

Plant: ABWR Date: March 13, 2008
Contact: Dennis Henneke Phone: (910) 675-6780
Email: Dennis.Henneke@ge.com

Distribution: *(NEI Internal Use)*

☒ 805 TF ☒ FPWG ☐ RATF ☐ RIRWG ☒ BWROG ☐ PWROG

Purpose of FAQ:

The purpose of this FAQ is to provide additional guidance on the location of Fires caused by electrical cabinets.

Is this Interpretation of guidance? ☒ Yes / No

Proposed new guidance not in NEI 04-02? ☒ Yes / No

Details:

NEI 04-02 guidance needing interpretation (include section, paragraph, and line numbers as applicable):

N/A

Circumstances requiring guidance interpretation or new guidance:

Lessons have been learned from pilot review of the Fire PRA Standard indicates conservative locations for Cabinet Fires is assumed in all cases. Conservative assumption of cabinet fires can greatly affect the results.

Detail contentious points if licensee and NRC have not reached consensus on the facts and circumstances:

None.

Potentially relevant existing FAQ numbers:

Response Section:

Proposed resolution of FAQ and the basis for the proposal:

NUREG/CR-6850, section G.3.2 provides two possible approaches to the location for a cabinet fire that is used for fire modeling. In the introduction paragraph, the method suggests opening the cabinet to determine where cable bundles are located to determine the location of the fire. In the itemized bullets, the method suggests locating the fire at the top of the cabinet.

In practical applications, the plants always start with the fire at the top of the cabinet. This assumption is applied even for cabinets that are sealed on the top (without top vents or openings).

The Fire SDP (NRC Inspection Manual, 0609, Appendix F), Page F-21, recommends assuming the location of the fire for a cabinet fire is 1 foot below the top of the cabinet.

The basis for this guidance was derived from experimental observations. Testing¹ has shown that early fire development within the cabinet begins heating the cables and other combustible materials within the cabinet. Once those internal combustibles get hot enough to generate significant pyrolysates, the fire will transition to an oxygen limited behavior within the cabinet. Under these conditions, burning does continue within the cabinet, but burning is limited by the oxygen available (i.e., the air flowing into the lower sections of the panel through ventilation grills, gaps between cabinet panels, gaps around the cabinet doors, and gaps opened by warping of the cabinet panels and doors). Significant unburned pyrolysates are also generated and vented from the upper portion of the cabinet. As these unburned pyrolysates leave the cabinet they come into contact ambient oxygen and burn at or near the exit point (e.g., the upper ventilation grills or other openings). Hence, assuming that the fire origin is near the base of the upper ventilation openings in a cabinet is a reasonable predictor of typical cabinet fire behavior under large-scale burning conditions. In general, such grills will typically be located

¹ Note that these insights are based on the same cabinet fire test programs referenced in NUREG/CR-6850, EPRI TR 1011989; namely, those from SNL/NRC, IRSN and VTT.

within 1 foot of the cabinet top so that the general application of the proposed “1ft rule” will be representative of the anticipated behavior for the vast majority of closed-top cabinets.

It is recommended that the assumed fire location used for screening and detailed fire modeling for electrical cabinets sealed on the top (without top vents or openings) is 1 foot below the top of the cabinet. This is assumed as a starting point until detailed review of the cabinet contents can be performed for additional location determination, per G.3.2 of NUREG/CR-6850.

The assumed fire location for a fire in cabinet that is not sealed at the top is top of the cabinet (see additional guidance below). As a point of clarification, it should be noted that in the above description on penetrations, sealed at the top of the cabinet was not intended to imply “fire-rated.” Rather the intent was that penetrations into a cabinet would be sealed such that they would not readily allow for the passage of air.

For vented cabinets, where the vent is either located on the side of the cabinet or top of the cabinet, the analysis can (as an alternative to the above assumed location) locate the fire at the upper most vent location. For example, if a cabinet includes two vents on the side of the cabinet, the fire should be assumed to be located at the upper vent location. Similarly, if there is a vent in the top corner of the cabinet, the fire should be assumed to be in the center of the corner vent. When 2 or more vents are located at the same height, then the analysis should conservatively assume the fire is located at the vent closest to any targets. If this last assumption greatly affects the results, additional refinement may be needed either by more accurate modeling of the fire size expected to occur at each vent or by using the general guidance discussed above from NUREG/CR-6850.

For cabinets that are not vented, but not considered sealed per FAQ-042, the fire would be assumed located at the top of the door or opening which is expected to fail when fire damage occurs. If multiple doors or openings would possibly fail, the analysis should conservatively assume the fire is located at the upper most door or opening. Additional refinement may be needed if this last assumption greatly affects the results.

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

Cabinet Fire Location Clarification: The assumed fire location used for screening and detailed fire modeling for electrical cabinets sealed on the top (without top vents or openings) is 1 foot below the top of the cabinet. The assumed fire location for a fire in cabinet that is not sealed at the top is the top of the cabinet. For particular characteristics, such as vents or doors, the guidance above should be used. This is a starting point for the fire modeling until detailed review of the cabinet contents can be performed for additional location determination, per G.3.2 of NUREG/CR-6850.