May 06, 2016

MEMORANDUM TO: Thomas H. Boyce, Chief
Regulatory Guidance and Generic Issues Branch
Division of Engineering
Office of Nuclear Regulatory Research

FROM: Mark Henry Salley, Chief ***/RA/***
Fire and External Hazards Analysis Branch
Division of Risk Analysis
Office of Nuclear Regulatory Research

SUBJECT: SUBMITTAL OF POSSIBLE GENERIC ISSUE CONCERNING THE DAMAGE CAUSED BY HIGH ENERGY ARC FAULTS IN ELECTRICAL EQUIPMENT CONTAINING ALUMINUM COMPONENTS

The Office of Nuclear Regulatory Research (RES) has identified a potential vulnerability where existing analytical models supporting plant specific safety analyses may be non-conservative. This vulnerability exists for electrical equipment that include components made of aluminum when subjected to high energy arc fault (HEAF) conditions. Recent testing indicates that the area damaged around the equipment or the "zone of influence" (ZOI) may be larger than postulated in the current methodology for HEAF analysis, NUREG/CR – 6850 EPRI 1011989 "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, Volume 2: Detailed Methodology". This methodology supports plant specific safety analyses used by licensees using the National Fire Protection Association Standard 805 (NFPA 805) to meet fire protection regulations (10 CFR 50.48). The presence of aluminum can create a more energetic plasma arc, that under some circumstances, can cause larger damage scenarios to electrical enclosures and/or transport high energy gaseous particles and plasma farther than previously assumed. In addition to NFPA 805 analyses, HEAF events involving aluminum components may require licensees and staff to re-analyze how licensees comply with regulatory requirements under Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, General Design Criteria 3, "Fire Protection".

The enclosed provides the information discussed in Management Directive 6.4, "Generic Issues Program." This matter is being placed into the Generic Issues program at the request of Joseph G. Giitter, Director, Division of Risk Assessment, Office of Nuclear Reactor Regulation (NRR) per memorandum dated March 4, 2016 (ML16064A250). The memorandum concluded that the potential increased ZOI due to the presence of aluminum in low and medium voltage electrical equipment is not an immediate safety concern for plants with a risk informed, performance based (RI/PB) fire protection program. This issue has also been discussed with our management and staff from RES, the Office of the Executive Director for Operations (OEDO), the Office of Nuclear Reactor Regulations (NRR), the Office of New Reactors (NRO), the Office of Nuclear Materials Safety and Safeguards (NMSS); and the Office of Nuclear Security and Incident Response (NSIR).

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SUBJECT: SUBMITTAL OF POSSIBLE GENERIC ISSUE CONCERNING THE DAMAGE CAUSED BY HIGH ENERGY ARC FAULTS INVOLVING ALUMINUM

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