NRC/EPRI HEAF Working Group Update

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Public Workshop

October 20th, 2021

Working Group Members

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Working Group Charter

- Characterize the primary factors that influence the occurrence and severity of arcing fault events (arc flash, arc blast, or HEAF).
- Develop tools and methods to assess the risk posed by arcing fault events based on experimental data, operating experience, and engineering judgement.

Public Website

 Provides the most up-to-date information about NRC's HEAF Research activities.

 Detailed project plan available for download.



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Fire Research Projects

Collaborative Research

NRC High Energy Arc Fault (HEAF) Research



🗟 Spotlight

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NRC High Energy Arc Fault (HEAF) Research

Recent News / Upcoming Events

September 30th, 2021: A public workshop on HEAFs has been scheduled for October 20th, 2021. The purpose of this public workshop between the U. S. Nuclear Regulatory Commission (NRC), Nuclear Energy Institute (NEI), Industry, and Electric Power Research Institute (EPRI), is to provide a status and update on NRC and EPRI activities related to the potential safety-significance of aluminum high energy arcing faults (AL HEAF), and to achieve an understanding of NRC, Industry, and EPRI perspectives related to this topic. Additionally, the purpose of this meeting is to explain the use of the Office of Nuclear Reactor Regulation Office Instruction LIC-504, "Integrated Risk-Informed Decisionmaking Process for Emergent Issues," to apply best available information, and NRC risk assessment tools to determine whether any regulatory actions should be considered to enhance public safety.

September 15th, 2021: "HEAF Cable Fragility Testing at the Solar Furnace at the NSTTF" 🖪 report now publicly available.

September 1, 2021: NRC staff has determined that pre-GI-018, "High Energy Arcing Faults Involving Aluminum," no longer meets Criterion 5 of NRC Management Directive (MD) 6.4, "Generic Issues Program" (ML14245A048 🖾), for remaining in the Generic Issues (GI) program. The staff has concluded that the risk or safety significance of HEAFs involving aluminum cannot be adequately determined in a timely manner without performing additional, long-term research to develop the methodology for such a determination. Therefore, Criterion 5 of the screening criteria in MD 6.4 is no longer being met.

Accordingly, the staff has exited the pre-GI-018 from the GI program (ML21237A360) and the staff is moving forward with a revised approach that supports a more efficient resolution of the issue by applying the *BeRiskSMART* framework.

The staff's revised approach for aluminum HEAF activities consists of two coordinated tracks for (a) research activities in coordination with EPRI and (b) use of LIC-504, "Integrated Risk-Informed Decisionmaking Process for Emergent Issues," Revision 5 (ADAMS Accession No. MI 19253D401 P. to apply best available information and NRC risk assessment tools to determine whether any

https://www.nrc.gov/about-nrc/regulatory/research/fire-research/heaf-research.html

Summary of Working Group Deliverables

Deliverable	Lead Org	Public Comment	Scheduled Publication (Draft)
Fragility Testing Data Report	SNL	No	Complete
Fragility Testing Methodology Report	NRC/EPRI	Yes	November 2021
KEMA Testing Data Report	NIST	No	December 2021
Modeling Report, Hazard Tables, and ZOIs	NRC/EPRI	Yes	March 2022
Final PRA Methodology Report	NRC/EPRI	Yes	June 2022



Fragility Testing Data Report Objective was to characterize the magnitude and durations

- Objective was to characterize the magnitude and durations of high flux, short duration exposures required to fail common PRA targets.
- 53 tests run between May of 2020 and February of 2021 at Sandia National Laboratories' Solar Thermal Test Facility.
- Report published in September 2021, and available on the NRC's HEAF Research Website.

Fragility Testing Methodology Report

Objective is to use the data from the fragility test report, expert judgement, and modeling to determine the damage criteria for common PRA targets.

The selected damage criteria will be coupled with the results of the hazard modeling to determine the Zone of Influence (ZOI) for HEAF events.

Report will also include fragility of bus ducts and ERFBS protection.

Draft publication for public comment scheduled for end of November 2021.

KEMA Testing Data Report

Objective is to document the full-scale tests performed at KEMA Laboratories.

Report consists of three parts: Medium-voltage switchgear tests, open-box tests, and low-voltage switchgear tests.

Each report will document the temperatures, pressures, heat fluxes, spectrometry, videography, and damage states evolved during testing.

Joint NIST/SNL/NRC report scheduled for publication by the end of December 2021.



Modeling Report, Hazard Tables, and ZOIs

- Objective is to model HEAFs, generate tables of environmental conditions, and calculate ZOIs based on target fragility criteria.
- Model in use is Fire Dynamics Simulator, which is widely used in fire PRA.
 - Benchmarks being performed against test data for validation of low voltage switchgear, medium voltage switchgear, and bus ducts.
- Report will document modeling assumptions, methodology, and results. Draft publication for public comment scheduled for end of March 2022.

Final PRA Methodology Report

- Objective is to provide the updated data, tools, and methods to analyze HEAFs in fire PRA.
- Includes an updated frequency and suppression rate based on review of OE.
- Defines scenarios and event trees based on fault location within plant electrical distribution system (EDS). Includes credit for EDS protective elements.
- Will incorporate the results of the other deliverables: modeling, fragility, and ZOIs.
- Report to be published for public comment by the end of June 2022.

