NRR-PMDAPEm Resource

From: Miller, Ed
Sent: Friday, July 11, 2014 9:07 AM
To: 'Bryant, Julius W (Julius.Bryant@duke-energy.com)'
Subject: Draft RAIs for McGuire NFPA-805 LAR (Fire Protection)
Attachments: McGuire Draft AFPB RAIs TAC Nos MF2934 and MF2935.docx

Julius,
The NRC staff's draft RAI for the subject relief request is attached to this e-mail. The draft RAI is not an official NRC staff request and is being provided to you to facilitate a subsequent conference call to determine: 1) If the questions clearly convey the NRC staff information needs; 2) Whether the regulatory basis for the questions is understood; 3) Whether the information is already available in existing, docketed, correspondence; and 4) To determine an appropriate response time-frame. After you've had a chance to review the draft information request, please contact me to schedule the conference call.

As we discussed on the phone, these are the RAIs for fire protection only. I expect to receive the draft RAIs from the PRA reviewers shortly. I'll provide those via separate correspondence. I intend to consolidate them into one set for the formal RAI letter.

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Hearing Identifier: NRR_PMDA
Email Number: 1421

Mail Envelope Properties (9C2386A0C0BC584684916F7A0482B6CAFD3006895A)

Subject: Draft RAIs for McGuire NFPA-805 LAR (Fire Protection)
Sent Date: 7/11/2014 9:07:03 AM
Received Date: 7/11/2014 9:07:00 AM
From: Miller, Ed

Created By: Ed.Miller@nrc.gov

Recipients:
"'Bryant, Julius W (Julius.Bryant@duke-energy.com)'" <Julius.Bryant@duke-energy.com>
Tracking Status: None

Post Office: HQCLSTR02.nrc.gov

Files	Size	Date & Time
MESSAGE	945	7/11/2014 9:07:00 AM
McGuire Draft AFPB RAIs TAC Nos MF2934 and MF2935.docx	51002	

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:
Recipients Received:

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

DUKE ENERGY CAROLINAS, LLC

MCGUIRE NUCLEAR STATION, UNITS 1 AND 2

DOCKET NO. 50-369, 50-370

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

License Amendment Request (LAR) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13276A126) Attachment A, Section 3.4.1(c) states that fire brigade members are plant operators and "qualifications of individuals in the fire protection organization are administratively controlled to ensure qualification of the individual commensurate with the position being held and activities being performed." National Fire Protection Association (NFPA) Standard 805, “Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants” (NFPA 805), Section 3.4.1(c) requires that the fire brigade leader and at least two brigade members have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria. In Section 1.6.4.1, “Qualifications” of NRC Regulatory Guide (RG) 1.189, “Fire Protection for Nuclear Power Plants”, Revision 2, September 2009, (ADAMS Accession No. ML092580550) the NRC staff has acknowledged the following example for the fire brigade leader as sufficient:

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

Provide additional detail regarding the training provided to the fire brigade leader and members that addresses their ability to assess the effects of fire and fire suppressants on nuclear safety performance criteria.

FPE RAI 02

LAR Attachment A, Section 3.11.5 states that Electrical Raceway Fire Barrier Systems (ERFBS) such as Thermo-Lag, 3M Interam, Hemyc, MT, or Darmatt systems are not utilized for Chapter 4 compliance. However, in LAR Attachment C, Table B-3, Hemyc is cited by engineering evaluations as adequate for the hazard in fire areas 2A (Unit 1 Turbine Driven CA Pump Room), and 3A (Unit 2 Turbine Driven CA Pump Room).

Provide clarification of the use of Hemyc materials. If Hemyc is used in a NFPA 805 compliance basis, then provide a description and location of the credited Hemyc fire barriers used for the Nuclear Safety Capabilities Assessment (NSCA). Provide the basis for credited ratings of the barriers as ERFBS. Identify and briefly describe any proposed plant modifications to barriers using Hemyc or MT. Identify if any compensatory measures are currently in place and the justification for their use, and whether compensatory measures will remain after completion of any proposed plant modifications. If performance-based methods are used, include consideration of safety margin and defense-in-depth (DID) in the evaluations.

