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

December 28, 1989

NRC INFORMATION NOTICE NO. 89-90: PRESSURIZER SAFETY VALVE LIFT SETPOINT SHIFT

Addressees:

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

Purpose:

This information notice is to alert addressees to potential problems resulting from operating pressurizer safety valves (PSVs) in an environment different from that used to establish the PSV lift setpoint. It is expected that recipients will review this information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

In October 1989, Westinghouse informed its plant owners of a potential deviation of the PSV set pressure from the ASME Code and the plant technical specification (TS) requirements for plants having loop seals upstream of the PSVs. Recent plant operating experience and test data indicate that the PSV lift pressure changes by more than 1 percent from the original set pressure when the valve is operated at conditions different from those used during the establishment of the lift setpoint. Westinghouse observed a shift of 4 to 8 percent on Crosby PSVs when setpoints were initially established using a loop seal with 300°F water, draining the loop seal, and checking the lift set pressure with steam. As ASME Code Section III requires a safety valve setting with a tolerance of +1/-1 percent of the set pressure and the plant TSs typically specify the PSV lift setting of 2485 psig +1/-1 percent, some plants may be operating with PSV setpoints not in compliance with their TSs or the ASME Code if they are operating in an environment different from that used to establish the valve setpoints. In addition, some plant TSs have a footnote which states, "The lift setting pressure shall correspond to ambient conditions of the valve at nominal operating temperature and pressure."

The Westinghouse letter specifically identified a potential safety issue with setting the PSV setpoint with steam and operating the valves in a loop seal containing water. Because the actual lift set pressure could be 4 to 8 percent higher than the 2485 psig +1% set pressure, this increased PSV lift setpoint

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could result in primary system overpressurization for certain event scenarios. Thus, plant-specific analyses of those scenarios in which the availability of the PSV was used in the licensing basis criteria for the facility may show that the appropriate pressure limit is exceeded for the pressurizer and associated piping.

The PSV loop seals may be uninsulated or insulated and may or may not have heaters. Water temperatures in the uninsulated and insulated loop seals are approximately 140°F and 300°F to 400°F, respectively. The temperature of the loop seal water affects the PSV temperature and the lift pressure. The lift pressure setpoints of the PSVs with loop seals are not established consistently by the industry. A survey showed that the inlet conditions under which the PSV lift setpoints were established include steam, nitrogen, and actual loop seal water conditions. As a result, the actual PSV lift pressure could be either too high or too low, depending on the method of PSV setting and the actual fluid condition upstream of the PSVs.

Discussion:

Inconsistencies in the conditions at which the PSV lift pressure is actually established, compared to actual operating conditions of the PSV, have safety implications and affect compliance with the plant TSs. It is essential that the PSVs be operable with proper lift pressure settings that are low enough for acceptable plant overpressure protection but high enough to prevent lifting of the PSVs at a pressure approaching the reactor coolant system (RCS) operating conditions. If the lift pressure for a PSV is set on steam and is operated with loop seal water, the actual lift setpoint may be too high and result in noncompliance with the TSs as well as possible overpressurization of the primary system in excess of the acceptance limit of 110 percent of design pressure for certain accidents. On the other hand, if the PSV setpoint is established with loop seal water, a loss of loop seal water will result in a lower actual PSV lift pressure. This situation may result in noncompliance with the plant TSs and also may cause the PSV to lift at a pressure approaching the RCS operating pressure, increasing the probability of a challenge to the PSVs. NUREG-0737, Item II.K.3.2, addresses the need for reducing challenges to PSVs. Repetitive or frequent challenges to the PSVs may prevent the PSVs from reseating, with a potential for an unisolable small-break loss-of-coolant accident (LOCA). The effect on the actual lift pressure of a PSV that is set with nitrogen and operated with loop seal water has not been determined.

There were two instances (on May 17 and August 25, 1989) at the V. C. Summer plant in which the loop seal was lost as a result of the PSV leakage. Because the setpoint of the V.C. Summer PSV was established with hot water, the actual lift setpoint decreased as a result of the absence of water in the loop seal piping. The PSV opened prematurely, resulting in a partial depressurization of the reactor coolant system. PSV leakage also occurred at the Diablo Canyon plant, where the PSV setpoint was also established with hot water. Leakage past the PSV was detected by the PSV tailpipe temperature monitoring devices and the acoustic leak monitors and subsequently resulted in a plant shutdown.

