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

February 22, 2008

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

SUBJECT: Draft Final Revision 1 to Regulatory Guide 1.45, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage"

Dear Mr. Reyes:

During the 549th meeting of the Advisory Committee on Reactor Safeguards, February 7- 9, 2008, we met with representatives of the NRC staff to review Draft Final Regulatory Guide 1.45, Revision 1, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage." We also had the benefit of the documents referenced.

RECOMMENDATION

Revision 1 to Regulatory Guide 1.45 should be issued.

BACKGROUND AND DISCUSSION

The current Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," was issued in 1973. The Guide classifies leakage into identified and unidentified categories. Unidentified leakage sources are of particular concern because they could include through-wall penetrations of the reactor coolant pressure boundary caused by mechanical or environmental degradation mechanisms such as fatigue or stress corrosion cracking.

Regulatory Guide 1.45 suggests employing at least three different methods to detect unidentified leakage, with an accuracy of 1 gallon per minute (gpm) or better, within one hour. Two of these methods are: sump level or flow monitoring and airborne particulate radioactivity monitoring. The third method could be either monitoring of condensate flow rate from air coolers or airborne gaseous radioactivity. Humidity, temperature, or pressure monitoring of the containment atmosphere are considered as indirect indications of leakage to the containment.

Revision 1 of Regulatory Guide 1.45 was motivated by the Davis-Besse event in which leaks from small stress-corrosion cracks in control rod drive mechanism (CRDM) nozzles, over a prolonged period, resulted in the accumulation of boric acid deposits and significant corrosion of the carbon steel vessel head. Following the event, the Executive Director for Operations established the Davis-Besse Lessons Learned Task Force to evaluate NRC regulatory processes for ensuring reactor pressure vessel integrity and to recommend improvements that may be applicable to either the NRC or the nuclear industry. One of the recommendations of the Task Force was to assess leak detection requirements and practices.

As part of this assessment, the staff issued NUREG/CR-6861, "Barrier Integrity Research Program, Final Report." This report provides valuable information on unidentified leaks in nuclear power plants and their detectability. Over half of the reported leaks were very small (<0.01 gpm), and were detected visually. Larger leaks were detected primarily by methods specified in Regulatory Guide 1.45 (changes in sump level, radiation alarms, inventory balance checks, or pressure changes). According to NUREG/CR-6861, current technical specification limits on unidentified leakage provide significant margin against structural failure of piping systems. However, for some structural components such as CRDM nozzles, current leak detection requirements may not provide sufficient margin against structural failure. In such cases, localized leak detection systems could provide increased margin against structural failure or boric acid corrosion of low-alloy steel components. Following completion of NUREG/CR-6861, the NRC Office of Nuclear Reactor Regulation issued a user need request for revising Regulatory Guide 1.45.

Revision 1 incorporates progress in reactor coolant pressure boundary leakage detection technology, addresses the reduced activity levels of coolant resulting from improved fuel integrity and resulting effects on radiation monitoring systems, and incorporates lessons learned from operating experience. The title of the Regulatory Guide 1.45, Revision 1, has been changed to, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," reflecting its broader scope. Revision 1 provides detailed guidance for timely detection and location of leaks, continuous monitoring, quantifying and trending of leak rates, assessing safety significance, and specifying plant actions following confirmation of an adverse trend in unidentified leak rate. Revision 1 describes acceptable leakage detection systems and methods, using risk-informed and performance-based criteria to the extent practical. It retains the recommendations for monitoring of sump level or flow, airborne particulate activity, and condensate flow rate from air coolers. Other supplementary detection methods can be used where and when appropriate.

Based on backfit considerations, the staff has concluded that application of Revision 1 to operating plants is not justified and plans to apply Revision 1 only to new plants. However, many of the improved practices identified in Revision 1 are already being used in operating plants on a voluntary basis due to heightened awareness of the potential for damage that may be caused by small leaks of prolonged duration. The industry is developing its own leakage monitoring guidelines for application to operating plants, and will likely incorporate many of the practices included in Revision 1. Regulatory Guide 1.45 Revision 1 should be issued.

Sincerely,

/RA/

William J. Shack
Chairman

REFERENCES

1. Regulatory Guide 1.45, Revision 1, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," November 2007, ML003740113. (Draft issued as, "DG-1173 for Public Comment," June 2007.)

2. U.S. Atomic Energy Commission, Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973, ML0037401130.

3. NUREG/CR-6861, "Barrier Integrity Research Program: Final Report," D. S. Kupperman, S. H. Sheen, W. J. Shack, R. Diercks, P. Krishnaswamy, D. Rudland, G. M. Wilkowski. Prepared by Argonne National Laboratory for the U.S. Nuclear Regulatory Commission, December 2004, ML0435802071.

4. Memorandum to Carl J. Paperiello, Director, Office of Nuclear Regulatory Research, from J. E. Dyer, Director, Office of Nuclear Reactor Regulation, "User Need Request for a Revision of Regulatory Guide 1.45," NRR-UNR-2006-002, January 9, 2006, ML051290113.

5. "Staff Disposition of Public Comments," November 7, 2007, ML0732002892.

6. "Compared Version of RG 1.45 Revision 1 with DG-1173," November 16, 2007, ML0732002741.

REFERENCES

1. Regulatory Guide 1.45, Revision 1, "Guidance on Monitoring and Responding to Reactor Coolant System Leakage," November 2007, ML003740113. (Draft issued as, "DG-1173 for Public Comment," June 2007.)

2. U.S. Atomic Energy Commission, Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems," May 1973, ML0037401130.

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