Item A-23: Containment Leak Testing (Rev. 1)

DESCRIPTION

Historical Background

Since the issuance of Appendix J to 10 CFR Part 50 in February 1973, certain requirements of the appendix have been found to be conflicting, impractical for implementation, or subject to a variety of interpretations by the NSSS vendors, architect-engineers, utilities, and the staff. These requirements made it difficult to determine if applicants and licensees had developed uniformly acceptable containment leak testing programs and for field inspectors to judge the acceptability of a licensee's containment leak testing practices. This also led to increases in the time devoted to leak testing that could unnecessarily delay the return of a plant to service following a refueling outage.

This NUREG-0371[1] item consists of revising and clarifying Appendix J and issuing a Regulatory Guide to establish containment leak testing methods which incorporate containment leak testing experience and are

acceptable to the NRC staff. Thus far, NRR has provided recommended changes to a Working Paper[2] on Appendix J which was developed by RES in May 1982. Also, NRR is currently reviewing a draft Regulatory

Guide[3] which will endorse ANSI/ANS 56.8-1981,[4] "Containment System Leakage Testing Requirements." This task was assumed not to include the issue of implementing a gross check for containment integrity which is addressed separately as TMI Action Plan Item II.E.4.3.

Safety Significance

Containment leak testing is part of assuring and verifying containment structure pressure integrity. Therefore, uncertainties in conducting containment leak tests can reduce assurance that the containment structure is being maintained to meet its design leakage rate.

Possible Solutions

Revising and clarifying the Appendix J requirements and issuing a Regulatory Guide that provides acceptable containment leak testing methods would eliminate ambiguities in the regulation, reduce the compliance burden on licensees by reducing the number of exemption requests licensees are required to submit, and reduce the paperwork burden on NRC.

PRIORITY DETERMINATION

Frequency/Consequence Estimate

A preliminary risk reduction assessment has been performed for the containment leak rate improvements expected from the Appendix J revision and the proposed Regulatory Guide. In this assessment, we assumed that the improvement in leak testing requirements could potentially reduce the uncertainty in

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[1] NUREG-0371, "Task Action Plans for Generic Activities (Category A)," U.S. Nuclear Regulatory Commission, November 1978.
[2] Working Paper on Appendix J to 10 CFR Part 50, "Leak Tests for Primary and Secondary Containments of Light-Water-Cooled Nuclear Power Plants," U.S. Nuclear Regulatory Commission, May 17, 1982. [8401040228]
[3] Working Paper on Draft Regulatory Guide (MS021-5), "Containment System Leakage Testing," U.S. Nuclear Regulatory Commission, May 1982. [8405240527]
[4] ANSI/ANS 56.8, "Containment System Leakage Testing Requirements," American National Standards Institute, 1981.

containment integrated leak rate test results by an amount equivalent to the design leakage rate. Improvement in containment leakage will only affect the consequence of core-melt events and mitigated LOCA events in which overall

containment integrity is maintained. Therefore, we limited the public risk calculation to WASH-1400[5] PWR-7 and PWR-9 events, an event similar to a BWR-4 event but with lower containment leakage and less offsite dose consequences, and a BWR-5 event in determining the probability of the events and the potential reduction in offsite consequences. We assumed that the potential offsite dose was 20,000 man-rem/event for the PWR-7 and BWR-4 type of events, 120 man-rem/event for a PWR-9 event, and 20 man-rem/event for a BWR-5 event.

These are taken from recent CRAC Code[6] calculations of the integrated whole body man-rem dose to the public in a 50-mile radius of a plant with an average population density of 340 persons per square mile. We assumed a total population of 143 plants (i.e., those now operating plus those yet to be licensed) with an average remaining operating life of 28 years. These assumptions resulted in an estimated probable total dose to the public of slightly over 1,000 man-rem over the lifetime of the reactors.

Cost Estimate

The Working Paper[7] on revising Appendix J and the draft Regulatory Guide,[8] while eliminating the ambiguities in the current regulation, include some proposed provisions that potentially represent more stringent requirements on the licensee. Examples of such provisions are: (1) to require reporting results of unsuccessful containment penetration leak tests as well as successful tests; (2) to require Type A leak tests to be conducted at full pressure rather than at reduced pressure and extrapolated to full pressure; and (3) to provide specific guidance for standardization of acquisition, evaluation, and reporting of leak test data.

We estimated that these changes in leak rate test requirements would result in a net cost to a licensee of an average of $0.5M/yr for additional testing and evaluation of data, reporting, etc. We assumed that the NRC resources necessary to complete revision of Appendix J and issue a Regulatory Guide on leak testing would be balanced by the subsequent reduction of paperwork burden on NRC.

Value/Impact Assessment

Using the information above, the overall value/impact score for PWRs and BWRs is about 0.5 man-rem/$M.

CONCLUSION

Staff stated in the main report of NUREG-0933 published in 1983 that revising Appendix J and issuing a Regulatory Guide with acceptable containment leakage testing methods had a low potential for reducing risk. However, considering the work accomplished at that time, it was recommended that the containment leakage task be completed as a Regulatory Impact issue on the basis of reducing the compliance burden on licensees and the paperwork burden on the NRC. However, emphasis was placed on eliminating the ambiguities in the present regulation without imposing more stringent leakage testing requirements since they did not appear to be effective in reducing risk.

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[5] WASH-1400 (NUREG-75/014), "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants," U.S. Atomic Energy Commission, October 1975.
[6] NUREG/CR-2800, "Guidelines for Nuclear Power Plant Safety Issue Prioritization Information Development," U.S. Nuclear Regulatory Commission, February 1983, (Supplement 1) May 1983, (Supplement 2) December 1983, (Supplement 3) September 1985, (Supplement 4) July 1986, (Supplement 5) July 1996.
[7] Working Paper on Appendix J to 10 CFR Part 50, "Leak Tests for Primary and Secondary Containments of Light-Water-Cooled Nuclear Power Plants," U.S. Nuclear Regulatory Commission, May 17, 1982. [8401040228]
[8] Working Paper on Draft Regulatory Guide (MS021-5), "Containment System Leakage Testing," U.S. Nuclear Regulatory Commission, May 1982. [8405240527]

As a part of the improvements to NUREG-0933, the NRC staff clarified in SECY-11-0101, "Summary of Activities

Related to Generic Issues Program," dated July 26, 2011,[9] that the Generic Issues Program will not pursue any further actions toward resolution of licensing and regulatory impact issues. Because licensing and regulatory impact issues are not safety issues by the classification guidance in the legacy Generic Issues Program, these issues do not meet at least one of the Generic Issues Program screening criteria and do not warrant further processing in accordance with Management Directive 6.4, "Generic Issues Program," dated November 17,

2009.[10] Therefore, this issue will not be pursued any further in the Generic Issues Program.

[9] SECY-11-0101, "Summary of Activities Related to Generic Issues Program," July 26, 2011. [ML111590814]

[10] Management Directive 6.4, "Generic Issues Program," U.S. Nuclear Regulatory Commission, November 17, 2009.