

Burkhardt, Janet

From: Wilkins, Lynnea
Sent: Wednesday, August 14, 2013 9:31 AM
To: LIPPY, DONNA L (dllippy@oppd.com)
Cc: Sebrosky, Joseph; EDWARDS, MICHAEL L (medwards@oppd.com); HANSHER, BILL R (bhansher@oppd.com); Burkhardt, Janet
Subject: Fort Calhoun NFPA 805, Third Round, Second Part, of RAIs (ME7244)

Donna,

By letter dated September 28, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML112760660), as supplemented by letters dated December 19 and 22, 2011, and March 20, 2012 (ADAMS Accession Nos. ML113540334, ML11363A077, and ML12083A147, respectively), Omaha Public Power District, (the Licensee), submitted a license amendment request (LAR) to transition their fire protection licensing basis at the Fort Calhoun Station, Unit 1, from Title 10 of the Code of Federal Regulations (CFR), Section 50.48(b), to 10CFR50.48(c), National Fire Protection Association Standard NFPA 805 (NFPA 805). A review team, consisting of U.S. Nuclear Regulatory Commission (NRC) staff and contractors from Pacific Northwest National Laboratory (PNNL) and the Center for Nuclear Waste Regulatory Analyses (CNWRA) participated in a regulatory audit of Fort Calhoun in Blair, NE from March 5 -9, 2012. By letter dated April 26, 2012, (ADAMS Accession No. ML12198A406) the NRC issued requests for additional information (RAIs). By letters dated July 24, 2012 (ADAMS Accession No. ML12208A131), August 24, 2012 (ADAMS Accession No. ML12240A151), and September 27, 2012 (ADAMS Accession No. ML12276A046) the licensee provided responses to the RAIs. The NRC staff reviewed the information provided by the licensee in response to the first set of RAIs and determined that additional information was needed for the staff to complete its evaluation. Consequently, the staff issued a second round of RAIs on February 22, 2013, (ADAMS Accession No. ML13053A226) and a third round of RAIs on June 27, 2013 (ADAMS Accession No. ML13178A035). The licensee responded to these RAIs in letters dated April 23, 2013 (ADAMS Accession No. ML13116A015), May 21, 2013 (ADAMS Accession No. ML13144A814), and July 29, 2013 (ADAMS Accession No. ML13211A055).

The U.S. NRC staff has reviewed the information provided in your application and determined that additional information is required in order to complete its review. These RAIs can be found below. The NRC considers these RAIs to be the second set of the third round of RAIs. Based on discussions with you on August 13, 2013, it was agreed that a response to the RAIs found below will be provided in accordance with the following schedule:

- Safe Shutdown Analysis (SSA) RAI response to be provided by September 13, 2013
- PRA RAIs 01.i.02, 01.j.02, 01.j.03, 23.01, and 27 responses to be provided by October 7, 2013
- PRA RAIs 07.02, 19.01, 24, 25, and 26 responses to be provided by November 6, 2013.

In addition, as discussed with you during the August 13, 2013, phone call the staff has determined that you no longer need to provide a response to SSA RAI 07.01 that was issued to you on June 27, 2013 (ADAMS Accession No. ML13178A035). The staff determined that SSA RAI 07.01 response is not needed in order for the staff to complete its safety evaluation. The staff also discussed with you during the August 13, 2013, phone call that the response to PRA RAI 24 should include two additional sensitivity studies as a result of issues that were raised during a July 22 through July 24, inspection at your site.

Should the NRC determine that the RAIs found below are no longer necessary prior to the dates found above, the request will be withdrawn. If circumstances result in the need to revise the requested response date, please contact me or Joe Sebrosky.

REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST TO ADOPT
NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805
PERFORMANCE-BASED STANDARD FOR FIRE PROTECTION FOR LIGHT WATER REACTOR
GENERATING PLANTS
FORT CALHOUN STATION, UNIT 1
(TAC NO. ME7244)

SSA RAI 17.01

License Amendment Request, Attachment S, Table S-2, "Plant Modifications Committed," Item REC-117, states:

"Modification to change the normal operating alignment for 480 V load center tie breakers BT-1B4A, BT-1B3B, and BT-1B4C from normally open and racked-in, to normally racked-out (or otherwise disabled from spuriously closing due to fire damage to DC breaker control circuits in the opposite Train 4kV switchgear room, main control room, or cable spreading room). This modification addresses the issue associated with electrical failure resulting from spurious connection of out-of-synch power sources (offsite power to diesel generator, diesel generator to diesel generator)."

It is further stated that: "The proposed modification will maintain breaker manual trip capability from main control room, protective trip, automatic load shed trip and accident signal trip for fire areas 36A, 36B, 41 and 42."

According to NRC Special Inspection Report dated March 12, 2012 (ADAMS Accession No. ML12072A128), there are interconnecting control wires (operated at 125 V DC) between 480V tie breakers in Electrical Switchgear Fire Areas 36A (East Switchgear) and 36B (West Switchgear) (typical - between breakers BT-1B3A and BT-1B4A). These wires are used in the control circuitry of the breakers. A fire in these breakers in either Switchgear Fire Area 36A or 36B can cause damage to the control wires (such as shorts to ground) in the opposite area breakers.

During a recent inspection conducted from July 22, 2013 to July 24, 2013, Office of Nuclear Reactor Regulation (NRR) reviewers questioned the plant technical staff about the potential negative impact of performing the design change (modification) to rack out the normally open cross-tie breakers on the 480VAC switchgear. Discussions with plant staff indicate that a contingency plan exists to modify the control circuit to preclude spurious closure should the modification to rack out the breaker be deemed impractical.

By letter dated September 18, 2011, the licensee stated, "... (or otherwise disabled from spuriously closing due to fire damage to the DC breaker control circuits in the opposite train 4kV switchgear room...)." The committed modification is not specified in sufficient detail for the NRC staff to determine its acceptability due to the open-ended parenthetical. Please provide a written description of the specific modification that will be implemented as part of the NFPA 805 transition as well as conceptual circuit design sketches indicating the existing portions of the circuit as well as those parts being added/modified.

Probabilistic Risk Assessment (PRA) RAI 01.i.02

By letter dated April 23, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13116A015) the licensee responded to RAI 01.i.01.b and stated that the change in risk reported from the sensitivity study on increased ignition frequencies resulted in lower (not the expected higher) change in risk values because new credit for human actions in alternative shutdown process (in abnormal operating procedure (AOP) 06) was simultaneously added into the PRA. No acceptable approach for the human reliability analysis (HRA) for abandonment due to loss of control has been developed and thus no technical basis for this new credit exists, (i.e., for the human error probability/conditional core damage probability (HEP/CCDP) for abandoning the main control room (MCR) due to loss of control. No description or justification for the HRA method was provided. Please provide the results of the requested sensitivity study on ignition frequencies by removing the credit of the new operator action.

Please clarify whether credit will be retained in the PRA for abandonment of the MCR on loss of control for fires in the cable spreading room (CSR), and, if so, describe and justify the HRA methods applied and their relation to current HRA methods. Currently, these actions are listed as being retained as defense-in-depth (DID) actions in FC41 per license amendment request (LAR) Attachment G (ADAMS Accession No. ML11376A072, non-publicly available) and not credited in the PRA. Update the information as necessary.

PRA RAI 01.j.02

By letter dated May 21, 2013 (ADAMS Accession No. ML13144A814), the licensee responded to RAI 01.j.01.a.iv and provided a HEP of 1.50E-02 and CCDP/conditional large early release probability (CLERP) of 1.41E-01 for abandoning the MCR due to loss of habitability with no explanation of how these values were developed.

- a. Please provide a summary of how the HEP of 1.50E-02 was developed. The discussion should include whether each of the performance shaping factors identified in Section 4.6 of NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines," and if each of the large number of MCR abandonment recovery actions (RAs) identified in LAR Attachment G were addressed in the detailed HRA.
- b. In light of the large number of primary control station (PCS) activities and RAs identified in LAR Attachment G, identify the actions that are the significant contributors to the HEP and discuss their timing and complexity. Also discuss the timing and complexity of the non-significant actions.

PRA RAI 01.j.03

By letter dated May 21, 2013 (ADAMS Accession No. ML13144A814), the licensee responded to RAI 01.j.01.a.iv and indicated that the sensitivity analysis results reflect a change in the optical density criterion for abandoning the MCR due to loss of habitability from 0.3 m⁻¹ to 3.0 m⁻¹. Please clarify if the resultant abandonment time/probability bounds the NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," Section 11.5.2.11, heat flux criterion of 1 kW/m² at 6' above the floor, corresponding to a smoke layer temperature of 95°C. If not, provide a sensitivity analysis of core damage frequency/large early release frequency (CDF/LERF), delta (Δ) CDF and Δ LERF from using the abandonment time/probability based on the heat flux criterion.

PRA RAI 07.02

By letter dated May 21, 2013 (ADAMS Accession No. ML13144A814), the licensee responded to PRA RAI 07.01.d, and proposed an administrative limit to require a continuous fire watch when transient combustibles with the potential to damage targets are stored in the CSR, FC41. However, the process to determine when transient combustibles can cause damage, and thus require a continuous fire watch, was not explained. The response did imply that a permitting process already exists to establish when transient combustibles might damage targets. Please describe the permitting process and indicate how this process provides confidence that no targets would be damaged by a transient fire.

The response also indicated that this new proposed administrative limit is already modeled in the fire PRA (FPRA). Describe how the existing PRA captures this new proposed administrative limit. Specifically indicate if the severity factor applied in the analysis encompasses those heat release rates (HRRs) from transient combustibles which can cause damage, yet are less than the 5 pound combustible limit originally employed in FC41.

PRA RAI 19.01

By letter dated April 23, 2013 (ADAMS Accession No. ML13116A015) the licensee responded to PRA RAI 19 and stated that high concentrations of conduits were considered when identifying pinch points. However, the highest concentration of cables is not necessarily correlated with the locations with high CCDP which may have fewer cables. Please describe the criteria used to identify high concentrations of conduits and justify how implementation of this criteria ensures that pinch points are identified.

PRA RAI 23.01

By letter dated April 23, 2013 (ADAMS Accession No. ML13116A015) the licensee responded to PRA RAI 23 and described plans to upgrade the fire HRA to NUREG-1921 during the National Fire Protection Association Standard 805 "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants", 2001 Edition, (NFPA 805) implementation period, and to notify the NRC and provide a resolution plan if the upgrade causes the risk acceptance guidelines to be exceeded. Propose a regulatory mechanism that provides confidence that this upgrade will be completed. One regulatory mechanism used in NFPA-805 transition are the implementation items in LAR Attachment S, Table S-3. Since this is a PRA upgrade which could have a substantive impact on the PRA, the upgrade and a focused scope peer review should be completed prior to self approval.

PRA RAI 24

Section 2.4.3.3 of NFPA 805 states that the probabilistic safety assessment (PSA) (PSA is also referred to as PRA) approach, methods, and data shall be acceptable to the authority having jurisdiction (AHJ). Section 2.4.4.1 of NFPA-805 states that the change in public health risk from any plant change shall be acceptable to the AHJ. Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," provides quantitative guidelines on CDF and LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plants licensing basis and describes a general framework for determine the acceptability of risk-informed changes.

