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NLS2014001
January 17, 2014

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

Subject: 60-Day 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 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)
3. Letter from Kenneth Higginbotham, Nebraska Public Power District, to U.S. Nuclear Regulatory Commission, dated December 12, 2013, "Response to Request For Additional Information Regarding License Amendment Request To Adopt National Fire Protection Association Standard 805" (NLS2013104)

Dear Sir or Madam:

The purpose of this letter is for the Nebraska Public Power District to provide the 60-day response to a Nuclear Regulatory Commission Request for Additional Information (Reference 1) related to the Cooper Nuclear Station (CNS) License Amendment Request 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 and supplements the 30-day response made in Reference 3. The commitments made in Reference 3 have been modified for purposes of clarity in Attachment 2 of this submittal.

Should you have any questions concerning this matter, please contact Troy Barker, Engineering Programs and Components Manager, at (402) 825-5027.

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NRR

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

Executed on 01\17\14
(Date)

Sincerely,

Oscar A. Limpias
Vice President – Nuclear and
Chief Nuclear Officer

OAL/wv

Attachments:
1. 60-Day Response to Cooper Nuclear Station Request For Additional Information Regarding License Amendment Request To Adopt National Fire Protection Association Standard 805
2. 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

60-Day 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) responses to the Probabilistic Risk Assessment (PRA) RAIs are 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>

PRA RAI 02.c.01 was addressed in the 30-day response.

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

PRA RAI 02.f.01 was addressed in the 30-day response.

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

PRA RAI 02.f.i.01 was addressed in the 30-day response.

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.

NPPD Response

As noted in the PRA Standard for Capability Category II for supporting requirement QU-E3 (ASME/ANS Ra-Sa-2009) propagation of parameter uncertainty is not required; state-of-knowledge correlation needs to be taken into account in estimating the uncertainty interval. As discussed in the response to PRA RAI 02 h, correlation between probabilities is not significant in the fire PRA (FPRA). This conclusion is based on a review of the cut-sets contributing to core damage frequency (CDF) and large early release frequency (LERF). Also, as noted in NUREG-1855, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making" on page 44, section 4.1.2, paragraph two: "However, for CC II, this

correlation may be ignored in calculating the probability distribution provided that it is shown not to be significant for the particular case under assessment."

The distribution is not used in the analysis, as the decision guidance is based on mean values, which have been used in this analysis.

Propagation of parameter uncertainty would not cause the risk estimates to increase beyond the 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 due to the insignificance of correlation on the calculated results.

Per the response to PRA RAI 19.01 a. Implementation Item S-3.30 addresses potential changes as follows:

> 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 RG 1.205 acceptance criteria are met.

Correlation will be formally included in the model as the FPRA is reconciled to the "total modifications."

As stated in the response to PRA RAI 19.01 b., the acceptance guidelines will not differ from those applied in the LAR. This includes application of RG 1.174 criteria as well as RG 1.205 Position 2.2.4.2.

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 [sic] *805) License Amendment Request (LAR) for transition or post-transition.*

NPPD Response

PRA RAI 02.o.01 was addressed in the 30-day response.

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. As stated in the responses to parts b and c of this RAI (provided in 30-day response), should the incipient detection or Very Early Warning Fire Detection System (VEWFDS) fail or operators fail to respond to a VEWFDS alert, other fire detection would alert operators to a fire in the Auxiliary Relay Room (Fire Zone 8A of Fire Area CB-D).

   Given the loss of trains/systems from a fire in Panels 9-32 or 9-33 along with a failure of VEWFDS, a failure to respond to VEWFDS or failure of operators to respond from the MCR, the operators would perceive a significant loss of command and control in the

MCR and enter Procedure 5.4FIRE-SD. This procedure provides for MCR abandonment and reaching a "safe and stable" condition from the ASD panel for fires in Fire Area CB-D. Therefore, using MCR abandonment CCDP/CLERP for the fire scenarios where VEWFDS is failed or operators do not respond to the early fire alert properly or do not respond from the MCR is justified.

b. PRA RAI 03.01b was addressed in the 30-day response.

c. PRA RAI 03.01c was addressed in the 30-day response.

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. PRA RAI 04.01a was addressed in the 30-day response.

b. PRA RAI 04.01b was addressed in the 30-day response.

