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10 CFR 50.90

February 9, 2015

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-53 and DPR-69
NRC Docket Nos. 50-317 and 50-318

Subject: Request for Additional Information Regarding the National Fire Protection Association Standard 805 License Amendment Request

References:
1. Letter from G. H. Gellrich (CCNPP) to Document Control Desk (NRC), dated September 24, 2013, License Amendment Request re: Transition to 10 CFR 50.48(c) - NFPA 805 Performance Based Standard for Fire Protection
2. Letter from N. S. Morgan (NRR) to G. H. Gellrich (CCNPP), dated January 12, 2015, Calvert Cliffs Nuclear Power Plant, Unit Nos. 1 and 2 – Request for Additional Information Regarding the National Fire Protection Association Standard 805 License Amendment Request (TAC Nos. MF2993 and MF2994)

In Reference 1, Calvert Cliffs Nuclear Power Plant, LLC submitted a license amendment request to transition to 10 CFR 50.48(c) – NFPA 805 Performance Based Standard for Fire Protection. In Reference 2 the NRC staff requested additional information regarding this amendment request. Attachment (1) and the Enclosure provide the response to the request for additional information. The schedule for providing responses to individual questions was provided in Reference 2. Enclosure 1 contains markups of the original license amendment package pages and supersedes the previously provided pages.

This additional information does not change the No Significant Hazards Determination provided in Reference 1. No regulatory commitments are contained in this letter.

Should you have questions regarding this matter, please contact Mr. Douglas E. Lauver at (410) 495-5219.

I declare under penalty of perjury that the foregoing is true and correct. Executed on February 9, 2015.

Respectfully,

George H. Gellrich
Site Vice President

GHG/PSF/bjm

Attachment: (1) Request for Additional Information Regarding the National Fire Protection Association Standard 805
Enclosure: 1. Updated pages

cc: NRC Project Manager, Calvert Cliffs
NRC Regional Administrator, Region I
NRC Resident Inspector, Calvert Cliffs
S. Gray, MD-DNR

ATTACHMENT (1)

REQUEST FOR ADDITIONAL INFORMATION REGARDING THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

Calvert Cliffs Nuclear Power Plant
February 9, 2015

ATTACHMENT (1)

REQUEST FOR ADDITIONAL INFORMATION REGARDING THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

By letter dated September 24, 2013 Calvert Cliffs Nuclear Power Plant, LLC (CCNPP), submitted a license amendment request (LAR) for Calvert Cliffs Nuclear Power Plant, Units 1 and 2 (Calvert Cliffs) to transition its fire protection licensing basis from Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.48(b) to 10 CFR 50.48(c), National Fire Protection Association Standard (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. The Nuclear Regulatory Commission (NRC) staff is reviewing the application and has determined that the following additional information is needed to complete the review of the LAR:

Fire Protection Engineering (FPE) Request for Additional Information (RAI) 01:

Section 3.3.4 of NFPA 805, 2001 Edition, requires that thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials be noncombustible or limited combustible. In Attachment A, "NEI [Nuclear Energy Institute] 04-02 Table B-1 - Transition of Fundamental Fire Protection Program & Design Elements," of the LAR, the licensee stated that the plant "Complies with Clarification" on the basis that the referenced procedures, specifications, and the Combustible Loading Analysis Database control and account for the use of thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials. The licensee does not state whether these materials are specified in the documents to be noncombustible or limited combustible. Provide the following information:

a. *Clarify that the procedure(s), specifications, and database specify that thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible.*

b. *Clarify in the compliance bases whether thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials that are either permanently or temporarily installed in the plant are noncombustible or limited combustible.*

c. *If installed materials are not noncombustible or limited combustible, describe how these materials are accounted for and managed in the fire protection program.*

CCNPP RESPONSE FPE RAI 01:

Response to be provided by 3/11/15.

FPE RAI 02:

Section 3.4.1(c) of NFPA 805 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 (NSPC). In Section 1.6.4.1, "Qualifications," of NRC Regulatory Guide (RG) 1.189, "Fire Protection for Nuclear Power Plants," Revision 2, September 2009 (ADAMS Accession No. ML092580550), the NRC staff has acknowledged the following example for the fire brigade leader as sufficient:

> *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.*

ATTACHMENT (1)

REQUEST FOR ADDITIONAL INFORMATION REGARDING THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805

In Attachment A, the licensee stated that it complies and references Procedure SA-1-105, Fire Brigade Training, Section 4.4.A.1, which includes the NFPA 805, Section 3.4.1(c) requirement as a responsibility for the shift manager to assure the fire brigade members have the requisite training and knowledge. Provide additional detail regarding the training that is provided to the fire brigade leader and members that addresses their ability to assess the effects of fire and fire suppressants on NSPC.

CCNPP RESPONSE FPE RAI 02:

The compliance basis of Section 3.4.1(c) has been changed to "Complies with Clarification." Calvert Cliffs Nuclear Power Plant (CCNPP) is utilizing the exception to 3.4.1(c), which states:

> "Exception: Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support."

CCNPP administrative procedures and the UFSAR ensure that an operations technical advisor, a licensed operator position, is dedicated to respond with the industrial fire brigade.

FPE RAI 03:

In the compliance bases in Attachment A for NFPA 805, Sections 3.10.1(2) and 3.10.3, the licensee refers to a required action in Attachment S, Table S-2, Item 18 of the LAR. Attachment S, Table S-2 does not include an Item 18; however, Attachment S, Table S-2, Item 17 appears to address these elements. Confirm that Attachment S, Table S-2, Item 17 is the correct reference for the implementation item or provide the correct implementation item for the Halon system actions identified in the LAR.

CCNPP RESPONSE FPE RAI 03:

Attachment S, Table S-2, Item 17 is the correct reference for the implementation item identified in Attachment A for NFPA 805 Sections 3.10.1(2) and 3.10.3. The compliance basis for NFPA 805 Sections 3.10.1(2) and 3.10.3, have been revised to reference Attachment S, Table S-2, Item 17.

FPE RAI 04:

Section 3.11.3(2), "Fire Barrier Penetrations," of NFPA 805 requires that fire dampers comply with NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems." In Attachment A, the licensee requested NRC approval for the use of a performance-based methodology described in Electric Power Research Institute (EPRI) TR-1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features," to change the surveillance frequencies for fire dampers. Attachment L of the LAR, Approval Request 1, which is related to the use of performance-based methodology described in EPRI TR-1006756, only includes NFPA 805, Section 3.2.3(1), as the NFPA 805 requirement that is applicable.

Clarify if Attachment L, Approval Request 1, is also applicable to NFPA 805, Section 3.11.3(2), and revise Approval Request 1 as necessary to accommodate the additional section.

CCNPP RESPONSE FPE RAI 04:

The intent of Attachment L, Approval Request 1, is to request NRC approval for the option to utilize the performance-based methodology described in EPRI TR-1006756 for all fire protection inspection, testing, and maintenance at CCNPP. Therefore, the approval request is applicable to NFPA 805 Section 3.2.3(1).

Attachment A, Section 3.11.3(2) has been revised to remove the "Submit for NRC Approval" compliance statement. The additional existing "Complies, with Required Action" compliance statement remains in Attachment A as damper inspection frequencies may potentially be updated based on the guidance in EPRI TR-1006756 during or after implementation.

FPE RAI 05:

In Attachment L, Approval Request 2, the licensee proposed a performance-based approach to evaluate the acceptability of unprotected cables located above the suspended ceilings for compliance with the requirements of NFPA 805, Section 3.3.5.1. Provide the following information:

a. *Provide further details that describe the extent of use of extension cords that are located above the suspended ceilings, such as number, length, size, use (e.g., types of electrical loads), and if the extension cords are for permanent or temporary use.*

b. *Describe the administrative controls that are (or will be) in place to maintain the technical bases for the request (e.g., prevent/limit future placement of ignition sources and combustible materials, periodic surveillance above the ceiling, etc.).*

c. *Clarify the following:*

   i. *If the Nuclear Safety Capability Assessment (NSCA) credited cables that are routed in metal conduit above the suspended ceiling need to be free from fire damage in order to support a nuclear safety function or fire risk evaluation (FRE) for a fire in the fire areas described in this request.*

   ii. *The NSPC discussion implies fire damage will not occur because, in part, the cables are protected in metal conduit or in metal covered trays. Metal conduit and metal trays are not generally sufficient to protect cables from exposure fire damage. Provide additional discussion and/or details that provide assurance that NSCA credited cables are not susceptible to damage from extension cords or other potential fire hazards in the area above the ceiling.*

d. *The licensee appears to conclude that because defense-in-depth (DID) Echelon 1 is satisfied, that Echelons 2 and 3 are also satisfied. The NRC staff notes that DID is based on a balance of the three echelons. Provide additional details related to how Echelons 2 (fire detection and suppression) and 3 (safe shutdown) of the DID concept are maintained.*

CCNPP RESPONSE FPE RAI 05:

05a – Response to be provided 4/13/15.

05b – Response to be provided 3/11/15.

05c –

i. The NSCA credited cables that are routed above suspended ceilings were evaluated on a fire area basis to determine if their failure would result in a VFDR. Cables routed in metal conduit were not screened out of the analysis or considered to be free from the effects of fire in the area; those cables above the suspended ceiling were evaluated as failed in the NSCA. There are some conduits routed above suspended ceilings that contain NSCA credited cables. A few conduits contained NSCA cables that resulted in VFDRs. Those VFDRs were evaluated in accordance with NFPA 805, Section 4.2.4.2, performance-based approach – fire risk evaluation with simplifying deterministic assumptions. The risk assessment concluded for each of these VFDRs that the risk, safety margin, and defense-in-depth meet the acceptance criteria of NFPA 805 Section 4.2.4, therefore, no further action is required.

ii. As stated in the response to part (i) of this response, the NSCA did not credit the metallic conduit as a means to prevent fire induced failure of NSCA-credited cables routed above suspended ceilings. The NSCA credited cables that are routed above suspended ceilings were evaluated on a fire area basis to determine if their failure would result in a VFDR. Cables routed in metal conduit were not screened out of the analysis or considered to be free from the effects of fire in the area; those cables above the suspended ceiling were evaluated as failed in the NSCA. NSCA cable failures that resulted in a VFDR were evaluated in accordance with NFPA 805, Section 4.2.4.2, performance-based approach – fire risk evaluation with simplifying deterministic assumptions. NSCA credited cables are susceptible to damage from extension cords and other potential fire hazards in the area above a ceiling and no assurance is given that metal conduit will protect those cables.

05d – Response to be provided 4/13/15.

FPE RAI 06:

In Attachment L, Approval Request 3, the licensee requested the use of procedural guidance that will allow performance of welding, cutting and other hot work in sprinklered fire areas while the suppression system is impaired, as an acceptable performance-based approach to comply with NFPA 805, Section 3.3.1.3.1. Provide the following information:

a. *In the bases for the request, the licensee stated that this request is applicable to any fire area containing a sprinkler system, as identified in Attachment C, Table C-2. Discuss the bases for limiting this hot work procedure request to only fire areas that contain required fire sprinkler systems identified in Attachment C, Table C-2.*

b. *Describe the hot work administrative controls for the fire areas that contain a suppression system that is not identified as a required suppression system in Attachment C, Table C-2, and whether the administrative controls are different than those for fire areas with required fire suppression systems.*

c. *In the bases for the request, the licensee stated that permanent combustibles located within 35 feet of the work area that cannot be removed must be covered with the appropriate style of blanket. Clarify if the "appropriate style of blanket" is a listed or approved welding curtain, welding blanket, welding pad, or equivalent, as required by NFPA 51B, "Standard for Fire Prevention During Welding, Cutting, and Other Hot Work."*

d. Describe any additional actions/controls to be used when hot work is performed in fire areas/zones where one or more sprinkler systems are impaired above and beyond those taken for any other hot work activity conducted when sprinklers are in service.

CCNPP RESPONSE FPE RAI 06:

a. Attachment L, Approval Request 3, is applicable to any fire area containing a sprinkler system and is not limited to only fire areas that contain required fire sprinkler systems. Attachment C, Table C-2 lists all sprinkler systems in plant fire areas, regardless of whether the system is required. The text of Attachment L, Approval Request 3, has been revised to clarify that the request is applicable to all fire areas containing fire sprinkler systems.

b. As discussed in (a), above, Approval Request 3 is applicable to all fire areas containing fire sprinkler systems.

c. Permanent combustibles located within 35 feet of the work area that cannot be removed must be covered with an NFPA 51B compliant blanket. The text of Attachment L, Approval Request 3, has been revised to clarify that an "appropriate style of blanket" is an NFPA 51B compliant blanket.

d. The Technical Requirements Manual (TRM) ensures that appropriate contingency measures are in place when TRM sprinkler systems are not in service. These contingency measures, which are above and beyond those taken for any other hot work activity conducted when sprinklers are in service, may include, but are not limited to, ensuring backup suppression is available (i.e., laying hose from an operable hose station in an adjacent fire area). This is addressed by one of the bases for Attachment L, Approval Request 3, which states "Back-up fire suppression equipment is available in areas where the fire suppression system is inactive."

Note: Editorial changes were made to the text of Attachment L, Approval Request.

FPE RAI 07:

NRC endorsed guidance NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Program Under 10 CFR 50.48(c)," states that, where used in Chapter 3, "power block" and "plant" refer to structures that have equipment required for nuclear plant operations, such as containment, auxiliary building, service building, control building, fuel building, radiological waste, water treatment, turbine building, and intake structure, or structures that are identified in the facility's pre-transition licensing basis.

Section 4.1.3 and Attachment I, Table I-1, "Definition of Power Block," of the LAR state that buildings that are required for nuclear plant operations (i.e., required to meet the nuclear safety or radioactive release (RAD) performance criteria identified in Sections 1.5.1 and 1.5.2 of NFPA 805) are considered within the power block. The licensee reviewed the plant for compliance with the RAD performance criteria, and the results are documented in Attachment E, which includes the following compartments as screened in for RAD review, but are not described as part of the power block in Attachment I, Table I-1:

- *Interim Resin Storage Facility (Lake Davies)*
- *Material Processing Facility*

- *Office and Training Facility*
- *Original Steam Generator Storage Facility*
- *Pre-Assembly Facility (Upper Laydown Area)*
- *Sewage Treatment Plant*
- *Unit 1 Butler Building*
- *Unit 2 Butler Building*
- *Warehouse No. 3*
- *West Road Cage*

Describe the basis for excluding these structures from the power block, based on the criteria stated in Section 4.1.3, " ... those that contain equipment required to meet the nuclear safety and RAD criteria ... ," and consequently, exclusion from the NFPA 805, Chapter 3 elements that apply to the power block.

CCNPP RESPONSE FPE RAI 07:

Response to be provided 3/11/15.

FPE RAI 08:

Section 3.11.1 of NFPA 805 requires that each major building within the power block be separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 feet or space that meets the requirements of NFPA 80A, "Recommended Practice for Protection of Buildings from Exterior Fire Exposures." In Attachment A, the licensee stated that it "Complies with Clarification" and described that the North Service Building and Turbine Building are analyzed as one fire area in the NFPA 805 NSCA, and are, therefore, treated as one building from a building separation perspective. The licensee also stated that it "Complies with Use of EEEE's" with respect to excluding the 45'-0" elevation of the North Service Building from the power block. The licensee did not discuss the basis for excluding this specific elevation from the power block in Attachment I.

Provide the basis for excluding the 45'-0" elevation of the North Service Building from the power block.

CCNPP RESPONSE FPE RAI 08:

Attachment I has been revised to discuss the basis for excluding the 45' elevation of the North Service Building from the power block.

The 45' elevation is excluded from Fire Area TB/NSB/ACA and the power block as justified by an engineering equivalency evaluation. The bases for acceptability are summarized as follows:

- There are no cables or equipment required to achieve nuclear safety performance criteria (NSPC) in the 45' elevation of the North Service Building.
- There are no cables or equipment required to achieve NSPC in the Yard within 50 feet of the 45' elevation of the North Service Building.

A fire originating in the 45' elevation of the North Service Building will not impact cables or equipment required to achieve NSPC in adjacent fire area TB/NSB/ACA.

FPE RAI 09:

Section 3.4.1(a) of NFPA 805 requires that a fully staffed, trained, and equipped fire-fighting force be available at all times to control and extinguish all fires on site. In Attachment A, the licensee stated that in Section 5.5.B of Procedure SA-1-101, "If there are less than 5 brigade members notify the Control Room."

Current NRC guidance, Frequently Asked Question (FAQ) 12-0063, "Fire Brigade Make-Up" (ADAMS Accession No. ML121980572), discusses conditions where fire brigade complement may be less than the minimum for a period of time, in order to accommodate unexpected absence of on-duty shift members. Further, licensees may claim prior approval if their current technical specifications or fire protection safety evaluation addresses the issue. If prior approval has not been granted, then the licensee should seek NRC approval in the NFPA 805 LAR.

Provide additional detail on the compliance bases related to conditions when there are less than 5 fire brigade members onsite.

CCNPP RESPONSE FPE RAI 09:

Response to be provided 4/13/15.

FPE RAI 10:

Section 3.11.5 of NFPA 805 requires that Electrical Raceway Fire Barrier Systems (ERFBS) that are required by NFPA 805, Chapter 4, be capable of resisting the fire effects of the hazards in the area. In Attachment A, the licensee stated that there are no ERFBS credited for compliance with Chapter 4, and, therefore, there is no compliance applicable to NFPA 805, Section 3.11.5. However, in Attachment B (Attributes 3.4.1.3, 3.4.1.5, 3.4.2.2, and 3.4.2.3) the licensee described that one of the means of addressing cable impacts of fire damage is to protect the cables by an ERFBS.

a. *Clarify if there were any cable resolutions in the NSCA that credit an ERFBS to protect the affected cables to meet NFPA 805, Chapter 4. If yes, then clarify if the ERFBS are in compliance with NFPA 805, Section 3.11.5.*

CCNPP RESPONSE FPE RAI 10:

LAR Attachment B documents the Nuclear Safety Capability Assessment Methodology Review. Sections 3.4.1.3, 3.4.1.5, 3.4.2.2, and 3.4.2.3 of LAR Attachment B identify that ERFBS may be utilized as an acceptable method to protect cables from fire damage and be credited within the analysis. The NSCA has not credited any ERFBS.

Safe Shutdown Analysis (SSA) RAI 01:

Attribute 3.2.1.2 of NEI 00-01, Revision 2, includes the assumption that exposure fire damage to manual valves and piping does not adversely impact their ability to perform their pressure boundary or safe shutdown function, and that any post-fire operation of a rising stem valve located in the fire area of concern should be well justified using an engineering evaluation. In Attachment B, the alignment bases for NEI 00-01, Attribute 3.2.1.2, states that manual valves that are repositioned for credited NFPA 805 recovery actions (RAs) are included in the NFPA 805 NSPC equipment list and are subject to assessment of feasibility.

Provide the following information:

a. *Clarify if any rising stem valves involved in an RA are subjected to fire damage.*

b. *If any of the valves in the fire area of concern being repositioned by an RA are rising stem valves, then clarify if an engineering evaluation was performed to evaluate the exposure fire damage to manual valves and piping to determine if the exposure to fire would adversely impact their ability to perform their pressure boundary or safe shutdown function. If used, describe the method and results obtained from the engineering evaluation.*

CCNPP RESPONSE SSA RAI 01:

a. All recovery actions as documented in LAR Attachment G were reviewed. There are no recovery actions that credit the manipulation of rising stem valves that have been exposed to the effects of fire.

b. An engineering evaluation is not required as there are no recovery actions that require the manipulation of a rising stem valve that has been exposed to fire.

SSA RAI 02:

Attribute 3.3.1.1.4 of NEI 00-01, Revision 2, includes criteria and assumptions for evaluating power cables for breaker coordination concerns and includes safe shutdown cables and those non-safe shutdown cables that can impact safe shutdown. In Attachment B of the LAR, the alignment bases for NEI 00-01, Attribute 3.3.1.1.4, states that the NSCA circuit identification and analysis should utilize a "building block" approach and include only, as applicable, the power cable from the NSCA component to the upstream electrical power source.

Provide the following information:

a. *Clarify if cables that supply loads not required to meet the NSPC off of the nuclear safety buses are classified as "required" cables. If non-nuclear safety cables are not included, then provide the justification for not considering the failure of non-nuclear safety cables in meeting the breaker coordination criteria for protection.*

b. *The alignment basis states that plant modifications have been identified to achieve selective coordination of breakers/fuses and identified as implementation items in Attachment S, Table S-2. Identify the specific modifications that are required to achieve the selective coordination of breakers/fuses.*

CCNPP RESPONSE SSA RAI 02:

Response to be provided 3/11/15.

