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NLS2013104
December 12, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Subject: Response to Request For Additional Information Regarding License Amendment Request To Adopt National Fire Protection Association Standard 805
Cooper Nuclear Station, Docket No. 50-298, DPR-46

Reference:
1. E-mail from Lynnea E. Wilkins, U.S. Nuclear Regulatory Commission, to David Van Der Kamp, Nebraska Public Power District, dated November 14, 2013, "Cooper Nuclear Station: Round 2 RAIs Re: NFPA-805 LAR (ME8551)"
2. Letter from Brian J. O'Grady, Nebraska Public Power District, to U.S. Nuclear Regulatory Commission, dated April 24, 2012, "License Amendment Request to Revise the Fire Protection Licensing Basis to NFPA 805 Per 10 CFR 50.48(c)" (NLS2012006)

Dear Sir or Madam:

The purpose of this letter is for the Nebraska Public Power District to respond to a Nuclear Regulatory Commission (NRC) Request for Additional Information (Reference 1) related to the Cooper Nuclear Station (CNS) License Amendment Request (LAR) to adopt National Fire Protection Association (NFPA) Standard 805 as the CNS Fire Protection licensing basis per 10 CFR 50.48(c) (Reference 2). This response is provided in Attachment 1. Associated changes to the LAR are provided in Attachment 2. The LAR changes are bounded by the No Significant Hazards Consideration Evaluation performed in Reference 2. As previously agreed to with the NRC staff, certain responses will be provided in a subsequent 60-day response. There are additional and revised commitments made as provided in Attachment 3.

Should you have any questions concerning this matter, please contact Todd Stevens, CNS NFPA 805 Transition Project Manager, at (402) 825-5159.

A006
NRR

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 12/12/13
(Date)

Sincerely,

Kenneth Higginbotham
General Manager of Plant Operations

KH/wv

Attachments:
1. Response to Cooper Nuclear Station Request For Additional Information Regarding License Amendment Request To Adopt National Fire Protection Association Standard 805
2. Revisions to the Cooper Nuclear Station License Amendment Request To Adopt National Fire Protection Association Standard 805 Performance-Based Standard For Fire Protection For Light Water Reactor Generating Plants
3. List of Regulatory Commitments

cc: Regional Administrator w/ Attachments
USNRC - Region IV

Cooper Project Manager w/ Attachments
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector w/ Attachments
USNRC - CNS

Nebraska Health and Human Services w/ Attachments
Department of Regulation and Licensure

NPG Distribution w/o Attachments

CNS Records w/ Attachments

Attachment 1

Response to Cooper Nuclear Station
Request For Additional Information Regarding
License Amendment Request To Adopt
National Fire Protection Association Standard 805

The Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI) regarding the National Fire Protection Association (NFPA) Standard 805 Transition License Amendment Request (LAR) is shown in italics. The Nebraska Public Power District (NPPD) response to the probabilistic risk assessment (PRA) RAIs is shown in block font.

PRA RAI 02.c.01

The licensee's response to PRA RAI-02.c dated January 14, 2013 (ADAMS Accession No. ML13018A006) states "The exceptions to setting HEP to 1.0 when all instrumentation is impacted by a fire are the EOP actions to depressurize the PRV [sic] *and initiate low pressure injection. If the PRV level is unknown, which could be the case for fire impacted RPV level instruments, the operators are instructed to depressurize and flood the core using any low pressure Emergency Core Cooling System (ECCS) and alternate injection alignments. For those fire zones where all RPV level instrumentation was failed, the human error probability associated with "Minimum Instrumentation Available" was used for the actions to depressurize the RPV and use low pressure systems to flood the core. In this case, the minimum instrumentation needed is actually none." Provide the procedural steps that would direct the operator to depressurize and flood after fire-induced failure of the RPV level instrumentation. Also provide justification for not using an HEP of 1.0 using NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines - Final Report" guidance provided, for example in section B.5.1, "Instrumentation," or from NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," Volumes 1 and 2, and Supplement 1."*

<u>NPPD Response</u>

The following procedural steps direct operations personnel to depressurize and flood after the fire-induced failure of the reactor pressure vessel (RPV) level instrumentation:

- Emergency Procedure 5.8 Attachment 1, EOP1A (RPV Control), Step RC/L-2, states that if RPV water level cannot be determined then proceed to EOP2B (RPV Flooding), Section 6.
- EOP2B (RPV Flooding) describes the needed actions to depressurize the RPV and initiate low pressure injection.

The issue involved here is not a question of minimum instrumentation required to perform an action, but rather an action to be performed due to the absence of instrumentation. No parametric value of RPV water level is used as an entry point into the procedural steps for RPV Flooding. If RPV water level could be determined (e.g., any instrumentation is available), RPV flooding would not be performed. Since this human error probability (HEP) is based on a procedural step and the absence of RPV water level instrumentation, neither the instrumentation guidance in NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines - Final Report," nor NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," apply, and the use of a HEP of 1.0 is inappropriate.

For those scenarios where all RPV level instrumentation was failed, the HEP associated with "Minimum Instrumentation Available" was used for the actions to depressurize the RPV. The "Minimum Instrumentation Available" case recognizes that the cognitive evaluation of inadequate instrumentation, whether losing some indication or all indications, is similar and therefore appropriate.

PRA RAI 02.f.01

PRA RAI-02f involved a Fact and Observation (F&O) against FSS-H5. The licensee's response to PRA RAI-02.f.ii dated January 14, 2013 (ADAMS Accession No. ML13018A006) equates sensitive plant equipment to "solid-state control components". In addition, the response to fire modeling (FM) RAI-02.c dated February 12, 2013 (ADAMS Accession No. ML03051A539) identifies Fire Zones 3A, 3B, 8A, 8B, 8C, 8D, 8G, 8H, 9A, and 13B as the only ones containing sensitive equipment considered by the detailed fire modeling analyses. Please describe the process by which sensitive components or devices were identified, selected, and located, and summarize what components or devices were included as sensitive electronics.

NPPD Response

Temperature-sensitive plant equipment was identified and located using Calculation NEDC 08-032, "Fire Ignition Frequencies," which located plant equipment utilizing the Cooper Nuclear Station (CNS) plant equipment database, the Fire Probabilistic Risk Assessment (FPRA) component list, and direct visual examination of each ignition source via plant walkdowns. Temperature-sensitive components identified as FPRA equipment targets were further evaluated during fire modeling walkdowns of each fire zone for which detailed fire modeling was performed. Every potential ignition source and FPRA component in modeled fire zones were evaluated for the potential to be characterized as a temperature-sensitive component or device. Components and devices identified as temperature-sensitive plant equipment are documented in the detailed fire modeling reports.

Per vendor procedure EPM-DP-FP-001, "Detailed Fire Modeling," solid-state devices and printed circuit based components (e.g. circuit cards, electronic relays, computers, electronic signal conditioning equipment, digital instrumentation and control circuits, electronic displays, etc.) were identified and modeled as temperature-sensitive components.

FAQ 13-0004, "Clarifications on Treatment of Sensitive Electronics," provides the following additional guidance for identifying the scope of plant equipment to be treated using the lower damage threshold specified in Section H.2 of NUREG/CR-6850:

- Electro-mechanical devices are not considered sensitive electronics.
- Integrated circuits employing any of the variants of pin-grid arrays should be treated as sensitive electronics.

Specific to the detailed fire modeling performed at CNS, the following components and devices were treated as temperature-sensitive plant equipment:

Fire Zone	Equipment ID	Equipment Type
3A	EE-SWGR-4160F	Switchgear
3A	EE-SWGR-480F	Switchgear
3B	EE-SWGR-4160G	Switchgear
3B	EE-SWGR-480G	Switchgear
8A	LRP-PNL- 9-30	Relay Panel
8A	LRP-PNL- 9-32	Relay Panel
8A	LRP-PNL- 9-33	Relay Panel
8A	LRP-PNL- 9-39	Relay Panel
8A	LRP-PNL- 9-41	Relay Panel
8A	LRP-PNL- 9-42	Relay Panel
8A	LRP-PNL- 9-45	Relay Panel
8B	EE-CHG-24 1B1	Battery Charger
8B	EE-CHG-24 1B2	Battery Charger
8C	EE-CHG-24 1A1	Battery Charger
8C	EE-CHG-24 1A2	Battery Charger
8D	EE-CHG-125 1C	Battery Charger
8D	EE-CHG-250 1C	Battery Charger
8G	EE-CHG-125 1B	Battery Charger
8G	EE-CHG-250 1B	Battery Charger
8H	EE-CHG-125 1A	Battery Charger
8H	EE-CHG-250 1A	Battery Charger
8H	EE-IVTR-1A	Inverter Panel
9A	LRP-PNL-ARC-CCP	Relay Panel
9A	LRP-PNL-ARC-CCP1A	Relay Panel
9A	LRP-PNL-ARC-CCP1B	Relay Panel
9A	LRP-PNL-ARC-NBPP	Relay Panel
9A	ISOLATION RELAY CABINET A	Relay Panel
9A	ISOLATION RELAY CABINET B	Relay Panel
13B	EE-SWGR-4160A	Switchgear
13B	EE-SWGR-4160B	Switchgear
13B	EE-SWGR-4160C	Switchgear

Fire Zone	Equipment ID	Equipment Type
13B	EE-SWGR-4160D	Switchgear
13B	EE-SWGR-4160E	Switchgear
13B	EE-SWGR-480A	Switchgear
13B	EE-SWGR-480B	Switchgear

PRA RAI 02.f.i.01

The licensee's response to PRA RAI-02.f.i dated January 14, 2013 (ADAMS Accession No. ML13018A006) states that open-back MCBs and other open back MCR electrical panels were walked down to confirm that there were no cable runs between adjacent panels, with the exception of MCR Panels 9-2 and 9-21. Clarify if the vented cable run atop the MCBs has been included as a target in the MCR risk analysis, and if so, discuss how NUREG/CR-6850 guidance was used. In the response, specifically address how the vented cable run, and associated contained cables, was treated as both a target and as a potential means of fire spread. If the impacts on MCR risk of the cables contained within the vented cable run have not been addressed, include the effects in the composite analysis requested in RAI-40.

