Issue 14: PWR Pipe Cracks (Rev. 2)

DESCRIPTION

Historical Background

Cracking has occurred in PWR piping systems as a result of stress corrosion, vibratory and thermal fatigue, and dynamic loading. However, as of February 1981, no cracking had been experienced in the primary system piping of PWRs. All incidents of cracking had been detected and corrective actions were taken prior to any catastrophic

failures. This issue was identified as a potential USI in Appendix B to NUREG-0705[1] and addressed cracking of high pressure piping in PWRs. The issue of stress corrosion cracking of low pressure piping in PWRs was addressed separately in Item 7.

This issue deals with ongoing occurrences of main feedwater line cracking in certain and CE PWRs. In May 1979, the NRC was notified of cracking in two main feedwater lines at D.C. Cook, Unit 2. Subsequent volumetric examinations revealed crack indications at similar locations in all feedwater lines of both D.C. Cook Units 1 and

2. Follow-up action by the NRC resulted in the issuance of IE Bulletin No. 79-13[2] (including Revisions 1 and 2) requiring feedwater piping inspections at other and CE PWRs. A total of 17 incidents of cracking were reported at the 35 plants examined and these incidents encompassed all main feedwater piping.

A PWR Pipe Crack Study Group was established by the NRC in 1979 and its charter included investigations of:

(1) the causes and safety significance of pipe cracks in PWR safetyrelated systems; (2) the ability of existing ISI and leak detection techniques to detect these cracks; and (3) recommendations for both upgrading the licensing process for plants in the operating license and CP stages and for implementation of new criteria on operating plants. In September 1980, the PWR Pipe Crack Study Group completed its investigation of the issue and published its findings in NUREG-0691.[3]

Safety Significance

Cracking in PWR nonprimary system piping could lead to a lessening of the system functional capability and possibly result in situations such as degraded core cooling. Cracking in PWR primary system piping has not been experienced and the mechanisms and environmental conditions necessary to initiate and propagate the cracking in this piping are not known to exist. Therefore, the risk associated with PWR pipe cracks is negligible for the primary system and low for the other piping systems.

Possible Solution

The staff recommended that licensees implement an augmented ISI program.[4]

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[1] NUREG-0705, "Identification of New Unresolved Safety Issues Relating to Nuclear Power Plant Stations," U.S. Nuclear Regulatory Commission, March 1981.
[2] IE Bulletin 79-13, "Cracking in Feedwater System Piping," June 25, 1979 [ML080310492], (Rev. 1) August 29, 1979 [ML031220023], (Rev. 2) October 17, 1979 [ML080310535].
[3] NUREG-0691, "Investigation and Evaluation of Cracking Incidents in Piping in Pressurized Water Reactors," U.S. Nuclear Regulatory Commission, September 1980.
[4] Memorandum for R. Vollmer from T. Murley, "PWR Feedwater Line Cracks—New Regulatory Requirements," March 10, 1981. [8103250569]

CONCLUSION

Work performed by the staff resulted in the evaluation of two proposed courses of action: (1) augumented inspection (short-term); and (2) SRP11 inspection requirements (long-term). Both of these options were calculated to have very low public risk reduction and, therefore, low value/impact. [5][6] As a result of the staff's work, this issue was RESOLVED and no new requirements were established.[7]

[5] Memorandum for T. Murley from M. Ernst, "Prioritization of New Requirements for PWR Feedwater Line Cracks," June 30, 1981. [8108030041]
[6] Memorandum for R. Vollmer from T. Murley, "Prioritization of New Requirements for PWR Feedwater Line Cracks," July 21, 1981. [8108180001]
[7] Memorandum for T. Speis from H. Denton, 'Resolution of Generic Issue 14, "PWR Pipe Cracks,'" October 4, 1985. [9909290092]