SSA RAI 03:

Attribute 3.5.1.3 of NEI 00-01, Revision 2, includes an assumption that circuit contacts are initially positioned (i.e., open or closed) consistent with the normal mode/position of the "required for hot shutdown" equipment, and that the analyst must consider the position of the "required for hot shutdown" equipment for each specific shutdown scenario when determining the impact that fire damage to a particular circuit may have on the operation of the equipment. In LAR Attachment B, the alignment basis for Attribute 3.5.1.3 states that the circuit analysis may discount spurious operation based on a fire affected cable being routed in a dedicated

conduit and the cable being protected from external sources of voltage (also taking into consideration the potential impact from ground equivalent hot shorts).

For multi-conductor cables routed in dedicated conduit, provide a description if intra-cable hot shorts (wire-to-wire shorts) are considered as a potential impact of fire damage on required position of the NSCA equipment (i.e., the function of the initial position of circuit contacts are not affected by intra-cable hot shorts).

CCNPP RESPONSE SSA RAI 03:

Response to be provided 3/11/15.

SSA RAI 04:

The nuclear safety goal described in NFPA 805, Section 1.3.1, is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition. In Section 4.2.1.2, the licensee stated that the NSCA will demonstrate that the plant can achieve and maintain safe and stable conditions for at least 12 hours with the minimum shift operating staff. After 12 hours, the Emergency Response Organization (ERO) will be available to support "safe and stable" actions to extend hot standby conditions.

a. *In Section 4.2.1.2, subsection "Methods to Maintain 'Safe and Stable' and Extend Hot Standby Conditions," of the LAR, local manual actions are described to align various systems and functions. In Item No. 8, the licensee stated that should alternating current (AC) charging sources be lost, local manual operator action may be required, and that station batteries are capable of providing a minimum of 4 hours of 125 V direct current power to their respective loads during a station blackout without AC charging sources. The licensee further stated that this time allowance credits securing 1INV1T11 in the cable spreading room (CSR) within 45 minutes. Clarify if this local manual action is credited as an RA in any fire area.*

b. *In Section 4.2.1.2, subsection "Assessment of Risk," the licensee stated that the ERO provides sufficient resources for assessment of fire damage and completion of repairs to equipment necessary to maintain hot standby for an extended period, transition to cold shutdown, or return to power operations as dictated by the plant fire event. Describe if any repair activities are necessary to maintain hot standby for an extended period (safe and stable conditions), including a detailed description of the specific repairs that would be needed, the success path(s) being restored, and the time frame required to complete the repair.*

CCNPP RESPONSE SSA RAI 04:

Response to be provided 3/11/15.

SSA RAI 05:

Section 2.4 of RG 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, dated December 2009 (ADAMS Accession No. ML092730314) describes the treatment of RAs supplemented by guidance provided in NEI 04-02 and FAQ 07-0030, "Establishing Recovery Actions" (ADAMS Accession No. ML110070485). In RG 1.205, the NRC staff clarifies that operation of alternative or dedicated shutdown controls while the main control room (MCR) remains the command and control

location would primarily be considered an RA because, for such scenarios, the dedicated or alternative controls are not considered primary. Attachment G of the LAR describes the primary control stations (PCS) and identifies RAs performed at the PCS in Fire Area 16 (Unit 1 CSR and 1C cable chase) and Fire Area 17 (Unit 2 CSR and 2C cable chase). Provide the following information:

a. *Clarify if the control room remains the command and control location for a fire in Fire Areas 16 and 17, and if so, discuss how the RAs at the PCS are evaluated for compliance with NFPA 805, Section 4.2.4.*

b. *In Fire Areas 16 and 17, there are RAs at the PCS that are not associated with a variance from deterministic requirement (VFDR).*

   - *For Fire Area 16, the RAs are:*

     6ICHECKRXSD1; 16ICONSERVE1; 16ISECHTR11_13; 16IADV1C43; 16I1C43CONTROL; and 16IRCSTEMP1.

   - *For Fire Area 17, the RAs are:*

     17ICHECKRXSD2; 17ICONSERVE2; 17ISECHTR21_23; 17IADV2C43; 17I2C43CONTROL; and 17IRCSTEMP2.

   Clarify the purpose of performing these RAs, and whether the actions are required to meet the NSPC required by NFPA 805, Section 1.5.1.

c. *In Attachment G, Table G-1 of the LAR, disposition of VFDR 16-19-1 credits RAs at the PCS to energize pressurizer backup heater banks 11 and 13; however, another non-VFDR related RA (16ISECHTR11_13) is credited to secure the pressurizer backup heater banks 11 and 13. Discuss how the contradicting RAs are evaluated in the NSCA.*

d. *In LAR Attachment G, Table G-1, RAs are credited to disposition VFDRs 16-27-1 and 17-25-2 to control atmospheric dump valve (ADV) hand valves to support control of the ADVs at the PCS locations 1C43 and 2C43, respectively. However, the RAs (16IADV1C43 and 17IADV2C43) to control the ADVs at the PCS location do not have a VFDR associated with them. Discuss the method for crediting RAs to support the VFDR disposition without crediting the RA at the PCS.*

CCNPP RESPONSE SSA RAI 05:

Response to be provided 3/11/15.

SSA RAI 06:

Attachment W Tables W-6 and W-7 of the LAR appear to conflict with information described in Attachment C, Table C-1, and Attachment G, Table G-2. Clarify the following discrepancies:

a. *In Attachment C, Table C-1, Fire Area 34 is identified as transitioning deterministically in Unit 2 (Section 4.2.3.2 of NFPA 805) with no VFDRs identified. However, in Attachment W, Table W-7, Fire Area 34 is identified as transitioning using performance-based methods (Section 4.2.4.2 of NFPA 805), VFDRs are identified, RAs are credited, and the risk of the RA was calculated. Clarify the correct nuclear safety compliance strategy for Fire Area 34.*

b. *In Attachment C, Table C-1, the following fire areas are identified as transitioning deterministically with no VFDRs identified. However, Attachment W, Table W-6 (for*

Unit 1) and Attachment W, W-7 (for Unit 2) identify that these fire areas have VFDRs identified. Further, an FRE was performed that calculated a delta core damage frequency (CDF) and delta large early release frequency (LERF) value as follows:

Unit 1: 2, 8, 13, 18, 18A, 22, 23, 25, 26, 27, 28, 31, 38, 40, and 2CNMT
Unit 2: 3, 4, 6, 14, 15, 19, 19A, 21, 30, 33, 39, and 1CNMT

For each of these fire areas, clarify the correct nuclear safety compliance strategy, and justify the bases for performing an FRE that is not discussed in the NSCA in LAR Attachment C, Table C-1, and the bases for crediting RAs that are not included in LAR Attachment G, Table G-1.

c. *In Attachment C, Table C-1, the following fire areas are identified as transitioning using performance-based methods (FRE) to meet the NSPC, and no RAs were credited (either for risk or DID). However, Attachment W, Table W-6 (for Unit 1) and Attachment W, W-7 (for Unit 2) identify these fire areas as crediting RAs and the risk of the RA was calculated:*

   Unit 1: 12, 14, 15, 19A, 21, 30, 32, 33, 35, 36, 39, 1 CNMT, and IS
   Unit 2: 12, 13, 18A, 20, 26, 27, 28, 32, 34, 35, 36, 40, 2CNMT and IS

   For each of these fire areas, clarify the correct nuclear safety compliance strategy for these fire areas and the bases for crediting RAs that are not included in Attachment G, Table G-1.

d. *In Attachment C, Table C-1, the following fire areas are identified as transitioning using deterministic methods to meet the NSPC, and no RAs were credited (either for risk or DID). However, Attachment W, Table W-6 (for Unit 1) and Attachment W, W-7 (for Unit 2) identifies these fire areas as crediting RAs and the risk of the RA was calculated:*

   Unit 1: 13, 18, 18A, 22, 23, 25, 26, 27, 28, and 2CNMT
   Unit 2: 14, 15, 19, 19A, 21, 30, 33, 39 and 1CNMT

   For each of these fire areas, clarify the correct nuclear safety compliance strategy and justify the bases for not including these RAs in Attachment G, Table G-1, if these RAs are actually credited in the NSCA.

CCNPP RESPONSE SSA RAI 06:

Response to be provided 4/13/15.

SSA RAI 07:

Modifications were identified in Attachment S, Table S-2, that appear to resolve certain VFDR issues. However, the disposition of the certain VFDRs as summarized in Attachment C, Table C-1, do not describe whether the modification was credited or not. Provide clarification on how the modifications described below were addressed in the disposition of the VFDRs listed:

a. *Attachment S, Table S-2, Item 7, involves modifying control circuits for the Pressurizer Power Operated Relief Valves (PORVs), 1(2)ERV402 and 1 (2)ERV404, to prevent the PORVs from spuriously opening. However, VFDRs 16-46-1, 24-26-1, 16-47-1, 24-27-1, 17-41-2, 24-63-2, 17-42-2, and 24-64-2 involve fire damage to cables which could result in spurious opening of the Pressurizer PORV, and the VFDR dispositions credits an RA for DID.*

b. *Attachment S, Table S-2, Item 8, involves modifying the control circuits for the auxiliary feed water (AFW) steam admission valves 1(2)CV4070 and 1(2)CV4071 to ensure adequate separation such that one set of valves will be available during a fire in either the CSR or switchgear rooms. However, VFDRs (16-22-1, 17-16-2, 16-26-1, and 17-26-2) involve fire damage to cables that could cause the loss of control and/or spurious operation of 1(2)CV4070 and 1(2)4071, and the VFDR dispositions credit an RA either to reduce risk (VFDRs 16-22-1 and 17-16-2) or for DID (VFDRs 16-26-1 and 17-26-2).*

c. *Attachment S, Table S-2, Item 11, involves modifying control circuits for the Main Steam Isolation Valves (MSIVs), 1(2)CV4043OP and 1(2)CV4048OP, to ensure at least one solenoid dump valve can be energized to close the MSIVs. However, VFDRs 16-31-1, 16-32-1, 17-23-2, and 17-24-2 involve fire damage to cables that could cause a loss of control and/or spurious operation of the associated MSIV, and the VFDR dispositions credit an RA for DID (VFDRs 16-31-1, 16-32-1, 17-23-2, and 17-24-2).*

CCNPP RESPONSE SSA RAI 07:

Response to be provided 4/13/15.

SSA RAI 08:

In Attachment K, Licensing Action 5, the licensee requested that a previously approved exemption, related to dedicated water curtains as being adequate to maintain the 3-hour fire rating of barriers, be transitioned to the NFPA 805 program. The licensee described the sprinkler systems located in Room 216A and Room 106 as supplying the sprinkler heads for the dedicated water curtains. In the summary of the exemption approved by the NRC in a letter dated March 15, 1984 (ADAMS Accession No. ML010430325), the licensee stated that on the Corridor No. 110 side of the hatch, a dedicated sprinkler head will be supplied from the Room No. 116 sprinkler system. However, in the Baltimore Gas & Electric Company submittal dated November 21, 1983 (ADAMS Accession No. 8311290159), the licensee stated that on the corridor No. 110 side of the hatch, a dedicated sprinkler head will be supplied from the Room No. 106 sprinkler system. The NRC staff also noted that Attachment C, Table C-1, refers to room numbers in the "Required Fire Protection System and Features," and Attachment C, Table C-2, refers to fire zones. The NRC staff also noted in the discussion for Licensing Action 1 that room numbers at the plant may have changed over time. Provide the following information:

a. *Describe if the fire zone numbers listed in Attachment C, Table C-2, are the same as the room numbers listed in the fire area summary in Attachment C, Table C-1. Describe if the room numbers in Attachment C correspond with the room numbers cited in the previous licensing actions in Attachment K.*

b. *Provide a description of the water curtain arrangement, including the sprinkler systems that supply the required sprinkler heads using the current terminology for rooms, fire areas, and/or fire zones such that the staff can fully understand the installation and how the installation is represented in the various tables in the submittal and the previous licensing actions.*

CCNPP RESPONSE SSA RAI 08:

a. The "fire zone" numbers listed in Attachment C, Table C-2 are the same as the "room numbers" listed in the fire area summary in Attachment C, Table C-1. The "room numbers" in Attachment C also correspond with the "room numbers" cited in the previous

licensing actions in Attachment K. There is a typographical error in Section II of the Enclosure to NRC letter dated March 15, 1984 (ADAMS Accession No. ML010430325), which summarizes the exemption request. This is discussed in part (b.), below.

b. Attachment C, Table C-1 and Table C-2, identify water curtain sprinkler in room 110 as protecting the hatch to room 216A and the water curtain sprinkler in room 216A as protecting the hatch to room 110.

   The room 216A water curtain is supplied by the room 216A sprinkler system as described in the BG&E exemption request dated November 21, 1983 (ADAMS Accession No. 8311290159) and in the summary of the exemption approved by the NRC in the letter dated March 15, 1984 (ADAMS Accession No. ML010430325).

   The room 110 water curtain is supplied by the room 106 sprinkler system as described in the BG&E exemption request dated November 21, 1983 (ADAMS Accession No. 8311290159). There is a typographical error in Section II of the Enclosure to NRC letter dated March 15, 1984 (ADAMS Accession No. ML010430325) which inaccurately describes the system as being supplied by the sprinkler system in room 116. The system has been confirmed to be supplied by the sprinkler system in room 106.

SSA RAI 09:

In Attachment C, Table C-1, under the heading "Fire Suppression Effects on Nuclear Safety Performance Criteria," the majority of the fire areas contain the concluding statement, "Fire suppression in this fire area will not impact the ability to achieve the NSPC in accordance with NFPA 805, Sections 4.2.1 and 4.2.4.1.5." NFPA 805, Section 4.2.4.1.5, is associated with the fire modeling performance-based approach, which the licensee stated it did not use in Section 4.5.2.1 of the LAR. In addition, the suppression effects sections for several other fire areas (e.g., 18A, 20, 21, 22, 23, 35, and 36) contain the statement, "There is no suppression effect concern for this fire area as the fire area does not contain NSCA equipment," yet the fire area contains VFDRs. Address the following:

a. *Clarify the basis for discussing the fire suppression effects for a fire modeling performance-based approach when the fire areas used a risk evaluation performance-based approach.*

b. *Provide additional discussion for those fire areas where VFDRs are identified, but the suppression effects discussion states there is no NSCA equipment in the fire area.*

CCNPP RESPONSE SSA RAI 09:

Response to be provided 3/11/15.

SSA RAI 10:

In Section 4.5.2.2, the licensee stated that there are no VFDRs that involved performance-based evaluations related to wrapped or embedded cables. However, in Attachment C, Table C-1, Fire Areas 18, 19, 35, 36, and TB/NSB/ACA are performance-based fire areas and credit EEEE, "ECP-13-000359 - "Generic Letter (GL) 86-10 Evaluation of Embedded Conduit in the Turbine Building and Barrier Thickness of the Floor/Ceiling Barrier between AB-4/AB-5 and 517/518," which justifies the acceptability of conduits embedded in the Turbine Building floor slab (elevation 27'), the floor/ceiling slab between stairwells AB-4 and AB-5, and the horizontal

cable chases (Rooms 517 and 518). Clarify if the disposition of the VFDRs in Fire Areas 18, 19, 35, 36, and TB/NSB/ACA credit the embedment as evaluated in the EEEE.

CCNPP RESPONSE SSA RAI 10:

Response to be provided 3/11/15.

SSA RAI 11:

In Attachment C, Table C-1, the licensee identified Marinite boards as fire protection features that are credited for "S" (required for Chapter 4 separation criteria) and "R" (required for risk significance) to protect cables for a fire in Fire Area 1CNMT (Unit 1 Containment) and 2CNMT (Unit 2 Containment). Provide the following information:

a. *Describe the extent that Marinite boards are credited for Chapter 4 separation ("S") and for risk significance ("R") in the Unit 1 and Unit 2 Containments. In addition, describe the design and plant configuration of the Marinite boards and the nuclear safety functions that the passive fire protection features are protecting.*

b. *Provide previous NRR staff approval (if any) for the use of Marinite boards in containment to demonstrate meeting the requirements of Appendix R, Section III.G.2, which can be credited to meet the requirements of NFPA 805, Section 4.2.3.4, or evaluate acceptability using a performance-based analysis approach in accordance with NFPA 805, Section 4.2.4.*

CCNPP RESPONSE SSA RAI 11:

Response to be provided 4/13/15.

SSA RAI 12:

In Attachment C, Table C-2, the licensee makes reference to "Unit 1 Containment (App-R Purposes Only)" and "Unit 2 Containment (App-R Purposes Only)," for fire protection systems and features. The fire protection systems and features are identified as required for "S" (Required for Chapter 4 Separation Criteria), "R" (Required for Risk Significance), and/or "D" (maintain an adequate balance of DID in a change evaluation or FRE).

Clarify the meaning of "Appendix-R Purposes Only" and if these fire protection systems and features are credited with respect to compliance with NFPA 805, Chapter 4.

CCNPP RESPONSE SSA RAI 12:

The containment areas were divided into rooms under the Appendix R program. The current descriptions for these rooms, as identified in plant documents, contain "(App-R Purposes Only)" within their name. The phrase "(App R Purposes Only)" will be removed from plant documentation upon implementation of NFPA 805. The phrase can be found in the following sections of the LAR:

- In attachment C, Table C-1 – NEI 04-02 Table B-3 Fire Area Transition
- In attachment C, Table C-2 – Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features
- In attachment E, NEI 04-02 Radioactive Release Transition

The fire protection systems and features are credited with respect to compliance with NFPA 805 Chapter 4. The containment fire areas will remain subdivided as described in plant documents.

SSA RAI 13:

Provide the following pertaining to non-power operations (NPO) discussions provided in Section 4.3 and Attachment D:

a. *Section 4.3.2 and Attachment D state that incorporation of the recommendations from the "KSF [key safety function] pinch point" evaluations into appropriate plant procedures prior to implementation will be done to ensure the requirements of NFPA 805 are met. Identify and describe the changes to outage management procedures, risk management tools, and any other document resulting from incorporation of KSFs identified as part of NFPA 805 transition. Include changes to any administrative procedures such as "Control of Combustibles."*

b. *For those components that had not previously been analyzed in support of the at-power analysis or whose functional requirements may have been different for the non-power analysis, cable selection was performed in accordance with approved project procedures. Provide a list of the additional components and a list of those at-power components that have a different functional requirement for NPO. Describe the difference between the at-power safe shutdown function and the NPO function. Include with this list a general description by system indicating why components would be selected for NPO and not be included in the at-power analysis.*

c. *Section 4.3.1 and Attachments D and H state that the NPO analysis was performed in accordance with FAQ 07-0040, "Non-Power Operations Clarifications (ADAMS Accession No. ML082200528). However, the LAR did not provide the results of the KSF pinch point analysis. Provide a list of KSF pinch points by fire area that were identified in the NPO fire area reviews using FAQ 07-0040, including a summary level identification of unavailable paths in each fire area. Describe how these locations will be identified to the plant staff for implementation.*

d. *During NPO modes, spurious actuation of valves can have a significant impact on the ability to maintain decay heat removal and inventory control. Provide a description of any actions being credited to minimize the impact of fire-induced spurious actuations on power operated valves (e.g., air-operated valves and motor-operated valves) during NPO (e.g., pre-fire rack-out, actuation of or pinning of valves, and isolation of air supplies).*

e. *During normal outage evolutions, certain NPO credited equipment will have to be removed from service. Describe the types of compensatory actions that will be used during such equipment down-time.*

f. *The description of the NPO review for the LAR does not identify locations where KSFs are achieved via 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 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.*

CCNPP RESPONSE SSA RAI 13:

13a – Plant procedure updates are to be completed during NFPA 805 implementation. These updates will include procedures such as NO-1-103, Conduct of Lower Mode Operations, to incorporate Key Safety Function (KSF) Pinch Point Analysis as identified in LAR Attachment S, Table S-3 IMP-4. Changes will include the following:

- Limiting/prohibiting hot work in select Fire Zones.
- Detection/Suppression Systems should be verified to be functional, (not tagged out etc.).
- Limiting/Prohibiting the hazard of combustible materials.
- Using alternate equipment and/or the equipment's position whenever removing power.
- Appropriate compensatory measures required during periods of increased vulnerability.
- Activities that may impact KSFs should be limited and strictly controlled to mitigate losses.
- Consider the hazards from the introductions of combustible materials and sources of fire precursors.
- Limiting work during periods of High Risk Evolution (HRE) conditions.
- Ensure HRE are identified in a manner consistent with NUMARC 91-06 and FAQ 07-0040.