NPPD Response

Calculation NEDC 08-041, "Main Control Room Forced Abandonment," considered the potential for fire propagation between adjacent main control boards (MCB) consistent with the guidance provided in Appendix S of NUREG/CR-6850. The two adjacent MCBs on either side of the primary ignition source were assumed to ignite 10 minutes after ignition of the primary MCB fire, which bounds the spread of fire along the cables within the vented cable run to an adjacent panel. In addition to the vented cable run, the cable tray routed above the MCBs within the main control room (MCR) horseshoe was considered and modeled using the guidance provided in Appendix R of NUREG/CR-6850. Upon ignition of the cable tray (i.e. cable tray exposed to gas temperatures 330°C or greater), via an MCB fire or a transient ignition source, a cable tray heat release rate per unit area of 222 kW/m² (thermoset) with a fire spread rate of 0.02 meters per minute (thermoset) were programmed into the Fire Dynamics Simulator (FDS). Two directions of spread were assumed for the cable tray fire and the fire growth was assumed to continue until the end of the simulation (25 minute simulation times). As the vented cable run only contains a limited quantity of cabling, this additional combustible material would have limited impact on the heat release rate modeled (three open panel vertical sections and two directions of cable tray spread) in the abandonment calculation.

The MCB panels are modeled in Calculation NEDC 10-001, "Main Control Room Analysis," as opened-back and closed top panels that do not propagate fires to adjacent MCB panels using the guidance provided in Appendix S of NUREG/CR-6850. A recent MCR walkdown identified that the vented cable runs provide a fire propagation path through previously unidentified openings between the MCBs and the vented cable runs that were not assessed in NEDC 10-001. The vented cable run would not likely present any additional targets beyond those already identified on the MCBs. Fire propagation as a result of this new path is not expected to be risk significant and results will be provided in response to PRA RAI 40.

PRA RAI 02.h.01

RAI-02h involved an F&O against QU-E3. The licensee's response to PRA RAI-02.h dated January 14, 2013 (ADAMS Accession No. ML13018A006) indicates that statistical propagation of parametric uncertainty has not been performed and the response's qualitative factor of 5 to 10 overestimation of the estimated results appears to be some measure of perceived conservatism in the analyses. The Capability Category II (CC-II) for QU-E3 supporting requirement (SR) addresses the uncertainty interval around the estimated value taking into account the state-of-knowledge correlations. Describe how the effect of propagating parametric uncertainty on the change in risk estimate was evaluated. In addition, clarify if statistical propagation of parametric uncertainty would cause the risk estimates to increase beyond the Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Rev. 2, acceptance guidelines; and if not, provide an explanation.

<u>NPPD Response</u>

PRA RAI 02.h.01 will be addressed in the 60-day response.

PRA RAI 02.o.01

In a letter dated January 14, 2013 (ADAMS Accession No. ML13018A006) the licensee responded to PRA RAI 02.o and described a method by which human error probability (HEP) dependencies were identified and quantified in addressing F&O 2-15 against HR-G7. The steps in the methodology, according to the response, involve using only a finite number of cutsets to identify and evaluate HEP dependencies. That is, only a certain number of top cutsets for the fire scenarios are used in the HEP dependency analysis. This process may result in a significant number of cutsets not being part of the HEP dependency analysis, and potentially significantly underestimating risk by not adjusting a large number of HEPs for dependency in the cutsets which were not in the top cutsets selected. Provide a discussion as to how those cutsets not selected for HEP dependency analysis were treated for HEP dependency. If those unselected cutsets were not assigned a screening HEP floor, use a floor of 1E-5 unless a lower value can be justified, consistent with NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines - Final Report" guidance, in quantifying those cutsets and provide the results of the requantification. Alternatively, show that the unselected cutsets are not significant for the National Fire Protection Association Standard 805, (NPFA 805 [sic]*) License Amendment Request (LAR) for transition or post-transition.*

<u>NPPD Response</u>

For the human failure event (HFE) dependency analysis, the FPRA model was run with all HFEs set to 0.98. This created over 8 million cutsets which computer aided fault tree analysis (CAFTA) cannot merge into a single cutset equation. Therefore, to work within the limits of CAFTA, the top 1000 cutsets from each scenario (and there are over 900 scenarios) were then merged into a single equation. This ensured that all significant cutsets with dependencies were included. The dependency analysis is only concerned with combinations of operator actions so the cutsets with either one or no operator actions were not retained. The file generated was labeled Merge.cut.

The use of the top 1000 cutsets per scenario combined with using an HEP of 0.98 is an appropriate approach to determining the total cutsets to be examined. After setting HEPs to 0.98 for a total of 958 scenarios, only 266 scenarios have more than 1000 cutsets. Thus 692 scenarios are retained in their entirety. Of the 266 scenarios, the effect of removing the lower worth cutsets still retains a minimum conditional core damage probability (CCDP) percentage of 96% of the total CCDP for each scenario, and usually greater than 99%. Total CCDP of all scenarios (including the fire scenarios with the lower worth cutsets removed and those scenarios with less than 1000 cutsets) was still maintained greater than 99.9% of the total CCDP without removing any cutsets.

By using the top 1000 cutsets from each scenario with greater than 1000 cutsets there are some cutsets that are not part of the HEP dependency analysis; even when using an HEP of 0.98. The joint HEPs in these unselected cutsets are not identified by this process and assigning a screening HEP floor cannot be done because the combinations are not identified. And this need not be done because their overall contribution to results is insignificant. Consider that an HEP floor of 1E-5 when combined with the frequency of all relevant scenarios is much less than 1E-7/year in core damage frequency (CDF).

Because the FPRA applies different values to the same HFE, every variation of the HFE was given a unique basic event name. This was the nominal HFE basic event name with an appendage such as _C, _M, _A, _OMA.

The Merge.cut file was imported into the human reliability analysis (HRA) database and the HRA Calculator default dependency rules were applied. At this stage, no analysis of the HFE combinations was performed. All combination events were created and a conservative lower bound of 1E-3 was applied to all joint HEPs. The HRA Calculator dependency rules are known to be conservative and by applying a lower bound of 1E-3, the overall results of the HRA dependency analysis are known to be conservative.

The merge cutset equation can only be used to identify combination of HFEs. In order to understand a combination, each combination must be reviewed in the context of the fire scenario in which it occurs; but this information was not retained during the merging and cutset import process. The results of the HRA Calculator were exported and a recovery rule file generated for use with Qrecover.

Each fire scenario was re-run using the recovery rule file. For each scenario the change in CDF was compared to the scenario run with no dependency rules applied.

On an as-needed basis, selected scenario cutset files were reviewed and HFE combinations were analyzed in detail. On a scenario-by-scenario basis, the reviewer can understand the context of the HFE combination. In many cases this detailed review showed that the joint HEP for the combination should be lower than the 1E-3 assumed lower bound. Because the combinations could be reviewed in the context of a specific fire scenario, the HRA analyst could sometimes justify a lower level of dependency.

Each time a combination was reviewed in detail, a "D" was appended to the end of the combination name. In some cases the HRA Calculator default results were not changed as part of this review. As an additional level of conservatism, a lower bound of 1E-6 was applied to combinations that were reviewed in detail.

There were two exceptions to the above. The fault tree logic already explicitly contains a dependency of depressurization and injection; ADS-XHE-FO-COND. ADS-XHE-FO-COND represents the joint HFE so it does not need additional consideration for the dependency analysis. ADS-XHE-FO-COND was left at its pre-dependency value. In addition, DEP-XHE-FO-SPTDV, "Operating Staff Fails to Initiate both SPC and TORUS-DW Vent (HEP Floor)," represents a floor dependency implemented in the fault tree. Because the internal events logic structure was not changed for fire, this event was left in place and the HEP value was increased to 5E-6.

PRA RAI 03.01

Section 2.4.3.3 of NFPA 805 states that the probabilistic risk assessment (PRA) approach, methods, and data shall be acceptable to the NRC. RG 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," identifies NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," Volumes 1 and 2, and Supplement 1," as documenting a methodology for conducting a fire PRA (FPRA) and endorses, with exceptions and clarifications, NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Rev. 2, as providing methods acceptable to the staff for adopting a fire protection program consistent with NFPA-805. Additional information is requested on the main control room (MCR) risk analysis.

LAR Attachment W indicates that a conditional core damage probability/conditional large early release probability (CCDP/CLERP) equivalent to shutting down from the alternate shutdown (ASD) panel is assumed for those sequences involving failure of the incipient detection system to notify operators, failure of operators to respond to alert, or failure of operators to respond from the MCR.

a. *For each of these failure paths, justify the use of a CCDP/CLERP associated with MCR abandonment.*

b. *For the scenario in which operators fail to respond from the MCR, provide justification that failure of associated MCR and local recovery actions (RAs) may be further mitigated by use of the ASD path.*

c. *For the scenario in which the incipient detection system fails to notify operators, clarify how operators are made aware of a fire in Relay Panels 9-32 and 9-33.*

NPPD Response

a. PRA RAI 03.01 (a) will be addressed in the 60-day response.

b. If the incipient detection system fails to notify the operator, or if the operator fails to respond to the incipient detection alarm, they would rely on other MCR indications. The MCR personnel would enter any of the following procedures: 5.1INCIDENT, 5.4POST-FIRE or 5.4FIRE-S/D when a fire occurs in Relay Panels 9-32 and 9-33 based on impact on various plant components and indications. The operators will determine which of those procedures to utilize based on the component's positions and the indication they have knowing that the fire may have caused spurious component operation and/or MCR indication. These procedures will direct the operators to enter procedure 5.4FIRE-S/D and to take actions to Shutdown and establish the Safe and Stable conditions using field recovery actions and actions at the alternate shutdown (ASD) panel. The FPRA results demonstrate acceptable reliability for establishing Safe and Stable conditions. The actions associated with MCR abandonment show sufficient isolation in conjunction with the actions taken outside the MCR to ensure the plant can be taken safely to Safe and Stable conditions. These actions are local operation at components as well as necessary indications and controls at the ASD Panel.

c. Per Calculation NEDC 09-100, "Detailed Fire Modeling Report Fire Compartment CB-G," independent of the incipient detection system to be installed in Relay Panels 9-32 and 9-33, Fire Zone 8A (the Auxiliary Relay Room) is provided with an automatic smoke detection system that alarms locally and in the MCR. Relay Panels 9-32 and 9-33 are well sealed, robustly secured, and non-ventilated panels, capable of preventing a fire from propagating beyond the panel. As these panels are not air/water tight enclosures, quantities of smoke would be expected to activate the ceiling mounted smoke detectors exterior to the panels.

   Furthermore, it is expected as a fire develops in these relay panels, erroneous indications in the MCR would cause the operators to enter the procedures described in the response to RAI 03.01.b.

PRA RAI 04.01

In a letter dated January 14, 2013 (ADAMS Accession No. ML13018A006) the licensee responded to PRA RAI-04 and provided additional justification for the use of 69 kW transient fires in Fire Zones 8A and 9A. In particular, the response stated that "the transient fire history was reviewed, and a transient fire has not occurred in these fire areas". The response to fire protection engineering (FPE) RAI-08 discusses "enhanced transient and combustible controlled zones" in Fire Zones 8A and 9A as well as selected areas of Fire Zones 2C, 3C, and 3D. The response to FM RAI-02b indicates that reductions in HRR are made for transient fires in Fire Zones 8B, 8C, 8E, 8F, 8G, and 8H (i.e., 142 kW 75th percentile HRR).

a. *Discuss the results of a review of records related to violations of the transient combustible controls not just the lack of fires. This review may include both internal plant records (e.g., condition reports) and NRC inspection records (e.g., by residents or during triennials).*

b. *Provide justification for the use of 142 kW transient fires in Fire Zones 8B, 8C, 8E, 8F, 8G, and 8H, and any others where the 142 kW transient fire is used. In the response, specifically address the specific attributes and considerations applicable to the location, plant administrative controls, the results of a review of records related to violations of transient combustible controls (not just the lack of fires), and any other key factors for this reduced fire size. If the heat release rate (HRR) cannot be justified using the guidance criteria, discuss the impact on the analysis using acceptable methods.*

NPPD Response

a. A review of plant Condition Reports (CRs) (which includes internal plant records and any findings identified during NRC inspections) over the last 5 years identified transient combustible control procedure violations in the Cable Spreading Room (Fire Zone 9A). These violations were limited to minor combustibles left in the fire zone which included: 4-5 lbs of wood, 12" high plastic footstool, a 5 gallon bucket, a wooden handled broom, a small tank of Freon in a cardboard box, gauges with small rubber hoses, plastic bucket, and a small oily rag. Each of the CRs involved only one of these minor combustibles, except for the plastic footstool and 5 gallon bucket, and based on the limited combustible material associated with these violations would be below the enhanced controlled transient heat release rate of 69 kW. These fire zones are currently (pre-NFPA 805) considered Level 1 administratively controlled zones which are strictly controlled areas and will be further enhanced. There were no transient violations in the Auxiliary Relay Room (Fire Zone 8A) over the last 5 years.

b. In a letter dated September 27, 2011, from B. Bradley (Nuclear Energy Institute) to D. Harrison (NRC), "Recent Fire PRA Methods Review Panel Decisions: Clarifications for Transient Fires and Alignment for Pump Oil Fires," Attachment 1, "Description of Treatment for Transient Fires," and Attachment 3, "Panel Decision," allow the user to choose a lower screening heat release rate for transient fires in a fire compartment based on "the specific attributes and considerations applicable to that location." The guidance indicates that "plant administrative controls should be considered in the appropriate heat release rate (HRR) for a postulated transient fire" and that "a lower screening HRR can be used for individual plant specific locations if the 317 kW value is judged to be unrealistic given the specific attributes and considerations applicable to that location."

At CNS, the 75th percentile transient heat release rate (142 kW) was implemented in Fire Zones 8B, 8C, 8E, 8F, 8G, and 8H.

Fire Zones 8B and 8C are RPS Room 1B and 1A, respectively. These fire zones each contain electrical panels, batteries, battery charges, a reactor protection system motor generator set, and a transformer. The combustibles in these fire zones are limited to plastics associated with the battery cases.

Fire Zones 8E and 8F are Battery Room 1A and 1B. These fire zones each contain electrical panels and batteries. The combustibles in these fire zones are limited to plastics associated with the battery cases.

Fire Zones 8G and 8H are DC Switchgear Room 1B and 1A, respectively. These fire zones each contain switchgear and electrical panels. There are no significant combustibles in either fire zone.

The 75^{th} percentile transient heat release rate (142 kW) was selected for these fire zones based on several factors:

- Large combustible liquid fires are not expected in these fire zones since pumps are not located in these areas and activities in the fire zones do not include maintenance of oil containing equipment. Therefore, the 75th percentile HRR bounds the possible transient ignition sources expected in the fire zones.

- Per CNS Administrative Procedure 0.7.1, "Control of Combustibles," all fire zones modeled with the 75^{th} percentile transient heat release rate of 142 kW are Level 2 administratively controlled zones which permit limited transient combustibles with strict combustible controls. These controls include combustible materials being stored in closed solid metal containers, evaluation performed by qualified Fire Protection staff or constant attendance (fire watch) required for excess combustibles, and all combustibles to be removed from the fire zone upon job completion.

- A review of plant CRs over the last 5 years identified that no transient fires have occurred in these fire zones and that there were no violations of the transient combustible control procedure recorded for these fire zones.

- The 75th percentile heat release rate bounds the fires which were fire tested and identified in NUREG/CR-6850, Appendix G, Table G-7, with the exception of:

    - tests involving wood (wood storage is controlled per Plant Procedure 0.7.1),

    - airline trash bags with over 2 kg of trash products (such large quantities of paper products, polystyrene, and polyethylene, are not likely to be present in these fire zones),

    - over 4 kg of straw/grass/eucalyptus duff (such large quantities of combustible plant matter are unlikely to be present in these fire zones).

- Since the fires that are not bounded by the tests are not expected to be in these fire zones, the 75th HRR was implemented for transients.

- A review of the transient ignition source tests in Table G-7 of NUREG/CR-6850 indicates that the type of transient fire expected in these fire zones (i.e. polyethylene trash can or a bucket containing rags and paper) were measured at peak heat release rates below 142 kW, therefore, the 75th percentile heat release rate bounds the transient ignition sources expected in these fire zones.

- These fire zones have restricted access due to electrical equipment hazards. Access doors are locked and specialized electrical hazard training is required to enter several of the areas.

- Due to the limited exposed floor area in these fire zones, storage and staging of significant quantities of materials and equipment is unlikely.

Since only limited quantities of combustibles in trash cans or buckets can be expected in these fires zones, the 75th percentile transient heat release rate (142 kW) was determined to be appropriate. The 142 kW heat release rate bounds the expected transient ignition sources for these fire zones as reported in NUREG/CR-6850, Appendix G.

PRA RAI 11.01

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. RG 1.205 identifies NUREG/CR-6850 as documenting a methodology for conducting a FPRA and endorses, with exceptions and clarifications, NEI 04-02, Rev. 2, as providing methods acceptable to the staff for adopting a fire protection program consistent with NFPA-805. Additional information is requested for transient fires.

a. *Address frequently asked question (FAQ) 12-0064, "Hot Work/Transient Fire Frequency Influence Factors" (ADAMS Accession No. ML12346A488) guidance for the MCR analysis and for other fire areas with respect to transient and hot work in physical analysis units (PAUs).*

   i. *It is not clear if transients due to hot work were evaluated in the MCR analysis. Confirm that transient fires, hot work fires, and transient fires caused by hot work are postulated in all fire areas, including the MCR, unless such fires may be precluded as stipulated within the FAQ.*

   ii. *More generally, discuss how the FAQ guidance is applied to the FPRA.*

   iii. *Provide the impact on the risk results (i.e., core damage frequency (CDF), large early release frequency (LERF), delta (Δ) CDF, Δ LERF) if the method for applying influence factors is not in accordance with the guidance in the FAQ.*

b. *In a letter dated March 13, 2013 (ADAMS Accession No. ML13080A266) the licensee responded to PRA RAI-11b and assessed the risk impact of postulating seven new transient fire scenarios at the main control board (MCB) and MCR electrical cabinet 'pinch points"; however, no additional information is provided for these scenarios to sufficiently evaluate the acceptability of risk results provided. In light of this, address the following:*

   i. *Describe the fire frequency apportioning methodology used for transient fires in the MCR.*

   ii. *Justify that these fires were, at a minimum, placed at "pinch points" that bound the risk associated with transient fires.*

c. *Confirm that the availability of mechanical ventilation was considered for those transient scenarios affecting equipment that is assumed to lead to MCR HVAC failure.*

NPPD Response

a.i. Per Calculations NEDC 08-041, "Main Control Room Forced Abandonment," and NEDC 08-032, "Fire Ignition Frequencies," the Total Fire Zone Transient Frequency was used to calculate the probability of MCR Forced Abandonment due to general transients and transient activities (including hotwork). The Total Fire Zone Transient Frequency is the sum of the frequencies of Bins 5, 6, and 7, and each Bin is defined as:

- Bin 5: Cable fires caused by welding and cutting (Control/Aux/Rx Bldg)
- Bin 6: Transient fires caused by welding and cutting (Control/Aux/Rx Bldg)
- Bin 7: Transients (Control/Aux/Rx Bldg)

For the MCR habitability scenarios, the transient point value heat release rates identified in Table E-9 of NUREG/CR-6850, were modeled in FDS. Per frequently asked question (FAQ) 08-0052, the transient fires burned with t^2 growth profiles reaching peak heat release rate at 8 minutes and continuing at steady-state burning for the remainder of the simulation (25 minute scenarios). A configuration was selected such that all possible floor-based transient (Bins 6 and 7) fires would be bound by the analysis. The transient fuel package was placed directly in front of an open-faced MCB panel and under the cable tray within the MCB, allowing the transient fire to spread to the electrical cabinet and the cable tray.

A fire was not specifically initiated in the cable tray as cable fires caused by welding and cutting were not postulated for trays containing Thermoset cables only. This approach is in accordance with the guidance provided in NUREG/CR-6850, Appendix R, Section R.1 and FAQ 13-005 which state that "Self ignited cable fires should be postulated in rooms with unqualified cables only or a mix of qualified and unqualified cables." NUREG/CR-6850 identifies that a similar approach is recommended for the case of cable fires caused by welding and cutting. Sparks and slag produced by cutting and welding will not present a significant and sustained heat source, and therefore, in the same concept as a self-ignited cable fire for Thermoset cable, will not lead to a challenging fire for Thermoset cables.

Transient fires (Bin 7) and transient fires caused by welding and cutting (Bin 6) are included in Calculation NEDC 10-001, "Main Control Room Analysis," for their contribution to MCR abandonment, however the contribution for transient fires due to welding and cutting was assessed as 0 as stated in the Assumptions. The fire ignition frequency for transient fires caused by welding and cutting is two orders of magnitude lower than the frequency for transient fires (Bin 7). When the probability of abandonment for transient fires determined in NEDC 08-041 is applied to the transient fires caused by welding and cutting the total CDF results in Tables 8 and 9 of NEDC 10-001 are unchanged.

General transient fires (Bin 7) and transient fires caused by welding and cutting (Bin 6) were also evaluated in the detailed fire modeling calculations for fire zones with a plant location of "Control/Aux/Rx Bldg", along with the general transients and transient activities (including hotwork) bins for all other plant locations, as applicable, and defined as:

- Bin 24: Transient fires cause by welding and cutting (Plant-Wide Components)
- Bin 25: Transients (Plant-Wide Components)
- Bin 36: Transient fires cause by welding and cutting (Turbine Building)
- Bin 37: Transients (Turbine Building)

Similar to the MCR, cable fires caused by welding and cutting (Bins 5, 11, and 31) were not postulated for other areas based on the guidance stated above.

a.ii. The guidance provided in FAQ 12-0064 was not directly applied to Calculation NEDC 08-032, "Fire Ignition Frequencies," as the frequency calculation was developed prior to the development of the FAQ. Fractional transient fire frequency influence factors were implemented for certain fire zones at CNS that differ slightly from those recommended in FAQ 12-0064.

