will be developed. Provide an implementation item for LAR, Table S-2, to update the FLEX equipment failure rates/probabilities to reflect actual equipment performance as part of the PRA maintenance and upgrade process, or justify why it is not necessary.

vi. Explain how fire impacts to FLEX equipment were addressed in the fire PRA. If FLEX equipment needs to be relocated and installed, include discussion of the treatment of fire impact on the storage and installation locations of the FLEX equipment.

vii. During the onsite audit, the licensee indicated that the following four functions provided by FLEX actions and equipment were being credited in the fire PRA: emergency feedwater, RCS charging, backup power to the RCS charging pumps, and backup alternate low-pressure emergency feedwater. Provide the risk reduction (i.e., CDF and LERF) for each of these functions separately and the total risk reduction for all four functions together.

f. F&O PRM-B13-01 – Failure-to-Run Rate for Diesel-Driven Pumps After 1 Hour

F&O PRM-B13-01 discusses the new emergency feedwater system and indicates that the estimated failure-to-run rate for diesel-driven pumps after 1 hour (9.48E-5/hour) is inconsistent with more recent experience (2.16E-3/hour). Based on the disposition to F&O PRM-B13-01, it appears that the licensee continues to use the 9.48E-5/hour failure rate published in NUREG/CR-6928, "Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants," February 2007 (ADAMS Accession No. ML070650650), and not the updated failure rate of 2.16E-3/hour provided on the NRC reactor operational experience results and databases website, "Summary of SPAR [Simplified Plant Analysis Risk] Component Unreliability Data and Results".[4] LAR, Table W-3, indicates a very large risk reduction associated with the installation of the emergency feedwater system. This suggests that there could be a strong sensitivity in the fire PRA risk estimates to the cited failure rate.

Justify that the failure-to-run rate used for the new emergency feedwater system has an insignificant impact on the transition risk estimates and will have an insignificant impact on post-transition risk estimates supporting self-approval. Alternatively, confirm that the current NUREG/CR-6928 failure rate for the cited failure mode will be used in the integrated analysis provided in response to PRA RAI 03.

g. F&O PRM-B15-01 – Basis for Excluding Containment Buckling Scenario

The disposition to F&O PRM-B15-01 states that discussion of the LERF scenario identified in the F&O was added to the fire PRA documentation, but no change was made to the fire PRA model because subatmospheric containment pressure created by the scenario is not expected to challenge containment integrity.

Provide a basis for the statement that the cited scenario would not challenge containment integrity. Include a discussion of the normal leak rate and operator actions to vent containment and the extent to which they would offset negative pressure for the scenario. Alternatively, confirm that this scenario will be included in the integrated analysis provided in response to PRA RAI 03.

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[4] http://nrcoe.inel.gov/resultsdb/publicdocs/AvgPerf/ComponentUR2010.pdf.

h. F&O FSS-C8-01 – Fire PRA Credit for Use of Kaowool

The disposition for F&O FSS-C8-01 states that fire modeling calculations credits use of Kaowool. Explain how Kaowool is credited in the fire PRA and provide justification for this credit. Discuss the performance characteristics of Kaowool relative to how it is credited in the fire PRA and how it is monitored to ensure its continued performance.

i. F&O FSS-G2-01 – Multi-Compartment Scenario Screening

The disposition to F&O FSS-G2-01 states that the multi-compartment scenarios were screened based on estimated scenario frequency using guidance from NUREG/CR-6850, Section 11.5.4.4, without regard to the cumulative risk of screened scenarios.

i. Explain how DBNPS ensures that the cumulative risk contribution from the screened multi-compartment scenarios is insignificant for the transition to NFPA 805. Demonstrate that the cumulative risk contribution of screened multi-compartment scenarios has an insignificant impact on the fire risk estimates determined by the integrated analysis provided in response to PRA RAI 03.

ii. Confirm that the cumulative risk contribution of screened multi-compartment scenarios is evaluated as part of updating the fire PRA. Otherwise, add an implementation item to LAR, Table S-2, to determine the cumulative risk contribution of screened multi-compartment scenarios and to include the cumulative screened contribution in fire risk estimates in future self-approved changes, if significant, or justify why this is not needed. The response should consider that the proposed threshold for self-approved changes to the fire protection program is a risk increase less than 1E-7/year for CDF and less than 1E-8/year for LERF.

