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Washington, DC 20555

Duke Energy Carolinas, LLC (Duke Energy)
McGuire Nuclear Station (MNS), Units 1 and 2
Docket Numbers 50-369, 50-370
Renewed License Numbers NPF-9 and NPF-17

**Subject:** Response to August 28, 2014, NRC Request for Additional Information Regarding License Amendment Request To Implement A Risk-Informed Performance-Based Fire Protection Program (TAC Nos. MF2934 and MF2935).

**References:**

1. MNS Letter, License Amendment Request (LAR) to Adopt National Fire Protection Association (NFPA) 805 Performance-Based Standard for Fire Protection for Light-Water Reactor Generating Plants, dated September 26, 2013, Agencywide Document and Management System (ADAMS) Accession Number ML13276A126.
2. NRC E-Mail, McGuire 1 and 2 NFPA 805 License Amendment Request - Unacceptable With The Opportunity To Supplement, dated December 18, 2013, ADAMS Accession Number ML13352A514.
3. MNS Letter, Supplemental Information For License Amendment Request (LAR) to Adopt National Fire Protection Association (NFPA) 805 Performance-Based Standard for Fire Protection for Light-Water Reactor Generating Plants, dated January 8, 2014, ADAMS Accession Number ML14016A097.
4. NRC Letter, McGuire Nuclear Station, Units 1 and 2 - Acceptance of Requested Licensing Action RE: License Amendment Request to Adopt National Fire Protection Association (NFPA) 805 Performance-Based Standard for Fire Protection for Light-Water Reactor Generating Plants (TAC Nos. MF2934 and MF2935), dated January 15, 2014, ADAMS Accession Number ML14014A279).
5. NRC Letter, Request for Information Regarding License Amendment Request To Implement A Risk-Informed Performance-Based Fire Protection Program (TAC Nos. MF2934 and MF2935), dated August 28, 2014, ADAMS Accession Number ML14233A366).

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6. MNS Letter, Response to August 28, 2014, NRC Request for Additional Information Regarding License Amendment Request To Implement A Risk-Informed Performance-Based Fire Protection Program, dated October 13, 2014, No ADAMS Number.
7. MNS Letter, Response to August 28, 2014, NRC Request for Additional Information Regarding License Amendment Request To Implement A Risk-Informed Performance-Based Fire Protection Program, dated November 12, 2014, No ADAMS Number.

By letter dated September 26, 2013 (Reference 1), Duke Energy submitted a license amendment request (LAR) to adopt a new, risk-informed, performance-based (RI-PB) fire protection licensing basis for the MNS Unit Nos. 1 and 2.

On December 18, 2013 (Reference 2), the NRC requested supplemental information in order to make the September 26, 2013, LAR complete and acceptable for review by the NRC. By letter dated January 8, 2014 (Reference 3), Duke Energy provided the requested supplemental information to the NRC. By letter dated January 15, 2014 (Reference 4), the NRC accepted the September 26, 2013, LAR for review.

By letter dated August 28, 2014 (Reference 5), the NRC requested additional information (RAI) in order to complete their review of the September 26, 2013, LAR. That letter grouped the RAIs into 60-day, 90-day, and 120-day response times. Duke Energy provided the 60-day and 90-day RAI responses by letters dated October 13, 2014, and November 12, 2014, respectively (References 6 and 7 respectively). During a conference call on December 8, 2014, Duke Energy requested an extension on the response date for some of the 120-day RAIs to allow more time to develop accurate and complete responses for those RAIs. The NRC subsequently agreed to this request and the revised due dates for these responses are documented in Enclosure 4. Duke Energy's responses to the balance of the 120-day RAIs are provided in Enclosure 1.

During a conference call on November 19, 2014, the NRC requested Duke Energy provide additional details related to the 60-day RAI responses for FPE RAI 01, FPE RAI 10.a, and FM RAI 2.c. These details are provided in the revised responses to these RAIs in Enclosure 2. The revised responses to FPE RAI 01, FPE RAI 10, and FM RAI 2.c replace the responses to those RAIs provided on October 13, 2014.

During a conference call on December 8, 2014, the NRC requested Duke Energy provide additional details related to the 90-day RAI response for FM RAI 01.k. As documented in Enclosure 4, these details will be provided in a revised response to that RAI by January 26, 2015.

Duke Energy has determined that information was inadvertently omitted from the response to PRA RAI 14.b provided as part the October 13, 2014 60-day RAI responses. This omission has been entered into the MNS Corrective Action Program. The revised response to PRA RAI 14 incorporating the omitted information is provided in Enclosure 2.

As a result of some of the responses to the MNS NFPA 805 LAR 60-day, 90-day, and 120-day RAIs, it was necessary to perform some reanalysis and to revise some pages of the LAR. Those LAR revisions and analyses have been entered into the MNS Corrective Action Program. The LAR revisions are included in Enclosure 3. Any LAR revisions resulting from the RAI responses due January 26, 2015, and February 27, 2015, will be provided by February 27, 2015.

The conclusions reached in the original determination that the September 26, 2013, LAR contains No Significant Hazards Considerations and the categorical exclusion from performing an Environmental/Impact Statement have not changed as a result of the August 28, 2014, RAIs and the RAI responses in Enclosure 1 and Enclosure 2.

This submittal does not contain any new or revised regulatory commitments.

Please direct any questions on this matter to Jeffrey N. Robertson at 980-875-4499.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 12, 2014.

Sincerely,

Steven D. Capps

Enclosures 1, 2, 3, and 4

xc:

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# ENCLOSURE 1

## Duke Energy Responses To The MNS NFPA 805 LAR 120-Day RAIs for Which a Due Date Extension Was Not Requested.

**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 NOS. 50-369, 50-370**

By letter dated September 26, 2013, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13276A126), Duke Energy Carolinas (Duke) submitted a license amendment request to change its fire protection program to one based on the National Fire Protection Association (NFPA) Standard-805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition, as incorporated into Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.48(c). In order for the U. S. Nuclear Regulatory Commission (NRC) staff to complete its review of the license amendment request (LAR), the following additional information is requested:

## Fire Modeling (FM) Request for Additional Information (RAI) - 120-Day Responses

### FM RAI 01.a

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 MNS, 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 the 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.

Duke Energy Response:

a. Section B.3.1 of the updated MCR abandonment calculation (Report 25018-RPT-01, Rev. 0) addresses the effect of the false ceilings in the adjacent equipment areas on both the calculated abandonment times and the total probability of control room abandonment. This is accomplished by comparing the results obtained using a two room baseline configuration to a four room sensitivity configuration. The four room configuration includes the combined operator area/interstitial space, the Main Control Boards (MCBs), and the east and west electrical equipment areas below the false ceiling. Fire scenarios are postulated in the operator area, the east electrical equipment area, and the west electrical equipment area and the results are compared to fires postulated in the MCR of the two room model.

   It is shown that the two room configuration introduces a significant conservative bias for fires postulated in the east and west electrical equipment rooms of up to 45%. This occurs because the abandonment conditions are based on the fire environment within the operator area. Fires that are below the false ceiling spread smoke products into the operator area/interstitial volume, but the entrainment distance from the fire base to the ceiling is shorter resulting in a slower descending hot gas layer. The conditions in the operator area are non-conservatively biased by up to 80% for a four room model for the multiple cable bundle electrical panel fire scenarios, both those that propagate to adjacent panels and those that do not. The conditions in the operator area are conservatively biased or are not sensitive as compared to the results obtained using a two room model for the single bundled electrical panel, transient ignition source, and severe transient ignition source fire scenarios.

When results for the multiple cable bundle electrical panel fire scenarios are combined with the effects of a fire in the east and west electrical equipment rooms using the floor area fractions, the maximum non-conservative bias in the probability of control room abandonment is 4.86%. The two room CFAST model combines all three areas; therefore, the combined results for the four room model is the appropriate comparison metric. A non-conservative bias of 4.86% is not considered significant because it is lower than the uncertainty in the heat release rate and is readily bound by conservative bias introduced by other parameters described in Section 3 of Report 25018-RPT-01, Rev. 0.

**FM RAI 01.c**

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 MNS, 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 the FPRA.

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

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.

Duke Energy Response:

c. The fire propagation time between adjacent electric panels has been revised to ten minutes in the updated MCR abandonment calculation (Report 25018-RPT-01, Rev. 0). Refer to Section 5.3.3 and Figure 5-17.

**FM RAI 01.d**

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 MNS, 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 the FPRA.

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

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.

Duke Energy Response:

d. The growth time for transient fuel package fires has been revised in the updated MCR abandonment report (Report 25018-RPT-01, Rev. 0) to meet the guidance provided in FAQ 08-0052. Specifically, a baseline growth time of eight minutes with fuel properties that correspond to poorly-ventilated conditions is postulated. The sensitivity analysis provided in Section B.3.6 of Report 25018-RPT-01, Rev. 0 compares the probability of control room abandonment for the baseline transient with a transient fuel package fire scenario having a growth rate of two minutes and fuel properties that correspond to well-ventilated conditions. It is shown that the eight minute growth rate coupled with poor ventilation fuel properties introduces a maximum non-conservative bias of 9% into the probability of control room abandonment calculation for the severe transient fire scenario (workstation), which is not considered significant. In all other cases, the results are either not sensitive to the growth rate or the baseline configuration introduces a significant conservative bias (up to 45%) into the calculation of the probability of control room abandonment.

**FM RAI 01.e**

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 MNS, 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 the FPRA.

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

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.

Duke Energy Response:

e. The cable fuel properties, including the soot yield and the heat of combustion, are described in Table 5-12 of the updated MCR abandonment calculation (Report 25018-RPT-01, Rev. 0). The fuel properties values are selected to maximize the production of soot as described in Section 5.3.4 of Report 25018-RPT-01, Rev. 0. Specifically, the fuel properties for all thermoset cables tabulated in Section 3–4 of the 4th Edition of the *SFPE Handbook of Fire Protection Engineering* are assessed for their potential to generate soot. It is shown in Table 5-11 of Report 25018-RPT-01, Rev. 0 that the Cross-Linked Polyethylene (XLPE)/Neoprene Cable 2 produces the largest soot mass per unit mass of fuel consumed. The fuel properties for this cable are thus used to define the baseline cable fuel properties. It is shown in Section B.3.6 of Report 25018-RPT-01, Rev. 0 that a poorly ventilated burning regime, which is characterized by an increased soot yield, decreased heat of combustion, and decreased carbon dioxide yield, results in the most conservative (minimized) control room abandonment times. Accordingly, the baseline fuel properties for fire scenarios involving cables are based on poorly-ventilated burning conditions for XLPE Neoprene cables. This produces a conservative result that bounds the results that could arise for different cable composition mixtures.

**FM RAI 01.f**

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 MNS, 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 the FPRA.

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

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.

Duke Energy Response:

f. Both doors between the MCBs and the MCR area are modeled as opened when an MCR area boundary door is opened. This is described in Section 5.3.2.4 and Table 5-9 of the updated MCR abandonment calculation (Report 25018-RPT-01, Rev. 0).

**FM RAI 01.g**

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 MNS, 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 the FPRA.

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

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.

Duke Energy Response:

g. Certain scenarios may not show significant sensitivity to the initial ambient temperature if the visibility parameter leads to abandonment, particularly if the temperature is relatively low at the time the visibility threshold is reached. The updated control room abandonment calculation (Report 25018-RPT-01, Rev. 0) provides an indication which threshold leads to abandonment (temperature or visibility) for both the baseline and parameter sensitivity scenarios. Table B-12 in Report 25018-RPT-01, Rev. 0 shows that scenarios in which the temperature is the criterion for control room abandonment are sensitive to the initial ambient temperature (i.e., the multiple cable bundle fires in the MCR). In contrast, scenarios in which visibility is the criterion for control room abandonment (i.e., the multiple cable bundle fire scenarios in the MCBs and the transient and severe transient fire scenarios in the MCR) are not sensitive to the initial temperature and may even show a slight increase in the abandonment time due to variations in the layer position.

   Nevertheless, the scenario showing the greatest sensitivity to the initial temperature is used to establish the limiting conditions under which the model results are applicable. Namely, the propagating multiple cable bundle fire scenario is most sensitive to the initial ambient temperature and it is determined that the maximum initial temperature for which the abandonment times are applicable is 27.4°C (81.3°F). This exceeds the maximum normal operating temperature of 23.9°C (75.0°F) and is thus an off-normal condition that would require specific analysis.

**FM RAI 01.I**

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 MNS, 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 the FPRA.

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

I. 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 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.

Duke Energy Response:

I. As stated in the fire scenario report, in addition to assuming loss of power at the switchgear/load center, the ZOI for a HEAF includes:

   - The first adjoining cubicle (if adjoining cubicle is empty, damage to first non-empty adjoining cubicle is to be assumed)
   - Targets, including cable trays, within 5' vertical distance of the top of the panel
   - Targets within 3' horizontal distance from the front and back of the panel, below the top of the panel and 1' horizontal distance above the top of the panel

   Any resulting Heat Release Rate (HRR) following the HEAF event is subsumed by the Bin 15 HRR which is used for the determination of the target damage set. No credit is taken for "time to peak HRR" for the ZOI/target damage associated with the modeled HEAF events.

   Fire propagation was treated such that the target trays within the ZOI are assumed to ignite with propagation up to the ceiling. Exceptions were limited to configurations where there is significant distance between trays such that the fire would not propagate to the next tray. Flame spread is further discussed in FM RAI 01.j.

   Tray covers and fire resistant wraps were not credited for HEAF fires.

**FM 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.

Duke Energy Response:

The GFMT approach is intended to provide conservative ZOI dimensions and HGL timing for various types of ignition sources when used within the stated limitations. There are six basic limitations that should be considered when applying the original GFMT approach to determine ZOIs and HGL temperatures. The six limitations represent conditions or configurations for which the GFMT ZOI data may potentially be non-conservative if applied outside the particular limitation:

1. The application of the generic ZOI data in compartments in which the hot gas layer temperature exceeds 80°C (176°F).
2. The application of the generic ZOI data to fire scenarios in wall and corner configurations.
3. The application of the generic ZOI data for panel ignition sources with panels having plan dimensions greater than 0.9 × 0.6 m (3 × 2 ft.).
4. The application of the generic ZOI data to scenarios that result in flame impingement to the ceiling.
5. The application of the generic HGL data to configurations in which secondary combustibles (cable trays) are ignited.
6. Application of the GFMT CFAST fire modeling results to spaces that exceed the limitation for CFAST.

*ZOIs in Elevated Temperature Enclosures:*

The fire scenarios considered in the PRA limit the use of ZOIs to situations in which the maximum HGL temperature is 80°C (176°F). If the temperature exceeds 80°C (176°F), an expanded ZOI was applied or full room burnout conditions were conservatively assumed. Refer to the response to RAI FM 01.h for additional details on this limit.

*ZOIs in Wall and Corner Locations:*

Although the GFMT report is limited to open configurations, wall and corner effects are determined using the 'Image' method, which postulates an equivalent plume by increasing the fire size and enclosure volume by a factor of two or four depending on the fire location. As discussed in Section 9.3 of the Fire Scenario Report, no fixed ignition sources were identified as being located in a corner. The 120 VAC Vital Inverters (1/2EVIA, 1/2EVIB, 1/2EVIC, & 1/2EVID) in the Battery Room (Fire Area 13) were confirmed to be located against a wall. The inverters, which stand nearly 8' tall, were located against individual battery room walls that are approximately 8' high with significant free space between the top of the cabinet and the adjacent room and the overall battery room ceiling; therefore, the location of these cabinets against the wall has minimal impact on the heat release rate.

*ZOIs for Large Dimension Electrical Panels:*

The GFMT report was derived for panels having plan dimensions up to 0.9 × 0.6 m (3 × 2 ft.). The dimensions primarily affect the extent of the horizontal component of the ZOI that is below the top of the panel. This ZOI component is calculated from an energy balance at the panel surface, and the target exposure mechanism is a heated radiating vertical plane. Consequently, changes in the panel dimensions affect the dimensions of the radiating plane, which in turn affects the geometry configuration factor between the target and the radiating plane. The lower horizontal ZOI dimension is the limiting horizontal ZOI dimension and is used in the FPRA as the basis for determining the affected target set.

An approximate upper limit for the ZOI dimensions based on the conservative 0.9 × 0.6 m (3 × 2 ft.) plan dimensions may be estimated by comparing against a limiting open panel configuration. In this case, the maximum heat transferred across one boundary would be given through the definition of the emissive power and a radiation area as follows:

$$\dot{Q}_{b,\,max} = A_b E \qquad \text{(FM 04–1)}$$

where $\dot{Q}_{b,\,max}$ is the maximum heat that can be transferred across a vertical boundary of an electrical panel (KW [Btu/s]), $A_b$ is the area of the boundary (m² [ft²]), and $E$ is the flame emissive power (KW/m² [Btu/s-ft²]). Assuming the maximum average flame emissive power over the panel boundary is 120 KW/m² (10.6 Btu/s-ft²) based on Section 3–10 of the *SFPE Handbook of Fire Protection Engineering* and data provided in *Combustion and Flame*, No. 139, pp. 263–277, the maximum heat that could be transferred across a vertical boundary via thermal radiation is about 235 KW (223 Btu/s) if the heat transferred across an open boundary is considered to be an upper limit on the boundary heat losses in any one direction. To link this heat loss to the postulated fire size, the radiant fraction is used, which is reasonably approximated as 0.3 for enclosure fires per Section 3–8 of the *SFPE Handbook of Fire Protection Engineering*. Dividing the maximum boundary heat loss of 235 KW (223 Btu/s) by the radiant fraction (0.3) results in the largest fire size for which the lateral ZOI dimensions would be conservative, or 783 KW (742 Btu/s). This value exceeds the severe fire heat release rate used to characterize both the multiple bundle (717 KW [680 Btu/s] based on the Bin 8 heat release rate) and single bundle (211 KW [200 Btu/s]) electrical panels. This result is based on a radiant fraction of 0.3; if a value at the upper end of the often cited range 0.3 – 0.4 is assumed per Section 3–8 of the *SFPE Handbook of Fire Protection Engineering*, the largest fire size for which the lateral ZOI dimensions would be conservative, or 588 KW (557 Btu/s). However, this would be based on all heat losses being directed toward the target. The internal temperature during a fully developed enclosure fire would be greater than 600°C (1,112°F), which suggests the heat losses from all boundaries, except the open boundary, would be on the order of 110 KW (104 Btu/s). This means that the maximum total energy that could radiate toward the target via thermal radiation would be about 600 KW (253 Btu/s) × 0.4 or 240 KW (227 Btu/s). This is comparable to the maximum boundary heat loss via thermal radiation (235 KW [223 Btu/s]), which indicates the conclusion applies over a wider range of radiant fractions when the additional boundary heat losses are included. The limiting fire size (and plan dimension for the panels) for wall and corner locations is increased by a factor of two and four due to the symmetry planes assumed in the 'Image' method and applies when the lower ZOI dimension is limiting. There are no electrical panel ignition sources evaluated at MNS using the GFMT approach with a heat release rate greater than 783 KW (742 Btu/s) in an open configuration, 1,566 KW (1,484 Btu/s) in a wall location, or 3,132 KW (2,970 Btu/s) in a corner configuration. Therefore, although the specific limitation in the GFMT report is exceeded, there is no adverse effect on the ZOI dimensions for the MNS applications.

*Flame Height Limitation for ZOIs:*

The GFMT report limits the application of the ZOIs to situations in which the flames remain lower than the ceiling height. From Table 5-4 in the GFMT report, the maximum flame height for a 98$^{th}$ percentile (Bin 8) electrical panel fire is 1.6 m (5.4 ft) for Cases 1, 3, & 6 and 2.6 m (8.6 ft) for Case 2. Given a typical difference in floor elevations of 17' within the Auxiliary Building and 25' in the Turbine Building, the minimum ceiling height above the top of the tallest enclosure is beyond the flame height limitation. In pump rooms where the flame height constraint may be challenged, the scenario assumes room burnout which eliminates any ZOI concern.

*ZOIs and Hot Gas Layer Temperatures for Scenarios with Secondary Combustibles:*

Regarding HGL, there is margin in the HGL analysis to accommodate additional heat load from cable tray targets. Due to the time-based nature of the expected fire behavior, multiple trays burning at their peak HRR is not considered a credible FPRA assumption for a plant with armored cables. Refer to the response to RAI FM 01.j for additional consideration of the impact of these limitations on ZOIs and the HGL.

*Application of GFMT CFAST Results:*

The GFMT approach involves CFAST calculations for generic enclosures that minimize the heat losses to the boundaries. The key CFAST model limits that apply to the MNS CFAST evaluations as identified in NIST SP 1026 and NUREG-1824, Volume 5 are as follows:

- Maximum vent size to enclosure volume ratio should not exceed 2 $m^{-1}$ (0.61 $ft^{-1}$)
- Maximum heat release rate per unit volume of 1 $MW/m^3$ (0.027 $Btu/ft^3$)
- Maximum enclosure aspect ratio of five (length to width)

The approach adopted in the generic enclosure analysis is to evaluate a range of ventilation fractions, from 0.001 to 10 percent of the enclosure boundary. Given that the width is set equal to the length in both the generic evaluations, the maximum vent size to enclosure volume ratio is given by the following equation:

$$\frac{W+2H}{5HW} \qquad \text{(FM 04–2)}$$

where W is the enclosure width (m [ft]), and H is the enclosure height. Based on the definition of the generic volume, the enclosure height is one-half the enclosure width, so that the vent size to enclosure volume ratio can only exceed 2 $m^{-1}$ (0.61 $ft^{-1}$) if the ceiling height is 0.2 m (0.7 ft.) or less. Because the minimum ceiling height considered is 1.4 m (4.5 ft.), this condition is necessarily met in the tabulated data. Further, there are no spaces at MNS for which the GFMT approach is applied that has an actual ceiling height that is lower than 0.2 m (0.7 ft.); thus, this limitation is met in practice as well.

The maximum heat release rate per unit volume for CFAST is 1 $MW/m^3$ (0.027 $Btu/ft^3$), above which the two layer approach breaks down. The smallest volume considered in the GFMT report is 10 $m^3$ (353 $ft^3$) and the largest fire size considered is 10 MW (9,470 Btu/s). As such, the heat release rate per unit volume limitation is met in all cases considered.

A third CFAST model limitation of the GFMT approach relates to the maximum aspect ratio of an enclosure for which HGL data is applied. The HGL information is provided for enclosures having an aspect ratio up to five, per NUREG-1824, Volume 5, Section 3.2. In situations where the model is applied to enclosures having a larger aspect ratio, the behavior transitions to a channel flow typical of a corridor configuration. Localized effects in the vicinity of the fire could

be more severe than the average conditions throughout the enclosure length, and a non-conservative result could be generated. NUREG-1934 describes a method to apply a fire model in a conservative manner under these conditions. This method involves the modification of the enclosure dimensions such that the application falls within the model limitation and the HGL temperature results are conservative. This modification has been applied to fire scenarios postulated in spaces having an aspect ratio greater than five at MNS. For example, even with a significantly truncated volume, the HGL burnout time for the switchgear rooms (FA 11, 12, 17, & 18) remains beyond 60 minutes for a 2,000 kW (1,900 Btu/s) fire. Additionally, HGL / room burnout scenarios were recently added for each Load Center located in these switchgear rooms to account for potential HGL impact on ZOI; the impact of this adjustment on base fire risk and delta risk will be addressed in the response to RAI PRA 03. As such, the three CFAST limitations are met for the MNS GFMT applications.

**Probabilistic Risk Assessment (PRA) RAIs - 120-Day Responses**

**PRA RAI 01.b**

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

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

b) FSS-C5-02: The resolution to this F&O identifies non-armored cable as primarily related to security and communication (phone, LAN, or fiber optic cables) and concludes that "the low concentration of non-qualified cables, which are not associated with credited circuits, is considered insufficient to impact the results." Identify the other functions that include non-armored cable employed at MNS to provide the basis for concluding that these do not impact the FPRA results, both total and delta risks.

Duke Energy Response:

b) A review of credited PRA cables was conducted, and some instances of non-armored cables involving credited control power circuits were discovered. These instances were generally confined to the Unit 2 Cable Room (Fire Area 20). The flame spread and cable damage criteria assumptions applied in the MNS FPRA are unaffected by armor, since neither of these assumptions credited the armor. There is a potential impact on circuit failure probabilities from NUREG/CR-7150 for armored versus non-armored cables. The appropriate values from the NUREG/CR-7150 are now being applied to the identified non-armored cables, and the impact on the total Core Damage Frequency (CDF), Large Early Release Frequency (LERF), and delta risk results will be incorporated in the integrated analysis performed in response to PRA RAI 3.

**PRA RAI 01.c**

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

established for evaluations that could influence the regulatory decision. The primary result of a peer review are the facts and observations (F&Os) recorded by the peer review and the subsequent resolution of these F&Os.

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

c) HRA-E1-01: The resolution to F&O HRA-E1-01 explains that human error probability (HEP) values for IEPRA actions were increased by a specified factor depending on action time and complexity for actions both inside and outside the control room. Table V-2 of the LAR justifies the peer reviewer assessment for SR HRA-C1 to be acceptable for the NFPA 805 application on the basis that this factor or multiplier methodology is a conservative approach. The methodology, which is essentially an HRA seeping approach, does not follow the NRC-accepted guidance in NUREG/CR-6850 or NUREG-1921. In light of these issues:

   i. Provide further justification that explains how the multiplier methodology for developing HEPs accounts for the various factors discussed in Section 5 of NUREG-1921 for performing a seeping/screening fire HRA. Alternatively, provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03 applying HEP and JHEP values developed using NRC-accepted guidance such as NUREG-1921 or NUREG/CR-6850.

   ii. Provide further explanation of how using conservative or seeping values for HEPs for significant human actions impacts the delta risk results reported in the fire risk evaluations. The response should specifically address each HFE determined to be significant in accordance with the PRA standard. Alternatively, provide updated risk results as part of the aggregate change-in- risk analysis requested in PRA RAI 03 applying HEP values for risk significant HFEs developed using detailed HRA.

   iii. NUREG-1921 indicates, and NUREG-1792 (Table 2-1) states that joint HEP values should not be below 1E-5. Electric Power Research Institute (EPRI) Table 4-3 provides a lower limiting value of 1E-6 for sequences with a very low level of dependence. Confirm that each joint HEP value used in the FPRA below 1E-5 includes its own justification that demonstrates the inapplicability of the NUREG-1792 lower value guideline. Provide an estimate of the number of these joint HEPs below 1E-5 and at least two different examples of the justification.

Duke Energy Response:

c) i. In response to this RAI, the NUREG-1921 methodology was reviewed and an application of this method with screening or detailed Human Reliability Analysis (HRA), as appropriate, will be performed. Any updated HEPs and/or joint HEP values (JHEPs) will be included in the PRA RAI 03 response.

   ii. There are three potential categories of Human Failure events (HFEs) that might influence the delta risk results determined in the fire risk evaluations: 1) the HFE is not related to the variance and appears in the cutsets for both the variant and compliant case, 2) the HFE is related to the variance but appears in the cutsets for both the variant and compliant case, and 3) the HFE is related to the variance and only appears in the cutsets for the "compliant" case (i.e., the success path was set to TRUE in the variant case). For the first category, there is no impact on delta risk because the HFE is not material to the results but a higher HEP would maximize any potential influence. Regarding the second category identified above, the use of the more conservative HEP would result in higher

delta risk values than if a lower HEP was used. For the third category, due to the nature of the Variance From Deterministic Requirements (VFDRs) there were no identified instances where the HFE was only included in cutsets for the compliant case.

iii. The McGuire FPRA credits four JHEPs that are below the suggested floor value of 1E-05 discussed in NUREG-1792.

As noted in NUREG-1792, there is a greater possibility of dependence (higher JHEP value) among the HFEs based on the following commonalities:

- The same crew member(s) is responsible for the actions.
- The actions take place relatively close in time such that a crew "mindset" or interpretation of the situation might carry over from one event to the next.
- The procedures and cues used along with the plant conditions related to performing the actions are identical (or nearly so) or related, and the applicable steps in the procedures have few or no other steps in between the applicable steps.
- Similar Performance Shaping Factors (PSFs) apply to actions.
- How the actions are performed is similar and they are performed in or near the same location.
- There is reason to believe that the interpretation of the need for one action might bear on the crew's decision regarding another action, i.e., the basis for one decision in a scenario may influence another decision later in the scenario.

Additionally, a high JHEP value is anticipated if there are failures associated with previous operator action(s) in the sequence.

While all four JHEPs less than 1E-05 were analyzed, two examples for Joint HEPs evaluations are provided: ZHFC-3-030 and ZLHFC-4-04 were reviewed against the guidance found in NUREG-1792. Below is a discussion of the findings.

<u>ZHFC-3-030</u>

Joint HEP ZHFC-3-030 is comprised of three HFEs: YSMISOLDHE - Operators Fail to Isolate Ruptured Steam Generator, FCACSMUDHE - Failure to Refill From Condensate Grade Sources and TRECIRCDHE - Operators Fail To Establish High Pressure Recirculation. YSMISOLDHE is not a time critical action and FCACSMUDHE has a system window of 180 minutes; therefore, the relative timing between YSMISOLDHE and FCACSMUDHE is considered long. Likewise, as FCACSMUDHE has a system window of 180 minutes before TRECIRCDHE needs to be performed, the relative timing between the two events is considered long. The relative timing between these events/actions supports that the crew's interpretation of the event will not carry over between events.

The cue associated with YSMISOLDHE is Steam Generator level increasing, while the cues associated with FCACSMUDHE and TRECIRCDHE entail responses to low level in the Upper Surge Tanks (USTs) during Feedwater operation and low level in the Feedwater Storage Tank (FWST) after some hours of successful feed-and-bleeding, respectively. Therefore, the cues and procedures for these actions are dissimilar.

While there are no intervening successes between the first and second actions, the decision to implement feed and bleed has to be successful after the loss of

all Feedwater. Therefore, there are intervening successes between FCACSMUDHE and TRECIRCDHE.

ZLHFC-4-04

Joint HEP ZLHFC-4-004 consists of four operator actions: DDCEVDDRHE - Operators Fail to Restore Equipment Function Following a T14 (plant trip as a result of losing power on 125V vital bus EVDA or EVDD), FCACSMUDHE - Failure to Refill From Condensate Grade Sources, XHM1A1BDHE - Operators Fail To Turn Igniters On and TRECIRCDHE - Operators Fail To Establish High Pressure Recirculation.

The restoration of vital I&C power is needed early in the event if Main Feedwater is to be made available. If Auxiliary Feedwater (AFW) were successful, the supply in the UST should last for a matter of hours. Therefore, the relative timing for the first two events is considered to be long. The hydrogen igniters would be turned on at the time feed and bleed cooling was started. There would be a period of some additional hours before it would become necessary to initiate high pressure recirculation. Therefore, the relative timing between events is considered to be long.

The cues for the first event relate to the loss of vital power. For the second event, the primary cue is low level in the USTs. The cue for the third event is a loss of secondary side heat removal and hydrogen buildup. The fourth event is initiated based on low level in the FWST. Therefore, the cues for all events are different. Additionally, there are intervening successes between the third and last event in the sequence.

Additionally, the level of dependence among the individual HFEs was evaluated for all JHEPs. The quantitative factors discussed in NUREG-1792, Good Practice #6 were applied based on the first HEP in the sequence. The application of these factors further justifies the low JHEP values.

In conclusion, all JHEPs below the floor limit of 1E-5 were reviewed. Based on the relative timing between the above mentioned actions, the use of dissimilar cues and procedures, there being little or no dependency among the individual HEPs comprising the JHEP, as well as the intervening successes between the actions justify using a JHEP value below the floor limit of 1E-5.

Appendix D of the MNS Human Reliability Calculation discusses the relative timing between the individual HEPs comprising the JHEPs, as well as similarity of cues and intervening successes between the actions. As noted in the MNS FPRA Model Development Calculation, the individual HEPs credited in the FPRA were adjusted to account for the effects of fire; similar adjustments were made for the JHEPs involving these HEPs. These discussions provide justification as to why these and other JHEPs have a lower value than the floor value of 1E-5 recommended in NUREG-1792.

**PRA RAI 01.e**

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

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

e) HRA-84: The disposition to the peer review assessment for SR HRA-B4 (LAR Table V-2) does not provide the basis for the conclusion that "this SR is now considered met at CC-II" nor was there a basis provided for how it was concluded that the treatment of instrumentation in the Fire PRA model does not impact delta risk. Provide justification for these conclusions, specifically addressing how undesired operator actions were evaluated, the results of this evaluation, and how these results were incorporated in the Fire PRA model.

