

**Technical Evaluation for Generic Issue: Pre-GI-018,
“High-Energy Arc Faults Involving Aluminum”**

Actions Going Forward

The NRR staff performed an initial evaluation and determined there was no immediate safety concern based upon the requirement that plants have contingency plans in place for loss of large areas due to fire and explosions (ADAMS Accession No. ML16064A250). The GIRP reviewed this initial evaluation and based on information available to the GIRP found that it continues to remain valid. The GIRP proposes a series of short-term and long-term actions to systematically determine what actions are necessary to resolve this proposed GI. The GIRP will lead the staff's efforts on this GI, with resources and support from RES/DRA and NRR.

Short-Term Actions: These actions are anticipated to occur during the Assessment Stage

Task 1: Determine the extent of condition (e.g., use of aluminum in electrical components in areas subject to potential HEAFs) and issue generic communications as necessary.

Responsibility: GIRP Assessment Team, with support from NRR.

Objectives:

1. Using the results of the NEI informal survey, determine the degree to which aluminum components are currently installed in electrical equipment in currently operating NPPs.
2. Using the results of the NEI informal survey, determine the extent to which the NPPs contain aluminum components in areas that are subject to a HEAF.
3. Make an assessment of the extent of condition of aluminum in areas of NPPs subject to a HEAF and identify any other generic implications for NPPs.
4. Issue generic communications to communicate the potential increase in damage for HEAF events involving aluminum components and potentially gather more information.

Task 2: Develop an interim ZOI for NPPs with aluminum components in areas where HEAFs are postulated to occur.

Responsibility: GIRP Assessment Team, with support from RES/DRA.

Objectives:

1. Use a joint industry/NRC expert elicitation process to make an informed judgment on how much the ZOI will increase.
2. If this elicitation process is not possible, the NRC staff will perform the evaluation using insights from operating experience and recent test results.
3. The ZOI profile should include an assessment of the travel of conductive aluminum byproducts and its impact on electrical equipment.

Task 3: Determine electrical fault characteristics which correspond with including HEAF events into bin 16 of NUREG-2169, "Nuclear Power Plant Fire Ignition Frequency and Non-Suppression Probability Estimation Using the Updated Fire Events Database."

Responsibility: GIRP Assessment Team, with support from RES/DRA.

Objectives:

1. Use a joint industry/NRC expert elicitation process to make an informed judgment on how arc fault events are counted towards HEAF frequency.
2. If this elicitation process is not possible, the NRC staff will perform the evaluation using insights from operating experience and recent test results.
3. The frequency of HEAF events should relate to the modeling and treatment of HEAF events from operating history

Task 4: Develop a risk/safety determination.

Responsibility: GIRP Assessment Team, with support from NRR.

Objectives:

1. Recruit pilot plants to assess the risk to operating NPPs with aluminum in the areas where HEAFs are evaluated to possibly occur. Using the information in Task 1 obtained from survey results and pilot plants and the understanding of an extended ZOI from Task 2, assess the damage to structures, systems, and components (SSCs) in the areas of NPPs that have increased ZOIs.
2. Based on the assessment of damage to SSCs, and factoring in the insights from Task 3, determine the potential increase in risk by performing an evaluation in accordance with Enclosure 4.

Task 5: Develop a plan for future testing.

Responsibility: RES/DRA and NRR/DRA

Objectives:

1. Perform a phenomenon identification and ranking table (PIRT) exercise to determine influencing parameters.
2. Perform a systematic and thorough review of test results to determine state of knowledge and additional research needs.
3. Develop a test plan, based on the results of the PIRT and review of initial test results.
4. Obtain test plan feedback from applicable NRC offices, industry stakeholders (e.g. EPRI), and the international community involved with future research.

Task 6: Develop interim guidance.

Responsibility: GIRP Assessment Team, with support from NRR.

Objectives:

Assess existing risk-informed/performance based (RI/PB) fire protection program guidance to determine whether any necessary short term corrective actions are appropriate to ensure adequate safety in the event a HEAF occurs in areas where aluminum components are present.

Task 7: Perform additional focused HEAF testing.

Responsibility: RES/DRA

Objectives:

1. Orient testing to quantify the ZOI applicable when aluminum components are present.
2. Evaluate applicability of potential mitigation strategies.
3. Form a team of experts to develop revised guidance (using either a Working Group as was done for cabinet heat release rates or using an expert elicitation as was done for the hot short probabilities) using the results of new HEAF testing on aluminum components.

Task 8: Determine whether the issue needs to proceed to the next stage, Regulatory Office for Implementation (if needed).

Responsibility: GIRP Assessment Team

Objectives:

1. Make a determination based upon information obtained from testing and industry.
2. Form a transition team to transfer the issue to the appropriate regulatory office.

Long Term Actions: These actions are possible actions that NRR may consider during the Regulatory Implementation Stage

- Task 1: Issue generic communications, requests for information, or orders, as deemed necessary.
Responsibility: NRR
Objectives:
Inform industry of findings, request plant specific information, or direct licensees to make necessary changes.
- Task 2: Revise technical guidance.
Responsibility: RES with support from industry (EPRI)
Objectives:
Revise or supplement NUREG/CR-6850 and other associated guidance documents to reflect new information and methods.
- Task 3: Assess risk through long-term performance monitoring.
Responsibility: NRR
Objectives:
 1. Develop training for inspectors on the hazards from a HEAF involving aluminum and identify inspections items and areas of interest.
 2. Review and revise as necessary NRC procedures for inspecting licensee's fire PRA during fire protection inspections.