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

May 22, 1989

NRC INFORMATION NOTICE NO. 89-49: FAILURE TO CLOSE SERVICE WATER CROSS-CONNECT ISOLATION VALVES

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 problems that may result from failure to close isolation valves in service water system loop cross-connect piping during certain scenarios. 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:

While Nine Mile Point Unit 2 was shutdown in October 1988 for refueling, the licensee reviewed the control logic which actuates certain service water valves which are used to isolate redundant loops of service water. It was determined that a loss-of-offsite power with a single failure (i.e., failure to start one of two diesel generators), could lead to loss of the operating diesel generator, due to inadequate cooling water flow from the service water system.

The service water system at Nine Mile Point Unit 2 consists of two cross-connected and redundant cooling loops (divisions), each with service water pumps and various loads, including a diesel generator. (A third diesel generator dedicated to high-pressure core spray takes cooling water from either loop, but it does not provide emergency ac power for any other function.) During normal operation, the isolation valves in the cross-connect piping are open so that any combination of service water pumps may be used to provide cooling water to all loads. In response to a loss-of-offsite power, the isolation valves should close so that each loop will operate independently of the other. With a loss-of-offsite

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power, the control logic would ensure that closure of the isolation valves would occur after power is restored from either offsite sources or the diesel generators. However, if one of the diesel generators fails to operate, power would be supplied to only one ESF division.

The design deficiency in the control logic involved the need for power to actually exist on ESF buses in both divisions for either of two isolation valves to close. Therefore, the isolation valves would not close when there was a loss-of-offsite power and the failure of one diesel generator. With the valves open the cooling water flow provided by a single service water pump associated with the operable diesel generator would be distributed to all loads in both loops. As a result, it was postulated that with open valves in the cross-connect piping, there would be inadequate cooling water flow in the service water loop with the operable diesel generator, and that diesel generator would probably fail due to overheating. The control logic design deficiency has existed since the plant was initially constructed and the licensee's pre-operational routine surveillance and post maintenance/ modification testing did not detect the design deficiency. The licensee subsequently made changes to the control logic that eliminated the single failure deficiency.

The licensee for the Cooper Nuclear Station was concerned about having an adequate flow of service water to essential loads following a loss-of-coolant accident given a loss-of-offsite power and the failure of the number 1 diesel generator to start. Without power from this diesel generator, the single motor operated block valve which would automatically close to isolate non-essential loads from the essential loads would fail to close. Without valve closure, there may be inadequate flow to the essential service water loads and a single service water pump could be operating in a runout condition. This problem was identified during the construction and licensing phase, but station procedures were not modified adequately to mitigate the concern over pump runout with a potential for loss of flow. The licensee modified procedures to assure that reactor operators take steps to close another valve in the cross-connect piping that would isolate the nonessential loads, thereby assuring adequate cooling water flow to essential loads, including the operating diesel generator.

Discussion:

With the service water system cross-connect valve closure problems as described above, the loss-of-offsite power and a single failure could result in a station blackout. Because the potential consequences are significant, licensees have evaluated possible improvements such as reducing cooling water flow to non-essential components following a loss-of-offsite power event, changing the control logic so that loop isolation occurs with power available to only one division and clarifying procedures that specify corrective operator actions to ensure that adequate service water flow to the essential components is maintained.

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.

Charles E. Rossi

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

Technical Contact: J. Carter, NRR
(301) 492-1194

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
89-48	Design Deficiency in the Turbine-Driven Auxiliary Feedwater Pump Cooling Water System	5/22/89	All holders of OLs or CPs for nuclear power reactors.
89-47	Potential Problems With Worn or Distorted Hose Clamps on Self-Contained Breathing Apparatus	5/18/89	All holders of OLs or CPs for nuclear power reactors and fuel facilities.
89-46	Confidentiality of Exercise Scenarios	5/11/89	All holders of licenses for fuel cycle facilities and byproduct material licensees having an approved emergency response plan.
89-45	Metalclad, Low-Voltage Power Circuit Breakers Refurbished with Substandard Parts	5/8/89	All holders of OLs or CPs for nuclear power reactors.
89-44	Hydrogen Storage on the Roof of the Control Room	4/27/89	All holders of OLs or CPs for nuclear power reactors.
88-82, Supp. 1	Torus Shells with Corrosion and Degraded Coatings in BWR Containments	5/2/89	All holders of OLs or CPs for BWRs.
89-43	Permanent Deformation of Torque Switch Helical Springs in Limitorque SMA-Type Motor Operators	5/1/89	All holders of OLs or CPs for nuclear power reactors.
88-97, Supp. 1	Potentially Substandard Valve Replacement Parts	4/28/89	All holders of OLs or CPs for nuclear power reactors.
89-42	Failure of Rosemount Models 1153 and 1154 Transmitters	4/21/89	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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JCarter:db	PBaranowsky		WDLanning	CHBerlinger	CERossi
5/12/89	5/2/89	/ /89	5/8/89	5/12/89	5/16/89

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The design deficiency in the control logic was that for either isolation valve to close, power must actually exist on ESF buses in both divisions. Therefore, the isolation valves would not close upon loss of offsite power and the failure of one diesel generator. With the valves open the cooling water flow provided by the service water pump associated with the operable diesel generator would be distributed to all loads in both loops. As a result, it was postulated that with open valves in the cross-connect piping, there would be inadequate cooling water flow in the service water loop with the operable diesel generator, and that diesel generator would probably fail due to overheating.

Discussion:

With the service water system cross-connect valve isolation logic as described above, the loss of offsite power and a single failure could result in a station blackout. Because the potential consequences of this design deficiency are significant, the licensee is evaluating possible corrections, such as reducing cooling water flow to non-vital components following a loss-of-power event and changing the control logic so that loop isolation occurs with power available to only one division. The control logic deficiency was present since the plant was initially constructed. The licensee's pre-operational routine surveillance and post maintenance/modification testing did not detect the design deficiency.

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