As provided in Letter NLS2012068, "Response to Acceptance Review of Cooper Nuclear Station LAR to Adopt NFPA-805 (ME8551)," NPPD Response to NRC Comment 3, the fractional transient fire frequency influencing factors are based on proposed modifications/enhancements to the combustible and hot work controls for Fire Zone 8A (Auxiliary Relay Room) and Fire Zone 9A (Cable Spreading Room). The fire frequency was initially calculated using transient influencing factors identified in Table 6-3 of NUREG/CR-6850; however, it was determined that these two fire zones would receive enhanced administrative controls. NPPD identified that fractional values less than 1 were appropriate for the enhanced administrative controls instead of a value of zero (0) for the influencing factors to account for any unlikely violations of the new enhanced controls. The fractional values were utilized for only two of the influencing factors, therefore, the total transient influencing factor values for these two fire zones were greater than 1 (i.e., 1.15 and 3.15), which does not represent orders of magnitude differences in the ranges of influencing factors. The ignition frequency calculation weighting factors for all other areas of the plant were analyzed based on the existing occupancy, storage, and maintenance factors, and as such, it was not appropriate to increase the influencing factors for the other areas to account for the proposed enhanced controls in these two fire zones.

A sensitivity analysis was performed for the fire frequency results for transient fire scenarios in the Control/Auxiliary/Reactor Building Plant Locations based on using only NUREG/CR-6850 methods by replacing the fractional influencing factor values with maintenance and storage weighting factors identified Table 6-3 of NUREG/CR-6850. The results of the sensitivity analysis were provided in letter NLS2012068, "Response to Acceptance Review of Cooper Nuclear Station LAR to Adopt NFPA-805 (ME8551)," [ADAMS Accession No. ML12202A042].

Additionally, the CNS FPRA did not utilize the hot work influencing factor provided in FAQ 12-0064. The fire frequencies calculated in NEDC 08-032 for transient fires caused by welding and cutting and for cable fires caused by welding and cutting utilized the NUREG/CR-6850 maintenance influencing factor. The use of the general maintenance factor would be bounding as the maintenance activities in each area would be greater than only the hot work activities.

a.iii. As identified in the response to Part ii of this RAI, a sensitivity analysis was performed for the fire frequency results for transient fire scenarios in the Control/Auxiliary/Reactor Building plant locations based on using non-fractional values in accordance with NUREG/CR-6850 methods. The results of the sensitivity analysis provided in Letter NLS2012068, NPPD Response to NRC Comment 3) indicate that the risk increases by 2.54E-06/year for CDF (5% increase) and 1.51E-06/year (12% increase) for Large Early Release Frequency (LERF). The delta risk increases are 6.10E-08/year for CDF (<1% increase) and 1.10E-08/year for LERF (<1% increase). As these results for the LIC-109 response sensitivity utilized non-fractional values, a new sensitivity utilizing the FAQ 12-0064 fractional values allowed for these enhanced controlled areas would yield a much smaller increase in risk and therefore, the impact on the risk results applying influencing factors in accordance with the FAQ are bound by the previous sensitivity and do not change the FPRA conclusions with respect to Regulatory Guide 1.174 acceptance guidelines.

b. PRA RAI 11.01 (b) will be addressed in the 60-day response.

c. PRA RAI 11.01 (c) will be addressed in the 60-day response.

PRA RAI 14.01

In a letter dated January 14, 2013 (ADAMS Accession No. ML13018A006) the licensee responded to PRA RAI-14 and provided justification of a value of 0.1 to represent the failure to reach safe shutdown using alternate means. The justification largely consists of a qualitative argument that the feasibility assessment and the seven considerations identified in NUREG-1921 are addressed for alternate shutdown. A quantitative assessment of the failure of alternate shutdown is not presented. It appears from the response that this single HEP value of 0.1 is used for every MCR abandonment scenario.

a. *Describe whether there are any values other than 0.1 used to characterize the HEP following MCR abandonment and whether the 0.1 also represents the CCDP. In addition, describe the CLERP.*

b. *If any values other than 0.1 are used, (e.g., 1.0), provide the other values, a characterization of the scenarios where these values are used, and a summary of how each value is developed. This information should include explanations of how the following scenarios are addressed.*

   i. *Scenarios where fire induced spurious actuations of equipment can affect the preferred shutdown path.*

   ii. *Scenarios where the fire could cause recoverable failures to the preferred shutdown path. If every such failure, absent recovery, is assumed to immediately fail the success path, provide confirmation.*

   iii. *Scenarios with fire induced failures unrelated to the preferred success path. Such failures can complicate the efforts to shut down the plant through, for example, spurious operations of unrelated equipment to the success path. If every such failure is assumed immediately fail the success path, please confirm this.*

c. *If no values other than 0.1 are used, explain how scenarios characterized under b.i, b.ii, and b.iii (above) are included in the MCR abandonment evaluations.*

d. *The fire risk evaluations (FREs) should be performed consistent with FAQ 07-0030, "Establishing Recovery Actions" (ADAMS Accession No. ML110070485), and FAQ 08-0054, "Demonstrating Compliance with Chapter 4 of National Fire Protection Association 805" (ADAMS Accession No. ML110140183) guidance. Note that FAQ 08-0054 provides guidance on the additional risk of RAs for alternative or dedicated shutdown. Discuss the FRE method followed from these FAQs for the MCR FREs, and explain how the compliant case is defined.*

<u>NPPD Response</u>

PRA RAI 14.01 will be addressed in the 60-day response.

PRA RAI 16.01

In a letters dated January 14, 2013 (ADAMS Accession No. ML13018A006) and February 12, 2013 (ADAMS Accession No. ML03051A539) the licensee responded to PRA RAI-16 and provided a high-level description of the methodology used to determine the changes in risk reported in the LAR Attachment W, Table W-2, as clarified in the licensees July 12, 2012 letter (ADAMS Accession ML12202A042). The staff's review of the response has determined that additional information is needed to evaluate the results in LAR Attachment W, Table W-2.

The response to PRA RAI 16 part d) defines the Post-NFPA 805 case baseline as that which includes plant modifications (hardware and procedural) aimed at resolving selected variance from deterministic requirements (VFDRs) and additional modifications beyond those addressing VFDRs.

RG 1.205 position 2.2.4.3 notes that the risk of the plant at the point of full implementation of NFPA 805 is that after completing all plant modifications and changes that the licensee has committed to make during transition. Since the "beyond compliance modifications" are being credited to contribute to a negative total delta risk for the transition, such credited modifications should be part of the commitment to make the transition.

a. *Provide a complete list of the "beyond compliance" modifications credited in LAR Attachment W, Table W-2. Confirm the beyond compliance modifications which will be part of the baseline risk post-transition are included in the commitments for transition.*

b. *The partial list of modifications identified in part d) of the response to PRA RAI 16 notes "establishing transient free zones." SR IGN-A9 requires a non-zero fire ignition frequency for PAUs regardless of administration controls. Confirm that "transient free zones" does not correspond to a zero transient fire ignition frequency. If it does, please discuss how this will be made consistent with SR IGN-A9.*

c. *Since the fire area transition delta-risk calculation uses the Pre-NFPA 805 compliant case, the Pre-NFPA 805 plant FPRA model should credit current plant modifications and not the planned post-transition modifications. Provide confirmation that this is the case.*

d. *Discuss whether each if the modifications in LAR Attachment S are related to addressing VFDRs, or are "beyond compliance" modifications such as the incipient detection modification (S-2.4).*

NPPD Response

a. As provided in LAR, Attachment S, Table S-2, the following summary table provides a complete list of the committed plant modifications that were credited in LAR Attachment W, Table W-2. All of the modifications listed in the "Proposed Beyond Compliance Modification" table below will be part of the baseline risk post-transition and are included in the requirements for transition.

Item/ Fire Area	Problem Statement/ Proposed Beyond Compliance Modification	Included in FPRA Model
S-2.1/RB-K	Control (and feeder) cables associated with 4kV circuit breakers (1FA & 1FS) and first-level undervoltage circuitry traverse through the G Critical Switchgear Room. Cables to be re-routed such that they do not traverse the G Critical Switchgear Room.	Post-NFPA 805
S-2.2/TB-A	Control cables associated with 4kV circuit breakers (1FA & 1FS) and first-level undervoltage circuitry are routed along the same path as the 1GB and 1GS through the Non-Critical Switchgear Room. Cables to be re-routed such that they do not traverse any fire scenarios common with the control cables associated with the 1GB and 1GS breakers in the Non-Critical Switchgear Room.	Post-NFPA 805
S-2.3/CB-A	Feeder cables to 1A and 1B 125 and 250V DC Battery Chargers are routed along the same path through the Control Building Controlled Corridor resulting in a loss of all battery chargers. Cables MLX36 and MLX37 to be re-routed through the RPS Rooms to provide a minimum of a channel of battery chargers to support long term battery usage.	Post-NFPA 805
S-2.4/CB-D	Control Room abandonment is required along with the usage of the alternate shutdown procedures for a fire in Panel 9-32 or 9-33. Install incipient detection in Panel 9-32 and 9-33 in the Auxiliary Relay Room (Fire Zone 8A) allows for shutdown from the Control Room with minimal field actions.	Post-NFPA 805
S-2.5/RB-M	Transient fires impacting multiple trains of conduit outside the Critical Switchgear Room common passageway. Install conduit shields to prevent damage to conduit banks from transient fires in Fire Area RB-M/ Fire Zone 3C.	Post-NFPA 805
S-2.6/RB-M	Transient fires impacting vertical cable trays in corner of RB-M for opposite train. Install bottom tray covers to prevent damage to cable tray risers from transient fires in Fire Area RB-M/ Fire Zone 3C.	Post-NFPA 805

Item/ Fire Area	Problem Statement/ Proposed Beyond Compliance Modification	Included in FPRA Model
S-2.7/CB-D	LNK 6 fire impacts conduits and trays in vicinity requiring Control Room abandonment along with usage of the alternate shutdown procedure. Installation of board shielding for cable trays and conduit to prevent damage from fires involving panel PMIS-MUX-LNK6 and PMIS-MUX-LNK7 in the Cable Spreading Room (Fire Zone 9A).	Post-NFPA 805

b. Per Calculation NEDC 08-032, "Fire Ignition Frequencies," and consistent with the requirements of SR IGN-A9, modifications establishing "transient free zones" do not correspond to a zero transient fire ignition frequency.

c. None of the Post-NFPA 805 modifications, identified in the "Proposed Modification" table below (as part of the response to part d), were included in the Pre-NFPA 805 plant Fire PRA model.

d. The following summary table provides a complete list of the modifications in LAR Attachment S. The column titled Modification Category specifies if the modifications address VFDRs, or are considered "beyond compliance" modifications. In most cases, the modifications did not eliminate the variance but did reduce risk.