j. F&O IGN-A8-01 – Modeling Self-Ignited Cable Fires in Containment

The disposition for F&O IGN-A8-01 explains that self-ignited cable fires in containment do not meet the definition for fires to be included for fire ignition frequency Bin 12 (plant-wide self-ignited cable fires) and, therefore, the cable weight of containment cables was not included as part of the Bin 12 cable weight. From this explanation, it appears that self-ignition of containment cables was not addressed in the fire PRA. NUREG/CR-6850, Appendix R.1, states that, "self-ignited cable fires should be postulated in rooms with unqualified cables only or a mix of qualified and unqualified cables." Justify that self-ignited cable fires in containment have an insignificant impact on the application. Alternatively, confirm that modeling of self-ignited containment cable fires will be included in the integrated analysis provided in response to PRA RAI 03.

k. F&O CF-A1-01 – Use of Updated Guidance on Circuit Failure Mode Likelihood

F&O CF-A1-01 and its disposition indicate that updated guidance on circuit failure mode likelihood analysis provided in NUREG/CR-7150, "Joint Assessment of Cable Damage and quantification of Effects from Fire (JACQUE-FIRE)," Volume 2: Expert Elicitation

Exercise for Nuclear Power Plant Fire-Induced Electrical Circuit Failure," May 2014 (ADAMS Accession No. ML14141A129), have not yet been applied to the fire PRA. New guidance on using conditional probabilities of spurious operation for control circuits is contained in a letter dated April 23, 2014, from Joseph Giitter, NRC, to Michael Tschiltz, NEI, "Supplemental Interim Technical Guidance on Fire-Induced Circuit Failure Mode Likelihood Analysis" (ADAMS Package Accession No. ML14111A366), and in Section 7 of NUREG/CR-7150. This guidance includes:

i. Replacement of the conditional hot short probability tables in NUREG/CR-6850 for Option #1 (including removal of credit for control power transformers and conduit) with new circuit failure probabilities for single-break and double-break control circuits (Option #2 in NUREG/CR-6850 is no longer an adequate method and should not be used).

ii. Replacement of the probability of spurious operation duration shown by Figure 1 in FAQ 08-0051, "Hot Short Duration," dated April 1, 2010 (ADAMS Accession No. ML100900052),[5], for alternating-current control circuits and additional guidance to address duration for direct-current control circuits.

iii. A method for incorporation of the uncertainty values for the circuit failure probabilities and spurious operation duration in the state-of-knowledge correlation for developing the mean CDF and LERF.

iv. Recommendations on the hot short probabilities to use for other cable configurations, including panel wiring, trunk cables, and instrument cables.

Provide an assessment of the assumptions used in the fire PRA relative to the updated guidance in NUREG/CR-7150, Volume 2, specifically addressing each of the items (i through iv) above. If the fire PRA assumptions do not bound the new guidance, justify each difference or confirm that the guidance in NUREG/CR-7150, Volume 2, will be used in the integrated analysis provided in response to PRA RAI 03.

PRA RAI 03 – Integrated Analysis

Section 2.4.4.1 of NFPA 805 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, Revision 2, 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 additional information that is required to fully characterize the risk estimates.

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[5] Also see NUREG/CR-6850, Supplement 1, "Fire Probabilistic Risk Assessment Methods Enhancements," September 2010 (ADAMS Accession No. ML103090242).

The PRA methods discussed in the following RAIs may need to be revised to be acceptable by the NRC:

- Fire Modeling RAI 01.e regarding fire modeling plexiglass cabinet doors
- PRA RAI 01.a.i regarding screening of pre-initiator HFEs
- PRA RAI 02.a.i regarding spatial separation
- PRA RAI 02.a.ii regarding active fire barriers
- PRA RAI 02.b regarding inadequate circuits
- PRA RAI 02.c regarding exclusion of a PORV failure mode
- PRA RAI 02.f regarding emergency feedwater pump failure-to-run after 1 hour
- PRA RAI 02.g regarding containment buckling
- PRA RAI 02.i regarding multi-compartment scenario screening
- PRA RAI 02.j regarding self-ignited cable fires in containment
- PRA RAI 02.k regarding use of updated guidance in NUREG/CR-7150, Volume 2
- PRA RAI 06 regarding application of a minimum joint human error probability
- PRA RAI 07 regarding assumed cable routing
- PRA RAI 08 regarding state-of-knowledge correlation
- PRA RAI 09 regarding exclusion of transient fires in inaccessible floor space
- PRA RAI 15 regarding large risk reduction credit

