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

March 8, 1993

NRC INFORMATION NOTICE 93-17: SAFETY SYSTEMS RESPONSE TO LOSS OF COOLANT AND LOSS OF OFFSITE POWER

Addressees

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

Purpose

The U. S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to a condition in which automatic safety systems could have responded inappropriately to certain sequences of loss of coolant and loss of offsite power. 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

In a report of May 1, 1989, the Virginia Electric Power Company, the licensee for the Surry Power Station, reported a deficiency in the emergency diesel generator (EDG) loading logic that could have resulted in overloading the EDGs if a loss of offsite power had occurred after a loss of coolant accident (LOCA) or other design basis event causing the automatic start of the safety system electrical loads. The loading logic was not designed properly to respond to this sequence of events. During recent work on the Improved Standard Technical Specification program and through discussion with nuclear steam supply system owners groups, the NRC has determined that licensees may have similar design logic problems at other plants. The logic at these plants may have been designed to respond properly to a simultaneous LOCA and loss of offsite power but may not have been designed to respond appropriately to other sequences.

Discussion

General Design Criteria 17 (GDC 17) of Appendix A to Part 50 of Title 10 of the Code of Federal Regulations requires that, following a loss of offsite power, the onsite power system be sufficient to ensure that the core is cooled and containment integrity and other vital functions are maintained in the

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event of postulated accidents. Licensees typically include an analysis in Chapter 15 of the plant Safety Analysis Report for a simultaneous occurrence of a loss of offsite power and a LOCA. However, licensees may not always analyze for other possible sequences. Thus, the safety systems in some plants may have been designed to respond properly if these events occurred alone or if they occurred simultaneously, but not for other possible sequences.

A LOCA with a delayed loss of offsite power may occur in various ways. In one scenario, the LOCA results in a turbine trip and a loss of power generation to the grid causing grid instability and a loss of offsite power seconds later. In another scenario, the loss of power generation causes a degraded voltage at the plant switchyard, which causes the degraded voltage relays to actuate, resulting in a delayed loss of offsite power to the safety buses. In plants where the safety buses are normally fed from the unit auxiliary transformer connected to the output of the main generator, the loss of offsite power could result from a failure of the buses to transfer to the offsite source after the LOCA, or a failure of the offsite transformer to carry the additional load. In such events, offsite power will be lost to the safety buses during the sequencing of the LOCA loads (if LOCA loads are designed to be sequenced on offsite power) or shortly thereafter. The control logic and piping systems (safety injection, service water, etc.) at some plants may not be designed to meet the consequences of such events. Possible adverse results include the failure to reenergize loads required to respond to a LOCA, improper loading and loss of the diesel generators, and water hammer in the piping systems.

The opposite sequence is a loss of offsite power followed by a delayed LOCA. One way in which this sequence could occur is if, after the loss of power occurred, a safety relief valve lifted and failed to properly reseat resulting in a loss of reactor coolant inventory and a LOCA initiation signal.

Properly designed safety systems will respond appropriately to all credible sequences of a loss of offsite power and LOCA. The design of the control logic, the electrical power and control systems, and the fluid systems all contribute to ensuring that safety systems respond appropriately to these events.

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 (NRR) project manager.

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

Technical contact: James Lazevnick, NRR
(301) 504-2782

Attachment: List of Recently Issued NRC Information Notices
See File jacket

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-16	Failures of Nut-Locking Devices in Check Valves	02/19/93	All holders of OLs or CPs for nuclear power reactors.
93-15	Failure to Verify the Continuity of Shunt Trip Attachment Contacts in Manual Safety Injection and Reactor Trip Switches	02/18/93	All holders of OLs or CPs for nuclear power reactors.
93-14	Clarification of 10 CFR 40.22, Small Quantities of Source Material	02/18/93	All licensees who possess source material.
93-13	Undetected Modification of Flow Characteristics in the High Pressure Safety Injection System	02/16/93	All holders of OLs or CPs for nuclear power reactors.
93-12	Off-Gassing in Auxiliary Feedwater System Raw Water Sources	02/11/93	All holders of OLs or CPs for nuclear power reactors.
93-11	Single Failure Vulnerability of Engineered Safety Features Actuation Systems	02/04/93	All holders of OLs or CPs for nuclear power reactors.
93-10	Dose Calibrator Quality Control	02/02/93	All Nuclear Regulatory Commission medical licensees.
93-09	Failure of Undervoltage Trip Attachment on Westinghouse Model DB-50 Reactor Trip Breaker	02/02/93	All holders of OLs or CPs for nuclear power reactors.
93-08	Failure of Residual Heat Removal Pump Bearings due to High Thrust Loading	02/01/93	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original signed by
Brian K. Grimes

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Attachment: List of Recently Issued NRC Information Notices

*SEE PREVIOUS CONCURRENCES Document Name: 93-17.IN

*EELB:DE:NRR	*C/EELB:DE:NRR	*C/SRXB:DSSA:NRR	*RPB:ADM
JLazevnick	CHBerlinger	RCJONES	TechED
02/01/93	02/01/93	02/01/93	01/25/93
*OGCB:DORS:NRR	*C/OGCB:DORS:NRR	D/DORS:NRR	
JLBirmingham:mkm	GHMarcus	BKGrimes	
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possible sequences. Thus, the safety systems in some plants have been designed to respond properly to an independent LOCA or LOOP or a simultaneous LOCA and LOOP combination, but not for other possible sequences of a LOCA and LOOP.

A LOCA with a delayed LOOP may occur in various ways. In one scenario, the LOCA results in a turbine trip and a loss of power generation to the grid causing grid instability and a LOOP seconds later. In another scenario, the loss of power generation causes a degraded voltage at the plant switchyard, which causes the degraded voltage relays to actuate, resulting in a delayed LOOP to the safety buses. In plants where the safety buses are normally fed from the unit auxiliary transformer connected to the output of the main generator, the LOOP could result from a failure of the buses to transfer to the offsite source after the LOCA, or a failure of the offsite transformer to carry the additional load. In such events, offsite power will be lost to the safety buses during the sequencing of the LOCA loads (if LOCA loads are designed to be sequenced on offsite power) or shortly thereafter. The control logic and piping systems (safety injection, service water, etc.) at some plants may not be designed to meet the consequences of such events. Possible adverse results include the failure to reenergize loads required to respond to a LOCA, improper loading and loss of the diesel generators, and water hammer in the piping systems.

The opposite sequence is a LOOP followed by a delayed LOCA. This sequence could occur if, after a LOOP occurred, a safety relief valve lifted and failed to properly reseat resulting in a loss of reactor coolant inventory and a LOCA initiation signal. The LOCA could also follow the LOOP as the result of stress caused by the rapid shedding and starting of piping system loads.

Properly designed safety systems will respond appropriately to all credible sequences of a LOOP and LOCA. The design of the control logic, the electrical power and control systems, and the hydraulic systems all contribute to ensuring that safety systems respond appropriately to these events.

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