Item/ Fire Area	Problem Statement/ Proposed Modification	Modification Category	Notes
S-1.1/RB-CF & RB-DI	Electrical Panels HPI-CBX-1, 2, 3 require de-energization to remove a fixed ignition source in Fire Zones 2A-2 and 2A-3 (RB-CF and RB-DI). Permanently remove power to HPI-CBX-1, 2, 3 when at power.	VFDR	VFDR RBCF-08 eliminated
S-2.1/RB-K	Control (and feeder) cables associated with 4kV circuit breakers (1FA & 1FS) and first-level undervoltage circuitry traverse through the G Critical Switchgear Room. Cables to be re-routed such that they do not traverse the G Critical Switchgear Room.	Beyond Compliance	VFDRs RBK-02, -03, and -04; risk reduced but VFDRs not eliminated

Item/ Fire Area	Problem Statement/ Proposed Modification	Modification Category	Notes
S-2.2/TB-A	Control cables associated with 4kV circuit breakers (1FA & 1FS) and first-level undervoltage circuitry are routed along the same path as the 1GB and 1GS through the Non-Critical Switchgear Room. Cables to be re-routed such that they do not traverse any fire scenarios common with the control cables associated with the 1GB and 1GS breakers in the Non-Critical Switchgear Room.	Beyond Compliance	VFDRs TBA-02, -04, and -05; risk reduced but VFDRs not eliminated
S-2.3/CB-A	Feeder cables to 1A and 1B 125 and 250V DC Battery Chargers are routed along the same path through the Control Building Controlled Corridor resulting in a loss of all battery chargers. Cables MLX36 and MLX37 to be re-routed through the RPS Rooms to provide a minimum of a channel of battery chargers to support long term battery usage.	Beyond Compliance	VFDR CBA-06; risk reduced but VFDR not eliminated
S-2.4/CB-D	Control Room abandonment is required along with the usage of the alternate shutdown procedures for a fire in Panel 9-32 or 9-33. Install incipient detection in Panel 9-32 and 9-33 in the Auxiliary Relay Room (Fire Zone 8A) allows for shutdown from the Control Room with minimal field actions.	Beyond Compliance	Risk reduced but not applicable to specific VFDR(s)
S-2.5/RB-M	Transient fires impacting multiple trains of conduit outside the Critical Switchgear Room common passageway. Install conduit shields to prevent damage to conduit banks from transient fires in Fire Area RB-M/ Fire Zone 3C.	Beyond Compliance	Risk reduced but not applicable to specific VFDR(s)
S-2.6/RB-M	Transient fires impacting vertical cable trays in corner of RB-M for opposite train. Install bottom tray covers to prevent damage to cable tray risers from transient fires in Fire Area RB-M/ Fire Zone 3C.	Beyond Compliance	Risk reduced but not applicable to specific VFDR(s)

Item/ Fire Area	Problem Statement/ Proposed Modification	Modification Category	Notes
S-2.7/CB-D	LNK 6 fire impacts conduits and trays in vicinity requiring Control Room abandonment along with usage of the alternate shutdown procedure. Installation of board shielding for cable trays and conduit to prevent damage from fires involving panel PMIS-MUX-LNK6 and PMIS-MUX-LNK7 in the Cable Spreading Room (Fire Zone 9A).	Beyond Compliance	Risk reduced but not applicable to specific VFDR(s)

PRA RAI 16.02

FAQ 08-0054 (ADAMS Accession No. ML110140183), discusses evaluating the additional risk of RAs and includes options to evaluate the change in risk associated with a VFDR and associated RAs. As discussed in the LAR, for Fire Area RB-A, cable damage to M923 represents two separate VFDRs: RBA-02 and RBA-03. Cable damage to M923 would result in failure of more than one PRA target. However, neither RBA-02 or RBA-03 included all failed equipment due to loss of the cable, and therefore their FREs do not appear to correspond to a physical event. The FPRA must be of sufficient technical adequacy to evaluate fire scenarios for use in performing FREs. Therefore, address the following:

a. *The FRE for failure of this cable should be re-evaluated unless justification can be provided such that the cause and affect of the cable failure is accounted for in the analysis.*

b. *Consider if there are other VFDRs for which the FREs do not accurately model the physical impact of the fire, and re-evaluate or provide justification for those also.*

c. *If any LAR results change as a result of parts a or b, discuss their impact.*

d. *Confirm that FAQ 08-0054 (ADAMS Accession No. ML110140183), and FAQ 07-0030 (ADAMS Accession No. ML110070485), guidance related to calculating both change in risk and the additional risk of RAs was followed. If not, provide justification for any differences and provide an assessment of the impact on the reported risk results of following the FAQ guidance.*

<u>NPPD Response</u>

PRA RAI 16.02 will be addressed in the 60-day response.

PRA RAI 19.01

In a letter dated January 14, 2013 (ADAMS Accession No. ML13018A006) the licensee responded to PRA RAI-19. The staff noted that the response does not seem to be consistent with the related implementation item 3-30 that was added to LAR Attachment S, Table S-3. While Item S-3.30 commits to verifying the validity of changes in risk following the implementation of Table S-2 modifications, it does not address Table S-3 implementation items, and does not explain what values (e.g., individual modifications, modifications type, total modifications, etc.) will be compared to what other values in order to verify the validity of the change in risk calculations. In addition, Item S-3.30 states that if the verification effort determines that the as-built risk metrics have changed, the revised risk metrics are evaluated against the proposed license condition requirements in the new licensee condition 2.C(4). The new licensee condition is to be used to support changes to the plant after transition, and has no role in the transition evaluations. Similar change in risk verification implementation items have been developed and approved for previous NFPA-transition requests, please consider these previous items.

a. *Since there are implementation items in LAR Attachment S, Table S-3 which are modeled in and can affect the FPRA, the license condition verification activity should also include S-3 modifications as appropriate. If S-3 modifications are not included, provide justification why they should be treated differently than S-2 modifications.*

b. *You reported a total additional risk from additional RAs of 1.12E-5/year and 3.97E-6/year for CDF and LERF respectively. These values are above the guidelines for acceptable increases in risk in RG 1.174. RG 1.205 Position 2.2.4.2 states that, "If the additional risk associated with previously approved RAs is greater than the acceptance guidelines in RG 1.174, then the net change in total plant risk incurred by any proposed alternatives to the deterministic criteria in NFPA 805, Chapter 4 (other than the previously approved recovery actions), should be risk-neutral or represent a risk decrease". Application of this guidance to RAs in general (i.e., not solely to previously approved RAs) indicate that the proposed additional risk of RAs will be acceptable if the total change risk is risk-neutral or represents a risk decrease. Your current transition change in risk estimates represent a risk decrease indicating the additional risk of RAs somewhat exceeding the acceptance guidelines should be acceptable. Define the acceptance guidelines that will be used to determine the acceptability of the transition change in risk if the validity evaluation indicates that the as-built facility results differ from the results reported in the LAR.*

<u>NPPD Response</u>

a. The license condition verification activity will include those modifications in LAR Attachment S, Table S-3 that are modeled in the FPRA. Implementation Item S-3.30 is revised to read (see Attachment 2, Change 4):

> Upon completion of all Fire PRA credited implementation items in Transition report Tables S-2 and S-3, verify the validity of the change-in-risk (total

modifications) provided in Attachment W. If this verification determines that the risk metrics have changed such that the risk metrics from LAR Attachment W are exceeded, additional analytical efforts, and/or procedure changes, and/or plant modifications will be implemented to assure the Regulatory Guide 1.205 acceptance criteria are met.

b. The acceptance guidelines will not differ from those applied in the LAR. This includes application of Regulatory Guide (RG) 1.174 criteria as well as RG 1.205 Position 2.2.4.2.

PRA RAI 24.01

In a letter dated November 14, 2013 (ADAMS Accession No. ML12312A281), the staff issued PRA RAI-24 and requested information on the technical basis for including new success criteria in the FPRA for the residual heat removal service water (RHRSW) booster pumps. This success path will involve operator actions to open service water valve(s) which close on loss of the service water booster pumps due to an interlock. Confirm that this has been considered in modeling the new success criteria for the FPRA.

NPPD Response

The success criteria referenced in the response to PRA RAI 24 does include the operator actions necessary to use service water to supply the RHR heat-exchangers if all RHRSW booster pumps are rendered unavailable due to fire. These operator actions are modeled as basic events SWS-XHE-FI-MO89AOMA for valve SW-MOV-MO89A and SWS-XHE-FI-MO89BOMA for valve SW-MOV-MO89B.

PRA RAI 27.01

In a letter dated January 14, 2013 (ADAMS Accession No. ML13018A006), the licensee responded to PRA RAI-27 and discussed that air accumulators are credited as a back-up source of instrument air to manipulate valves associated with the hard pipe vent system. Air accumulators could be an important consideration in the successful operation of the hard pipe vent system, given that the instrument air (IA) system cables were not traced and may be modeled by exclusion for this system. Discuss important FPRA assumptions in crediting them, for example, the ability to manipulate the air accumulators for the modeled mission times.

NPPD Response

As stated in PRA RAI-27, the hard pipe vent (HPV) system components are explicitly included in the FPRA model. The HPV system is normally aligned from the MCR and includes valves PC-MOV-233MV, PC-AOV-237AV, and PC-AOV-A032.

Accumulators are provided for the air operated valves PC-AOV-237AV and PC-AOV-AO32 to provide a motive force for valve operation upon loss of instrument air (IA). The two accumulators for PV-AOV-237AV are sized for 1 cycle and the one accumulator for PC-AOV-

AO32 is sized for 5 cycles. Once PC-MOV-233MV and PC-AOV-237AV have been opened, PC-AOV-AO32 can be cycled 5 times to support containment venting. PC-AOV-237AV and PC-AOV-AO32 are tested for operability on a monthly basis and leakage from the valves is very small. As such, a 24-hour mission time is maintained.

The probability of the air accumulators failing to open the HPV path is explicitly included in the FPRA model. As stated in PRA RAI-27, the IA system is assumed to be failed for fires; and so the IA cables were not traced, and no exclusion analysis was performed for the purposes of HPV operation.