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.*

<u>NPPD Response</u>

a. PRA RAI 11.01a was addressed in the 30-day response.

b. Response on Transient Scenarios

   i. MCR (Fire Zone 10B) transient fire scenario frequencies were determined by apportioning the MCR transient fire ignition frequency determined in NUREG/CR-6850 Task 6 [NEDC 08-032] by the fraction of the footprint or floor area of each postulated transient fire to the total available MCR floor area, e.g., the floor area free of equipment.

   ii. The transient scenarios were developed at MCR pinch points where the fire risk would be most significant. Transient fires were placed at locations which affect two or more MCBs and/or electrical cabinets containing FPRA targets. All FPRA components located in these MCBs or electrical cabinets were considered failed due to the transient fires. These postulated transient fires, which modeled the failure of multiple MCBs and/or electrical cabinets, bound the consequences of transient fires that affect a smaller subset of MCBs or electrical cabinets, thus bounding the risk of MCR fires.

c. One of the postulated transient fire scenarios discussed in Item b above impacts MCR electrical cabinet VBD-R. This panel contains MCR ventilation controls and fire impact is postulated to cause a loss of MCR ventilation. However, loss of MCR ventilation will not cause additional loss of MCR equipment. Room heat up evaluations of the MCR have determined that there are no MCR equipment malfunctions after failure of the MCR Heating Ventilating and Air Conditioning (HVAC) system. Transient and electrical cabinet fires that can fail MCR ventilation and force MCR abandonment due to habitability are addressed and analyzed in the MCR Analysis NEDC 10-001.

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* [to] *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>

a. In the analysis for the LAR submittal, only the value of 0.1 was used for MCR abandonment fire scenarios. The MCR abandonment CCDP/CLERP of 0.1 was characterized by incorporating both the HEP for shutdown from outside the MCR and system/train failures into the CCDP/CLERP. The MCR abandonment value for CLERP was taken to be equal to the MCR abandonment value for CCDP.

b. In response to this RAI, the MCR abandonment analysis was revisited. The re-analysis for MCR abandonment addresses human and equipment performance in lieu of the screening approach presented in the LAR. The same procedure is used for all fires leading to MCR abandonment; whether abandonment was due to loss of command and control or loss of MCR habitability. The re-analysis identified actions at the primary control station (PCS), local actions (actions away from the PCS), and equipment reliability/availability.

The ASD procedure uses Reactor Pressure Vessel (RPV) injection with High Pressure Coolant Injection (HPCI) as the preferred safe shutdown path with Residual Heat Removal (RHR) pump D in Suppression Pool Cooling (SPC). Should HPCI injection fail, RHR pump D is available for Low Pressure Coolant Injection (LPCI) injection providing the RPV is depressurized. A MCR abandonment tree was developed for ASD as shown in Figure 1 below.

The ASD HEPs for all actions, both at the PCS and away from the PCS, were developed using the Human Reliability Analysis (HRA) Calculator and the methods in NUREG-1921. HEPs for MCR abandonment scenario actions are provided in Table 1 below. Equipment reliability/availability was determined for ASD systems and is provided in Table 2 below. The incorporation of ASD human actions and equipment performance into the model resulted in a MCR abandonment CCDP of approximately 0.108 as shown in the MCR abandonment tree (Figure 1). MCR abandonment CLERP was again taken to be the same as CCDP.

i. For some MCR abandonment scenarios, fire-induced spurious actuations can affect the preferred safe shutdown path. MCR abandonment procedures are in place to mitigate the impact of these potential spurious operations; for example, by removing power from Safety Relief Valves (SRVs) to prevent spurious opening leading to depressurization and the loss of HPCI, the preferred high pressure injection source. In addition, the conditional probability of spurious actuations is small compared to the overall system failure probabilities.

ii. Fire-induced recoverable failures can affect the preferred safe shutdown path for some MCR abandonment scenarios. MCR abandonment procedures provide recovery actions to restore the preferred safe shutdown path. These actions are included in the MCR abandonment model. Recovery Actions, such as local operation of HPCI valves or diesel generator alignment, are modeled independently from actions taken at the PCS. The MCR abandonment model was constructed so that RAs must be successful for the system to perform its function. If the RAs fail, the system is immediately considered failed.

iii. Fire-induced spurious operations of equipment unrelated to the preferred safe shutdown path, but that might have a detrimental impact on the safe shutdown path, are addressed by the MCR abandonment procedure and are removed from service as necessary. Should operators fail to perform actions to mitigate detrimental impacts, and remote shutdown is not successful, the fire scenario results in core damage.

c. In the initial LAR submittal, no values other than 0.1 were used for MCR abandonment scenarios. In the revised MCR abandonment model, other values for the MCR abandonment HEPs were used. Please refer to the discussion in b.(i), (ii), and (iii) above.

d. Consistent with FAQ 07-0030 and FAQ 08-0054, in the MCR abandonment re-analysis, the base case identified actions performed at the PCS and actions performed locally.