FPE RAI 03

LAR Attachment I, Table I-1 "Definition of Power Block" states that structures required to meet the radioactive release criteria described in Section 1.5 of NFPA 805 but not required to meet the nuclear safety criteria are not defined within the power block. Currently, the endorsed guidance of Nuclear Energy Institute (NEI) 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Program Under 10 CFR 50.48(c)," states that, where used in Chapter 3, "power block" and "plant" refers to structures that have equipment required for nuclear plant operations, such as containment, auxiliary building, service building, control building, fuel building, radiological waste, water treatment, turbine building, and intake structure, or structures that are identified in the facility's current license basis. As currently described in the LAR Attachment E, the Rad Waste Facility is a standalone building within the Yard Fire Area. Additionally, the Contaminated Material Handling and Waste Handling areas are described as part of the Auxiliary Building. Included in this compartment are Building 1202 and the Waste Solidification Building.

Provide clarification that those structures listed within the guidance are accounted for as either within or not within the power block.

FPE RAI 04

LAR Attachment L, Approval Request 2 requests to provide a performance-based evaluation in place of the NFPA 805 Section 3.3.5.1 requirement that wiring above suspended ceiling shall be kept to a minimum and where installed, electrical wiring shall be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers. The LAR stated that the wiring/cable is installed above suspended ceilings which may not comply with the requirements and that the wiring has no impact to nuclear safety.

Describe the proximity of these unqualified cables to nuclear safety capability components or cables, and address the likelihood and significance of potential fires adjacent to those nuclear safety capability components or cables. Additionally, describe what mechanisms are in place to prevent future non-code compliant installations.

FPE RAI 05

LAR Attachment L, Approval Request 6 provides for a performance-based evaluation for the non-dedicated use of the fire water system.

For those evolutions that initiate and control non-dedicated fire water use of the fire protection system:

a) Describe the administrative controls in place for these evaluations to occur;
b) Describe how approvals are obtained to establish these alternative uses;
c) Describe whether these activities are conducted simultaneously; and
d) Describe how they are controlled in the event of a fire.

FPE RAI 06

LAR Attachment K, Licensing Action 11, identifies that the licensing action will transition. However, the licensee stated that MCC-1435.00-00-0033, “NFPA 20 Code Compliant Report” evaluated fire pumps A, B, and C present compliance with NFPA 20, “Standard for the Installation of Stationary Pumps for Fire Protection,” 2007 edition. The licensee further stated that once the non-compliances identified are addressed, the fire pumps will be considered functionally equivalent and therefore, the licensing action is not required for transition.

Provide clarification with regard to the desired transition compliance method. Additionally, lack of compliance with NFPA 20 is identified in LAR Attachment L, Approval Request 5. Describe the differences between Licensing Action 11 and Approval Request 5.

FPE RAI 07

LAR Attachment C, Table C-2 provides a consolidated summary of the required fire protection systems and features as identified for each fire area. In general, the licensee has identified where required systems are installed on a room basis, however, in the Turbine Building (TB), for example, the licensee has only identified that required suppression and detection is installed. The staff could not determine if all systems in the Turbine Building are required or only certain systems. In addition, LAR Attachment C, Table C-2 identifies in TB1 and TB2 “Water Suppression” and “Suppression” and “Detection System” and “Detection” as required but does not specify the type of suppression or detection system (e.g., sprinkler, deluge, or preaction; smoke or UV).

Provide clarification regarding the types of suppression and detection systems provided in the TB and include a description of which systems are required.