13b – Report NFPA 805-00008, Section 4 provides an overview of the Non-Power Operations (NPO) model development methodology, including cable selection. Section 7 of this report documents systems included and excluded. Attachment A to this report provides detailed description of the NPO model. Attachment C to this report contains the NPO Equipment List including required/credited function. NPO only components appear in this attachment but not in NFPA 805-00006, Nuclear Safety Capability Assessment (NSCA) Attachment 7-5, the NSCA Equipment List. Functional differences can be identified by comparing the required NSCA and NPO positions which are identified in these reports and also in a plant database. Cable selection packages for components credited in the NPO evaluation that have a different function from the function required by the NSCA, were reviewed, evaluated and updated as required, for all credited functions. Differences in equipment and functions are typically attributable to the difference in plant operating state.

Some example systems where a change in state or different equipment selection may occur include:

- Process Monitoring – Different instruments are required due to differences in plant operating state and differences in credited systems (e.g. Shutdown Cooling).
- Shutdown Cooling (Low Pressure Safety Injection) – Credited for decay heat removal (DHR) KSF in NPO, not credited in NSCA.
- Shutdown Cooling Isolation Valves – Required closed High Low Pressure interface for the NSCA, required open for DHR KSF in NPO.
- High Pressure Safety Injection – Credited for Inventory KSF in NPO, not credited in NSCA.
- Auxiliary Feedwater System – Required operable for DHR in NSCA, not credited in NPO.

13c – Report NFPA 805-00008, Attachment B documents the results of the pinch point analysis. This attachment identifies the key safety functions (KSFs) that are evaluated and the status

of each path that could be used to accomplish the KSF for each fire area. As identified in LAR Attachment D, there were 51 fire areas for which the evaluation identified one or more pinch points for Unit 1 and 46 fire areas for which the evaluation identified one or more pinch points for Unit 2. Thirty-five fire areas were identified to have at least one pinch point for both units. Report NFPA 805-00008, Attachment B will be used as a reference document in support of site procedure updates, as discussed in response to item (a) of this RAI, and will be available during outage planning and HRE fire risk mitigation reviews.

13d – Response to be provided 3/11/15.

13e – Response to be provided 3/11/15.

13f – Recovery actions have not been credited as the sole means of mitigating KSF pinch points. However, recovery actions have not been excluded as a method of mitigating fire impact to KSFs. Recovery actions have been evaluated for several failure modes including loss of HVAC systems, loss of Instrument Air and loss of control room indicators (where local or backup indication is available). These recovery actions were evaluated using existing plant procedural guidance which will be reviewed and updated as necessary during NFPA 805 implementation. Any recovery actions that will be implemented during a HRE will be evaluated for feasibility in a manner consistent with NSCA credited recovery actions.

SSA RAI 14:

Describe if any RAs require the cross-tie of Unit 1 and Unit 2 systems to achieve the NSPC. Provide the following information:

a. *Describe whether these cross-connecting RAs require staff from both units. If so, describe how the feasibility analysis reflects the Unit 1 and Unit 2 staffing, communication, and operational interface.*

b. *Describe the operational impacts (by fire), if any, on the unaffected unit created by cross-tying these systems. Describe whether Technical Specification 3.0.3 is entered once the cross-tie with the opposite unit has been completed for fire safe shutdown.*

CCNPP RESPONSE SSA RAI 14:

The only recovery actions that credit a cross-tie between Unit 1 and Unit 2 systems to achieve the NSPC are cross-connecting air systems. Recovery actions to cross-tie the Unit 1 Instrument Air system to the Unit 2 Plant Air system are credited for fires in Fire Areas 19, 20 and 34. Recovery actions to cross-tie the Unit 2 Instrument Air system to the Unit 1 Plant Air system are credited for fires in Fire Areas 18, 22 and 25. In each area a recovery action was credited for the VFDR to reduce the risk due to fire in that area.

These recovery actions are updates to Table G-1 which currently credits N2 recharge. Additional changes to Table G-1 are anticipated as a result of other RAIs being resolved at different RAI milestone response requirements. LAR Attachment G, Table G-1, Recovery Actions and Activities Occurring at the Primary Control Station(s) will be updated and a markup provided with the 120 day submittal (4/13/15) that is required to support responses for additional RAIs.

a. Recovery action to cross-tie plant air systems requires staff from both units. The fire impacted unit staff will direct/request the supporting unit to perform the required alignment. The supporting unit staff will then operate the necessary equipment under their cognizance and report back to the fire impacted unit operators. The feasibility analysis identifies recovery actions, including sub-steps, by unit and operator to ensure adequate staffing. Communications between the units is specifically directed by plant procedures (fire AOPs) and this process will be maintained by updated procedures.

b. There are no recovery actions which credit unit cross-tie which require entry into Technical Specification LCO 3.0.3.

SSA RAI 15:

In Attachment B of the LAR, the alignment basis discussion for Attribute 3.2.1.2 provides the following statement on possible fire damage to instrument air tubing that includes copper tubing with soldered joints that are susceptible to separation during a fire and could cause the loss of instrument air to components:

> *These affects were evaluated on an area basis to determine if the instrument air system pressure could be maintained. Calculation CA07971 demonstrates that the instrument air system can maintain system pressure with a 1 inch line pipe rupture.*

Calculation CA07971 states, "Evaluation of Maximum Air Line Break Size in Which Nominal Instrument Air Pressure Can Be Maintained at 50 psig." The NRC staff noted apparent discrepancies in the use and recovery of instrument air as described in Attachment C. Provide the following:

a. *Provide justification that 50 psig of instrument air pressure will not prevent instrument air operated valves from changing position.*

b. *Provide justification for limiting the size of the line to 1" soldered joints being susceptible to separation during a fire. Describe the soldered joints used in the plant instrument air system. For any soldered joints larger than 1", describe how they were treated in the NSCA and Fire Probabilistic Risk Assessment (PRA).*

c. *For several fire areas in Attachment C (such as Fire Areas 18, 19, 20, 21, and 22), the licensee stated in the method of accomplishment for the vital auxiliaries performance goal that instrument air may be recoverable from the opposite unit plant air system. However, the VFDRs associated with the fire areas (such as VFDRs 18-16-2, 19-01-1, 20-02-1, 21-02-1, and 22-05-2) state that plant air from the opposite unit cannot be used because of failure of 1CV2061 or 2CV2061, and the VFDR disposition credits an RA that involves aligning backup nitrogen to the affected unit control valves. Clarify the discrepancy between the method described in the subject fire areas for achieving the performance goal, the VFDRs that state this method is not available, and the RAs cited in LAR Attachment G for resolution of the VFDRs.*

d. *In Attachment C, the discussion of fire suppression effects on the NSPC for Fire Areas 39 and 40 addresses the impact of suppression damage to redundant instrument air compressors and the saltwater air system, and states that the AFW air accumulators can be charged from the nitrogen system with an RA. However, the disposition of VFDRs 39-01-1 and 40-01-2, which address fire damage to the respective unit's instrument air system, stated that the VFDR has been evaluated with no further action required. In addition, the RA to align the nitrogen system to the AFW air accumulators is not discussed*

in LAR Attachment G for these fire areas. Clarify the apparent discrepancy between the effects of fire damage and suppression damage on the instrument air system and salt water air compressors (SWAC) with regard to the need for an RA. If an RA is necessary to mitigate the suppression effects on the instrument air compressors and SWAC, then describe the feasibility and additional risk of the RA.

CCNPP RESPONSE SSA RAI 15:

15a – Response to be provided 4/13/15.

15b – Soldered joints are only used at endpoint/load connections within the instrument air system. There are no soldered joints equal to or larger than 1" in the system. Any joints in the system of this size are pipe fittings. The parts of the system that could fail are the "soft" components connecting the instrument air distribution system to their loads. Each load that could be fire affected for a given fire area was reviewed. The cumulative impact of these failures was evaluated to determine if the system would blowdown due to the rupture being greater than the makeup capacity of the operable air compressors. This analysis was done on a deterministic basis and in each case, where system blowdown could occur, it was identified with a VFDR.

15c – Response to be provided 4/13/15.

15d – Response to be provided 4/13/15.

SSA RAI 16:

In Attachment C, the licensee stated in the summary of vital auxiliaries for Fire Area 17B that the control room and CSR heating, ventilating, and air conditioning (HVAC) is not available without an RA and referenced VFDR 17B-01-0. However, the disposition discussion for VFDR 17B-01-0 states that no further actions are required based on the performance-based analysis for the VFDR, and no RAs required for risk or DID were identified in Attachment G. Clarify the bases for the discrepancy between the description of the vital auxiliaries' discussion and the VFDR disposition.

CCNPP RESPONSE SSA RAI 16:

The deterministic NSCA evaluation identified that the Control Room and Cable Spreading Room HVAC System could be affected for a fire in Fire Area 17B. This failure was documented with VFDR 17B-01-0. The VFDR was evaluated in accordance with NFPA 805, Section 4.2.4.2, performance-based approach – fire risk evaluation with simplifying deterministic assumptions. The results of this fire risk evaluation determined that the risk, safety margin, and defense-in-depth, meet the acceptance criteria of NFPA 805 Section 4.2.4, with no further action required. A recovery action is not required for this VFDR. The Vital Auxiliary section of Fire Area 17B, Attachment C will be updated to state, "Control Room and Cable Spreading Room HVAC may not be available."

SSA RAI 17:

In Attachment G, there are numerous RAs to provide portable fans for temporary cooling of switchgear rooms for Unit 1 Fire Areas 11, 16, 17, 18, and 20, and for Unit 2 Fire Areas 22, 25,

34, and yard. Plant procedures indicate the use of portable generators to power the fans if normal power is not available. Provide the following additional information:

a. *Describe the location of the portable generators and the location of NSCA structures, systems, and components (SSCs), if any, in the vicinity of these location(s). In your description, include a summary of the procedure guidance for the use of portable gas generators and how the RA aligns with each of the feasibility criteria of FAQ 07-0030 (i.e., training, procedures, drills, etc.).*

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

c. *Provide justification that refueling the generators does not present a fire exposure hazard to NSCA SSCs.*

d. *Describe the installation of temporary power cables, connections to distribution panels, and any disruptions to fire area boundaries.*

e. *Describe the method (e.g., the analyzed ventilation path configuration) of providing temporary cooling when portable fans are used for these RAs.*

CCNPP RESPONSE SSA RAI 17:

Response to be provided 4/13/15.

RAD RAI 01:

The radioactive material (RAM) described in the CENG [Constellation Energy Nuclear Group] Calculation No. CA07953 provides a quantification of the maximum amount of RAM that may be stored in various areas. Provide information, if any, on site procedures that are (or will be) established to limit the amount of RAM in storage containers to the levels identified in the analyses (e.g., West Road Cage area, Warehouse #3, Pre-Assembly Facility, and Upper Laydown Area).

CCNPP RESPONSE RAD RAI 01:

Response to be provided 3/11/15.

RAD RAI 02:

Provide information, if any, on site procedures that establish operational controls to restrict the opening of storage containers in open, uncontained areas (e.g., West Road Cage area, Warehouse #3, Pre-Assembly Facility, and Upper Laydown Area).

CCNPP RESPONSE RAD RAI 02:

Response to be provided 3/11/15.

RAD RAI 03:

In the Upper Laydown Area, there are "sealed" Sealand containers, casks, and other containers. Describe what is meant by "sealed" (e.g., are the containers locked and access is not allowed, and do site procedures prevent the opening of these containers?). Also, describe

how potential effluent will be contained based on the "sealing" of containers and concluding that there will be negligible RAD.

CCNPP RESPONSE RAD RAI 03:

Response to be provided 3/11/15.

RAD RAI 04:

Describe any compensatory actions that may be taken during fire suppression activities to minimize RAD (e.g., diking of liquid effluent, use of storm drain covers, radioactive monitoring, or use of other gaseous effluent controls (e.g., use of eductors, effluent filtration)).

CCNPP RESPONSE RAD RAI 04:

Response to be provided 3/11/15.

Fire Modeling (FM) RAI 01:

Section 2.4.3.3 of NFPA 805 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 Fire Dynamics Tools (FDTs) were used to characterize flame radiation (heat flux), flame height, plume temperature, ceiling jet temperature, and hot gas layer (HGL) temperature, and the latter in the multi-compartment analysis (MCA).*
- *Fire Dynamics Simulator (FDS) was used to assess MCR habitability, to calculate temperatures and heat fluxes for damage assessment to critical targets in selected compartments, calculate the flame height and how that affected certain targets, and calculate temperature rise for the purposes of estimating smoke detector activation.*
- *The Thermally-Induced Electrical Failure model, as part of FDS, was used as a secondary check on the temperature and heat flux calculations using FDS for zone of influence (ZOI) purposes.*

Section 4.5.1.2, "Fire PRA" of the LAR states that fire modeling was performed as part of the Fire PRA (FPRA) development (NFPA 805, Section 4.2.4.2). Reference is made to 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 Attachment J. In addition, identify any fire modeling tools and methods that are discussed in Attachment J that were not used in the fire modeling analyses performed at the plant.*

b. *It is discussed in the detailed fire modeling analysis that, "the FDTs are not setup for secondary ignition or for the effects of suppression systems on a fire scenario." This implies that secondary combustibles were not considered for any fire modeling analysis at the plant, except those using FDS.*

c. *Provide justification for ignoring the effects of flame spread and fire propagation in secondary combustibles (for example, cable trays) and the corresponding heat release rate (HRR) on the calculated ZOI and HGL temperature.*

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

e. *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 analyses.*

f. *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. If applicable, describe the effect of tray covers and fire-resistant wraps on HEAF-induced cable tray ignition and subsequent fire propagation.*

g. *Provide justification for the assumed fire areas and elevations that were used in the transient ZOI calculations. Explain how the model assumptions in terms of location and HRR of transient combustibles in a fire area or zone will not be violated during and post-transition.*

h. *Explain how wall and corner effects were accounted for in the fire modeling calculations, or provide justification if these effects were not considered.*

i. *Specifically regarding the use of FDS in the MCR abandonment calculations:*

   i. *It appears that the ceiling height of the MCR used in the calculations is rather high (~ 17ft.). Explain how the MCR dimensions specified in the FDS input files were established, and confirm that they are consistent with the actual dimensions of the control room. In addition, if a false ceiling is present to separate the interstitial space above the operator and back panel areas, provide justification for ignoring it in the control room abandonment calculations.*

   ii. *Explain if the doors of the MCR were assumed to be closed or open at all times, or were assumed to be open at a specified time. Discuss the impact of this assumption on the calculated abandonment times. Describe the additional leakage paths that were specified in the FDS input files, and provide the technical basis for the assumed natural vent areas.*

   iii. *The abandonment calculations consider two mechanical ventilation modes: HVAC inoperative and HVAC in smoke purge mode. Explain why the normal HVAC mode was not considered in the analysis, and why the two modes that were considered are bounding.*

   iv. *The MCR abandonment calculations for a specified ignition source appear to include FDS runs for 10 HRR bins. Appendix-E of NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities: Volume 1: Summary and Overview," September 2005 (ADAMS Accession No. ML052580075) uses a 15-bin discretization. Explain why only 10 bins were used, and describe how the 10-bin discretization was established.*

   v. *Describe the technical basis for choosing the location of the ignition source in the electrical cabinet and transient fire scenarios that were modeled in FDS, and confirm*

that locations in the operator area and the back panel area were considered for both types of ignition sources. Provide technical justification for not considering fire scenarios with the ignition source against a wall or in a corner.

vi. *Explain how the area and elevation of electrical cabinet and transient fires were determined, and demonstrate that the assumed areas and elevations are consistent with plant conditions or lead to conservative estimates of the abandonment times.*

vii. *Provide justification for not considering scenarios that involve secondary combustibles in the MCR abandonment calculations.*

viii. *Explain how the HRRs for electrical cabinets were determined and whether the values are consistent with the type(s) of cabinets present in the MCR at the plant.*

ix. *Provide technical justification for not considering electrical cabinet fires that propagate to adjacent cabinets.*

x. *Provide the technical basis for the material properties that were specified in FDS for the cables inside the cabinets in the MCR. Provide confirmation that the assumed soot yield and heat of combustion values (the latter either explicitly or implicitly through the specified fuel composition) lead to conservative estimates of the soot generation rate.*

xi. *Describe the transient fire growth rate(s) used in the control room abandonment calculations and provide the technical basis for the assumed time(s) to peak HRR.*

xii. *Provide the technical basis for the material properties that were specified in FDS for the transient combustibles in the MCR. Provide confirmation that the assumed soot yield and heat of combustion values (the latter either explicitly or implicitly through the specified fuel composition) lead to conservative estimates of the soot generation rate.*

xiii. *Describe the habitability conditions that were used to determine the time to MCR abandonment. FDS "devices" (temperature and optical density) were placed at a height of 6 feet and at four different locations in the MCR. Describe the basis for choosing these locations and demonstrate that these locations are either representative of where operators are expected to be, or lead to conservative abandonment time estimates. Confirm that heat flux sensors were not specified and, if so, provide technical justification for using temperature sensors as a surrogate for heat flux sensors.*

xiv. *Variations in the input parameters such as ambient temperature, soot yield of the fuel, fire base height, etc., affect the output of FDS calculations. The abandonment analyses for the MCR were performed using a single set of input parameters for each scenario. Demonstrate that the FDS calculations obtained using this set of input parameters provide conservative or bounding results. Alternatively, demonstrate that the abandonment times for a given scenario are not sensitive to variations within the uncertainty of the input parameters.*

xv. *Explain how the results of the MCR abandonment time calculations were used in the FPRA.*

j. *Specifically regarding the 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): Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program," December 2004 (ADAMS Accession No. ML043290075) were used in the calculations to screen an ignition source based on insufficient HRR to generate a HGL condition in the exposing compartment. In addition, clarify which FDTs were used for the HGL calculations.*

iii. *In the MCA scenario analysis, explain the technical basis of modeling the ZOI as a vertical cylinder with the radius equal to 0.2 times the ceiling height in scenarios where the fire occurs near the opening between the two compartments and damages items on both sides within its ZOI.*

iv. *Some of the FDT calculations make the following assumption: "It is assumed that the forced ventilation of air flow rate is distributed among the interconnected compartments, especially corridors, based on the volume of the compartments." Provide technical justification for this assumption.*

v. *The screening process based on the ZOI specifies that if there are cable trays, conduits, or targets on the exposed side of the barrier within the ZOI, which may not be the same as those inside the exposing compartment, the scenario should be analyzed further. Provide details about this additional analysis.*

k. *Specifically regarding the use of FDS in the CSR (physical analysis units (PAUs) 306 and 302) calculations:*

i. *It is stated that engineering judgment is used to assess that the delay in smoke detector activation, which is associated with cross-train logic that is not possible to incorporate in FDS, would be in the range of 2 to 10 seconds. Provide technical justification for this estimate.*

ii. *The FDS "devices" (temperature and heat flux) were placed at different locations around the switchgear rooms. Describe the basis for choosing these locations.*

iii. *The analysis highlights the location of possible electrical cabinet fires that were considered. Provide technical justification for selecting these specific fire locations or demonstrate that these locations lead to bounding or conservative estimates.*

iv. *A number of transient fires were postulated in the CSRs, but the documentation indicates that the walkdown identified no transient combustibles and there were no storage areas for more permanent combustibles in the fire areas. Provide justification for selection of the transient fire areas and indicate if this selection is dependent on any administrative controls of transient combustibles in the CSRs.*

v. *The HRR used for the cabinet fires indicates that the cabinet doors were assumed to be closed. Provide justification for this assumption (e.g., on the basis of the actual plant configuration or operational condition).*

vi. *As stated in FM RAI 1.b, it is expected that secondary combustibles (ignition, flame spread, and cable tray fire propagation) would be part of the FDS analysis for the CSRs. Clarify how secondary combustibles were considered in the FDS analysis of the CSRs, and if they were not considered, provide justification for their omission.*

l. *During the walkdown of the MCR, several observations were made, which require additional information:*

i. *The main horseshoe and back panel cabinet configurations consist of open cabinets with a steel mesh open top with the open sides facing each other across a narrow aisle. The FDS analysis utilizes an HRR case from Appendix G of NUREG-CR 6850, which assumes closed cabinets. Provide justification for not using an HRR case applicable to open cabinets or update the analysis with the appropriate HRR.*

ii. *During the discussion about the open cabinets, it was also discussed that the current analysis does not consider the potential for fire spread across the aisle (i.e., within the horseshoe) from the front to back or vice versa. Provide justification for not considering this potential fire spread or update the analysis to include this scenario.*

iii. *During the walkdown of the MCR, several combustible items, which could be considered transient fire sources, were observed that could potentially have an HRR of greater than 317 kW. Examples include the kitchen area, the upholstered furniture in the shift manager's office and space below the shift manager's office, and photocopiers. Provide additional information that can justify that the transient fire source selected in the FDS analysis is conservative and bounding.*

CCNPP RESPONSE FM RAI 01:

Response to be provided 4/13/15.