In the case of the PSVs at Summer, the PSV lift setpoints are still based upon a loop seal configuration. The licensee has taken steps to maintain the loop seal. They have installed thermocouples in the PSV loop seals to monitor the PSV body inlet and loop seal temperatures. If the valve body inlet temperature exceeds a predetermined temperature, this is considered indicative of an impending loss of the loop seal and the licensee will then take action to shut down the plant to restore the loop seal. The licensee is considering removing the PSV loop seals at the next refueling outage.

In October 1989, the Surry Station Unit 2 PSVs were shipped to the Westinghouse Western Service Center to undergo testing after leakage was observed from one of the valves. The setpoints of the Surry PSVs had been established with steam. The test results showed that the as-found lift pressure setpoints differed significantly when tested under steam vs loop seal water conditions. The licensee reset the Unit 2 PSVs under water conditions to comply with the TS requirements. However, during a subsequent post-maintenance pressure test, the "C" PSV lifted at an RCS pressure of 2335 psig and reclosed at 2255 psig, apparently from a loss of loop seal water. As a result of this event, the licensee decided to return to the previous method of establishing the PSV lift pressure with steam to avoid challenges to the Unit 2 PSVs. On November 10, 1989, the licensee requested a TS change for Units 1 and 2 for the remainder of Cycle 10 operation to increase the PSV setpoint tolerance to the value observed in the Unit 2 PSV test data. This TS change request was supported by a safety analysis showing that the reactor system pressure remains below the 110-percent design pressure limit for the limiting pressurization events if the PSV setpoint is increased provided a power-operated relief valve (PORV) is operable. The TS change was approved with the provision that the licensee take compensatory measures to ensure operability of at least one of the PORVs and also ensure the operability of the direct reactor trip upon a turbine trip.

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 NRR project manager.

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

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(301) 492-0887

W. Jensen, NRR
(301) 492-1190

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
89-89	Event Notification Worksheets	12/26/89	All holders of OLs or CPs for nuclear power reactors.
89-88	Recent NRC-Sponsored Testing of Motor-Operated Valves	12/26/89	All holders of OLs or CPs for nuclear power reactors.
89-87	Disabling of Emergency Diesel Generators by Their Neutral Ground-Fault Protection Circuitry	12/19/89	All holders of OLs or CPs for nuclear power reactors.
89-45, Supp. 2	Metalclad, Low-Voltage Power Circuit Breakers Refurbished with Substandard Parts	12/15/89	All holders of OLs or CPs for nuclear power reactors.
89-86	Type HK Circuit Breakers Missing Close Latch Anti-Shock Springs.	12/15/89	All holders of OLs or CPs for nuclear power reactors.
89-85	EPA's Interim Final Rule on Medical Waste Tracking and Management	12/15/89	All medical, academic, industrial, waste broker, and waste disposal site licensees.
89-84	Failure of Ingersoll Rand Air Start Motors as a Result of Pinion Gear Assembly Fitting Problems	12/12/89	All holders of OLs or CPs for nuclear power reactors.
89-83	Sustained Degraded Voltage on the Offsite Electrical Grid and Loss of Other Generating Stations as a Result of a Plant Trip	12/11/89	All holders of OLs or CPs for nuclear power reactors.
89-82	Recent Safety-Related Incidents at Large Irradiators	12/7/89	All NRC licensees authorized to possess and use sealed sources at large irradiators.

OL = Operating License
CP = Construction Permit

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*SEE PREVIOUS CONCURRENCES

*EAB:NRR	*NRR:SRXB	*TECH:EDITOR	*EAB:NRR	*NRR:DST	*C:EAB:NRR
WJensen:db	GHsii		DCFischer	AThadani	CJHaughney
12/11/89	12/11/89	12/11/89	12/13/89	12/18/89	12/20/89

*C:OGCB:NRR	D:DOEA:NRR
CHBerlinger	CERossi
12/20/89	12/27/89

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