



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001

ACRSR-2203

August 1, 2006

Mr. Luis A. Reyes  
Executive Director for Operations  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

SUBJECT: GENERIC SAFETY ISSUE 191 - ASSESSMENT OF DEBRIS ACCUMULATION  
ON PWR SUMP PERFORMANCE

Dear Mr. Reyes:

On April 10, 2006, we issued a report to Chairman Diaz discussing the resolution of Generic Safety Issue (GSI) 191, "Assessment of Debris Accumulation on PWR Sump Performance." On May 2, 2006, you responded that it is the staff's intent to terminate research activities related to GSI-191 in June 2006. You indicate that additional work by the industry and the staff may be needed to address some remaining issues such as chemical and downstream effects. The staff's current approach is to rely on large-scale integral tests of screens by the industry to demonstrate that the safety margin is sufficiently conservative to accommodate phenomenological uncertainties. Because of the complexity of the phenomena that affect the pressure drop across debris beds, particularly when chemical effects are included, the staff has concluded that the development of predictive models is a "challenging and long-term effort which may not achieve timely closure of GSI-191 issues."

The efforts that are being taken by the industry in response to Generic Letter 2004-02 to substantially increase screen size are appropriate. We also agree that the industry's integral experiments will help to support the safety case. However, it is important to recognize the limitations of these tests.

Historically, integral tests have been used to validate predictive analytical tools. These tools are used to evaluate the performance of safety systems. Integral tests have not been used as "proof tests" as an alternative to analytical tools because of the difficulty of achieving conditions that are truly prototypic. In addition, it is not practical to examine system behavior experimentally over the full range of variability of input conditions. The planned tests of full-size screen modules will be performed using conditions that vary substantially from prototypic, including differences in water temperature, water chemistry, pre-conditioning of insulation debris, and the actual system configuration, such as multiple modules. In order to understand the impact of these experimental non-typicalities, it is necessary to have some level of quantitative understanding of the phenomena. The staff must have the capability to perform an independent technical assessment of the approaches used by licensees to address GSI-191 issues.

During a meeting on June 13-14, 2006, our Thermal-Hydraulic Phenomena Subcommittee reviewed the status of the NRC's sump performance research program. Substantial progress has been made in a number of areas. Progress on developing a predictive tool for debris bed

pressure drop without chemical effects is very promising but further work is required. Experiments have been performed that indicate that chemical effects can be substantial. However, to date, the staff has not interpreted the experimental results from these tests within the context of a mechanistic model or even correlated them empirically. The staff only recently initiated calculations to assess potential downstream effects, particularly related to in-vessel flow blockages. These are examples of areas in which additional research is still warranted.

A continued regulatory research program to address key areas of uncertainty is a risk-management strategy for reducing the likelihood of erroneous regulatory conclusions. We recommend that confirmatory research on GSI-191 be continued.

Dr. William J. Shack did not participate in the Committee's deliberations regarding this matter.

Sincerely,

**/RA/**

Graham B. Wallis  
Chairman

References:

1. Report dated April 10, 2006 from Graham B. Wallis, Chairman, Advisory Committee on Reactor Safeguards, to Nils J. Diaz, Chairman, Nuclear Regulatory Commission, Subject: Generic Safety Issue 191 - Assessment of Debris Accumulation on PWR Sump Performance.
2. Memorandum dated May 2, 2006 from Luis Reyes, Nuclear Regulatory Commission, for Graham B. Wallis, Chairman, Advisory Committee on Reactor Safeguards, Subject: Generic Safety Issue 191 - Assessment of Debris Accumulation on PWR Sump Performance.
3. U.S. Nuclear Regulatory Commission Generic Letter 2004-02: "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors," September 13, 2004.

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