01I.i – Response to be provided 3/11/15.

FM RAI 02:

The ASME/ANS Standard RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment 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. If thermoplastic cables are present, explain how raceways with a mixture of thermoset and thermoplastic cables were treated in terms of damage thresholds.*

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

c. *Explain how exposed temperature-sensitive equipment was treated, and provide a technical justification for the damage criteria that were used.*

CCNPP RESPONSE FM RAI 02:

02a – Response to be provided 4/13/15.

02b – Response to be provided 3/11/15.

02c – Response to be provided 4/13/15.

FM RAI 03:

Section 2.7.3.2 of NFPA 805 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.

Section 4.5.1.2 of the LAR states that fire modeling was performed as part of the FPRA development (NFPA 805, Section 4.2.4.2). Reference is made to Attachment J for a discussion of the verification and validation (V&V) of the fire models that were used. Furthermore, Section 4.7.3 of the LAR states that "Calculation 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."

For any tool or method identified in the response to FM RAI 1.a above, provide the V&V basis if not already explicitly provided in the LAR (for example, in Attachment J). Provide technical details to demonstrate that these models were applied within the validated range of input parameters, or justify the application of the model outside the validated range in the V&V basis documents.

CCNPP RESPONSE FM RAI 03:

Response to be provided 3/11/15.

FM RAI 04:

Section 2.7.3.3 of NFPA 805 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.

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

Regarding the limitations of use, 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.

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

CCNPP RESPONSE FM RAI 04:

Response to be provided 4/13/15.

FM RAI 05:

Section 4.5.1.2 of the LAR states that fire modeling was performed as part of the FPRA development (NFPA 805, Section 4.2.4.2). The NRC staff notes this requires that qualified fire modeling and PRA personnel work together. Furthermore, Section 4.7.3 of the LAR states the following:

Cognizant personnel who use and apply engineering analysis and numerical methods in support of compliance with 10 CFR 50.48(c) are competent and experienced as required by Section 2.7.3.4 of NFPA 805.

For personnel performing fire modeling for FPRA development and evaluation, CCNPP [Calvert Cliffs Nuclear Power Plant] develops and maintains qualification requirements for individuals assigned various tasks. Position specific guides were 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.

Qualification cards provide evidence that Design Engineering and PRA personnel have the appropriate training and technical expertise to perform assigned work, including the use of engineering analyses and numerical models.

Qualification requirements are contained in procedure CNG-TR-1.01-1014 (Reference 6.47). CCNPP will maintain qualification requirements for the performance of NFPA 805 related tasks. Position specific qualification cards identify and document required training and mentoring to ensure cognizant individuals are appropriately qualified to perform assigned work per the requirements of NFPA 805, Section 2.7.3.4.

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.*

CCNPP RESPONSE FM RAI 05:

05a – Fire modeling calculations were performed by engineers who meet the qualification requirements of Section 2.7.3.4 of NFPA 805. The qualification process through December 2014 followed the guidance of ACAD 98-004, "Guidelines for Training and Qualification of Engineering Personnel," and the CENG procedure on "Conduct of Training." All those performing Fire Modeling for the Fire PRA were qualified and their qualifications were documented in the CENG training database. This qualification includes basic fire modeling techniques as well as Fire PRA techniques. The CENG PRA Engineering Supervisor reviewed experience and education for all fire modeling work. Those performing detailed fire modeling analysis using tools such as CFAST (Consolidated Model of Fire and Smoke Transport) or FDS (Fire Dynamics Simulator) were required to have the relevant qualifications and experience in fire modeling to perform the analysis.

In the case of the initial fire modeling, the vendor provided the credentials of the fire modelers, which were reviewed and approved by Risk Management Supervision. During and following transition, the existing engineering staff will continue to be knowledgeable in fire modeling techniques, including interpreting and maintaining the fire modeling database. If new fire modeling personnel are needed in the future, their credentials will also be reviewed and approved by Exelon supervision. Currently the Risk Management organization has transitioned to Exelon qualification processes which include the Fire PRA qualification.

Engineering Supervisors have responsibility for "Verifying qualifications prior to assigning personnel to perform job performance requirement independently." This requires reviewing the qualifications in the training server to verify the qualification is current.

05b – Response to be provided 3/11/15.

05c – Response to be provided 3/11/15.

FM RAI 06:

Section 4.7.3 of the LAR states that, "Uncertainty analyses were performed as required by Section 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 FPRA development."

Regarding the uncertainty analysis for fire modeling:

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

b. *Describe how the "model" and "completeness" uncertainties were accounted for in the fire modeling analyses.*

CCNPP RESPONSE FM RAI 06:

Response to be provided 4/13/15.

PRA RAI 01 - Fire Event Facts and Observations:

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

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

a) *PRM-83-01: The disposition to F&O PRM-83-01 appears to indicate that the FPRA was updated to address events involving a fire induced loss of MCR HVAC, which the peer review suggests has a conditional core damage probability (CCDP) of 1.0, by increasing the likelihood of functional failures in lieu of assuming their occurrence. Justify the functional failures modeled by the FPRA to address this loss of MCR HVAC. In addition, explain how the FPRA evaluates the degradation of equipment due to elevated temperatures caused by loss of HVAC as an increase in equipment failure rates, and provide a technical basis for doing so.*

b) FSS-A5-01: *This F&O states that some PAUs are further divided into "sub-PAUs" and appears to indicate that there is no explicit process for evaluating the fire spread across sub-PAU boundaries, which, as the peer review noted, are not defined by physical barriers. The disposition to this F&O, however, does not discuss such a process, and by referencing a sensitivity analysis limited to a number of "representative" PAUs, suggests that this apparent deviation from acceptable methods has not been fully addressed for all PAUs for which sub-PAUs have been defined. Explain how the fire effects across non-physical sub-PAU boundaries are identified and evaluated. Discuss how this approach is consistent with or conservatively bounds acceptable methods.*

c) FSS-G4-01: *The disposition to this F&O indicates that the MCA did not postulate a propagation scenario if doing so would require failure of a penetration seal. The licensee's analysis (C0-FSS-08) suggests that a similar approach may have also been followed for other barrier types (e.g., walls). As a result, identify each barrier type for which propagation scenarios were not postulated, and provide quantitative justification (e.g., an evaluation demonstrating that MCA scenarios involving barrier failure are low risk, even considering the risk associated with the multi-compartment fire) for not addressing propagation. As an alternative, provide updated risk results as part of the integrated analysis requested in PRA RAI 03, summing the generic barrier failure probabilities for each type of barrier present between communicating compartments, consistent with NUREG/CR-6850.*

d) FSS-G5-01: *The disposition to this F&O indicates that unreliability values were applied to all normally open, self-closing dampers and doors; however, the disposition neither provides a basis for the values applied nor mentions active elements discussed elsewhere (e.g., water curtains in F&O PP-B5-01). Summarize the types of active fire barrier elements credited in the FPRA, and provide quantitative justification for their unreliability and unavailability.*

e) HRA-B2-01: *The disposition to this F&O indicates that "adverse" operator actions, which include actions to de-energize electrical busses as a means to address spurious operations, are modeled in the FPRA by assuming all equipment disabled by the action is failed (i.e., the action is successful). Although the licensee's analysis (Section 2.2 of C0-HRA-001) indicates that this assumption is conservative, the basis for this conclusion is unclear if the action is taken to reduce risk. In light of this:*

   i. *Provide justification for the assumption that modeling "adverse" actions as successful is conservative. Note that guidance in NUREG-1921 offers considerations for evaluating fault clearing strategies in the FPRA human reliability analysis (HRA).*

   ii. *Clarify how "adverse" actions are addressed by the FPRA HRA dependency analysis, given that these actions are modeled by failing associated equipment directly within the PRA logic model.*

   iii. *Explain the statement in Attachment G that "[n]one of the recovery actions were found to have an adverse impact on the FPRA." In doing so, clarify how "adverse" risk impact was defined. Note that FAQ 07-0030 states that "[i]f activities (recovery actions or other actions in the post-fire operational guidance) are determined to have an adverse risk impact, they should be resolved during NFPA 805 implementation via an alternate strategy that eliminates the need for the action in the NSCA."*

f) CS-B1-01: *The licensee's analysis (Appendix F of ECP-13-000321, "Common Power Supply and Common Enclosure Study") identifies several MCC 208/120 Volts alternating*

current load breakers that were not coordinated with their respective feed breakers. The disposition to this F&O indicates that these 120V panel breaker coordination issues are to be addressed by plant modification; however, Attachment S does not appear to contain such a modification. Identify the Attachment S modification(s) being credited to resolve the 120V panel breaker coordination issues identified in the disposition to this F&O.

CCNPP RESPONSE PRA RAI 01:

01a – Modeling of the loss of control room HVAC impact was developed for internal events prior to the NFPA 805 application. The Calvert Cliffs control room and cable spreading rooms share the common control room HVAC system. A GOTHIC thermal hydraulic analysis of the heat-up following a loss of control room HVAC determined the maximum temperature in the rooms is 112°F. The design temperature limit is 104°F and the normal control room temperature is considered to be 72°F. Given the maximum temperatures are slightly above the design temperature, the failure rates of the equipment were increased rather than assuming a complete failure.

The basis for the failure rate increases is IEEE 500, "Guide to the Collection and Presentation of Electrical, Electronic, Sensing Component, and Mechanical Equipment Reliability Data for Nuclear-Power Generating Stations." IEEE 500 listed a range of potential failure rate increases for various equipment types. The maximum recommend increase was selected from among all equipment types in the control room and cable spreading rooms. Since all of the control room and cable spreading room controls and instrumentation are supplied from 125VDC and/or 120VAC buses, the failure likelihood of these power supplies was increased by the maximum recommended increase over the mission time of the ventilation loss.

01b - Response to be provided 4/13/15.

01c – Response to be provided 4/13/15.

01d – Normally open fire dampers are not considered active fire barriers in the CCNPP FPRA.

The CCNPP FPRA does not model any normally open doors with closures which initiate door closure due to fire.

The following failure probabilities were used for fire barriers that were credited in the CCNPP FPRA:

- For fire dampers the probability of failure 2.70E-03 was used based on the suggested values in NUREG/CR-6850 Table 11-3.
- For doors, including watertight doors, the probability of failure 7.40E-03 was used based on the suggested values in NUREG/CR-6850 Table 11-3. It may be noted that the watertight doors included in the scenarios are used on a regular basis to enter and exit the compartments. Also, the probability values used is assumed to include the possibility of finding a door being propped open given a fire in the exposing compartment.
- For credited, installed water curtains, the fire barrier failure probability was based on a non-suppression probability (NSP) derived per the guidance in NUREG/CR-6850

Appendix P, as suggested in NUREG/CR-6850 Section 11.5.4.4. Installed water curtains were credited in the CCNPP FPRA for the following potential multi-compartment fires:

- Fires that could potentially propagate from PAU 101 (Unit 2 ECCS Pump Room) to PAU 120E (Unit 2 Containment Recirculation Pipe Tunnel – East)
- Fires that could potentially propagate from PAU 102 (Unit 2 ECCS Pump Room) to PAU 120W (Unit 2 Containment Recirculation Pipe Tunnel – West)
- Fires that could propagate from PAU 118 (Unit 1 #12 ECCS Pump Room) to PAU 122E (Unit 1 Containment Recirculation Pipe Tunnel – East)
- Fires that could propagate from PAU 119 (Unit 1 #11 ECCS Pump Room) to PAU 122E (Unit 1 Containment Recirculation Pipe Tunnel – East)

Plant specific failure data was not collected to verify these probability values; however, procedures are implemented that ensure integrity of the active fire barriers that are credited in the CCNPP fire protection program, including the active fire barriers that have been credited in the CCNPP FPRA. The active fire barriers that have been credited in the CCNPP FPRA are, therefore, inspected periodically per plant procedures. Also, the active fire barriers that have been credited in the CCNPP FPRA that are relied upon to maintain safety / separation have established compensatory measures that are put in place whenever an issue is discovered with the credited feature.

01e –

i. There are both positive and negative aspects to "adverse" operator actions. On the positive side, a successful "adverse" operator action will preclude a spurious actuation that could otherwise have negative consequences. On the negative side, an "adverse" operator action disables equipment that may be credited in the CCNPP FPRA. When the "adverse" operator action is assumed to be successful, the negative impact must also be assumed (i.e., the associated mitigation function credited in the CCNPP FPRA model must be assumed to be failed). When an "adverse" operator action is credited, a detailed human reliability analysis (HRA) quantification is required. This was the methodology employed in the CCNPP FPRA HRA. As an example, when the CCNPP FPRA HRA credited a procedure to de-energize a valve such as a PORV to prevent a spurious opening which can lead to a loss of coolant accident (LOCA) scenario, such credit was only applied following a detailed HRA quantification, it also always assumed the negative impact that the valve was not available to energize to support a feed and bleed type function (the negative impact is incorporated by, setting the associated basic event, failure to open the pilot operated relief valve (PORV) in this case, to TRUE in the quantification, such that the risk of core damage or large early release frequency (LERF) increases).

ii. The CCNPP FPRA will model all equipment disabled by the "adverse' action as being failed (i.e., the action is successful and, as a consequence, equipment is disabled); therefore, this is not evaluated in the dependency evaluation. If an "adverse" action is credited to prevent spurious actuation, then a detailed human reliability analysis (HRA) is developed. All of the detailed HRAs are evaluated in the dependency evaluation.

iii. A recovery action is considered to have an adverse impact on the CCNPP FPRA if it causes more than a negligible increase in core damage frequency (CDF) or large, early release frequency (LERF). Through implementation of Item 15 in LAR Table S-3, CCNPP will ensure that there is not an adverse impact on the CCNPP FPRA. Implementation Item 15 in LAR Attachment S table S-3 includes updating the Abnormal Operating Procedures (AOPs) for severe fires for the recovery actions evaluated. As part of this effort, actions are either functionally based actions or direct procedure steps that are always required. Functional actions are only implemented as required to support a functional loss. For example, if 4kV Bus 21 cannot be re-powered, then action 11|OPEN4KVBKRS in Table G-1 would be implemented. In other cases, the actions are only conditional on some fire-related condition such as the MCR being abandoned. The negative aspects of these actions will always be assumed to occur when the fire-related condition occurs. Although some of the directly implemented actions may have both negative and positive impacts, overall recovery actions are only credited when they are judged to be risk beneficial. In support of Implementation Item 15, the actions that are ultimately credited in the AOPs for severe fires will be risk beneficial or will include the quantification of the adverse impact of the actions in the FPRA quantification.

All risk adverse actions will be removed from the AOPs for severe fires except those required due to operational concerns. Risk adverse actions that are required due to operational concerns will be appropriately modeled in the CCNPP FPRA.

01f - While Appendix F of ECP-13-000321, "Common Power Supply and Common Enclosure Study," does state that several MCC 208/120 VAC load circuit breakers were not coordinated with their respective feed circuit breakers; a later, more detailed, analysis documented in ECP-13-000776 concluded that those same power supplies did not have any coordination issues. A plant modification is not, therefore, required.

PRA RAI 02 - Internal Event F&Os:

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

Clarify the following dispositions to internal events F&Os and SR assessments identified in Attachment U of the LAR that have the potential to impact the FPRA results and do not appear to be fully resolved:

a) *4-5: This F&O indicates that the alignment strategy assumed by the PRA for the 0C diesel generator (DG) is not appropriately justified and may be non-conservative. While the disposition to this F&O clarifies how alignment of the 0C DG is modeled in the PRA, a justification for this treatment is not provided. Provide a technical and/or procedural basis for the alignment strategy assumed in the PRA for the 0C DG, and indicate whether any operator interviews were conducted to support the analysis.*

b) 6-23: This F&O indicates that some joint human error probabilities (HEPs) applied within the internal events PRA (IEPRA) may not accurately reflect the sequential timing of associated operator actions. While the disposition appears to address the specific example referenced by the F&O, it is not clear that the broader issue has been fully resolved in the fire PRA, particularly noting that the status of this F&O in Table U-1 is identified as "open."

i. Explain how the HRA methods used by the FPRA for developing HEP and joint HEP values are consistent with or conservatively bound NRC-accepted guidance in NUREG/CR-6850 or NUREG-1921. Alternatively, provide updated risk results as part of the aggregate change-in-risk analysis requested in PRAN RAI 03 applying HEP and joint HEP values developed using NRC-accepted guidance.

ii. NUREG-1921 indicates and NUREG-1792 (Table 2-1) states that joint HEP values should not be below 1.0E-05. Confirm that each joint HEP value used in the FPRA below 1.0E-05 includes its own justification that demonstrates the inapplicability of the NUREG-1792 lower value guideline. Provide an estimate of the number of these joint HEPs below 1.0E-05 and at least two different types of justification.

CCNPP RESPONSE PRA RAI 02:

a) The alignment of the 0C Diesel Generator (DG) is not fixed. In the AOPs for severe fires, the 0C DG is aligned to both 4kV Buses 11 and 24. Depending on the circumstance, Operations personnel will align the 0C DG to the location where the most equipment can be restored. 4kV Buses 11 and 24 support a motor driven Auxiliary Feedwater (AFW) pump and MCR heating, ventilation and air conditioning (HVAC). 4kV Buses 14 and 21 support a similar set of loads. As such, in many circumstances those buses would be the logical choice. There is nothing, however, to prevent a re-alignment if the equipment being powered from the 0C DG fails or is not otherwise satisfying operational needs. To prevent excessive model complexity, a fixed alignment strategy is used which is conservative compared to the reality of the flexible alignment strategy.

Additional operator interviews regarding alignment of the 0C DG will be conducted. Summaries of these interviews will be added to the CCNPP FPRA documentation. The CCNPP FPRA documentation will also be revised to capture simulator observations regarding alignment of the 0C DG. As revisions are drafted for the AOPs for severe fires, the impacts on the 0C DG alignment modeling will be considered to ensure appropriate modeling for the expected post transition configuration. These changes will also be discussed during interviews with operators to ensure realistic modeling is performed.

The revised documentation containing the additional operator interviews described above will be will be generated in conjunction with the update of CCNPP FPRA analysis documentation supporting RAI PRA-03.

b)i. As noted in Attachment U of the LAR, human failure event (HFE) timelines were reviewed. Some events in the CCNPP FPRA human reliability assessment (HRA) were split into multiple HFEs, where appropriate, to account for the different scenarios and to ensure that the sequential timing of the associated operator actions is appropriate. The CCNPP FPRA HFEs were then assessed as part of the dependency analysis using the EPRI's HRA

Calculator. This is considered an acceptable HRA method for developing HEP and joint HEP values.

To confirm the appropriateness of the review mentioned in Attachment U of the LAR an additional step was taken: A review all CCNPP FPRA HEPs with a T_{delay} of zero was undertaken. T_{delay} represents the period between the start time of an event and the time the operator acknowledges the cue. All HEPs with a T_{delay} of zero were reviewed to determine if these HEPs were discussed during interviews with CCNPP Operations personnel. Operator interviews provide valuable insights and understanding of plant-specific crew responses and feasibility. It was determined that all HEPs with a T_{delay} of zero were discussed during operator interviews conducted either during the Internal Events PRA's Peer Review or the FPRA's Peer Review, or as part of the original Internal Events PRA's HRA. It should be noted that, while all HEPs were discussed during these interviews, only a very small fraction of the HEPs were found to have a T_{delay} of zero that might not be appropriate.

Changes to the T_{delay} could increase or decrease the risk. As the number of potentially affected HEPs in the CCNPP FPRA is small as compared to the total number of HEPs in the CCNPP FPRA, any such changes to the T_{delay} would likely have a negligible impact on the CCNPP FPRA results.

b)ii. None of the individual HEPs included in the CCNPP FPRA have a value less than 1.00E-05. The CCNPP FPRA evaluated 2700 joint human error probabilities (JHEPs); 2259 of these 2700 JHEPs are below 1.00E-05.