FPE RAI 08

For the existing Appendix R deviations being transitioned as identified in LAR Attachment K, several licensing actions rely on fire protection features which do not appear in LAR Attachment C, Table C-2.

a. Licensing Action 01, the fire protection feature relied upon in this deviation included silicon dioxide insulated cable as a 3-hour rated barrier, but in LAR Attachment C, Table C-2 for fire area 9-11, the cable is identified as only required for risk.

b. Licensing Action 02, Auxiliary Building Deviations, provides manual suppression (portable extinguishers and hose stations) as a fire protection feature supporting the approved deviation, but it is not apparent that it was identified in LAR Attachment C, Table C-2 for fire areas 02, 02A, 03, 03A, 04, 14.

Provide a clarification for these, and any similar discrepancies.

FPE RAI 09

In LAR Attachment A, Table B-1, Section 3.3.5.3., the LAR indicates that electrical cables comply with IEEE-383 flame propagation testing (Institute of Electrical and Electronics Engineers Standard 383 “IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations”). The staff noted that the

LAR only describes armored cables in conjunction with a discussion of an outer jacket, but the licensee’s analysis includes unjacketed armored cables and the staff notes that rapid and significant flame spread is associated with unjacketed armored cables.

a. Describe whether unjacketed armored cable is installed, and if it is, describe the extent and installed locations.

b. Describe the qualification of unjacketed cables and, if this configuration is unqualified, describe how the lack of qualification has been addressed, including in the performance-based analyses.

c. If the unjacketed cables are unqualified, describe the impact on the Fire Probabilistic Risk Assessment (PRA) analysis.

Safe Shutdown Analysis (SSA) RAI 01

LAR Attachment B, Table B-2, identifies certain attributes of NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis" Revision 1, as "Aligns with Intent." For the following attributes, the alignment basis does not fully explain why there are deviations from the recommendations of the attribute.

For each attribute listed below, provide a detailed justification as to what specifically does not align.

a. 3.1C Spurious Operation
b. 3.1.1.7 Offsite power
c. 3.1.1.11 Multiple units
d. 3.2.1.6 Spurious components
e. 3.3.1.3 Isolation Devices
f. 3.3.1.6 Auto Initiation Logic
g. 3.3.1.7 Circuit Coordination
h. 3.5.1.3 Duration of Circuit Failures
i. 3.5.2.1 Circuit Failures Due to an Open Circuit
j. 3.4.1.4 Manual Actions

SSA RAI 02

LAR Attachment B, Table B-2, Section 3.1[C, Spurious Operation], states that the high/low pressure interfaces consist solely of interface with the residual heat removal (RHR) system in accordance with Safety Evaluation Report, NUREG-0422, "Transient Analysis of the Research Reactor MARIA MC Fuel Elements Using RELAP5 Mod 3.3," Supplement 6. The staff noted that the cited reference, however, does not explicitly state that the RHR is the only high/low pressure interface of concern. NEI 00-01 defines high/low pressure interface as "a subset of components considered for spurious actuation involves reactor coolant pressure boundary (RCPB) components whose spurious operation can lead to an unacceptable loss of reactor pressure vessel/reactor coolant system (RPV/RCS) inventory via an interfacing system loss of coolant accident…selected RCPB valves are defined as high/low pressure interface valve components requiring special consideration and criteria," as endorsed by the NRC through Frequently Asked Question (FAQ) 06-0006, "High-Low Pressure Interface Definition and NEI 00-01/NFPA 805 Discrepancies."

a. Provide more detail with regard to the statement that RHR is the only high/low pressure interface to be evaluated as such. If the basis of this limitation is prior approval by the NRC, then justify why the alignment statement is not "Does Not Align but has Previous Approval," or change the entry to revise the alignment statement.

b. For other reactor coolant boundary valves (e.g.; RCS high point vents, RCS letdown isolation valves) that are typically considered high/low pressure interface valves, provide a description of the spurious operation analysis performed for those that justifies not evaluating them as high/low pressure interfaces.