This list may be revised following the NRC review of the licensee's response to all the RAIs (not just those listed here).

a. Provide the results of an aggregate analysis that provides the integrated impact on the fire risk (i.e., the total transition CDF, LERF, ΔCDF, and ΔLERF) 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.

b. For each method (i.e., each bullet) above, explain how the issue will be addressed in (1) 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 method to ensure that (1) all changes will be made, (2) a focused-scope peer review will be performed on changes that are PRA upgrades as defined in the PRA standard, and (3) 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. If applicable, include a description of any new modifications or operator actions being credited to reduce the change in risk, as well as a discussion of the associated impacts to the fire protection program.

d. If any unacceptable methods or weaknesses will be retained in the PRA that 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 unacceptable methods or weaknesses.

e. During the onsite audit, the licensee indicated that a number of fire PRA modeling improvements are being made that will be included as part of the integrated analysis. Identify and summarize the changes to the fire PRA model not associated with the RAIs cited above, and explain how each change is based on approaches acceptable to the NRC. If any unacceptable approach is used, it should be addressed under PRA RAI 03(d) above.

PRA RAI 04 – Internal Events PRA Peer Review

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," March 2009 (ADAMS Accession No. ML090410014), describes a peer review process using 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 U of the LAR explains that an assessment was performed in April 2008 by a contractor on the internal events PRA against supporting requirements in PRA Standard ASME/ANS RA-Sb-2005, "Addenda to ASME RA-S-2002 Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," dated December 30, 2005, as qualified by RG 1.200, Revision 1. Differences exist between the supporting requirements in PRA Standard ASME/ANS RA-Sb-2005, as qualified by RG 1.200, Revision 1, and the supporting requirements in ASME/ANS RA-Sa-2009, as qualified by RG 1.200, Revision 2. In accordance with RG 1.200, Revision 2, it is expected that the differences between the current version of the PRA standard and the earlier version of the standard used in the internal events PRA assessment be identified and addressed (i.e., a gap assessment be performed). While LAR, Table U-1, provides a cross-reference between the two versions of the standard, the LAR does not address the additional changes between the standards that would require re-evaluation of the PRA against the current ASME/ANS PRA standard. Provide a gap assessment of the internal events PRA against ASME/ANS RA-Sa-2009, as qualified by RG 1.200, Revision 2.

PRA RAI 05 – Internal Events PRA Focused-Scope Peer Review

Attachment U of the LAR explains that focused-scope peer reviews were performed by a contractor on the LERF element of the internal events PRA in October 2011, and on the internal flooding PRA in July 2012, using the current PRA standard. The licensee's March 7, 2016, supplement to the LAR states that the focused-scope peer reviews were performed using ASME/ANS RA-Sa-2009, but does not indicate that these reviews were consistent with RG 1.200, Revision 2, or met industry and NRC criteria (e.g., NEI 05-04 guidance). Clarify whether the focused-scope peer reviews were performed using PRA standard ASME/ANS RA-Sa-2009, as qualified by RG 1.200, Revision 2, and that the peer review process met criteria for a focused-scope peer review.

PRA RAI 06 – Minimum Joint Human Error Probability

NUREG-1921 discusses the need to consider a minimum value for the joint probability of multiple HFEs in human reliability analyses. NUREG-1921 refers to Table 2-1 of NUREG-1792, "Good Practices for Implementing Human Reliability Analysis (HRA)," April 2005 (ADAMS Accession No. ML051160213), which recommends that joint human error probability (HEP) values should not be below 1E-5. Table 4-4 of EPRI 1021081, "Establishing Minimum Acceptable Values for Probabilities of Human Failure Events," provides a lower limiting value of 1E-6 for sequences with a very low level of dependence. Therefore, the guidance in NUREG-1921 allows for assigning joint HEPs that are less than 1E-5, but only through assigning proper levels of dependency.

Confirm that each joint HEP value used in the fire PRA below 1E-5 includes its own justification that demonstrates the inapplicability of the NUREG-1792 lower value guideline (i.e., that the criteria for independent HFEs are met). Provide an estimate of the number of these joint HEP values below 1.0E-5, discuss the range of values, and provide at least two different examples where this justification is applied. Alternatively, confirm that joint HEPs of 1E-5 will be used in the integrated analysis provided in response to PRA RAI 03.

PRA RAI 07 – Assumed Cable Routing

RG 1.174 includes consideration of change in risk as part of the acceptance guidelines for risk-informed applications. The cable selection analysis, F&Os ES-A3-01, and PRM-B10-01, refer to a UNL logic list, and in the latter case, states that, "equipment not cable traced were assumed to be failed using the UNL tag." F&O FSS-E4-01 refers to cables that are failed due to assumed cable routing. The assumption that untraced cables are failed is a conservative approach for modeling untraced cables for the post-transition plant model but can lead to underestimation of the change in risk when used in the compliant plant model.

a. Describe the extent of untraced fire PRA cables and how they were treated in the fire PRA. Explain how they were treated in the compliant and post-transition plant models.

b. Explain how assumptions made about untraced cables do not significantly contribute to the underestimation of the transition change in risk. Alternatively, confirm that an acceptable approach will be used in the integrated analysis requested in PRA RAI 03.

PRA RAI 08 – State-of-Knowledge Correlation

Section W.3.1 of the LAR states that risk estimates provided in LAR, Table W-3, are based on point estimates rather than mean values, but that an uncertainty analysis was performed as a sensitivity study to support use of point estimates. In the variant case of the sensitivity study, mean values from parametric probability distributions were used, and a state-of-knowledge correlation was performed. The study results show that the difference between the CDF and LERF values, based on point estimates and mean values, are minimal. LAR, Section W.3.1, explains that the uncertainty analysis was performed using the software program UNCERT and that ignition frequency, weighting factors, and non-suppression probability were assumed to be independent. The LAR does not explain what fire parameters were correlated in the state-of-knowledge correlation. In addition, the UNCERT software tool is typically used for performing internal events uncertainty analysis, as opposed to fire event uncertainty analysis.

a. Clarify which fire parameters were addressed and correlated in the state-of-knowledge correlation. Provide justification for any circuit failure probabilities that were not addressed in the state-of-knowledge correlation, or confirm that this correlation will be included in the integrated analysis provided in response to PRA RAI 03.

b. Provide an implementation item for LAR, Table S-2, to update the use of point estimates and exclusion of state-of-knowledge correlation in the PRA maintenance and upgrade process, or justify why it is not needed. The justification should explain how DBNPS will ensure that the difference in estimated risk values based on using point values versus using mean values is still insignificant relative to the risk criteria for self-approval of post-transition changes (i.e., risk increase less than 1E-7/year for CDF and less than 1E-8/year for LERF).

PRA RAI 09 – Fire Modeling of Inaccessible Floor Space

LAR, Table J-2 (p. J-19), states that, "[t]ransient and hot work fires were not postulated in locations within fire compartments that were considered inaccessible." Inaccessible areas are defined, in part, as, "An area where access is prohibited or extremely difficult due to the presence of a permanent fixture (as defined above) and there is no credible reason to expect transient material to accumulate (e.g., areas on top of half height rooms, confined areas behind a floor to ceiling stack of cable trays with no expected reason for access)."

Guidance in NUREG/CR-6850 pertaining to exclusion of locations for transient fire analysis states:

> It is assumed that transient fires may occur at all areas of a plant unless precluded by design and/or operation, such as inside a BWR [boiling-water reactor] drywell or torus during power operation. Administrative controls significantly impact the characteristics and likelihood of transient fires, but they do not preclude their occurrence, since there is industry evidence of failure to follow administrative control procedures.

The exclusion of locations from transient fire analysis because there is no credible reason to expect accumulation of transient material does not appear to meet the guidance in NUREG/CR-6850. Furthermore, areas on top of half-height rooms and confined areas behind a floor-to-ceiling stack of cable trays are not visible during normal operation, and transient material accumulation could go unnoticed. Additionally, excluded transient fires near cable tray stacks could represent important risk contributors.