Duke Energy Response:

e) The component selection calculation was updated to address the peer review F&O. The peer review comment associated with this finding was: "In order to meet CCII, HEPs for instrumentation failures would need to be developed." Capability Category (CC) II of SR HRA-B4 requires that the FPRA model include HFEs for cases where fire-induced instrumentation failure of any single instrument could cause an undesired operator action. This SR is considered met at CC-II because the instrumentation study, which included a review for errors of commission, determined that there were no HFE cases to model involving a single fire-induced instrument failure which leads to an undesired action. No single instruments were identified that would cause an undesired operator action without first taking one or more confirmatory actions. After the peer review, the component selection calculation was also enhanced to provide details on the reviewer qualifications. For example, both reviewers were SRO licensed with extensive experience in plant systems and plant operations. The revision also highlighted that operations staff respond to routine plant duties and to plant events based on confirmatory indications such as redundant instrumentation and independent measurements per the Conduct of Operations Procedure for Event Free Human Performance. This SR, HRA-B4, is considered met at CC-II for the reasons described above. The delta risk conclusions with respect to the RG 1.174 acceptance thresholds are not impacted.

**PRA RAI 2**

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, Revision 2, as providing methods acceptable to the staff for adopting a fire protection program consistent with NFPA-805. RG 1.200 describes a peer review process utilizing an associated ASME/ANS standard (currently ASME/ANS-RA-Sa-2009) as one acceptable approach for determining the technical adequacy of the PRA once acceptable consensus approaches or models have been established. The primary results of a peer review are the F&Os recorded by the peer review and the subsequent resolution of these F&Os.

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

f) The dispositions to F&O IE-02 and IE-C14 concludes that any additional risk would be small and would not have a significant impact on the Fire PRA results or results for the NFPA-805 application. Define what is meant by small and non-significant impact. The response should address small and non-significant in the context of both the RG 1.174 risk guidelines for transition and the post-transition change evaluation criteria, which is two orders-of-magnitude less than the RG 1.174 risk guidelines for Region II.

g) AS-04: The peer review Finding is that seal injection cooling must be restored within 15 minutes or seal failure may occur, which apparently was not accounted for in the PRA model at the time for scenarios in which control was transferred to the Safe Shutdown Facility (SSF). It is unclear how the disposition to the Finding, incorporating the updated WOG2000 seal leakage model and the performance of MAAP runs that determined that core uncovery time is less than 3 hours, addresses the Finding. Provide further explanation for how the PRA model was updated to address the peer review Finding.

h) TH-02: The disposition to this F&O concludes that difference in the time to core damage is not significant when using either 2000 Deg F or 4000 Deg F "because the exothermic nature of the zircaloy-water reaction rapidly increases the fuel temperature." Relatively small changes in "the time available for human recoveries or other nonrecovery events such as loss of offsite power recoveries" could change the likelihood of some events. Provide further clarification on the difference in the time available and what is meant by not significant and negligible impact. The response should address not significant and negligible in the context of both the RG 1.174 risk guidelines for transition and the post-transition change evaluation criteria, which is 'two orders-of-magnitude less than the RG 1.174 risk guidelines for Region II.

i) QU-02: The disposition to this F&O addresses the broader issue of lack of a systematic process for applying recovery rules, however, the specific example wherein one Unit 2 nuclear service water (RN) pump is always assumed to be available for cross-tie to Unit 1, even during Modes 5 and 6 at Unit 2, is not addressed. Clarify if unavailability of the Unit 2 RN pump is now appropriately accounted for in the modeling of the cross-tie to Unit 1, and vice-versa. If not, provide justification for the treatment of this cross-tie in the PRA model and the implications of this treatment on the risk and delta risk results reported in the LAR.

j) HR-01: The disposition to this F&O concludes that the absence of miscalibration errors in the PRA model is not significant to the FPRA results based on the results of a sensitivity study adding four miscalibration events to the PRA. Provide further justification for this conclusion, including discussing why modeling just the four miscalibration events in the sensitivity study is a reasonable representation of potential miscalibration errors at MNS. The response should characterize what is meant by not significant impact in the context of both the RG 1.17 4 risk guidelines for transition and the post-transition change evaluation criteria, which is two orders-of-magnitude less than the RG 1.174 risk guidelines for Region II.

k) F&Os DE-04 and DA-05: Address the following regarding common cause failure (CCF) modeling in the PRA model:

   iv. The disposition to SR DA-05 indicates that a single CCF event is utilized that combines the various combinations of failures. It is not clear how this approach is implemented and if it impacts the FPRA for situations when a CCF and a fire failure may be combined in a fire scenario. Provide justification that the CCF modeling methodology does not underestimate the fire risk.

   v. Clarify if the updated CCF modeling made in response to these F&Os was incorporated in the Fire PRA risk results reported in the LAR. If not, provide further justification for the conclusions for various SRs that there is no impact to the FPRA or NFPA-805 from the CCF modeling changes or that CCF is not a significant contributor to fire risk. The response should address not significant in the context of both the RG 1.17 4 risk guidelines for transition and the post-transition change evaluation criteria, which is two orders-of- magnitude less than the RG 1.174 risk guidelines for Region II.

l) SR HR-D6: The status of this SR is reported as "open" and the disposition states "the HRA values have been updated to mean values during the Fire PRA development." The disposition further states that "the suggested data refinement is not expected to have a significant impact on applications." Clarify what the "suggested data refinement" issue is from the 2008 self-assessment, and how the disposition resolves the issue, and why the issue is considered to be an "open" item. If further changes to the PRA are necessary to resolve the issue, discuss their potential impact to the Fire PRA and results reported in the LAR.

m) SR HR-G6: The 2013 self-assessment concludes that this SR is not met and the status of this SR is reported as "open." The disposition further states that a meeting will be conducted with the PRA model integrator, the human reliability analysis (HRA) specialist and plant operators to perform a formal consistency check of the post-initiator human error probability quantifications. Clarify if this action has been completed and, if so, discuss the results of the review and if it resulted in any PRA model changes. If changes to the PRA were necessary to resolve the issue, discuss their potential impact to the FPRA and results reported in the LAR.

Duke Energy Response:

f) F&O IE-02 identified the fact that the impact of switchgear room HVAC dependencies were not modeled in the PRA or FPRA. Since the issuance of the F&O, room heat-up analyses were performed for the switchgear rooms, battery rooms, and the control room. The results of these analyses show that equipment in these rooms will not be adversely impacted by the loss of HVAC over the 24-hour mission time. Therefore, there is no impact on the FPRA results or the NFPA 805 transition risk.

   F&O IE-C14 identified that credit may have been given to Motor Operated Valves (MOVs) that will not function under the differential pressure conditions that result from

ruptured check valves. Specifically, it is concerned with reliance on Safety Injection System (NI) MOVs NI-173A and NI-178B to close under beyond analyzed differential pressure conditions if redundant Reactor Coolant System (NC) cold leg check valves were to rupture. Since the issuance of the F&O, MNS emergency operating procedures have been modified to provide direction for operators to reduce the differential pressure across these valves to the point where the valves will close. This procedure change addresses the F&O. However, the procedure change requires updating of the Interfacing System Loss of Coolant Accident (ISLOCA) modeling to account for the additional operator action required. This updated modeling will be incorporated into the model used in developing the response to PRA RAI 3.

g) F&O AS-4 asserts that if seal injection is restored after 15 minutes of a loss of all seal cooling, this could thermally shock the seals and induce a seal Loss of Cooling Accident (LOCA). The F&O recommends considering this scenario for addition to the PRA.

   To investigate the sensitivity of the Reactor Coolant Pump (RCP) seals to the time of seal injection restoration, an analysis was performed. Normally, seal injection would be restarted within 10 minutes per plant procedures. However, the analysis considered four cases for seal injection restorations times of 15, 20, 25 and 30 minutes following a loss of all seal cooling. The analysis determined that the stresses induced in the No. 1 seal faces during the heatup and cooldown phases of the transient would not result in thermal shock. The potential for significantly increased leakage through the No. 2 seal was also examined. It was determined that the seal would remain closed in the face rubbing mode and prevent increased leakage.

   The median response time for restoration of seal cooling is 7.5 minutes (which includes transfer of control to the SSF). Restoration of seal cooling after 30 minutes is not expected, as plant procedures do not direct restoring cooling to hot seals. Thus, it is concluded that the thermal shock scenario need not be added to the PRA.

h) Based on a review of the thermohydraulic (TH) runs performed in support of success criteria and HRA timing analysis for an update to the MNS PRA, there is no impact on the results if core damage is defined as 2000°F as F&O TH-2 describes. There was no change in the success criteria. Also, the new plant specific HRA timing analysis bounded the HRA timing used in the FPRA with respect to the core damage definition of 2000°F.

i) A preliminary analysis was performed to assess the sensitivity of the FPRA results to the consideration of the unavailability (during outage and online conditions) of RN from the opposite unit. The results showed a small increase in FPRA risk. Therefore, this modeling change will be evaluated as part of MNS PRA RAI 03.

j) This RAI points out that the F&O disposition for this issue does not include the justification for modeling only four miscalibration events in a sensitivity to address the issue. The justification is provided below.

   The four miscalibration events were identified through a screening process, consistent with the PRA standard, starting with an extensive list of potential miscalibration events. The screening process and results are documented in Appendix F of the McGuire HRA analysis (MCC-1535.00-00-0020 Rev.1). The following are some elements of the screening process: Miscalibration activities related to the reactor trip signals are not modeled since they would be far less than 1% of the total trip failure probability and thus are not required to be modeled per PRA Standard supporting requirement SY-A15. For signals that are simply generated by relay contacts due to loss of voltage across the relay coil, miscalibration is deemed not to be a significant contributor to signal failure. Miscalibration is therefore not to be modeled for the signals such as loss of offsite power/4 KV bus undervoltage. Based on ASME/ANS PRA Standard requirement HR-

B2, which states that activities that could simultaneously have an impact on multiple trains of a redundant system or diverse systems should not be screened out, four miscalibration activities were screened in for consideration.

A sensitivity study was performed that added the four miscalibration events to the internal events model which is the model that the FPRA is based on. The resulting impacts on CDF and LERF are two orders-of-magnitude less than the RG 1.174 risk guidelines for Region II. Additionally, a sensitivity study was performed that added these four events to the MNS FPRA. There was a negligible (i.e., several orders of magnitude below the RG 1.174 criteria for Region II) impact on the FPRA base risk values for CDF and LERF. The resulting change in fire risk was less than the post transition change evaluation criteria of 1E-07 for CDF and 1E-08 for LERF.

k) iv. In response to F&O DA-D5, the system fault trees were reviewed and the following list of common cause basic events were identified and quantified. These events were added to the internal events PRA model, which was used as the framework for developing the FPRA model. This successfully addresses the concerns identified by the F&O.

DC Power (Batteries)

| CCF Event | Description |
|---|---|
| DDABAT4COM | Common Cause Failure of Batteries EVCA, EVCB, EVCC, & EVCD |
| DDA00ABCOM | Common Cause Failure of Batteries EVCA & EVCB |
| DDA00ADCOM | Common Cause Failure of Batteries EVCA & EVCD |
| DDA0ABCCOM | Common Cause Failure of Batteries EVCA, EVCB, & EVCC |
| DDA0ABDCOM | Common Cause Failure of Batteries EVCA, EVCB, & EVCD |
| DDA0BCDCOM | Common Cause Failure of Batteries EVCB, EVCC, & EVCD |
| DDA0ACDCOM | Common Cause Failure of Batteries EVCA, EVCC, & EVCD |
| DDA00CDCOM | Common Cause Failure of Batteries EVCC & EVCD |

Diesel Generator / 4kV Power

| CCF Event | Description |
|---|---|
| JFDPMPSCOM | Common Cause Failure of Fuel Oil Transfer Pumps to Run |
| JFDPMPRCOM | Common Cause Failure of Fuel Oil Transfer Pumps to Start |
| JDGET01COM | Common Cause Failure of 4KV Feed Breakers To Open (ETA-1, ETB-1) |
| JDGET14COM | Common Cause Failure of D/G Output Breakers To Close |
| JSFFUELCOM | Common Cause Failure of Both EDGs and SSF Diesel (Fuel Delivery) |

RN Pumps and Strainers

| CCF Event | Description |
|---|---|
| WRN04PRCOM | Common Cause Failure of All (4) McGuire RN Pumps To Run |
| WRN04STCOM | Common Cause Failure of All (4) McGuire RN Pump Strainers |

ECCS Valves

| CCF Event | Description |
|---|---|
| INIOCLACOM | Common Cause Failure of Safety Injection (NI) Check Valves From Cold Leg Accumulators To Open |
| ININCCKCOM | Common Cause Failure of Common Primary Check Valves To Open |
| ININICKCOM | Common Cause Failure of NI Injection Check Valves To Open |
| LNDCLCVCOM | Common Cause Failure of Residual Heat Removal (ND) Cold Leg Injection Check Valves To Open |

v. Yes, the updated CCF modeling, represented by the events identified in the response to the previous RAI sub-question, has been incorporated in the FPRA risk results reported in the LAR.

l) The "suggested data refinement" from the 2008 self-assessment was to use mean HEP values instead of median values. This was an open issue with respect to the MNS Rev. 3a internal events model; however, it was addressed in the FPRA model (i.e., mean HEP values were used). Thus for the FPRA, SR HR-D6 is met.

m) A consistency check meeting the requirements of SR HR-G6 for the post-initiator HEP quantifications has been completed. Based on the results of the review, the post-initiator HEP quantifications are reasonable. Therefore, PRA model changes resulting from the review are not necessary.

**PRA RAI 6**

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

LAR Section 4.7.3 explains that the sources of uncertainty in the FPRA were identified and specific parameters were analyzed for sensitivity in support of the NFPA-805 FRE process. It is further explained that during the Fire Risk Evaluation process, the uncertainty and sensitivity associated with specific FPRA parameters were considerations in the evaluation of the change in risk relative to the applicable acceptance thresholds. Based on these explanations it is apparent that the risk results presented in Attachment W of the LAR are point estimates and do not include parameter uncertainty. Explain how SOKCs were taken into account in the FPRA quantification, including fire ignition frequencies, circuit failure likelihood and hot short duration, and non-suppression probabilities. If SOKC for these parameters were not accounted for in the Fire PRA quantification, then include the impact of the SOKC for these parameters in the integrated analysis performed in response to PRA RAI 3.

Duke Energy Response:

The MNS FPRA uncertainty analysis treated the initiating events as independent events, and therefore does not account for correlations unique to specific ignition frequency bin types. The uncertainty specific to hardware failure rates are correlated. Uncertainties were applied to the various sub groups of altered events and hot short duration events, however; these and the non-suppression probabilities did not have any correlation addressed in the uncertainty analysis.

In support of the MNS PRA RAI 03 response, the uncertainty analysis is being updated to account for SOKCs for circuit failure likelihood, hot short duration, severity factors and non-suppression probabilities. Addressing SOKC for fire initiating events is not necessary because there is only one fire ignition event per each cutset. The altered events (circuit failure likelihood, and hot short duration) uncertainty bands will come from NUREG/CR-7150. The uncertainty analysis update will address these factors as necessary. SOKC would only need to be addressed for severity factors and non-suppression probabilities if there is more than one severity factor or non-suppression probability in a cutset. Refer to MNS PRA RAI 3 for impact on results.

**PRA RAI 7.d**

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

LAR Attachment G identifies three categories of operator manual actions [OMA(s)] in post-fire procedures: (1) recovery actions (RAs) to reduce risk, (2) RAs required for DID, and (3) actions associated with VFDRs but are screened out due to no or very low risk and are not considered recovery actions. Provide the following regarding these screened actions:

d) Explain how the screened-out OMAs will be treated in the post-transition fire procedures. If they will be retained in the procedures, clarify that they have been evaluated for adverse impact on the PRA (e.g., the HRA/feasibility analysis of RAs considered these OMAs in development of timing, operator availability, etc.).

Duke Energy Response:

d) In addition to the evaluation of risk presented by the use of RAs per Section 4.2.4 of NFPA 805, a review was performed to determine those OMAs (from the fire response procedure) that could have an adverse impact on plant risk. As part of the evaluation, the procedure actions were reviewed to determine if an adverse risk impact exists. The review looked for actions that are generally preemptive in nature and have the undesired effect of essentially removing potentially non-fire affected equipment from service that may otherwise be available for crediting in one or more fire scenarios. No such adverse actions were identified during the fire risk evaluations. The actions in this third category (i.e., not required for Risk or Defense-In-Depth), are candidates for deletion from fire response procedures.

**PRA RAI 9**

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

LAR Attachment V Section V.2.1 states that the "The MNS Fire PRA does not employ any unreviewed analysis methods as identified in NRC Letter dated June 21, 2012" (ADAMS Accession No. ML12171A583). Indicate if any other methods were employed that deviate from guidance in NUREG/CR-6850 or other acceptable guidance (e.g., FAQs or interim guidance documents). If so, describe and justify any proposed method that deviates from NRC guidance, or replace the proposed method with an accepted method. Also, include the proposed method as a method "currently under review" as part of the integrated analysis in the response to PRA RAI 3.

Duke Energy Response:

No unreviewed methods or deviations from NUREG/CR-6850 (or other acceptable guidance) were utilized in the FPRA model development. As indicated in responses to PRA RAI Nos. 16 and 22, not all FPRA FAQs have been formally incorporated into the FPRA. Analysis refinements that are not considered unreviewed methods or deviations from NUREG/CR-6850 but required clarification or additional justification have been addressed in response to specific RAIs (e.g., PRA RAI 1c, PRA RAI 19, and PRA RAI 20). Any potential impact on the total CDF/LERF and delta risk results is to be further assessed in the integrated analysis performed in response to PRA RAI 03.

**PRA RAI 10**

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

LAR Section V.2.2 states that reduced circuit failure probabilities for circuits with control power transformers (CPTs) was not credited in the FPRA. Recently, new guidance on using conditional probabilities of spurious operation for control circuits was issued by the NRC in Section 7 of NUREG/CR-7150, Volume 2. This guidance included: a) replacement of the conditional hot short probability tables in NUREG/CR-6850 for Option #1 with new circuit failure probabilities for single break and double break control circuits, b) Option #2 in NUREG/CR-6850 is not an adequate method and should not be used, c) replacement of the probability of spurious operation duration figure in FAQ 08-0051 for AC control circuits, d) aggregate values for circuit failure probabilities should be used unless it is demonstrated that a cable is only susceptible to a single failure mode, e) incorporation of the uncertainty values for the circuit

failure probabilities and spurious operation duration in the SOKC for developing the mean CDF/LERF, and f) recommendations on the hot short probabilities to use for other cable configurations, including panel wiring, trunk cables, and instrument cables. Provide an assessment of the assumptions used in the McGuire FPRA relative to the updated guidance in NUREG/CR-7150, Volume 2, specifically addressing each of these items. If the FPRA assumptions are not bounded by the new guidance provide a justification for each difference or provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03, utilizing the guidance in NUREG/CR-7150.

Duke Energy Response:

An assessment of each of the items listed in this RAI is provided below.

Item a: Replacement of the conditional hot short probability tables in NUREG/CR-6850 for Option #1 with new circuit failure probabilities for single break and double break control circuits.

Response: The conditional hot short probabilities in the MNS FPRA have either been updated to the appropriate circuit failure probabilities for single break or double break control circuits in NUREG/CR-7150 Vol. 2, or have been confirmed to bound the NUREG/CR-7150 values. All updated values will be included in the updated risk results as part of the aggregate change-in-risk analysis provided in response to PRA RAI 03.

Item b: Option #2 in NUREG/CR-6850 is not an adequate method and should not be used.

Response: Option #2 of NUREG/CR-6850 was not used in the original MNS FPRA for developing any of the conditional hot short probabilities. Therefore elimination of this option in NUREG/CR-7150 has no impact on the MNS FPRA results.

Item c: Replacement of the probability of spurious operation duration figure in FAQ 08-0051 for AC control circuits.

Response: The MNS FPRA applied a probability value of 0.06 for a hot short duration of greater than 15 minutes. This value bounds the values in Table 6-3 of NUREG/CR-7150 for both AC circuits (7.10E-03) and DC circuits (2.2E-02). However, in most cases, this value has been updated to the new value from NUREG/CR-7150. For all cases where credit has been taken in the MNS FPRA for components which need to be recovered in less than 15 minutes, the values used have been updated using probability values in NUREG/CR-7150. All updated values will be included in the updated risk results as part of the aggregate change-in-risk analysis provided in response to PRA RAI 03.

Item d: Aggregate values for circuit failure probabilities should be used unless it is demonstrated that a cable is only susceptible to a single failure mode.

Response: The conditional hot short probabilities in the MNS FPRA have either been updated to the appropriate aggregate circuit failure probabilities for single break or double break control circuits in NUREG/CR-7150, have been confirmed to bound the NUREG/CR-7150 aggregate values, or it has been demonstrated that the cable is only susceptible to a single failure mode. All updated values will be included in the updated risk results as part of the aggregate change-in-risk analysis provided in response to PRA RAI 03.

Item e: Incorporation of the uncertainty values for the circuit failure probabilities and spurious operation duration in the SOKC for developing the mean CDF/LERF.

Response: Uncertainty values for circuit failure probabilities and spurious operation duration will be incorporated into the updated SOKC analysis provided in response to PRA RAIs 06 and 03.

Item f: Recommendations on the hot short probabilities to use for other cable configurations, including panel wiring, trunk cables, and instrument cables.

Response: Section 7.4 of NUREG/CR-7150 provides recommendations for conditional hot short probabilities for panel wiring, trunk cables, and instrument cables. For panel wiring and trunk cables, Section 7.4 recommends the use of the aggregate values from the tables in section 4 and 5 of the NUREG. The conditional hot short probabilities in the MNS FPRA for trunk cables and panel wiring have either been updated to the appropriate aggregate circuit failure probabilities, or have been confirmed to bound those values. For instrument cables, the MNS FPRA assumed that the instrument cable fails to the worst-case state whenever impacted by a fire. No conditional probabilities have been applied. All updated values will be included in the updated risk results as part of the aggregate change-in-risk analysis provided in response to PRA RAI 03.

**PRA RAI 11**

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

LAR Section V.2.6 indicates that only Bins 4 and 15 are applicable to the fire ignition frequency sensitivity analysis. For each of the other Bins having an alpha of less than or equal to 1, provide the basis for concluding that each does not impact the VFDR delta risk results.

Duke Energy Response:

PRA FAQ 08-0048 communicated the NRC's acceptance of the updated frequencies provided a sensitivity study was performed to address the differences in risk and delta-risk results. This provision was limited to the bins with an alpha of less than or equal to 1. Besides Fire Event Bins 4 and 15, Bins 1, 9, 11, 13, 22, and 31 have alphas less than or equal to 1. Bin 1 (battery) fire scenarios are limited to loss of the battery itself and were not associated with any VFDRs. PRA FAQ 08-0048 noted that a sensitivity analysis need not be performed for Bin 9. Bin 13 was not used in the MNS FPRA. Bins 11 & 31 were grouped with Bins 24 & 36, respectively, in transient hotwork fire scenarios which were not associated with any VFDRs. Similarly, Bin 22 was only applied to 'A' case scenarios (fire area burnout) for Fire Area 22 and 23 which generated zero VFDR delta risk and therefore was not associated with any VFDRs.

**PRA RAI 16**

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, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC staff or acceptable methods that appear to have been applied differently than described require additional justification to allow the NRC staff to complete its review of the proposed method.

In regard to modeling fire damage to sensitive electronics, neither Appendix H of the LAR or the licensee's procedures refer to use of FAQ 13-0004, "Clarifications on Treatment of Sensitive Electronics", dated December 3, 2013 (ADAMS Accession No. ML13322A085). Describe the treatment of sensitive electronics for the FPRA and explain whether it is consistent with the guidance in FAQ 13-0004, including the caveats about configurations that can invalidate the approach (i.e., sensitive electronic mounted on the surface of cabinets and the presence of louver or vents). If the approach is not consistent with FAQ 13-0004, justify the approach or replace the current approach with an acceptable approach in the integrated analysis performed in response to PRA RAI 3.

Duke Energy Response:

In the MNS FPRA, when a target cabinet is within the ZOI of another ignition source (based on thermoset cable damage criteria), its contents are assumed to fail with no credit for the protection provided by the enclosure. This methodology is consistent with FPRA FAQ-13-0004 for addressing damage to sensitive electronics mounted inside the cabinet due to heat flux exposure to the cabinet (i.e., the thermoset damage criterion applies to sensitive electronics protected by the enclosure). For cabinets which contain sensitive electronics mounted inside them, which are outside the ZOI of the ignition source but which have louvers, the impact of a HGL on the sensitive electronics was assessed per the FAQ. The MNS FPRA HGL analysis expands the ZOI for a given ignition source based on the expected maximum HGL temperature prior to fire brigade response, to account for the reduced critical heat flux given the higher ambient temperature caused by the HGL. That is, less heat flux is required from the ignition source to cause damage to the target, so the ZOI from the ignition source is increased. Initially, the time for the upper layer HGL temperature to reach 80 °C is determined. If the expected fire brigade response time is greater than the time for the HGL to reach 80 °C (i.e., an 80 °C HGL will occur), the ZOI for the ignition source is increased. This same approach applies to sensitive electronics, except that a 65 °C threshold would apply. However, the initial 80°C evaluation is based on the upper gas layer temperature reaching 80°C, not the gas layer temperature at the target. This is done since cables are often located near the ceiling of a room such that they would be in the upper gas layer. However, this is conservative relative to sensitive electronic equipment in cabinets which are located well below the upper layer. That is, an 80°C temperature in the upper gas layer would result in a lower temperature at a target farther from the ceiling. Further, the protection provided by the enclosure (even considering the louvers) provides some additional time for the interior of the floor mounted cabinets to reach the temperature of the HGL that it is immersed in. Given this, the difference between the 80°C used in the initial evaluation and the 65°C damage criterion for sensitive electronics is considered to have a negligible impact on the actual time to damage for sensitive electronics contained within cabinets.

The above discussion does not apply to sensitive electronics mounted on the outside of cabinets, or those which penetrate the cabinet surface. In order to address these, MNS used a successive screening approach to identify such equipment. The result of this was the identification of electronic equipment that is mounted on the outside of cabinets or which penetrate the cabinet surface. The majority of these are located in the MCR. No specific

treatment of these is required since the impact on sensitive electronics located in the MCR is adequately addressed with the MCR abandonment scenarios. Electronics mounted on the outside of cabinets or which penetrate the cabinet surface, and which are located outside the MCR, will now be assumed to be targets for nearby ignition sources having a direct line of sight to the device(s) based on the lower recommended critical radiant flux of 3 $KW/m^2$ in the FAQ. Any additional or updated fire scenarios resulting from use of this lower critical radiant heat flux will be included in the updated risk results as part of the aggregate change-in-risk analysis provided in response to PRA RAI 03.

**PRA RAI 19**

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 Fire PRA and endorses, with exceptions and clarifications, NEI 04-2, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC staff or acceptable methods that appear to have been applied differently than described require additional justification to allow the NRC staff to complete its review of the proposed method.

The licensee's analysis appears to indicate that fires within some Bin 15 cabinets above 440V [e.·g., motor control centers (MCCs)], are not assumed to propagate outside of the cabinet. In addition, it is indicated that the damage for some well-sealed MCC fires is limited through the application of a 0.20 severity factor. Guidance in Frequently Asked Question 08-0042 from Supplement 1 of NUREG/CR-6850 applies to electrical cabinets below 440 V. With respect to Bin 15 as discussed in Chapter 6, it clarifies the meaning of "robustly- or well-sealed" when used in conjunction with these lower voltage cabinets. For those cabinets of 440 V and higher, the original guidance in Chapter 6 remains: "Also note that panels that house circuit voltages of 440 V or greater are counted because an arcing fault could compromise panel integrity (an arcing fault could burn through the panel sides, but this should not be confused with the high energy arcing fault type fires)." Therefore, propagation of fire outside the ignition source panel must be evaluated for all Bin 15 panels that house circuits of 440 V or greater.

a) Describe how fire propagation outside of well-sealed cabinets greater than 440 V is evaluated.

b) Clarify under what circumstances the 0.20 severity factor is used, how it is used, and what is the justification.

c) If well-sealed cabinets less than 440 V are included in the Bin 15 count provide justification for using this approach.

<u>Duke Energy Response</u>:

a) Non-power (i.e., non-MCC) electrical cabinets at MNS primarily contain communication, control and instrumentation signals/wiring, yet may contain 600VAC conductors for MOV power, which are only energized during MOV operation. Examples include a limited number of cabinets identified as Terminal Boxes and Area Termination Cabinets. These non-power cabinets are grounded using 2/0 copper cable, or equivalent. Cabinets with back panels or non-conducting plastic panel conduit channels provide additional physical barriers that prevent a short circuit from affecting the back of an electrical cabinet. Given the relatively small gage cables used for MOV power compared to the size of the cabinet ground, the thickness of the cabinet steel, and that the MOV power cables are protected by appropriate fault protection devices (i.e., breakers), the proposed arcing fault (i.e., severe enough in duration and magnitude of current to burn

through the side of one of these cabinets) is not deemed a credible scenario for these non-power electrical cabinets. Therefore, MNS non-power electrical cabinets which are well sealed and robustly secured are evaluated as non-propagating cabinet fires: i.e., fires are not modeled as propagating outside of these cabinets.

Load center and switchgear fires are modeled as propagating outside of the electrical cabinet, even if the cabinet has no observed openings.

Well-sealed and robustly-secured MCCs, which are all 600VAC at MNS, were evaluated as non-propagating cabinet fires. The impact on the total CDF/LERF due to fire propagating outside of well-sealed and robustly-secured MCCs will be further assessed in the integrated analysis performed in response to RAI PRA 3, using the methods outlined in draft Fire PRA FAQ 14-0009, Treatment of Electrical Panels Greater than 440V.

b) For well-sealed MCC severe fire scenarios, all internal spurious actuations that could occur are assumed to occur, followed by a loss of power to the loads fed by the MCC. For the severe MCC fire scenarios, where the assumption of multiple internal spurious actuations and the loss of power was proven to be overly conservative, an assumed 0.20 severity factor was applied. As part of the response to MNS PRA RAI 03, MCC severe fire scenarios will be evaluated as mentioned in part a of this RAI. The 0.2 severity factor will be removed and the internal spurious operations will no longer be assumed. The results of these changes will be evaluated as part of MNS PRA RAI 03.

c) Guidance was provided to the team that binned FPRA ignition sources through plant walkdowns. The ignition source walkdown criteria and results are documented in calculation MCC-1435.00-00-0020, NFPA 805 Ignition Source Walkdown Record, Attachment A. Consistent with NUREG-6850, Section 6.5.6, Bin 15 criteria include (note that this is a partial list):

- Terminal boxes (labeled TB) or unlabeled electrical cabinets with any dimension greater than 6'. (Most TB's are low voltage, typically they are labeled as High Voltage if they have voltage greater than 440 VAC. If labeled as high voltage, they shall be counted).

- Count wall mounted panels not excluded by the rules below. Exclusions:
    - Well sealed, secured doors, less than 440V and less than 4 switches or lights

Upon review, wall-mounted electrical cabinets that are well sealed, robustly secured, and housing circuits below 440V have been identified as having been included in Bin 15. The walkdown guidance, to count wall-mounted panels unless specific exclusion criteria are met, introduced a bias to include wall-mounted cabinets in Bin 15 when the voltage values of the circuits contained in any given electrical cabinet were not readily known. A portion of these cabinets, representing approximately one percent (1%) of the total non-MCC Bin 15 count, have been evaluated as ignition sources in the FPRA, and therefore, have contributed risk and insights to the FPRA results. While MNS acknowledges that a larger population of Bin 15 cabinets inherently results in a lower per-cabinet Bin 15 fire frequency, the resulting FPRA has captured additional risk and insights that may otherwise have been excluded, resulting in a more thorough and robust PRA.