SSA RAI 03

LAR Attachment F, “Fire-Induced Multiple Spurious Operations Resolution,” provides a description of the process for evaluating potential multiple spurious operations (MSOs). In order to clarify the methodology, provide the following:

a. In describing the documents used for guidance by the expert panel, LAR Attachment F stated that some of these documents (NEI 00-01, NEI 04-06, Fire PRA Task Instruction, and PWROG MSO list) were identified as “draft.” Describe what reconciliation was done to ensure completeness of the analysis with the final documents.

b. LAR Attachment F stated that the expert panel consisted of MNS fire protection and post-fire safe shutdown, MNS Operations, PRA, and members of the Strategic Alliance for NFPA 805 Transition team. Describe what the “Strategic Alliance” is, and what qualifications or experience they provided the expert panel.

SSA RAI 04

LAR Attachment G, “Recovery Actions Transition,” identifies a “third” category of recovery actions (beyond risk reduction and defense-in-depth) as additional actions that screened out due to no or very low risk. The LAR stated that these actions are not considered recovery actions for NFPA 805 and therefore, feasibility is not evaluated against the criteria in NFPA 805 Section B.5.2(e), NEI 04-02, and FAQ 07-0030, “Establishing Recovery Actions.”

a. Provide a detailed description of these recovery actions, including:
   - how they were originally identified;
   - what nuclear safety performance goals they are associated with;
   - what fire safe shutdown function they provide; and
   - whether they are currently listed in LAR Attachment G.

b. Describe whether these recovery actions will remain in the procedures. If they will remain in the procedures, justify why feasibility evaluations are not performed for these actions.

c. Provide examples of these types of recovery actions.

SSA RAI 05

LAR Section 4.2.1.1, “Comparison to NEI 00-01 Revision 2,” states that post fire manual operation of rising stem valves in the fire area of concern, noted as an additional NEI 00-01 Revision 2 element, will be evaluated as part of the feasibility evaluation conducted as documented in “NFPA 805 Recovery Action Feasibility Review”. LAR Attachment B, Table B-2, Section 3.2.1.2, identifies MCC-1435.00-00-0045 Rev. 0 – “NFPA 805 Transition Recovery Action Feasibility Review,” as the referenced documentation. However, there is no identification of this element in the recovery action feasibility review. It appears that neither the assumptions nor the criteria in the recovery action feasibility review address this element.

Provide more detail with regard to which recovery actions require operation of rising stem valves in the fire area of concern. Identify where the criterion used in the evaluation is specifically identified, and how the criterion is evaluated.

SSA RAI 06

LAR Attachment B, Table B-2, Section 3.2.1.2, "Fire Damage to Mechanical Components," states that heat sensitive piping materials, including tubing with brazed or soldered joints are not included in the assumption of no mechanical damage. The licensee's analysis stated that instrument sensing lines were evaluated as if the fluid boundary remains intact.

Provide the justification for this assumption specifically with regard to heat sensitive piping materials, including tubing with brazed or soldered joints.

SSA RAI 07

LAR Attachment D describes the methods and results for non-power operations (NPO) transition. Provide the following additional information:

a. A description of any actions that are credited to minimize the impact of fire-induced spurious actuations on power operated valves (e.g., air-operated valves and motor-operated valves) during NPO either as pre-fire plant configuring or as required during the fire response recovery.

b. Identify those recovery actions relied upon in NPO and describe how recovery action feasibility is evaluated.

Programmatic RAI 01

Based on the NRC Staff's review of the LAR and associated documentation, it was determined that the LAR did not provide the information needed for the NRC staff to evaluate what changes will be made to the site Quality Assurance (QA) program as well as to site procedures to incorporate NFPA 805 requirements.

Describe the changes to the QA program and site procedures to ensure NFPA 805 fire protection requirements are incorporated into existing processes and programs. Further, discuss how NFPA 805 Section 2.7.3 requirements are or will be included within and implemented by the existing QA program and any planned modifications.

Fire Modeling (FM) RAI 01

NFPA 805 Section 2.4.3.3 states that the PRA approach, methods, and data shall be acceptable to the NRC. The NRC staff noted that the fire modeling analysis comprised the following:

- The Generic Fire Modeling Treatments (GFMTs) approach was used to determine the Zone of Influence (ZOI) for ignition sources and the time to Hot Gas Layer (HGL) conditions in all fire areas throughout McGuire Nuclear Station, Unit 1 and 2.