PRA RAI 29.01

In a letter dated January 14, 2013 (ADAMS Accession No. ML13018A006) the licensee responded to PRA RAI-29b and indicated that an HEP of 0.1 was chosen for HFE PCV-XHE-FO-AOV. Given that a detailed analysis of this action was not performed for the FPRA, provide further justification for this HEP, including why the internal events PRA (IEPRA) HEP value is applicable. In addition, discuss how this action relates to human factors evaluation (HFE) PCV-XHE-FO-HPV, clarifying how they both are credited in the FPRA. Further, the response to PRA RAI 29c (ADAMS Accession No. ML13018A006) appears to indicate that valves associated with PCV-XHE-FO-HPV for the hard pipe vent can be manipulated from the MCR. However, some of the valves are air operated valves (AOVs). Provide clarification regarding if there are cases where the AOVs cannot be used from the CR and if these cases are treated in the FPRA model.

NPPD Response

The FPRA model includes local operation of PC-AOV-237AV and PC-AOV-AO32. These ex-control room actions are modeled with HFE: PCV-XHE-FO-AOV, "Human Error Fail to Locally Open HPV AOVs, PC-AOV-237AV and PC-AOV-32AV." This HFE has a screening probability of 0.1 which is the same value as used for the internal events PRA. The 0.1 screening HEP is appropriate for several reasons. The prompt to vent occurs at approximately 12 hours and vent pressure is exceeded at 19 hours. Manual operation of air-operated valves (AOVs) is well trained on by plant operators. This training includes overriding air operation of AOVs and manually opening the valves. These actions occur long after the fire is out and at this point there would be no challenges to the crew composition. Because the prompt for these actions occurs hours after the fire is extinguished, the same HEP value as for internal events is applicable to the fire scenarios. These actions fall into Screening Category Set 1 of NUREG-1921 and for long term actions the same HEP as for internal events can be used.

In addition to the local actions discussed above, PCV-XHE-FO-HPV models alignment of the HPV and includes the cognitive portion of the HFE on making the correct decision to initiate Primary Containment Venting. If the HFE PCV-XHE-FO-HPV fails, then the Primary Containment Venting function fails. In contrast, PCV-XHE-FO-AOV models local actions to be performed in the event that the ability to align the HPV AOVs from the MCR is lost.

All components that are part of the HPV were identified in Task 2, "Component Selection" and were cable traced in Task 3, "Cable Selection." Fire affected equipment was identified for each of the fire scenarios. For those scenarios in which the cables associated with hard pipe vent AOVs were impacted by a fire, the AOVs were modeled as being failed for operation from the MCR. For fires in Fire Zones 1C, 2A-2, 3A, 3B, 3C, 3D, 3E-2, 14A, 14B, and 14C local actions for opening the AOVs modeled by PCV-XHE-FO-AOV were credited and set to the screening value of 0.1. Local operation entails hands-on operation of the AOVs after disengaging the operators and removing operating air.

PRA RAI 35

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 that recovery actions must be addressed. The NRC staff's sample review of FREs noted that some HRA basic events appear to be credited; however do not appear in the LAR, Attachment G as credited recovery actions.

a. *A review of the FRE for RB-M suggests that the recovery of SW-MOV-M089B may be a credited RA for VFDR RBM-07; however, neither LAR Table G-1 (including revisions made in response to SSD RAI-09) nor LAR Table B-3 credit the recovery of SW-MOV-M089B as a RA for VFDR RBM-07. Confirm whether or not the recovery of SW-MOV-M089B is a RA that should be in Table G-1. If it is a RA, clarify if it is reflected in LAR Attachment W, or provide updated results if necessary.*

b. *A review of FREs for RBK-04 and TBA-05 appear to credit EAC-XHE-FI-SWEDG1 and SWS-XHE-FI-SWPACOMA; however, according to LAR Table G-1 and LAR Table B-3, no RAs are credited to meet RG 1.174 risk acceptance guidelines or defense-in-depth (DID) criteria for VFDRs RBK-04 and TBA-05. Clarify if these actions are credited in the LAR Attachment W results, and provide updated results if necessary.*

c. *Explain the cause of these apparent discrepancies and confirm that LAR Table G-1, as supplemented by the response for safe shutdown analysis (SSD) RAI-09, is a complete list of RAs for the LAR, (i.e., it includes RAs which may or may not be credited in the FPRA in performing the FREs.)*

<u>NPPD Response</u>

PRA RAI 35 will be addressed in the 60-day response.

PRA RAI 36

In a letter dated February 12, 2013 (ADAMS Accession No. ML03051A539) the licensee responded to RRA RAI-13 and PRA RAI-15 and stated that corrections were made to the FPRA model after the LAR submittal for several scenarios in Fire Area TB-A and RB-FN (via RAI 16e); however, the changes made are not identified. In the responses to PRA RAI 13 and PRA RAI 15, the pre-sensitivity study results would seem to correspond to the original LAR Attachment W evaluations after the corrections were made to the fire model. Comparison of the total delta CDF in attachment W (-8.71E-06) with the total pre-sensitivity study delta CDF in RAI 15 (-1.2E-05) indicates an additional decrease in risk caused by the corrections. Conversely, the response to PRA RAI16e (February 12, 2013, ADAMS Accession No. ML03051A539) states that changes in the evaluation for RB-FN caused the delta CDF to change from -1.24E-07 to 1.59E-07, an increase of 2.83E-07. Provide a description of the corrections made and an explanation for the changes.

NPPD Response

The responses for PRA RAI 13 and PRA RAI 15 state:

> ...corrections made to the fire PRA model after LAR submittal for several scenarios in Fire Area TB-A, and the correction of the human failure event inconsistencies discussed in the response to PRA RAI-16e.

While performing additional reviews of the FPRA results, it was determined that the fire affected equipment lists for several transient fire scenarios in Fire Zone 13B (zone within Fire Area TB-A) were inappropriate. These were revised. In addition, although treated as a recovery action in LAR Attachment G, the FPRA did not include crediting recovery of critical bus 1F. The revised fire affected equipment lists coupled with inclusion of the recovery of critical bus 1F were used when performing the sensitivity studies in responding to PRA RAI 13, PRA RAI 15, and PRA RAI 16e. The critical bus 1F recovery had the largest impact on change in risk. Inclusion of bus 1F recovery coupled with the revisions to the fire affected equipment lists in Area TB-A did result in a calculated decrease in delta risk (more negative delta risk) for the base case used in the sensitivity study for control power transformers credited [PRA RAI 15]).

PRA RAI 16e provides a description of the revisions made to HFEs credited in Fire Area RB-FN and an explanation of their impact on delta risk. The revised HFEs were incorporated into the sensitivity studies performed in response to PRA RAI 13 and PRA RAI 15 in a manner similar to the Fire Area TB-A revisions.

PRA RAI 37

Section 2.4.3.3 of NFPA 805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Containment overpressure (COP) is an important consideration in the plant response, and is also related to some VFDRs. The staff is requesting clarification on the FPRA modeling of COP. Address the following:

a. Discuss the system assumptions made in the FPRA and FREs given loss of COP.

b. Provide a comprehensive discussion on how the timing of the COP analysis in CNS PSA-007 is consistent with human reliability analysis (HRA) modeling of containment isolation (e.g., CNT-XHE-FO-L2ISL and CNT-XHE-FO-L2ISO), and other possible F PRA modeling related to loss of COP and timing of containment isolation actions (e.g., COP is not adversely affected by the spurious opening of containment vents that last up to 1 hour).

c. Describe whether cable tracing was performed for cables which may result in potential containment bypass pathways as a result of a fire. If not, describe whether these cables were modeled in the FPRA by exclusion. If so, discuss the consistency of the fire impact on the bypass pathway with the COP analysis in CNS PSA-007.

<u>NPPD Response</u>

a. The FPRA model includes the need for COP if suppression pool cooling (SPC) is not initiated within 4 hours.

Containment isolation failures that can result in the loss of COP are included in the FPRA model as the following flowpaths:

- Secondary Containment Vacuum Breaker Line A or B Fails Open
- Drywell Equipment Drain or Drywell Floor Drain containment isolation valves fail open
- Torus or Drywell purge lines fail open
- Torus or Drywell vent lines fail open

Given a loss of COP due to failure to isolate containment under this condition, the RHR pumps and Core Spray pumps are assumed to be failed.

The same COP criteria and COP modeling were used in both the Fire PRA and in the FREs.

b. CNT-XHE-FO-L2ISO and CNT-XHE-FO-L2ISL are Primary Containment isolation HFEs performed in the MCR. CNT-XHE-FO-L2ISO is for transients and CNT-XHE-FO-L2ISL is for large loss-of-coolant accidents (LOCAs). Time for both MCR review and MCR crew manipulation is estimated to be 10 minutes for HFEs CNT-XHE-FO-L2ISO and CNT-XHE-FO-L2ISL.

HFE CNT-XHE-FO-L2ISL "Op Fails to Isolate Cntmnt Penetrations Given Auto Isolation Fails (LOCA)," is the operator action to isolate containment, exclusive of the main steam isolation valves (MSIVs). In the FPRA, this HFE is always assumed to fail.

HFE CNT-XHE-FO-L2ISO "Op Fails to Isolate Cntmnt Penetrations Given Auto Isolation Fails (Transient)," is the operator action to isolate containment, including the MSIVs, in the event of containment isolation failure for transients. This HFE supports both the COP function and the operation of HPCI and RCIC. Per CNS PSA-007, "Deterministic Calculations," COP is not adversely affected by the spurious opening of containment vents that last for up to 1 hour. A 30-minute time period is based on transient and small LOCA MAAP calculations contained in CNS PSA-007. Therefore, the more limiting 30-minute timing is applied for CNT-XHE-FO-L2ISO.

Additional HFEs dealing with maintaining containment integrity are as follows:

RW-XHE-FI-AO82AO83, "Operator Fails to Isolate DW Floor Drain Sump Line (RW-AO82 and AO83)," and RW-XHE-FI-AO94AO95, "Operator Fails to Isolate DW Equip Drain Sump Line (RW-AO94 and AO95)," are for maintaining containment and so the actions are not required within the first hour. Per NUREG/CR-6850, 12.5.3.6 Set Criteria, Step 2, these HEPs are set to 0.1 for screening.

RW-XHE-FI-AO94AO95, "Operator Fails to Isolate PC-MOV-230MV and PC-V-511," and PCV-XHE-FI-231MV, "Operator Fails to Isolate PC-MOV-231MV and PC-V-510," are set to a screening value of 1.0 (always failure).

c. All components in the containment isolation paths needed to maintain COP were identified in Task 2 of NUREG/CR-6850 and during the Multiple Spurious Operation (MSO) Expert Panel meetings and were subsequently cable traced as part of Task 3 "Cable Selection." This cable tracing included supporting components, cables, and power supplies to perform the function. As such the containment bypass pathways and FPRA analysis are consistent with the COP analysis in CNS PSA-007.

