

July 22, 2014

MEMORANDUM TO: APLA Files

FROM: Hossein G. Hamzehee, Branch Chief /RA/
PRA Licensing Branch
Division of Risk Assessment
Office of Nuclear Reactor Regulation

SUBJECT: CLOSE-OUT OF FIRE PROBABILISTIC RISK ASSESSMENT
FREQUENTLY ASKED QUESTION 14-0008 ON MAIN CONTROL
BOARD TREATMENT

BACKGROUND

During industry peer reviews and Nuclear Regulatory Commission (NRC) review of Fire Probabilistic Risk Assessment (FPRA) applications to implement National Fire Protection Association "Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants" (NFPA 805), methods and approaches that were different from the accepted methods were encountered. U.S. Nuclear Regulatory Commission (NRC) staff collaborated with the Nuclear Energy Institute (NEI) and the nuclear industry to identify these methods, approaches, and factors in current FPRA applications (including but not limited to NFPA 805 applications) that are different from the NRC accepted methods, and to address them by providing clarification through a frequently asked question (FAQ) process. Other differing methods and approaches were also identified to be addressed outside the FPRA FAQ process by development of new methods through the Memorandum of Understanding between the Office of Nuclear Regulatory Research and Electric Power Research Institute.

Appendix L, "Main Control Board Fires," to NUREG/CR-6850, "Fire PRA Methodology for Nuclear Power Facilities," describes the process for estimating the conditional probability of damage to a set of target items inside the main control board (MCB). Currently, the MCB definition can be interpreted to exclude the rear side of the MCB panel. A review of the background supporting NUREG/CR-6850 development suggests that this interpretation may not be appropriate, and that the MCB should also include the rear side of the MCB panel. The purpose of FPRA FAQ 14-0008 is to clarify MCB definition and to give guidance on application of the frequencies in Appendix L to NUREG/CR-6850.

CONTACT: J.S. Hyslop, NRR/DRA
(301) 415-4107

Mehdi Reisi Fard, NRR/DRA
(301) 415-3092

CONCLUSION

The NRC staff and nuclear industry held a series of public meetings to discuss the resolution of FPRA FAQ 14-0008 along with other FPRA FAQs. Technical exchange between the NRC staff and industry led to the resolution of this FAQ, which is documented in the Enclosure to this memorandum. This FPRA FAQ provides conditions, with clarifications, for the rear side of the MCB to be treated as part of the MCB. Additionally, the FPRA FAQ concludes that as the front and rear sides of the MCB are generally configured in similar manners, the Appendix L damage model is applicable to the front and rear sides of the MCB. Finally, the FPRA FAQ discusses three alternatives for treating partitions between panels/cabinets that impact the progression of a fire and the characterization of damage sets across those partitions.

The guidance in FPRA FAQ 14-0008 is acceptable for use by licensees. This guidance will be endorsed in the next revision to Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants."

Enclosure:
As stated

CONCLUSION

The NRC staff and nuclear industry held a series of public meetings to discuss the resolution of FPRA FAQ 14-0008 along with other FPRA FAQs. Technical exchange between the NRC staff and industry led to the resolution of this FAQ, which is documented in the Enclosure to this memorandum. This FPRA FAQ provides conditions, with clarifications, for the rear side of the MCB to be treated as part of the MCB. Additionally, the FPRA FAQ concludes that as the front and rear sides of the MCB are generally configured in similar manners, the Appendix L damage model is applicable to the front and rear sides of the MCB. Finally, the FPRA FAQ discusses three alternatives for treating partitions between panels/cabinets that impact the progression of a fire and the characterization of damage sets across those partitions.

The guidance in FPRA FAQ 14-0008 is acceptable for use by licensees. This guidance will be endorsed in the next revision to Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants."

Enclosure:
As stated

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OFFICE	DRA/APLA	DRA/APLA	DRA/APLA
NAME	MReisiFard	JHyslop	HHamzehee
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FAQ Number 14-0008

FAQ Revision 1

FAQ Title Main Control Board Treatment

Plant: Various

Date: 6/5/2014

Contact: Jeff Stone
Francisco Joglar

Phone:

Email: jeffrey.stone@exeloncorp.com
fjoglar@haifire.com

Distribution: *(NEI Internal Use)*

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Purpose of FAQ: To clarify the definition of the Main Control Board, and to extend the definition to cover rear side of the main control board.

Relevant NRC document(s): NUREG/CR-6850

Details:

NRC document needing interpretation (include document number and title, section, paragraph, and line numbers as applicable): NUREG/CR-6850, Appendix L

Circumstances requiring interpretation or new guidance: Currently, the main control board (MCB) definition can be interpreted to exclude the rear side of the MCB panel. However, a review of the background supporting NUREG/CR-6850 development suggests that this interpretation may not be appropriate, and that the MCB should also include the rear side of the MCB panel. The purpose of this FAQ is to clarify this definition, and to give guidance on application of the frequencies in Appendix L, Figure L-1.