- The Consolidated Fire Growth and Smoke Transport (CFAST) model was used to assess the main control room (MCR) abandonment time calculations.

LAR Section 4.5.1.2, "Fire PRA," states that fire modeling was performed as part of the fire PRA (FPRA) development (NFPA 805 Section 4.2.4.2). Reference is made to Attachment J, "Fire Modeling Verification and Validation," for a discussion of the acceptability of the fire models that were used to develop FPRA.

Regarding the acceptability of CFAST for the MCR abandonment time calculations:

a. A luminous slotted ceiling covers part of the MCR area, while the remainder of the suspended ceiling consists of acoustical tile. The latter is ignored in the CFAST fire modeling calculations and the MCR area below the false ceiling and the interstitial space above the ceiling are combined into one large volume. Provide technical justification for ignoring the separation provided by the acoustical tile ceiling, or demonstrate that the abandonment times calculated based on the combination of the two spaces are conservative and bounding.

b. In the MCR abandonment time analysis, it is assumed that the external doors of the MCR open at 15 minutes based on an estimated fire brigade arrival time. Provide a technical justification for the assumption that the fire brigade will arrive 15 minutes after a fire event based on historic drill records or demonstrate that this assumption is conservative.

c. For the case where cables in an adjacent electrical cabinet are in direct contact with the separating wall, NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, Final Report," Appendix S recommends a fire spread time of 10 minutes. Provide technical justification for using the assumption in the MCR abandonment time calculations that fire spreads to adjacent cabinets in 15 minutes.

d. LAR Attachment H, Table H-1 indicates that FAQ-08-0052, "Transient Fires: Growth Rates and Control Room Non-Suppression" was used in the MCR abandonment time calculations. Describe and provide technical justification for any deviations taken from the guidance in FAQ 08-0052 "Transient Fires: Growth Rates and Control Room Non-Suppression," in the MCR abandonment time calculations, including to transient fire growth rates.

e. Explain what CFAST input value (or values) was (were) used for the heat of combustion of cables in the MCR. Describe whether the soot yield and heat of combustion values that were used in the analysis result in conservative estimates of the soot generation rate.

f. Explain if and when the door between the Main Control Board (MCB) and the MCR area was opened in any of the scenarios that were modeled.

g. Explain why, based on the sensitivity analysis, it appears that variations in the initial ambient temperature do not affect the abandonment times for the MCB fire scenarios.

Specifically regarding the acceptability of the GFMTs approach:

h. The GFMTs approach describes the critical heat flux for a target that is immersed in a thermal plume. Explain how the modification to the critical heat flux was used in the ZOI and HGL timing determinations. Provide additional discussion of how target damage time was converted to a percent of damage as a function of critical heat flux.

Specifically regarding the acceptability of the PRA approach, methods, and data:

i. Identify whether any fire modeling tools and methods have been used in the development of the LAR that are not discussed in LAR Attachment J. One example would be a methodology used to convert damage times for targets in Appendix H of NUREG/CR-6850 to percent damage as a function of heat flux and time.

j. Regarding the flame spread and fire propagation in cable trays, describe how the flame spread and fire propagation in cable trays and the corresponding heat release rate (HRR) of cables were determined. Explain how the flame spread, fire propagation and HRR estimates affect the ZOI determination and HGL temperature timing determination for fires that involve cable trays. Also explain how cable tray covers and wraps affect the ignition and fire propagation in cable trays.

k. Regarding the fires in the proximity of a wall or a corner, explain how the GFMTs approach was applied for a fire against a wall or in a corner. Explain how wall and corner affects in the ZOI and HGL timing calculations were accounted for, or provide a technical justification if these effects were not considered.

l. Regarding transient combustible fires, provide justification for assuming a 142 kW 75th percentile HRR in most transient fire scenarios. In the response, 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 HRR cannot be justified using the guidance criteria, discuss the impact on the analysis using another method.

m. Regarding high energy arcing fault (HEAF) generated fires, describe the criteria that were used to decide whether a cable tray in the vicinity of an electrical cabinet will ignite following a high energy arcing fault (HEAF) event in the cabinet. Explain how the ignited area was determined and subsequent fire propagation was calculated. Describe the effect of tray covers and fire-resistant wraps on HEAF induced cable tray ignition and subsequent fire propagation.

Fire Modeling RAI 02

American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) Standard RA-Sa-2009, “Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications,” Part 4, requires damage thresholds be established to support the FPRA. The standard further states that thermal impact(s) must be considered in determining the potential for thermal damage of systems, structures, and components (SSCs) and appropriate temperature and critical heat flux criteria must be used in the analysis.

Provide the following information:

a. Describe how the installed cabling in the power block was characterized, specifically with regard to the critical damage threshold temperatures and critical heat fluxes for thermoset and thermoplastic cables as described in NUREG/CR-6850.

b. The GFMTs approach includes damage criteria for different types of targets and states that “Damage to IEEE-383 qualified cables is quantified as either an imposed incident heat flux of 11.4 kW/m^2 (1 Btu/s-ft^2) or an immersion temperature of 329°C (625°F) per Nuclear Regulatory Guidance [NRC, 2005, NUREG 6850, 2005].” The GFMTs approach further states: “Damage to non-IEEE-383 qualified cables is quantified as either an imposed incident heat flux of 5.7 kW/m^2 (0.5 Btu/s-ft^2) or an immersion temperature of 204°C (400°F) per Nuclear Regulatory Guidance [NRC, 2005, NUREG 6850, 2005].”

   The staff notes that in the GFMTs approach, IEEE-383 qualified cables are assumed to be equivalent in terms of damage thresholds to “thermoset” cables as defined in Table 8-2 of NUREG/CR-6850. In addition, in the GFMTs approach, non-IEEE-383 qualified cables are assumed to be equivalent to “thermoplastic” cables as defined in Table 8-2 of NUREG/CR-6850. These assumptions may or may not be correct. An IEEE-383 qualified cable may or may not meet the criteria for a “thermoset cable” as defined in NUREG/CR-6850. It is also possible that a non-IEEE-383 qualified cable actually meets the NUREG/CR-6850 criteria for a “thermoset” cable.

   For those areas that are assumed to have thermoset damage criteria, confirm that the cables are actually thermoset and that the potential confusion about IEEE-383/thermoset is not applicable.

c. The resolution to finding and observation (F&O) FSS-C5-01 refers to a licensee analysis as the basis for concluding that the armored cable, which has a thin PVC exterior jacket or thermoplastic coating, can be treated as a thermoset material and its associated damage criteria. NUREG/CR-6850 Section H.1.3 recommends that the failure criteria for thermoplastic materials should be applied for mixed configurations, unless appropriate justification for treatment as a thermoset material is provided. Provide justification for concluding that the armored cable can be treated as thermoset material. In the response, specifically address whether a thermoplastic fire can form in the immediate vicinity of the cables themselves given that thermoplastic materials melt and can form a burning pool of liquid material, and how the cable tray configurations identified in Section H.1.3 of NUREG/CR-6850 correspond to those at the plant.

d. Describe how cable tray covers, conduits and wraps affect the damage thresholds that were used in the fire modeling analyses.

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

f. Describe the damage criteria that were used for exposed temperature-sensitive electronic equipment. Explain how temperature-sensitive equipment inside an enclosure was treated, and provide a technical justification for these damage criteria.

Fire Modeling RAI 03

NFPA 805, Section 2.7.3.2, states that each calculational model or numerical method used shall be verified and validated through comparison to test results or comparison to other acceptable models.