HEPs were developed for each of the actions. Those actions performed away from the PCS were considered RAs. For the compliant case, human factors evaluations (HFEs) performed at the PCS retained the same HEPs as in the base case. However, the HEPs for RAs performed away from the PCS were set to success, i.e., failure probability of 0. This is addressed in the response to PRA RAI 40.

Table 1: Main Control Room Abandonment Human Failure Events

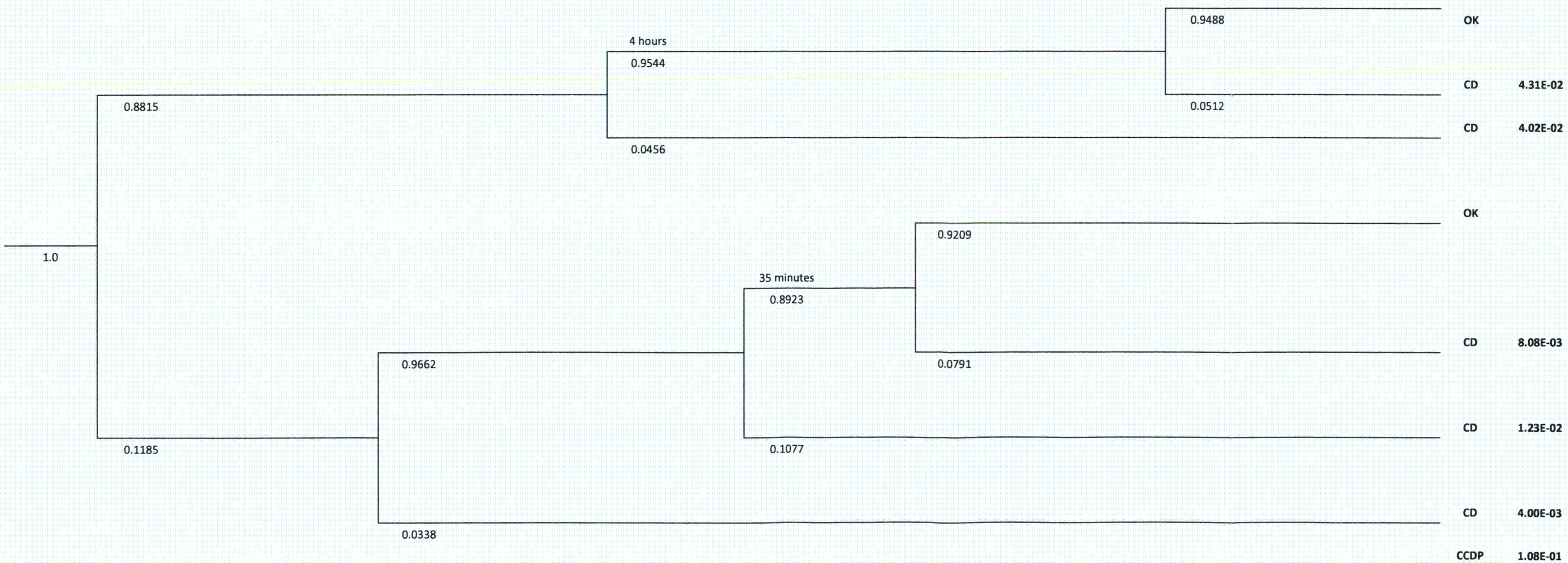
Recovery Actions	HFE Name	HFE Description	HEP	Error Factor
	ADS-XHE-FI-SORV-ASD	OPERATOR FAILURE TO DEPRESSURIZE WITH SRVs FROM ASD	3.30E-02	5
RA	EAC-XHE-FI-DG2BUS1G-HPCI	OPERATOR FAILS TO START DG2 FROM DG2 ROOM & ALIGN TO BUS 1G FOR HPCI	3.20E-03	5
RA	EAC-XHE-FI-DG2BUS1G-RHR	OPERATOR FAILS TO START DG2 FROM DG2 ROOM & ALIGN TO BUS 1G FOR LPCI	6.80E-02	5
	ECS-XHE-FI-TRANS-ASD	OP FAILS TO MANUALLY INITIATE LPCI FROM ASD	1.30E-02	5
RA	ECS-XHE-FI-TRANS-ASD-SUPPORT	OPERATOR SUPPORTS LPCI INITIATION AWAY FROM ASD	4.60E-02	5
	HCI-XHE-FI-HPCIASD	OPERATOR FAILS TO START AND OPERATE HPCI FROM ASD AFTER MCR ABANDONMENT	5.10E-02	5
RA	HCI-XHE-FI-HPCIASDSUPPORT	OPERATOR FAILS TO SUPPORT ACTIONS FOR HPCI AWAY FROM ASD	2.20E-02	5
	RHR-XHE-FI-RHRASD	OPERATOR FAILS TO INITIATE SUPPRESSION POOL COOLING AFTER MCR ABANDONMENT	9.30E-04	10
RA	RHR-XHE-FI-RHRASDSUPPORT	OPERATOR FAILS TO SUPPORT SUPPRESSION POOL COOLING INITIATION AWAY FROM ASD	1.50E-03	5

