

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

September 22, 1988

NRC INFORMATION NOTICE NO. 88-77: INADVERTENT REACTOR VESSEL OVERFILL

Addressees:

All holders of operating licenses or construction permits for boiling-water reactors (BWRs).

Purpose:

This information notice is being provided to alert addressees to potential problems resulting from inadvertent overfilling of the reactor vessel. 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On January 20, 1988, Nine Mile Point, Unit 2, personnel were performing start-up testing; the reactor was in the natural circulation mode and at 42 percent power. An auxiliary operator, who was performing maintenance without informing the control room, isolated the instrument air system, which eventually led to tripping both operating feedwater pumps and one of two operating condensate booster pumps. All three condensate pumps and one condensate booster pump remained running. After the reactor tripped because of low water level, the water level in the reactor vessel was restored to level 8 by the high-pressure core spray (HPCS) and the reactor core isolation cooling (RCIC) systems with the reactor pressure decreasing slowly from 655 to 625 psig.

Meanwhile, the operator who isolated the instrument air system realized his error and restored the isolated air system. This action reestablished the normal valve arrangement for the condensate/feedwater system. Since the condensate and condensate booster pumps were still operating and the master feedwater controller had previously been put in manual, feedwater flow to the vessel resumed. The reactor operator was unaware that feedwater was being injected. When the operator noticed that the water level in the reactor vessel was starting to rise without HPCS or RCIC operating, he attempted to close the feedwater flow control valves. However, the feedwater flow control valves locked up when they were approximately 20 percent closed. This valve lock-up caused reactor vessel overfilling and flooding of the main steam lines up to the turbine stop valves. It was later found that information regarding the potential for valve lock-up and corrective actions had not been provided to the operators prior to the event. A detailed discussion of this event can be found in NRC Inspection Report No. 50-410/88-01, dated March 8, 1988, prepared by an Augmented Inspection Team.

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On March 22, 1987, Washington Nuclear Power, Unit 2, was operating at approximately 71 percent power when the operators manually scrambled the reactor following a loss of both feedwater pumps. The water level in the reactor vessel was restored to level 8 by the HPCS and RCIC systems. Because of an erroneous report that the RCIC system had tripped on overspeed, the operators were relying on the condensate/feedwater system to control the water level, while the safety relief valves (SRVs) were used to control pressure. Additionally, the plant was operating with an abnormal feedwater/condensate system lineup for which temporary procedure deviations had not been incorporated into the scram procedures. The operators failed to complete the valving sequence required to establish shutdown level control by failing to close two high-pressure heater block valves. The reactor vessel overflowed and water entered the steam lines.

Discussion:

Although the events at Nine Mile Point, Unit 2, and Washington Nuclear Power, Unit 2, followed different scenarios, there are common factors that contributed to overflowing the reactor vessel, such as inadequate procedures and training, poor or no communication, lack of updated information for the operators, and failure of the operators to observe the water level in the reactor vessel after it reached level 8.

Both plants had previously experienced an overflow event: Washington Nuclear Power, Unit 2, on July 25, 1986, and Nine Mile Point, Unit 2, on October 1, 1987. Neither plant considered the filling of the steam lines with water as significant and neither reported the details of the events in their 10 CFR 50.72 notifications. The NRC regards a reactor vessel overflow event as a significant safety concern and has identified the following four safety issues with these events:

- (1) Hydrodynamic effects of water or two-phase fluid being discharged through the SRVs. This process could damage the SRVs.
- (2) Stressing of the vessel, steam line nozzles, steam line snubbers, pipe supports, and hangers as a result of:
 - (a) the thermal transient caused by colder water flowing into the hot main steam line and reactor vessel;
 - (b) the weight of water in the main steam lines; and
 - (c) the dynamic transient loads caused by water flow in the main steam lines.
- (3) Potential for MSIVs not to close if the steam lines are filled with water.
- (4) Placing the plant in a condition that has not been analyzed in the final safety analysis report (FSAR).

Although not a reactor safety concern, water could damage the main turbine.

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No specific action or written response is required by this information notice. If you have any questions about this matter, please contact the technical contact listed below or the Regional Administrator of the appropriate regional office.


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Office of Nuclear Reactor Regulation

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Attachment: List of Recently Issued NRC Information Notices