Justify that exclusion of locations because there is no credible reason to expect transient material, such as on top of half-height rooms and in confined areas behind a floor-to-ceiling stack of cable trays, is consistent with NRC guidance on transient fire analysis. Alternatively, confirm that these excluded transient locations will be included in the integrated analysis provided in response to PRA RAI 03.

PRA RAI 10 – Reduced Transient Heat Release Rates

Attachment J of the LAR (p. J-20) identifies three fire compartments (D-01, BF-01, and BG-01) for which the transient fire heat release rate is reduced from 317 kilowatts to 69 kilowatts, or 142 kilowatts, per the guidance endorsed by the June 21, 2012, memo from Joseph Giitter, NRC, to Biff Bradley, NEI, "Recent Fire PRA Methods Review Panel Decisions and EPRI 1022993, 'Evaluation of Peak Heat Release Rates in Electrical Cabinets Fires'" (ADAMS Accession No. ML12171A583). LAR, Attachment J, explains that walkdowns and review of combustible materials, flammable liquids, and activities in these areas provide a basis for assuming that the reduced heat release rate is consistent with the specific attributes and considerations applicable to those locations. LAR, Attachment J, also explains that transient combustible control permits are required prior to taking any combustible or flammable material into these areas and that compensatory actions will be implemented as appropriate. The criteria that triggers the need for a combustible control permit for fire compartments BF-01 and BG-01 is wood scaffolding or flammable liquids greater than one gallon.

a. Explain why combustible control permits are not required for solid combustibles other than wood scaffolding and how administrative controls justify the reduced heat release rates used for fire compartments BF-01 and BG-01 without restricting such combustibles.

b. Given that combustible and flammable materials are allowed to be taken into the three fire compartments for which a reduced heat release rate is credited, explain what kind of compensatory measures will be taken when such materials are taken into these fire compartments.

PRA RAI 11 – Main Control Room (MCR) Abandonment on Loss of Habitability

Section W.3.7 of the LAR and other sections indicate that fire modeling was performed to determine when the MCR needs to be abandoned due to loss of habitability and that the conditional core damage probabilities (CCDPs) of associated scenarios were evaluated using a simplified fault tree model. LAR, Table W-2, presents a single MCR abandonment scenario due to loss of habitability in the list of dominate fire scenarios but states that this single scenario represents "the summation of all scenarios leading to abandonment." The LAR did not describe the event tree logic that would define multiple scenarios for MCR abandonment due to loss of habitability. It is not clear whether the treatment of MCR abandonment due to loss of habitability addresses the complexity associated with the range of fire impacts that can occur from fires in the MCR. The NRC staff notes that use of overly conservative assumptions in the compliant plant model can lead to underestimation of the transition change in risk.

a. Describe how MCR abandonment was modeled for loss of habitability for the post-transition and compliant plant. Include an explanation of how the CCDPs and conditional large early release probabilities (CLERPs) were estimated. Include identification of the actions required to execute successful alternate shutdown and how they are modeled in the fire PRA, including actions that must be performed before leaving the MCR.

b. Explain how various possible fire-induced failures are addressed in the CCDP and CLERP estimates for fires that lead to abandonment due to loss of habitability. 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. Provide the range of CCDP and CLERP values determined for the post-transition and compliant plant models.

d. Provide the frequency of MCR abandonment scenarios due to loss of habitability for the post-transition and compliant plant cases.

PRA RAI 12 – Loss of Control from the MCR

The NRC staff reviewed the MCR analysis (C-FP-013.10-35) as part of its audit of licensee documents. The analysis indicated that the fire PRA treats scenarios where there is a loss of control from the MCR the same as any other fire scenario in which the control room remains habitable, with the exception of one scenario involving the whole panel burn of electrical distribution panel C5715. The LAR does not describe how the fire PRA modeled these loss of control scenarios. Fires that lead to loss of control in the MCR are inherently different from other fires in the MCR for which control is maintained.

The LAR does not indicate if the loss of control scenarios are conservatively modeled by assuming that such fires lead to core damage. The LAR also does not indicate if actions taken from the alternative shutdown panel were credited as RAs when command and control is retained in the MCR. The NRC staff notes that the information in the MCR analysis would not be sufficient to address these questions.

a. Indicate those locations in the plant for which fire could lead to loss of control in the MCR.

b. Explain how fire scenarios in the MCR or other locations that could lead to loss of control, such as the cable spreading room, were modeled. Explain whether RAs from the alternate shutdown panel are credited.

c. Provide an explanation of how various possible fire-induced failures are addressed in the CCDP and CLERP estimates for fires that lead to abandonment due to loss of control from the MCR. Specifically, include in this explanation a discussion of how the following scenarios are addressed. As a part of this response, indicate if the plant response is fully integrated into the PRA.