Large floor mounted cabinets were included in Bin 15, regardless of voltage contained within the cabinet. NUREG-6850, Section 6.5.6, states that well-sealed electrical cabinets that have robustly secured doors (and/or access panels) and that house only circuits below 440V should be excluded from the counting process, yet does not limit this requirement to electrical cabinets that are wall-mounted. Thus, it is not clear whether this guidance must be applied to large floor

mounted cabinets. Likewise, NUREG-6850, Section 6.5.6, states that free-standing electrical cabinets should be counted by their vertical segments, but does not limit this requirement to electrical cabinets housing circuits 440V or greater. Thus, it is not clear whether this guidance must be applied to free-standing cabinets housing circuits below 440V. Additionally, NUREG-6850, Section 6.5.6, states that an average number of vertical segments may be used for such cabinets as motor control centers and DC distribution panels. Typical DC distribution panels, including all at MNS, house circuits less than 440V, implying that free-standing electrical cabinets are to be included in Bin 15 without any consideration given to voltage values. Therefore, large floor mounted cabinets at MNS are included in Bin 15, without consideration given to the voltage values contained within these cabinets.

Several FPRA fire scenarios have been analyzed for floor mounted cabinets that are well sealed and robustly secured, and house circuits below 440V. These cabinets scenarios include, but are not limited to, multiple DC power panelboards and distribution centers, as well as several Area Termination Cabinets (ATCs). ATCs are non-power (i.e., non-MCC) electrical cabinets that contain communication, control and instrumentation circuits. The analyzed DC panelboard and distribution centers plus ATCs represent over three percent (3%) of the total non-MCC Bin 15 count.

The potential impact of the per-cabinet Bin 15 fire frequency on the FPRA results will be further assessed in the integrated analysis performed in response to RAI PRA 3.

**PRA RAI 20**

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, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC staff or acceptable methods that appear to have been applied differently than described require additional justification to allow the NRC staff to complete its review of the proposed method.

A severity factory of 0.20 is applied to all MCA scenarios "to account for the probability that only 1 in 5 fires are expected to challenge the zone boundary." This is an industry average-type factor that does not account for the design-specific considerations and potential for hot gas layer (HGL) formation at MNS. In addition, a barrier failure probability of 7.4E-03 is also applied to all MCA scenarios, which only accounts for the barrier having the highest probability of failure (e.g., non-rated barrier, door, damper, or wall)."

a) Is the 0.20 factor only applied when there is a rated fire barrier? If not provide further justification of the use of any factor.

b) Provide justification for the use of the single barrier failure probability appropriately accounting for the MNS-specific design and potential for HGL formation potential in the MCA, or provide updated risk results as part of the aggregate change-in-risk analysis requested in PRA RAI 03 without the severity factor and summing the barrier failure probabilities for each type of barrier present per NUREG/CR-6850.

Duke Energy Response:

a) The 0.2 factor relates to the frequency of a potential multi-compartment analysis (MCA) scenario and is not related to the fire barrier rating. As described in Section 11.5.4 of NUREG/CR-6850, a screening process was used to eliminate certain compartments from MCA consideration. Initially, the compartments where a damaging HGL cannot be generated were screened from MCA consideration. For the remaining compartments

where a damaging HGL is possible, the additional screening criteria of ignition frequency, combined severity factor and non-suppression probability, and barrier failure probability were applied. The 0.2 factor was multiplied by the entire ignition frequency for each compartment to account for the fact that many ignition scenarios cannot generate a hot gas layer.

In response to this RAI, the actual ignition source frequency contribution to HGL scenarios was developed. As a result of this effort, it was determined that for many of the compartments, the actual frequency for the scenario(s) capable of generating the HRR input into the HGL was less than the assumed 0.2 "initial term". However, for the following fire areas it was determined that a higher scenario frequency than the 0.2 "initial term" should be used:

- The Diesel Generator rooms (FA 5, 6, 7, & 8) would increase from 0.2 to 0.49.
- The switchgear HVAC rooms (FA 17A & 18A) would increase from 0.2 to 0.25.
- The cable rooms (FA 19 & 20) would increase from 0.2 to 0.45.

b) In response to this RAI, the barrier failure term was increased to the sum of the barrier failure probabilities for each type of barrier present per NUREG/CR-6850 (door, damper, and wall/penetration).

In summary, the MCA has been updated to include consideration of a compartment specific "initial term" and a barrier failure term equal to the sum of the barrier failure probabilities for each type of barrier present. All of the compartments still screen from consideration as potential MCA scenarios.

**PRA RAI 22**

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, Revision 2, as providing methods acceptable to the NRC staff for adopting a fire protection program consistent with NFPA-805. Methods that have not been determined to be acceptable by the NRC staff or acceptable methods that appear to have been applied differently than described require additional justification to allow the NRC staff to complete its review of the proposed method.

The MNS FPRA does not employ junction boxes based on scenario walk downs and due to utilization of armored cables, and therefore there were no Bin 18 fires assumed in the MNS Fire PRA. However, per FAQ 13-0006, it is noted that junction box frequencies should be included for both thermoplastic and thermoset cables as the fire event experience suggests that these fires start due to small arcs generated by bad connections, which is not influenced by the cable insulation or jacket type. Provide further justification for not including junction box fires in the FPRA by specifically addressing the definition and characteristics of junction boxes in FAQ 13-0006. If the apportioning method used is not in conformance with the acceptable methods defined in NUREG/CR-6850 or FAQ 13-0006, provide a detailed justification for the alternate method that includes a discussion of conservatisms and non-conservatisms relative to the accepted methods and assesses the associated impacts on the fire total and delta risk results, or replace the current approach with an acceptable approach in the integrated analysis performed in response to PRA RAI 3.

Duke Energy Response:

MNS has not incorporated FPRA FAQ 13-0006. MNS does not have any enclosures that meet the criteria for a junction box as outlined in FPRA FAQ 13-0006, which states that "cables entering or exiting the junction box should be in metal conduits and have mechanical connections to the metal box." Cables at MNS are not typically routed using conduits. There are no known fully enclosed metal boxes containing terminals for joining or splicing cables to and from which cables are routed in metal conduits. Thus, strictly following the guidance in FPRA FAQ 13-0006 would result in a Bin 18 count of zero (0) at MNS.

This approach is supported further in FPRA FAQ 13-0006, Section 1.0, which states that the definition of a junction box specifically excludes:

- Relatively large termination panels on the floor with high cable loading intended for joining and splicing cables. Specifically, large floor based termination panels are classified as "electrical cabinets" in the generic ignition frequency model and should not be considered junction boxes.

  > Termination panels are typically characterized by high cable loading. Due to the relatively high cable loading, the cables are not routed in or out of the panels with conduits. Instead, cables drop into the panels from cable trays. This configuration is not consistent with the definition of a junction box described earlier.

Given the logic and emphasis that a lack of conduit is the basis for excluding relatively large termination panels, because that configuration is not consistent with the definition of a junction box, the Bin 18 count at MNS of zero (0) is confirmed to be appropriate.

While applying the guidance in FPRA FAQ 13-0006 in such a strict manner may appear to be overly restrictive, strict adherence to the definition of a Junction Box, as defined in FPRA FAQ 13-0006, allows the Bin 18 frequency and the recommended analytical methodology to be properly applied in the FPRA. This includes the stated treatment of junction box scenarios/fires as self-contained fires that do not spread outside of the junction box. FPRA FAQ 13-0006, Section 3.0 [Selection and Definition of Junction Box Fire Scenarios] states that "...In effect, this approach assumes that the zone of influence for these fires is equal to the junction box only."

Taking a less narrow approach to the Bin 18 counting guidance, the impact of including splice boxes and small Terminal Boxes (identified as 1/2TBxxxx, and 1/2ATBxxxx throughout MNS) as Bin 18 Junction Boxes is further examined below.

Less than 100 cables were noted in the MNS cable database as being spliced. Additionally, a handful of splice boxes were identified during plant walkdowns to address this RAI. This low count of splice boxes is an appropriate indication that very few cables have been spliced at MNS, consistent with EQ-2.02, Electrical Criteria for Field Splicing, which states in Section 5.1 that "Cable systems should be designed such that cable runs between pieces of equipment are one continuous length of cable." The extensive use of flexible armored cable at MNS has allowed the vast majority of cables to be run as continuous lengths of cable, thus virtually eliminating the need for splice boxes at MNS. The majority of the spliced cables at MNS, both identified in the MNS cable database and by walkdowns, were not associated with circuits credited in the FPRA. The few that are in the FPRA database have an insignificant impact on the quantification of fire risk.

Relatively small Terminal Boxes throughout MNS were included in Bin 15, Electrical Cabinets. MCC-1535.00-00-0101, FPRA Partitioning and Frequency Calculation, states:

> Junction boxes (BIN 18) were not counted during the ignition source walkdown, and ...based on subsequent scenario walkdowns and due to utilization of armored cables, it can be concluded that MNS does not employ junction boxes. Consequently, there is no equipment assigned to Bin 18.

MCC-1535.00-00-0101, FPRA Partitioning and Frequency Calculation, includes Assumption 5, which states "...based on the subsequent scenario walkdowns and due to utilization of armored cables, it can be concluded that MNS does not employ junction boxes." This assumption addresses unlabeled splice boxes, vs. labeled Terminal Boxes. A more thorough discussion of Assumption 5:

- The use of armored cable at MNS allows cables to be more easily routed from end point to end point. Since conduit is rarely used at MNS, there is no need to pull cables through conduit, and therefore, the need to splice cables is greatly reduced. One of the characteristics of junction boxes included in FPRA FAQ 13-0006 is that "cables entering or exiting the junction box should be in metal conduits and have mechanical connectors to the metal box." This characteristic acknowledges that a junction box, as defined for FPRA applications in FPRA FAQ 13-0006, is to be associated with the use of metal conduits. Assumption 5 is consistent with this statement in FPRA FAQ 13-0006 by expressing that the absence of metal conduits at MNS is an indication of the absence of junction boxes.

- Assumption 5 is not intended to address the type of insulation used on cable conductors at MNS. The use of armored cables at MNS is not intended to be used as a surrogate phrase for thermoset cables, as discussed in FPRA FAQ 13-0006. Assumption 5 is not intended to justify that the use of armored cables or thermoset insulation would eliminate the occurrence of Bin 18 fires inside Junction Boxes.

Eliminating all identified concerns with splice boxes still leaves the question of whether small Terminal Boxes (found as 1/2TBxxxx, and 1/2ATBxxxx throughout MNS) should be treated as Bin 18 Junction Boxes. As previously discussed, a Bin 18 Junction Box was interpreted to strictly mean a splice box at MNS. Thus, terminal boxes have been treated as Bin 15 Electrical Cabinets. This treatment could result in two (2) potentially non-conservative impacts upon the FPRA.

The first impact is that the fire scenarios involving Bin 15 ignition sources that could have been designated as Bin 18 ignition sources would potentially have a higher event frequency, and therefore, the overall FPRA risk would actually be higher. This is considered a "direct impact" on the FPRA. See Note 1 below regarding the designation of Bin 15 vs. Bin 18 for certain ignition sources housing circuits between 440V and 1000V.

Of the Bin 15 electrical cabinets (i.e., Bin 15 count, which includes multiple vertical sections for large cabinets, Motor Control Centers, etc.), approximately 10% of these cabinets are labeled/named either Area Terminal Boxes or Terminal Boxes (hereafter, TBs) at MNS. Of these TBs (i.e., 10% of Bin 15 electrical cabinets), which could therefore potentially be placed in Bin 18, only approximately 25% have been analyzed as unique scenarios, or were included in full compartment burn scenarios: i.e., approximately 2.5% of the total Bin 15 population. The rest of these boxes/cabinets (i.e., approximately 75% of TBs) did not have any FPRA significant cables or components in them, and therefore, would have no direct impact on the FPRA. Of the TBs that have been analyzed as unique scenarios, or were included in full compartment burn scenarios (i.e., approximately 2.5% of the total Bin 15 population), more than half do not qualify as Bin 18 sources due to (a) having electrical components other than terminals or splices, or (b)

because 600V power is routed through the box. Thus, of the total Bin 15 population, only approximately one percent (1%) of these sources both (a) contribute to risk in the FPRA, and (b) could potentially be moved to Bin 18. Because none of these TBs are significant contributors to the overall plant FPRA, even if the event frequency of these sources were changed by being placed in Bin 18, the impact on the MNS FPRA is not expected to be significant.

The second impact, considered an "indirect impact," is that including all TBs in Bin 15, versus Bin 18, could have diluted the Bin 15 fire frequency such that the FPRA results are impacted in the non-conservative direction. Given that:

a) only approximately 10% of the total Bin 15 count is made of TBs that could potentially be counted in Bin 18, and

b) a review of a select population of TBs (i.e., individual Area Terminal Box and Terminal Box scenarios, as described in the previous paragraph) shows that more than half of the risk contributing TBs cannot be placed in Bin 18 due to having electrical components other than terminals or splices, or because 600V power is routed through the box

it is reasonable to estimate that the total Bin 15 count would not be decreased more than five percent (5%) by having followed the guidance found in FPRA FAQ 13-0006 and having placed some Bin 15 ignition sources into Bin 18. This sensitivity analysis (i.e., shift in bin count and any attendant impact on the total CDF/LERF and delta risk results) will be further assessed in the integrated analysis performed in response to RAI PRA 3.

<u>Note 1:</u>

Within the range of 440V to 1000V, following the guidance that is provided in both FPRA FAQ 13-0006 and NUREG/CR-6850 Chapter 6 (Bin 15 discussion) requires a bias for determining whether a particular potential ignition source should be placed in Bin 15 or Bin 18. The guidance in NUREG/CR-6850 Chapter 6 (Bin 15 discussion), that "well-sealed electrical cabinets... that house only circuits below 440V should be excluded from the counting process" implies that a well-sealed and robustly secured cabinet housing circuits above 440V should not be excluded from the counting process (i.e., the Bin 15 count), so should be placed in Bin 15. FPRA FAQ 13-0006 states that "Junction boxes containing high voltage circuits above 1000V... should be treated as electrical cabinets:" i.e., placed in Bin 15, implying that an ignition source that meets all other requirements of Bin 18, and contains circuits less than 1000V, should be placed in Bin 18. Given that there are TBs at MNS which are well-sealed, robustly secured, contain only terminal strips and house 600V circuits, a decision must be made whether to place these TBs in Bin 18 or Bin 15. Because Fire PRA FAQ 13-0006, Section 1.0 states "...exclusion from counting as electrical cabinets does not automatically exclude an item from consideration as a junction box," MNS interprets the guidance as having a bias for Bin 15, vs Bin 18, within the range of 440V to 1000V. Therefore, ignition sources which are well sealed and robustly secured, contain only terminal strips, and house 600V circuits, are placed into Bin 15 at MNS.

# ENCLOSURE 2

## Duke Energy MNS NFPA 805 LAR - Revised Responses to FPE RAI 01, FPE RAI 10, and FM RAI 2.c, and PRA RAI 14

Note: The revised responses to FPE RAI 01, FPE RAI 10, FM RAI 2.c, and PRA RAI 14 replace the responses to those RAIs provided on October 13, 2014.

**FPE RAI 01**

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." 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.

<u>Duke Energy Response</u>:

MNS utilizes a fire brigade where the brigade leader and at least two brigade members of the on-shift fire brigade shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance. This is consistent with NFPA 805 Chapter 3 (Section 3.4.1(c)) and described in fleet procedure AD-EG-ALL-1530, Fire Brigade Training.

An equivalent knowledge of plant systems is provided for under fleet procedure AD-EG-ALL-1530, Fire Brigade Training Program, Section 5.5 and Attachment 3. Attachment 3 specifies the plant systems for a Pressurized Water Reactor (PWR) that represent the minimum plant knowledge for a Non-Licensed Operator fire brigade member or leader to understand the effects of fire and fire suppressants on nuclear safety performance criteria (ref. NFPA 805 Section 3.4.1(c)). Specifics from the procedure are described as follows:

5.5 Fire Brigade Leader Training

1. The Fire Brigade Leader is required to complete:
   - Fire Brigade Leader training
   - An in-plant fire drill as fire brigade team leader
   - Fire Brigade Leader qualification
2. In addition to the fire brigade member training and drill requirements (defined in this procedure), Fire Brigade Leader training should address and emphasize the following objectives:
   - Command structure
   - Roles of Fire Brigade Leader and Fire Chief
   - Command of a fire brigade – Concepts of Incident Command
   - Incident Safety Officer Responsibility
   - Organizational setup for emergency response
   - Coordination of off-site fire company using ICS
   - Managing resources
   - Pre-Incident Information

- Communications
- Site Fire Brigade Standard Operating Guidelines
- Fire brigade checklist and drill review
- Firefighting survival, strategy, and tactics
- Site fire strategies
- Fighting of fires in RCAs and RCZs and potential Radioactive Material Releases
- Case studies of fire incidents (OE)
- Fire Brigade Leader practical to include special problems with fire suppression and leadership

From Attachment 3:

**Fire Brigade Safety Systems Individual System Knowledge List**

| PWR |
|---|
| Reactor Coolant System |
| Steam Generator System |
| Auxiliary Feed System |
| Charging and Volume Control System |
| Residual Heat Removal System |
| Safety Injection System |
| Containment Spray System |
| Component Cooling Water System |
| Emergency Service Water System |
| Electrical System Overview – AC & DC |
| Emergency Core Cooling Systems |

**FPE RAI 10**

NFPA-805, Section 3.3.7.2, requires that "Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings." In LAR Attachment A, the compliance statement for this element is listed as "Complies via Use of EEEE," with a reference to the licensee calculation that should demonstrate compliance of the installed configuration. However, the staff noted that the referenced licensee document does not make a conclusion regarding acceptability. The staff also noted that the text in the compliance basis does not align with the compliance statement for this element.

Therefore, provide:

a. A summary of the calculation which demonstrates the acceptability of the installed configuration, including the key assumptions, results, and acceptance criteria;
b. A revised compliance statement for this NFPA-805 Chapter 3 element which references the correct document; and
c. A revised compliance basis which aligns with the compliance statement.

Duke Energy Response:

An incorrect calculation, MCC-1513.03-00-0001 was referenced in the MNS LAR, Attachment A, Section 3.3.7.2. The correct calculation referenced should have been MCC-1139.01-00-0040, “Missile Barrier - Air Exhaust, Diesel Generator Building”. MNS LAR, Attachment A, Section 3.3.7.2 will be revised to reference the correct calculation.

MNS LAR, Attachment A, Section 3.3.7.2, Compliance Basis is incorrect by stating, “The bulk hydrogen storage cylinders are orientated with the long axis parallel to the plant.” Parallel orientation of the hydrogen cylinders to the plant will be changed to perpendicular orientation. The revised compliance basis will state “The bulk hydrogen storage cylinders are orientated with the long axis perpendicular to the plant. An evaluation conducted by MNS found this configuration to be acceptable.”

Calculation MCC-1139.01-00-0040 used the manufacturer drawing, MCM-1215.01-0001.001 stating that the hydrogen storage tank has a rupture disk that ruptures at approximately 500 degrees F. Calculation MCC-1139.01-00-0040 uses input from calculation MCC-1513.03-00-0001 that at 530 degrees F the hydrogen storage tank velocity at impact with the Diesel Building would be 31.97 ft./sec.

Calculation MCC-1139.01-00-0040 uses 32 ft./sec to conclude that the Diesel Building wall design is robust enough to prevent scabbing from a Hydrogen cylinder traveling at 32 ft./sec.

**FM RAI 02.c**

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:

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.

Duke Energy Response:

c. From MCC-1535.00-00-0104, section 6.1, it states, that "it is reasonable to expect that cables above electrical cabinets would tend to have the PVC jacket melt and flow away creating voids for the flow of melting materials from other cables. In addition, the ridges that are characteristic of the armor jacketing provide additional free space for the flow of material. As such, it is not expected that pooling of PVC is likely to occur even if multiple layers of armored cables exist." Consistent with Appendix H of NUREG/CR-6850, the low likelihood of a burning pool is attributable in large part to MNS not

employing solid bottom trays. The heat release rate contribution from the small amount of flame-retardant, self-extinguishing jacket material that might collect on the top surface of the ignition source (e.g., electrical panel) is considered negligible in comparison with the peak HRR of the ignition source and is therefore considered insignificant with respect to the postulated target damage. The contribution of the PVC outer jacketing to target damage is negligible and therefore the cables are treated as thermoset consistent with the cable insulation characteristics. The applicability of the thermoset insulation damage criteria to the MNS fire scenarios will be addressed in FM RAI 2b.

**PRA RAI 14**

Section 2.4.3.3 of NFPA-805 states that the PRA approach, methods, and data shall be acceptable to the NRC. Section 2.4.4.1 of NFPA-805 further states that the change in public health risk arising from transition from the current fire protection program to an NFPA-805 based program, and all future plant changes to the program, shall be acceptable to the NRC. RG 1.17 4 provides quantitative guidelines on CDF, LERF, and identifies acceptable changes to these frequencies that result from proposed changes to the plant's licensing basis and describes a general framework to determine the acceptability of risk-informed changes. The NRC staff review of the information in the LAR has identified additional information that is required to fully characterize the risk estimates.

LAR Section W.2.1 describes only one method for estimating the delta risk, as follows: "The compliant case was created by manipulating the Fire PRA model to 'remove' the VFDR(s). Fire PRA manipulations involved toggling off' or excluding specific PRA basic events to remove the potential fire induced failure associated with the VFDRs." It does not address if there are any exceptions to this method, such as potentially with MCR abandonment scenarios or the use of bounding methods per FAQ 08-0054 (use of the bounding method seems to be implied by the delta risk results presented in Tables W-3 and W-4 for some fire areas). Provide further description of the methods used to determine the change in risk values reported in LAR Tables W-3 and W-4 and additional discussion of the results as requested below.

a) RG 1.174 states that combined change requests (i.e., those that combine risk increases with risk decreases) should report the risk increases and risk decreases separately. Please explain how these values can be obtained from the tables in Appendix W or provide for the post-transition plant an estimate of the risk increase from the retained VFDRs and, separately, the risk decrease associated with modifications made only to reduce risk.

b) Were any methods other than the basic event toggling already described used to determine the fire area change in risk or delta risk reported in LAR Tables W-3 and W-4? If so, describe each method.

c) Describe how the change in risk was determined for MCR abandonment scenarios, including a summary of how the CCDP was determined for the compliant and the variant plants. Note that an overestimate of the compliant plant risk, unless offset with a similar overestimate in the variant plant risk, results in a non-conservative analysis of the delta risk. If the method described applies different assumptions to the variant and the compliant plant risk estimates, an indeterminate but non-conservative impact on the change-in-risk estimate may result.

Duke Energy Response:

a) The risk increases from the retained VFDRs are shown in the "Total" row of LAR tables W-3 and W-4 under the "Fire Risk Eval. ΔCDF" and "Fire Risk Eval ΔLERF" columns. Regarding the portion of the RAI on risk decreases, the Liquid Radwaste System (WL)

modification was the only modification credited for risk reduction and only applies to the LERF results. The amount by which the risk would decrease as a result of this modification is found in the "Total" row under the "Offset Risk (WL Mod) Δ LERF" column of tables W-3 and W-4.

b). For most of the VFDR evaluations, basic event toggling was the method used to provide a delta CDF and delta LERF result. In other VFDR evaluations, the use of basic event toggling was investigated but upon inspection it was determined that the delta CDF/delta LERF would not be measureable due to factors such as cable routing or conservative deterministic assumptions (e.g., off-site power availability), thus the VFDR under consideration does not change the plant risk. In certain cases where the function associated with the VFDR was not explicitly modeled, qualitative arguments were provided to support the delta risk conclusion. In some low risk fire areas, the base risk for the entire fire area is assumed for the delta risk from VFDRs.

c) There are two MCR abandonment scenarios modeled in the FPRA, one for the sub-group of ignition sources that make up the MCB fire scenarios and another for the sub-group that comprises the non-MCB fire scenarios. For each case, the Conditional Core Damage Probability (CCDP) was based on the worst case scenario for that sub-group plus additional failures to ensure that the Safe Shutdown Facility (SSF) was the sole success path for the abandonment scenario. Similar to other scenarios, to determine the compliant case, these scenarios were re-quantified after removing the non-compliances associated with the VFDRs for the fire area.

# ENCLOSURE 3

## Duke Energy MNS NFPA 805 LAR Revisions Resulting From The MNS Responses to the 60-Day, 90-Day, and 120-Day RAIs.

Note: The revised LAR Attachment A Table B-1 pages in this Enclosure replace the September 26, 2013 LAR Attachment A Table B-1 pages in their entirety. The remaining revised LAR pages in this Enclosure replace the corresponding pages in the September 26, 2013 LAR.

The revised content of the LAR pages are denoted by revision bars in the margin of the applicable pages.

# A. NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements

43 Pages Attached

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.1 General | 3.1* General.<br>This chapter contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. These fire protection program elements and minimum design requirements shall not be subject to the performance-based methods permitted elsewhere in this standard. Previously approved alternatives from the fundamental protection program attributes of this chapter by the AHJ take precedence over the requirements contained herein. | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.2 Fire Protection Plan | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.2.1 Intent | 3.2.1 Intent.<br>A site-wide fire protection plan shall be established. This plan shall document management policy and program direction and shall define the responsibilities of those individuals responsible for the plan's implementation. This section establishes the criteria for an integrated *combination of components, procedures, and personnel to implement all* fire protection program activities | Comply | A site-wide Fire Protection Program has been established and is documented in the Fire Protection Program Design Basis Specification. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App. A.1; Section A] - Design Basis Specification for Fire Protection | | |
| 3.2.2 Management Policy Direction and Responsibility. | 3.2.2* Management Policy Direction and Responsibility.<br>A policy document shall be prepared that defines management authority and responsibilities and establishes the general policy for the site fire protection program. | Comply | A policy document has been developed to define management authority and responsibilities and is documented in the Design Basis Specification for the Plant Fire Protection |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section A.1] - Design Basis Specification for Fire Protection | | |
| 3.2.2.1 [Management Policy on Senior Management] | 3.2.2.1*<br>The policy document shall designate the senior management position with immediate authority and responsibility for the fire protection program. | Comply | The Site Vice President is documented as responsible for the implementation of the fire protection program. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section A.1] - Design Basis Specification for Fire Protection | | |
| 3.2.2.2 [Management Policy on Daily Administration] | 3.2.2.2*<br>The policy document shall designate a position responsible for the daily administration and coordination of the fire protection program and its implementation. | Comply | The Fire Protection Engineer is responsible for the daily administration and coordination of the fire protection program. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section A.1] - Design Basis Specification for Fire Protection | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.2.2.3 [Management Policy on Interfaces] | 3.2.2.3*<br>The policy document shall define the fire protection interfaces with other organizations and assign responsibilities for the coordination of activities. In addition, this policy document shall identify the various plant positions having the authority for implementing the various areas of the fire protection program. | Comply | The interfaces between the fire protection program and other organizations and the assignment of responsibilities for station personnel are included in various station documents. Station documentation identifies various plant positions with the authority having jurisdiction for implanting various areas of the fire protection program. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section A.1] - Design Basis Specification for Fire Protection<br>MNS FP ESD Rev. 5 [Section 4] - MNS Fire Protection Program Engineering Support Document<br>NSD-112 Rev. 11 [Section 112.4] - Fire Brigade Organization, Training & Responsibilities<br>NSD-316 Rev. 13 [Section 316.4] - Fire Protection Impairment and Surveillance | | |
| 3.2.2.4 [Management Policy on AHJ] | 3.2.2.4*<br>The policy document shall identify the appropriate AHJ for the various areas of the fire protection program. | Comply | The NRC is the AHJ for fire protection changes requiring approval. The NRC is notified of changes to the fire protection program in accordance with NSD-320. NSD-320 screens changes to the fire protection program to determine if NRC approval is required.<br><br>Implementation Item: The Design Basis Specification for Fire Protection, which is the primary fire protection program policy document, will be updated to include the statement that the NRC is the AHJ for fire protection changes requiring approval. See Implementation Item in Table S-3 of Attachment S. |
| **References** | **Document ID**<br>NSD-320 Rev. 4 [Sections 320.1, 320.3] - Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program | | |
| 3.2.3 Procedures | 3.2.3* Procedures.<br><br>Procedures shall be established for implementation of the fire protection program.In addition to procedures that could be required by other sections of the standard, the procedures to accomplish the following shall be established | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.2.3 Procedures (1) | 3.2.3 (1) * Inspection, testing, and maintenance for fire protection systems and features credited by the fire protection program | Comply | Procedures have been established or implemented for inspection, testing, and maintenance of the fire protection systems and features. The Fire Protection Engineering Support Document (ESD) contains an uncontrolled list of the fire protection related inspection and maintenance procedures. |
| **References** | **Document ID**<br>MNS FP ESD Rev. 5 [Att. C] - MNS Fire Protection Program Engineering Support Document | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | | Submit for NRC Approval | Surveillance frequencies may be modified in accordance with the methodology in EPRI Report TR1006756, "Fire Protection Equipment Surveillance Optimization and Maintenance Guide." MNS requests formal NRC approval of this methodology.<br><br>See Attachment L of the License Amendment Request for further details on the request for NRC approval of the EPRI Surveillance Frequency Optimization and Maintenance Guide.<br><br>Implementation Item: Appropriate fire protection program document(s) will be updated to provide a requirement that if a plant elects to implement the methodologies in EPRI Report TR1006756, that the methodologies will be implemented in their entirety as they pertain to the fire protection systems or features being evaluated. See Implementation Item in Table S-3 of Attachment S. |
| 3.2.3 Procedures (2) | 3.2.3 (2) * Compensatory actions implemented when fire protection systems and other systems credited by the fire protection program and this standard cannot perform their intended function and limits on impairment duration | Comply | A fire protection impairment and surveillance procedure has been established to identify the compensatory actions implemented when fire protection features cannot perform their intended function. |
| **References** | **Document ID** | | |
| | NSD-316 Rev. 13 - Fire Protection Impairment and Surveillance | | |
| 3.2.3 Procedures (3) | 3.2.3 (3) * Reviews of fire protection program — related performance and trends | Comply | Procedures have been established for fire protection program reviews.<br><br>Implementation Item: The monitoring program required by NFPA 805 will include a process that monitors and trends the fire protection systems and features based on specific goals established to measure availability and reliability. See Implementation Item in Table S-3 of Attachment S. |
| **References** | **Document ID** | | |
| | EDM-201 Rev. 15 - Risk Category Scoping, Health Grouping and ER Strategy | | |
| | EDM-203 Rev. 4 - Equipment Reliability Health Monitoring, Assessing, Reporting and Action Planning | | |
| 3.2.3 Procedures (4) | 3.2.3 (4) Reviews of physical plant modifications and procedure changes for impact on the fire protection program | Comply | Procedures have been established for plant modification reviews and procedure revisions for impact on the fire protection program. |
| **References** | **Document ID** | | |
| | EDM-601 Rev. 14 [App. N] - Engineering Change Manual | | |
| | NSD-228 Rev. 10 [App. E] - Applicability Determination | | |
| | NSD-301 Rev. 41 [Sections 301.6.2.1.3 and 6.2.4.2] - Engineering Change Program | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | NSD-320 Rev. 4 - Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program | | |
| 3.2.3 Procedures (5) | 3.2.3 (5) Long-term maintenance and configuration of the fire protection program | Comply | Procedures have been established for the long term maintenance and configuration of the fire protection program. |
| **References** | **Document ID** | | |
| | MCS-1274.00-00-0016 Rev. 2 [Section 4.13] - McGuire License Renewal Commitments | | |
| | NSD-106 Rev. 7 [App. A] - Configuration Management | | |
| | NSD-228 Rev. 10 [App. E] - Applicability Determination | | |
| | NSD-320 Rev. 4 - Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program | | |
| 3.2.3 Procedures (6) | 3.2.3 (6) Emergency response procedures for the plant industrial fire brigade. | Comply | Emergency response procedures for the plant fire brigade have been established. |
| **References** | **Document ID** | | |
| | McGuire Nuclear Station Fire Strategies - | | |
| | NSD-112 Rev. 11 [Section 112.2] - Fire Brigade Organization, Training & Responsibilities | | |
| | RP/0/A/5700/025 Rev. 19 - Fire Brigade Response | | |
| 3.3 Prevention | 3.3 Prevention.<br>A fire prevention program with the goal of preventing a fire from starting shall be established, documented, and implemented as part of the fire protection program. The two basic components of the fire prevention program shall consist of both of the following:<br>(1) Prevention of fires and fire spread by controls on operational activities<br>(2) Design controls that restrict the use of combustible materials<br>The design control requirements listed in the remainder of this section shall be provided as described. | Comply | The MNS fire prevention program is described in the Fire Protection Program Design Basis Specification. The Fire Protection Program Design Basis Specification identifies activities for fire prevention via controls on operational activities and design controls for use of combustible materials. The objectives are implemented by various station directives and other documents as described in subsequent NFPA 805 sections. |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section B] - Design Basis Specification for Fire Protection | | |
| | NSD-104 Rev. 33 - Materiel Condition/Housekeeping, Foreign Material Exclusion and Seismic Concerns | | |
| | NSD-313 Rev. 13 - Control of Flammable and Combustible Materials | | |
| | NSD-314 Rev. 14 - Hot Work Authorization and Portable Heater Control | | |
| | NSD-315 Rev. 5 - Temporary Structures | | |
| | NSD-316 Rev. 13 - Fire Protection Impairment and Surveillance | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.3.1 Fire Prevention for Operational Activities. | 3.3.1 Fire Prevention for Operational Activities.<br>The fire prevention program activities shall consist of the necessary elements to address the control of ignition sources and the use of transient combustible materials during all aspects of plant operations. The fire prevention program shall focus on the human and programmatic elements necessary to prevent fires from starting or, should a fire start, to keep the fire as small as possible. | Comply | Fire prevention program, activities for control of ignition sources and transient combustibles include training, inspections, and administrative controls have been established. The fire prevention objectives are implemented by various station directives and other documents as described in subsequent sections. |
| **References** | **Document ID** | | |
| | Duke PAT Rev. 08/01/2012 - Duke Energy - Plant Access Training | | |
| | NSD-104 Rev. 33 - Materiel Condition/Housekeeping, Foreign Material Exclusion and Seismic Concerns | | |
| | NSD-313 Rev. 13 - Control of Flammable and Combustible Materials | | |
| | NSD-314 Rev. 14 - Hot Work Authorization and Portable Heater Control | | |
| | NSD-315 Rev. 5 - Temporary Structures | | |
| | NSD-316 Rev. 13 - Fire Protection Impairment and Surveillance | | |
| 3.3.1.1 General Fire Prevention Activities | 3.3.1.1 General Fire Prevention Activities.<br>The fire prevention activities shall include but not be limited to the following program elements: | N/A | N/A - Section Heading; see sub-sections for any specific compliance statements.<br><br>Note: Duke Energy has developed multiple directives and work practices to address fire prevention. These directives include but are not limited to the programmatic elements provided in NFPA 805 Section 3.3.1.1. Upon review of the elements listed below, MNS believes that the NFPA 805 code requirements are satisfied and no additional elements were evaluated. |
| 3.3.1.1 General Fire Prevention Activities (1) | 3.3.1.1 (1) Training on fire safety information for all employees and contractors including, as a minimum, familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms. | Comply | The prevention of fires and fire spread are managed through administrative controls and continual training of personnel. |
| **References** | **Document ID** | | |
| | Duke PAT Rev. 08/01/2012 [Page 16, 67, 116] - Duke Energy - Plant Access Training | | |
| | NSD-313 Rev. 13 - Control of Flammable and Combustible Materials | | |
| | NSD-314 Rev. 14 - Hot Work Authorization and Portable Heater Control | | |
| 3.3.1.1 General Fire Prevention Activities (2) | 3.3.1.1 (2) * Documented plant inspections including provisions for corrective actions for conditions where unanalyzed fire hazards are identified. | Comply | Plant inspections are documented and provisions for implementing corrective actions, where unidentified fire hazards are identified, are tracked through the station's Corrective Action Process. |
| **References** | **Document ID** | | |
| | NSD-208 Rev. 38 - Problem Investigation Program (PIP) | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.3.1.1 General Fire Prevention Activities (3) | 3.3.1.1 (3) * Administrative controls addressing the review of plant modifications and maintenance to ensure that both fire hazards and the impact on plant fire protection systems and features are minimized. | Comply | All plant modifications and changes are screened for impact on the plant fire protection program during both the design phase and the implementation phase. Administrative controls are provided in various directives. |
| ***References*** | ***Document ID*** | | |
| | EDM-601 Rev. 14 [Att. N] - Engineering Change Manual | | |
| | NSD-228 Rev. 10 - Applicability Determination | | |
| | NSD-301 Rev. 41 - Engineering Change Program | | |
| | NSD-315 Rev. 5 - Temporary Structures | | |
| | NSD-320 Rev. 4 - Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program | | |
| 3.3.1.2 Control of Combustible Materials | 3.3.1.2* Control of Combustible Materials.<br>Procedures for the control of general housekeeping practices and the control of transient combustibles shall be developed and implemented. These procedures shall include but not be limited to the following program elements: | N/A | N/A - Section Heading; see sub-sections for any specific compliance statements.<br><br>Note: Duke Energy has developed multiple directives and work practices to address fire prevention and control of combustible materials. These directives include but are not limited to the programmatic elements provided in NFPA 805 Section 3.3.1.2. Upon review of the elements listed below, MNS believes that the NFPA 805 code requirements are satisfied and no additional elements were evaluated. |
| 3.3.1.2 Control of Combustible Materials (1) | 3.3.1.2 (1) * Wood used within the power block shall be listed pressure-impregnated or coated with a listed fire-retardant application.<br>Exception: Cribbing timbers 6 in. by 6 in. (15.2 cm by 15.2 cm) or larger shall not be required to be fire-retardant treated. | Comply | Wood is required to be flame retardant except where allowed by the exception to this section.<br><br>Implementation Item: Revise station procedures/directives to comply with NFPA 805 Section 3.3.1.2(1). See Implementation Item in Table S-3 of Attachment S. |
| **References** | **Document ID** | | |
| | NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| 3.3.1.2 Control of Combustible Materials (2) | 3.3.1.2 (2) Plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, large-scale tests, or equivalent. | Comply | Specific administrative directives have been developed for the control of combustible materials which require plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, or equivalent. |
| **References** | **Document ID** | | |
| | NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| 3.3.1.2 Control of Combustible Materials (3) | 3.3.1.2 (3) Waste, debris, scrap, packing materials, or other combustibles shall be removed from an area immediately following the completion of work or at the end of the shift, whichever comes first. | Comply | Specific administrative directives have been developed for the control of combustible materials including the removal of all unnecessary waste, debris, scrap, packaging materials, and other combustibles at the end of each shift. |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| **References** | **Document ID**<br>NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| 3.3.1.2 Control of Combustible Materials (4) | 3.3.1.2 (4) * Combustible storage or staging areas shall be designated, and limits shall be established on the types and quantities of stored materials. | Comply | Specific administrative directives have been developed for the control of combustible materials including limits on the types and quantities of stored materials. |
| **References** | **Document ID**<br>NSD-313 Rev. 13 [Section 313.5, App. A, Supplement S.2] - Control of Flammable and Combustible Materials | | |
| 3.3.1.2 Control of Combustible Materials (5) | 3.3.1.2 (5) * Controls on use and storage of flammable and combustible liquids shall be in accordance with NFPA 30, Flammable and Combustible Liquids Code, or other applicable NFPA standards. | Comply | Specific administrative directives and procedures have been developed for the use and storage of flammable and combustible liquids in accordance with NFPA 30 guidance. No other NFPA standards were determined to be applicable based on the guidance in FAQ 06-0020. |
| **References** | **Document ID**<br>Duke Energy SWP Manual Rev. 03/13 [Page 141] - Safe Work Practices 2013<br>NEWP 7.2 Rev. 1 - Storing Chemicals<br>NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| 3.3.1.2 Control of Combustible Materials (6) | 3.3.1.2 (6) * Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards. | Comply | Specific administrative directives and procedures have been developed for the use and storage of flammable gases in accordance with NFPA 55. No other NFPA standards were determined to be applicable based on the guidance in FAQ 06-0020. |
| **References** | **Document ID**<br>Duke Energy SWP Manual Rev. 03/13 [Page 21] - Safe Work Practices 2013<br>NEWP 7.2 Rev. 1 - Storing Chemicals<br>NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| 3.3.1.3 Control of Ignition Sources | 3.3.1.3 Control of Ignition Sources | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.3.1.3.1 [Control of Ignition Sources Code Requirements] | 3.3.1.3.1*<br>A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations. | Comply | Hot work is controlled through an administrative directive in accordance with NFPA 51B." The directive is updated on an "as needed" basis.<br><br>NFPA 241 is addressed through compliance with NFPA 51B. NFPA 241, 2000 edition, as referenced by NFPA 805-2001 ed., Section 5.1.1, with respect to hot work, states "Responsibility for hot work operations and fire prevention precautions , including permits and fire watches, shall be in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work." |
| ***References*** | ***Document ID*** | | |
| | NSD-314 Rev. 14 - Hot Work Authorization and Portable Heater Control | | |
| 3.3.1.3.2 [Control of Ignition Sources on Smoking Limitations] | 3.3.1.3.2<br>Smoking and other possible sources of ignition shall be restricted to properly designated and supervised safe areas of the plant. | Comply | Smoking is restricted to approved locations and other sources of ignition are controlled through administrative directives and as directed in the General Plant Access Training program. |
| **References** | **Document ID** | | |
| | Duke PAT Rev. 08/01/2012 [Page 6] - Duke Energy - Plant Access Training | | |
| | NSD-104 Rev. 33 [Section 104.5.3] - Materiel Condition/Housekeeping, Foreign Material Exclusion and Seismic Concerns | | |
| 3.3.1.3.3 [Control of Ignition Sources for Leak Testing] | 3.3.1.3.3<br>Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing | Comply | Open flame or combustion-generated smoke is prohibited for use in leak and air testing. |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section B.3.6] - Design Basis Specification for Fire Protection | | |
| 3.3.1.3.4 [Control of Ignition Sources on Portable Heaters] | 3.3.1.3.4*<br>Plant administrative procedure shall control the use of portable electrical heaters in the plant. Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire. | Comply | Portable electric heaters are controlled through administrative directives.<br><br>Portable fuel-fired heaters are not permitted in the power block. |
| **References** | **Document ID** | | |
| | NSD-314 Rev. 14 [Section 314.6] - Hot Work Authorization and Portable Heater Control | | |
| 3.3.2 Structural. | 3.3.2 Structural.<br>Walls, floors, and components required to maintain structural integrity shall be of noncombustible construction, as defined in NFPA 220, Standard on Types of Building Construction. | Comply | Power block buildings are constructed of non-combustible materials, primarily reinforced concrete or concrete block with structural steel framing. |
| **References** | **Document ID** | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | MCS-1465.00-00-0008 Rev. 14 [App. A.2] - Design Basis Specification for Fire Protection | | |
| 3.3.3 Interior Finishes | 3.3.3 Interior Finishes.<br>Interior wall or ceiling finish classification shall be in accordance with NFPA 101®, Life Safety Code®, requirements for Class A materials. Interior floor finishes shall be in accordance with NFPA 101 requirements for Class I interior floor finishes. | Comply | The fire protection design basis specification states that interior wall and structural components, thermal insulation materials, radiation shielding materials, and sound proofing materials have a flame spread rating of 25 or less, as tested in accordance with American Society for Testing and Materials (ASTM) E-84. Interior finishes have flame spread of 25 or less and smoke and fuel contribution of 50 or less in its use configuration. NFPA 101 defines Class A finishes are non-combustible and are defined as those that have a flame spread index of less than or equal to 25 and a smoke developed index of less than or equal to 450.<br><br>NSD-318 includes the requirement that Service Level I, II, and IV coatings used on interior floors, walls, and ceilings in "power block" buildings are required to meet the requirements of NFPA 805, Section 3.3.3.<br><br>Implementation Item: Update station documentation to indicate requirements for interior floor finish requirements. See Implementation Item 18 in Table S-3 of Attachment S. |
| **References** | **Document ID** | | |
| | MCS-1206.10-00-0000 Rev. 9 [Section 5] - Conventional Heat Insulation | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.1.d] - Design Basis Specification for Fire Protection | | |
| | NSD-318 Rev. 5 [Section 318.7] - Coatings Program | | |
| 3.3.4 Insulation Materials | 3.3.4 Insulation Materials.<br>Thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible. | Comply | Thermal insulation materials, radiation shielding materials, ventilation duct materials, and sound proofing materials are non-combustible or limited combustible.<br><br>Any new insulation materials would require a screening determination in accordance with NSD-301, "Engineering Change Program", and EDM-601, "Engineering Directives Manual." Part of the screening process is an evaluation of the potential effects on the Fire Protection Program which would require the use of noncombustible or limited combustible materials. |
| **References** | **Document ID** | | |
| | EDM-601 Rev. 14 - Engineering Change Manual | | |
| | MCS-1206.10-00-0000 Rev. 9 - Conventional Heat Insulation | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.1.d] - Design Basis Specification for Fire Protection | | |
| | NSD-301 Rev. 41 - Engineering Change Program | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.3.5 Electrical. | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.3.5.1 [Electrical Wiring Above Suspended Ceiling Limitations] | 3.3.5.1<br>Wiring above suspended ceiling shall be kept to a minimum. 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. | Submit for NRC Approval | Combustibles in concealed spaces are minimized.<br><br>Wiring above some suspended ceilings may not meet this requirement. See Attachment L of the License Amendment Request for further details on the request for NRC approval for wiring above suspended ceilings.<br><br>Implementation Item: Appropriate station documentation will be updated to include the requirements for installation of cable above suspended ceilings. See Implementation Item in Table S-3 of Attachment S. |
| **References** | **Document ID** | | |
| | 1978-03-22 Duke Letter - Duke Response to 3-2-1978 RAI | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.1.f] - Design Basis Specification for Fire Protection | | |
| 3.3.5.2 [Electrical Raceway Construction Limits] | 3.3.5.2<br>Only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables. Flexible metallic conduits shall only be used in short lengths to connect components. | Comply | Cable trays are constructed of galvanized steel. All exposed conduit is hot-dipped, rigid galvanized steel or rigid aluminum. Thinned wall electrical metallic tubing (EMT) is not used for power, control, or instrumentation. |
| **References** | **Document ID** | | |
| | DC-3.06 Rev. 3 [Section 4.1.1] - Conduit Systems for Power Plants | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.3.a] - Design Basis Specification for Fire Protection | | |
| | | Submit for NRC Approval | PVC conduit is permitted in embedded and buried locations. See Attachment L of the License Amendment Request for further details on the request for NRC approval for evaluation of PVC conduits. |
| **References** | **Document ID** | | |
| | DC-3.06 Rev. 3 [Section 4.2, 4.3] - Conduit Systems for Power Plants | | |
| 3.3.5.3 [Electrical Cable Flame Propagation Limits] | 3.3.5.3*<br>Electric cable construction shall comply with a flame propagation test as acceptable to the AHJ. | Comply | Electrical cable complies with IEEE-383 or equivalent flame propagation testing which is acceptable as outlined in FAQ 06-0022, "Acceptable Electrical Cable Construction Tests." |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App. A.1; Section D.3.f] - Design Basis Specification for Fire Protection | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.3.6 Roofs. | 3.3.6 Roofs.<br>Metal roof deck construction shall be designed and installed so the roofing system will not sustain a self-propagating fire on the underside of the deck when the deck is heated by a fire inside the building. Roof coverings shall be Class A as determined by tests described in NFPA 256, Standard Methods of Fire Tests of Roof Coverings. | Comply | The Fire Protection Program Design Basis Specification states that the "metal deck roof construction is listed as Class I by Factory Mutual System Approval Guides or Class A by Underwriters' Laboratories." A Factory Mutual Class I roof is considered equivalent to NFPA 256 Class A roof classification. |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App. A.1; Section D.1.f] - Design Basis Specification for Fire Protection | | |
| 3.3.7 Bulk Flammable Gas Storage. | 3.3.7 Bulk Flammable Gas Storage.<br>Bulk compressed or cryogenic flammable gas storage shall not be permitted inside structures housing systems, equipment, or components important to nuclear safety. | Comply | Bulk flammable gas is not stored in structures housing systems, equipment, or components important to nuclear safety. |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.2.b] - Design Basis Specification for Fire Protection | | |
| | NEWP 7.2 Rev. 1 [Section 3] - Storing Chemicals | | |
| | NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| 3.3.7.1 [Bulk Flammable Gas Location Requirements] | 3.3.7.1<br>Storage of flammable gas shall be located outdoors, or in separate detached buildings, so that a fire or explosion will not adversely impact systems, equipment, or components important to nuclear safety. NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites, shall be followed for hydrogen storage. | Comply | Bulk flammable gas is stored in the northwest yard area. |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.2.b] - Design Basis Specification for Fire Protection | | |
| | NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| | | Complies via Use of EEEE | The bulk hydrogen storage cylinders are installed with the long axis perpendicular to the plant. A Design Engineering Analysis of Hydrogen Tank Failure found that safety related systems would not be affected in the event of a failure.<br><br>The hydrogen storage was evaluated for compliance in the NFPA 55 Code Conformance Review. Note that NFPA 50A was *incorporated into* NFPA 55. *The MNS Code of Record is* NFPA 50A, 1978 edition. |
| **References** | **Document ID** | | |
| | MCC-1139.01-00-0040 Rev. 10 - Missile Barrier – Air Exhaust, Diesel Generator Building | | |
| | MCC-1435.00-00-0036 Rev. 0 - NFPA 55 Code Conformance Review | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.3.7.2 [Bulk Flammable Gas Container Restrictions] | 3.3.7.2<br>Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings. | Complies via Use of EEEE | The bulk hydrogen storage cylinders are orientated with the long axis perpendicular to plant buildings. An evaluation conducted by MNS found this configuration to be acceptable. |
| **References** | **Document ID** | | |
| | MCC-1139.01-00-0040 Rev. 10 - Missile Barrier -- Air Exhaust, Diesel Generator Building | | |
| | MCS-1465.00-00-0008 Rev. 14 - Design Basis Specification for Fire Protection | | |
| 3.3.7.3 [Bulk Flammable Gas Cylinder Limitations] | 3.3.7.3<br>Flammable gas storage cylinders not required for normal operation shall be isolated from the system. | Comply | Gas cylinders are isolated when not in use and controlled by plant directives. |
| **References** | **Document ID** | | |
| | NEWP 7.2 Rev. 1 [Section 3] - Storing Chemicals | | |
| | NSD-313 Rev. 13 [Section 313.5.1] - Control of Flammable and Combustible Materials | | |
| 3.3.8 Bulk Storage of Flammable and Combustible Liquids. | 3.3.8 Bulk Storage of Flammable and Combustible Liquids.<br>Bulk storage of flammable and combustible liquids shall not be permitted inside structures containing systems, equipment, or components important to nuclear safety. As a minimum, storage and use shall comply with NFPA 30, Flammable and Combustible Liquids Code. | Complies via Use of EEEE | Bulk storage of flammable/combustible liquids include the Turbine Oil Transfer Tanks, Service Building Lube Oil Room, and Diesel Generator Lube Oil Transfer Tanks which were installed as part of the original plant design. The bulk oil storage was evaluated for compliance in the NFPA 30 Code Conformance Review. The MNS Code of Record is NFPA 30, 1977 edition. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0035 Rev. 0 - NFPA 30 Code Conformance Review | | |
| | MCS-1465.00-00-0008 Rev. 14 [ Section 4.1.8.3.9; App A.1, Section D.2.d] - Design Basis Specification for Fire Protection | | |
| | NSD-313 Rev. 13 [Section 313.5, Supplement 3] - Control of Flammable and Combustible Materials | | |
| 3.3.9 Transformers. | 3.3.9* Transformers.<br>Where provided, transformer oil collection basins and drain paths shall be periodically inspected to ensure that they are free of debris and capable of performing their design function. | Comply | The transformer oil collection basins are periodically inspected to ensure they perform their design function as part of the transformer wet test. |
| **References** | **Document ID** | | |
| | PT/1/A/4400/001B Rev. 013 - Automatic Mulsifyre System Annual Test | | |
| | PT/2/A/4400/001B Rev. 015 - Automatic Mulsifyre System Annual Test | | |
| 3.3.10 Hot Pipes and Surfaces. | 3.3.10* Hot Pipes and Surfaces.<br>Combustible liquids, including high flashpoint lubricating oils, shall be kept from coming in contact with hot pipes and surfaces, including insulated pipes and surfaces. Administrative controls shall require the prompt cleanup of oil on insulation. | Comply | Administrative directives ensure, upon identification, the prompt correction of any oil leakage. |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| **References** | **Document ID** | | |
| | NSD-104 Rev. 33 [Section 104.5.5] - Materiel Condition/Housekeeping, Foreign Material Exclusion and Seismic Concerns | | |
| | NSD-413 Rev. 9 [Section 413.4.1, 413.4.7] - Fluid Leak Management Program | | |
| 3.3.11 Electrical Equipment | 3.3.11 Electrical Equipment<br>Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment. | Comply | Administrative directives control combustible material near electrical equipment. |
| **References** | **Document ID** | | |
| | NSD-313 Rev. 13 [Section 313.5.2, App. A] - Control of Flammable and Combustible Materials | | |
| 3.3.12 Reactor Coolant Pumps | 3.3.12* Reactor Coolant Pumps.<br>For facilities with non-inerted containments, reactor coolant pumps with an external lubrication system shall be provided with an oil collection system. The oil collection system shall be designed and installed such that leakage from the oil system is safely contained for off normal conditions such as accident conditions or earthquakes. All of the following shall apply. | Comply | The Reactor Coolant Pump (NCP) oil collection systems are designed to withstand off normal conditions such as accident conditions or a safe shutdown earthquake (SSE). |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.2.a(3)] - Design Basis Specification for Fire Protection | | |
| | MCS-1553.NC-00-0001 Rev. 29 [Section 2.3] - Design Basis Specification for the NC System | | |
| 3.3.12 Reactor Coolant Pumps (1) | 3.3.12 (1) The oil collection system for each reactor coolant pump shall be capable of collecting lubricating oil from all potential pressurized and nonpressurized leakage sites in each reactor coolant pump oil system. | Comply | The Reactor Coolant Pump (NCP) oil collection system for each Reactor Coolant Pump is capable of collecting leakage oil for all pressurized and non-pressurized sites in the pump. |
| **References** | **Document ID** | | |
| | MCM 1201.01-0080.001 Rev. 18 - Reactor Coolant Pump | | |
| | MCS-1465.00-00-0008 Rev. 14 - Design Basis Specification for Fire Protection | | |
| | MCS-1553.NC-00-0001 Rev. 29 [Section 3.1.1.2.3, 4.1.1.2.3] - Design Basis Specification for the NC System | | |
| | | Submit for NRC Approval | The Reactor Coolant Pump oil collection systems are designed and sized to collect and contain oil from potentially pressurized and unpressurized leakage areas in a seismic event resulting in failure of the lubrication system. See Attachment L of the License Amendment Request for further details on the request for NRC approval for evaluation of oil misting from the reactor coolant pumps/motors. |
| 3.3.12 Reactor Coolant Pumps (2) | 3.3.12 (2) Leakage shall be collected and drained to a vented closed container that can hold the inventory of the reactor coolant pump lubricating oil system. | Comply | Leakage oil is drained to a vented closed container capable of containing the maximum potential inventory. |
| **References** | **Document ID** | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | MCFD-1553-04.00 Rev. 11 - Flow Diagram of Reactor Coolant System (NC)<br>MCS-1465.00-00-0008 Rev. 14 - Design Basis Specification for Fire Protection<br>MCS-1553.NC-00-0001 Rev. 29 - Design Basis Specification for the NC System | | |
| 3.3.12 Reactor Coolant Pumps (3) | 3.3.12 (3) A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of a fire flashback. | Comply | A flame arrestor is provided in each of the Reactor Coolant Pump drain tank vents. |
| **References** | **Document ID**<br>MCFD-1553-04.00 Rev. 11 - Flow Diagram of Reactor Coolant System (NC) | | |
| 3.3.12 Reactor Coolant Pumps (4) | 3.3.12 (4) Leakage points on a reactor coolant pump motor to be protected shall include but not be limited to the lift pump and piping, overflow lines, oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and the oil reservoirs, where such features exist on the reactor coolant pumps. | Comply | All potential vulnerable points on the Reactor Coolant Pumps are protected by components capable of containing the leaks. All oil carrying pipes and assemblies, at the lower bearing area, are located inside the motor air frame. All oil carrying pipes and *assemblies, at the upper bearing area, are located inside a* shroud external to the frame. The leakage within the upper shroud or motor air frame is collected in the NC pump motor drain tanks. |
| **References** | **Document ID**<br>MCS-1553.NC-00-0001 Rev. 29 - Design Basis Specification for the NC System | | |
| 3.3.12 Reactor Coolant Pumps (5) | 3.3.12 (5) The collection basin drain line to the collection tank shall be large enough to accommodate the largest potential oil leak such that oil leakage does not overflow the basin. | Comply | Reactor Coolant Pumps are enclosed to contain leaks and high pressure oil sprays. The enclosure ensures drainage directly to the oil collection basin and the drain lines are sized to control the maximum volume. |
| **References** | **Document ID**<br>MCS-1553.NC-00-0001 Rev. 29 - Design Basis Specification for the NC System | | |
| 3.4 Industrial Fire Brigade. | N/A | N/A | N/A - *Section Heading, see sub-sections for any specific* compliance statements |
| 3.4.1 On-Site Fire-Fighting Capability | 3.4.1 On-Site Fire-Fighting Capability.<br>All of the following requirements shall apply. | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.1 On-Site Fire-Fighting Capability (a) | 3.4.1 (a) A fully staffed, trained, and equipped fire-fighting force shall be available at all times to control and extinguish all fires on site. This force shall have a minimum complement of five persons on duty and shall conform with the following NFPA standards as applicable:<br><br>(1) NFPA 600, Standard on Industrial Fire Brigades (interior structural fire fighting)<br>(2) NFPA 1500, Standard on Fire Department Occupational Safety and Health Program<br>(3) NFPA 1582, Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians | Complies via Use of EEEE | The onsite Fire Brigade is appropriately staffed, trained, and equipped and complies with NFPA 600. The MNS Code of Record is NFPA 600, 2005 edition.<br><br>NFPA 1500 and 1582 do not apply to MNS. |
| **References** | **Document ID**<br>MCC-1435.00-00-0040 Rev. 0 - NFPA 600 Code Conformance Review | | |
| | | Complies with previous NRC Approval | SLC 16.13.1 "Fire Brigade" states: A site Fire Brigade of at least five members shall be maintained onsite. If the fire brigade composition is not met then restore mimimum fire brigade compostion within 2 hours.<br><br>The Fire Brigade requirement is met by using personnel from Operations and Single Point of Contact (SPOC). Four (4) personnel from Operations are required (including the Fire Brigade Leader) and the other (1) person is from SPOC.<br><br>SLC 16.13.4 "Minimum Station Staffing Requirements" identifies the same requirements as SLC 16.13.1 and states "The 2-hour remedial action for restoring minimum station staffing levels is consistent with TS 5.2.2c and 5.2.2d, which allow 2 hours to accommodate unexpected absence of on-duty shift crew members provided immediate action is taken to restore the shift crew composition to within the minimum requirements."<br><br>This staffing position is documented in the McGuire Units 1 and 2 Technical Specifications, section 5.2.2.c which states "Shift crew composition may be less than the minimum requirement of 10 CFR 50.54(m)(2)(i) and 5.2.2.a and 5.2.2.g for a period of time not to exceed 2 hours in order to accommodate unexpected absence of on-duty shift crew members provided immediate action is taken to restore the shift crew composition to within the minimum requirements."<br><br>This reflects the current MNS fire brigade organization. This position is in accordance with FAQ 12-0063. |
| **References** | **Document ID**<br>SLC 16.13.1 Rev. 51 - Fire Brigade<br>SLC 16.13.4 Rev. 58 - Minimum Station Staffing Requirements<br>Technical Specifications Rev. 239 / 221 [Section 5.2.2.c] - McGuire Units 1 and 2 Technical Specifications | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.1 On-Site Fire-Fighting Capability (b) | 3.4.1 (b) * Industrial fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required. | Comply | The industrial fire brigade is appropriately staffed and members are independent of other responsibilities during a fire emergency. |
| **References** | **Document ID** | | |
| | NSD-112 Rev. 11 [Section 112.2.7] - Fire Brigade Organization, Training & Responsibilities | | |
| | SLC 16.13.1 Rev. 51 - Fire Brigade | | |
| | SLC 16.13.4 Rev. 58 - Minimum Station Staffing Requirements | | |
| 3.4.1 On-Site Fire-Fighting Capability (c) | 3.4.1 (c) During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance<br>Exception: Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support criteria. | Comply | Station directive dictates that during each shift the Fire Brigade Leader and a minimum of two brigade members have sufficient training and knowledge of the nuclear safety systems to understand the effects of fire and fire suppressants on the *nuclear safety performance.* |
| **References** | **Document ID** | | |
| | NSD-112 Rev. 11 [Section 112.2.7] - Fire Brigade Organization, Training & Responsibilities | | |
| 3.4.1 On-Site Fire-Fighting Capability (d) | 3.4.1 (d) * The industrial fire brigade shall be notified immediately upon verification of a fire. | Comply | The industrial fire brigade is notified immediately upon verification of a fire. |
| **References** | **Document ID** | | |
| | NSD-112 Rev. 11 [Section 112.2.6] - Fire Brigade Organization, Training & Responsibilities | | |
| | RP/0/A/5700/025 Rev. 19 [Enclosure 4.1] - Fire Brigade Response | | |
| 3.4.1 On-Site Fire-Fighting Capability (e) | 3.4.1 (e) Each industrial fire brigade member shall pass an annual physical examination to determine that he or she can perform the strenuous activity required during manual fire-fighting operations. The physical examination shall determine the ability of each member to use respiratory protection equipment. | Comply | Annual physical examinations are required to remain on the "Active" list for MNS fire brigade members. The physical examinations include the use of respiratory equipment. |
| ***References*** | ***Document ID*** | | |
| | NSD-112 Rev. 11 [Section 112.4] - Fire Brigade Organization, Training & Responsibilities | | |
| 3.4.2 Pre-Fire Plans. | 3.4.2* Pre-Fire Plans.<br>*Current and detailed pre-fire plans shall be available to the industrial fire* brigade for all areas in which a fire could jeopardize the ability to meet the performance criteria described in Section 1.5. | Comply | Current and detailed Fire Strategies (pre-fire plans) are available *for all plant locations that contain systems or components that* could impact nuclear safety performance or present a potential for radioactive releases or life safety. |
| **References** | **Document ID** | | |
| | McGuire Nuclear Station Fire Strategies - | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.2.1 [Pre-Fire Plan Contents] | 3.4.2.1*<br>The plans shall detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present. | Comply | Detailed pre-fire plans are available in the McGuire Nuclear Station Fire Strategies. The Fire Strategies contain the following information:<br>• Graphic representations of the various plant areas that depict the installed fire protection/suppression features<br>• Equipment important to safety and other potentially affected equipment<br>• Listing of special hazards including: Radiological, Electrical, Chemical, Physical, and Flammable Liquids Gases<br>• Notes such as special access, special concerns, ventilation, etc<br><br>Implementation Item: The Fire Strategies will be reviewed and *updated to include any changes to equipment important to* nuclear safety and other updates pertinent to the NFPA 805 Transition. See Implementation Item in Table S-3 of Attachment S. |
| **References** | **Document ID**<br>McGuire Nuclear Station Fire Strategies - | | |
| 3.4.2.2 [Pre-Fire Plan Updates] | 3.4.2.2<br>Pre-fire plans shall be reviewed and updated as necessary. | Comply | The Fire Strategies are updated as required. Plant directives, for modification to plant features and equipment, require a review for potential impact to the Fire Strategies. A procedure is used to perform field walkdowns of a specific group of fire plan strategies annually to ensure accuracy. |
| **References** | **Document ID**<br>EDM-601 Rev. 14 - Engineering Change Manual<br>NSD-228 Rev. 10 [App. E] - Applicability Determination<br>NSD-301 Rev. 41 - Engineering Change Program<br>PT/0/B/4600/119 Rev. 000 - MNS Annual Fire Plan Strategy Walkdown | | |
| 3.4.2.3 [Pre-Fire Plan Locations] | 3.4.2.3*<br>Pre-fire plans shall be available in the control room and made available to the plant industrial fire brigade. | Comply | The Fire Strategies are available in the Control Room, at the Fire Brigade Administrator's Desk, and in the Work Control Center. |
| **References** | **Document ID**<br>McGuire Nuclear Station Fire Strategies -<br>PT/0/A/4600/112 Rev. 008 [Enclosure 13.7] - Exterior/Interior Fire Equipment Inspection<br>RP/0/A/5700/025 Rev. 19 - Fire Brigade Response | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.2.4 [Pre-Fire Plan Coordination Needs] | 3.4.2.4* Pre-fire plans shall address coordination with other plant groups during fire emergencies. | Complies with Clarification | Fire Strategies (pre-fire plans), plant directives, and fire brigade procedures address coordination with other plant groups. |
| **References** | **Document ID** | | |
| | McGuire Nuclear Station Fire Strategies - | | |
| | NSD-112 Rev. 11 [Section 112.2] - Fire Brigade Organization, Training & Responsibilities | | |
| | RP/0/A/5700/025 Rev. 19 - Fire Brigade Response | | |
| 3.4.3 Training and Drills | 3.4.3 Training and Drills. Industrial fire brigade members and other plant personnel who would respond to a fire in conjunction with the brigade shall be provided with training commensurate with their emergency responsibilities. | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.4.3 Training and Drills (a)(1) | 3.4.3 (a) Plant Industrial Fire Brigade Training. All of the following requirements shall apply.<br>(1) Plant industrial fire brigade members shall receive training consistent with the requirements contained in NFPA 600, Standard on Industrial Fire Brigades, or NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, as appropriate. | Complies via Use of EEEE | Fire Brigade members receive training consistent with NFPA 600, 2005 edition. NFPA 1500 is not applicable to MNS. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0040 Rev. 0 - NFPA 600 Code Conformance Review | | |
| | NSD-112 Rev. 11 - Fire Brigade Organization, Training & Responsibilities | | |
| 3.4.3 Training and Drills (a)(2) | 3.4.3 (a)(2) Industrial fire brigade members shall be given quarterly training and practice in fire fighting, including radioactivity and health physics considerations, to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire. | Comply | Quarterly training is administered to remain on the "Active" list. Training includes fire fighting strategies in radiological areas. |
| **References** | **Document ID** | | |
| | MTP 7111.0 [Attachment 6] - Emergency Response (ER) Training Program | | |
| | NSD-112 Rev. 11 [Section 112.4] - Fire Brigade Organization, Training & Responsibilities | | |
| 3.4.3 Training and Drills (a)(3) | 3.4.3 (a)(3) A written program shall detail the industrial fire brigade training program. | Comply | MNS maintains a written program detailing the industrial fire brigade training program. |
| **References** | **Document ID** | | |
| | MTP 7111.0 - Emergency Response (ER) Training Program | | |
| | NSD-112 Rev. 11 [Section 112.4] - Fire Brigade Organization, Training & Responsibilities | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.3 Training and Drills (a)(4) | 3.4.3 (a)(4) Written records that include but are not limited to initial industrial fire brigade classroom and hands-on training, refresher training, *special training schools attended, drill attendance records, and leadership* training for industrial fire brigades shall be maintained for each industrial fire brigade member. | Comply | Drill and training records for fire brigade members are maintained, including initial training, refresher training, drills, and *fire brigade leader training.* |
| **References** | **Document ID** | | |
| | MTP 7111.0 - Emergency Response (ER) Training Program | | |
| | NSD-112 Rev. 11 - Fire Brigade Organization, Training & Responsibilities | | |
| | PT/0/B/4600/118 Rev. 003 - Fire Brigade Qualification Verification | | |
| | PT/0/B/4600/121 Rev. 6 - Fire Drill | | |
| 3.4.3 Training and Drills (b) | 3.4.3 (b) Training for Non-Industrial Fire Brigade Personnel. Plant personnel who respond with the industrial fire brigade shall be trained as to their responsibilities, potential hazards to be encountered, and interfacing with the industrial fire brigade. | Comply | Other non-fire brigade personnel that respond to a fire incident are trained with regards to the responsibilities, hazards, and for interfacing with the fire brigade. |
| **References** | **Document ID** | | |
| | MTP 7111.0 [Section 112.5] - Emergency Response (ER) Training Program | | |
| | NSD-112 Rev. 11 - Fire Brigade Organization, Training & Responsibilities | | |
| | PT/0/B/4600/121 Rev. 6 - Fire Drill | | |
| 3.4.3 Training and Drills (c)(1) | 3.4.3 (c) * Drills. All of the following requirements shall apply. (1) Drills shall be conducted quarterly for each shift to test the response capability of the industrial fire brigade. | Comply | The industrial fire brigade conducts quarterly drills for each shift. |
| **References** | **Document ID** | | |
| | NSD-112 Rev. 11 [Section 112.5] - Fire Brigade Organization, Training & Responsibilities | | |
| | PT/0/B/4600/121 Rev. 6 [Section 3] - Fire Drill | | |
| 3.4.3 Training and Drills (c)(2) | 3.4.3 (c)(2) Industrial fire brigade drills shall be developed to test and challenge industrial fire brigade response, including brigade performance as a team, proper use of equipment, effective use of pre-fire plans, and coordination with other groups. These drills shall evaluate the industrial fire brigade's abilities to react, respond, and demonstrate proper fire-fighting techniques to control and extinguish the fire and smoke conditions being simulated by the drill scenario. | Comply | Drills are developed to challenge the industrial fire brigade and the response are evaluated, critiqued, and documented. |
| **References** | **Document ID** | | |
| | NSD-112 Rev. 11 [Section 112.5] - Fire Brigade Organization, Training & Responsibilities | | |
| | PT/0/B/4600/121 Rev. 6 [Section 1] - Fire Drill | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.3 Training and Drills (c)(3) | 3.4.3 (c)(3) Industrial fire brigade drills shall be conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards. | Comply | Drills are conducted in various plant areas, especially in those areas identified to be essential to plant operation and to containing significant fire hazards. |
| **References** | **Document ID**<br>NSD-112 Rev. 11 [Section 112.5] - Fire Brigade Organization, Training & Responsibilities<br>PT/0/B/4600/121 Rev. 6 - Fire Drill | | |
| 3.4.3 Training and Drills (c)(4) | 3.4.3 (c)(4) Drill records shall be maintained detailing the drill scenario, industrial fire brigade member response, and ability of the industrial fire brigade to perform as a team. | Comply | Drill records are maintained and performance critiques are conducted which document the scenario, attendance, and performance of the fire brigade. |
| **References** | **Document ID**<br>NSD-112 Rev. 11 [Section 112.5] - Fire Brigade Organization, Training & Responsibilities<br>PT/0/B/4600/121 Rev. 6 - Fire Drill | | |
| 3.4.3 Training and Drills (c)(5) | 3.4.3 (c)(5) A critique shall be held and documented after each drill. | Comply | Each fire drill is critiqued and the critique is documented and maintained. |
| **References** | **Document ID**<br>NSD-112 Rev. 11 [Section 112.5] - Fire Brigade Organization, Training & Responsibilities<br>PT/0/B/4600/121 Rev. 6 - Fire Drill | | |
| 3.4.4 Fire-Fighting Equipment. | 3.4.4 Fire-Fighting Equipment.<br>Protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment shall be provided for the industrial fire brigade. This equipment shall conform with the applicable NFPA standards. | Comply | The appropriate fire fighting equipment is located in each fire area and on the fire brigade equipment carts. Radiation Protection Technicians will respond with appropriate radiological monitoring equipment. Equipment is purchased by the Emergency Service Coordinator who ensures that the equipment complies with applicable NFPA standards. Fire brigade PPE is inspected per NFPA requirements. |
| **References** | **Document ID**<br>McGuire Nuclear Station Fire Strategies -<br>PT/0/A/4600/112 Rev. 008 [Enclosure 13.5 and 13.6] - Exterior/Interior Fire Equipment Inspection<br>PT/0/B/4600/126 Rev. 1 - Fire Brigade PPE Inspection<br>RP/0/A/5700/025 Rev. 19 - Fire Brigade Response | | |
| 3.4.5 Off-Site Fire Department Interface. | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.5.1 Mutual Aid Agreement. | 3.4.5.1 Mutual Aid Agreement.<br>Off-site fire authorities shall be offered a plan for their interface during fires and related emergencies on site. | Comply | Offsite fire departments are provided a plan for interface during fires and other conduitions requiring the use of the fire fighting resources through Letters of Agreement. The Letters of Agreement identify the responding organizations would be under the direct guidance of MNS personnel. In addition, the Offsite Fire Department Strategy indicates that communciation will be established with the MNS Fire Brigade Leader as the point of contact. |

**References** — **Document ID**

2010-03-16 Letter of Agreement - Cornelius - Letter of Agreement, Duke Energy Carolinas with Cornelius Volunteer Fire Department

2010-03-16 Letter of Agreement - Mecklenburg - Letter of Agreement, Duke Energy Carolinas with Mecklenburg County Fire Marshal

2010-05-10 Letter of Agreement - Huntersville - Letter of Agreement, Duke Energy Carolinas with Huntersville Fire Department

FS/0/B/9000/200 Rev. 0 - Offsite Fire Department Fire Strategy #200

McGuire Emergency Plan -

RP/0/A/5700/025 Rev. 19 - Fire Brigade Response

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.5.2 Site-Specific Training. | 3.4.5.2* Site-Specific Training.<br>Fire fighters from the off-site fire authorities who are expected to respond to a fire at the plant shall be offered site-specific training and shall be invited to participate in a drill at least annually. | Comply | Annual training is specified in the Letters of Agreement with the off-site fire authorities. The training includes topics in fire protection, radiation protection, station familiarization, and station security procedures. |

**References** — **Document ID**

2010-03-16 Letter of Agreement - Cornelius - Letter of Agreement, Duke Energy Carolinas with Cornelius Volunteer Fire Department

2010-03-16 Letter of Agreement - Mecklenburg - Letter of Agreement, Duke Energy Carolinas with Mecklenburg County Fire Marshal

2010-05-10 Letter of Agreement - Huntersville - Letter of Agreement, Duke Energy Carolinas with Huntersville Fire Department

NSD-112 Rev. 11 [Section 112.5] - Fire Brigade Organization, Training & Responsibilities

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.5.3 Security and Radiation Protection. | 3.4.5.3* Security and Radiation Protection.<br>Plant security and radiation protection plans shall address off-site fire authority response. | Comply | Site documents include Security and Radiation Protection provisions for assistance to off-site fire authorities. |

**References** — **Document ID**

NSD-112 Rev. 11 [Section 112.2.9, 112.2.10] - Fire Brigade Organization, Training & Responsibilities

RP/0/A/5700/025 Rev. 19 [Enclosure 4.1] - Fire Brigade Response

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.4.6 Communications. | 3.4.6* Communications.<br>An effective emergency communications capability shall be provided for the industrial fire brigade. | Comply | Emergency communication capabilities include the telephone system, public address system, and radios. |

**References** — **Document ID**

MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.5.d] - Design Basis Specification for Fire Protection

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | RP/0/A/5700/025 Rev. 19 - Fire Brigade Response | | |
| 3.5 Water Supply | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.5.1 [Water Supply Flow Code Requirements] | 3.5.1<br>A fire protection water supply of adequate reliability, quantity, and duration shall be provided by one of the two following methods.<br>(a) Provide a fire protection water supply of not less than two separate 300,000-gal (1,135,500-L) supplies.<br>(b) Calculate the fire flow rate for 2 hours. This fire flow rate shall be based on 500 gpm (1892.5 L/min) for manual hose streams plus the largest design demand of any sprinkler or fixed water spray system(s) in the power block as determined in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection. The fire water supply shall be capable of delivering this design demand with the hydraulically least demanding portion of fire main loop out of service. | Comply | MNS complies via method (b). The maximum single demand is 2,583 gpm to Unit 2 Turbine Building Mezzanine Area 2 (South). This fire flow rate for two hours plus a 500 gpm hose stream is 369,960 gallons. The water supply for the fire protection system is Lake Norman which has a capacity well in excess of this demand. |
| **References** | **Document ID**<br>MCS-1599.RF-00-0001 Rev. 23 [Section 3.1.2.1.1] - Design Basis Specification for the RF/RY System | | |
| 3.5.2 [Water Supply Tank Code Requirements] | 3.5.2*<br>The tanks shall be interconnected such that fire pumps can take suction from either or both. A failure in one tank or its piping shall not allow both tanks to drain. The tanks shall be designed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.<br><br>Exception No. 1: Water storage tanks shall not be required when fire pumps are able to take suction from a large body of water (such as a lake), provided each fire pump has its own suction and both suctions and pumps are adequately separated.<br><br>Exception No. 2: Cooling tower basins shall be an acceptable water source for fire pumps when the volume is sufficient for both purposes and water quality is consistent with the demands of the fire service. | Comply | MNS does not utilize tanks for fire protection water. MNS complies via Exception 1 and draws water from Lake Norman as the primary fire water source using separated fire pumps with independent suction lines. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section E.2] - Design Basis Specification for Fire Protection<br>MCS-1599.RF-00-0001 Rev. 23 [Section 3.11] - Design Basis Specification for the RF/RY System | | |
| 3.5.3 [Water Supply Pump Code Requirements] | 3.5.3*<br>Fire pumps, designed and installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, shall be provided to ensure that 100 percent of the required flow rate and pressure are available assuming failure of the largest pump or pump power source. | Complies via Use of EEEE | The pumps were evaluated in accordance with NFPA 20. Three fire pumps are provided and each is sized to provide 100 percent of the required flow rate and pressure. The MNS Code of Record is NFPA 20, 1978 edition. |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| **References** | **Document ID**<br>MCC-1435.00-00-0033 Rev. 0 - NFPA 20 Code Conformance Review<br>MCS-1465.00-00-0008 Rev. 14 [Section 4.1.8.3.6] - Design Basis Specification for Fire Protection | | |
| | | *Submit for NRC Approval* | *The fire pump controllers are not installed to all requirements of* NFPA 20. See Attachment L to the License Amendment Request for further details on the request for NRC approval of minor non-conformances with NFPA 20. |
| 3.5.4 [Water Supply Pump Diversity and Redundancy] | 3.5.4<br>At least one diesel engine-driven fire pump or two more seismic Category I Class IE electric motor-driven fire pumps connected to redundant Class IE emergency power buses capable of providing 100 percent of the required flow rate and pressure shall be provided. | Complies with previous NRC Approval | Diesel-engine driven fire water pumps are not utilized. MNS uses three electric fire pumps capable of each providing 100% of the required flow and pressure.<br><br>NRC SER *Supplement 2 states "The fire water system is* common to both units and consists of three full capacity 2500 gallons per minute motor drive pumps." "Power to fire pump A is from Unit 2, 2TB switchgear; power to fire pump B is from Unit 1 1TD switchgear; and power to fire pump C is from the 44 kilovolt substation independent of the McGuire Station auxiliary power system." "We have reviewed the design criteria and bases for the water suppression system and conclude that these systems meet the guidelines of Appendix A to Branch Technical Position 9.5.1 and are in accord with the applicable portions of the National Fire Protection Associated (NFPA), Codes, and are, therefore, acceptable."<br><br>There have been no changes to invalidate the basis for this approval. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section E.2.c] - Design Basis Specification for Fire Protection<br>NRC SER No. 2 dated March 1, 1979 [App. D; Section II.A] - Safety Evaluation Report Supplement 2 | | |
| 3.5.5 [Water Supply Pump Separation Requirements] | 3.5.5<br>Each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers. | Complies with previous NRC Approval | Fire Pumps A and B are separated from Fire Pump C and their associated controllers by 3 hour fire barriers.<br><br>NRC SER Supplement 2 states "The fire pumps are located in the seismic Category 1 intake structure and separated by three hour fire rated barriers from the other pumps in that structure." "We have reviewed the design criteria and bases for the water suppression system and conclude that these systems meet the guideline sof Appendix A to Branch Technical Position 9.5.1 and are in accord with the applicable portions of the National Fire Protection Associated (NFPA), Codes, and are, therefore, acceptable."<br><br>There have been no changes to invalidate the basis for this approval. |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| **References** | **Document ID**<br>NRC SER No. 2 dated March 1, 1979 [App. D; Section II.A] - Safety Evaluation Report Supplement 2 | | |
| 3.5.6 [Water Supply Pump Start/Stop Requirements] | 3.5.6<br>Fire pumps shall be provided with automatic start and manual stop only. | Comply | Fire pumps are provided with auto-start and can only be shut off by the manual stop. |
| **References** | **Document ID**<br>MCC-1435.00-00-0033 Rev. 0 [Section 10.5.2] - NFPA 20 Code Conformance Review | | |
| 3.5.7 [Water Supply Pump Connection Requirements] | 3.5.7<br>Individual fire pump connections to the yard fire main loop shall be provided and separated with sectionalizing valves between connections. | Comply | There are separate connections between the fire pumps and the main fire loop for MNS. Post indicator valves are provided. |
| **References** | **Document ID**<br>MC-1384-07.22-00 Rev. 8 - Fire Plan Outside Fire Loop<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section E.2.a] - Design Basis Specification for Fire Protection | | |
| 3.5.8 [Water Supply Pressure Maintenance Limitations] | 3.5.8<br>A method of automatic pressure maintenance of the fire protection water system shall be provided independent of the fire pumps. | Comply | The system pressure is maintained by a pressurization tank and two jockey pumps. |
| **References** | **Document ID**<br>MCC-1435.00-00-0033 Rev. 0 [Section 5.24] - NFPA 20 Code Conformance Review | | |
| 3.5.9 [Water Supply Pump Operation Notification] | 3.5.9<br>Means shall be provided to immediately notify the control room, or other suitable constantly attended location, of operation of fire pumps. | Comply | Visible pump running signals for the fire pumps are sent to the control room. |
| **References** | **Document ID**<br>MCC-1435.00-00-0033 Rev. 0 [Section 10.4.7] - NFPA 20 Code Conformance Review | | |
| 3.5.10 [Water Supply Yard Main Code Requirements] | 3.5.10<br>An underground yard fire main loop, designed and installed in accordance with NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be installed to furnish anticipated water requirements. | Complies via Use of EEEE | An underground fire loop is provided around the perimeter of the plant to service fire protection requirements. The underground fire water piping system was evaluated in accordance with NFPA 24. The MNS Code of Record is NFPA 24, 1977 edition. |
| **References** | **Document ID**<br>MCC-1435.00-00-0034 Rev. 0 - NFPA 24 Code Conformance Review<br>MCS-1465.00-00-0008 Rev. 14 [Section 4.1.8.3.7] - Design Basis Specification for Fire Protection | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.5.11 [Water Supply Yard Main Maintenance Issues] | 3.5.11<br>Means shall be provided to isolate portions of the yard fire main loop for maintenance or repair without simultaneously shutting off the supply to both fixed fire suppression systems and fire hose stations provided for manual backup. Sprinkler systems and manual hose station standpipes shall be connected to the plant fire protection water main so that a single active failure or a crack to the water supply piping to these systems can be isolated so as not to impair both the primary and backup fire suppression systems. | Comply | Sectionalizing valves are provided to allow isolation of various sections of the fire water system for maintenance or repair.<br><br>The main underground fire loop is provided with post indicator valves that are arranged to provide isolation to portions of the loop for maintenance or repair without shutting off the complete system. The Fire Protection Program Design Basis Specification states "Each sprinkler system and manual hose station has an independent connection to the fire protection feeder; therefore, a single failure cannot impair both the primary and backup fire protection systems." |
| **References** | **Document ID**<br>MC-1384-07.22-00 Rev. 8 - Fire Plan Outside Fire Loop<br>MCC-1435.00-00-0034 Rev. 0 [Section 6.6] - NFPA 24 Code Conformance Review<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section E.3.a] - Design Basis Specification for Fire Protection | | |
| | | Complies with previous NRC Approval | A single control valve is provided for the reactor building fire suppression and standpipe system. This configuration was identified and disucssed with the NRC which found the arrangement acceptable.<br><br>The letter states, "I&E Inspection Reports numbered 50-369/80-25 and 50-370/80-15 contain items of noncompliance and deviations, which are presented below:<br><br>Single Failure in the Fire Suppression System - The I&E inspection report was concerned with a containment piping arrangement, whereby, a single control valve in the fire protection water supply system could, if shut, prevent water from reaching the standpipe and sprinkler systems simultaneously. The applicant's response included a chronology of NRC review events that culminated in our approval for the use of a remote, manually operated control valve for the containment hose stations and sprinklers. We concur with the applicant's response and find the use of a single control valve to be acceptable, since it can readily be rendered open from the control room."<br><br>There have been no changes to invalidate the basis for this approval. |
| **References** | **Document ID**<br>1981-01-08 NRC Memo - McGuire Nuclear Facility, I&E Notice of Deviation, Fire Protection | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.5.12 [Water Supply Compatible Thread Connections] | 3.5.12<br>Threads compatible with those used by local fire departments shall be provided on all hydrants, hose couplings, and standpipe risers.<br>Exception: Fire departments shall be permitted to be provided with adapters that allow interconnection between plant equipment and the fire department equipment if adequate training and procedures are provided. | Comply | Threads compatible with those used by the local fire department are provided on all hydrants, hose couplings, and standpipe risers. |
| **References** | **Document ID**<br>MCC-1435.00-00-0032 Rev. 0 [Section 4.7.2] - NFPA 14 Code Conformance Review<br>MCC-1435.00-00-0034 Rev. 0 [Section 7.1.2] - NFPA 24 Code Conformance Review | | |
| 3.5.13 [Water Supply Header Options] | 3.5.13<br>Headers fed from each end shall be permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, Code for Power Piping, are used for the headers (up to and including the first valve) supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. Where provided, such headers shall be considered an extension of the yard main system. Each sprinkler and standpipe system shall be equipped with an outside screw and yoke (OS&Y) gate valve or other approved shutoff valve. | Comply | MNS licensing commitments do not require seismically designed standpipe systems.<br><br>Each water supply connection to the standpipe system is provided with a listed indicating valve.<br><br>Each sprinkler system is equipped with a listed/approved control shutoff valve except for the Reactor Building sprinkler systems, reactor coolant pumps and pipe corridor. The Reactor Building sprinkler systems, reactor coolant pumps and pipe corridor are provided with seismically qualified control valves. UL/FM does not list/approve seismically qualified valves. |
| **References** | **Document ID**<br>MCC-1435.00-00-0032 Rev. 0 [Section 6.3.6] - NFPA 14 Code Conformance Review<br>MCS-1465.00-00-0008 Rev. 14 - Design Basis Specification for Fire Protection<br>MCS-1599.RF-00-0001 Rev. 23 - Design Basis Specification for the RF/RY System | | |
| 3.5.14 [Water Supply Control Valve Supervision] | 3.5.14*<br>All fire protection water supply and fire suppression system control valves shall be under a periodic inspection program and shall be supervised by one of the following methods.<br>(a) Electrical supervision with audible and visual signals in the main control room or other suitable constantly attended location.<br>(b) Locking valves in their normal position. Keys shall be made available only to authorized personnel.<br>(c) Sealing valves in their normal positions. This option shall be utilized only where valves are located within fenced areas or under the direct control of the owner/operator. | Comply | Fire protection valves are periodically inspected and electronically monitored in the Control Room or their position is locked or sealed in place. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section E.3.b] - Design Basis Specification for Fire Protection<br>PT/0/A/4400/001C Rev. 061 - Fire Protection System Monthly Test | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.5.15 [Water Supply Hydrant Code Requirements] | 3.5.15<br>Hydrants shall be installed approximately every 250 ft (76 m) apart on the yard main system. A hose house equipped with hose and combination nozzle and other auxiliary equipment specified in NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be provided at intervals of not more than 1000 ft (305 m) along the yard main system.<br>Exception: Mobile means of providing hose and associated equipment, such as hose carts or trucks, shall be permitted in lieu of hose houses. Where provided, such mobile equipment shall be equivalent to the equipment supplied by three hose houses. | Comply | Hydrants are installed at a maximum of 250 ft on the yard main system. Hose houses are installed at a maximum of 1000 ft. |
| **References** | **Document ID** | | |
| | MC-1384-07.22-00 Rev. 8 - Fire Plan Outside Fire Loop | | |
| | MCC-1435.00-00-0034 Rev. 0 [Section 7.2.1] - NFPA 24 Code Conformance Review | | |
| | MCFD-1599-01.00 Rev. 17 - Flow Diagram of Fire Protection System (RF) | | |
| | | Complies via Use of EEEE | The hose houses were evaluated for compliance in the NFPA 24 Code Conformance Review. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0034 Rev. 0 [Section 8] - NFPA 24 Code Conformance Review | | |
| 3.5.16 [Water Supply Dedicated Limits] | 3.5.16*<br>The fire protection water supply system shall be dedicated for fire protection use only.<br><br>Exception No. 1: Fire protection water supply systems shall be permitted to be used to provide backup to nuclear safety systems, provided the fire protection water supply systems are designed and maintained to deliver the combined fire and nuclear safety flow demands for the duration specified by the applicable analysis.<br><br>Exception No. 2: *Fire protection water storage can be provided by plant* systems serving other functions, provided the storage has a dedicated capacity capable of providing the maximum fire protection demand for the specified duration as determined in this section. | Submit for NRC Approval | The fire water supply system is used for specific purposes other than fire protection. See Attachment L of the License Amendment Request for NRC approval of the evaluation for alternate uses. |
| 3.6 Standpipe and Hose Stations. | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.6.1 [Standpipe and Hose Station Code Requirements] | 3.6.1<br>For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14, Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems. | Complies with previous NRC Approval | The standpipe and hose system was found acceptable by the NRC. Appendix A to Branch Technical Position APCSB 9.5-1 Section E.3.d requires 1-1/2" hose connection/fire hose. This is a Class II standpipe.<br><br>The NRC previously found the MNS standpipe and hose system acceptable per the Supplement 2 to the 1978 NRC SER.<br><br>"Manual hose stations are located throughout the plant to ensure that an effective hose stream can be directed to any safety related area in the plant. These systems are consistent with the requirements of NFPA Standard No. 14, "Standpipe and Hose System for Sizing, Spacing, and Pipe Support Requirements... We have reviewed the design criteria and bases for the water suppression systems and conclude that these systems meet the guidelines of Appendix A to Branch Technical Position 9.5.1 and are in accord with the applicable portions of the National Fire Protection Association (NFPA), Codes, and are, therefore, acceptable."<br><br>There have been no changes to invalidate the basis for this approval. |
| **References** | **Document ID** | | |
| | NRC SER No. 2 dated March 1, 1979 [App. D; Section II.A] - Safety Evaluation Report Supplement 2 | | |
| | | Complies via Use of EEEE | The standpipe and hose system was evaluated in accordance with NFPA 14. The MNS Code of Record is NFPA 14, 1976 edition. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0032 Rev. 0 - NFPA 14 Code Conformance Review | | |
| | MCS-1465.00-00-0008 Rev. 14 [Section 4.1.8.3.4] - Design Basis Specification for Fire Protection | | |
| 3.6.2 [Standpipe and Hose Station Capability Limitations] | 3.6.2<br>A capability shall be provided to ensure an adequate water flow rate and nozzle pressure for all hose stations. This capability includes the provision of hose station pressure reducers where necessary for the safety of plant industrial fire brigade members and off-site fire department personnel. | Comply | The fire water supply system can provide adequate water flow and nozzle pressure at the hose stations. Pressure reducing devices are not requried as the fire brigade is trained on the use of fire hose streams. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0032 Rev. 0 [Section 7.2] - NFPA 14 Code Conformance Review | | |
| | MCS-1465.00-00-0008 Rev. 14 [App A.1; Section E.3] - Design Basis Specification for Fire Protection | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.6.3 [Standpipe and Hose Station Nozzle Restrictions] | 3.6.3<br>The proper type of hose nozzle to be supplied to each power block area shall be based on the area fire hazards. The usual combination spray/straight stream nozzle shall not be used in areas where the straight stream can cause unacceptable damage or present an electrical hazard to fire-fighting personnel. Listed electrically safe fixed fog nozzles shall be provided at locations where high-voltage shock hazards exist. All hose nozzles shall have shutoff capability and be able to control water flow from full open to full closed. | Comply | The appropriate hose nozzles have been provided. |
| ***References*** | ***Document ID***<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section E.3.e] - Design Basis Specification for Fire Protection<br>RP/0/A/5700/025 Rev. 19 [Enclosure 4.3] - Fire Brigade Response | | |
| 3.6.4 [Standpipe and Hose Station Earthquake Provisions] | 3.6.4<br>Provisions shall be made to supply water at least to standpipes and hose stations for manual fire suppression in all areas containing systems and components needed to perform the nuclear safety functions in the event of a safe shutdown earthquake (SSE). | Complies with previous NRC Approval | There were no design requirements in the original licensing of MNS for any standpipes to be functional in the event of an SSE. The NRC previously approved the hose stations in regards to the NFPA 14-1976 edition which does not contain provisions for seismically designed hose stations.<br><br>Supplement 2 to the 1978 NRC Safety Evaluation Report states: "Manual hose stations are located throughout the plant to ensure that an effective hose stream can be directed to any safety related area in the plant. These systems are consistent with the requirements of NFPA Standard No. 14, "Standpipe and Hose System for Sizing, Spacing, and Pipe Support Requirements... We have reviewed the design criteria and bases for the water suppression systems and conclude that these systems meet the guidelines of Appendix A to Branch Technical Position 9.5.1 and are in accord with the applicable portions of the National Fire Protection Association (NFPA), Codes, and are, therefore, acceptable."<br><br>There have been no changes to invalidate the basis for this approval. |
| **References** | **Document ID**<br>1979-03-01 NRC Letter [App. D; Section II.A] - SER Supplement No. 2 | | |
| 3.6.5 [Standpipe and Hose Station Seismic Connection Limitations] | 3.6.5<br>Where the seismic required hose stations are cross-connected to essential seismic non-fire protection water supply systems, the fire flow shall not degrade the essential water system requirement. | N/A | MNS does not have seismic required hose stations. |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.7 Fire Extinguishers. | 3.7 Fire Extinguishers.<br>Where provided, fire extinguishers of the appropriate number, size, and type shall be provided in accordance with NFPA 10, Standard for Portable Fire Extinguishers. Extinguishers shall be permitted to be positioned outside of fire areas due to radiological conditions. | Complies via Use of EEEE | Fire extinguishers, where provided, are in accordance with NFPA 10, and meet the associated number, size, and type requirements. The MNS Code of Record is NFPA 10, 1978 edition. |
| **References** | **Document ID**<br>MCC-1435.00-00-0029 Rev. 0 - NFPA 10 Code Conformance Review<br>MCS-1465.00-00-0008 Rev. 14 [Section 4.1.8.3.1] - Design Basis Specification for Fire Protection | | |
| 3.8 Fire Alarm and Detection Systems. | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.8.1 Fire Alarm | 3.8.1 Fire Alarm.<br>Alarm initiating devices shall be installed in accordance with NFPA 72, National Fire Alarm Code. Alarm annunciation shall allow the proprietary alarm system to transmit fire-related alarms, supervisory signals, and trouble signals to the control room or other constantly attended location from which required notifications and response can be initiated. Personnel assigned to the proprietary alarm station shall be permitted to have other duties. *The following fire-related signals shall be transmitted:*<br>(1) Actuation of any fire detection device<br>(2) Actuation of any fixed fire suppression system<br>(3) Actuation of any manual fire alarm station<br>(4) Starting of any fire pump<br>(5) Actuation of any fire protection supervisory device<br>(6) Indication of alarm system trouble condition | Complies via Use of EEEE | The fire alarm and signaling system was evaluated in accordance with NFPA 72. Signals (alarm, trouble) for detection devices, suppression system actuation, supervisory devices, manual fire alarm stations, and fire pump start annunicaite to a separate panel in the control room. MNS has various code of records: NFPA 72D, 1975 edition; NFPA 72, 2002 edition (Reactor Buidling Pipe Corridor and Containment EFA System); and NFPA 72, 2007 edition (Interior/Exterior Doghouses and modifications including MD501276/EC95846, MD501277/EC95847, EC95850 and EC103255. |
| **References** | **Document ID**<br>EC 103255/MD501280B -<br>EC 103258/MD501280D -<br>EC 95846/MD501276 -<br>EC 95847/MD501277 -<br>EC 95850/MD501280A -<br>MCC-1435.00-00-0037 Rev. 0 - NFPA 72 Code Conformance Review | | |
| 3.8.1.1 [Fire Alarm Communication Requirements] | 3.8.1.1<br>Means shall be provided to allow a person observing a fire at any location in the plant to quickly and reliably communicate to the control room or other suitable constantly attended location. | Comply | Means to report a fire are provided including telephone and radio communication. |
| **References** | **Document ID**<br>Duke PAT Rev. 08/01/2012 [Page 67] - Duke Energy - Plant Access Training | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.8.1.2 [Fire Alarm Prompt Notification Limits] | 3.8.1.2<br>Means shall be provided to promptly notify the following of any fire emergency in such a way as to allow them to determine an appropriate course of action: | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.8.1.2 [Fire Alarm Prompt Notification Limits] (1) | 3.8.1.2 (1) General site population in all occupied areas | Comply | Means are provided to notify the general site population via the PA system. |
| **References** | **Document ID**<br>Duke PAT Rev. 08/01/2012 [Page 69] - Duke Energy - Plant Access Training<br>RP/0/A/5700/025 Rev. 19 [Section 1.5.12, Enclosure 4.1] - Fire Brigade Response | | |
| 3.8.1.2 [Fire Alarm Prompt Notification Limits] (2) | 3.8.1.2 (2) Members of the industrial fire brigade and other groups supporting fire emergency response | Comply | Means are provided to notify the industrial fire brigade and other supporting groups via the PA systems, pagers, and radios. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 [App A.1; Section D.5.c, E.1.b] - Design Basis Specification for Fire Protection<br>RP/0/A/5700/025 Rev. 19 [Section 1.5.12, Enclosure 4.1] - Fire Brigade Response | | |
| 3.8.1.2 [Fire Alarm Prompt Notification Limits] (3) | 3.8.1.2 (3) Off-site fire emergency response agencies. Two independent means shall be available (e.g., telephone and radio) for notification of off-site emergency services | Comply | Means are provided to notify the offsite fire departments for assistance via phone (land line and cell) and radio. |
| **References** | **Document ID**<br>RP/0/A/5700/025 Rev. 19 [Section 1.5.12, Enclosure 4.1] - Fire Brigade Response | | |
| 3.8.2 Detection. | 3.8.2 Detection.<br>If automatic fire detection is required to meet the performance or deterministic requirements of Chapter 4, then these devices shall be installed in accordance with NFPA 72, National Fire Alarm Code, and its applicable appendixes. | Complies via Use of EEEE | The fire detection devices were evaluated in accordance with NFPA 72. See LAR Table 4-3 for required detection systems. MNS has various code of records: NFPA 72E, 1974 edition; NFPA 72, 2002 edition (Reactor Buidling Pipe Corridor and Containment EFA System); and NFPA 72, 2007 edition (Interior/Exterior Doghouses and modifications including MD501276/EC95846, MD501277/EC95847, EC95850 and EC103255. |
| **References** | **Document ID**<br>MCC-1435.00-00-0037 Rev. 0 - NFPA 72 Code Conformance Review<br>MCS-1465.00-00-0008 Rev. 14 [Sections 4.1.8.3.12, 4.1.8.3.14, and 4.1.8.3.15] - Design Basis Specification for Fire Protection | | |
| 3.9 Automatic and Manual Water-Based Fire Suppression Systems. | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.9.1 [Fire Suppression System Code Requirements] | 3.9.1* If an automatic or manual water-based fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be installed in accordance with the appropriate NFPA standards including the following:<br><br>(1) NFPA 13, Standard for the Installation of Sprinkler Systems<br>(2) NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection<br>(3) NFPA 750, Standard on Water Mist Fire Protection Systems<br>(4) NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems | Complies via Use of EEEE | MNS is protected by automatic wet pipe sprinkler systems, water spray system, and deluge systems that were designed to conform to the requirements of NFPA 13 and 15. See LAR Table 4-3 for required suppression systems. The MNS Code of Record for NFPA 13 is the 1978 edition and the Code of Record for NFPA 15 is the 1977 edition.<br><br>There are no NFPA 16 Foam-Water or NFPA 750 Water Mist systems installed at MNS. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0046 Rev. 0 - NFPA 13 Code Conformance Review – Motor Driven CA Pump Rooms | | |
| | MCC-1435.00-00-0047 Rev. 0 - NFPA 13 Code Conformance Review – Nuclear Service Water (RN) Pumps | | |
| | MCC-1435.00-00-0048 Rev. 0 - NFPA 13 Code Conformance Review – Cable Shaft (RM 648) | | |
| | MCC-1435.00-00-0049 Rev. 0 - NFPA 13 Code Conformance Review – Battery Rooms | | |
| | MCC-1435.00-00-0050 Rev. 0 - NFPA 13 Code Conformance Review – Unit 1 Component Cooling (KC) Pumps | | |
| | MCC-1435.00-00-0051 Rev. 0 - NFPA 13 Code Conformance Review – Reactor Building Pipe Corridor | | |
| | MCC-1435.00-00-0052 Rev. 0 - NFPA 15 Code Conformance Review – CF Pump Turbine 1A, 1B, 2A, & 2B | | |
| | MCC-1435.00-00-0053 Rev. 0 - NFPA 15 Code Conformance Review – Diesel Generator Lube Oil Transfer Storage | | |
| | MCC-1435.00-00-0054 Rev. 0 - NFPA 15 Code Conformance Review – Hydrogen Seal Oil | | |
| | MCC-1435.00-00-0055 Rev. 0 - NFPA 15 Code Conformance Review – Oil Purifier | | |
| | MCC-1435.00-00-0056 Rev. 0 - NFPA 15 Code Conformance Review – Turbine Lube Oil Reservoir | | |
| | MCC-1435.00-00-0057 Rev. 0 - NFPA 15 Code Conformance Review – Turbine Lube Oil Transfer Tank | | |
| | MCC-1435.00-00-0058 Rev. 0 - NFPA 15 Code Conformance Review – Turbine Piping and Bearings | | |
| | MCC-1435.00-00-0062 Rev. 0 - NFPA 13 Code Conformance Review - Reactor Building Annulus | | |
| | MCC-1435.00-00-0063 Rev. 0 - NFPA 13 Code Conformance Review - Connecting Corridor (Room 508) - Auxiliary | | |
| | MCC-1435.00-00-0064 Rev. 0 - NFPA 15 Code Conformance Review - Cable Spreading Rooms | | |
| | MCS-1465.00-00-0008 Rev. 14 [4.1.8.3.3, 4.1.8.3.5; App A.1, Section E.3.c] - Design Basis Specification for Fire Protection | | |
| | | Complies with previous NRC Approval | A manually actuated "fog-type" sprinkler system is installed in each cable spreading room. However, the water spray systems provided do not meet all of provisions of the NFPA codes but have been approved by the NRC.<br><br>NRC Supplement 5 states, "Areas that have been equipped or will be equipped with water suppression systems are:<br><br>(a) Cable spreading room (Manual Fog System)<br><br>(b) ... |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | | | ...We have reviewed the design criteria and bases for the water suppression systems and conclude that these systems meet the guidelines of Appendix A to Branch Technical Position 9.5.1 and are in accord with the applicable portions of the National Fire Protection Association (NFPA), Codes, and are, therefore, acceptable."<br><br>There have been no changes to invalidate the basis for this approval. |
| **References** | **Document ID**<br>NRC SER No. 5 dated April 1981 - Safety Evaluation Report Supplement No.5 | | |
| 3.9.2 [Fire Suppression System Flow Alarm] | 3.9.2 Each system shall be equipped with a water flow alarm. | Complies via Use of EEEE | Each fixed automatic suppression system is provided with a water flow alarm device. Manual only actuated systems are not provided with water flow alarms.<br><br>Lack of water flow alarms for manual actuated systems has been evaluated as acceptable in the code compliance evaluation(s). |
| **References** | **Document ID**<br>MCC-1435.00-00-0046 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review – Motor Driven CA Pump Rooms<br>MCC-1435.00-00-0047 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review – Nuclear Service Water (RN) Pumps<br>MCC-1435.00-00-0048 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review – Cable Shaft (RM 648)<br>MCC-1435.00-00-0049 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review – Battery Rooms<br>MCC-1435.00-00-0050 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review – Unit 1 Component Cooling (KC) Pumps<br>MCC-1435.00-00-0051 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review – Reactor Building Pipe Corridor<br>MCC-1435.00-00-0052 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review – CF Pump Turbine 1A, 1B, 2A, & 2B<br>MCC-1435.00-00-0053 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review – Diesel Generator Lube Oil Transfer Storage<br>MCC-1435.00-00-0054 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review – Hydrogen Seal Oil<br>MCC-1435.00-00-0055 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review – Oil Purifier<br>MCC-1435.00-00-0056 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review – Turbine Lube Oil Reservoir<br>MCC-1435.00-00-0057 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review – Turbine Lube Oil Transfer Tank<br>MCC-1435.00-00-0058 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review – Turbine Piping and Bearings<br>MCC-1435.00-00-0062 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review - Reactor Building Annulus<br>MCC-1435.00-00-0063 Rev. 0 [Att. A; Section 6.9] - NFPA 13 Code Conformance Review - Connecting Corridor (Room 508) - Auxiliary<br>MCC-1435.00-00-0064 Rev. 0 [Att. A; Section 5.11] - NFPA 15 Code Conformance Review - Cable Spreading Rooms | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.9.3 [Fire Suppression System Alarm Locations] | 3.9.3<br>All alarms from fire suppression systems shall annunciate in the control room or other suitable constantly attended location. | Comply | Fire suppression systems that are equipped with alarms annunciate in the Control Room. |
| **References** | ***Document ID***<br>MCFD-1599-02.02 Rev. 11 [Section 3.1.2.1.1, 3.4] - Flow Diagram of Fire Protection System (RF) | | |
| 3.9.4 [Fire Suppression System Diesel Pump Sprinkler Protection] | 3.9.4<br>Diesel-driven fire pumps shall be protected by automatic sprinklers. | N/A | MNS does not utilize diesel driven fire water pumps. |
| **References** | ***Document ID***<br>MCC-1435.00-00-0033 Rev. 0 - NFPA 20 Code Conformance Review | | |
| 3.9.5 [Fire Suppression System Shutoff Controls] | 3.9.5<br>Each system shall be equipped with an OS&Y gate valve or other approved shutoff valve. | Complies via Use of EEEE | Each sprinkler system is equipped with an shutoff valve, or evaluated as acceptable /equivalent in the code compliance evaluation. |
| **References** | ***Document ID***<br>MCC-1435.00-00-0046 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review – Motor Driven CA Pump Rooms<br>MCC-1435.00-00-0047 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review – Nuclear Service Water (RN) Pumps<br>MCC-1435.00-00-0048 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review – Cable Shaft (RM 648)<br>MCC-1435.00-00-0049 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review – Battery Rooms<br>MCC-1435.00-00-0050 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review – Unit 1 Component Cooling (KC) Pumps<br>MCC-1435.00-00-0051 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review – Reactor Building Pipe Corridor<br>MCC-1435.00-00-0052 Rev. 0 [Att. A; Section 5.7] - NFPA 15 Code Conformance Review – CF Pump Turbine 1A, 1B, 2A, & 2B<br>MCC-1435.00-00-0053 Rev. 0 [Att. A; Section 5.7] - NFPA 15 Code Conformance Review – Diesel Generator Lube Oil Transfer Storage<br>MCC-1435.00-00-0054 Rev. 0 [Att. A; Section 5.7] - NFPA 15 Code Conformance Review – Hydrogen Seal Oil<br>MCC-1435.00-00-0055 Rev. 0 [Att. A; Section 5.7] - NFPA 15 Code Conformance Review – Oil Purifier<br>MCC-1435.00-00-0057 Rev. 0 [Att. A; Section 5.7] - NFPA 15 Code Conformance Review – Turbine Lube Oil Transfer Tank<br>MCC-1435.00-00-0058 Rev. 0 [Att. A; Section 5.7] - NFPA 15 Code Conformance Review – Turbine Piping and Bearings<br>MCC-1435.00-00-0062 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review - Reactor Building Annulus<br>MCC-1435.00-00-0063 Rev. 0 [Att. A; Section 6.7] - NFPA 13 Code Conformance Review - Connecting Corridor (Room 508) - Auxiliary<br>MCC-1435.00-00-0064 Rev. 0 [Att. A; Section 5.7] - NFPA 15 Code Conformance Review - Cable Spreading Rooms | | |
| 3.9.6 [Fire Suppression System Valve Supervision] | 3.9.6<br>All valves controlling water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall be supervised as described in 3.5.14. | Comply | Valves are either electrically supervised or they are locked or sealed in accordance with Section 3.5.14. |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| ***References*** | ***Document ID*** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App. A.1; Section E.3.b] - Design Basis Specification for Fire Protection | | |
| | PT/0/A/4400/001C Rev. 061 - Fire Protection System Monthly Test | | |
| 3.10 Gaseous Fire Suppression Systems. | N/A | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.10.1 [Gaseous Suppression System Code Requirements] | 3.10.1 If an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the following applicable NFPA codes:<br>(1) NFPA 12, Standard on Carbon Dioxide Extinguishing Systems<br>(2) NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems<br>(3) NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems | Complies via use of EEEE | MNS does not use fixed Carbon Dioxide Extinguishing or Clean Agent Fire Extinguishing Systems.<br>Each of the Turbine Driven Auxiliary Feedwater Pumps and the Emergency Diesel Generators are protected with an automatic Halon 1301 suppression system. The Halon systems have been evaluated in accordance with NFPA 12A. The MNS Code of Record is NFPA 12A, 1977 edition. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0030 Rev. 0 - NFPA 12A Code Conformance Review - Diesel Generator Room | | |
| | MCC-1435.00-00-0031 Rev. 0 - NFPA 12A Code Conformance Review - Turbine Driven Auxiliary Feedwater Pump Room | | |
| | MCS-1465.00-00-0008 Rev. 14 [Section 4.1.3.8.2; App. A.1, Section E.5] - Design Basis Specification for Fire Protection | | |
| 3.10.2 [Gaseous Suppression System Alarm Location] | 3.10.2<br>Operation of gaseous fire suppression systems shall annunciate and alarm in the control room or other constantly attended location identified. | Comply | The MNS Halon 1301 systems are actuated manually or automatically. Activation of systems annunciate and alarm in the Control Room. |
| **References** | **Document ID** | | |
| | MCS-1599.RF-00-0001 Rev. 23 [Section 3.4.3] - Design Basis Specification for the RF/RY System | | |
| 3.10.3 [Gaseous Suppression System Ventilation Limitations] | 3.10.3<br>Ventilation system design shall take into account prevention from over-pressurization during agent injection, adequate sealing to prevent loss of agent, and confinement of radioactive contaminants. | Complies via Use of EEEE | The ventilation systems automatically shutdown and dampers close upon initiation of the Halon system. Sealing is provided to prevent loss of agent. There is no radiological contamination in the areas of these systems. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0030 Rev. 0 - NFPA 12A Code Conformance Review - Diesel Generator Room | | |
| | MCC-1435.00-00-0031 Rev. 0 - NFPA 12A Code Conformance Review - Turbine Driven Auxiliary Feedwater Pump Room | | |
| | McGuire Nuclear Station Fire Strategies - | | |
| | MCS-1599.RF-00-0001 Rev. 23 [Section 3.1.2.1.2] - Design Basis Specification for the RF/RY System | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| 3.10.4 [Gaseous Suppression System Single Failure Limits] | 3.10.4* In any area required to be protected by both primary and backup gaseous fire suppression systems, a single active failure or a crack in any pipe in the fire suppression system shall not impair both the primary and backup fire suppression capability. | N/A | The primary gaseous fire suppression systems are not provided with backup gaseous fire suppression systems at MNS. Fire hose stations are available as a backup fire suppression feature. |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App. A.1; Section E.3, E.4] - Design Basis Specification for Fire Protection | | |
| | MCS-1599.RF-00-0001 Rev. 23 [Section 3.1] - Design Basis Specification for the RF/RY System | | |
| 3.10.5 [Gaseous Suppression System Disarming Controls] | 3.10.5 Provisions for locally disarming automatic gaseous suppression systems shall be secured and under strict administrative control. | Comply | Documented administrative procedures are in place for locally disarming automatic gaseous suppression systems. |
| **References** | **Document ID** | | |
| | OP/0/A/6400/002B Rev. 017 - Halon Fire Protection System | | |
| 3.10.6 [Gaseous Suppression System CO2 Limitations] | 3.10.6* Total flooding carbon dioxide systems shall not be used in normally *occupied areas.* | N/A | MNS does not utilize total flooding carbon dioxide systems. |
| 3.10.7 [Gaseous Suppression System CO2 Warnings] | 3.10.7 Automatic total flooding carbon dioxide systems shall be equipped with an audible pre-discharge alarm and discharge delay sufficient to permit egress of personnel. The carbon dioxide system shall be provided with an odorizer. | N/A | MNS does not utilize total flooding carbon dioxide systems. |
| 3.10.8 [Gaseous Suppression System CO2 Required Disarming] | 3.10.8 Positive mechanical means shall be provided to lock out total flooding carbon dioxide systems during work in the protected space. | N/A | MNS does not utilize total flooding carbon dioxide systems. |
| 3.10.9 [Gaseous Suppression System Cooling Considerations] | 3.10.9 The possibility of secondary thermal shock (cooling) damage shall be considered during the design of any gaseous fire suppression system, but particularly with carbon dioxide. | Comply | Systems and equipment are located a sufficient distance from the Halon 1301 discharge points to prevent thermal shock upon contact with the vaporizing liquid. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0030 Rev. 0 - NFPA 12A Code Conformance Review - Diesel Generator Room | | |
| | MCC-1435.00-00-0031 Rev. 0 - NFPA 12A Code Conformance Review - Turbine Driven Auxiliary Feedwater Pump Room | | |
| | NFPA 12A - Halon 1301 Fire Extinguishing Systems 2009 Edition | | |
| 3.10.10 [Gaseous Suppression System Decomposition Issues] | 3.10.10 Particular attention shall be given to corrosive characteristics of agent decomposition products on safety systems. | Comply | Halon 1301 in the applications and concentrations used at MNS does not present a concern on safety systems. |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| **References** | **Document ID**<br>Fire Protection Handbook, 20th Edition, Section 17/Chapter 6 - Halogenated Agents and Systems | | |
| 3.11 Passive Fire Protection Features | 3.11 Passive Fire Protection Features.<br>This section shall be used to determine the design and installation requirements for passive protection features. Passive fire protection features include wall, ceiling, and floor assemblies, fire doors, fire dampers, and through fire barrier penetration seals. Passive fire protection features also include electrical raceway fire barrier systems (ERFBS) that are provided to protect cables and electrical components and equipment from the effects of fire. | N/A | N/A - Section Heading, see sub-sections for any specific compliance statements |
| 3.11.1 Building Separation. | 3.11.1 Building Separation.<br>*Each major building within the power block shall be separated from the* others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 ft (15.2 m) or space that meets the requirements of NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.<br>Exception: Where a performance-based analysis determines the adequacy of building separation, the requirements of 3.11.1 shall not apply. | Comply | The major buildings within the power block are separated by *qualified three-hour fire barriers or evaluated as* equivalent. Major buildings include Turbine Buildings, Service Building, Auxiliary Building, Reactor Buildings, Fuel Pool Buildings, SSF, Discharge Structure, and Intake Structure. |
| **References** | **Document ID**<br>MCS-1465.00-00-0008 Rev. 14 - Design Basis Specification for Fire Protection | | |
| | | Complies via Use of EEEE | Separation between the Turbine Buildings and the Service Building is documented via engineering evaluation. |
| **References** | **Document ID**<br>MCC-1435.03-00-0014, Att. 06 Rev. 1 - GL 86-10 Evaluation of Unrated fire barrier between Service Building and Unit 1 and Unit 2 Turbine Building (FA SRV to FA TB1 and to FA TB2) | | |
| 3.11.2 Fire Barriers. | 3.11.2 Fire Barriers.<br>Fire barriers required by Chapter 4 shall include a specific fire-resistance rating. Fire barriers shall be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire tests. The qualification fire tests shall be in accordance with NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials. | Complies with previous NRC Approval | Fire barriers are generally three-hour fire rated construction. Certain deviations were approved by the NRC.<br><br>Fire barrier deviations from Appendix R criteria are addressed, with technical justification, in a letter from Duke to the NRC dated August 3, 1984. Deviations include steel penetrating fire barriers, penetrations through the Reactor Building walls, unrated door hardware, and cork expansion joints between the Auxiliary Building and the Reactor Building. Each deviation is addressed with a technical justification.<br><br>The NRC later found the deviations addressed in the August 3, 1984 letter to be acceptable. In a letter to Duke Power dated May 15, 1989 the NRC states: "By letter of August 3, 1984, you identified and justified four deviations of the McGuire Fire |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
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| | | | Protection Program from Section III.G of Appendix R to 10 CFR 50. The deviations are in regards to (1) the Auxiliary Building at elevations 716 and 733 feet, (2) wall penetrations for the Reactor Buildings, (3) fire boundary doors with security hardware, and (4) seismic expansion joints for the Auxiliary, Diesel Generator and Reactor Buildings. The NRC, with technical assistance from Franklin Research Center has reviewed these deviations and finds them to be acceptable."<br><br>The barrier separating FAs 19 and 20 (Unit 1 and 2 Cable Rooms is less than 3 hours. A 1/8/1981 NRR Memo to Duke stated "A second concern in the I&E report was with the fire resistance rating not being a full three hours for the duct shaft walls and cable spreading room. The duct shaft and cable spreading room walls were fire tested by the ASTM E-119 fire test method. We have reviewed the test results and determined the fire resistance to be in excess of two hours. We have also reviewed the areas around the direct shaft walls and the cable spreading room for existing fuel load, safety related equipment, fire detection systems in the area, the fire suppression capability, and conclude that a two-hour fire rating is adequate for the wall assembly. Therefore, we find the two hour fire rated walls to be acceptable for these areas." NRC SER, Supplement 5, April 1981, found the wall to be an acceptable barrier given the criteria above and the installation of a fire proofed angle iron at the ceiling of the wall separating Unit 1 and Unit 2 cable rooms. The angle iron has been installed.<br><br>In a letter dated 09-30-1980, the NRC identified the walls enclosing the duct shafts next to the cable spreading rooms are not of three hour fire rated construction and it is probable that this deficiency exist in other areas of the plant. Duke responded 10-24-1980 stating the duct shaft walls of concern were not provided with gypsum inside the duct shaft. Duke believes this configuration is functionally equivalent since the duct shaft walls need only prevent fire from entering the duct shaft from one fire area and exiting the duct shaft into another fire area. For a fire to follow this path would require burning through six layers of gypsum as was tested. The NRC found Duke's response acceptable in a memo dated 01-08-1981. The letter stated, "We reviewed this existing situation and determined that no fire rating is required inside of the duct shaft. Therefore, we find the applicant's design approach of providing fire resistance on only the exterior side of the shaft wall to be acceptable."<br><br>There have been no changes to invalidate the basis for these approvals. |

| References | Document ID |
|---|---|
| | 1980-09-30 NRC Letter - IR 50-369/80-25 & -370/60-15 - |
| | 1980-10-24 DPC Letter to NRC - Response to IR 50-369/80-25 & -370/80-15 |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | 1981-01-08 NRC Memo - McGuire Nuclear Facility, I&E Notice of Deviation, Fire Protection | | |
| | 1984-08-03 Duke Letter - McGuire Nuclear Station Docket Nos. 50-369, 50-370 | | |
| | 1989-05-15 NRC Letter - Reply to Duke Response, Fire Protection Deviations, McGuire Nuclear Station, Units 1 and 2 | | |
| | NRC SER No. 5 dated April 1981 - Safety Evaluation Report Supplement No.5 | | |
| | | Complies via Use of EEEE | Separation between specific fire areas has been evaluated in attachments to the referenced calculation. |
| **References** | **Document ID** | | |
| | *MCC-1435.03-00-0014 Rev. 5 - Generic Letter 86-10 Evaluations for Fire Protection Features* | | |
| | | Complies | Rated fire barriers are provide between fire areas unless otherwise previously approved by the NRC or evaluated as equivalent. Fire barriers are generally three-hour rated construction. |
| **References** | **Document ID** | | |
| | MCS-1465.00-00-0008 Rev. 14 [App. A.1; Section D.1.j; App. A.2] - Design Basis Specification for Fire Protection | | |
| 3.11.3 Fire Barrier Penetrations. | 3.11.3* Fire Barrier Penetrations. Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire resistance rating of the barrier as determined by the performance requirements established by Chapter 4. (See 3.11.3.4 for penetration seals for through penetration fire stops.) Passive fire protection devices such as doors and dampers shall conform with the following NFPA standards, as applicable: (1) NFPA 80, Standard for Fire Doors and Fire Windows (2) NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems (3) NFPA 101, Life Safety Code Exception: Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, a performance-based analysis shall be required to assess the adequacy of fire barrier forming the fire boundary to determine if the barrier will withstand the fire effects of the hazards in the area. Openings in fire barriers shall be permitted to be protected by other means as acceptable to the AHJ. | Complies with previous NRC Approval | Fire barriers penetrations are generally provided with three hour fire rated fire door assemblies or fire rated dampers. Certain deviations were approved by the NRC.<br><br>Supplement 2 to the 1978 NRC Safety Evaluation Report states:<br><br>"The applicant has committed to making all improvements prior to initial fuel loading of Unit 1 with the following exceptions which will be implemented prior to commercial operation of Unit 1: (3) Fire doors and dampers installed in penetrations in room 807 and 820 on elevation 750 feet of the auxiliary building which are adjacent to safety related equipment area. (4) Fire doors, dampers and the 1 1/2 hour rated ceilings for the peripheral rooms within the control complex. We have reviewed the applicant's schedule and find it acceptable. In summary, the fire protection system modifications to be completed by commercial operation as well as the... the barriers between fire areas... provide adequate protection from the adverse effects of a fire during the interim period prior to installation and operation of the Safe Shutdown System (SSS). We find that the Fire Protection Program for the McGuire Nuclear Plant with the improvements already made and those being made by the licensee is adequate for the present and, with the scheduled SSS, will meet the guidelines contained in Appendix A to Branch Technical Position 9.5-1 and meets General Design Criterion 3 and is, therefore, acceptable."<br><br>In additon, the NRC Safety Evaluation Report Supplement 2, fire doors were not installed on the 3 hour barriers of the Residual |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
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| | | | Heat Removal Pump Rooms. Due to Duke agreeing to extend sprinkler coverage the NRC has concluded that the appropriate fire protection has been provided and is acceptable. Original text from the NRC Safety Evaluation Report Supplement 2:<br><br>"There are no fire doors installed on the three-hour fire barriers of each Residual Heat Removal pump rooms. Access for manual fire fighting is very limited by two open spiral stairways from the level above. At our request, the applicant has agreed to extend the sprinkler system in each Residual Heat Removal pump room to cover the adjacent corridor area where an exposure fire may occur and threaten the Residual Heat Removal pumps. We have reviewed the applicant's Fire Hazards Analysis for the Residual Heat Removal pump rooms and conclude that appropriate fire protection has been provided and is acceptable."<br><br>The Reactor Building HVAC penetrations and personnel access portals do not meet the three-hour rated barrier criteria. The NRC concluded in a letter to Duke dated 5/15/89 that "it is concluded that the existing reactor building penetrations for the process piping, spare sleeves, HVAC ducts, and personnel access portals are equivalent to a 3-hour fire rated penetration seal and/or are sufficient to withstand the expected fire severity with considerable conservatism.<br><br>Therefore, the omission of standard designed fire tested penetration seals in these areas is an acceptable deviation from Section III.G.2.a of Appendix R."<br><br>There have been no changes to invalidate the basis for these approvals. |
| **References** | **Document ID** | | |
| | 1989-05-15 NRC Letter - Reply to Duke Response, Fire Protection Deviations, McGuire Nuclear Station, Units 1 and 2 | | |
| | NRC SER No. 2 dated March 1, 1979 [Att. D; Section V.D, VIII] - Safety Evaluation Report Supplement 2 | | |
| | | Complies via Use of EEEE | Fire doors and fire dampers have been evaluated in accordance with NFPA 80 and NFPA 90A. The MNS Code of Record for NFPA 80 is the 2007 edition and the Code of Record for NFPA 90A is the 1978 edition. |
| **References** | **Document ID** | | |
| | MCC-1435.00-00-0038 Rev. 0 - NFPA 80 Code Conformance Review | | |
| | MCC-1435.00-00-0039 Rev. 0 - NFPA 90A Code Conformance Review | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
|---|---|---|---|
| | | Complies with Clarification | NFPA 101, Section 8.2.3.2.1(a) with regards to rated fire door assemblies refers to NFPA 80. NFPA 101, Section 9.2.1. with regards to rated fire dampers refers to NFPA 90A. Therefore compliance with NFPA 101 is achieves compliance with NFPA 101 via the NFPA 80 and 90A code conformance reviews. |
| 3.11.4 Through Penetration Fire Stops. | 3.11.4* Through Penetration Fire Stops. Through penetration fire stops for penetrations such as pipes, conduits, bus ducts, cables, wires, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows.<br><br>(a) The annular space between the penetrating item and the through opening in the fire barrier shall be filled with a qualified fire-resistive penetration seal assembly capable of maintaining the fire resistance of the fire barrier. The assembly shall be qualified by tests in accordance with a fire test protocol acceptable to the AHJ or be protected by a listed fire-rated device for the specified fire-resistive period.<br><br>(b) Conduits shall be provided with an internal fire seal that has an equivalent fire-resistive rating to that of the fire barrier through opening fire stop and shall be permitted to be installed on either side of the barrier in a location that is as close to the barrier as possible.<br><br>Exception: Openings inside conduit 4 in. (10.2 cm) or less in diameter shall be sealed at the fire barrier with a fire-rated internal seal unless the conduit extends greater than 5 ft (1.5 m) on each side of the fire barrier. In this case the conduit opening shall be provided with noncombustible material to prevent the passage of smoke and hot gases. The fill depth of the material packed to a depth of 2 in. (5.1 cm) shall constitute an acceptable smoke and hot gas seal in this application. | Complies via Use of EEEE | MNS penetration seals comply with the typical details except where identified in MCC-1435.03-00-0010, "McGuire Nuclear Station Fire Barrier Penetration Seal Safety Analysis." This document analyzes non-conforming fire barrier penetration seals in the regulatory commitment program. Barriers include those separating safety from non-safety related areas or containment from non-containment areas, the Control Complex from the remainder of the plant, and post fire safe shutdown equipment. |
| **References** | **Document ID**<br>MCC-1435.03-00-0010 Rev. 0 - McGuire Nuclear Station Fire Barrier Penetration Seal Safety Analysis | | |
| | | Comply | (a) MNS penetration seals comply with typical details as documented in MCS-1435.00-00-0003, "Design Specification for Mechanical and Electrical Penetration Fire, Flood, and Pressure Seals." The purpose of penetration seals, location of required penetration seals, designs, and installation procedures are documented in this specification.<br><br>(b) MNS internal conduit seals comply with the exception to this section. |
| **References** | **Document ID**<br>MCS-1435.00-00-0003 Rev. 7 - Design Specification for Mechacnical and Electrical Penetration Fire, Flood and Pressure Seals | | |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
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| | | Complies with previous NRC Approval | There are unprotected cable tray hangers and steel supports that penetrate fire barriers in the Auxiliary Building, Elevations 716 and 733 Feet (Fire Areas 2, 2A, 3, 3A, 4, and 14). These penetrations are not provided with a traditional seal as the barrier (wall) is formed around the penetrants. The NRC concluded in a letter to Duke dated 5/15/89 that "The staff has determined that the unprotected steel cable tray and pipe supports/restraints that penetrate fire barriers in the above-mentioned fire areas would not significantly upgrade the level of fire protection if they were provided with a fire rated wrap.<br><br>Based on the evaluation, the staff concludes that existing fire protection features and the availability of a dedicated safe shutdown system provide a level of fire protection equivalent to the technical requirements of Section III.G.2.c of Appendix R. Therefore, the deviation identified is acceptable."<br><br>The Reactor Building process piping penetrations and spare sleeves do not meet the three-hour rated barrier criteria. The NRC concluded in a letter to Duke dated 5/15/89 that "it is concluded that the existing reactor building penetrations for the process piping, spare sleeves, HVAC ducts, and personnel access portals are equivalent to a 3-hour fire rated penetration seal and/or are sufficient to withstand the expected fire severity with considerable conservatism.<br><br>Therefore, the omission of standard designed fire tested penetration seals in these areas is an acceptable deviation from Section III.G.2.a of Appendix R."<br><br>There have been no changes to invalidate the basis for these approvals. |
| **References** | **Document ID**<br><br>1989-05-15 NRC Letter - Reply to Duke Response, Fire Protection Deviations, McGuire Nuclear Station, Units 1 and 2 | | |
| 3.11.5 Electrical Raceway Fire Barrier Systems (ERFBS). | 3.11.5* Electrical Raceway Fire Barrier Systems (ERFBS). ERFBS required by Chapter 4 shall be capable of resisting the fire effects of the hazards in the area. ERFBS shall be tested in accordance with and shall meet the acceptance criteria of NRC Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Safe Shutdown Trains Within the Same Fire Area." The ERFBS needs to adequately address the design requirements and limitations of supports and intervening items and their impact on the fire barrier system rating. The fire barrier system's ability to maintain the required nuclear safety circuits free of fire damage for a specific thermal exposure, barrier design, raceway size and type, cable size, fill, and type shall be demonstrated.<br><br>Exception No. 1: When the temperatures inside the fire barrier system | Complies with previous NRC Approval | MNS does not utilize any Electrical Raceway Fire Barrier Systems such as Thermo-Lag, 3M Interam, Hemyc, MT, or Darmatt systems for Chapter 4 compliance.<br><br>The NRC previously approved the use of Meggitt Safety Systems Cable in Fire Area 11 (now Fire Area 9-11) in a letter dated 1/13/2003. The Meggitt Safety Systems Cable is not specifically an ERFBS but it will be addressed under this section due to its design function and qualification testing using the test methods and acceptance criteria the same as an ERFBS.<br><br>The NRC concluded "The NRC staff finds that the licensee has adequately demonstrated that the protection provided by the silicon dioxide insulated cable in this specific application is equivalent to the protection provided by a 3-hour rated fire |

| NFPA 805 Ch. 3 Reference | Requirements / Guidance | Compliance Statement | Compliance Basis |
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| | exceed the maximum temperature allowed by the acceptance criteria of Generic Letter 86-10, "Fire Endurance Acceptance Test Criteria for Fire Barrier Systems Used to Separate Redundant Safe Shutdown Training Within the Same Fire Area," Supplement 1, functionality of the cable at these elevated temperatures shall be demonstrated. Qualification demonstration of these cables shall be performed in accordance with the electrical testing requirements of Generic Letter 86-10, Supplement 1, Attachment 1, "Attachment Methods for Demonstrating Functionality of Cables Protected by Raceway Fire Barrier Systems During and After Fire Endurance Test Exposure."<br><br>Exception No. 2: ERFBS systems employed prior to the issuance of Generic Letter 86-10, Supplement 1, are acceptable providing that the system successfully met the limiting end point temperature requirements as specified by the AHJ at the time of acceptance. | | barrier. Accordingly, the deviation from the approved fire protection program commitments to 10 CFR Part 50, Appendix R, Section III.G.2, with respect to having a three hour rated fire barrier, in these particular circumstances for Fire Area 11, provides an equivalent level of protection necessary to achieve the underlying purpose of the rule. Based on the NRC staff's review, as described above, the NRC staff concludes that the licensee's identified deviation from its fire protection program as it incorporates Section III.G.2 of Appendix R to 10 CFR Part 50, with respect to the enclosure of cables of one redundant train of safe shutdown equipment in a 3-hour fire rated barrier, is a change to the approved fire protection program that does not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. Therefore, this deviation does not require prior approval of the Commission under Paragraph 2.C.4 of Facility Operating License No. NPF-9."<br><br>There have been no changes to invalidate the basis for this approval. |

**2.4.2.1 Nuclear Safety Capability System and Equipment Selection**

**NEI 00-01 Ref.**
3.1 [C, Spurious Operations] Safe Shutdown Systems and Path Development

**NEI 00-01 Guidance**
In addition to the above listed functions, Generic Letter 81-12 specifies consideration of associated circuits with the potential for spurious equipment operation and/or loss of power source, and the common enclosure failures. Spurious operations/actuations can affect the accomplishment of the post-fire safe shutdown functions listed above. Typical examples of the effects of the spurious operations of concern are the following:

- *A loss of reactor pressure vessel/reactor coolant inventory in excess of the safe shutdown makeup capability.*
- A flow loss or blockage in the inventory makeup or decay heat removal systems being used for the required safe shutdown path.

Spurious operations are of concern because they have the potential to directly affect the ability to achieve and maintain hot shutdown, which could affect the fuel and cause damage to the reactor pressure vessel or the primary containment. Common power source and common enclosure concerns could also affect these and must be addressed.

**Applicability**
Applicable

**Alignment Statement**
Aligns with intent

**Alignment Basis**
Spurious operations are considered in both the selection of nuclear safety performance criteria functions and systems as well as the cabling associated with the components relied upon to achieve those functions. A special subset of components considered for spurious operation involves reactor coolant pressure boundary components whose spurious operation can lead to an unacceptable loss of reactor pressure vessel / Reactor Coolant System inventory via an interfacing system loss of coolant accident. These components are defined as high/low pressure interface valves and are subject to more stringent circuit analysis. For McGuire Nuclear Station the high/low pressure interfaces consist solely of interface with the residual heat removal system in accordance with NUREG 0422 Supplement 6 as defined in c.3.2.

Section C.3 of NEI 00-01 Rev. 2 further clarifies the criterion for the determination of a high-low pressure interface valve:

"A valve whose spurious opening could result in a loss of RPV/RCS inventory and, due to the lower pressure rating on the downstream piping, an interfacing LOCA outside of Primary Containment (i.e., pipe rupture in the low pressure piping)."

Revision 5:

McGuire aligns with the guidance of considering spurious operations, but aligns with the intent for high/low pressure interfaces. High/low pressure interfaces are limited to meeting the latest guidance in NEI 00-01, Revision 2. NEI 00-01 Revision 1 states that high/low pressure interfaces result in a LOCA. RG 1.189 Revision 2 Section 5.3.2.c endorses NEI 001-01 Revision 2, which expands the high/low pressure interface definition to a LOCA outside containment. McGuire analyzed high/low pressure interfaces resulting in a LOCA outside containment.

**Reference**
MCC-1435.00-00-0023 Rev. 1 - NFPA Transition Expert Panel Report for Addressing Potential McGuire Multiple Spurious Operations

**2.4.2.1 Nuclear Safety Capability System and Equipment Selection**

**NEI 00-01 Ref.**
3.1.1.7 [ Offsite Power]

**NEI 00-01 Guidance**
For the case of redundant shutdown, offsite power may be credited if demonstrated to be free of fire damage. Offsite power should be assumed to remain available for those cases where its availability may adversely impact safety (i.e., reliance cannot be placed on fire causing a loss of offsite power if the consequences of offsite power availability are more severe than its presumed loss). No credit should be taken for a fire causing a loss of offsite power. For areas where train separation cannot be achieved and alternative shutdown capability is necessary, shutdown must be demonstrated both where offsite power is available and where offsite power is not available for 72 hours.

**Applicability**
Applicable

**Alignment Statement**
Aligns with intent

**Alignment Basis**
McGuire does not rely on offsite power for redundant safe shutdown. Emergency diesel generators are relied upon for electrical power. Offsite power has not been analyzed or demonstrated to be free of fire damage for redundant shutdown. The cascading power supply analysis determines fire impact to relied on power sources and is utilized in the analysis of fire areas for safe shutdown. This analysis ensures power is available to operate relied upon safe shutdown equipment. Power supply/cable failures are analyzed for effects of loss with and without offsite power. For alternate shutdown, a dedicated diesel generator is provided independent of emergency diesel generator systems that can supply the necessary electrical power for Hot Standby. Since McGuire does not rely on offsite power, it is not required to demonstrate it is free of fire damage. Thus, McGuire meets the intent of the guidance.

Revision 5:

McGuire aligns with the intent of considering offsite power during analysis, but does not credit it. McGuire analyzed safe shutdown success paths as shown on the functional logic diagrams with and without offsite power for normal and alternate shutdown components. For example, for normal shutdown, pressurizer heaters need to be off, but spurious operation could turn them on with offsite power available and operator action to trip the supply breakers is then required. Without offsite power this is not an issue. Similarly, for alternative shutdown areas, McGuire specifically assumes it is available where availability could adversely affect alternative safe shutdown, otherwise, alternative shutdown is shown without offsite power.

**Reference**
MCC-1435.00-00-0059 Rev. 2 - NFPA 805 - App. R Safe Shutdown Deterministic Analysis (AREVA EIR 51-9156402-002)

**2.4.2.1 Nuclear Safety Capability System and Equipment Selection**

**NEI 00-01 Ref.**
3.1.1.11 [Multiple Affected Units]

**NEI 00-01 Guidance**
Where a single fire can impact more than one unit of a multi-unit plant, the ability to achieve and maintain safe shutdown for each affected unit must be demonstrated.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
Fire impacts at the component level have been evaluated for each unit separately and for both units collectively where required.

Revision 5:

In common Fire Areas (e.g., FA-4, 13, and 14), both units were analyzed. In unit specific Fire Areas (e.g., FA-2, 5, 19, and 20), there is potential for an opposite unit impact (e.g. in FA-2 – Unit 1 Motor Driven CA Pump Room, FA-19 – Unit 1 Cable Room, and FA-20 – Unit 2 Cable Room) that could possibly affect the opposite unit. In such cases, we are bounded by NUREG 0422, Supplement 6, which states we can simultaneously achieve HSB for both units at the SSF. Unit specific fire areas were mostly found to not have any potential for an opposite unit impact through analysis of fire impacts by equipment and cable location. Some unit specific fire areas (e.g. FA-5 – U1 A Train D/G) can have an impact on the opposite unit. For example, the Unit 1 A Train battery charger is normally aligned to Unit 1. However, if a fire occurred during those cases, operators can promptly realign the battery charger to Unit 2. Thus, McGuire aligns with the guidance.

**Reference**
MCC-1435.00-00-0059 Rev. 2 - NFPA 805 - App. R Safe Shutdown Deterministic Analysis (AREVA EIR 51-9156402-002)

**2.4.2.1 Nuclear Safety Capability System and Equipment Selection**

**NEI 00-01 Ref.**
3.2.1.6 [Spurious Components]

**NEI 00-01 Guidance**
Identify equipment that could spuriously operate or mal-operate and impact the performance of equipment on a required safe shutdown path during the equipment selection phase. Consider Bin 1 of RIS 2004-03 during the equipment identification process.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
Spurious operation was considered in identification of SSEL components. Conductor-to-conductor shorts within a multiconductor cable configurations were considered for power, control, and instrumentation circuits whose fire-induced failures could prevent operation of safe shutdown equipment or through maloperation cause a flow diversion, loss of coolant, or other scenario that could significantly impact the ability to achieve and maintain hot standby. All McGuire cable conductors used for control have thermoset insulation or are MI cable. Some instrumentation conductors use thermoplastic cables that are armored which would preclude cable-to-cable interaction.

Revision 5:

McGuire aligns since equipment was identified for NSCA that could spuriously operate or mal-operate, which meets the NEI 00-01 guidance.

**Reference**
MCC-1435.00-00-0023 Rev. 1 - NFPA Transition Expert Panel Report for Addressing Potential McGuire Multiple Spurious Operations
MCC-1435.00-00-0059 Rev. 2 - NFPA 805 - App. R Safe Shutdown Deterministic Analysis (AREVA EIR 51-9156402-002)

**2.4.2.2 Nuclear Safety Capability Circuit Analysis**

**NEI 00-01 Ref.**
3.3.1.3 [Isolation Devices]

**NEI 00-01 Guidance**
Electrical devices such as relays, switches and signal resistor units are considered to be acceptable isolation devices. In the case of instrument loops, review the isolation capabilities of the devices in the loop to determine that an acceptable isolation device has been installed at each point where the loop must be isolated so that a fault would not impact the performance of the safe shutdown instrument function.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
The cables were selected using the component's electrical elementary diagram as a guide. A point to point review of the associated connection diagrams and/or wire tabulations was performed to identify all associated circuits. This includes instrument loops. All circuits/cables that are electrically connected to the circuit under analysis were identified up to a credited isolation device.

Revision 5:

Isolation devices were analyzed for the credited train in a given FA; therefore, McGuire aligns with the guidance.

**Reference**
MCC-1435.00-00-0059 Rev. 2 - NFPA 805 - App. R Safe Shutdown Deterministic Analysis (AREVA EIR 51-9156402-002)

**2.4.2.2 Nuclear Safety Capability Circuit Analysis**

**NEI 00-01 Ref.**
3.3.1.6 [Auto Initiation Logic]

**NEI 00-01 Guidance**
The automatic initiation logics for the credited post-fire safe shutdown systems are not required to support safe shutdown. Each system can be controlled manually by operator actuation in the main control room or emergency control station. If operator actions outside the MCR are necessary, those actions must conform to the regulatory requirements on manual actions. However, if not protected from the effects of fire, the fire-induced failure of automatic initiation logic circuits must not adversely affect any post-fire safe shutdown system function.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
Automatic initiation logic was not relied on for performance of functions. Manual operation of components from the Main Control Room, SSF or locally were identified during the fire area compliance assessment task as needed. To preclude adverse impact from automatic initiation logic circuits or control logic circuits where multiple components receive signals from common control logic, the control logic was analyzed as a primary component and a pseudo component was created for the logic with cables selected accordingly. This same methodology was used for similar circuit scenarios such as common power supplies. In this way the effects of a fire induced failure causing spurious component operation were fully evaluated. Variances from the Deterministic Requirements of NFPA 805, Section 4.2.3 (VFDRs) were identified and evaluated in Fire Risk Evaluations (FREs) to assess the impact of the variances and any required recovery actions.

The cables were selected using the component's electrical elementary diagram as a guide and performing a point to point review of the associated connection diagrams. During the cable selection process, a circuit fault analysis for each safe shutdown component was not initially performed. This made the initial compliance analysis bounding. Further analysis to determine the effects of a fire induced hot short, open circuit and short to ground as applicable was performed during the fire area compliance assessment task. Component interlocks affecting operation were either specifically identified, routed, and incorporated into the component's function and analyzed, or, alternatively the interlock can be analyzed to show acceptability for operation in either state during analysis and thus its cabling, routing etc. is not required. This approach analyzes automatic actuation as component interlocks.

Revision 5:

In addition to the guidance, the analysis was not limited to "...the fire-induced failure of automatic logic circuits..." The automatic interlock signals were analyzed and assumed to occur / not occur in the worst case situation unless specifically analyzed not to do so. This approach exceeds the guidance. Thus, McGuire Aligns with the guidance.

**Reference**
MCC-1435.00-00-0059 Rev. 2 - NFPA 805 - App. R Safe Shutdown Deterministic Analysis (AREVA EIR 51-9156402-002)

**2.4.2.2 Nuclear Safety Capability Circuit Analysis**

**NEI 00-01 Ref.**
3.3.1.7 [Circuit Coordination]

**NEI 00-01 Guidance**
Cabling for the electrical distribution system is a concern for those breakers that feed associated circuits and are not fully coordinated with upstream breakers. With respect to electrical distribution cabling, two types of cable associations exist. For safe shutdown considerations, the direct power feed to a primary safe shutdown component is associated with the primary component. For example, the power feed to a pump is necessary to support the pump. Similarly, the power feed from the load center to an MCC supports the MCC. However, for cases where sufficient branch-circuit coordination is not provided, the same cables discussed above would also support the power supply. For example, the power feed to the pump discussed above would support the bus from which it is fed because, for the case of a common power source analysis, the concern is the loss of the upstream power source and not the connected load. Similarly, the cable feeding the MCC from the load center would also be necessary to support the load center.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
McGuire has completed a breaker coordination calculation to address coordination concerns. Concerns/coordination issues identified during the analysis were dispositioned similar to other identified concerns; e.g., analytical dispositioning, creating a VFDR, modification, etc.

Revision 5:

Fault coordination impacts were analyzed for the credited trains/busses. Thus, McGuire aligns with the guidance in that a breaker coordination analysis was performed.

**Reference**
MCC-1381.05-00-0335 / AREVA calc. 32-9043224-001 Rev. 1 - McGuire Nuclear Station Appendix R NFPA 805 Coordination Study

**2.4.2.2 Nuclear Safety Capability Circuit Analysis**

**NEI 00-01 Ref.**
3.5.1.3 [Duration of Circuit Failures]

**NEI 00-01 Guidance**
Assume that circuit failure types resulting in spurious operations exist until action has been taken to isolate the given circuit from the fire area, or other actions have been taken to negate the effects of circuit failure that is causing the spurious actuation. The fire is not assumed to eventually clear the circuit fault. Note that RIS 2004-03 indicates that fire-induced hot shorts typically self-mitigate after a limited period of time.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
Multiple fire induced failures and multiple spurious actuations were considered to occur concurrently in accordance with the guidance provided in NEI 00-01, Section 3.5.1.5[B]. This methodology is applied at the safe shutdown component level regardless of how many components that may share a common multi conductor cable. Based on this methodology, McGuire considers any and all potential spurious actuations that may result from intractable shorting, which may occur concurrently regardless of number. The fire was not assumed to eventually clear the circuit fault. All potential hot shorts always failed the equipment and no probability was used in the deterministic analysis. Details of faults were provided but credit was not taken to clear them.

Revision 5:

McGuire goes beyond the guidance since the analysis did not limit the number of spurious actuations in a fire and dispositioned those that resulted in VFDRs. McGuire did not take credit to clear (i.e. the duration of the hot short was not limited) spurious operations in the deterministic analysis. Thus, McGuire Aligns with this guidance.

**Reference**
MCC-1435.00-00-0059 Rev. 2 - NFPA 805 - App. R Safe Shutdown Deterministic Analysis (AREVA EIR 51-9156402-002)

**NEI 00-01 Ref.**
3.5.2.1 Circuit Failures Due to an Open Circuit

**NEI 00-01 Guidance**
This section provides guidance for addressing the effects of an open circuit for safe shutdown equipment. An open circuit is a fire-induced break in a conductor resulting in the loss of circuit continuity. An open circuit will typically prevent the ability to control or power the affected equipment. An open circuit can also result in a change of state for normally energized equipment. For example, a loss of power to the main steam isolation valve (MSIV) solenoid valves [for BWRs] due to an open circuit will result in the closure of the MSIV.

NOTE: The EPRI circuit failure testing indicated that open circuits are not likely to be the initial fire-induced circuit failure mode. Consideration of this may be helpful within the safe shutdown analysis. Consider the following consequences in the safe shutdown circuit analysis when determining the effects of open circuits:

Loss of electrical continuity may occur within a conductor resulting in de-energizing the circuit and causing a loss of power to, or control of, the required safe shutdown equipment.

In selected cases, a loss of electrical continuity may result in loss of power to an interlocked relay or other device. This loss of power may change the state of the equipment. Evaluate this to determine if equipment fails safe.

Open circuit on a high voltage (e.g., 4.16 kV) ammeter current transformer (CT) circuit may result in secondary damage.

Figure 3.5.2-1 shows an open circuit on a grounded control circuit.

[Refer to hard copy of NEI 00-01 for Figure 3.5.2-1]

Open circuit No. 1:
An open circuit at location No. 1 will prevent operation of the subject equipment.

Open circuit No. 2:
An open circuit at location No. 2 will prevent opening/starting of the subject equipment, but will not impact the ability to close/stop the equipment.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
Open circuits are analyzed as shown on the referenced figures from NEI 00-01. Current transformers (CTs) may induce secondary fires through the fire-induced opening of circuitry associated with the secondary side windings of the CT. Where such circuitry exits in a fire area or provides a common enclosure concern within a fire area, the impact of such secondary fires was properly considered. The following information is being provided to demonstrate that metering and relaying circuits have been analyzed for the potentially adverse impact of fire damage, including, but not limited to open secondary CT windings:

- Cables associated to suspect secondary CT circuits (4 KV and above) are included in the cable selection of the associated buses as part of the cable selection performed for the EIR, PRA, and NPO required equipment.
- The cable routing for these circuits and fire areas that the raceways are located in are documented.
- The cable impacts for secondary CT circuits are evaluated on a Fire Area basis.

The following additional design features were considered:

- CT circuits which do not leave the fire area which contains power supply of

**Reference**
1984-06-27 NRC Memo, Power Systems Branch - Unresolved Technical Issue Concerning Alternative Safe Shutdown
PIP-07-1571 - Reportability

**2.4.2.2 Nuclear Safety Capability Circuit Analysis**

| Alignment Statement | Alignment Basis | Reference |
|---|---|---|
| | concern were not required to be modeled.<br>• CT circuits associated with switchgear feeders to motors, etc. stay within the fire area of the switchgear.<br>• Transducers were considered an isolation device and further modeling of the transducer's secondary cables were not required.<br>• CT circuits may provide input into transformer or generator differential circuits. Any imbalance or disturbance on these circuits was considered to isolate the protected device within a few cycles. These were considered to trip the respective feeder as a source of power, however there should be only a low likelihood of a secondary fire.<br>• CTs wired in a delta configuration, versus that of a wye configuration, are not subject to failure due to an open circuit on external cables<br><br>Any imbalance or disturbance on these circuits was considered to isolate the protected device within a few cycles. These were considered to trip the respective feeder as a source of power, however not to cause a secondary fire. The results from the analysis of the secondary CT circuits were used to demonstrate whether or not the redundant systems (i.e. SSF, Train A or Train B as credited) used to achieve and maintain safe and stable conditions were impacted by the failure of the secondary CT open circuit. The results from the analysis were also used to determine whether or not redundant system (i.e. SSF, Train A or Train B as credited) cables or components were located in the areas of the CT or secondary CT circuit routing. Impact concerns were documented as VFDRs, as necessary. This analysis satisfies the criteria of NFPA 805 and the guidance provided in NEI 00-01, Revision 1.<br><br>Gap Analysis: NEI 00-01 Revision 2 added additional guidance on the open circuit of a high voltage ammeter current transformer (CT) circuit. McGuire properly considered this additional guidance in their evaluations (see above).<br><br>Revision 5:<br><br>McGuire analyzed open circuits per the NEI 00-01 guidance, including potential high voltage CT secondary damage as itemized. Thus, McGuire aligns with the guidance. | |

**2.4.2.4 Fire Area Assessment.**

**NEI 00-01 Ref.**
3.4.1.4 [Manual Actions]

**NEI 00-01 Guidance**
Use manual actions where appropriate to achieve and maintain post-fire safe shutdown conditions in accordance with NRC requirements.

**Applicability**
Applicable

**Alignment Statement**
Aligns

**Alignment Basis**
The least impacted success path was analyzed and VFDRs were identified. Mitigating strategies to address the VFDRs in a performance based Fire Risk Evaluation were developed and documented. One of the potential mitigating strategies is procedural action (recovery action) to mitigate the operational effects from fire damage.

Revision 5:

VFDR resolutions included in the performance based FREs included recovery actions as potential mitigating actions to maintain a safe and stable condition for the operational effects of fire damage. Recovery actions are demonstrated to be feasible in accordance with NRC requirements as documented in MCC-1435.00-00-0045. Thus, McGuire Aligns with the guidance.

**Reference**
MCC-1435.00-00-0045 Rev. 0 - NFPA 805 Transition Recovery Action Feasibility Review
MCC-1435.00-00-0059 Rev. 2 - NFPA 805 - App. R Safe Shutdown Deterministic Analysis (AREVA EIR 51-9156402-002)

- Area fixed automatic suppression systems
- Administrative controls for hot work and combustible loading
- Area fire detection
- Penetration seal construction.

Due to the conditions identified above and the presence of the SSF, a fire in the MDCA or TDCA Pump Rooms is not anticipated to impact the site's ability to achieve and maintain safe shutdown.

| | |
|---|---|
| **Engineering Evaluation ID Revision** | MCC-1435.03-00-0012, Att. 05 Fire Protection Evaluation For Over Sized Pipe Penetration |
| **Inactive** | No |
| **Functionally Equivalent** | No |
| **Adequate for the Hazard** | Yes |
| **Summary** | This calculation evaluates the adequacy of the non-standard penetration seal configurations presently installed at ten (10) penetrations (716-16.1-12, 716-16.1-13, 2-716-108.1-6, 733-92.1-1, 733-92.1-2, 750-21.2-1, 750-35.1-1, 750-35.1-2, 750-35.1-3, and 750-178.1-10). These seal configurations do not fully conform to a qualified 3-hour fire rated typical detail design from DPC 1435.00-00-0006, and therefore, must be evaluated. In each case, the pipe size and opening size exceeds the limitation of the associated typical detail design. Each of these penetrations is located in a NRC committed fire barrier.<br><br>The calculation determined the penetration seals currently installed at penetrations identified are adequate for the hazard. In all cases the present seal configuration has been demonstrated as capable of providing a 3 hour F rating. Furthermore, applications in 1-1/2 hour rated barriers do not present realistic T rating concerns, due to the location of the seals and the fact that the 1-1/2 hour rated barriers are partial length walls (i.e., they do not provide complete separation of adjacent areas). Applications in 3 hour rated barriers do not result in T rating concerns due to the minimal increase in pipe size (12" actual vs. 10" qualified by test) and the fact that no exposed combustible materials are in contact with or adjacent to these penetrations. Therefore, a fire initiating in one area will be contained to the area of origin by existing structural components of the plant, including these penetration seals, and postulated safe shutdown methods will not be adversely impacted for these plant areas. |

- Area fixed automatic suppression systems
- Administrative controls for hot work and combustible loading
- Area fire detection
- Penetration seal construction.

Due to the conditions identified above and the presence of the SSF, a fire in the MDCA or TDCA Pump Rooms is not anticipated to impact the site's ability to achieve and maintain safe shutdown.

**Fire Area ID:** 09-11 - Unit 1 Train B Electrical Penetration & Switchgear Rooms **Required Systems and Features**
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 702 | Electrical Penetration | — | E, R | E, R | Combustible Control: E<br>Detection System, FA 09-11 Detection: E R<br>Internal Wall: R |
| 705 | 4 kV Switchgear 1ETB 600V MCC | — | E, R | E, R | Combustible Control: E<br>Detection System, FA 09-11 Detection: E R<br>Internal Wall: R<br>MI on some Train A cables: E R |

**Title** Fire Risk Evaluation for Fire Area 09-11

**Risk Summary** The delta CDF and delta LERF are above the screening acceptance criteria of 1E-07/rx-yr (CDF) and 1E-08/rx-yr (LERF) for acceptable risk but within the acceptance thresholds in RG 1.174. All scenario CCDPs and CLERPs are less than 1.0 ensuring that the acceptance criteria is not solely met based on low fire ignition frequency.

**Δ CDF** Units: [1] 1.55E-06

**Δ LERF** Units: [1] 2.72E-08

**DID Maintained** A review of defense in depth and risk evaluation results shows that Regulatory Guide 1.174 risk criteria are met and that the balance of defense in depth is maintained. The Regulatory Guide 1.174 risk acceptance criteria are met with margin to account for analytical methods associated with fire scenarios. These analyzed scenarios credit Train A cables located in Train B Switchgear Room as fire resistant mineral insulated cables: therefore, this additional fire protection feature is required. Administrative controls would not provide appreciable benefit to the overall fire area risk. The installed detection system is required to meet risk criteria to ensure the fire brigade response is effectively initiated. In addtion, an internal wall between rooms is required to meet risk criteria. The FPRA did not credit the wall's rating, but the wall itself was relied on to limit the zone of influence for some scenarios. Provided the wall remains intact with no significant openings, the FPRA results are not affected. Given the actions required by the risk analysis and the DID assessment, the ability to meet nuclear safety performance criteria is ensured.

**Safety Margin Maintained** All analyses and assessment have been performed utilizing accepted techniques and industry accepted standards. In addition, safety analysis acceptance criteria in the licensing basis (e.g., UFSAR, supporting analyses) have been considered and provides sufficient margin to account for analysis and data uncertainty.

# Attachment C

## Table C-1 – NFPA 805 Ch 4 Compliance (NEI 04-02 Table B-3)

**Fire Area ID:** 32 - Unit 1 Reactor Building **Required Systems and Features**
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 1RB-1 | Unit 1 Annulus | E | E | E, D | Combustible Control: E<br>Containment liner as radiant energy shield: D<br>Detection System, FA 32 Detection: E<br>Water Suppression, FA 32 Suppression: E |
| 1RB-2 | Unit 1 Pipe Corridor | D | D | — | Detection System, FA 32 Detection: D<br>Water Suppression, FA 32 Suppression: D |
| 1RB-3 | Unit 1 Lower Containment | — | — | E, D | Combustible Control: E<br>MI as radiant energy shield on cables: E D |

**Title** Fire Risk Evaluation for Fire Area 32

**Risk Summary** The delta CDF and delta LERF are below the screening acceptance criteria of 1E-07/rx-yr (CDF) and 1E-08/rx-yr (LERF) for acceptable risk. All scenario CCDPs and CLERPs are less than 1.0 ensuring that the acceptance criteria is not solely met based on low fire ignition frequency.

**Δ CDF** Units: [1] 2.50E-08

**Δ LERF** Units: [1] 4.90E-09

**DID Maintained** A review of defense in depth and risk evaluation results show that risk acceptance criteria are met and that the balance of defense in depth is maintained. The risk acceptance criteria are met with margin to account for analytical methods associated with fire scenarios. The scenarios for a severe reactor coolant pump fire, transient fire in the annulus, and pipe corridor fire, bound potential fuel packages which can reasonably be expected to occur in this area. Given the restricted access to the containment area during power operations, it is not expected that additional administrative controls would provide appreciable benefit. However, since the evaluated fire scenario for the pipe corridor is the dominant scenario, requiring the installed detection and water sprinkler systems for DID is deemed appropriate and will provide additional margin to account for analytical uncertainties. The detection system would also account for the lack of alternate detection by plant personnel due to the pipe corridor being a restricted access area. As a final measure for DID, the installed (lower containment) MI cable is being required as a radiant energy shield and the containment liner is being required as a radiant energy shield for the annulus. In the event of no intervention by the plant fire brigade, it is not expected that a credible fire would develop which would invalidate the scenarios analyzed above, including the HGL analysis and the MCA. The ability to meet nuclear safety performance criteria is ensured.

**Safety Margin Maintained** All analyses and assessment have been performed utilizing accepted techniques and industry accepted standards. In addition, safety analysis acceptance criteria in the licensing basis (e.g., UFSAR, supporting analyses) have been considered and provides sufficient margin to account for analysis and data uncertainty.

**Fire Area ID:** 33 - Unit 2 Reactor Building
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

**Required Systems and Features**

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 2RB-1 | Unit 2 Annulus | E | E | E, D | Combustible Control: E<br>Containment liner as radiant energy shield: D<br>Detection System, FA 33 Detection: E<br>Water Suppression, FA 33 Suppression: E |
| 2RB-2 | Unit 2 Pipe Corridor | D | D | — | Detection System, FA 33 Detection: D<br>Water Suppression, FA 33 Suppression: D |
| 2RB-3 | Unit 2 Lower Containment | — | — | E, D | Combustible Control: E<br>MI as radiant energy shield on cables: E D<br>Oil collection system on pump 2B: D |

**Title** Fire Risk Evaluation for Fire Area 33

**Risk Summary** *The delta CDF is below and the delta LERF is above the screening acceptance criteria of 1E-07/rx-yr (CDF) and 1E-08/rx-yr (LERF) for acceptable risk, but* within the acceptance thresholds in RG 1.174. All scenario CCDPs and CLERPs are less than 1.0 ensuring that the acceptance criteria is not solely met based on low fire ignition frequency.

**Δ CDF** Units: [2] 2.85E-08

**Δ LERF** Units: [2] 1.74E-08

**DID Maintained** A review of defense in depth and risk evaluation results show that risk acceptance criteria are met and that the balance of defense in depth is maintained. The risk acceptance criteria are met with margin to account for analytical methods associated with fire scenarios. The scenarios for a severe reactor coolant pump fire, transient fire in the annulus, and pipe corridor fire, bound potential fuel packages which can reasonably be expected to occur in this area. Given the restricted access to the containment area during power operations, it is not expected that additional administrative controls would provide appreciable benefit. However, since the evaluated fire scenario for the pipe corridor is the dominant scenario, requiring the installed detection and water sprinkler systems for DID is deemed appropriate and will provide additional margin to account for analytical uncertainties. Due to the increased risk associated with the 2B NC pump fire, an additional DID measure requiring the Oil Collection System for 2B NC pump is being imposed. The detection system would also account for the lack of alternate detection by plant personnel due to the pipe corridor being a restricted access area. As a final measure for DID, the installed (lower containment) MI cable is being required as a radiant energy shield and the containment liner is being required as a radiant energy shield for the annulus. In the event of no intervention by the plant fire brigade, it is not expected that a credible fire would develop which would invalidate the scenarios analyzed above, including the HGL analysis and the MCA. The ability to meet nuclear safety performance criteria is ensured.