Table 2: ASD Equipment Failure Probability Results

HPCI Failure Probability	SRV Failure Probability	Bus 1G Failure Probability	RHR in LPCI Mode Failure Probability	RHR in SPC Mode Failure Probability
5.02E-02	7.87E-04	4.26E-02	2.20E-02	4.89E-02

Figure 1: Main Control Room Abandonment Tree

Fire Event Leading to MCR Abandonment	HPCI			RPV Depressurization			Bus 1G Powered by EDG 2				RHR Pump D in LPCI Mode			RHR Pump D in SPC Mode			CLASS	Prob
	HPCI Failure Probability	HPCI HFE (PCS)	HPCI HFE (RA)	SRV Failure Probability	RPV Depress (PCS)	RPV Depress (RA)	Bus 1G w/ EDG Failure Probability	Bus 1G w/DG2 HFE (PCS)	Bus 1G w/DG2 HFE (RA)		RHR D LPCI Failure Probability	LPCI HFE (PCS)	LPCI HFE (RA)	SPC Failure Probability	SPC HFE (PCS)	SPC HFE (RA)		
	Top-U1	HCI-XHE-FI-HPCIASD	HCI-XHE-FI-HPCIASDSUPPORT	Top-X1	ADS-XHE-FI-SORV-ASD	NA	EAC-1G-000	NA	EAC-XHE-FI-DG2BUS1G-HPCI (4 hours)	EAC-XHE-FI-DG2BUS1G-RHR (35 minutes)	Top-V3	ECS-XHE-FI-TRANS-ASD	ECS-XHE-FI-TRANS-ASD-SUPPORT	SPC-TRNB-013	RHR-XHE-FI-RHRASD	RHR-XHE-FI-RHRASDSUPPORT		
	5.02E-02	5.10E-02	2.20E-02	7.87E-04	3.30E-02	NA	4.26E-02	NA	3.20E-03	6.80E-02	2.20E-02	1.30E-02	4.60E-02	4.89E-02	9.30E-04	1.50E-03		



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

PRA RAI 16.01 was addressed in the 30-day response.

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.*

NPPD Response

a. The VFDRs RBA-02 and RBA-03 do consider cable damage to M923 separately, however the FRE for fire area RB-A also includes a VFDR RBA-ALL case. The ALL case combines all the fire area RB-A VFDRs into a single composite VFDR to address any interdependencies and synergisms. Therefore, composite VFDR RBA-ALL accounts for the cable failure in both RBA-02 (air-operated valve securing flow to Service Water through the credited Reactor Equipment Cooling system heat exchanger) and RBA-03 (motor-operated valve securing flow to Service Water through the credited RHR heat exchanger).

b. In addition to fire area RB-A, fire areas RB-FN, RB-CF, and RB-M each include instances where multiple VFDRs, within each respective fire area, are impacted by the same cable failure but not all equipment is included in each VFDR. However, similar to fire area RB-A, each fire area includes a composite VFDR designated as XXX-ALL. The composite ALL case for each fire area consolidates all of the VFDRs for that fire area into a single composite VFDR. The delta risk values reported in LAR Attachment W, Table W-2, are based upon the composite VFDR XXX-ALL case for each fire area.

c. There are no changes to the LAR results based on the evaluation performed for parts a and b above.

d. The method for calculating both change in risk and the additional risk of RAs followed the guidance provided in both FAQ 08-0054 (see LAR, Section 4.2.4) and FAQ 07-0030 (see LAR, Section 4.2.1.3 and Att. G).

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.*

NPPD Response

PRA RAI 19.01 was addressed in the 30-day response.

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

PRA RAI 24.01 was addressed in the 30-day response.

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

PRA RAI 27.01 was addressed in the 30-day response.

