



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

ACRSR-2158

October 18, 2005

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

SUBJECT: PROPOSED RECOMMENDATION FOR RESOLVING GENERIC  
SAFETY ISSUE 80, "PIPE BREAK EFFECTS ON CONTROL ROD  
DRIVE HYDRAULIC LINES IN THE DRYWELLS OF BWR MARK I AND  
II CONTAINMENTS"

Dear Mr. Reyes:

During the 526<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, October 6-7, 2005, we reviewed the recommendation proposed by the Office of Nuclear Regulatory Research (RES) for resolving Generic Safety Issue (GSI) - 80, "Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywells of BWR Mark I and II Containments." During our review, we had the benefit of discussions with representatives of the NRC staff and the documents referenced.

## **RECOMMENDATION**

We agree with the RES recommendation that GSI-80 be closed without any changes to the regulations or guidance.

## **BACKGROUND AND DISCUSSION**

Damage to control rod drive (CRD) hydraulic lines by mechanical impact as a result of a loss-of-coolant accident (LOCA) was raised as an issue by the ACRS in 1978 during operating license reviews of some boiling water reactors (BWRs). Such damage could prevent control rod insertion, creating the potential for recriticality when the core is reflooded.

The failure to insert a significant number of control rods could pose two separate safety problems. First, when the core is reflooded by cold emergency core cooling water, the reactor will undergo a cold-water reactivity transient if the core is not sufficiently subcritical. The portions of the core where control rods failed to insert can return to a significant power level and may even overshoot to power levels in excess of the full-power limits of the fuel. Second, the residual heat removal system is sized to remove the core decay heat. If fission heat is added to decay heat, the heat removal capacity of the system may not be able to remove this additional heat load. The suppression pool would overheat and could lead to coolant boil-off, containment failure, and core melt.

The staff addressed this issue several times over the years and initially concluded that the frequency of this scenario was sufficiently low that the staff assigned a low priority to the final resolution of GSI-80. During subsequent site visits conducted by the staff

associated with GSI-156.6.1, "Pipe Break Effects on Systems and Components," new piping configurations were discovered that were not considered in the original evaluation of GSI-80. In its periodic review of low-priority GSIs conducted in March 1998, the staff concluded that the priority for resolving GSI-80 should be increased. Consequently, RES initiated an additional study to determine the safety significance of the issue.

Control rod insertion would not be prevented by breakage or crimping of the CRD accumulator piping or breakage of the scram discharge piping. RES performed an assessment of the probability of a high-energy pipe break that would result in the crimping and complete closure of one or more of the scram discharge pipes and would prevent CRD discharge flow and rod insertion. RES found that the estimated frequency of high-energy pipe breaks that can impact the CRD discharge piping is low. Even if such an event occurs, analysis using the ANSYS code indicates that it would result in bending and breaking of the CRD piping rather than crimping the piping closed. Pipe-to-pipe impact testing confirmed these results. Consequently, the staff concluded that the contribution of this accident to the core damage frequency is very low.

We agree with the RES recommendation to close GSI-80 without any changes to existing regulations or regulatory guidance.

Sincerely,

**/RA/**

William J. Shack  
Acting Chairman

References:

1. Memorandum from F. Eltawila, RES, to J. Larkins, ACRS, dated August 11, 2005, Subject: Proposed Closure of Generic Safety Issue 80, "Pipe Break Effects on Control Rod Drive Hydraulic Lines in the Drywells of BWR Mark I and II Containments," (ADAMS Accession No. ML052230517)
2. NUREG-0933, "A Prioritization of Generic Safety Issues," 1984
3. NUREG/CR-6395, "Enhanced Prioritization of Generic Safety Issue 156.6.1: 'Pipe Break Effects on Systems and Components Inside Containment,'" U.S. Nuclear Regulatory Commission, November 1999 (ADAMS Accession No. ML003732008)

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\* See previous concurrence.

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