



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

September 20, 2016

MEMORANDUM TO: Richard Y. Lee, Chief  
Fuel and Source Term Code Development Branch  
Division of Systems Analysis  
Office of Nuclear Regulatory Research

FROM: Michael F. Weber */RA/*  
Director of Nuclear Regulatory Research

SUBJECT: CLOSURE OF GENERIC ISSUE GI-0010, "DISPERSAL OF FUEL, FRAGMENTATION, RELOCATION AND DISPERSAL UNDER LOSS-OF-COOLANT ACCIDENT"

The purpose of this memorandum is to inform you of the actions taken in response to the proposed generic issue (GI), GI-0010, "Dispersion of Fuel Particles during a LOCA," regarding fuel fragmentation, relocation, and dispersal (FFRD) during a loss-of-coolant accident (LOCA). Although the issue was screened out of the GI program because it was being considered as part of an ongoing rulemaking, the GI program staff continued to monitor the rulemaking to ensure the issue was evaluated before closing the issue. The NRC staff has completed an evaluation of FFRD as part of the rulemaking, and concluded that no further action was required. Therefore, the GI program staff considers this issue to be closed. A summary of the actions taken for the proposed GI is below.

You submitted the proposed GI to the Generic Issues Program on behalf of the Division of Systems Analysis in the Office of Nuclear Regulatory Research on October 6, 2011. This issue was discovered during a review of test results from the Halden IFA-650 program and the NRC-Studsvik LOCA research program. The GI staff completed an initial screening assessment in accordance with Management Directive (MD) 6.4, "Generic Issues Program," and accepted it into the GI program on October 21, 2011.<sup>1</sup>

A Generic Issue Review Panel (GIRP) was formed to evaluate the proposed issue and recommend whether it met all the screening criteria to continue in the GI Program into the assessment stage of the GI Program. The GIRP concluded that the proposed GI did not pass the third criterion, which states, "The issue cannot be readily addressed through other regulatory programs and processes; existing regulations, policies, or guidance; or voluntary industry initiatives." Specifically, a rulemaking had been initiated to address issues associated with separate LOCA phenomenon (i.e., embrittlement and breakaway oxidation), and the Commission had directed the staff to complete its research on FFRD and incorporate any necessary changes before requesting Commission approval of the draft final rule.<sup>2</sup> Because the

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<sup>1</sup> Acceptance Review of Proposed Generic Issue on Dispersion of Fuel Particles During a Loss of Coolant Accident," October 21, 2011, Agencywide Documents Access and Management System (ADAMS) Accession No. ML112910156

<sup>2</sup> SRM-SECY-12-0034, "Staff Requirements – SECY-12-0034 – Proposed Rulemaking - 10 CFR 50.46c: Emergency Core Cooling System Performance during Loss-of-Coolant Accidents (RIN 3150-AH42)," January 7, 2013, ADAMS Accession No. ML13007A478

third criterion was not met, the GIRP concluded that the proposed GI should exit the GI process and not move to the safety/risk assessment stage of the GI process. The GIRP chairman presented the panel's recommendations on April 14, 2014. I concur with that conclusion.<sup>3</sup>

On November 30, 2015, the staff issued SECY-15-0148, "Evaluation of Fuel Fragmentation, Relocation and Dispersal under Loss-of-Coolant Accident (LOCA) Conditions Relative to the Draft Final Rule on Emergency Core Cooling System Performance during a LOCA (50.46c)"<sup>4</sup>. You and your staff directly contributed to this rulemaking. As discussed in SECY-15-0148, the staff determined that "...the inclusion of new requirements associated with FFRD within § 50.46c is not practicable or appropriate...". The staff's decision was made based on the understanding of the FFRD phenomena, considerations of current operating practices, and modern fuel design. In particular, experimental results indicated that fine fuel fragmentation will be limited to high burnup rods and that fuel relocation will be limited to the region near the fuel rod rupture. The results further suggested that fine fragments from high burnup rods can easily disperse from ruptured rods during a LOCA, while larger fragments from lower burnup rods will not easily disperse from ruptured rods. The experimental results continued to support the hypothesis that FFRD phenomena are primarily a high burnup fuel issue and that the current licensing limits in the U.S. are adequate to prevent dispersal of large quantities of fine fuel fragments. Therefore, the rulemaking staff concluded that the § 50.46c final rule may proceed without incorporation of regulatory requirements to address FFRD. Nonetheless, the NRC staff will continue multilateral research activities and interactions with stakeholders with the goal of developing a regulatory framework to address FFRD, if needed, in the next few years.

I wanted to thank you for submitting this proposed GI for consideration. You personally contributed to NRC's nuclear safety goals by submitting this issue. Please contact the GI Program Manager, Thomas Boyce, should you have any questions.

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<sup>3</sup> "Generic Issue Review Panel Recommendation for the Proposed Generic Issue Pertaining to the Dispersal of Fuel Particles During a Loss-of-Coolant Accident," April 14, 2014, ADAMS Accession No.: ML13192A494

<sup>4</sup> SECY-15-0148, "Evaluation of Fuel Fragmentation, Relocation and Dispersal under Loss-of-Coolant Accident (LOCA) Conditions Relative to the Draft Final Rule on Emergency Core Cooling System Performance during a LOCA (50.46c)" November 30, 2015, ADAMS Accession No. ML15230A200

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**ADAMS Accession No.: ML16204A136**

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