Item A-49: Pressurized Thermal Shock (Rev. 1)

DESCRIPTION

Neutron irradiation of reactor pressure vessel weld and plate materials decreases the fracture toughness of the materials. The fracture toughness sensitivity to radiation-induced change is increased by the presence of certain materials such as copper. Decreased fracture toughness makes it more likely that, if a severe overcooling event occurs followed by or concurrent with high vessel pressure, and if a small crack is present on the vessel's inner surface, that crack could grow to a size that might threaten vessel integrity.

Severe pressurized overcooling events are improbable since they require multiple failures and improper operator performance. However, certain precursor events have happened that could have potentially threatened vessel integrity if additional failures had occurred and/or if the vessel had been more highly irradiated.

Therefore, the possibility of vessel failure due to a severe pressurized overcooling event cannot be ruled out. In December 1981, this issue was declared a USI in SECY-81-687 and was later published in the NRC 1982

Annual Report. A detailed action plan for resolving this issue was published in NUREG-0649,[1] Rev. 1.

CONCLUSION

An Advance Notice of Proposed Rulemaking was submitted to the Commission in SECY-83-288[2] and was later approved in January 1984.[3] After public comments were addressed, the final rule (10 CFR 50.61) on

pressurized thermal shock was approved by the Commission in July 1985. Regulatory Guide 1.154[4] was later published in February 1987. Thus, this issue was RESOLVED and new requirements were established.

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[1] NUREG-0649, "Task Action Plans for Unresolved Safety Issues Related to Nuclear Power Plants," U.S. Nuclear Regulatory Commission, February 1980, (Rev. 1) September 1984.
[2] SECY-83-288, "Pressurized Thermal Shock (PTS) Rule," U.S. Nuclear Regulatory Commission, July 15, 1983. [8307270206]
[3] Memorandum for W. Dircks from S. Chilk, "SECY-83-288, `Proposed Pressurized Thermal Shock (PTS) Rule,'" January 13, 1984. [8402100267]
[4] Regulatory Guide 1.154, "Format and Content of Plant-Specific Pressurized Thermal Shock Safety Analysis Reports for Pressurized Water Reactors," U.S. Nuclear Regulatory Commission, January 1987.