   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.

d. For MCR abandonment scenarios due to a loss of control, identify the range of CCDP and CLERP values determined for the post-transition models. Identify those scenarios that have a CCDP of 1, or explain why there are no such scenarios.

e. Indicate how the decision to abandon the MCR due to a loss of control is incorporated into the PRA model.

PRA RAI 13 – Calculation of the Change in Risk

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. RG 1.174 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. LAR, Section W.2.1, provides a high-level description of how the change in risk associated with VFDRs is determined, but additional information is needed to fully understand the approach.

a. Describe the types of model adjustments made to remove different types of VFDRs from the compliant plant model, such as adding events or logic, or use of surrogate events. Clarify whether the approach is consistent with guidance in FAQ 08-0054, "Demonstrating Compliance with Chapter 4 of National Fire Protection Action 805, Revision 1" (see ADAMS Accession No. ML15016A280 and associated references therein). In addition, identify any major changes made to the fire PRA models or data for the purpose of evaluating VFDRs.

b. For the MCR abandonment scenarios, describe the model adjustments that were made to remove the VFDRs to create the compliant plant model. Clarify the statement in LAR, Section W.2.1, that the compliant plant model for these scenarios, "includes setting the contribution from control room abandonment due to loss of habitability to zero." Describe any differences in how VFDRs were identified for MCR abandonment areas compared to non-abandonment areas.

c. Describe the types of VFDRs identified, and discuss whether and how the VFDRs identified, but not modeled in the fire PRA, impact the risk estimates. Describe the qualitative rational for excluding VFDRs from the change-in-risk calculations.

PRA RAI 14 – Additional Risk of Recovery Actions

LAR, Attachment W, provides the total additional risk of RAs for each fire area but does not provide a description of how the additional risk of RAs was calculated. Footnote 3 to LAR, Attachment W, Table W-3, states:

> There are many operator actions that are modeled in the PRA. In order to verify all operator actions are captured, the Additional Risk of RAs is equal to the All VFDR resolved case, and the delta is reported without credit for the risk offset; therefore, the threshold is exceeded. However, this value is not used for compliance with RG 1.174 or RG 1.205.

The meaning of this statement is not completely clear. For example, the CDF and LERF values reported in LAR, Table W-3, in the "All VFDRs Fixed" column (which is presumably associated with the risk of the compliant plant) are not the same as the CDF and LERF values presented in the "Additional Risk of RAs" column as stated in Footnote 3. Thus, it is not clear how the additional risk of RAs was calculated.

RAs to reduce risk are identified for certain fire compartments in LAR, Attachment G, Table G-1, but in some cases, no corresponding additional risk of RA values was reported in LAR, Attachment W, Table W-3, for these same fire compartments (e.g., BF-01, BG-01, G-01, HH-01, UU-01). In addition, LAR, Attachment G, Results of Step 3, states that, "[a]ssessment of potential adverse effects of operator actions is addressed in the development of operator actions in the fire compartment specific Fire Risk Evaluations." It is not clear whether any potential adverse effects associated with operator actions were identified, and if they were identified, how they were treated in the fire PRA.

a. Explain how the additional risk of RAs was calculated, and confirm that the approach is consistent with guidance in FAQ 07-0030 and RG 1.205.

b. Reconcile the apparent inconsistencies in the LAR in which RAs to reduce risk are identified for fire compartments in LAR, Attachment G, Table G-1, but no additional risk of RAs is reported in LAR, Attachment W, Table W-3, for these same fire compartments.

c. Explain whether any potential adverse effects associated with operator actions were identified, and if they were identified, how they were treated in the fire PRA.

PRA RAI 15 – Large Risk Reduction Credit

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. RG 1.174 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 notes that conservative calculations of the compliant plant CDF and LERF can lead to a non-conservative calculation of the ΔCDF and ΔLERF.