The documentation provided in the EPRI HRA Calculator justifies each unique HEP value, including the unique values used for all JHEPs. The evaluations of the individual HEPs include common cognitive actions where appropriate. JHEPs are only developed when there is not a common cognitive failure mode.

Justification examples of JHEPs Combination_U1_1770 and Combination_U1_1065 are described below:

Combination_U1_1770 – 4.23E-09

- FW00HFMPZ9-FR – 1.9E-02 - Operations fails to control Main Feedwater flow post-trip to prevent Steam Generator overfill given fire-induced plant trip
  Impact: SG overfill fails the running turbine driven Auxiliary Feedwater pump
  Location: Main Control Room
- CST0HF-DEPLETION-FR – 6.00E-05 - Operations fails to detect Condensate Storage Tank level dropping during fire (common cognitive)
  Impact: Failure of AFW pumps
  Location: MCR
- CVC0HFOTA8HRS-FR – 7.1E-03 - OTCC - All AFW / MFW failed after CST depletion during fire
  Impact: Failure of once through core cooling and all AFW start actions
  Location: MCR

All of the actions in combination U1_1770 are treated independently largely due to time separation. Operations fails to secure the MFW pumps prior to a SG overfill (FW00HFMPZ9-FR) this fails the running TD AFW pump. The minimum time to CST depletion is six hours following the trip. Although this is the time used in the HRA evaluation with a TD AFW pump failed, this would be longer. Due to this large time separation and different cues (SG water level and CST water level), these actions are considered independent. If Operations fails to recognize that the condensate storage tank is depleting (CST0HF-DEPLETION-), then all the running AFW pumps fail. Operations could start the other unit's AFW pump or align for OTCC (CVC0HFOTA8HRS-FR). There is at least two hours available to align following a CST depletion AFW failure. A CST depletion failure in combination with an AFW failure would provide even more time. Due to the large time separation and different cues (SG water level and CST water level), this is also considered to be independent.

Combination_U1_1065 – 1.38E-07

- AFW0HFCCSGDEC-FR – 1.2E-03 – Operations fails to diagnose SG level decreasing during fire (common cognitive)
  Impact: Failure of OTCC and AFW start actions
  Location: MCR
- CA00HFN2C8-FRI – 7.80E-04 - Operations fails to start both Salt Water Air Compressors (SWACs), in Emergency Operating Procedure (EOP) 8, no loss of air annunciators, dual unit trip during fire
  Impact: Loss of air to AFW flow control valves. AFW delivers full flow to the SGs.
  Location: MCR
- AFW0HFHXB-FR – 5.6E-3 - Operators fail to control AFW flow during fire, no CR flow support, EOP-8
  Impact: SG overfill fails the running TD AFW pump
  Location: AFW Pump Room

Action AFW0HFHXB-FR and AFW0HFCCSGDEC-FR are considered independent while actions CA00HFN2C8-FRI and AFW0HFHXB-FR are considered a medium dependency (per THERP, maximum credit for a medium action is 0.14). Operations fail to start both SWACs and provide long term air for AFW before the AFW accumulators deplete (CA00HFN2C8-FRI). Once air is lost, Operations has a limited time to prevent overfill (AFW0HFHXB-FR); as such, this action has a medium dependency with CA00HFN2C8-FRI. Following a late overfill event caused by AFW accumulator depletion, Operations has over two hours to re-establish AFW flow. Due to the large time separation, these actions are considered independent.

It should be noted that for these joint events to occur, not only does the whole Operations crew need to fail, but the whole emergency response organization must fail as well. For actions to be independent there needs to be at least 60 minutes of time separation between the cues for the Operations actions as well as no common cognitive function. Any fire that progresses to core damage must affect multiple redundant groups of safety related equipment. The Calvert Emergency Action Level procedure requires us to declare an "Alert" when:

FIRE or EXPLOSION resulting in EITHER:
VISIBLE DAMAGE to ANY SAFETY-RELATED

STRUCTURE, SYSTEM, OR COMPONENT within ANY
Table H-1 area
OR
Control Room indication of degraded performance of ANY
SAFETY-RELATED STRUCTURE, SYSTEM, OR
COMPONENT within ANY Table H-1 area

Table H-1 areas include: MCR, Containment, Auxiliary Building, Diesel Generator Rooms, Intake Structure, 1A/0C Diesel Generator Buildings, Refueling Water Tank (RWT), RWT Rooms, CST No. 12, Fuel Oil Storage Tank (FOST) No. 2 and AFW Pump Rooms.

As a fire that progresses to core damage always affects safety related equipment in these areas, a core damage or large early release fire will always result in the activation of the emergency response organization. The Technical Support Center is required to be operational within 60 minutes of activation.

PRA RAI 03 - Integrated Analysis:

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

The PRA methods currently under review in the LAR include:

- *PRA RAI 01.a regarding loss of MCR HVAC*
- *PRA RAI 01.b regarding division of PAUs into "sub-PAUs"*
- *PRA RAI 01.c regarding treatment of propagation in the MCA*
- *PRA RAI 01.d regarding unreliability and unavailability of active barriers*
- *PRA RAI 01.e regarding adverse operator actions*
- *PRA RAI 01.f regarding 120V panel breaker coordination issues*
- *PRA RAI 02.a regarding alignment of OC diesel generator*
- *PRA RAI 02.b regarding HRA methods, including sequential timing of operator actions*
- *PRA RAI 04 regarding placement of transient fires*
- *PRA RAI 05 regarding transient influence factors*
- *PRA RAI 06 regarding reduced transient HRR*
- *PRA RAI 07 regarding self-ignited cable fires and those caused by welding and cutting*
- *PRA RAI 08 regarding treatment of junction boxes*
- *PRA RAI 09 regarding treatment of sensitive electronics*
- *PRA RAI 10 regarding circuit failure probabilities*
- *PRA RAI 11 regarding counting and treatment of Bin 15 electrical cabinets*
- *PRA RAI 12 regarding treatment of HEAF*
- *PRA RAI 13 regarding MCR modeling*
- *PRA RAI 14 regarding credit for MCR abandonment actions*
- *PRA RAI 15 regarding MCR abandonment on loss of control*

- *PRA RAI 16 regarding application of the state-of-knowledge correlation (SOKC)*
- *PRA RAI 18 regarding ΔICDF, ΔLERF and additional risk of RAs*
- *PRA RAI 23 regarding other deviations from acceptable methods*

Provide the following:

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

b) *For each method (i.e., each bullet) above, explain how the issue will be addressed 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 process to ensure that all changes will be made, that a focused-scope peer review will be performed on changes that are PRA upgrades as defined in the PRA standard, and that any findings will be resolved before self-approval of post-transition changes.*

c) *In the response, explain how RG 1.205 risk acceptance guidelines are satisfied for the aggregate analysis. Additionally, discuss the likelihood that the risk increase in any individual fire area would exceed the acceptance guidelines, and if so, why exceeding the guidelines should be acceptable. If applicable, include a description of any new modifications or operator actions being credited to reduce delta risk as well as a discussion of the associated impacts to the fire protection program.*

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

CCNPP RESPONSE PRA RAI 03:

Response to be provided 4/13/15.

PRA RAI 04 - Transient Fire Placement at Pinch Points:

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

The NRC staff could not identify in the LAR or licensee's analysis a description of how "pinch points" for transient fires were treated in the FPRA. Per NUREG/CR-6850, Section 11.5.1.6,

transient fires should, at a minimum, be placed in locations within the plant PAUs where CCDPs are highest for that PAU (i.e., at "pinch points"). Pinch points include locations of redundant trains or the vicinity of other potentially risk-relevant equipment. Cable congestion is typical for areas like the CSR, so placement of transient fire at pinch points in those locations is important. Hot work should be assumed to occur in locations where hot work is possible, even if improbable, keeping in mind the same philosophy.

a) *Clarify how "pinch points" were identified and modeled for general transient fires and transient fires due to hot work.*

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

CCNPP RESPONSE PRA RAI 04:

Response to be provided 4/13/15.

PRA RAI 05 - Transient Influencing Factors:

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

Appendix H of the LAR does not indicate that FAQ 12-0064, "Hot Work/Transient Fire Frequency Influence Factors," dated January 17, 2013 (ADAMS Accession No. ML12346A488), was used in preparation of the FPRA. According to this FAQ, transient influence factor may not be assigned a ranking value of 0, unless associated activities and/or entrance during power operation are precluded by design and/or operation. The licensee's analysis (Table C-2 of C0-IGN-001) indicates, however, that a large number of PAUs are assigned ranking values of 0 for one or more of the transient influence factors. As a result, clarify whether ranking values assigned to transient influencing factors were developed consistent with the guidance in NUREG/CR-6850 and FAQ 12-0064, in particular Section 6.5.7.2, and if not, provide justification. If justification cannot be provided, then provide treatment of transient influence factors consistent with NRC guidance in the integrated analysis provided in response to PRA RAI 03.

CCNPP RESPONSE PRA RAI 05:

Response to be provided 4/13/15.

PRA RAI 06 - Reduced Transient Heat Release Rates:

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting an FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. Methods that have not been determined to be acceptable

by the NRC staff, or acceptable methods that appear to have been applied differently than described require additional justification, to allow the NRC staff to complete its review of the proposed method.

It appears that reductions below the NUREG/CR-6850 98th percentile HRR of 317 kilowatt (kW) for transient fires may have been credited in the FPRA. In particular, the licensee's analysis (e.g., Section 6.5.4 of Addendum 1 to C0-FSS-004) indicates that a 142 kW (75th percentile) HRR transient fire was postulated in the switchgear rooms. As a result, discuss the key factors used to justify any reduced HRR below 317 kW, per the guidance endorsed by the June 21, 2012, memo from Joseph Giitter to Biff Bradley, "Recent Fire PRA Methods Review Panel Decisions and EPRI 1022993, 'Evaluation of Peak Heat Release Rates in Electrical Cabinet Fires'" (ADAMS Accession No. ML12171A583). In doing so:

a) *Identify all PAUs for which a reduction in the HRR below 317 kW for transient fires is credited.*

b) *For each location where a reduced HRR is credited, describe the administrative controls that justify the reduced HRR, including how location-specific attributes and considerations are addressed.*

c) *Provide the results of a review of records related to violations of transient combustible and hot work controls, including how this review informs the development of administrative controls credited, in part, to justify an HRR lower than 317 kW.*

CCNPP RESPONSE PRA RAI 06:

Response to be provided 4/13/15.

PRA RAI 07 - Self-Ignited and Caused by Welding and Cutting:

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

Appendix H of the LAR does not indicate that FAQ 13-0005, "Cable Fires Special Cases: Self-Ignited and Caused by Welding and Cutting," dated June 26, 2013 (ADAMS Accession No. ML13322B260), was used in preparation of the FPRA. Explain whether the treatment of self-ignited fires and fires caused by welding and cutting is consistent with FAQ 13-0005, and if not, provide justification. If justification cannot be provided, then provide treatment of self-ignited fires and fires caused by welding and cutting consistent with NRC guidance in the integrated analysis provided in response to PRA RAI 03.

CCNPP RESPONSE PRA RAI 07:

Response to be provided 3/11/15.

PRA RAI 08 - Junction Boxes:

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

Appendix H of the LAR does not indicate that FAQ 13-0006, "Modeling Junction Box Scenarios in an Fire PRA," dated May 6, 2013 (ADAMS Accession No. ML13149A527), was used in preparation of the FPRA. Explain whether the treatment of junction box fires is consistent with FAQ 13-0006, and if not, provide justification. If justification cannot be provided, then provide treatment of junction box fires consistent with NRC guidance in the integrated analysis provided in response to PRA RAI 03.

CCNPP RESPONSE PRA RAI 08:

Response to be provided 3/11/15.

PRA RAI 09 - Sensitive Electronics:

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

The NRC staff could not identify in the LAR or licensee's analysis a description of how potential fire damage to sensitive electronics was modeled. Though the treatment of sensitive electronics may be consistent with recent guidance on the modeling of sensitive electronics, Appendix H of the LAR does not cite FAQ 13-0004, "Clarifications Regarding Treatment of Sensitive Electronics," dated December 3, 2013 (ADAMS Accession No. ML13322A085), as one of the FAQ guidance documents used to support the FPRA. Describe the treatment of sensitive electronics for the FPRA and explain whether it is consistent with the guidance in FAQ 13-0004, including the caveats about configurations that can invalidate the approach (i.e., sensitive electronic mounted on the surface of cabinets and the presence of louvers or vents). If the approach is not consistent with FAQ 13-0004, justify the approach, or replace the current approach with an acceptable approach in the integrated analysis performed in response to PRA RAI 03.

CCNPP RESPONSE PRA RAI 09:

Response to be provided 4/13/15.

PRA RAI 10 - Conditional Probabilities of Spurious Operations:

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

Attachment V of the LAR indicates that application of circuit failure probabilities was limited to circuits without control power transformers and further clarifies that the probabilities applied yield conservative risk and delta risk estimates relative to the July 1, 2013, interim guidance (ADAMS Accession No. ML13165A214). However, new guidance on using conditional probabilities of spurious operation for control circuits was recently issued by the NRC in Section 7 of NUREG/CR-7150, Volume 2. This guidance included a) replacement of the conditional hot short probability tables in NUREG/CR-6850 for Option #1 with new circuit failure probabilities for single break and double break control circuits, b) Option #2 in NUREG/CR-6850 is not an adequate method and should not be used, c) replacement of the probability of spurious operation duration figure in FAQ 08-0051 for AC control circuits, d) aggregate values for circuit failure probabilities should be used unless it is demonstrated that a cable is only susceptible to a single failure mode, e) incorporation of the uncertainty values for the circuit failure probabilities and spurious operation duration in the SOKC for developing the mean CDF/LERF, and f) recommendations on the hot short probabilities to use for other cable configurations, including panel wiring, trunk cables, and instrument cables. Provide an assessment of the assumptions used in the Calvert Cliffs FPRA relative to the updated guidance in NUREG/CR-7150, Volume 2, specifically addressing each of the above items. If the FPRA assumptions are not bounded by the new guidance, provide a justification for each difference, or provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03, utilizing the guidance in NUREG/CR-7150.

CCNPP RESPONSE PRA RAI 10:

Response to be provided 4/13/15.

PRA RAI 11 - Counting and Treatment of Bin 15 Electrical Cabinets:

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

The licensee's analysis (Section 2.2.1 of C0-FSS-002) appears to indicate that the FPRA evaluates the potential for propagation of electrical cabinet fires based solely on the text in Appendix G (Section G.3.3) to NUREG/CR-6850; however, portions of this text were either

clarified or disregarded in Chapter 8 of Supplement 1 of NUREG/CR-6850. In light of this observation, address the following:

a) *Per Section 6.5.6 of NUREG/CR-6850, fires originating from within "well-sealed electrical cabinets that have robustly secured doors (and/or access panels) and that house only circuits below 440V" do not meet the definition of potentially challenging fires and, therefore, should be excluded from the counting process for Bin 15. By counting these cabinets as ignition sources within Bin 15, the frequencies applied to other cabinets are inappropriately reduced. Clarify that this guidance is being applied. If not, then address the impact as part of the integrated analysis performed in response to PRA RAI 03.*

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

c) *All cabinets having circuits of 440V or greater should be counted for purposes of Bin 15 frequency apportionment based on the guidance in Section 6.5.6 of NUREG/CR-6850. Clarify that this guidance is being applied. If not, then address the impact as part of the integrated analysis performed in response to PRA RAI 03.*

d) *For those cabinets that house circuits of 440V or greater, propagation of fire outside the ignition source should be evaluated based on guidance in Chapter 6 of NUREG/CR-6850, which states that "an arcing fault could compromise panel integrity (an arcing fault could burn through the panel sides, but this should not be confused with the high energy arcing fault type fires)." Describe how fire propagation outside of cabinets greater than 440V is evaluated (including those that are considered "well-sealed"). If propagation is not evaluated, then address the impact as part of the integrated analysis performed in response to PRA RAI 03.*

CCNPP RESPONSE PRA RAI 11:

11a – Response to be provided 4/13/15.

11b – Response to be provided 3/11/15.

11c – Response to be provided 3/11/15.

11d – Response to be provided 3/11/15.

PRA RAI 12 - High Energy Arcing Faults:

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

The NRC staff could not identify in the LAR or licensee's analysis a description of how HEAF were modeled. The licensee's analysis (e.g., Appendix B to C0-FQ-001) appears to indicate

that HEAF ignition sources are combined with other ignition sources (e.g., transients) to form fire scenarios. Per Appendix P of NUREG/CR-6850, however, HEAF events and other types of fires have different non-suppression probability curves. In addition, the NRC staff's interpretation of the NUREG/CR-6850 guidance is that the growth of a fire subsequent to a HEAF event, unlike other types of fires, instantaneously starts at a non-zero HRR because of the intensity of the initial heat release from the HEAF. As a result, provide a detailed justification of the FPRA's treatment of HEAF events and the ensuing fire that includes a discussion of conservatisms and non-conservatisms relative to the accepted methods and assesses the associated impacts on the fire total and delta risk results. Alternatively, replace the current approach with an acceptable approach in the integrated analysis performed in response to PRA RAI 03. Note that the response should address the treatment of all HEAF scenarios, including in the HGL analysis and MCA.

CCNPP RESPONSE PRA RAI 12:

Response to be provided 4/13/15.

PRA RAI 13 - MCR Modeling:

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, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

The licensee's analysis (Section 11.1 of CO-FSS-007) appears to assume that all of the wiring inside MCR control panels is qualified, even though unqualified wiring is known to be present as well. Describe how the presence of both qualified and unqualified wiring is incorporated into the NUREG/CR-6850 Appendix L evaluation. Alternatively, provide treatment of qualification that is consistent with or bounds the actual MCR configuration in the integrated analysis provided in response to PRA RAI 03.

CCNPP RESPONSE PRA RAI 13:

Response to be provided 4/13/15.

PRA RAI 14 - Credit for MCR Abandonment Actions:

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

Tables W-2 through W-5 of the LAR and the licensee's analysis (Section 9.0 of C0-FSS-007) appear to represent MCR abandonment on loss of habitability as a single scenario with unit specific CCDP and conditional large early release probability (CLERP) values. However, the NRC staff could not identify in the LAR or the licensee's analysis the method(s) used to obtain these values. In light of this:

a) *Describe how MCR abandonment was modeled for loss of habitability in both the post-transition and the compliant plant. 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, provide 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) *Explanation of the timing considerations (i.e., total time available, time until cues are reached, manipulation time, and time for decision-making) made to characterize scenarios in Part (b). Include in the explanation the basis for any assumptions made about timing.*

d) *Discussion of how the probability associated with failure to transfer control to the Auxiliary Shutdown Panel is taken into account in Part (b).*

CCNPP RESPONSE PRA RAI 14:

Response to be provided 4/13/15.

PRA RAI 15 - MCR Abandonment on Loss of Control:

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, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

LAR Table G-1 identifies several PCS actions for non-MCR fire areas (Fire Areas 16 and 17), which encompass, in part, the Unit 1 and Unit 2 CSRs. Additionally, the licensee's analysis (Table 6 of C0-HRA-001) appears to credit actions to transfer control from the MCR to the auxiliary shutdown panel for fires in the CSR. In light of this:

a) *Clarify whether the above fire areas (or other non-MCR areas) contain fire scenarios for which primary command and control is not retained in the MCR (i.e., the MCR is abandoned), and if so, explain how this decision was reached.*

b) *If primary command and control is retained in the MCR, then RG 1.205 states, "Operation of dedicated or alternative shutdown controls while the MCR remains the command and control location would normally be considered a recovery action." If actions taken at the PCS are not considered RAs for scenarios in which primary command and control are retained in the MCR, assess the impact of treating such actions consistent with RG 1.205 on both the delta risk and additional risk of RAs as part of the integrated analysis performed in response to PRA RAI 03. Additionally, discuss the results of the feasibility and reliability evaluation of any new RAs in accordance with FAQ 07-0030.*

c) *For scenarios in which primary command and control is not retained in the MCR and is instead transferred to the PCS, the actions taken at the PCS are not RAs, and the MCR is assumed to be abandoned on loss of control (or function). Describe these scenarios, discussing how actions taken prior to and after MCR abandonment are modeled in the FPRA and its HRA. Additionally, explain the cues that result in the decision to abandon and their timing, identify the instruments being relied upon to make the abandonment decision, discuss whether the identified instruments are protected, and discuss how failure to transfer control to the PCS is taken into account.*

CCNPP RESPONSE PRA RAI 15:

Response to be provided 4/13/15.