PRA RAI 38

Describe whether the FPRA considers the heat contribution from fires to heat loads in the room in order to determine that sufficient heating ventilation and air conditioning system (HVAC) cooling is available. If not considered, provide justification that it is not important for the application.

NPPD Response

PRA RAI 38 will be addressed in the 60-day response.

PRA RAI 39

The NRC staff's review of the detailed HRA identified observations which need clarification or resolution. These observations are discussed below.

- *There appears to be inconsistencies in the detailed HRA and its applicability to the fire scenarios to which it is mapped. An example is the basic event EAC-XHE-FI-BUS1G which is mapped to a fire scenario in VFDR RBFN-3 which involves fire-related damage to both 4kv buses. Potential inconsistencies in this detailed HRA are:*

    - *The HEP does not appear to be reflective of the complexity of the fire scenario to which it is mapped due to the small failure probability associated with the complex scenario.*

    - *May not consider the dependency on needing to recover BUS1F.*

    - *Assumptions in the detailed HRA appear to be different from the VFDR RBFN-3; and,*

    - *Detailed HRA applicable fire areas and the VFDR fire areas appear not to match.*

- *Detailed HEPs may be optimistic given the extent of fire damage. In the above scenario two 4kv buses experience the fire affects, yet the success path is recovered with a relatively small failure probability for EAC-XHE-FI-BUS1G. Other detailed HRA showing possible optimistic HEPs are EAC-XHE-FI-SWEDG1 and SW-XHE-FI-SWACOMA which are mapped to fire scenarios in TBA-5. These are field actions to be taken within five minutes. Such HEP may reflect a belief that there is no delay due to uncertainty in travel time, or in implementing emergency operating procedures (EOPs) if applicable.*

- *Timing assumed in the detailed HEP may be optimistic. For example, EAC-XHE-FI-BUS1F1G says both buses 1F and 1G will be recovered in 12 minutes which includes travel and manipulation time. This is comparable to recovery of offsite power due to plant-centered random loss of offsite power even though it is mapped to a fire scenario in which the fire affects two 4 kv buses*

Review the observations identified above for the identified examples as well as for other detailed HRA basic events to ensure the detailed HRAs performed have a justifiable technical basis. Discuss:

a. *The results of the review*

b. *Justification that the timing associated with the detailed HEP analyses is reasonable or bounding for the fire scenarios to which it is mapped.*

c. *The process by which the manipulation times were increased from the times used in the IEPRA and the extent to which the manipulation times for risk-significant actions were verified in the context of the fire scenarios to which they were applied.*

For detailed HEPs for which the timing does not have a justifiable technical basis, assign a screening HEP using acceptable HEP screening guidance, and discuss the impact of this sensitivity analysis on the LAR results.

NPPD Response

Response a and b for EAC-XHE-FI-BUS1G

It was stated that EAC-XHE-FI-BUS1G does not appear to be reflective of the complexity of the fire scenario to which it is mapped due to the small failure probability associated with the complex scenario. Information justifying this HFE is as follows:

EAC-XHE-FI-BUS1G: OPERATOR FAILS TO ALIGN BUS 1G TO AVAILABLE POWER SOURCE

The fire alarm in the MCR directs operator to Procedure 5.4Post-Fire. Additionally, the loss of power to critical instruments would be a prompt for the operators.

The preceding events include that a fire causes a reactor trip, and loss of power to Bus 1G due to breaker EE-CB-4160F-1GA spuriously opening.

The Operator fire response is to restore bus 1G. The location of actions is 4160 Critical Switch Gear Room 1G. Since this HFE is an operator manual action (OMA) as defined by Appendix R, this action has been walked down for a fire. The fire location will not impact the operators' performance of this action.

Based on interviews, the operators stated that getting the critical safety buses back will be a high priority. Due to the loss of power, the operators asserted that it would be obvious as to which critical bus failed, and that the post-fire procedure step would be implemented as soon as possible.

The workload is considered high due to the fire and the necessity to restore bus 1G. Additionally, the execution is considered complex and a charging ratchet is required for 4160V breakers manual operation.

Timing Analysis:

Tsw = 5.1 hrs - Time until batteries deplete. There would be additional time following battery depletion until top of active (TAF) is reached but 5.1 hrs is used a conservative case. (PSA 007)

Tdelay = 30 minutes - During the first 30 minutes the operators highest priority will be getting the fire under control. With the batteries available, the operators have time to first attend to fire mitigation. Note that the very first step in 5.4Post-Fire is to monitor DG and SW operation throughout the performance of the procedure.

T1/2 = 1 minute to read the step in the procedure.

Tm = 10 minutes (Appendix M page M-24). This manipulation time includes travel time.

Time available for cognition and recovery: 200.00 Minutes

Time available for recovery: 199.00 Minutes

BUS1F is assumed unrecoverable in the scenarios associated with this HFE so there is no dependency on needing to recover BUS1F.

As shown, a detailed HEP was performed and the timing has a justifiable technical basis.

Response a and b for VFDR RBFN-3

It was stated that detailed HRA applicable fire areas and the VFDR fire areas appear not to match.

From FRE Area RB-FN it is specifically stated in Table 2, OMAs in Base Case FPRA for Area RB-FN, that the OMA HEP value is set to 1.0 (failure) in RBFN-3 for EAC-XHE-FI-BUS1G, "Failure to Align Bus 1G For a Fire in Zone 3B." No credit is taken for this HFE in RBFN-3 for the base case. For the compliant case, EAC-XHE-FI-BUS1G was set to 0.0 (success) which maximizes the delta risk for VFDR RBFN-3. Thus there is no disagreement between the HRA and the VFDR. Additionally, no credit is taken for recovery of Bus 1F, so there is no dependency to be considered.

Response a and b for SW-XHE-FI-SWACOMA and EAC-XHE-FI-SWEDG1

It was stated that SW-XHE-FI-SWACOMA has field actions to be taken within five minutes. The actual time available for field actions is 25 minutes, not 5 minutes, and there is adequate time for performance and recovery. A detailed HEP was performed and the timing has a justifiable technical basis.

It was stated that EAC-XHE-FI-SWEDG1 has field actions to be taken within five minutes. This is correct and information justifying this HFE is as follows:

EAC-XHE-FI-SWEDG1: Operator Fails to Trip EDG1 if No SW Available

Annunciator FP-1/D-5, "RX BLDG CRITICAL SWGR RM ZONE 22," is a "Red Tile" alarm such that operators are directed to enter 5.4Post Fire directly before confirming that a real fire exists in the area. If a fire annunciator is not a "Red Tile" alarm, a fire must be confirmed before entry into 5.4Post Fire. This delay would conservatively result in the probability of this HFE being set to 1.0 as there would not be enough time to procedurally stop an emergency diesel generator (EDG) running without service water (SW).

The preceding events include that a fire causes reactor trip, Bus 1F loses power which causes an automatic start of EDG1, and EDG1 cannot load onto Bus 1F and is running without SW.

Operator fire response is to locally stop EDG1 if it has been running for longer than 5 minutes without SW flow. Operators stated that they are trained to carefully monitor EDGs after they start so that a running EDG without service water can be identified within 1 minute. Monitoring EDG and SW operation was thought of as a continuous action step by operators.

Timing Analysis:

Tsw = 5 minutes (from Procedure 5.4Post Fire)

Tdelay = 2 minutes to respond to fire alarm and annunciator FP-1/D-5 referral to Procedure 5.4Post Fire. Note that the very first step in 5.4 Post-Fire is to monitor EDG and SW operation throughout the performance of the procedure. SW flow is also indicated on the DG panel and will be checked on any EDG start.

T1/2 = 0.5 minutes for recognition of SW failure to supply EDG.

Tm = 2 minutes are needed to travel to EDG1 room and stop EDG1 locally by pressing the "EMERGENCY STOP" button. The two minutes needed is based on operator interviews.

Time available for cognition and recovery: 1.00 Minutes

Time available for recovery: 0.50 Minutes. No recoveries are applied to the execution due to the very short time window.

As shown, a detailed HEP was performed and the timing has a justifiable technical basis.

Response a and b for EAC-XHE-FI-BUS1F1G

It was stated that timing assumed in the detailed HEPs may be optimistic. Where available, the manipulation time of field actions are from Appendix M, Operator Manual Action Time Lines, which contains the feasibility studies for required actions in the Safe Shutdown Analysis Report.

EAC-XHE-FI-BUS1F1G was stated as an example and that this HEP is comparable to recovery of offsite power. Information justifying this HFE is as follows:

> EAC-XHE-FI-BUS1F1G: OPERATOR FAILS TO ALIGN EITHER BUS 1F OR BUS 1G TO AVAILABLE POWER SOURCES
>
> A fire alarm in the MCR directs operators to Procedure 5.4Post-Fire. The procedure specifically directs the operator to Attachment 24 safe shutdown analysis for TB-A. Additionally, the loss of power to critical instruments would be a prompt for the operators.
>
> The preceding events include that fire causes reactor trip, loss of power to 1F due to breaker EE-CB-4160F-1FA spuriously opening, and loss of power to Bus 1G due to breaker EE-CB-4160F-1GA spuriously opening. Batteries are available for 5.1 hrs and high pressure coolant injection (HPCI) is available until batteries deplete.
>
> The Operator fire response is to restore bus 1F and Restore bus 1G. The fire procedures direct the operators to restore both. There are only ten steps to be performed, which is much less involved than recovery of offsite power.
>
> The location of actions is 4160 Critical Switchgear Room 1F and 1G. Since this HFE is an OMA as defined by Appendix R, this action has been walked down for a fire in TB-A. The fire location will not impact the operators' performance of this action.
>
> The operators stated that getting the critical safety buses back will be a high priority. Due to the loss of power the operators asserted that it would be obvious as to which critical bus failed and the post-fire procedure step would be implemented as soon as possible.
>
> The workload is considered high due to the fire and the necessity to restore buses 1F and 1G. Additionally, the execution is considered complex and a charging ratchet is required for 4160V breakers manual operation.
>
> <u>Timing Analysis:</u>
>
>> Tsw = 5.1 hrs - Time until batteries deplete. There would be additional time following battery depletion until TAF is reached but 5.1 hrs is used as the conservative case. (PSA 007)

Tdelay = 30 minutes - During the first 30 minutes the operators' highest priority will be getting the fire under control. With the batteries available, the operators have time to first attend to fire mitigation.

T1/2 = 1 minute to read the step in the procedure.

Tm = 12 minutes (Appendix M page M-33). This manipulation time includes travel time and includes the time to restore both bus 1F and bus 1G.

Time available for cognition and recovery: 198.00 Minutes

Time available for recovery: 197.00 Minutes

As shown, a detailed HEP was performed and the timing has a justifiable technical basis.

Response c for Process for Evaluation of HFEs

None of the HFEs addressed in this request for additional information are based on HFEs from the Internal Events PRA. These are all fire response actions. For fire response actions, detailed analyses were performed. These HFEs were identified, defined, and quantified using the EPRI HRA Calculator and the individual analyses are shown in Appendix B of NEDC 09-083, Task 7.12 Fire Human Reliability Analysis. The methodology used in the fire HRA portion of the FPRA followed the guidance provided in the recently released EPRI/NRC fire HRA guidelines in NUREG-1921.

From NEDC 09-083, Task 7.12 Fire Human Reliability Analysis:

7.1.2 Fire Response Actions

Fire response actions consist of operator actions added during the development of the fire-induced risk model (NUREG/CR-6850 Task 5) [2]. To provide support to the fire PRA modelers, the fire procedures were reviewed and every action that is proceduralized in the fire procedures was identified and an HFE was defined at basic event level. This list was used by the fire PRA to determine initially if an action could be credited the fire PRA. Table 10, "Definition of All Potential Fire Response HFEs That Could Be Credited In Fire PRA," lists all the HFEs identified by review of the fire procedures. The review of the fire procedures consisted of both 5.4Post-Fire and 5.4Fire S/D. The control room abandonment procedure was reviewed to identify operator actions outside the control room which are necessary for safe shutdown. The operator interviews confirmed that operators can refer to the control room abandonment procedures for additional information without completely abandoning the control room. The operators stated that they will remain in the control room and will direct the actions to local Reactor Operators (ROs) who implement actions as necessary. For a fire in the cable spreading room, the control room may remain habitable, but some of the Reactor Pressure Level (RPV) level indicators will be impacted by the fire, in this case the control room operators will send a local RO to read the RPV levels from either the alternate shutdown panel or the local RPV level indications at the alternate shutdown panel at the 903' elevation. The operators will only abandon the CR if it becomes uninhabitable. A CCDP of 0.1 for control room abandonment has been assigned based on NUREG 6850 Task 12.

The fire procedures were also reviewed to identify any operator actions that - if carried out - would isolate or de-energize safe shutdown equipment used to mitigate core damage in the fire PRA. These actions could be directed by the fire procedures as pre-emptive actions to prevent spurious actuations, or to isolate and preserve equipment for later use. A generic example would be if the procedures directed the operators to de-energize the 4160 kV bus during fires that damaged the 480V bus. The undesired consequence would be loss of the entire 4160 kV bus instead of only the 480V bus. During the procedure review, if the procedure required the operator to confirm indications and the need for the action, then it was screened from consideration. For example if the procedure reads "If necessary then ...." at CNS, no undesired pre-emptive operator actions were identified. As noted in Attachment A, Operator Interviews, any specific action listed in the fire procedures (including pre-emptive actions) will be reviewed by the operators to determine if it is necessary and when to perform the action(s).

Table 2: "Fire Response HFEs Included In the Fire PRA," lists fire response HFEs that are credited in the FPRA. In order for an action to be credited in the FPRA it must be feasible in that there is enough time to diagnose and execute the action, there is enough crew to perform the action, and there must be cues and indications. Appendix M, "Operator Manual Action Time Lines," from the CNS Appendix R report, shows that all actions in the fire procedures have been walked down and demonstrated to be feasible per Appendix R requirements and times are listed in Table 9, "Justification For Feasibility For Fire Response HFEs," which lists the fire zone where the action is credited and where the execution is taking place. No action was credited where the environment would be affecting operator performance.

The observations identified above for the identified examples as well as for other detailed HRA basic events have been evaluated to ensure the detailed HEPs performed have a justifiable technical basis.

PRA RAI 40

The NRC staff identified several methods and weaknesses used in the FPRA that have not been accepted by the staff. RAIs were provided about these methods and weaknesses and the responses have been reviewed. The staff has concluded that some of these methods and weaknesses are unacceptable in that justification does not seem to be technically available (e.g., credit for control power transformers is not supported by experiments).

<u>Unacceptable methods and weaknesses:</u>

- *Transient fire influence factors (LAR Supplement dated July 12, 2012)*
- *Treatment of kerite cables (PRA RAI-02b)*
- *Addition of Fire Area DW (PRA RAI-32)*
- *Corrections associated with Fire Area TB-A (PRA RAI-36).*
- *Corrections associated with Fire Area RB-FN (PRA RAI-16e)*
- *Credit for control power transformers (PRA RAI-15)*
- *Changes to the recovery actions (PRA RAI-34)*

The following methods and weaknesses have been identified, but the NRC Staff review is continuing with additional RAIs and further supporting information being requested. Alternatively, any of these methods and weaknesses may be replaced with a method or model previously accepted by the NRC by modifying the FPRA.

<u>Methods and weaknesses still under review:</u>

- *Use of probabilities less than 1E-5 as the floor HEP screening value (PRA-02-01)*
- *Credit for minim instrumentation after loss of RPV level instrumentation (PRA RAI 02c-01)*
- *Estimate of CCDPs including vented cable run atop the MCBs (PRA RAI 02f(i)-01)*
- *Use of less than 317KW for transient fires (PRA RAI 04-01)*
- *Estimate of HEP/CCDPs following MCR abandonment (PRA RAI 11-01, 14-01)*

a) *Please provide the results of a composite analysis that shows the integrated impact on the fire risk CDF,LERF, ΔCDF, ΔLERF) after replacing all the unacceptable methods and weaknesses with acceptable ones. As the review process is concluded, additional changes to replace any method or weakness still under review that are determined to be unacceptable may be required. In this composite 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. In the response, explain how the RG 1.205 risk acceptance guidelines are satisfied for the composite analysis and, if applicable, a description of any new modifications or operator actions being credited to reduce delta risk and the associated impacts to the fire protection program.*

b) *If any of the unacceptable methods or weaknesses will be retained in the PRA that will be used to estimate the change in risk of post transition changes to support self-approval, please explain how the quantitative results for each future change will account for the use of the unacceptable method or weakness.*

<u>NPPD Response</u>

PRA RAI 40 will be addressed in the 60-day response.

Attachment 2

Revisions to the Cooper Nuclear Station
License Amendment Request To Adopt
National Fire Protection Association Standard 805
Performance-Based Standard For Fire Protection
For Light Water Reactor Generating Plants

This attachment provides changes to the National Fire Protection Association (NFPA) 805 License Amendment Request based on the responses to the Requests for Additional Information (RAI) provided in Attachment 1, or as otherwise specified. The changes are presented in underline/strikeout format.

1. Section 4.6, "Monitoring Program," is revised to state:

   The NFPA 805 Monitoring Program, as described in this Section, will be implemented within ~~six~~twelve months after issuance of the NFPA 805 Transition License Amendment (see Attachment S, Table S-3, Implementation Item S-3.23).

   Reference: The basis for extending the implementation date is to ensure it falls well outside of the Cooper Nuclear Station (CNS) refueling outage scheduled in the Fall of 2014. This was discussed with Nuclear Regulatory Commission management in a conference call on November 25, 2013.

2. Section 5.5, "Transition Implementation Schedule," is revised to state:

   The Nebraska Public Power District (NPPD) proposes a ~~six~~twelve-month implementation period for the transition of CNS to the new fire protection licensing basis. Pursuant to this, the following activities are planned:

   - NPPD commits to the specific actions identified in Implementation Items S-3.1 through S-3.29 of Table S-3 of Attachment S to Enclosure 1, within ~~six~~twelve months after issuance of the NFPA 805 License Amendment.

   - NPPD will complete implementation of the required modifications identified in Table S-2 of Attachment S to the Transition Report prior to startup from the first refueling outage greater than 12 months following the issuance of the NFPA 805 License Amendment. Appropriate compensatory measures will be maintained until modifications are complete.

   - NPPD will implement Implementation Item S-3.30 of Table S-3 of Attachment S to Enclosure 1 by May 31, 2017.

Reference: The basis for extending the implementation date is to ensure it falls well outside of the CNS refueling outage scheduled in the Fall of 2014. This was discussed with Nuclear Regulatory Commission (NRC) management in a conference call on November 25, 2013. Regarding Implementation Item S-3.30, refer to the response to FPE RAI 04 and PRA RAI-19 of NLS2013011 [ADAMS Accession Number ML13018A006]. Since Implementation Item S-3.30 validates the validity of the changes in risk following implementation of the Table S-2 modifications, it is appropriate that it be a separate commitment from the other Table S-3 items. The May 31, 2017, completion date correlates to 6 months after implementation of the Table S-2 modifications.

3. The preface to Table S-3 is revised to state:

Table S-3: Items S-3.1 through S-3.29 provided below are certain items (procedure changes, process updates, and training to affected plant personnel) that will be completed pursuant to the implementation of the new NFPA 805 Fire Protection Program. This will occur within ~~six~~twelve (~~6~~12) months after NRC approval of the NFPA 805 Transition License Amendment Request. Item S-3.30 will be completed by May 31, 2017.

Reference: The basis for extending the implementation date is to ensure it falls well outside of the CNS refueling outage scheduled in the Fall of 2014. This was discussed with NRC management in a conference call on November 25, 2013. Regarding Implementation Item S-3.30, refer to the response to FPE RAI 04 and PRA RAI-19 of NLS2013011 [ADAMS Accession Number ML13018AO06]. The May 31, 2017, completion date correlates to 6 months after implementation of the Table S-2 modifications.

4. Implementation Item S-3.30 is revised to state:

~~Verify the validity of the change-in-risk following implementation of Table S-2 modifications. Change in risk differences resulting from this verification using as-built modification information will be evaluated in accordance with the proposed License Condition 2.C(4) requirements detailed in Attachment M of this Transition Report to determine if NC approval is required.~~Upon completion of all Fire PRA credited implementation items in Transition report Tables S-2 and S-3, verify the validity of the change-in-risk (total modifications) provided in Attachment W. If this verification determines that the risk metrics have changed such that the risk metrics from LAR Attachment W are exceeded, additional analytical efforts, and/or procedure changes, and/or plant modifications will be implemented to assure the Regulatory Guide 1.205 acceptance criteria are met.

Reference: Response to PRA RAI 19.01.

List of Regulatory Commitments

The following table identifies those actions committed to by Nebraska Public Power District in this document. Any other actions discussed in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT/COMMITMENT NO.	TYPE (Check one)		SCHEDULED COMPLETION DATE
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
NPPD will implement the new NFPA 805 fire protection program to include Implementation Items S-3.1 through S-3.29 as identified in Table S-3 of Attachment S to Enclosure 1. (NLS2012006-01 Rev. 1)		X	Within twelve months after issuance of the NFPA 805 License Amendment
NPPD will implement Implementation Item S-3.30 as identified in Table S-3 of Attachment S to Enclosure 1. (NLS2013011-01)	X		May 31, 2017