UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

May 1, 1996

NRC INFORMATION NOTICE 96-27: POTENTIAL CLOGGING OF HIGH PRESSURE SAFETY INJECTION THROTTLE VALVES DURING RECIRCULATION

Addressees

All holders of operating licenses or construction permits for pressurized water reactors (PWRs).

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to potential clogging of high pressure safety injection (HPSI) throttle valves during the recirculation phase of a design-basis loss-of-coolant accident because of restrictive flowpaths in the valves. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On February 20, 1996, Northeast Utilities (the licensee) shut down Millstone Unit 2 because of the discovery of a potential common-mode failure mechanism affecting the HPSI system.

During a review of an Institute of Nuclear Power Operations (INPO) Operational Experience report concerning potential clogging of emergency core cooling system (ECCS) throttle valves at the Diablo Canyon Nuclear Power Plant, the licensee determined that eight throttle valves in the HPSI injection lines in Unit 2 were susceptible to the failure mechanism identified in the INPO report. The failure mechanism described in the INPO report was the potential for clogging of ECCS throttle valves because of entrained debris that could pass through the containment sump strainers but not be able to pass through the throttle valves. The licensee based its susceptibility determination on the fact that the openings in the containment sump strainers were 0.47 cm [0.187 inch] and the minimum dimension within the valve flow-path was 0.32 cm [0.125 inch]. The throttle valves cannot be remotely actuated and are inaccessible during a design-basis accident.

Discussion

Because the containment sump strainer openings are 0.47 cm [0.187 inch] and the most restrictive dimension through which flow must pass within the throttle valve is 0.32 cm [0.125 inch], the potential exists for particles

of sizes between these dimensions to pass through the containment sump strainers, clog the throttle valves, and cause a partial or complete loss of post-accident HPSI flow during the recirculation phase of an accident.

At Millstone Unit 2, the normal lineup for the recirculation phase is such that all recirculation flow passes through the HPSI system. The licensee has adopted this arrangement because of potential structural and vibrational loading of the LPSI system during recirculation operation.

The licensee is evaluating this condition for a more thorough determination of operability.

Similar Events

The safety assessment performed by Pacific Gas and Electric for the Diablo Canyon plant indicated that the LPSI system, which does not have as restrictive a flowpath, can provide both cold-leg and hot-leg flow during the recirculation phase of a design-basis accident. Therefore, core cooling would not be compromised even if no flow were able to pass through the HPSI system. Also, Pacific Gas and Electric has indicated that, because of the small difference in size between the containment sump strainers and the minimum throttle valve dimension, debris that could pass through the sump strainers that could be larger than the throttle valve minimum dimension would likely be fragmented as it passed through the LPSI and HPSI pumps, and that high differential pressure at the valve would likely force the debris through the opening.

The safety assessment performed by Northeast Utilities for another unit, Millstone Unit 3, indicated that the ECCS pumps in the recirculation flow path will pulverize any material that passes through the sump screens, preventing clogging of the throttle valves. Also, the licensee stated that the flow velocity at the sump strainer will be approximately 0.05 m/sec [0.15 ft/sec] during a large-break loss-of-coolant accident. The licensee has stated it expects that at this flow velocity debris would settle out and not be transported through the sump strainers. In addition, the licensee stated that even if two of the eight throttle valves become clogged, the system would still perform its safety function of providing long-term cooling to the reactor core.

On the basis of its review of the information provided by the licensee of Millstone Unit 3 and as discussed above, the NRC staff concluded that fragile debris entering the sump screens is likely to be fragmented by the charging pumps and the HPSI pumps so that there is reasonable assurance that this debris is unlikely to clog the throttle valves at Millstone Unit 3. As this conclusion is based on specific design features at Millstone Unit 3, it may not be applicable to other plants.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Brian K. Grimes, Acting Director
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Information Notice No.	Subject	Date of Issuance	Issued to
96-26	Recent Problems with Overhead Cranes	04/30/96	All holders of OLs or CPs for nuclear power reactors
96-25	Transversing In-Core Probe Overwithdrawn at LaSalle County Station, Unit 1	04/30/96	All holders of OLs or CPs for nuclear power reactors
96-24	Preconditioning of Molded-Case Circuit Breakers Before Surveillance Testing	04/25/96	All holders of OLs or CPs for nuclear power reactors
96-23	Fires in Emergency Diesel Generator Exciters During Operation Following Undetected Fuse Blowing	04/22/96	All holders of OLs or CPs for nuclear power reactors
96-22	Improper Equipment Settings Due to the Use of Nontemperature-Compensated Test Equipment	04/11/96	All holders of OLs or CPs for nuclear power reactors
96-21	Safety Concerns Related to the Design of the Door Interlock Circuit on Nucletron High-Dose Rate and Pulsed Dose Rate Remote Afterloading Brachytherapy Devices	04/10/96	All U.S. NRC Medical to the Licensees authorized to use brachytherapy sources in high- and pulsed-dose-rate remote afterloaders
96-20	Demonstration of Associated Equipment Compliance with 10 CFR 34.20	04/04/96	All industrial radiography licensees and radiography equipment manufacturers
96-19	Failure of Tone Alert Radios to Activate When Receiving a Shortened Activation Signal	04/02/96	All holders of OLs or CPs for nuclear power reactors

OL = Operating License
CP = Construction Permit

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Original signed by Brian K. Grimes

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Tech editor reviewed and concurred on 4/17/96
No comments by Region per e-mail with NBlumberg on 4/11/96

Attachments filed in Jacket

* SEE PREVIOUS CONCURRENCE
** Concurrence per phonecon with EBenner

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