PRA RAI 16 - State-of-Knowledge Correlation:

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, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

Section 4.7.3 of the LAR explains that the sources of uncertainty in the FPRA were identified, and specific parameters were analyzed, for sensitivity in support of the NFPA 805 FRE process. It is further explained that during the FRE process, the uncertainty and sensitivity associated with specific FPRA parameters were considerations in the evaluation of the change in risk relative to the applicable acceptance thresholds. Based on these explanations, it appears that the risk results presented in Attachment W of the LAR are point estimates and do not include parameter uncertainty. Explain how the SOKC was taken into account in the FPRA quantification, including fire ignition frequencies, circuit failure likelihood and hot short duration, and non-suppression probabilities. If the SOKC for these parameters was not addressed in the FPRA quantification, then include the impact of the SOKC for these parameters in the integrated analysis performed in response to PRA RAI 03.

CCNPP RESPONSE PRA RAI 16:

The risk information presented in Attachment W is based on point estimate calculations. This is considered a reasonable approximation to the equivalent mean calculation. The state-of-knowledge correlation (SOKC) only causes the mean to be larger when multiple correlated parameters appear in a single cutset. The vast majority of the cutsets contain only uncorrelated parameters (e.g. fire scenario frequency, a single HRA failure likelihood, and a non-suppression probability). There are cutsets that contain multiple operator actions, but these events are already evaluated as a joint failure probability which addresses the correlation issue. There are also cutsets which could contain multiple circuit failure likelihood values. The CCNPP FPRA uncertainty notebook (C0-UNC-001 Revision 1) indicates only a minor change in the risk when circuit failure likelihoods are not credited (see sensitivity analysis summary below, for Unit 1 (Unit 2 similar):

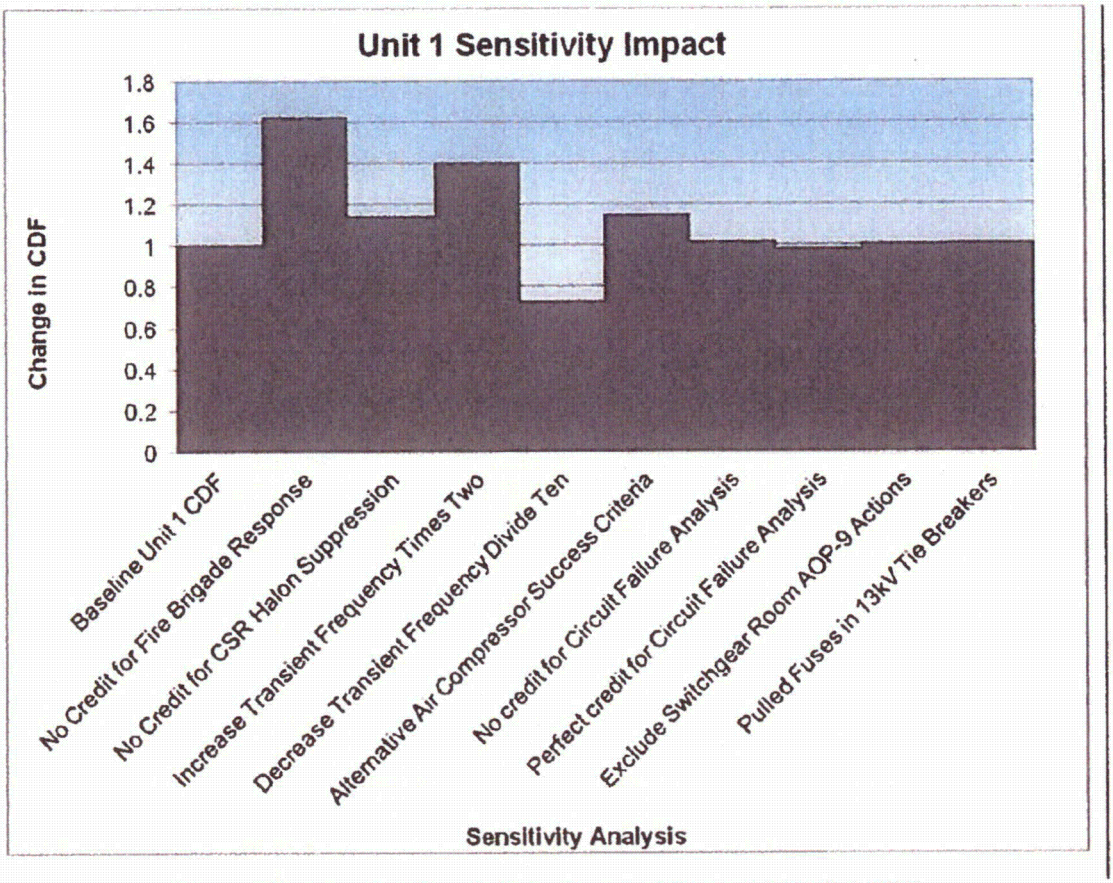

Figure 15: Impact of Sensitivity in Terms of Change to Unit 1 CDF

Given the above, the use of point estimates in the delta risk calculations is considered to be appropriate.

The uncertainty analysis documentation in C0-UNC-001 will be updated to include a comparison of the mean to the point estimate, and a sensitivity study on the circuit failure likelihood.

PRA RAI 17 - Sensitivity Analysis on FAQ 08-0048 Fire Bin Frequencies:

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

The licensee's analysis appears to indicate that generic fire ignition frequencies were based upon those provided in Supplement 1 to NUREG/CR-6850. Chapter 10 of this supplement, however, states that a sensitivity analysis should be performed when using the fire ignition frequencies in the supplement instead of those provided in Table 6-1 of NUREG/CR-6850. As part of the response to PRA RAI 03, provide the results (i.e., CDF, LERF, ΔCDF and ΔLERF) of a sensitivity analysis that evaluates the impact of using the supplement frequencies, consistent with Chapter 10 of Supplement 1 to NUREG/CR-6850. If RG 1.17 4 risk acceptance guidelines are exceeded, (1) discuss which ones are exceeded, (2) describe the fire protection or related measures that will be taken to provide additional DID, and (3) discuss conservatisms in the analysis and the risk significance of these conservatisms.

CCNPP RESPONSE PRA RAI 17:

Response to be provided 4/13/15.

PRA RAI 18 - Calculation of VFDR ΔCDF and ΔLERF:

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, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff's review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

Section W.2.1 of the LAR provides some description of how the change-in-risk and the additional risk of RAs associated with VFDRs is determined, but not enough detail to make the approach completely understood. As a result, provide the following:

a) *A detailed definition of both the post-transition and compliant plant models used to calculate the reported change-in-risk, including any special calculations for the MCR and other abandonment areas (if applicable). Include description of the model adjustments made to remove VFDRs from the compliant plant model, such as adding events or logic, or use of surrogate events. Also, provide an explanation of how VFDR- and non-VFDR-related modifications are addressed for both the post-transition and compliant plant models.*

b) Justification for the assumption in the licensee's analysis (Section 8.0 of EPM Report R2215-008-024) that the risk associated with the post-transition plant model is considered equivalent to that of the compliant plant model for scenarios requiring MCR abandonment.

c) A description of how the reported additional risk of RAs was calculated, including any special calculations performed for the MCR and other abandonment areas (if applicable). If non-VFDR-related modifications are credited to reduce delta risk, equating the additional risk of RAs (as discussed in W.2.1) to the sum of the delta risks of the VFDRs that are resolved by crediting an RA may be non-conservative. In this case, the additional risk of these RAs should be re-calculated consistent with FAQ 07-0030 as part of the integrated analysis performed in response to PRA RAI 03.

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

e) A clarification of whether they DID RAs listed in Attachment G of the LAR are quantified in the FPRA. Also, explain whether credit for such DID RAs is necessary for the change-in-risk to be acceptable.

CCNPP RESPONSE PRA RAI 18:

18a – Variances from deterministic requirements (VFDRs) were removed from the CCNPP FPRA compliant plant model by setting the VFDR related cables or basic events to false (no random failure for basic events set to false). Basic events are set to false when equipment in the room would be damaged by fire for those components whose loss causes the VFDR. The delta risk was obtained by quantifying this compliant case and comparing with the base model risk. All modifications, VFDR and non-VFDR related, were including in both the post-transition and compliant plant models.

There were no special considerations for the MCR regarding the VFDR calculations. Further, in the submittal, fires in the MCR are the only fires that forced a complete MCR abandonment. The VFDR delta risk approach as described above was used in all areas MCR and non-MCR, abandonment and non-abandonment.

18b - Response to be provided 4/13/15.

18c – The compliant plant will be evaluated by setting the root cause failures for each VFDR (cables or basic events) to FALSE (i.e., by simulating a deterministically compliant version of the fire area). Risk will then be calculated and the difference between the base model and the compliant case will be the delta risk. The delta risk of recovery action will be obtained by subtracting the baseline risk from the calculated risk with the HRA successful (i.e., the difference between the base model risk with the HRA set to zero, or equivalent compliant control room HEP value, and the base model risk). This delta risk can be represented as:

Delta Risk of Recovery Action = Rrecov base – Rrecov compl

Where:
Rrecov base = the baseline fire risk of associated scenario with credit for a recovery

Modifications not associated with VFDRs are not credited to reduce delta risk.

The results of the compliant plant evaluation described above will be will be submitted in conjunction with the response to RAI PRA-03.

18d – Variances from deterministic requirements were identified for the loss of required power supplies; loss of support systems, including HVAC; loss of pumps for credited flow paths; failures of valves for credited flow paths; and, spurious operations in both credited and non-credited paths which could impact the NSPC.

VFDRs were excluded from the change in risk calculations if the component or components covered by the VFDR were screened out during the CCNPP FPRA's component selection process. Examples include VFDRs covering non-FPRA credited instrumentation (e.g., Reactor Coolant System temperature indication) and pressurizer heaters.

18e – The instances in which recovery actions are specified as Risk / Defense In Depth (DID) (i.e., credited for both risk and DID), the actions will either be retained as Risk actions only and will be included in the CCNPP FPRA risk quantification or they will be re-classified as DID only and will not be credited in the FPRA risk quantification. This will ensure that all DID actions are credited as additional actions for which credit is not included in the CCNPP FPRA quantification.

PRA RAI 19 - Attachment W Inconsistencies:

Several inconsistencies were noted within Attachment W as well as between its tables and those in Attachments C and G for particular fire areas. In light of this:

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

i. In Table W-6, Unit 1 Fire Areas 2, 8, 13, 18, 18A, 22, 23, 25, 26, 27, 28, 31, 38, 40, and 2CNMT are indicated as Deterministically Compliant (4.2.3.2); however, they are indicated as having VFDRs (i.e., there is a "Yes"' under the "VFDR" column and sometimes under the "RAs" column) as well as very small risk values (i.e., Fire Area 18) or epsilon for ΔCDF/ΔLERF. Similarly, in Table W-7, Unit 2 Fire Areas 3, 4, 6, 14, 15, 19, 19A, 21, 30, 33, 39, and 1CNMT are noted as Deterministically Compliant (4.2.3.2); however, they are indicated as having VFDRs and very small risk values (i.e., Fire Areas 19 and 30) or epsilon for ΔCDF/ΔLERF. Attachment C does not identify any of the above deterministic fire areas as having VFDRs. Furthermore, while for most of these fire areas the ΔCDF/ΔLERF and additional risk of RAs is reported to be epsilon, actual (very small) numerical values are reported for ΔCDF/ΔLERF for Unit 1 Fire Area 18 and for Unit 2 Fire Areas 19 and 30, and actual (very small) numerical values are reported for additional risk of RAs for Unit 1 Fire Area 23.

ii. In Table W-6, Unit 1 Fire Areas 12, 14, 15, 19A, 21, 30, 32, 33, 35, 36, 39, 1CNMT, and IS are indicated as Performance-Based (4.2.4.2) and as having an RA credited in the FPRA (i.e., there is a "Yes"' under the "RAs" column); however, no RAs are described in the VFDR dispositions presented in Attachment C or listed in Attachment G for these areas. Similarly, Unit 2 Fire Areas 12, 13, 18A, 20, 26, 27, 28, 32, 34, 35, 36, 40, 2CNMT, and IS are indicated as Performance-Based (4.2.4.2) and identify a "Yes"' under RA; however, no RAs were described in the VFDR dispositions presented in Attachment C or listed in Attachment G for these areas. Furthermore,

while for most of these fire areas the additional risk of RAs is reported to be epsilon, actual (very small) numerical values are reported for Unit 1 Fire Areas 21 and 36 and for Unit 2 Fire Area 13.

iii. *The LERF (9.49E-08/year (yr) reported in Table W-4 for scenario PAU CC-1A-C (Complete Burn of Vertical Cable Chase 1A) is greater than the total LERF (4.04E-08/yr) reported in Table W-6 for Fire Area 20 (Cable Chase 1A). For two scenarios reported in Table W-4 (PAU 230E-C and PAU 230W-C), which represent fires in Unit 1 Containment, the summation of their LERF (1.99E-07/yr) is greater than the total LERF (1.91 E-07/yr) reported in Table W-6 for Fire Area 1CNMT (Unit 1 Containment). These inconsistencies also exist between Tables W-5 and W-7 for the same scenarios in Unit 2.*

iv. *The Table W-1 Unit 1 fire LERF of 3.2E-06/(chemical reactor (rx)-yr) does not match the corresponding value reported in Table W-6. Similarly, the Table W-1 Unit 2 fire LERF of 4.4E-06/(rx-yr) does not match the corresponding value reported in Table W-7.*

b) *Describe what is meant by the use of "ε," or epsilon, in columns for Fire Area CDF/LERF, ΔCDF/ΔLERF, and additional risk of RAs. Address if epsilon is defined by a specific cut-off value(s). Also, clarify how an actual value for LERF can be reported while epsilon is reported for the corresponding CDF (i.e., Unit 1 Fire Area 24 for additional risk of RAs, Unit 2 Fire Areas 8 and 10 for CDF/LERF and Δ CDF/LERF).*

c) *Describe what is meant by the use of "N/A" in columns for Fire Area CDF/LERF, ΔCDF/ΔLERF, and additional risk of RAs. In doing so, clarify the basis for not reporting Fire Area CDF/LERF values (or epsilon) for Unit 1 and Unit 2 Fire Areas 44, AB-1, AB-3, ABFL, DGB1, DGB2, and TBFL.*

d) *Tables W-6 and W-7 include a risk reduction credit for internal events that is described in a footnote to these tables as covering random failures and internal floods. This risk reduction credit is used to offset the increase in fire risk reported in these tables. Explain how the risk reduction from internal events reported in these tables is calculated.*

CCNPP RESPONSE PRA RAI 19:

19a – Response to be provided 4/13/15.

19b – Epsilon is not defined by a specific cutoff. It is used to indicate that the risk contribution from that element is negligible. A review of the usage of epsilon will be done in conjunction with the final quantification and submittal of RAI 3 Attachment W tables to eliminate inconsistencies in the use of this term in the LAR tables.

19c – Calvert Cliffs Nuclear Power Plant LAR Attachment W, Tables W-6 and W-7 utilized "N/A" in the columns for "Fire Area CDF/LERF, ΔCDF/ΔLERF" and "Additional Risk of RAs" for Fire Areas where there were no VFDRs and/or no risk assessments. Attachment W will be revised to provide an explanation of this use of "N/A" in the final Tables W-6 and W-7 which will be submitted in conjunction with the response to RAI PRA-03.

19d - Response to be provided 4/13/15

PRA RAI 20 - Implementation Item Impact on Risk Estimates:

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

Table S-3, Implementation Item 12 of the LAR commits to updating the FPRA and verifying the risk results after "risk related" plant modifications have been incorporated. However, it is unclear to which modifications the implementation item refers. Update Implementation Item 12 to reflect completion of both the Table S-2 modifications and Table S-3 implementation items before this verification.

CCNPP RESPONSE PRA RAI 20:

Any as-built changes that affect the CCNPP FPRA model will include an evaluation of whether the acceptance criteria and the delta risk criteria are still satisfied.

We propose revising Implementation Item 12 to read as follows:

Incorporate as built risk related modifications, implementation items and any other additional refinements that may be needed into the Fire PRA and Internal Events Model and verify the risk results are not appreciably changed. The credited modifications will be tracked through the design input and the engineering configuration control process. The PRA model will be updated as necessary to reflect the final change package, and impacts to the risk estimates will be verified. As the actual engineering implementation of each modification is developed in concert with Fire PRA evaluations of the proposed change, if the Fire PRA indicates that the as-built change in risk would not meet the acceptance criteria as described in LAR Section 4.5.2.2, the modification under development or its representation in the Fire PRA will be refined to ensure that the acceptance criteria are satisfied. In addition, CCNPP will verify the validity of the reported change-in-risk estimates of Attachment W following completion of both PRA-credited modifications and implementation items. If this verification determines that the risk metrics have changed such that the RG 1.205 acceptance guidelines are not met, the NRC will be notified and additional analytical efforts, and/or procedure changes, and/or plant modifications will be made to assure the RG 1.205 risk acceptance criteria are met.

This implementation item is an on-going action initiated within the 180 day timeframe for completion of implementation items but only complete after completion of modification implementation per Table S-2.

We also propose revising the last paragraph of LAR Section 4.8.2 to read as follows:

The FPRA model represents the as-built, as-operated and maintained plant as it will be configured at the completion of the transition to NFPA 805. The FPRA model includes credit for the planned implementation of modifications identified in Attachment S, Table S-2. Following

installation of modifications and the as-built installation details, additional refinements surrounding the modifications may need to be incorporated into the FPRA model (the FPRA will verify the validity of the reported change-in-risk on as-built conditions after the modifications are completed). However, these changes are not expected to be significant. No other significant plant changes are outstanding with respect to their inclusion in the FPRA model (see Attachment S, Table S-3, IMP-12). CCNPP will verify the validity of the reported change-in-risk estimates of Attachment W following completion of both PRA-credited modifications and implementation items. If this verification determines that the risk metrics have changed such that the RG 1.205 acceptance guidelines are not met, the NRC will be notified and additional analytical efforts, and/or procedure changes, and/or plant modifications will be made to assure the RG 1.205 risk acceptance criteria are met.

We propose revising the first bullet of LAR Section 5.5 to read as follows:

- Implementation of new NFPA 805 fire protection program to include procedure changes, process updates, and training to affected plant personnel. This will occur 180 days following the issuance of an approved SER from the NRC unless that date falls within a scheduled refueling outage. Then, implementation will occur 60 days after startup from that scheduled refueling outage. See Attachment S, Table S-3. It should be noted that implementation item IMP-12 is associated with incorporation of the NPFA 805 modifications and the completion of this implementation item is an on-going action initiated within the 180 day timeframe for completion of implementation items but only complete after completion of modification implementation per Table S-2.these procedure changes, process updates, and training represent implementation items that are on-going actions initiated within the 180 day timeframe for completion, but will only be complete after completion of modification implementation per Table S-2.

We propose revising Item (3) on Page M-5 of LAR Attachment M to read as follows:

(3) The licensee shall implement the items listed in Enclosure 1, Attachment S, Table S-3, "Implementation Items," from license amendment request dated _____ within 180 days after NRC approval unless that implementation date falls within a scheduled refueling outage. Then, implementation will occur 60 days after startup from that scheduled refueling outage. It should be noted that implementation item IMP-12 is associated with incorporation of the NPFA 805 modifications and the completion of this implementation item is an on-going action initiated within the 180 day timeframe for completion of implementation items but only complete after completion of modification implementation per Table S-2.It should be noted that these implementation items are on-going actions initiated within the 180 day timeframe for completion of implementation items but only complete after completion of modification implementation per Enclosure 1, Attachment S, Table S-3.

Markups of the submitted LAR pages for each of the above proposed revisions are enclosed.

PRA RAI 21 - Internal Events Peer Review:

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. The RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting an FPRA and endorses, with exceptions and clarifications, NEI 04-02, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA 805. The RG 1.200 describes a peer review process

utilizing an associated ASME/ANS standard (currently ASME/ANS-RA-Sa-2009) as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established.

Attachment U of the LAR indicates that the full-scope IEPRA peer review was performed against ASME/ANS PRA Standard, RA-S-2008a. In light of this observation, if RG 1.200, Revision 2, and ASME/ANS PRA Standard, RA-Sa-2009, were not used as the basis for the peer review of the IEPRA, then discuss whether any differences between SRs were evaluated and whether they had any impact on the application.

CCNPP RESPONSE PRA RAI 21:

The peer review of the CCNPP internal events PRA was completed against Regulatory Guide 1.200 Revision 2 and American Society of Mechanical Engineers (ASME) / American Nuclear Society (ANS) PRA Standard RA-Sa-2009.

PRA RAI 22 - PRA Upgrades:

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

The LAR does not indicate whether any changes made to the IEPRA or FPRA since their most recent full-scope peer reviews 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, Revision 2. In light of this, identify any such changes. If a focused-scope peer review has not been performed for the identified changes, describe what actions will be implemented to address this issue. If a focused-scope peer review has been performed, confirm whether it was done consistent with the guidance in ASME/ANS-RA-Sa-2009, as endorsed by RG 1.200, and provide any findings and their resolutions.

CCNPP RESPONSE PRA RAI 22:

No "PRA upgrades" (as defined in ASME/ANS-RA-Sa-2009, Regulatory Guide 1.200 Revision 2 and closed out Frequently Asked Questions) have been performed, or are planned to be performed, to the CCNPP Internal Events PRA model or the CCNPP FPRA model. As such, a focused scope peer review is not required. If in the course of developing the RAI responses a change to the FPRA is identified which constitutes a PRA upgrade, a focused scope peer review will be initiated in accordance with PRA analysis upgrade procedure requirements in Exelon Training and Reference Material (T&RM) guidance documents ER-AA-600-1015 (FPIE PRA Model Update) and ER-AA-600-1061 (Fire PRA Model Update and Control).

PRA RAI 23 - Deviations from Acceptable Methods:

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA 805 further states that the change in public

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

Section 4.5.1.2 of the LAR states that the FPRA model uses "a methodology consistent with the guidance provided in NUREG/CR-6850 and subsequent clarifications documented in responses to NFPA 805 FAQs" and that "[n]o unreviewed methods or deviations from NUREG/CR-6850 were utilized in the FPRA model development." Indicate if any other methods were employed that deviate from other NRC-accepted guidance (e.g., subsequent clarifications documented in FAQs, interim guidance documents, etc.). If so, describe and justify any proposed method that deviates from NRC guidance, or replace the proposed method with an accepted method. Also, include the proposed method as a method "currently under review" as part of the integrated analysis in the response to PRA RAI 03.

CCNPP RESPONSE PRA RAI 23:

Only mutually agreed upon methods will be used in preparation of the final CCNNP FPRA supporting the NFPA 805 LAR and the responses to the associated RAIs. The peer review of the CCNPP FPRA that was completed against Regulatory Guide 1.200 Revision 2 and American Society of Mechanical Engineers (ASME) / American Nuclear Society (ANS) PRA Standard RA-Sa-2009 did not find any unapproved methods. It is our intent to continue to use only mutually agreed upon methods for any future work done in support of the CCNPP FPRA and the LAR. Agreement on acceptable approaches based on the interpretation of acceptable methods will be resolved through the RAI process.

PRA RAI 24 - Defense-in-Depth and Safety Margin:

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

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

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

b) *Provide further discussion of the approach in applying the NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10*

CFR 50.48(c)," Revision 2 (ADAMS Accession No. ML081130188) criteria for assessing safety margin in the FREs.

CCNPP RESPONSE PRA RAI 24:

24a

The method used in the CCNPP FPRA Fire Risk Evaluations (FREs) to determine when a substantial imbalance between DID echelons existed was based on the guidance in NEI 04-02, Revision 2. Specifically, a review was performed of each DID echelon on a fire area basis based on the following considerations:

Echelon 1 (Prevent fires from starting):
Combustible and hot work controls are fundamental elements of DID and as such are always in place. The issue considered during FRE was whether this element needs to be strengthened to offset a weakness in another echelon, thereby providing a reasonable balance.

Considerations included:

- Creating a new Transient Combustible Free Area;
- Creating a new Hot Work Restriction Area; and/or,
- Modifying an existing Transient Combustible Free Area or Hot Work Restriction Area.

The fire scenarios involved in the FRE quantitative calculation were reviewed to determine if additional controls should be added.

The remaining elements of DID were reviewed to ensure an overreliance was not placed on programmatic activities for weaknesses in plant design.

Echelon 2 (Rapidly detect, control, and extinguish promptly those fires that do occur thereby limiting fire damage):

Automatic suppression and/or detection may or may not exist in the fire area in question. The issue considered during the FRE was whether installed suppression and/or detection was required for DID or whether suppression and/or detection needed to be strengthened to offset a weakness in another echelon, thereby providing a reasonable balance.

Considerations included:

Risk Insights:

- If existing VFDRs were never affected in a potentially risk significant fire scenario, manual suppression capability was generally considered adequate and no additional systems required.

Recovery Actions:

- If the fire area required recovery actions, typically detection and manual suppression capability were considered required. Additionally, requiring automatic suppression was considered.

- If the fire area contained neither suppression, nor detection; and a recovery action was required, the addition of automatic detection and/or suppression systems were considered.

Firefighting Activities:

- If firefighting activities in the fire area were expected to be challenging (either due to the nature of the fire scenario or accessibility to the fire location), then the addition of both suppression and detection were considered, if absent.

Fire Scenarios:

- If fire scenarios credited fire detection and/or fire suppression systems, then these were already considered to form an integral part of DID.

Echelon 3 (Provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed):

If fires occur and they are not rapidly detected and promptly extinguished, then the third echelon of DID would be relied upon. The issue considered during the FRE was whether existing separation was adequate (or over relied on) and whether additional measures (e.g., supplemental barriers, fire rated cable, or recovery actions) were required to offset a weakness in another echelon, thereby providing a reasonable balance.

Considerations included:

Risk Insights:

- If existing VFDRs were not affected in a "potentially risk significant" fire scenario, internal fire area separation was considered adequate and no additional reliance on recovery actions was considered necessary.
- If existing VFDRs were affected in a risk significant fire scenario, internal fire area separation may not be adequate and reliance on a recovery action, supplemental barrier, or other modification was considered.
- If the consequence associated with existing VFDRs were considered high (e.g., CCDP>1E-01 or by qualitative Safe Shutdown (SSD) assessment), regardless of whether it is in a risk significant fire scenario, a recovery action, supplemental barriers, or other modification was considered.
- There are known modeling differences between a FPRA and NSCA due to different success criteria, end states, etc. Although a VFDR may be associated with a function that is not considered a significant contribution to core damage frequency, in some cases, the VFDR may have been considered important enough to the NSCA to retain a recovery action as credited for DID, but not required for risk.

The fire scenarios involved in the FRE quantitative calculation were reviewed to determine the fires evaluated and the consequence in the area to best determine options for this element of DID.

Each fire area was evaluated for the need to incorporate DID enhancements to provide assurance that plant performance goals can be achieved and maintained. Documentation of

these DID enhancements was tied directly to applicable VFDR dispositions in the respective fire area FRE.

DID enhancements that were specifically implemented consisted of implementing transient combustible free and hot work restricted areas; credit for fire detection systems; credit suppression systems; and credit for DID recovery actions. These DID enhancements were implemented based on the above considerations.

24b

In accordance with NEI 04-02, Revision 2, the maintenance of adequate Safety Margin was assessed by the consideration categories of analyses used by the CCNPP FPRA FREs. Safety margins were considered to be maintained if:

- Codes and standards or their alternatives accepted for use by the NRC are met; and,
- Safety analysis acceptance criteria in the licensing basis (e.g., UFSAR, supporting analyses, etc.) are met, or provide sufficient margin to account for analysis and data uncertainty.

The requirements related to safety margins for the FREs were evaluated for each specific analysis type. These analyses can be grouped into four categories. These categories are:

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

As described in the CCNPP FREs, Safety Margins were maintained as follows:

1) Fire Modeling
   a) For all fire areas assessed, the "bounding risk assessment" or "combined analysis approach" was used as follows:
      i) Where the "bounding risk assessment" was used per NEI 04-02, Section 5.3.4.2, the analysis conservatively assumed that target set damage occurred for postulated fire events which resulted in whole room burn up. Fire modeling was not performed in support of the change evaluations for such areas and results were therefore based on whole area burn up. As such, the results are considered bounding.
      ii) Where the "combined analysis approach" was used per NEI 04-02, Section 5.3.4.3, fire modeling was performed in support of the transition within the CCNPP FPRA using codes and standards developed by industry and NRC staff which have been verified and validated in authoritative publications.
   b) The Risk-Informed, Performance-Based (RIPB) processes used were based upon NFPA 805, 2001 edition, as endorsed by the NRC in 10 CFR 50.48(c).

2) Plant System Performance
   a) The FRE process was performed in accordance with NEI 04-02, Revision 2. Regulatory Guide 1.205 endorses portions of NEI 04-02, Revision 2, where it has been found to provide methods acceptable to the NRC for implementing NFPA 805 and complying with 10 CFR 50.48(c).

b) Fire protection systems and features determined to be required by NFPA 805 Chapter 4 were confirmed to meet the requirements of NFPA 805 Chapter 3 and their associated referenced codes and listings, or provided with acceptable alternatives using processes accepted for use by the NRC.

3) FPRA Logic Model
   a) The CCNPP FPRA was developed in accordance with NUREG/CR-6850, which was developed jointly between the NRC and EPRI.
   b) The CCNPP FPRA has undergone an industry peer review, in order to ensure that it meets the appropriate quality standards of ASME / ANS Joint Standard RA Sa 2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," dated February 2, 2009.
   c) In accordance with the requirements of 10 CFR 50.48(c)(iii), the CCNPP FPRA results, including the sequences for the scenarios of concern, have been reviewed and it was verified that the results do not rely solely on feed and bleed as the fire-protected safe shutdown path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability for the fire areas considered.

4) Miscellaneous
   a) No analyses that were not addressed by the above categories were identified.

Example of a Typical Safety Margin Review as Contained in a FRE for a Fire Area with One or More VFDRs

In accordance with NEI 04-02, the maintenance of adequate safety margin is assessed by the consideration categories of analyses utilized by this FRE.

Safety margins are considered to be maintained if:

- Codes and Standards or their alternatives accepted for use by the NRC are met.

AND

- Safety analyses acceptance criteria in the licensing basis (e.g., FSAR, supporting analyses) are met, or provides sufficient margin to account for analysis and data uncertainty

The following summarizes the bases for ensuring the maintenance of safety margins:

- The risk-informed, performance based processes utilized are based on NFPA 805, 2001 edition, endorsed by the NRC in 10 CFR 50.48(c).
- The FRE process is in accordance with NEI 04-02, Revision 2, which is endorsed by the NRC in RG 1.205, Revision 1.
- The FPRA is developed in accordance with NUREG/CR-6850, which was developed jointly between the NRC and EPRI.
- The FPRA has undergone an industry peer review, in order to ensure the FPRA meets the appropriate quality standards of ASME/ANS Joint Standard RA-Sa-2009.
- The "combined analysis approach" is used during transition (NEI 04-02, Section 5.3.4.3); therefore, MEFS/LFS is not analyzed separately from the FPRA results, or

- The "bounding risk evaluation" is used during transition (NEI 04-02, Section 5.3.4.3); therefore, MEFS/LFS is not analyzed separately from the FPRA results.
- The CCNPP internal events PRA model received a formal industry peer review conducted in accordance with applicable NEI guidelines. The full-scope peer review was performed in 2010. The Pressurized Water Reactor Owners Group (PWROG) peer review covered all aspects of the CCNPP PRA model and administrative processes used to maintain the model. All findings which could impact the FPRA results have been dispositioned, and the CCNPP PRA model has been revised as appropriate. Some findings not relevant to FPRA, such as those related to internal flooding, are pending. Refer to LAR Attachment U – Internal Events PRA Quality – for the final disposition of internal events F&Os as related to FPRA.
- Fire protection systems and features determined to be required by NFPA 805 Chapter 4 have been confirmed to meet the requirements of NFPA 805 Chapter 3 and their associated referenced codes and listings, or provided with acceptable alternatives using processes accepted for use by the NRC (i.e., FAQ 06-0008, FAQ 06-0004, 07-0033).
- Fire modeling performed in support of the transition has been performed within the FPRA utilizing codes and standards developed by industry and NRC staff which have been verified and validated in authoritative publications, such as NUREG-1824, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications." In general, the fire modeling performed in support of the FREs has been performed using conservative methods and input parameters that are based upon NUREG/CR-6850 as documented in the detailed fire modeling notebook. While this is generally not ideal in the context of best estimate probabilistic risk analysis, it is a pragmatic approach given the current state of knowledge regarding the uncertainties related to the application of the fire modeling tools and associated input parameters for specific plant configurations.
- In accordance with the requirements of 10 CFR 50.48(c)(iii), the FPRA results, including cutsets for the scenarios of concern, have been reviewed and it was verified that the results do not rely solely on feed and bleed as the fire-protected safe shutdown path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability for the fire areas.

ENCLOSURE 1

UPDATED PAGES

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document	
3.4.1(c)	During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria. Exception: Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support.	Complies with Clarification	~~No Additional Clarification~~ CCNPP complies by utilizing the exception to this section of NFPA 805. CCNPP adminstrative procedures and the UFSAR ensure that an Operations Technical Advisor (OTA), a licensed operator position, is dedicated to industrial fire brigade support.	~~Procedure SA-1-105, Fire Brigade Training, Rev. 00500 / Section 4.4.A.1~~ Procedure NO-1-200, Control of Shift Activities, Rev. 05500 / Section 5.1.A Updated Final Safety Anaysis Report (UFSAR), Rev. 47 / Section 9.9.5	FPE RAI 02
3.4.1(d)	The industrial fire brigade shall be notified immediately upon verification of a fire.	Complies	No Additional Clarification	Procedure ERPIP-3.0, Immediate Actions, Rev. 05101 / Attachment 16, Section 2 Procedure SA-1-101, Fire Fighting, Rev. 00600 / Section 5.4.A and 5.4.B	
3.4.1(e)	Each industrial fire brigade member shall pass an annual physical examination to determine that he or she can perform the strenuous activity required during manual firefighting operations. The physical examination shall determine the ability of each member to use respiratory protection equipment.	Complies	No Additional Clarification	Procedure CNG-MD-1.01-3000, Physical Examination Process for Employees and Contractors, Rev. 00300 / Section 5.6.A.4 Procedure SA-1-105, Fire Brigade Training, Rev. 00500 / Sections 5.5.A and 5.5.A.4	

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document
3.10.1	If an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the following applicable NFPA codes:	N/A	N/A - General Statement; No Technical Requirements	N/A
3.10.1(1)	NFPA 12, Standard on Carbon Dioxide Extinguishing Systems	N/A	Carbon dioxide systems are not used at CCNPP.	N/A
3.10.1(2)	NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems	Complies, with Required Action	The halon systems are in compliance with NFPA 12A–1971 Edition as identified in report 51-9124415-000. The halon systems are set for automatic operation, and manual operation is accomplished by the manual release station(s) located at the room exit. Manual release stations are connected to the Pyrotronics System 3 that is provided with battery back-up in case of power outage per Document ES-2012-000156-001. See Attachment S, Table S-2, Item ~~18~~ 17.	Letter ES-2012-000156-001 Evaluate Halon System Manual Action and Determine If Current Set Up and NRC Correspondence Deem It Acceptable, dated January 31, 2013 / All NFPA 12A, Halon 1301 Extinguishing Systems, 1971 Edition / All FAQ 08-0054, Demonstrating Compliance with Chapter 4 of NFPA 805, Rev. 1 / All Report 51-9124415-000, CCNPP Code Compliance Reviews, Rev. 000 / Appendix C and Section 4.3

FPE RAI 03

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document
3.10.3	Ventilation system design shall take into account prevention from over-pressurization during agent injection, adequate sealing to prevent loss of agent, and confinement of radioactive contaminants.	Complies, with Required Action	Drawings 12263-0003, 12276-0006 and 60714SH0004 show door control wiring/circuits connected to the halon system control panel. Procedures STP-M-699-1, STP-M-699-2, STP-M-698-1, STP-M-698-2, FTE-72, and FTE-73 outline the testing protocol for control functions related to of the integrity of the room enclosures. Confinement of radioactive contaminants is not a concern as there are no halon systems installed in radiological areas. Procedures STP-M-699-1, STP-M-699-2, STP-M-698-1 and STP-M-698-2 all state the following purpose in Section 1: "A. Verify the Halon systems for the Unit 2 Cable Spreading Room (CSR) would actuate manually and automatically upon actuation signal. B. Verify that upon a simulated actuation, the associated ventilation dampers actuate. C. Verify that associated fire door monitor switches are operable." Procedures STP-M-699-1, STP-M-699-2, STP-M-698-1, STP-M-698-2, FTE-72 and FTE-73 all state the following purpose in Section 6 provides the procedure for performance testing of the halon system(s) including verifying door monitors. Item 48 of Appendix C of Report 9124415-000 indicates: "The results of discharge testing summarized in the referenced letters confirm that the enclosure strength is adequate such that pressure build-up is not a concern." See Attachment S, Table S-2, Item ~~48~~ 17.	Drawing 12263-0003, Halon 1301 Fire Supression System, Rev. 11 / All Drawing 12276-0006, Halon 1301 Fire Suppression System, Rev. 6 / All Drawing 60714SH0004, Halon 1301 Fire Suppression System, Rev. 11 / All Procedure FTE-72, Unit 1 DAS Room Halon System Functional Test, Rev. 00500 / Section 6.0 Procedure FTE-73, Unit 2 DAS Room Halon System Functional Test, Rev. 00500 / Section 6.0 Procedure STP M-698-1, Functional Test of Halon System for the Unit 1 Cable Spreading Room, Rev. 0101 / Section 1.0 and 6.0 Procedure STP M-698-2, Functional Test of Halon System for the Unit 2 Cable Spreading Room, Rev. 0201 / Section 1.0 and 6.0 Procedure STP M-699-1, Functional Test of Halon System for the Unit 1 Switchgear Rooms, Rev. 00600 / Section 1.0 and 6.0 Procedure STP M-699-2, Functional Test of Halon System for the Unit 2 Switchgear Rooms, Rev. 0501 / Section 1.0 and 6.0 Report 51-9124415-000, CCNPP Code Compliance Reviews, Rev. 000 / Appendix C, Item 48

FPE RAI 03

NFPA 805 Ch. 3 Ref.	Requirements/Guidance	Compliance Statement	Compliance Basis	Reference Document
		Complies, with Required Action	Implementation items are identified below.	None
	IMPLEMENTATION ITEMS (See Attachment S, Table S-3			
	IMP-2 Performance-based surveillance frequencies may be updated based on the guidance of Electric Power Research Institute (EPRI) Technical Report TR-1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features." As a minimum, surveillance frequencies for fire dampers will be reviewed against the EPRI guidance and updated if necessary.			
		~~Submit for NRC Approval~~	~~Approval is requested in Attachment L for the use of performance-based surveillance frequencies as described in Electric Power Research Institute (EPRI) Technical Report TR-1006756, "Fire Protection Surveillance Optimization and Maintenance Guide for Fire Protection Systems and Features" for the inspection, testing, and maintenance of fire protection systems and features credited by the fire protection program.~~	~~None~~
3.11.3(3) Fire Barrier Penetrations.	NFPA 101, Life Safety Code	Complies with Clarification	The requirements of NFPA 101 applicable to fire doors and fire dampers are bounded by NFPA 80 and NFPA 90A. NFPA 101 Section 8.2.3.2.1 refers to NFPA 80 and NFPA 101 Sections 9.2.1 refers to NFPA 90A.	NFPA 101, Life Safety Code, 2000 Edition / Section 8.2.3.2.1 and 9.2.1

FPE RAI 04

detection above the ceilings in these areas. However, the NSCA-credited cables that are routed through these above-ceiling areas are protected by metal conduit. **The metal conduits are not credited to prevent fire induced failure. (FPE RAI 5C)**

This variance is technically acceptable based on the following:

Based on walkdowns and above-ceiling surveys in these areas, no ignition sources were observed above the suspended ceilings except for extension cords which are potentially susceptible to self-ignition. Exposed wiring above these ceilings was observed to be low-voltage communication and data type "network" cables which are not prone to heat-generating overload faults. No other fixed ignition sources (i.e. fans, fan motors, etc.) were observed above the ceilings.

Industry experience has shown that in the unlikely event of a self-ignited cable tray fire, the fire is not expected to spread beyond the cable tray of fire origin. The EPRI fire events database shows that self-ignitable tray fires have only led to localized failures in a small number of cables within a single raceway. No event has led to sustained open flaming fires, or damage to cables beyond the initially impacted raceway.