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

PRA RAI 29.01 was addressed in the 30-day response.

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.)*

NPPD Response

a. The recovery of SW-MOV-MO89B was included in the pre-NFPA 805 plant FPRA model as part of the VFDR RBM-07. The original risk was of the magnitude of 1E-06 and was based on combining 4 VFDRs (RBM-2678). Sensitivities were performed for fire area RB-M, focusing specifically on VFDRs RBM-6 and RBM-7 which include SW-MOV-MO89B. These sensitivities were developed for the post-NFPA 805 plant configuration after implementation of the proposed plant modifications and procedural changes. As documented in the Delta Risk Calculation (NEDC 11-108 Attachment C, Section C.2), the sensitivity was performed by setting all of the RBM-6 and RBM-7 HFEs to guaranteed failure (1.0 failure probability). The Delta CDF and Delta LERF for this sensitivity were 2.16E-09 and 1.25E-09, respectively. Due to the low risk, it was determined that the RA SW-MOV-MO89B was no longer required in Area RB-M. The RA for SW-MOV-MO89B was not credited in Area RB-M in the post-NFPA 805 FPRA model and does not need to be included in Table G-1.

b. VFDRs RBK-04 and TBA-05 are similar to RBM-07 from part a, except that modifications will be made as documented in LAR Attachment S, Table S-2 (S-2.1 and S-2.2). These modifications result in EAC-XHE-FI-SWEDG1 and SWS-XHE-FI-SWPACOMA no longer being RAs. Therefore, the RAs were not included in the LAR Attachment G, Table G-1.

c. The LAR, Attachment G, Table G-1, as supplemented by the response for SSD RAI-09, was the complete listing of RAs at the time of submittal. However, there have been changes to this attachment due to modifications and proposed procedural changes in the plant that have created potential new RAs. The risk quantifications resulting from the response to PRA RAI 40 that will determine the risk of these actions has not yet been completed. Accordingly, an updated Table G-1 will be provided in a future submittal, in a time frame mutually agreed to by NPPD and the NRC Staff.

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

PRA RAI 36 was addressed in the 30-day response.

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.*

NPPD Response

PRA RAI 37 was addressed in the 30-day response.

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

Reactor Building Quads

HVAC for the FPRA was developed from the modeling used for the internal events PRA (IEPRA). Heat up calculations were performed for the IEPRA for loss of room cooling equipment over a 24 hour period. In addition, an equipment evaluation was performed that assessed potential high temperature limits.

Although the IEPRA heat up calculations do not account for the additional heat load from fires, the conclusions drawn from these calculations can be considered applicable to the FPRA. The heat up calculations were based on bounding scenarios with all equipment operating and in the case of the northeast quad also included the contribution from Reactor Core Isolation Cooling system gland seal leakage. Evaluations were performed using the equipment qualification temperatures and test temperatures and comparing these to the temperature rise determined by the heat up calculations. These evaluations showed that there was significant margin between the maximum calculated temperatures and the qualification and test temperatures.

The Reactor Building Quads have high ceilings, covering multiple elevations, which would preclude equipment failures due to fire heat loads from the fire scenarios that do not result in hot gas layer failures of the entire fire zone. These higher elevations allow hot gases and smoke to flow upward and away from the equipment, which would generally be located closer to the floor. Even for fire areas that are not conducive to these natural buoyant flows, the conditions under which a fire has the potential to fail additional equipment indirectly due to room temperature is limited.

While no additional analyses were performed to confirm that heat loads from fires do not fail additional equipment in rooms that do not credit HVAC, the success criteria for the IEPRA for HVAC remains valid.

In addition, the short term contribution from a fire would be dissipated by manual firefighting activities such as opening doors and use of hose stations. These actions would limit both the additional heat contribution and the duration of the exposure that is not included in the room heat up analyses.

Other areas

HVAC for the FPRA was developed from the modeling used for the IEPRA. Heat up calculations were performed for the IEPRA for loss of room cooling equipment over a 24 hour period. In addition, an equipment evaluation was performed that assessed potential high temperature limits. Although the analysis does not account for the additional heat load from fires, the conclusions drawn can be considered applicable to the FPRA.

The heat up calculations were based on bounding scenarios with all equipment operating. The short term contribution from a fire would be dissipated by manual firefighting activities such as opening doors and use of hose stations. These actions would limit both the additional heat contribution and the duration of the exposure; the impact of which is not included in the room heat up analyses.