**Safety Margin Maintained** All analyses and assessment have been performed utilizing accepted techniques and industry accepted standards. In addition, safety analysis acceptance criteria in the licensing basis (e.g., UFSAR, supporting analyses) have been considered and provides sufficient margin to account for analysis and data uncertainty.

# Attachment C
## Table C-1 – NFPA 805 Ch 4 Compliance (NEI 04-02 Table B-3)

**Fire Area ID:** TB1 - Unit 1 Turbine Building **Required Systems and Features**
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 1 Turbine Building | Unit 1 Turbine Building | D | D | E | Combustible Control: E<br>Detection System, FA TB1 Hydrogen Seal Oil: D<br>Detection System, FA TB1 Lube Oil Purifier: D<br>Detection System, FA TB1 Main Feedwater Pump: D<br>Detection System, FA TB1 Turb Lube Oil Reservoir: D<br>Detection System, FA TB1 Turb Lube Oil XFR Tank: D<br>Detection System, FA TB1 Turb Piping & Bearings: D<br>Water Suppression, FA TB1 Hydrogen Seal Oil: D<br>Water Suppression, FA TB1 Lube Oil Purifier: D<br>Water Suppression, FA TB1 Main Feedwater Pump: D<br>Water Suppression, FA TB1 Turb Lube Oil Reservoir: D<br>Water Suppression, FA TB1 Turb Lube Oil XFR Tank: D<br>Water Suppression, FA TB1 Turb Piping & Bearings: D |

**Title** Fire Risk Evaluation for Fire Area TB1

**Risk Summary** The delta CDF and delta LERF are below the screening acceptance criteria of 1E-07/rx-yr (CDF) and 1E-08/rx-yr (LERF) for acceptable risk. All scenario CCDPs and CLERPs are less than 1.0 ensuring that the acceptance criteria is not solely met based on low fire ignition frequency.

**Δ CDF** Units: [1] 0.00E+00

**Δ LERF** Units: [1] 0.00E+00

**DID Maintained** A review of defense in depth and risk evaluation results show that risk acceptance criteria are met and that the balance of defense in depth is maintained. In order to provide additional assurance that nuclear safety performance criteria are met, both installed detection and suppression systems (hazard specific only) are being required. These systems provide additional protection for plant equipment and structures and while ensuring calculated risk values continue to bound the analyzed scenarios. The risk acceptance criteria are met with substantial margin to account for analytical methods associated with fire scenarios since there are no offending cables to remove in order to create the compliant condition. The scenarios analyzed bound potential fuel packages which can reasonably be expected to occur in this area. In the event of no intervention by the plant fire brigade, it is not expected that a credible fire would develop which would not be bounded by the total area burnout scenario. The ability to meet nuclear safety performance criteria is ensured.

**Safety Margin Maintained** All analyses and assessment have been performed utilizing accepted techniques and industry accepted standards. In addition, safety analysis acceptance criteria in the licensing basis (e.g., UFSAR, supporting analyses) have been considered and provides sufficient margin to account for analysis and data uncertainty.

**Fire Area ID:** TB2 - Unit 2 Turbine Building **Required Systems and Features**
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 2 Turbine Building | Unit 2 Turbine Building | D | D | E | Combustible Control: E<br>Detection System, FA TB2 Hydrogen Seal Oil: D<br>Detection System, FA TB2 Lube Oil Purifier: D<br>Detection System, FA TB2 Main Feedwater Pump: D<br>Detection System, FA TB2 Turb Lube Oil Reservoir: D<br>Detection System, FA TB2 Turb Lube Oil XFR Tank: D<br>Detection System, FA TB2 Turb Piping & Bearings: D<br>Water Suppression, FA TB2 Hydrogen Seal Oil: D<br>Water Suppression, FA TB2 Lube Oil Purifier: D<br>Water Suppression, FA TB2 Main Feedwater Pump: D<br>Water Suppression, FA TB2 Turb Lube Oil Reservoir: D<br>Water Suppression, FA TB2 Turb Lube Oil XFR Tank: D<br>Water Suppression, FA TB2 Turb Piping & Bearings: D |

**Title** Fire Risk Evaluation for Fire Area TB2

**Risk Summary** The delta CDF and delta LERF are below the screening acceptance criteria of 1E-07/rx-yr (CDF) and 1E-08/rx-yr (LERF) for acceptable risk. All scenario CCDPs and CLERPs are less than 1.0 ensuring that the acceptance criteria is not solely met based on low fire ignition frequency.

**Δ CDF** Units: [2] 0.00E-00

**Δ LERF** Units: [2] 0.00E-00

**DID Maintained** A review of defense in depth and risk evaluation results show that risk acceptance criteria are met and that the balance of defense in depth is maintained. In order to provide additional assurance that nuclear safety performance criteria are met, both installed detection and suppression systems (hazard specific only) are being required. These systems provide additional protection for plant equipment and structures and while ensuring calculated risk values continue to bound the analyzed scenarios. The risk acceptance criteria are met with substantial margin to account for analytical methods associated with fire scenarios since there are no offending cables to remove in order to create the compliant condition. The scenarios analyzed bound potential fuel packages which can reasonably be expected to occur in this area. In the event of no intervention by the plant fire brigade, it is not expected that a credible fire would develop which would not be bounded by the analyzed scenarios. The ability to meet nuclear safety performance criteria is ensured.

**Safety Margin Maintained** All analyses and assessment have been performed utilizing accepted techniques and industry accepted standards. In addition, safety analysis acceptance criteria in the licensing basis (e.g., UFSAR, supporting analyses) have been considered and provides sufficient margin to account for analysis and data uncertainty.

# Attachment C

## Table C-2 – NFPA 805 Required Fire Protection Systems and Features

**Fire Area ID:** 08 - Unit 2 Train B Diesel Generator Room
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 715 | Diesel Generator 2B | R | None | None | Gaseous Suppression, FA 08 - Halon Suppression: R |

**Fire Area ID:** 09-11 - Unit 1 Train B Electrical Penetration & Switchgear Rooms
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 702 | Electrical Penetration | None | E, R | E, R | Combustible Control: E<br>*Detection System, FA 09-11 Detection:* E R<br>Internal Wall: R |
| 705 | 4 kV Switchgear 1ETB 600V MCC | None | E, R | E, R | Combustible Control: E<br>Detection System, FA 09-11 Detection: E R<br>Internal Wall: R<br>MI on some Train A cables: E R |

**Fire Area ID:** 10-12 - Unit 2 Train B Electrical Penetration & Switchgear Rooms
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 713 | Electrical Penetration | None | E, R | E, R | Combustible Control: E<br>Detection System, FA 10-12 Detection: E R<br>Internal Wall: R |
| 716 | 4 kV Switchgear 1ETB 600V MCC | None | E, R | E, R | Combustible Control: E<br>Detection System, FA 10-12 Detection: E R<br>Internal Wall: R |

# Attachment C

## Table C-2 – NFPA 805 Required Fire Protection Systems and Features

**Fire Area ID:** 32 - Unit 1 Reactor Building
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 1RB-1 | Unit 1 Annulus | E | E | E, D | Combustible Control: E<br>Containment liner as radiant energy shield: D<br>Detection System, FA 32 Detection: E<br>Water Suppression, FA 32 Suppression: E |
| 1RB-2 | Unit 1 Pipe Corridor | D | D | None | Detection System, FA 32 Detection: D<br>Water Suppression, FA 32 Suppression: D |
| 1RB-3 | Unit 1 Lower Containment | None | None | E, D | Combustible Control: E<br>MI as radiant energy shield on cables: E D |

**Fire Area ID:** 33 - Unit 2 Reactor Building
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| 2RB-1 | Unit 2 Annulus | E | E | E, D | Combustible Control: E<br>Containment liner as radiant energy shield: D<br>Detection System, FA 33 Detection: E<br>Water Suppression, FA 33 Suppression: E |
| 2RB-2 | Unit 2 Pipe Corridor | D | D | None | Detection System, FA 33 Detection: D<br>Water Suppression, FA 33 Suppression: D |
| 2RB-3 | Unit 2 Lower Containment | None | None | E, D | Combustible Control: E<br>MI as radiant energy shield on cables: E D<br>Oil collection system on pump 2B: D |

**Fire Area ID:** DIS (Unit 1) - Discharge Structure
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 1 Discharge Structure | Unit 1 Discharge Structure | None | None | None | None |

# Attachment C
## Table C-2 – NFPA 805 Required Fire Protection Systems and Features

**Fire Area ID:** SRV (Unit 2) - Service Building
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 2 Service Building | Unit 2 Service Building | None | None | E | Combustible Control: E |

**Fire Area ID:** SSF (Unit 1) - Safe Shutdown Facility
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 1 Safe Shutdown Facility | Unit 1 Safe Shutdown Facility | None | None | None | None |

**Fire Area ID:** SSF (Unit 2) - Safe Shutdown Facility
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 2 Safe Shutdown Facility | Unit 2 Safe Shutdown Facility | None | None | None | None |

**Fire Area ID:** TB1 - Unit 1 Turbine Building
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 1 Turbine Building | Unit 1 Turbine Building | D | D | E | Combustible Control: E<br>Detection System, FA TB1 Hydrogen Seal Oil: D<br>Detection System, FA TB1 Lube Oil Purifier: D<br>Detection System, FA TB1 Main Feedwater Pump: D<br>Detection System, FA TB1 Turb Lube Oil Reservoir: D<br>Detection System, FA TB1 Turb Lube Oil XFR Tank: D<br>Detection System, FA TB1 Turb Piping & Bearings: D<br>Water Suppression, FA TB1 Hydrogen Seal Oil: D<br>Water Suppression, FA TB1 Lube Oil Purifier: D<br>Water Suppression, FA TB1 Main Feedwater Pump: D<br>Water Suppression, FA TB1 Turb Lube Oil Reservoir: D<br>Water Suppression, FA TB1 Turb Lube Oil XFR Tank: D<br>Water Suppression, FA TB1 Turb Piping & Bearings: D |

# Attachment C

## Table C-2 – NFPA 805 Required Fire Protection Systems and Features

**Fire Area ID:** TB2 - Unit 2 Turbine Building
**Compliance Basis:** NFPA 805, Section 4.2.4.2 Performance Based

| Room ID | Description | Required Suppression System | Required Detection System | Required Fire Protection Feature | Required Fire Protection Feature and System Details |
|---|---|---|---|---|---|
| Unit 2 Turbine Building | Unit 2 Turbine Building | D | D | E | Combustible Control: E<br>Detection System, FA TB2 Hydrogen Seal Oil: D<br>Detection System, FA TB2 Lube Oil Purifier: D<br>Detection System, FA TB2 Main Feedwater Pump: D<br>Detection System, FA TB2 Turb Lube Oil Reservoir: D<br>Detection System, FA TB2 Turb Lube Oil XFR Tank: D<br>Detection System, FA TB2 Turb Piping & Bearings: D<br>Water Suppression, FA TB2 Hydrogen Seal Oil: D<br>Water Suppression, FA TB2 Lube Oil Purifier: D<br>Water Suppression, FA TB2 Main Feedwater Pump: D<br>Water Suppression, FA TB2 Turb Lube Oil Reservoir: D<br>Water Suppression, FA TB2 Turb Lube Oil XFR Tank: D<br>Water Suppression, FA TB2 Turb Piping & Bearings: D |

This attachment documents the Verification and Validation (V&V) basis for the Fire Probabilistic Risk Assessment (Fire PRA) fire modeling applications at MNS. Plant specific fire modeling used to support the MNS Fire PRA consists of the following:

- The calculation of the main control room operator abandonment times [Hughes Associates Report 25018-RPT-01, Evaluation of Units 1 and 2 Control Room Abandonment Times at the McGuire Nuclear Station, Revision 0]; and
- The use of generic fire modeling treatments and its associated supplements as applicable to develop Zones of Influence (ZOI) [Hughes Associates, Generic Fire Modeling Treatments, Revision 0, January 15, 2008].

**Main Control Room Abandonment Report**

The goal of the main control room (MCR) abandonment evaluation provided as Hughes Associates Report 25018-RPT-01, Rev. 0, "Evaluation of Units 1 and 2 Control Room Abandonment Times at the McGuire Nuclear Station," is to compute the time operators would abandon the main control room for both Units 1 and 2 using the NUREG/CR-6850 [2005] abandonment criteria for control room fire scenarios. The abandonment times are assessed for various electronic equipment fires and for ordinary combustible fires as defined by the discretized heat release rate conditional probability distributions presented in NUREG/CR-6850 [2005]. In addition, abandonment times are provided for severe transient fire scenarios. The abandonment time in the main control room is estimated by calculating the time to reach threshold values for temperature and visibility as identified by NUREG/CR-6850 [2005]. Abandonment times based on an immersion temperature of 50°C (122°F) are also provided in Appendix E of the MCR abandonment report that are more conservative than the associated NUREG/CR-6850 criteria but are consistent with an expectation that operators will continue to perform their duties before making a successful exit. The immersion temperature criterion is based on recommendations provided in NUREG-0700 [2002] and the results for this additional abandonment criterion are used in the MNS FPRA.

The focus of the MCR abandonment evaluation is on the first twenty-five minutes after ignition because the non-suppression probability (NSP) decreases to 0.001 at twenty-one minutes [NUREG/CR-6850, 2005]. The abandonment calculations are performed using the zone fire model Consolidated Fire and Smoke Transport (CFAST), Version 6.1.1 [National Institute of Standards and Technology (NIST) Special Publication (SP) 1026, 2009 and NIST SP 1041, 2008].

The MCR area geometry and fire parameters for the simulations fall within the model limits listed in NIST SP 1026 [2009], and NIST SP 1041 [2008]. Specifically, the vent area to enclosure volume ratio is less than two and the aspect ratio of the enclosures is less than five (for the true geometry). The physical input dimensions are adjusted to account for obstructions while maintaining the enclosure aspect ratio.

The verification for the CFAST model (Version 6.0.5) is provided in NUREG 1824, Volume 5 [2007]. Supplemental verification for CFAST, Version 6.1.1 is provided as an appendix to the MCR abandonment report as well as in NIST SP 1086 [2008].

The validation for the CFAST model application at MNS is provided by NUREG-1824, Volumes 1 and 5 [2007]. Overall, the application of CFAST, Version 6.1.1 at the MNS

control room falls entirely within the NUREG-1824, Volume 1 [2007] V&V non-dimensional parameter space or bounds baseline scenarios that would fall within the NUREG-1824, Volume 1 [2007] V&V non-dimensional parameter space for applicable parameter for all times up to the predicted abandonment time or would generate a conservative result relative to a baseline case that fell within the NUREG-1824, Volume 1 [2007] V&V parameter space and used the NUREG/CR-6850 [2005] abandonment criteria. The results after abandonment is predicted may be based on an application outside the NUREG-1824, Volume 1 [2007] V&V parameter space, but the results are not used in the Fire PRA.

The main control room abandonment report also provides benchmark and validation simulations for CFAST as applicable to the main control room area of MNS. In particular, the control room tests documented in NUREG/CR-4527, Volume 2 [1988], are used to provide additional validation basis for control room application of CFAST. Table J-1 provides a summary of the validation and verification basis for CFAST, Version 6.1.1 as applied in the main control room abandonment report.

**Generic Fire Modeling Treatments Report**

The generic fire modeling treatments, Revision 0 is used to establish zones of influence for specific classes of ignition sources and primarily serves as both a screening and final calculation of damage distances in the Fire PRA under NUREG/CR-6850 [2005], Sections 8 and 11. The generic fire modeling treatments document has two fundamental uses within the Fire PRA:

- Determine the ZOI inside which a particular ignition source is postulated to damage targets; and
- Determine the potential of the ignition sources to generate a hot gas layer within an enclosure that can either lead to full room burnout or invalidate the generic treatment ZOIs for a particular class of combustible materials.

The ZOI is determined using a collection of empirical and algebraic models and correlations. The potential for a hot gas layer having a specified temperature to form within an enclosure is determined using the zone model CFAST, Version 6.1.1 [NIST SP 1026, 2009 and NIST SP 1041, 2008].

***Verification***

The calculation development and review process in place at the time the Generic Fire Modeling Treatments was prepared included contributions from a calculation preparer, a calculation review, and a calculation approver. The responsibilities for each are as follows:

- The calculation preparer develops and prepares the calculation using appropriate methods.
- The calculation reviewer provides a detailed review of the report and supporting calculations, including spreadsheets and fire model input files. The reviewer provides comments to the preparer for resolution.
- Calculation approver provides a reasonableness review of the report and approves the document for release.

NUREG/CR–6850 / EPRI 1023259, Nuclear Regulatory Commission, Rockville, MD, September, 2005.

30. NUREG/CR–7010, "Cable Heat Release, Ignition, and Spread in Tray Installations During Fire (CHRISTIFIRE) Volume 1: Horizontal Trays," Draft Report for Comment, McGrattan, K., Office of Nuclear Regulatory Research, Nuclear Regulatory Commission, Washington, DC, October, 2010.
31. NUREG-6850 Supplement 1 (2010), "Fire Probabilistic Risk Assessment Methods Enhancements," Electric Power Research Institute (EPRI) 1019259, NUREG/CR-6850 Supplement 1, Nuclear Regulatory Commission, Washington, DC, September, 2010.
32. Hughes Associates Report 25018-RPT-01, "Evaluation of Units 1 and 2 Control Room Abandonment Times at the McGuire Nuclear Station," Revision 0, Hughes Associates, Inc., Baltimore, MD, December, 2014.
33. SFPE Handbook of Fire Protection Engineering, Section 2–1, "Fire Plumes, Flame Height, and Air Entrainment," Heskestad, G., *The SFPE Handbook of Fire Protection Engineering*, 4th Edition, P. J. DiNenno, Editor-in-Chief, National Fire Protection Association, Quincy, MA, 2008.
34. SFPE Handbook of Fire Protection Engineering, Section 2–5, "Effect of Combustion Conditions on Species Production," Gottuk, D. and Lattimer, B. Y., *The SFPE Handbook of Fire Protection Engineering*, 4th Edition, P. J. DiNenno, Editor-in-Chief, National Fire Protection Association, Quincy, MA, 2008.
35. SFPE Handbook of Fire Protection Engineering, Section 2–6, "Toxicity Assessment of Combustion Products," Purser, D. A., *The SFPE Handbook of Fire Protection Engineering*, 3rd Edition, P. J. DiNenno, Editor-in-Chief, National Fire Protection Association, Quincy, MA, 2002.
36. SFPE Handbook of Fire Protection Engineering, Section 2–14, "Heat Fluxes from Fires to Surfaces," Lattimer, B. Y., *The SFPE Handbook of Fire Protection Engineering*, 4th Edition, P. J. DiNenno, Editor-in-Chief, National Fire Protection Association, Quincy, MA, 2008.
37. SFPE Handbook of Fire Protection Engineering, Section 2–14, "Heat Fluxes from Fires to Surfaces," Lattimer, B. Y., *The SFPE Handbook of Fire Protection Engineering*, 3rd Edition, P. J. DiNenno, Editor-in-Chief, National Fire Protection Association, Quincy, MA, 2002.
38. SFPE Handbook of Fire Protection Engineering, Section 2–15, "Liquid Fuel Fires," Gottuk, D. and White, D., *The SFPE Handbook of Fire Protection Engineering*, 3rd Edition, P. J. DiNenno, Editor-in-Chief, National Fire Protection Association, Quincy, MA, 2002.
39. SFPE Handbook of Fire Protection Engineering, Section 3–1, "Heat Release Rates," Babrauskas, V., *The SFPE Handbook of Fire Protection Engineering*, 4th Edition, P. J. DiNenno, Editor-in-Chief, National Fire Protection Association, Quincy, MA, 2008.
40. SFPE Handbook of Fire Protection Engineering, Section 3–4, "Generation of Heat and Gaseous, Liquid, and Solid Products in Fires," Tewarson, A., *The*

**Licensing Action** 11. NFPA 20 Fire Pump Installation

**Required Post-Transition** Yes

**Licensing Basis**

The regional NRC inspector in a 10-19-1979 Inspection Report identified five issues that do not meet the provisions of NFPA 20. They are:

(1) The controllers/motor starters for pumps A and B are located within the turbine building and not adjacent to and within sight of the pump motors as required by Section 7-2.1 of NFPA-20.

(2) The arrangement of the water pressure sensing lines between fire protection system and pressure-activated swithes are 1/8 inch in diameter in lieu of 1/2 inch minimum as specified by Section 5.2.1 and Figure A-7-5.2.1 of NFPA-20. Also the water sensing lines are not provided with the required check valves, test connections, and related devices.

(3) The pump starting circuits from the pressure sensing system which are external from the pump controllers/ motor starters are not electrically supervised, nor arranged such that breakage, disconnecting, aborting of the wires or loss of power to the circuits will cause continous running of the fire pumps as required by Section 7-5.2.5 of NFPA-20.

(4) Controllers for Pumps A and B are not listed by Underwriters Laboratories, Inc. (UL) or approved by Factory Manual Laboratories Inc. (FM) for use on electric motor driven fire pumps as required by Section 7-1.1.1 of NFPA-20.

(5) The fire pumps are not provided with labels or otherwise identified to verify that the pumps are actually listed by UL or approved by FM for fire pump service as required by Section 2-2 of NFPA-20.

The regional inspector requested in a letter dated 12-6-1979 the NRR to evaluated these issues. The NRR responded 1-15-1980 that the MNS fire protection pumps are acceptable since the functional requirements are intact and the system is periodically tested.

The bases for previous acceptance remain valid.

**References**

**Document ID**

1979-10-19 NRC Notice of Deviation [Details section page 2-3] - Notice of Deviation

**Evaluation**

The Inspection Report states:

"a. Fire Pump

Section E.2.(C) of the licensee's McGuire Nuclear Station Fire Protection Reviev (FPR) states that the fire pump installation is designed to meet the standards developed by the National Fire Protection Association (NFPA) where practicable. The applicable standard or code for fire pump installations is NFPA-20, "Centrifugal Fire Pumps". The fire pump installation at the site does not meet the provisions of NFPA-20 due to the following:

(1) The controllers/motor starters for pumps A and B are located within the turbine buildiog and not adjacent to and within sight of the pump motors as required by Section 7-2.1 of NFPA-20.

(2) The arrangement of the water pressure sensing lines between fire protection system and pressure-activated swithes are 1/8 inch in diameter in lieu of 1/2 inch minimum as specified by Section 5.2.1 and Figure A-7-5.2.1 of NFPA-20. Also the water sensing lines are not provided with the required check valves, test connections, and related devices.

(3) The pump starting circuits from the pressure sensing system which are external from the pump controllers/ motor starters are not electrically supervised, nor arranged such that breakage, disconnecting, aborting of the wires or loss of power to the circuits will cause continous running of the fire pumps as required by Section 7-5.2.5 of NFPA-20.

(4) Controllers for Pumps A and B are not listed by Underwriters Laboratories, Inc. (UL) or approved by Factory Manual Laboratories Inc. (FM) for use on electric motor driven fire pumps as required by Section 7-1.1.1 of NFPA-20.

**Licensing Action** 11. NFPA 20 Fire Pump Installation

**Evaluation**

(5) The fire pumps are not provided with labels or otherwise identified to verify that the pumps are actually listed by UL or approved by FM for fire pump service as required by Section 2-2 of NFPA-20.

The above five items are identified as Unresolved Item (369/79-34-2 and 370/79-20-2). Substandard Fire Pump Installation, pending further evaluation by the NRC.

The electric motor for Fire Pump A has been removed to repair a defective bearing. Also, an automatic air release valve is not provided on the discharge pipe from this pump as required by Section 4-3.5.2 of NFPA-20. The licensee advised that these items will be corrected prior to fuel loading. This item is identified as Inspector Followup Item (369/79-34-3 and 370/79-20-3), Repairs to Fire Pump A, and will be reinspected during a subsequent NRC inspection."

**Document ID**

1980-01-15 NRR Memorandum [Page 1] -

**Evaluation**

The NRR Memorandum states:

"In accordance with your request dated December 6, 1979, we have reviewed and evaluated two unresolved items pertaining to the McGuire Plant fire protection systems.

Item 1 pertained to the fire pumps. Five separates areas were identified by the regional inspector as not being in compliance with the NFPA code. Although it is always desirable to fully comply with any applicable fire codes, for existing facilities seldom is this accomplished. The fire pump comments "a" thru "e" are properly identified as not being in strict conformance to the NFPA code. However, these areas were also identified by our fire protection consultants and discussed with the applicant. We granted code exemptions because important functional requirements still remained in effect. For example, even though the pumps are not UL labeled, their pump curves were examined and found to be acceptable. Another example is in the water pressure sensing line. Even though this line is only 1/8" in diameter in lieu of 1/2" diameter specified by the NRPA code, we still require the applicant to test these pumps by decreasing the system side pressure to start the pumps. Hence, the functional requirement is intact and periodically tested. Finally, inthe case of these fire pumps, it should be kept in mind that although our BTP 9.5-1 specifies two, 100% pumps, the applicant is providing three 100% pumps, which more than meets our requirements. Based on the above discussion, we conclude that the McGuire fire protection pumps are acceptable."

## Approval Request 6

### NFPA 805 Section 3.5.16

NFPA 805, Section 3.5.16 states:

> *"The fire protection water supply system shall be dedicated for fire protection use only.*
>
> *Exception No. 1: Fire protection water supply systems shall be permitted to be used to provide backup to nuclear safety systems, provided the fire protection water supply systems are designed and maintained to deliver the combined fire and nuclear safety flow demands for the duration specified by the applicable analysis.*
>
> *Exception No. 2: Fire protection water storage can be provided by plant systems serving other functions, provided the storage has a dedicated capacity capable of providing the maximum fire protection demand for the specified duration as determined in this section."*

There are three cases by design where fire protection system water is used for other than fire protection purposes at MNS. These cases include:

- Back-up to the Condenser Circulating Water pump seal/bearings.
- Back-up to the Low Level Intake (LLI) pump seal/bearings.
- Intake Screen Backwash (RS).

The use of the fire protection water for these non-fire protection system water demands would have no adverse impact on the ability of the fire protection system to provide required flow and pressure.

**Basis for Request**:

The basis for the approval request of this deviation is:

- The back-up to the Condenser Circulating Water pump seal/bearings demand is a total demand of 200 gpm for all Condenser Circulating Water pumps. This is an automatic alignment when both normal Condenser Circulating Water bearing cooling pumps are lost. Normally there is one bearing cooling pump in service and one standby. There are three sequential 2,500 gpm at 145 psi fire pumps which will provide the maximum single demand of 2,583 gpm and an additional 500 gpm hose stream plus 200 gpm for back-up Condenser Circulating Water pump demands.
- The back-up to the LLI pump seal/bearings demand is a total of 30 gpm for all three LLI pumps. This is manual alignment only by operations. This demand is within the available water supply per Exception No. 2. The largest suppression system demand is 2,583 gpm. The fire pumps are each rated for 2,500 gpm.
- The Intake RS demand is 1,100 gpm. This is manual alignment only by operations.

# S. Modifications and Implementation Items

**9 Pages Attached**

Table S-2 Plant Modifications Committed

| Item | Rank | Unit | Problem Statement | Proposed Modification | In Fire PRA | Comp Measure | Risk Informed Characterization |
|---|---|---|---|---|---|---|---|
| | | | 1SCTC1, 1SCTC2, 1UCTC1, 1UCTC2, 1UCTC3, and 2MLC. | 1SCTC1, 1SCTC2, 1UCTC1, 1UCTC2, and 1UCTC3.<br><br>Seal the top surface of the Unit 2 Fire Area 20, cabinet 2MLC.<br><br>Unit 1 will be completed: 1EOC24 (Spring 2016)<br>Unit 2 will be completed: 2EOC23 (Fall 2015) | | | performed by work orders. This activity is required to be done due to credit taken in the Fire PRA for sealed cabinets. This activity will reduce risk.<br><br>Appropriate compensatory measures needed for any outstanding NFPA 805 related compliance modifications will be in place at the time of NFPA 805 program implementation and will be maintained until associated modifications are complete. |
| 4 | Low | 1, 2 | Valves 1(2) CA161C and 1(2) CA162C are a rising stem concern in Fire Area 03, 04, and 14.<br><br>Component: 1CA161C<br>VFDR: 04-092, 14-030<br><br>Component: 2CA161C<br>VFDR: 03-01<br><br>Component: 1CA162C<br>VFDR: 04-093, 14-031<br><br>Component: 2CA162C<br>VFDR: 03-02 | Engineering Change (EC) will install a bypass around both valves. Manual butterfly valves will be installed around these valves.<br><br>Unit 1 will be completed: 1EOC23 (Fall 2014)<br>Unit 2 will be completed: 2EOC23 (Fall 2015) | N | N | This modification will eliminate impact of a hot gas layer impairing operation of the rising stem valve.<br><br>Appropriate compensatory measures needed for any outstanding NFPA 805 related compliance modifications will be in place at the time of NFPA 805 program implementation and will be maintained until associated modifications are complete. |

Table S-3 Implementation Items

| Item | Unit | Description | LAR Section / Source |
|---|---|---|---|
| 4 | 1, 2 | Revise appropriate fire protection program document(s) to provide a requirement that if a plant elects to implement the methodologies in EPRI Report TR-1006756, that the methodologies will be implemented in their entirety as they pertain to the fire protection systems or features being evaluated. | 4.1.2 and Attachment A, 3.2.3(1) |
| 5 | 1, 2 | The monitoring program required by NFPA 805 Section 2.6 will be implemented after the LAR approval as part of the fire protection program transition to NFPA 805, in accordance with NFPA 805 FAQ 10-0059, and will include a process that reviews the fire protection performance and trends in performance. | 4.1.2 and Attachment A, 3.2.3(3)<br>4.6.2 |
| 6 | 1, 2 | Revise station procedures/directives to comply with NFPA 805 Section 3.3.1.2(1). | 4.1.2 and Attachment A, 3.3.1.2(1) |
| 7 | 1, 2 | Revise appropriate station documentation to include the requirements for installation of cable above suspended ceilings. | 4.1.2, Attachment A, 3.3.5.1, and Attachment L, Approval Request #2 |
| 8 | 1, 2 | Review MNS fire strategies for compliance with NFPA 805 requirements and update as applicable. | 4.1.2 and Attachment A, 3.4.2.1 |
| 9 | 1, 2 | The Fire Protection Design Basis Document described in Section 2.7.1.2 of NFPA 805 and necessary supporting documentation described in Section 2.7.1.3 of NFPA 805 will be created as part of transition to 10 CFR 50.48(c) to ensure program implementation following receipt of the safety evaluation. Appropriate cross references will be established to supporting documents as required by MNS processes. | 4.7.1 |
| 10 | 1, 2 | Ensure the MNS configuration control process follows the requirements in NFPA 805 and the guidance outlined in RG 1.174 which requires the use of qualified individuals, procedures that require calculations be subject to independent review and verification, record retention, peer review, and a corrective action program that ensures appropriate actions are taken when errors are discovered. The configuration control requirements should be implemented in accordance with FAQ 12-0061. | 4.7.2 |
| 11 | 1, 2 | Develop Engineering training guidelines 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. | 4.7.3 |

Table S-3 Implementation Items

| Item | Unit | Description | LAR Section / Source |
|---|---|---|---|
| 19 | 1, 2 | Update the transient combustible control procedure to require additional controls in the identified fire areas to account for a larger transient fire heat release rate. | RAI PRA-17b |

# ENCLOSURE 4

## Revised Due Dates for Some MNS NFPA 805 LAR 120-Day RAI Responses and the Due Date for the Revised Response to 90-Day RAI FM RAI 01.k

**Revised Due Dates for Some MNS NFPA 805 LAR 120-Day RAI Responses and the Due Date for the Revised Response to 90-Day RAI FM RAI 01.k**

| RAI | Revised Due Date |
| --- | --- |
| PRA RAI 13 | January 26, 2015 |
| FM RAI 01.j | January 26, 2015 |
| FM RAI 02.a | January 26, 2015 |
| FM RAI 02.b | January 26, 2015 |
| FM RAI 06 | January 26, 2015 |
| FM RAI 01.k | January 26, 2015 |
| PRA RAI 03 | February 27, 2015 |
| PRA RAI 23 | February 27, 2015 |