The responses to the following RAIs provided sensitivity analyses to show the impact on fire risk of the indicated PRA modeling, and this included PRA upgrades to meet Capability Category II (CC-II) requirements:

- LAR Section 4.5.1.2 regarding the use of four methods that are deviations from the guidance in NUREG/CR-6850 and NRC-approved frequently asked questions (FAQs), with a composite sensitivity analysis of these four methods provided in Section W.2 of the LAR. The four methods are 1) generic severity factor/non-suppression probability for electrical cabinets, 2) pump fire frequency apportioning, 3) diesel generator generic severity factor/non-suppression probability, and 4) application of a draft version of FAQ 08-0050, "Manual Non-Suppression Probability," (ADAMS Accession No. ML092190555, closure memo).
- PRA RAI 01.e.01 regarding unavailability of the Halon system.
- PRA RAI 01.h.i, ii, and iii regarding manual suppression for multi-compartment analysis (MCA) with integration of MCA into the risk estimates.
- PRA RAI 01.h.01 regarding inappropriate crediting of gaseous suppression systems in the MCA.
- PRA RAI 01.h.02 regarding time available for manual fire suppression for non-rated fire barriers in the MCA.
- PRA RAI 01.i.02 regarding credit for MCR abandonment on loss of control
- PRA RAI 01.j.01 regarding both MCR abandonment, CCDP and main control board (MCB) fire spread that threatens MCR abandonment. The sensitivity analysis provided in response to RAI 01.j.01

encompassed both of these issues. If the MCR abandonment CCDP is revised in response to RAI 01.j.02, the revised CCDP should be used in response to this RAI.

- PRA RAI 01.j.03 regarding use of optical density criterion for abandonment. If the MCR abandonment probability is revised in response to RAI 01.j.03, the revised probability should be used in response to this RAI.
 - PRA RAI 07.a and b regarding credit for hot work procedural compliance and continuous fire watch of stored combustible material.
 - PRA RAI 07.02 regarding treatment of transient fires in the CSR (FC41). If the treatment of transient fires in FC41 is revised in the response to RAI 07.02, the revised treatment should be used in response to this RAI.
 - PRA RAI 08 regarding credit for Control Power Transformers (CPTs).
 - PRA RAI 15.c regarding component boundary definitions.
 - PRA RAI 15.d regarding state-of knowledge correlations (SOKC) including consideration of correlated fire related factors.
 - PRA RAI 27 on update of fire frequencies with potentially challenging event data.
 - FM RAI 01.a regarding wall and corner effects.
 - FM RAI 01.b regarding non-cable intervening combustibles.
 - FM RAI 01.d.iii regarding use of Beyler's correlation in closed compartments.
 - FM RAI 05.c.i regarding soot yield.
- a. Consistent with the requirement that the change in risk is developed using acceptable methods and meets the acceptance guidelines, provide the results of a composite sensitivity analysis that shows the integrated impact on the fire risk (CDF, LERF, Δ CDF, Δ LERF). The composite sensitivity analysis should utilize the accepted method that was substituted for the proposed method in all the above studies. 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 addition, an additional composite sensitivity analysis that includes only the sensitivity analyses believed appropriate may be provided.
- b. If the acceptance guidelines are exceeded, please provide justification of how RG 1.174 is nevertheless satisfied and, if applicable, a description of any new modifications or operator actions being credited to reduce Δ risk and the associated impacts to the fire protection program (FPP).
- c. Self-approval based on the results of the PRA after transition also requires the use of acceptable methods. For each of the above methods, identify which method is intended to be used in the PRA that will be used to support post-transition change in risk evaluations. Continued use of unacceptable methods will prohibit the staff from completing its review for self approval.

PRA RAI 25

Section 2.4.3.3 of NFPA 805 states that the PSA (PSA is also referred to as PRA) approach, methods, and data shall be acceptable to the AHJ. Section 2.4.4.1 of NFPA-805 states that the change in public health risk from any plant change shall be acceptable to the AHJ. RG 1.174, provides quantitative guidelines on CDF and LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plants licensing basis and describes a general framework for determine the acceptability of risk-informed changes.

The responses to the following RAIs provided sensitivity analyses to show the impact on fire risk of the indicated PRA modeling:

- PRA RAI 01.c.01 regarding analysis of hot work-induced cable fires.
- PRA RAI 01.g.01 regarding cable routing assumptions for cables EB12191G and 7700A-B.
- PRA RAI 02 regarding main feedwater (MFW) pump oil fire severity factors.
- PRA RAI 07.01.c regarding combustible control violations.
- PRA RAI 16.b regarding modeling of the auxiliary feedwater (AFW) pump.
- PRA RAI 21 regarding qualitative screening of MCR heating ventilation and air conditioning (HVAC) scenarios.
- FM RAI 01.d.ii regarding fire modeling of vent opening size.
- FM RAI 01.e regarding fire modeling of open door cabinets with non-qualified cable.
- FM RAI 01.03 regarding inappropriate use of the McCaffrey, Quintiere, Harkleroad (MQH) method.

The responses to the above RAIs indicate that these analyses individually and collectively do not have a potentially significant impact on the Δ risk for the transition based on the results of the individual sensitivity analysis. However, the self-approval guidelines are two orders of magnitude smaller than the transition acceptance guidelines and all future changes to the FPP must be adequately evaluated. For each of the above methods, identify which method is intended to be used in the PRA that will be used to support post-transition change in risk evaluations. Continued use of unacceptable methods will prohibit the staff from completing its review for self approval.

PRA RAI 26

Section 2.4.3.3 of NFPA 805 states that the PSA (PSA is also referred to as PRA) approach, methods, and data shall be acceptable to the AHJ. Section 2.4.4.1 of NFPA-805 states that the change in public health risk from any plant change shall be acceptable to the AHJ. RG 1.174, provides quantitative guidelines on CDF and LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plants licensing basis and describes a general framework for determine the acceptability of risk-informed changes.

With regard to the responses to PRA RAI 01.i (July 24, 2012, ADAMS Accession No. ML12208A131) and PRA RAI 01.i.01.a (April 23, 2013, ADAMS Accession No. ML13116A015), regarding use of fire ignition frequencies from NUREG/CR-6850, Supplement 1, indicate if the acceptance guidelines of RG 1.174 may be exceeded when this sensitivity study is applied to the integrated sensitivity study of PRA RAI 24 (above). If these guidelines may be exceeded, provide a description of fire protection, or related, measures that can be taken to

provide additional DID, as directed in the resolution of FAQ 08-0048, "Revised Fire Ignition Frequencies," (ADAMS Accession No. ML092190457, closure memo).

PRA RAI 27

By letter dated May 21, 2013 (ADAMS Accession No. ML13144A814) the licensee responded to PRA RAI 22 and indicated that no Bayesian Update is necessary for those fires self-identified as potentially challenging. Three past plant events appear to be candidates for input into a Bayesian update. The response indicated that the control room fire is within the range of data considered by EPRI 1019259 (NUREG/CR-6850, Supplement 1, "Fire Probabilistic Risk Assessment Methods Enhancements." However, the control room fire, dated 11/29/1997, is not in the database upon which the frequencies for NUREG/CR-6850 were established. Updating the generic bin 4 MCB frequencies from EPRI 1019259 with this event will make a substantial increase to the bin 4 fire frequency (approximately a factor of 2).

For the transient fire and electrical cabinet events, the update of each generic frequency will increase the frequency. Electrical cabinet fires include all events, at power and not at power. For bin 15.1, the addition of another event over 10 years will also approximately double the fire frequency for that bin. For bin 7, the increase is of a lesser amount, yet an increase will occur in frequency for bin 7 also. Thus, in each case, the plant has experienced more fires than would be expected from the generic industry database.

As a result, please perform a sensitivity study through updating the frequency bins for those events. Provide the impact on CDF/LERF/ Δ CDF/ Δ Delta LERF. More information may also be provided regarding the statement that the plant does not have a particular susceptibility to the fire type, as compared to the industry operating experience, and therefore the generic frequency is applicable.