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

November 16, 1988

NRC INFORMATION NOTICE NO. 88-87: PUMP WEAR AND FOREIGN OBJECTS IN PLANT PIPING SYSTEMS

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is being provided to alert addressees to potential flow reduction resulting from pump wear and foreign objects in plant piping systems. 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:

The NRC has received three licensee event reports (LERs) (50-281/88-004, 50-281/88-010, and 50-280/88-017) related to pump wear and foreign objects in plant piping systems that could affect the ability of plant safety systems to perform their functions during a design-basis accident. These events were reported by Virginia Electric and Power Company's Surry Nuclear Power Station.

On March 27, 1988, during a manual reactor trip on Surry Unit 2, the auxiliary feedwater (AFW) flow to the "A" steam generator (S/G) was noted to be low. Extensive valve testing and inspections at the time did not locate the cause of the low flow (LER 50-281/88-004).

On May 16, 1988, Surry Unit 2, while at 100 percent power, experienced a reactor trip as a result of S/G low-low level. Following the reactor trip, the AFW flow to the "A" S/G was noted lower than expected. The flow was observed to be 227 gallons per minute (gpm) compared with 325 gpm for the "B" and "C" S/G. Additional testing of the AFW flow to the "A" S/G indicated that a partial blockage existed in the flowpath.

The reduced AFW flow to the "A" S/G was due to a metallic object partially blocking the cavitating venturi in the "A" AFW line. The metal piece was determined to be from the channel ring vane on the "B" motor-driven AFW pump. Subsequent visual inspection using fiber optics located two metal pieces. One was located upstream of the cavitating venturi in the line to the "A" S/G and a second was at a flow orifice in the "C" S/G AFW line. Inspection of the

three AFW pumps revealed that one chip was missing from a channel ring vane tip in the "A" motor-driven AFW pump, eight small pieces were broken off from the channel ring vane tips in the "B" motor-driven AFW pump, and numerous chips were missing from the outer vane ends in the turbine-driven AFW pump. In addition, a nondestructive inspection revealed several cracked channel ring vanes in the turbine-driven AFW pump.

The two pieces retrieved from the piping were verified to have come from the "B" motor-driven AFW pump. Extensive inspection of the AFW system piping did not locate the other small pieces missing from the AFW pumps (LER 50-281/88-010).

On June 6, 1988, Surry Units 1 and 2 were in cold shutdown following a special test run of the Unit 1 inside recirculation spray pump (IRSP), and foreign material was found in the temporary discharge cone strainer. The material consisted of cap screws, a swagelock cap, nuts, weld wire, and other objects. As a result of this finding and the imminent return to power by Unit 2, the Unit 2 recirculation spray pump sumps were inspected. This area includes the pump suctions for the IRSPs, the outside recirculation spray pumps, and the low-head safety-injection pumps. This inspection, utilizing fiber optics, observed nuts, bolts, wire, metal and wood pieces, and other material in the sump. These foreign objects were subsequently removed (LER 50-280/88-017).

Discussion:

The events described above illustrate the potential for loss or significant reduction of flow from safety-related pumps as a consequence of pump wear and foreign objects in the plant piping systems. The objects in the AFW system significantly reduced the flow to the affected S/G. Lack of appropriate pump internal inspections may have contributed to the failure to identify the problem with the pump channel ring vanes earlier. The foreign objects found in the safety-related system piping resulted from inadequate foreign material exclusion from sump wells and/or inadequate inspection after maintenance activities in the past.

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

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

Technical Contacts: W. Holland, Region II
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Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
86-106, Supp. 3	Feedwater Line Break	11/10/88	All holders of OLs or CPs for nuclear power reactors.
88-86	Operating with Multiple Grounds in Direct Current Distribution Systems	10/21/88	All holders of OLs or CPs for nuclear power reactors.
88-85	Broken Retaining Block Studs on Anchor Darling Check Valves	10/14/88	All holders of OLs or CPs for nuclear power reactors.
88-84	Defective Motor Shaft Keys in Limitorque Motor Actuators	10/20/88	All holders of OLs or CPs for nuclear power reactors.
88-83	Inadequate Testing of Relay Contacts in Safety-Related Logic Systems	10/19/88	All holders of OLs or CPs for nuclear power reactors.
88-82	Torus Shells with Corrosion and Degraded Coatings in BWR Containments	10/14/88	All holders of OLs or CPs for BWRs.
88-81	Failure of Amp Window Indent Kynar Splices and Thomas and Betts Nylon Wire Caps During Environmental Qualification Testing	10/7/88	All holders of OLs or CPs for nuclear power, test, and research reactors.
88-80	Unexpected Piping Movement Attributed to Thermal Stratification	10/7/88	All holders of OLs or CPs for PWRs.
88-79	Misuse of Flashing Lights for High Radiation Area Controls	10/7/88	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit