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Michele Kaplan
Director, Division of Resource Management and Administration
Office of Administration
U.S. Nuclear Regulatory Commission
Mail Stop: TWFN-7-A60M
Washington, DC 20555–0001

Subject: Industry Comments on Draft Research Information Letter Reports "Determining the Zone of Influence for High Energy Arcing Faults using Fire Dynamics Simulator," and "Predicting High Energy Arcing Fault Zones of Influence for Aluminum Using a Modified Arc Flash Model, Evaluation of a modified model bias, uncertainty, parameter sensitivity and zone of influence estimation," Docket ID NRC-2022-0096

Project Number: 689

Dear Ms. Kaplan:

The Nuclear Energy Institute (NEI)[1], on behalf of its members, submits the following comments on Draft Research Information Letter Reports "Determining the Zone of Influence for High Energy Arcing Faults using Fire Dynamics Simulator," and "Predicting High Energy Arcing Fault Zones of Influence for Aluminum Using a Modified Arc Flash Model, Evaluation of a modified model bias, uncertainty, parameter sensitivity and zone of influence estimation." We appreciate the opportunity to comment on these important draft information research letter reports.

The contents of the first report, "Determining the Zone of Influence for High Energy Arcing Faults using Fire Dynamics Simulator," represent the results of collaborative work that will provide more detailed insights on plant risk presented by potential High Energy Arcing Fault (HEAF) events, and NEI supports its issuance following the consideration of comments in Attachment 1. This report is based on validated models and represents an improvement to the realism in methods available for development and refinement of Fire Probabilistic Risk Assessment (PRA) models.

[1] The Nuclear Energy Institute (NEI) is responsible for establishing unified policy on behalf of its members relating to matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect and engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations involved in the nuclear energy industry.

The contents of the second report, "Predicting High Energy Arcing Fault Zones of Influence for Aluminum Using a Modified Arc Flash Model, Evaluation of a modified model bias, uncertainty, parameter sensitivity and zone of influence estimation," are not technically sound for supporting HEAF zone of influence estimates for use in a PRA. The methodology used in the analysis was never intended to be used for this purpose; this methodology was instead developed for personnel safety in a wide variety of scenarios, including non-nuclear scenarios. This methodology is therefore inappropriately bounding for use in PRAs and it has never been validated for such an application. NEI recommends that this report clearly state that the methodology can potentially be used as a conservative screening approach but should not be used to calculate zones of influence for use in PRAs.

Additionally, NEI would like to ensure clarity regarding the use of any NRC-issued documents on modeling HEAF events in PRAs. Specifically, while licensees may choose to use these new methodologies, they are under no obligation to do so by any voluntary or compulsory regulatory program. Existing methodologies for modeling HEAF remain adequate for support of licensee PRAs, and there is no indication that any of this information would substantively change the results from a Fire PRA model. The existing methodologies used in licensee PRAs are therefore adequate for use and in accordance with Regulatory Guide 1.200, "Acceptability of Probabilistic Risk Assessment Results for Risk-Informed Activities," which provides guidance for PRA technical acceptability for PRAs supporting licensing applications.

We encourage the NRC to consider and address all stakeholder comments on these draft research information letter reports. Please contact me at vka@nei.org or (202) 739-8101 with any questions about the content of this letter.

Sincerely,

Victoria K. Anderson

c: Mr. Mark Salley, RES
Mr. Gabriel Taylor, RES
NRC Document Control Desk

Attachment 1: Comments on "Determining the ZOI for HEAF Using Fire Dynamics Simulator"

Location	Comment	Proposed Resolution
Executive Summary (page xxix, 2nd bullet)	This section includes a statement that "for vertical-lift breaker style switchgear in the supply configuration, there is no vertical (top) ZOI component." It is unclear if this is true for medium voltage switchgear.	Clarify whether or not this is applicable to medium voltage switchgear.
Page 2-1	The assumption that the pressure wave does not have an impact on PRA targets is not clearly justified.	Provide a technical basis for the assumption.
Section 5 Heading	"Development" is misspelled.	Correct spelling.
Section 6.1.3.3 (Page 6-34)	This section includes a statement that "for vertical-lift breaker style switchgear in the supply configuration, there is no vertical (top) ZOI component." It is unclear if this is true for medium voltage switchgear. Table 6-1 shows non-zero ZOIs for TOP of "PCCBB Supply." Table 6-1 also shows zero front ZOI for the vertical-lift, load configuration.	Clarify whether or not this is applicable to medium voltage switchgear.
Section 6-3	It is not clear if this report included re-evaluation of the ZOI descending from Non-Segregated Bus Ducts as suggested by Supplement 1 to NUREG/CR-6850.	Include statement specifying findings related to this re-evaluation, or explicitly state that it was not re-evaluated.

Attachment 2: Comments on "Predicting High Energy Arcing Fault Zones of Influence for Aluminum Using a Modified Arc Flash Model, Evaluation of a modified model bias, uncertainty, parameter sensitivity and zone of influence estimation"

Location	Comment	Proposed Resolution
Page xi	COVID is misspelled	Correct spelling
Section 2.2.1	IEEE 1584-2018 Appendix G.7.6 describes the minimum working distance of 12 inches is due to being within the range of the arc plasma cloud and metal droplets. No tests were performed at such short working distances. A minimum working distance of 12 inches was used because the plasma cloud is not considered to have exceeded a radius of 12 in. The plasma cloud size and effect of direct contact with it should be considered in future arc-flash model revisions. The arc flash boundary is not simply based on the limits for sustaining injury to humans, it is a limitation of the testing. Target response within the plasma cloud could be substantially different than target response outside the plasma cloud. Further justification should be provided to apply a model outside the validation range (less than the minimum 12 inch distance).	Reevaluate applicability of methodology and include clear bounds of use, including non applicability to use in PRAs due to conservatism.
Section 2.2.2	There is no clear basis for excluding insulated conditions, and this is therefore not realistic for cases with insulated bus bars.	Reevaluate applicability of methodology and include clear bounds of use, including non applicability to use in PRAs due to conservatism.
Page 3-15	HCB and VCB are not adequately explained, and the chosen approach was not sufficiently justified.	Include explanation and justification.
Section 3.4.2	The medium voltage equation on page 3-10 is written such that it is assumed that all three phases contribute to the fault. This is therefore not applicable for cases with two phases, or phase-to-ground. A single phase-to-ground fault, for example, would have less energy.	Clarify applicability of equation and reevaluate applicability of methodology and include clear bounds of use, including non applicability to use in PRAs due to conservatism.
Section 3.6	In the arcing power equation on page 3-13, it is unclear if the arc voltage is the terminal voltage or system voltage.	Specify terminal voltage or system voltage.

Figure 17	The Total Energy Release is linear with fault duration, but ZOI due to radiation is to the 4th power which would not be linear. There is no basis given for a linear increase in ZOI.	Revise the figure with an appropriate relationship or provide justification for the linear relationship.
Page 4-2	In the ZOI tables, the difference between Aluminum and Steel is not substantial. It would be useful to have the ZOI in different directions specified.	Specify the ZOI in different directions.
Page A-1	Arc voltage is smaller (20% of open circuit voltage) because high fault current generates large voltage drop (80%) through impedance in transformer and cables. Based on Figure 19, there does not appear to be a phase shift (the phase voltage sinusoids have the same period with no significant offset due the fault) from the open circuit condition to the fault condition. The transformer source is highly inductive (large X/R ratio) and the cable has a moderate X/R ratio. If the arc was purely resistive with no reactance, there would be a phase shift. The arc fault likely has a similar X/R ratio (reactance to resistance ratio) to the open circuit impedance and is likely not purely resistive.	Correct the X/R ratio.