Detail contentious points if licensee and NRC have not reached consensus on the facts and circumstances: None

Potentially relevant existing FAQ numbers: NFPA 805 FAQ 06-0018

Response Section:

Proposed resolution of FAQ and the basis for the proposal:

MCB Definition

Currently, the main control board (MCB) definition can be interpreted to exclude the rear side of the MCB panel. However, a review of the background supporting NUREG/CR-6850 development suggests that this interpretation may not be appropriate, and that the MCB should also include the rear side of the MCB panel.

FAQ Title Main Control Board Treatment

For clarity purposes, it is important to first distinguish between individual electrical cabinets behind the MCB that are detached from the MCB (e.g., relay racks) but still located in the main control room and what is referenced in this FAQ as the rear side of the MCB. The former are completely separate from the MCB panels and are not within the scope of this FAQ.

This FAQ specifically refers to the rear side of the MCB which may be part of a “whole” panel or a somewhat separate section where there may be a walkway between the “front” and “rear” sides.

It should be noted that NFPA 805 FAQ 06-0018 (NUREG/CR-6850 Supplement 1 Chapter 5) describes the criteria for the classification of the front side of the MCB.

Conditions for inclusion of the rear side of the MCB panel

For the rear side of the MCB to be treated as part of the MCB, both the rear and front sides should be connected together as a single enclosure. This essentially creates a MCB with a continuous overhead, or by an overhead with penetrations or vents along it longitudinally. That is, the presence of a MCB cabinet ceiling would connote a single cabinet. Also, cables may connect the front and back sides of the MCB, although these cable crossings do not need to extend the full length of the overall MCB. If the MCB meets this description, then the rear side of the MCB is classified as an integral part of the MCB. The following clarifications are also applicable to the definition of the MCB:

1. There may be partitions installed longitudinally between MCB panels (i.e., sections). These partitions may be credited as described later in this FAQ.
2. The front and rear side of the MCB cannot be separated by partitions or cabinet walls.

Any other cabinet or panel in the main control room other than the front side or rear side of the MCB as discussed above may need to be classified as an “electrical cabinet” (i.e., Bin 15) for determining fire ignition frequencies.

Treatment in Chapter 6 of NUREG/CR-6850 (Fire Ignition Frequencies)

A review of fire events categorization supporting the development of NUREG/CR-6850 suggests that the available data at the time did not distinguish between front and rear sides of MCB. Based on this evidence (i.e., the fire events data used for the development of NUREG/CR-6850), it is appropriate to include the rear side of the MCB panel in Bin 4.

Application of Appendix L, Figure L-1

The methodology described in Appendix L of NUREG/CR-6850 includes credit for applicable severity factor and non-suppression probability. Since the front and rear sides of the MCB are generally configured in similar manners, the Appendix L damage model is applicable to the front and rear sides of the MCB.

Partitions between panels/cabinets impact the progression of a fire and the characterization of damage sets across those partitions. Consequently, there are three alternatives for treating partitions:

1. Recalculate the values in Figure L-1 in NUREG/CR-6850 based on the physical dimensions of the credited partitioned section(s). Under this alternative, it is assumed

FAQ Title Main Control Board Treatment

that the partitions prevent fire propagation between panels provided partitions are solid, continuous, and noncombustible. In addition, the MCB frequency needs to be apportioned according to the partitions (i.e., dividing the generic frequency by the number of panels separated by the partitions). It should be noted that recalculating the values in Figure L-1 in NUREG/CR-6850 requires numerical methods for solving the model described in Appendix L of NUREG/CR-6850.

2. For the case where the values in Figure L-1 in NUREG/CR-6850 are not re-calculated, the MCB frequency should not be apportioned between different panel sections. The full MCB frequency should be assigned to all of the panels separate by the partitions. This is appropriate because the values in Figure L-1 represent the probability of a fire starting and growing anywhere in the length of a “typical” MCB regardless of the partitions. In this configuration, the partitions can be credited for preventing fire propagation provided that they are solid, continuous, and noncombustible. The practical implication of this approach results in conservatively applying the full MCB frequency to each panel (i.e., not apportioning the MCB frequency by panel sections) but limiting the fire propagation to each partitioned section.
3. The analysis can conservatively treat the panel as if the partitions did not exist to avoid the need to address the adequacy of the partition and recalculating the values in ‘Figure L-1’ in NUREG/CR-6850.

Fire propagation within credited partitions from the front to rear of the MCB panel should be considered when developing target sets. For scenarios where the fire can propagate from the front to the rear side of the MCB (or vice versa), the target set should include the damage associated with cable or components in both sides of the MCB.

If appropriate, provide proposed rewording of guidance for inclusion in the next Revision: