Issue 34: RCS Leak (Rev. 1)

DESCRIPTION

Historical Background

This issue was raised by AEOD[1,2] and involved isolation of the reactor coolant system charging and letdown system following a spurious safety injection transient at H. B. Robinson on January 29, 1981. Following the spurious safety injection, the plant operators initiated actions to bring the plant to hot shutdown. During automatic isolation of the CVCS letdown line due to the SI, it is believed that the outermost isolation valves closed faster than the two open orifice isolation valves. Leakage past the orifice isolation valves resulted in

opening of the relief valve and rupture of the valve bellows. Also, a pressure surge due to isolation valve closure caused an upstream valve drain line cap to blow off. Other concerns related to spurious actuation of SI are discussed in Issue 8 (Inadvertent Actuation of Safety Injection in PWRs).

Safety Significance

In a detailed review of the H. B. Robinson event by AEOD,[3] it was determined that no safety concern was involved and that the resultant small LOCA inside containment was within the analyzed SBLOCA. However, AEOD concluded that improved procedures to handle the spurious safety injection actuation signal could have prevented overpressurization of the CVCS piping run downstream of the orifice isolation valves but upstream of the CVCS containment isolation valves.

AEOD recommended that NRR review the procedures for identification and recovery from spurious SI actuations and the closing sequences in the CVCS isolation system. In regard to the latter, AEOD suggested that closing the orifice isolation valves prior to the CVCS containment isolation valves, could eliminate actuation of the

relief valve. However, it is noted that the closure sequence suggested by AEOD most likely would not have eliminated blowoff of the valve drain cap (valve CVC-200E), which appears to have been the major RCS leakage path. Also, even though the relief valve bellows failed, failure of the bellows did not affect the pressure relieving function of the relief valve in the low design pressure (600 psi) section of the CVCS piping run.

Solution

The RCS leakage to containment was primarily from a blown-off drain line cap in the letdown piping. A manual valve that is normally-closed upstream of the drain cap was either left partially open by maintenance error or opened by vibration. The licensee's fix to this problem consisted of locking closed the manual drain line valve in this piping segment. Other similar arrangements in the letdown piping were either locked closed or verification of closure required. The drain cap was replaced. The staff position is that the licensee's fix to preclude similar events at H. B. Robinson is acceptable.

The letdown piping configuration at H. B. Robinson is typical for **W** designs, but not typical for the CE or B&W designs. The CE and B&W designs principally have the containment isolation upstream of the

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[1] Memorandum for C. Michelson from H. Denton, "H.B. Robinson RCS Leak on January 29, 1981," June 15, 1981. [ML14188B792]

[2] AEOD/C102, "Engineering Evaluation of the H.B. Robinson Reactor Coolant System Leak on January 29, 1981," Office for Analysis and Evaluation of Operational Data, U.S. Nuclear Regulatory Commission, March 23, 1981. [ML14188B773]

[3] AEOD/C102, "Engineering Evaluation of the H.B. Robinson Reactor Coolant System Leak on January 29, 1981," Office for Analysis and Evaluation of Operational Data, U.S. Nuclear Regulatory Commission, March 23, 1981. [ML14188B773]

letdown orifices and orifice isolation valves. The event that occurred at H. B. Robinson should bound any similar events for all PWR designs.

CONCLUSION

The leak rate of 5 to 7 gpm that resulted from the event was well within the makeup capability of the charging system at H. B. Robinson. The event did not result in unacceptable consequences and is more appropriately termed a small leak and not an SBLOCA. Issue 58 (Containment Flooding) also bounds the event that occurred and NRR review of procedures for identification and recovery from spurious SI actuations is addressed in TMI Action Plan Item I.C.1.

The resultant SBLOCA described above is within the analyzed SBLOCA and overpressurization of the low pressure CVCS piping section was mitigated by the relief valve. Therefore, we are in agreement with AEOD that the event did not identify a new safety concern and recommend that this issue be DROPPED from further consideration as a generic safety issue.