Appreciable risk reduction credit (i.e., large negative CDF and LERF values) is presented in LAR, Attachment W, Table W-3, for non-VFDR related modifications referred to as the "risk offset." The risk offset is defined to be the risk reduction resulting from modifications that do not bring a fire compartment into compliance with NFPA 805 deterministic requirements. Section 3.2.5 of RG 1.205 states 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, Revision 2, but that the total increase and total decrease in the ΔCDF and ΔLERF should be provided. LAR, Table W-3, appears to report the total decrease associated with non-VFDR modifications in the form of risk offset values but does not appear to report the total increase associated with unresolved VFDRs.

a. Provide the total risk increase associated with unresolved VFDRs and the total risk decrease associated with non-VFDR modifications.

b. Summarize the risk-significant scenarios for fire areas in the compliant plant model that are most significantly impacted by risk reduction modifications, and discuss the contribution of fire-induced failures for those scenarios.

c. Discuss the impact of any important modeling assumptions contributing to the risk-significant scenarios for important fire areas in the compliant plant model. Specifically, include discussion of conservative modeling assumptions made in the compliant plant model that may artificially reduce the calculated change in risk.

d. If conservative modeling of the compliant plant is identified as contributing to the underestimation of the total change in risk, demonstrate that the total risk increase associated with unresolved VFDRs is offset by the total risk decrease associated with risk reduction modifications even when the conservative modeling is removed. Alternatively, confirm that realistic modeling that does not underestimate the total change in risk will be used in the integrated analysis provided in response to PRA RAI 03.

PRA RAI 16 – Defense-in-Depth (DID) and Safety Margin

Section 1.2 of NFPA 805 requires the fire protection standard to be based on the concept of DID, and specifies the three elements (or echelons) of DID that must be balanced. LAR, Section 4.5.2.2, provides a high-level description of how impacts on DID and safety margin were reviewed for the transition to NFPA 805 and includes a discussion of plant improvements made in response to this review. However, additional information is needed to fully understand the approach. Also, LAR, Section 4.5.2.2, states that, "[f]ire protection features and systems relied upon to ensure DID were identified as a result of the assessment of DID," but LAR, Table 4-3, does not identify any fire protection systems or features to be credited for DID.

a. Explain the criteria used to determine when a substantial imbalance between DID echelons exist in the fire risk evaluations, and identify the types of plant features and administrative controls credited for providing DID for each of the three DID echelons.

b. Clarify what fire protection features and systems were relied upon to ensure DID and explain why none are identified in LAR, Table 4-3. Explain how DID is ensured, given that automatic fire detection systems are not credited for maintaining DID.

c. Discuss the approach for reviewing safety margin using the NEI 04-02, Revision 2, criteria for assessing safety margin in the fire risk evaluations.

Radiological Release RAI 01

Attachment E of the LAR states several times that, "A bounding analysis was developed that determined that in the event of a fire the radiological release would not exceed 10 CFR limits." As part of the NRC staff's audit of licensee documents, the staff reviewed Radioactive Material Release Calculation RP-15-01. However, it is not clear if this calculation is the bounding analysis referred to in LAR, Attachment E, or if this is the only bounding analysis.

For each bounding analysis referred to in LAR, Attachment E, provide the title and a summary of the assumptions, methodologies, and resulting doses of the analysis.

Radiological Release RAI 02

LAR, Attachment E, Table E-1, states that compartment MC-01 should be screened in for analysis of radiological containment and monitoring actions associated with firefighting operations. However, LAR, Table E-2, states that compartment MC-01 was screened out and does not provide the results of the engineered controls review for liquid and gaseous effluents associated with firefighting activities.

Clarify whether compartment MC-01 should be screened in for analysis of radiological containment and monitoring actions associated with firefighting. If so, provide the results of the engineered controls review for compartment MC-01.

A response to the enclosed RAI is to be provided within 60 days from the date of this letter, except for the responses to FPE RAI 06 and PRA RAIs 02, 03, 11, and 12. Responses to FPE RAI 06 and PRA RAIs 02, 11, and 12 are to be provided within 90 days from the date of this letter. The due date for PRA RAI 03 will be provided after the NRC staff has reviewed the licensee's response to the other RAIs.

If you have any questions, please contact me at (301) 415-1380 or by e-mail at Blake.Purnell@nrc.gov.

Sincerely,

/RA/

Blake A. Purnell, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

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