LAR Section 4.5.1.2, states that fire modeling was performed as part of the FPRA development (NFPA 805 Section 4.2.4.2). Reference is made to Attachment J, for a discussion of the verification and validation (V&V) of the fire models that were used. Furthermore, LAR Section 4.7.3 states that "calculational models and numerical methods used in support of compliance with 10 CFR 50.48(c) were verified and validated as required by Section 2.7.3.2 of NFPA 805."

Regarding the V&V of fire models,
for any fire modeling tool or method that was used in the development of the LAR or that is identified in the responses to the above fire modeling RAIs, provide the V&V basis if it is not already explicitly provided in the LAR (for example in LAR Attachment J).

Fire Modeling RAI 04

NFPA 805, Section 2.7.3.3, states that acceptable engineering methods and numerical models shall only be used for applications to the extent these methods have been subject to verification and validation. These engineering methods shall only be applied within the scope, limitations, and assumptions prescribed for that method.

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

Regarding the limitations of use,
identify uses, if any, of the GFMTs approach outside the limits of applicability of the method and for those cases explain how the use of the GFMTs approach was justified.

Fire Modeling RAI 05

NFPA 805, Section 2.7.3.4, "Qualification of Users," states: "Cognizant personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations."

LAR Section 4.5.1.2, “Fire PRA,” states that fire modeling was performed as part of the FPRA development (NFPA 805 Section 4.2.4.2). This requires that qualified fire modeling and PRA personnel work together. Furthermore, LAR Section 4.7.3, “Compliance with Quality Requirements in Section 2.7.3 of NFPA 805,” states:

> Cognizant personnel who use and apply engineering analysis and numerical methods in support of compliance with 10 CFR 50.48(c) are competent and experienced as required by Section 2.7.3.4 of NFPA 805.
>
> During the transition to 10 CFR 50.48(c), work was performed in accordance with the quality requirements of Section 2.7.3 of NFPA 805. Personnel who used and applied engineering analysis and numerical methods (e.g. fire modeling) in support of compliance with 10 CFR 50.48(c) are competent and experienced as required by NFPA 805 Section 2.7.3.4.
>
> Post-transition, cognizant personnel who use and apply engineering analysis and numerical models shall be competent in this field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations. Duke Energy will develop and maintain qualification requirements for individuals assigned various tasks. Individuals will be qualified to appropriate job performance requirements per ACAD 98-004. Engineering training guidelines will be developed to identify and document required training and mentoring to ensure individuals are appropriately qualified per the requirements of NFPA 805 Section 2.7.3.4 to perform assigned work.

Regarding qualifications of users of engineering analyses and numerical models:

a. Describe what constitutes the appropriate qualifications for staff and consulting engineers to use and apply the methods and fire modeling tools included in the engineering analyses and numerical models.

b. Describe the process/procedures for ensuring the adequacy of the appropriate qualifications of the engineers/personnel performing the fire analyses and modeling activities.

c. Describe who performed the walk-downs of the MCR and other fire areas in the plant. Describe whether these were the same people who performed the fire modeling analysis.

d. Explain the communication process between the fire modeling analysts and PRA personnel to exchange the necessary information and any measures taken to assure the fire modeling was performed adequately and will continue to be performed adequately during post-transition.

e. Explain the communication process between the consulting engineers and McGuire Nuclear Station personnel to exchange the necessary information and any measures taken to assure the fire modeling was performed adequately and will continue to be performed adequately during post-transition.

Fire Modeling RAI 06

NFPA 805, Section 2.7.3.5, “Uncertainty Analysis,” states, “An uncertainty analysis shall be performed to provide reasonable assurance that the performance criteria have been met.”

LAR Section 4.7.3, states that uncertainty analyses were performed as required by Section 2.7.3.5 of NFPA 805 and the results were considered in the context of the application. This is of particular interest in fire modeling and FPRA development.

Regarding the uncertainty analysis for fire modeling:

a. Describe how the uncertainty associated with the fire model input parameters (compartment geometry, radiative fraction, thermophysical properties, etc.) was addressed and accounted for in the analyses.

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