UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

December 12, 1997

The Honorable Shirley Ann Jackson
Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Chairman Jackson:

SUBJECT: CREDIT FOR CONTAINMENT OVERPRESSURE TO PROVIDE ASSURANCE OF SUFFICIENT NET POSITIVE SUCTION HEAD FOR EMERGENCY CORE COOLING AND CONTAINMENT HEAT REMOVAL PUMPS

We initially discussed this subject during the 442nd meeting of the Advisory Committee on Reactor Safeguards in June 1997. After that meeting, and an exchange of letters with the EDO, we requested additional discussions with the NRC staff to address some of our continuing concerns. We addressed these concerns during our Plant Operations Subcommittee meeting on December 2, 1997, and during the 447th meeting of the ACRS on December 3-6, 1997. We also had the benefit of the documents referenced.

Recommendation

In our June 17, 1997, letter to the Executive Director for Operations regarding our review of Generic Letter (GL) 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps," we stated that giving credit for containment overpressure to provide assurance of sufficient net positive suction head (NPSH) should not be considered an acceptable corrective action for any deficiencies found by the reviews requested by GL 97-04. As a result of further review of this issue, we now concur with the NRC staff position that selectively granting credit for small amounts of overpressure for a few cases may be justified. We recommend that instead of using qualitative arguments and restricting attention to a limited range of accident sequences, the decisionmaking process should consider the time variation of NPSH for a broad range of accident sequences such as typically found in a probabilistic risk assessment (PRA).

Discussion

We recognize that previous NRC staff actions have established a precedent for giving credit for containment overpressure to assure sufficient NPSH. These actions have been based on the judgment that the consequences of reduced margins are small. These actions, however, depart from the basic guidance found in Regulatory Guide (RG) 1.1, "Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps," and the associated Standard Review Plan Section 6.2.2, "Containment Heat Removal Systems." RG 1.1 states that "emergency core cooling and containment heat removal systems should be designed so that adequate NPSH is provided to system pumps, assuming maximum expected temperatures of pumped fluids and no increase in containment pressure from that present before any postulated LOCA." The language in Section 6.2.2 of the Standard Review Plan backs away slightly from this guidance by stating that the NPSH analysis should be based on the assumption that the containment pressure equals the vapor pressure of the sump water.

The guidance in RG 1.1 was developed from a design-basis approach that utilizes surrogate design-basis accidents (DBAs) with conservative assumptions so that the resulting design is robust (has acceptable risk) for all accident sequences. Ideally, the justification for any departures from such guidance should be grounded in the proposed Regulatory Guide 1.174 (formerly DG-1061), "An Approach for Using PRA in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis," risk-informed process. In the absence of such justification, we believe that the original RG 1.1 guidance should be the appropriate regulatory position. Because of the nature of the DBA approach, however, it is difficult to quantify the impact on risk caused by the minor departures from this guidance associated with granting credit for containment overpressure to assure adequate NPSH. Therefore, the staff has relied on engineering judgment and qualitative arguments.

The potential for loss of adequate NPSH results from overheating of the sump water. The qualitative arguments used by the staff involved evaluation of selected accident sequences to show that when the sump is hot, overpressure will exist, and when overpressure is not available, the sump temperature will be limited to approximately 212° F. We conclude that these arguments do demonstrate an acceptable qualitative approach to assuring that the risk is small. We are concerned, however, with the completeness of the staff's evaluations with respect to the full spectrum of accident sequences. We recommend that future decisions

be guided by a more extensive PRA evaluation of the NPSH status for the specific plant of interest over a broader range of accident sequences, rather than relying completely on the above qualitative arguments.

The margins in NPSH afforded by the DBA approach constitute a level of defense in depth. Allowing more credit for containment overpressure reduces defense in depth. The staff's justification for this was that the consequences of losing NPSH would not be catastrophic, i.e., the particular pumps at issue would not suffer damage and the discharge flow rates would remain sufficiently high. We believe that the evidence to support these assertions needs to be identified as a part of the decisionmaking process.

In general, where departures from DBA requirements are being considered, we continue to believe that such departures should be justified using the risk-informed approach described in the proposed Regulatory Guide 1.174 (formerly DG-1061).

Sincerely,

R. L. Seale

R. L. Seale
Chairman

References:

1. Letter dated June 17, 1997, from R. L. Seale, Chairman, ACRS, to L. Joseph Callan, Executive Director for Operations, NRC, Subject: Proposed Final Generic Letter, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps."

2. Letter dated August 15, 1997, from L. Joseph Callan, Executive Director for Operations, NRC, to R. L. Seale, Chairman, ACRS, Subject: Proposed Final Generic Letter, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps."

3. Memorandum dated September 9, 1997, from John T. Larkins, Executive Director, ACRS, to L. Joseph Callan, Executive Director for Operations, NRC, Subject: Proposed Final Generic Letter "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps."

4. U. S. Nuclear Regulatory Commission, Generic Letter 97-04: Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal Pumps, dated October 7, 1997.

5. Memorandum dated November 24, 1997, from M. Wayne Hodges, Office of Nuclear Regulatory Research and Gary M. Holahan, Office of Nuclear Reactor Regulation, to John Larkins, Executive Director, ACRS, Subject: General Regulatory Guide (DG-1061) and Standard Review Plan (SRP-Chapter 19) for Risk Informed Regulatory Decisionmaking for Plant Specific CLB Changes.