The failure of credited equipment within a fire zone is dominated by the fire-induced (zone of influence) target failures. The Critical Switchgear 1F and 1G Rooms and the DC Switchgear 1A and 1B Rooms do not contain any secondary combustibles (cable trays). Therefore, the fire scenarios in these rooms would have fire durations of an hour or less. This hour fire duration is based on transient fires and electrical panels with a maximum spread to the two adjacent vertical sections. Although there is a potential for some of the fire scenarios to increase the gas layer temperature in the rooms to values slightly above the high temperature limits identified in the IEPRA heat up calculations, these elevated temperatures only last for a limited amount of time (i.e., 10 – 15 minutes). The equipment credited for operation that is not failed directly by the fire is only exposed to these slightly elevated temperatures for a short duration and the IEPRA HVAC considerations adequately address HVAC dependencies due to the short duration of the fires and the limited impact on long term temperatures in adjacent areas.

When HVAC was impacted due to a fire in an adjacent zone, the loss of cooling was evaluated via room equipment heat up calculations (maximum predicted temperature at 24 hours) and detailed computer fire modeling (CFAST) was used to determine the impact of fires in adjacent zones. The results of the room heat up calculations and the fire modeling are presented in the Fire Risk Evaluations for each applicable fire area.

In conclusion, the use of the internal events room heat up analyses is a viable means of determining the requirements for room cooling for the fire PRA.

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

PRA RAI 39 was addressed in the 30-day response.

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).

Unacceptable methods and weaknesses:

- *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.

Methods and weaknesses still under review:

- *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>

a. To demonstrate the integrated impact to CDF, LERF, ΔCDF, and ΔLERF, a composite fire PRA model was quantified (See Supplement 1 below). This analysis (a one-at-a-time analysis) was conducted and the potential for any synergistic impacts addressed conservatively. This model incorporated the items shown in Table 1 below.

   The FPRA composite model CDF is 6.07E-5 per year and LERF is 1.26E-5 per year. ΔCDF and ΔLERF are -6.94E-6/year and -1.25E-5/year respectively. Thus the conclusions reached in the LAR have not changed. As noted in Supplement 2, considerable conservatism remains in these values.

   The RG 1.205 risk acceptance guidelines were satisfied for the composite model. The total change in risk is consistent with the acceptance guidelines in RG 1.174. Note that the total change in risk for the composite model was negative. No new modifications or operator actions were credited in the development or quantification of the composite model, other than in TB-A (see response to PRA RAI 36).

b. No unacceptable methods will be retained in the reconciled model if there is any significance to results, conclusions and use. Each of the bullets listed under "Unacceptable methods and weaknesses" has been addressed (Please see Table 1.)

Table 1: Elements Incorporated into Composite Fire PRA Model

Parameter in PRA RAI 40	RAI 1st Round Sensitivity Performed	Included PRA RAI 40 Composite Model	PRA RAI 40 Bullets	Notes
Transient fire influence factors (LAR Supplement dated July 12, 2012)		Y	1st set, 1st bullet	LIC-109 Response Comment 3
Treatment of kerite cables (PRA RAI-02b)	Y	Y	1st set, 2nd bullet	
Addition of Fire Area DW (PRA RAI-32)	See note	Y	1st set, 3rd bullet	Fire Area DW (Drywell) has always been included in the fire PRA model. DW contains no VFDRs. DW has no impact on delta risk. PRA RAI-32 added entry for DW to Table W-2. No computations or changes to model were made.
Corrections associated with Fire Area TB-A (PRA RAI-36)	Y	Y	1st set, 4th bullet	See response to RAI-15
Corrections associated with Fire Area RB-FN (PRA RAI-16e)	Y	Y	1st set, 5th bullet	
Credit for control power transformers (PRA RAI-15)	Y	Y	1st set, 6th bullet	Credit for control power transformers in determining likelihood of spurious operations removed from model.
Changes to the recovery actions (PRA RAI-34)	See note	N	1st set, 7th bullet	Not necessary. No impact
Use of probabilities less than 1E-5 as the floor HEP screening value (PRA-02-01)		N	2nd set, 1st bullet	Not necessary. See response to PRA RAI 02.o.01
Credit for minimum instrumentation after loss of RPV level instrumentation (PRA RAI 02c-01)		N	2nd set, 2nd bullet	Not necessary. See response to PRA RAI 02.c.01
Estimate of CCDPs including vented cable run atop the MCBs (PRA RAI 02f(i)-01)		Partially	2nd set, 3rd bullet	Insignificant to CDF/LERF and bounded by Supplement 2 approach to assessing delta CDF/LERF. Will be included in final model.
Use of less than 317KW for transient fires (PRA RAI 04-01)		N	2nd set, 4th bullet	Not necessary. See response to PRA RAI 04.01
Estimate of HEP/CCDPs following MCR abandonment (PRA RAI 03.01, 11.01, 14.01)		Y	2nd set, 5th bullet	See Supplement 2

Parameter in PRA RAI 40	RAI 1st Round Sensitivity Performed	Included PRA RAI 40 Composite Model	PRA RAI 40 Bullets	Notes
MCR Transients (PRA RAI-11)	Y	Partially	NA	PRA RAI-11 was not explicitly included in the PRA RAI 40 request; however, MCR transients were considered in composite model and are insignificant to CDF/LERF and bounded by Supplement 2 approach to assessing delta CDF/LERF. Will be included in final model.

Per the response to PRA RAI 19.01 a., Implementation Item S-3.30 addresses potential changes as follows:

> 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 RG 1.205 acceptance criteria are met.

Supplement 1 to Response to PRA RAI 40 (Composite Assessment)

An assessment has been completed. The assessment considered each item as discussed below.

1. CDF/LERF and delta CDF/LERF included in Attachment W of the CNS LAR are as follows:

    a. CDF = 5.07E-5/year
    b. LERF = 1.05E-5/year
    c. Delta CDF = -8.71E-6/year
    d. Delta LERF = -1.29E-5/year

2. Transient Influence factors (based on the sensitivity evaluation previously conducted and provided in the LAR supplement dated July 12, 2012) have the following impact:

    a. CDF/LERF increases by 2.54E-6/year and 1.51E-6/year respectively
    b. Delta CDF/LERF increases by 6.10E-8/year and 1.1E-8/year, respectively

3. Kerite (PRA RAI-02b Response)

    a. CDF/LERF increases by about 4%/7%, respectively
    b. Delta CDF/LERF not assessed as will affect compliant and post-NFPA cases comparably; for conservatism assumed the total increase is applied to delta risk
    c. CDF increase is (5.07E-5/year + 2.54E-6) * .04 = 2.13E-6/year
    d. LERF increase is (1.05E-5/year + 1.51E-6/year) * .07 = 8.41E-7/year
    e. Delta CDF increase is 2.13E-6/year
    f. Delta LERF increase is 8.41E-7/year

4. DW (PRA RAI-32)

    a. CDF/LERF is about 1.27E-7/year and 1.27E-7/year, respectively, so the CDF/LERF is increased by these values
    b. No VFDRs so no delta risk

5. TB-A (PRA RAI-36)

    a. CDF decreased by 2.8E-6/year (4.8E-5 minus (5.07E-5 + 1.27E-7))
    b. LERF decreased by 1.9E-6/year (8.7E-6 minus (1.05E-5 + 1.27E-7))
    c. Delta CDF decreased by 3.3E-6/year (-1.2E-5 minus (-8.71E-6))
    d. Delta LERF decreased by 2.1E-6/year (-1.5E-5 minus (-1.29E-5))

6. RB-FN (PRA RAI-16e)

    a. CDF/LERF decreased 1E-8/year and 1E-10/year, respectively
    b. Delta CDF/LERF increased by 2.8E-7/year (1.59E-7 + 1.24E-7) and 5.8E-9/year (5.08E-9 + 7.03E-10), respectively

7. CPTs (PRA RAI-15)

    a. CDF and LERF increased by 7E-6/year and 5E-7/year, respectively
    b. Delta CDF/LERF increased 1E-6/year and 0, respectively

8. Recovery Actions (PRA RAI-34): No changes

9. MCR Abandonment Refined HEPs (RAI 14.01) Please see Supplement 2 which documents the following conservative analysis:

    a. Less than a 10% change in CDF and LERF so a net increase of about 1E-6/year for each
    b. Delta CDF/LERF increase of 1.6E-6/year

10. CDF and LERF are estimated as follows:

    a. Total calculated CDF increases by 2.54E-6/year + 2.13E-6/year + 1.27E-7/year - 2.8E-6/year - 1E-8/year + 7E-6/year + 1E-6/year = 1.0E-5/year, and thus yielding a calculated CDF of 6.07E-5/year.
    b. Total calculated LERF increases by 1.51E-6/year + 8.41E-7/year + 1.27E-7/year - 1.96E-6/year - 1E-10/year + 5E-7/year + 1E-6/year = 2.08E-6/year, and thus yielding a calculated LERF of 1.26E-5/year.

11. Delta CDF and Delta LERF are estimated as follows:

    a. Delta CDF = -8.71E-6/year + 6.1E-8/year + 2.13E-6/year + 0 - 3.3E-6/year + 2.8E-7/year + 1E-6/year + 1.6E-6/year = -6.94E-6/year, and thus delta CDF is still negative
    b. Delta LERF = -1.29E-5/year + 1.1E-8/year + 8.41E-7/year + 0 - 2.1E-6/year + 5.8E-9/year + 0 + 1.6E-6/year = -1.25E-5/year, and thus delta LERF is still negative

Supplement 2 to Response to PRA RAI 40 (MCR Abandonment)

The response to PRA RAI 14.01 developed CCDP and CLERP using a detailed analysis including RAs and equipment availability and reliability. As noted in the response to PRA RAI 14.01 to develop the delta risk the recovery actions will be assumed to have an HEP of zero for the compliant case. This bounds the delta risk. The calculation is provided below as follows:

- First, the top event probabilities are recalculated assuming the HEPs for recovery actions are zero
- Second, each core damage sequence is recalculated to develop a CCDP/CLERP
- Third, the CCDPs/CLERPs for each sequence are summed to develop a total CCDP/CLERP
- Finally, the impact on delta risk is developed using a bounding approach

Note: several significant digits are used simply to illustrate the math.

1. Top Event Probabilities with RA HEPs Set to Zero

    <u>HPCI</u>
    Failure probability = .0502 + .9498 * .0510 = .0986 compared to the base case value of .1185
    Success probability = .9014 compared to a base case value of .8815

    <u>RPV Depressurization</u>
    Failure probability = .000787 + .999213 * .033 = .0338 compared to a base case of 0.0338
    Success probability = .9662

<u>Bus 1G Powered from EDG2 (4 hours available)</u>
Failure probability = .0426 compared to a base case of .0456
Success probability = .9574

<u>Bus 1G Powered from EDG2 (35 minutes available)</u>
Failure probability = .0426 compared to a base case of .1077
Success probability = .9574

<u>RHR Pump D in LPCI Mode</u>
Failure probability = .022 + .978 * .013 = .0347 compared to a base case of .0791
Success probability = .9653

<u>RHR Pump D in SPC Mode</u>
Failure probability = .0489 + .9511 * .00093 = .0498 compared to a base case of .0512

2. CCDP/CLERP Sequence Calculations

CD Sequence 1 = .9014 * .9574 * .0498 = .0430
CD Sequence 2 = .9014 * .0426 = .0384
CD Sequence 3 = .0986 * .9662 * .9574 * .0347 = .0032
CD Sequence 4 = .0986 * .9662 * .0426 = .0041
CD Sequence 5 = .0986 * .0338 = .0033

3. Summation

The total CCDP/CLERP is .0919. This compares to a base case of .108. These are effectively the same value as judging the uncertainty in such calculations. RAs are not significant.

4. Delta Risk

Using a bounding approach the delta risk increase is developed as follows:

- A bounding MCR abandonment frequency of 1E-4/year is used
- The change in CCDP/CLERP = .016. Therefore the delta CDF/LERF is 1.6E-6/year.

There remains considerable conservatism in this estimate as follows:

- Conditional LERP given core damage is assumed to be 1.0
- Per the response to PRA RAI 03:

> In reviewing the latching mechanism for cabinets that VEWFDS is being installed, it was noted that the Relay Panels 9-32 and 9-33 latch at the top and bottom, but not at the center handle and may not meet the criteria of a "robustly secured" cabinet per Frequently Asked Question (FAQ) 08-0042. Based on the risk significance of these panels, NPPD has decided to

modify the panel doors to include additional mechanical latching around the perimeter of the panel doors, which will ensure that the doors are fully and mechanically secured, and will not create openings or gaps due to warping during an internal fire, in accordance with FAQ 08-0042. There are five (5) additional relay panels 9-30, 9-39, 9-41, 9-42, and 9-45 located in the Auxiliary Relay Room that are of similar latch construction. Therefore, NPPD is modifying these five relay panels similar to the modification identified for the 9-32 and 9-33 panels (see Attachment 2, Change 2).

Accordingly, per the response to PRA RAI 03, NPPD will robustly secure several cabinets which will reduce the potential for MCR abandonment. These cabinets do not need to be sealed to achieve a compliant configuration. The delta risk reduction associated with this commitment is not included.

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 of the LAR, as revised. (NLS2012006-01 Rev. 2)		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 of the LAR, as revised. (NLS2013104-01)	X		May 31, 2017