The extension cords above the ceilings in question are not bundled with cables or other combustibles, nor are they routed in cable trays. There is even less likelihood that a self-ignited extension cord fire will lead to a sustained open flaming fire, due to a lack of combustible material in the vicinity of the extension cords. The only other significant combustible material observed above the ceilings was ventilation duct wrap insulation. Documentation of this material identifies that the duct wrap insulation has a flame spread rating of less than 25. The duct wrap insulation will therefore not support sustained combustion or fire growth. In the unlikely event of fire originating in the exposed non-plenum cable, fire will not spread to the duct wrap insulation.

Attachment 3 of CNG-FES-007(Reference 6.38) states: "Minimize wiring above suspended ceilings. Where installed, electrical wiring shall be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers." This procedure is in place to ensure that future compliance with this NFPA 805 requirement is achieved.

Per Drawing 60739SH0001 (Reference L-2), ACA ventilation is served by one supply unit (RTU-1) and two independent exhaust units (access control exhaust fans 11 and 12).

In the Fire Area 11 portion of the ACA, supply and exhaust registers in the ceiling are ducted to and from these units, as shown in Drawing 60597 (Reference L-3). The above-ceiling space is therefore not used as an air plenum.

On the Turbine Building side of the ACA, supply registers in the ceiling are ducted to the supply unit, but some exhaust registers in the ceiling are not ducted, as shown in Drawing 60597 (Reference L-3). Exhaust air is pulled from the ceiling plenum into ducts that lead to the Unit 2 Main Exhaust Plenum where it is exhausted by the main plant exhaust fan 21 or 22. Per Drawings 61085SH00057 (Referecne L-4); 61085SH0058 (reference L-5); and 63085SH003B (Reference L-6); the ACA exhaust fans are interlocked with the Main Plant Exhaust Fans as well as the ACA supply unit RTU-1. Per Drawings 60739SH0001 (Reference L-7) and 60722SH0001 (Reference L-8), the

Approval Request 3

NFPA 805 Section 3.3.1.3.1 states:

"A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations."

NFPA 51B, 1999 Edition, Section 3-2 states, in part:

"Hot work shall not be allowed in the following areas:

(b) In sprinklered buildings while such protection is impaired."

CCNPP hot work procedures ~~are documented in Procedure SA-1-100 (Reference L-13). SA-1-100~~ allow~~s~~ hot work to be performed in plant areas that are protected by automatic sprinkler systems while such systems are impaired, contingent on fire marshal or Engineering Programs Unit approval. Administrative procedures ~~SA-1-100 is~~ are therefore not in compliance with the hot work requirements of section 3-2(b) of NFPA 51B. CCNPP requests NRC approval for performance of hot work in sprinklered buildings while such systems are impaired as an acceptable variance from the requirements of NFPA 805 Chapter 3 requirements.

Editorial

Editorial

Basis for Request:

While expected to be a very uncommon occurrence, CCNPP anticipates that there may be occasions where hot work is necessary in sprinklered plant areas while such systems are temporarily impaired. Any fire area containing a sprinkler system~~, as identified in Attachment C, Table C-2 of this transition report~~, is subject to the provisions of this request. Attachment C, Table C-2 identifies all sprinkler systems in plant fire areas. The administrative procedures that are in place ~~to~~ limit combustibles and control hot work ~~are administratively controlled per section 5.3.F.1 and 5.3.F.2 of procedure SA-1-100~~. With the exception of section 3-2(b) of NFPA 51B, the procedure employed for hot work is a rigorous one and in compliance with the applicable requirements of the 1999 Edition of NFPA 51B and the 2000 Edition of NFPA 241 (codes of record). A summary of the key elements of the procedure is provided below.

FPE RAI 06

Editorial

- A permit application for hot work is submitted to the fire marshal.
- The fire marshal assigns a number to the permit, reviews the permit, and conducts and inspection of the area prior to commencing work.
- A hot work permit hazard analysis checklist is successfully completed before starting work.
- The Operations group is notified prior to all hot work. This notification is required once per shift.
- A hot work fire watch, with the appropriate fire extinguisher for the type and size for the hazard, is required to be present during the hot work activity and must remain in

the immediate work area for a minimum of 30 minutes following completion of the hot work activity.

- Back-up fire suppression equipment is available in areas where the fire suppression system is inactive.
- Combustibles located within 35 feet of the work area are removed prior to hot work operations. For permanent combustibles that cannot be removed, they must be covered with ~~the appropriate style of~~ an NFPA 51B compliant blanket. | FPE RAI 06
- Equipment is checked prior to the activity to ensure it is in good working condition.
- If hot work is required in an area in which nuclear safety compensatory actions are in place, completion of a form approved by the system manager, shift manager/operations maintenance coordinator, fire marshal, and responsible maintenance group supervisor is required per ~~Procedure SA-1-102 (Reference L-15)~~ administrative procedures. | Editorial
- Hot work procedures are in compliance with all other applicable NFPA 51B and NFPA 241 requirements, including those related to management, permit-authorizing individual, hot work operator training, fire watch (and training) alarm activation, hot work areas, hot work permits, hot tapping, and fire prevention (precautions regarding combustibles, inadvertent sprinkler discharge, etc.)

~~These~~ Administrative procedures demonstrate the highest standard of care in fire prevention measures for hot work activities. The rigorous approval, documentation, training, hazard analysis, precautions, lack of combustibles, manual suppression, training, and vigilance ensure that the occurrence of a fire during hot work operations is very unlikely. The risk of a fire growing uncontrolled beyond the incipient stage due to hot work is therefore not considered a credible scenario. | Editorial

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:

Although the hot work requirements in administrative procedures ~~SA-1-100~~ do not comply with section 3-2(b) of NFPA 51B, there are strict procedures in place to limit the combustibles, control the hot work within the area, and provide a fire watch to promptly extinguish any fires that do occur. Therefore, there is no impact on the nuclear safety performance criteria. | Editorial

The use of ~~the current procedu~~re administrative procedures to perform hot work activities has no impact on the radiological release performance criteria. The radiological release performance criteria are satisfied based on the determination of limiting radioactive release (Attachment E)~~, which is not affected by SA-1-100~~. | Editorial | Editorial

Safety Margin and Defense-in-Depth:

There are procedures in place to limit the combustibles and control the hot work within the area. Since fire prevention and manual suppression is maintained per

administrative procedures ~~SA-1-100~~, the safety margin inherent in the analysis for the fire event has been preserved. Editorial

The three echelons of defense-in-depth are:

(1) To prevent fires from starting (combustible/hot work controls)

(2) Rapidly detect, control and extinguish fires that do occur, thereby limiting damage (fire detection systems, automatic fire suppression, manual fire suppression, pre-fire plans)

(3) Provide adequate level of fire protection for systems and structures so that a fire will not prevent essential safety functions from being performed (fire barriers, fire rated cable, success path remains free of fire damage, recovery actions)

Per NFPA 805 Section 1.2, defense-in-depth is achieved when an adequate balance of each of these elements is provided.

Echelons 1, 2, and 3 are met through the limiting of combustibles, control of hot work, and availability of fire watch (i.e., manual suppression), through administrative procedures ~~SA-1-100~~. The hot work procedures therefore do not compromise manual fire suppression functions or post-fire nuclear safety capability. Since a balance of the elements is provided, defense-in-depth is achieved. Editorial

Conclusion:

NRC approval is requested for the allowance of hot work activities in buildings with impaired sprinkler systems in accordance with administrative procedures ~~SA-1-100~~, contrary to the requirements of Section 3.2(b) of NFPA 51B, 1999 Edition. Based on the analysis above, the level of risk encountered by maintaining this current practice is acceptable, and the approach is considered acceptable because it: Editorial

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

(B) Maintains safety margins; and

(C) Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire nuclear safety capability).

The term "power block" is clarified in Section K.2 of NEI 04-02 as "structures that have equipment required for nuclear plant operations, such as containment, auxiliary building, service building, control building, fuel building, radiological waste, water treatment, turbine building, and intake structure, or structures that are identified in the facility's current license basis." The determination of which buildings are required for nuclear plant operations (i.e., required to meet the nuclear safety or radioactive release performance criteria identified in sections 1.5.1 and 1.5.2 of NFPA 805), and thus considered within the power block, is identified below.

For the purposes of establishing the structures included in the CCNPP Fire Protection program in accordance with 10 CFR 50.48(c) and NFPA 805, the buildings and structures listed in the following table are considered to be part of the power block based on the application of the preceding evaluation criteria.

Table I-1 – Power Block Definition

Power Block Structures	Fire Area(s)
Auxiliary Building	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 16A, 16B, 16C, 17, 17A, 17B, 17C, 18, 18A, 19, 19A, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, AB-1, AB-2, AB-3, AB-4, AB-5, ABFL, KWAL
1A Emergency Diesel Generator (EDG) Building	DGB1
0C Station Blackout (SBO) Diesel Generator Building	DGB2
Reactor Enclosure – Unit No. 1	1CNMT
Reactor Enclosure – Unit No. 2	2CNMT
Turbine Building/ North Service Building (NSB 12' & 27' Elevations*)	TB/NSB/ACA, TBFL
Intake Structure	IS
13.8 kV Switchgear House Unit 1	YARD
13.8 kV Switchgear House Unit 2	
Condensate Storage Tank No. 12 Enclosure	
Fire Protection Pump House	
No. 2 Fuel Oil Storage Tank No. 21 Building	
Pretreated-Well Water House	

FPE RAI 08

* Note: The 45' elevation of the North Service Building is excluded from Fire Area TB/NSB/ACA and the power block as justified by Engineering Equivalency Evaluation ECP-13-000357. The bases for acceptability are summarized as follows:

FPE RAI 08

- There are no cables or equipment required to achieve nuclear safety performance criteria (NSPC) in the 45' elevation of the North Service Building.
- There are no cables or equipment required to achieve NSPC in the Yard within 50 feet of the 45' elevation of the North Service Building.
- A fire originating in the 45' elevation of the North Service Building will not impact cables or equipment required to achieve NSPC in adjacent fire area TB/NSB/ACA.

FPE RAI 08

Table C-1 – NEI 04-02 Table B-3 Fire Area Transition

Withhold under 10 CFR 2.390

Table C-2 – Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Withhold under 10 CFR 2.390

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Table C-2 – Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Withhold under 10 CFR 2.390

NEI 04-02 Radioactive Release Transition

Fire Area	Room	Room Description	Pre-Fire Plan No. and Title	Screened In	Engineering Controls		Training and Pre-Fire Plan Review Results	Conclusions
					Liquid	Gaseous		
						such as SA-1-101 "Fire Fighting", SA-1-105 "Fire Brigade Training" (and associated fire drills), the ODCM, the Radiation Safety Manual, CNG-TR-1.01-1025 "Radiation Protection Training Program", RP-2-100 "Radioactive Materials Management", and RP-2-101 "Radioactive Waste Management" discuss containing, monitoring, and releasing of gaseous effluents.		
		SSA RAI-12						
1CNMT	230E	Unit 1 Containment ~~(App-R-Purposes-Only),~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 230	See Room 230	See Room 230	See Room 230
1CNMT	230N	Unit 1 Containment ~~(App-R-Purposes-Only)~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 230	See Room 230	See Room 230	See Room 230
1CNMT	230S	Unit 1 Containment ~~(App-R-Purposes-Only)~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 230	See Room 230	See Room 230	See Room 230
1CNMT	230W	Unit 1 Containment ~~(App-R-Purposes-Only)~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 230	See Room 230	See Room 230	See Room 230
2CNMT	121	Unit 2 Containment Tendon Gallery	SA-FFSM-AB, Auxiliary Building Fire Fighting	Yes	During Plant Operation: Floor drains are routed to the monitored Reactor Coolant	The Containment Ventilation System consists of several subsystems to fulfill the overall	Training materials reinforce the use of FFSM's and the Radiation Safety Manual for	Based on the availability of engineered controls for both smoke and fire suppression

NEI 04-02 Radioactive Release Transition

Fire Area	Room	Room Description	Pre-Fire Plan No. and Title	Screened In	Engineering Controls		Training and Pre-Fire Plan Review Results	Conclusions
					Liquid	Gaseous		
						associated fire drills), the ODCM, the Radiation Safety Manual, CNG-TR-1.01-1025 "Radiation Protection Training Program", RP-2-100 "Radioactive Materials Management", and RP-2-101 "Radioactive Waste Management" discuss containing, monitoring, and releasing of gaseous effluents.		
2CNMT	229E	Unit 2 Containment ~~(App-R-Purposes-Only)~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 229	See Room 229	See Room 229	See Room 229
2CNMT	229N	Unit 2 Containment ~~(App-R-Purposes-Only)~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 229	See Room 229	See Room 229	See Room 229
2CNMT	229S	Unit 2 Containment ~~(App-R-Purposes-Only)~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 229	See Room 229	See Room 229	See Room 229
2CNMT	229W	Unit 2 Containment ~~(App-R-Purposes-Only)~~	SA-FFSM-AB69, Auxiliary Building Fire Fighting Strategy Manual	Yes	See Room 229	See Room 229	See Room 229	See Room 229
DGB1	DB001	Stair No. 1 (EL-35)	N/A	No	N/A	N/A	N/A	N/A - Screened Out
DGB1	DB002	Oil Separator Room (EL-35)	N/A	No	N/A	N/A	N/A	N/A - Screened Out

Table C-1 – NEI 04-02 Table B-3 Fire Area Transition

Withhold under 10 CFR 2.390

Table C-1 – NEI 04-02 Table B-3 Fire Area Transition

Withhold under 10 CFR 2.390

(3) The licensee shall implement the items listed in Enclosure 1, Attachment S, Table S-3, "Implementation Items," from license amendment request dated _____ within 180 days after NRC approval unless that implementation date falls within a scheduled refueling outage. Then, implementation will occur 60 days after startup from that scheduled refueling outage. Insert

(4) The licensee shall maintain appropriate compensatory measures in place until completion of the modifications listed above.

Implementation Date

April 30, 2018

It should be noted that implementation item IMP-12 is associated with incorporation of the NPFA 805 modifications and the completion of this implementation item is an on-going action initiated within the 180 day timeframe for completion of implementation items but only complete after completion of modification implementation per Table S-2.

PRA RAI 20

The FPRA model represents the as-built, as-operated and maintained plant as it will be configured at the completion of the transition to NFPA 805. The FPRA model includes credit for the planned implementation of modifications identified in Attachment S, Table S-2. Following installation of modifications and the as-built installation details, additional refinements surrounding the modifications may need to be incorporated into the FPRA model (the FPRA will verify the validity of the reported change-in-risk on as-built conditions after the modifications are completed). However, these changes are not expected to be significant. ~~No other significant plant changes are outstanding with respect to their inclusion in the FPRA model. See Attachment S, Table S-3, IMP-12.~~

Insert

CCNPP will verify the validity of the reported change-in-risk estimates of Attachment W following completion of both PRA-credited modifications and implementation items. If this verification determines that the risk metrics have changed such that the RG 1.205 acceptance guidelines are not met, the NRC will be notified and additional analytical efforts, and/or procedure changes, and/or plant modifications will be made to assure the RG 1.205 risk acceptance criteria are met.

PRA RAI 20

4.8.3 Supplemental Information – Other Licensee Specific Issues

None.

51.22(c). That evaluation is discussed in Attachment R. The evaluation confirms that this LAR meets the criteria set forth in 10 CFR 51.22(c)(9) for categorical exclusion from the need for an environmental impact assessment or statement.

5.4 Revision to the UFSAR

After the approval of the LAR, in accordance with 10 CFR 50.71(e), the CCNPP UFSAR will be revised. The format and content will be consistent with NEI 04-02 FAQ 12-0062.

5.5 Transition Implementation Schedule

The following schedule for transitioning CCNPP to the new fire protection licensing basis requires NRC approval of the LAR in accordance with the following schedule:

- Implementation of new NFPA 805 fire protection program to include procedure changes, process updates, and training to affected plant personnel. This will occur 180 days following the issuance of an approved SER from the NRC unless that date falls within a scheduled refueling outage. Then, implementation will occur 60 days after startup from that scheduled refueling outage. See Attachment S, Table S-3.
- Modifications will be completed by April 30, 2018. This date assumes SER approval within two years from LAR submittal. Appropriate compensatory measures will be maintained until modifications are complete. See Attachment S, Table S-2.

Insert

It should be noted that Implementation Item IMP-12 is associated with incorporation of the NPFA 805 modifications and the completion of this implementation item is an on-going action initiated within the 180 day timeframe for completion of implementation items but only complete after completion of modification implementation per Table S-2.

PRA RAI 20

In accordance with RG 1.205 position 4.3:

> *"The licensee should submit the documentation described in Section 4.2 of Regulatory Guide 1.200 to address the baseline PRA and application-specific analyses. For PRA Standard "supporting requirements" important to the NFPA 805 risk assessments, the NRC position is that Capability Category II is generally acceptable. Licensees should justify use of Capability Category I for specific supporting requirements in their NFPA 805 risk assessments, if they contend that it is adequate for the application. Licensees should also evaluate whether portions of the PRA need to meet Capability Category III, as described in the PRA Standard."*

The PWROG performed a full scope internal events PRA peer review of CCNPP to determine compliance with ASME PRA Standard, ~~RA-S-2008a~~ and RG 1.200 (Reference 6.32) in June 2010. This review documented findings for all supporting requirements (SRs) which failed to meet at least Category II. The findings for that peer review are documented below in Table U-1. This table also includes the disposition, status, and impact on the FPRA.

PRA RAI 21

The peer review found that 97% of the SR's evaluated Met Capability Category II or better. There were 3 SR's that were noted as "not met" and 8 there were noted as Category 1. As noted in the peer review report the majority of the findings were documentation related. Of the 11 SR's which did not meet Category 2 or better, 7 were related to conservatisms or documentation in LERF and 2 were related to internal floods. There were 39 findings. All findings which could be relevant to FPRA were updated in the internal events model used to quantify the FPRA. Thus, with the exception of minor documentation concerns, the internal events model meets Category II or causes conservative results for all SR's relevant to FPRA results. No significant changes have been implemented in the internal events PRA. As there are no new methods applied, no follow on or focused peer reviews were required.

RA-Sa-2009 (Reference 6.31)

Table S-3 Implementation Items

Withhold under 10 CFR 2.390

Exemptions

Rescind the following exemptions granted against 10 CFR 50, Appendix R dated as follows:

- ~~August 16, 1982 – An exemption from the requirements of Section III.G.2 of Appendix R to allow alternatives to the 3 hour fire rated barriers for areas listed in the exemption.~~ → Deleted consistent with Attachment K
- April 21, 1983 – An exemption from the requirements of Section III.G.3 of Appendix R for the control room complex and the intake structure related to the installation of fixed fire suppression systems.
- March 15, 1984 – An exemption from the requirements of Section III.G to allow alternatives to the 3-hour rated fire barriers for areas listed in the exemption. An exemption was also granted for Section III.G for Fire Areas 10 and 11 related to the installation of fixed fire suppression systems. Additionally, an exemption from the requirements of Section III.O was granted regarding the capacity of the oil collection systems for the reactor coolant pumps.
- August 22, 1990 – An exemption from the requirements of Section III.J to allow the use of portable hand lights as an alternative to permanently installed 8-hour emergency lights in the Unit 1 and 2 containment buildings.
- April 7, 1999 – An exemption from the requirements for Section III.J to allow the use of security lighting in exterior areas, the use of portable lights in high radiation areas and the use of helmet mounted lights inside of switchgear cabinets as alternatives to permanently installed 8-hour emergency lights.

Specific details regarding these exemptions are contained in Attachment K.

Orders

No Orders need to be superseded or revised.

CCNPP implemented the following process for making this determination:

- A review was conducted of the CCNPP docketed correspondence. The review was performed by reviewing the correspondence files and performing electronic searches of internal CCNPP records and the NRC's ADAMS document system.

A specific review was performed of the license amendment that incorporated the mitigation strategies required by Section B.5.b of Commission Order EA-02-026 to ensure that any changes being made to ensure compliance with 10 CFR 50.48(c) do not invalidate existing obligations applicable to the plant. The review of this order demonstrated that changes to the fire protection program will not affect measures required by B.5.b.

The Fukushima Orders are being independently evaluated. Any plant changes will be evaluated for impact on the fire protection program in accordance with the CCNPP design change process.

Table S-3 Implementation Items

Withhold under 10 CFR 2.390