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

April 11, 1994

NRC INFORMATION NOTICE 94-29: CHARGING PUMP TRIP DURING A LOSS-OF-COOLANT EVENT CAUSED BY LOW SUCTION PRESSURE

Addressees

All holders of operating licenses or construction permits for pressurized-water reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the possibility of a charging pump trip caused by inadequate suction pressure because too many pumps may be aligned to a single suction path during accident mitigation. 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

During a steam generator tube rupture event at Palo Verde Unit 2 on March 14, 1993 (NRC Inspection Report 50-279/93-14), a charging pump tripped off on low suction pressure when the operators switched the charging pump suction source from the volume control tank to the refueling water tank. During the subsequent evaluation of the event, the licensee determined that four pumps, three charging pumps and a boric acid makeup pump, were all taking suction through the same 7.6-cm [3-in.] diameter pipe. The licensee also determined that the high rate of flow through the suction pipe that resulted from the simultaneous operation of all four pumps caused a sufficient pressure reduction at the suction of the pumps to lower this pressure below the low suction trip setpoints of the charging pumps.

Two charging pumps were already running when the tube rupture occurred. In addition, the operators were running a boric acid pump to circulate the refueling water through filters to purify it for an upcoming outage: The boric acid pump flow was being recirculated back to the refueling water tank and did not contribute to the makeup water going into the reactor coolant system. The operators started the third charging pump early in the event in an effort to restore the pressurizer level, which was decreasing because of the tube rupture. At that time all of the charging pumps were taking suction from the volume control tank, which is the normal source of makeup water for the reactor coolant system. Approximately 30 minutes later, in accordance with emergency procedures, the operators opened the suction valve from the

refueling water tank and then closed the suction valve from the volume control tank.

At this point one of the charging pumps tripped off. The operators were able to restore the tripped charging pump to operation by realigning the suction of the charging pumps to other suction paths from the refueling water tank.

Discussion

Following this event the licensee calculated that, with the boric acid pump running, the remaining flow capacity of the refueling water tank suction source that was in use was just sufficient for two charging pumps. With all four pumps running the suction pressure was below the low suction trip set points (81.0 kPa to 87.2 kPa [11.75 psia to 12.65 psia]) for the charging pumps. Because the trip set points are set at slightly different pressures, only one pump tripped. Once this first pump tripped, the resulting rise in suction pressure allowed the remaining pumps to keep running.

The licensee concluded that, if recirculation by the boric acid pump is not in progress, sufficient suction pressure exists for all three charging pumps. Consequently, the licensee revised the emergency procedures that involve the charging pumps to specify that any ongoing recirculation of the refueling water by the boric acid pump is to be terminated when refueling water is needed for emergency makeup.

Licensees of pressurized-water reactors use the charging systems in a number of ways for accident mitigation, such as including the charging system as a part of the automatic safety injection system. Charging systems are also used as a source of pressurizer spray to depressurize the reactor when the reactor coolant pumps are shut down. Emergency operating procedures often refer to the charging systems for other uses as well.

Some licensees do not isolate the volume control tank (or its equivalent) when the charging system source is switched to the refueling water tank (or its equivalent), but depend on the static pressure in the refueling water tank to keep the volume control tank from draining. Should the volume control tank empty in response to lower-than-expected suction pressure, hydrogen cover gas normally contained in this tank could enter the charging system suction and cause the pumps to malfunction.

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

C T Grimes for

Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contact: Warren C. Lyon, NRR
(301) 504-3892

Attachment:
List of Recently Issued NRC Information Notices
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LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-51, Supp. 1	Misapplication and Inadequate Testing of Molded-Case Circuit Breakers	04/12/94	All holders of OLs or CPs for nuclear power reactors.
94-28	Potential Problems with Fire-Barrier Penetration Seals	04/05/94	All holders of OLs or CPs for nuclear power reactors.
94-27	Facility Operating Concerns Resulting from Local Area Flooding	03/31/94	All holders of OLs or CPs for nuclear power reactors.
94-26	Personnel Hazards and Other Problems from Smoldering Fire-Retardant Material in the Drywell of a Boiling-Water Reactor	03/28/94	All holders of OLs or CPs for nuclear power reactors.
93-17, Rev. 1	Safety Systems Response to Loss of Coolant and Loss of Offsite Power	03/25/94	All holders of OLs or CPs for nuclear power.
94-25	Failure of Containment Spray Header Valve to Open due to Excessive Pressure from Inertial Effects of Water	03/25/94	All holders of OLs or CPs for nuclear power reactors.
94-24	Inadequate Maintenance of Uninterruptible Power Supplies and Inverters	03/24/94	All holders of OLs or CPs for nuclear power reactors.
94-23	Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program	03/25/94	All NRC Licensees.

OL = Operating License
CP = Construction Permit

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orig /s/'d by CIGrimes

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*D:DSSA	*C:OGCB/DORS	D:DORS/NRR
AThadani	GHMarcus	BKGrimes for
01/04/94	01/11/94	04/6/94

DOCUMENT NAME: 94-29.IN

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