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

July 22, 2019

MEMORANDUM TO: Raymond V. Furstenau, Director
Office of Nuclear Regulatory Research

FROM: Ho K. Nieh, Director ***/RA/***
Office of Nuclear Reactor Regulation

SUBJECT: CLOSURE MEMORANDUM FOR GENERIC SAFETY ISSUE 191

The Office of Nuclear Reactor Regulation (NRR) recommends that Generic Safety Issue 191 (GSI-191), "Assessment of Debris Accumulation on PWR Sump Performance" be closed. This recommendation is based on the staff's risk-informed re-evaluation of the safety significance of the remaining technical issues. This recommendation is aligned with the U.S. Nuclear Regulatory Commission's (NRC's) Principles of Good Regulation, particularly the principles of Efficiency, Clarity and Reliability. Over the decades since GSI-191 was opened, the associated regulatory activities have resulted in hardware and operational improvements that have improved safety at Pressurized-Water Reactors (PWRs). Moreover, the associated regulatory activities have greatly increased the NRC's level of knowledge of sump performance issues. As such, any additional use of NRC resources on GSI-191 would only provide marginal benefits to safety.

Under GSI-191, the NRC evaluated the potential for debris generated during a high energy line break inside the containment of pressurized water reactors to clog the emergency core cooling system (ECCS) and containment spray system (CSS) flow paths following switchover from the injection mode to the containment sump recirculation mode, which could potentially prevent the ECCS from performing its intended functions. The issue was transferred to NRR for plant-specific resolution via letter dated September 28, 2001, "RES Proposed Recommendation for Resolution of GSI-191, 'Assessment of Debris Accumulation on PWR Sump Performance'" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML012750091).

Safety issues related to both strainer and in-vessel effects have been adequately evaluated and documented based on testing and analysis conducted by industry and reviewed by the staff. Regulatory Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident," issued March 2012 (ADAMS Accession No. ML111330278), captures the early body of knowledge. WCAP-17788, "Comprehensive Analysis and Test Program for GSI-191 Closure" submitted July 17, 2015 (ADAMS Package Accession No. ML15210A667), documents more recent industry efforts especially related to in-vessel downstream effects. To support the closure recommendation for GSI-191, the NRC documented its evaluation of the low safety significance of in-vessel downstream effects in a staff technical evaluation (ADAMS Accession No. ML19073A044).

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A request for an evaluation of the effects of debris on components downstream of the sump strainer (including in-vessel), and the effects of chemical precipitates throughout the ECCS was documented later in Generic Letter (GL) 2004-02 “Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors,” issued September 13, 2004 (ADAMS Accession No. ML042360586).

NRR has been receiving licensee responses to GL 2004-02, and implementation and resolution activities are being addressed and tracked as part of the plant specific closure of this GL. The technical issues identified in GSI-191 are now well understood, and the staff believes that all safety significant issues have been adequately addressed by almost all PWR licensees.

GL 2004-02 addresses the below issues on a plant-specific basis. Specifically, it requests licensees to provide a basis for concluding that:

- they are in compliance with existing regulations,
- their ECCS strainer will provide adequate long-term core cooling under the postulated conditions, and
- inadequate core or containment cooling would not result due to debris blockage at flow restrictions in the ECCS and CSS flow paths downstream of the sump screen, (e.g., a HPSI throttle valve, pump bearings and seals, fuel assembly inlet debris screen, or containment spray nozzles).

Industry has already made substantial progress towards addressing the issues in GL 2004-02. Specifically, all licensees made modifications to their strainers to improve performance and implemented procedures to reduce potential debris in containment. Strainer modifications were inspected by the Regions. The staff has confirmed that most plants have already completed and submitted confirmatory technical evaluations using NRC accepted methods to demonstrate adequate strainer performance under the postulated conditions. The few that have not are being addressed individually.

Work is ongoing to determine the appropriate means for PWR licensees to respond to the in-vessel and associated compliance portions of GL 2004-02 as informed by the low safety significance of these issues documented in the technical evaluation report referenced above. To date, 21 units have successfully responded to and closed out GL 2004-02 using WCAP-16793-NP-A, Rev. 2, “Evaluation of Long-Term Cooling Considering Particulate, Fibrous and Chemical Debris in the Recirculating Fluid,” July 2013 (ADAMS Accession No. ML13239A111) or a risk informed evaluation. Forty-four units remain open. Of these, most are open solely for issues related to in-vessel downstream effects that the staff has concluded are of low safety significance.

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ADAMS Accession No.: ML19157A120 *via e-mail NRR-106

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