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IN 85-85

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

October 31, 1985

IE INFORMATION NOTICE 85-85: SYSTEMS INTERACTION EVENT RESULTING IN REACTOR SYSTEM SAFETY RELIEF VALVE OPENING FOLLOWING A FIRE-PROTECTION DELUGE SYSTEM MALFUNCTION

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This notice is provided to alert licensees of a serious systems interaction event involving the fire-protection deluge system located in the control room ventilation charcoal filter housing. Following inadvertent actuation of this system, an analog transient trip system (ATTS) panel was sprayed with water causing malfunctions in certain safety system components.

It is expected that recipients will review this notice for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, suggestions contained in this notice do not constitute requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On May 15, 1985, at Georgia Power Company's Hatch Unit 1, personnel manually scrammed the reactor from 75% power because of a stuck open low-low-set safety relief valve (LLS-SRV). Shorting of one of the two redundant power supplies and/or possibly intermittent shorting of logic system contacts in the ATTS panel is believed to have caused the stuck open LLS-SRV. The panel is one of two redundant panels located in the control room. The cause of the electrical shorts in the affected panel was water intrusion into the panel.

The event began about 8:35 p.m. when an instrument water supply vent valve was damaged, apparently by dragging of a crane hook along the line. The instrument water supply line eventually depressurized causing a portion of the fire-protection deluge system to actuate. The water supply line is located above the control building and the deluge system is located in the control room charcoal filter housing.

Following actuation of the deluge system, approximately 15 to 25 gal of water backed up into the ventilation header before the system could be secured. The

backup was caused by plugged drains in the charcoal filter housing. Water eventually leaked through a hole in the ventilation piping that was located above the ATTS panel in the control room. When the water sprayed onto the panel, one of two redundant panel power supplies apparently shorted because of water intrusion into the panel. As a result, a LLS-SRV valve began to cycle open and closed. The SRV cycled three times and then opened and remained open. The operator manually scrammed the reactor from 75% power. A false turbine high exhaust pressure trip signal also was generated, temporarily disabling the high pressure core injection (HPCI) system. The reactor core isolation cooling (RCIC) system was inoperable at the time, so neither HPCI nor RCIC was immediately available for use. Fortunately, neither system was needed during the event. This is because the water level was restored and maintained by the reactor feedwater system until the MSIVs were shut. Subsequent to MSIV closure, water level was maintained by the control rod drive (CRD) system with the excess water being dumped to the condenser via the reactor water cleanup system. The LLS-SRV closed without operator action at 9:52 pm.

Discussion:

The event is of considerable concern because of the potential for multiple safety system failures through unanalyzed systems interactions. In this event, the water from the fire-suppression deluge system in the control room caused opening of a safety relief valve and loss of primary system inventory. The event could have been seriously aggravated by the spurious HPCI turbine high exhaust pressure trip that was received, also apparently as a result of the water intrusion. Because the RCIC system was inoperable at the time of the event, no safety-related high pressure injection system would have been immediately available to restore water level should that have been necessary. The HPCI turbine trip signal was reset shortly after it occurred, however, and the system was returned to operability.

Perhaps more serious is the potential effect the water could have had on numerous other safety systems. The ATTS panels have permissive and arming logic and trip logic for various safety systems, as well as water level inputs to the HPCI, RCIC, core spray (CS), automatic depressurization system (ADS), residual heat removal (RHR) system, and diesel activation logic. It is hard to predict the anomalous behavior that could occur if both power supplies had been lost, or if other portions of the logic had been shorted; but quite possibly, several safety systems could have malfunctioned, seriously handicapping the operators during their efforts to stabilize the unit.

Prior to this event, no procedures were in place at Hatch Unit 1 for adequately cleaning the ventilation plenums or drains in the charcoal filter units. Had these procedures been prepared and implemented, the drains would have functioned as designed with no serious adverse effects. In response to this event, the licensee cleaned and inspected drains in the remaining filter units and is preparing cleanout and inspection procedures to be added to the maintenance schedules.

Another example of a design feature which could cause potential adverse system interactions was recently found at Unit 1 of the South Texas Project. A non-seismic, non-category I potable water line was found to pass through the control room envelope via a relay room next to the control room. This could subject the solid-state protection system cabinets and the Westinghouse 7300 process control system located nearby to water damage following a seismic event. Although this unit is under construction, it does point out that these problems can occur.

Also, IE Information Notice 83-41, "Actuation of Fire Suppression System Causing Inoperability of Safety Related Equipment," was issued on June 22, 1983. That notice identified a number of instances in which automatic actuation of fire suppression systems degraded or jeopardized the operability of safety-related equipment.

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

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact: David R. Powell, IE
(301) 492-8373

Attachment: List of Recently Issued IE Information Notices

Attachment 1
IN 85-85
October 31, 1985

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-84	Inadequate Inservice Testing Of Main Steam Isolation Valves	10/30/85	All power reactor facilities holding an OL or CP
85-83	Potential Failures Of General Electric PK-2 Test Blocks	10/30/85	All power reactor facilities holding an OL or CP
85-82	Diesel Generator Differential Protection Relay Not Seismically Qualified	10/18/85	All power reactor facilities holding an OL or CP
85-81	Problems Resulting In Erroneously High Reading With Panasonic 800 Series Thermoluminescent Dosimeters	10/17/85	All power reactor facilities holding an OL or CP and certain material and fuel cycle licensees
85-80	Timely Declaration Of An Emergency Class Implementation Of An Emergency Plan, And Emergency Notifications	10/15/85	All power reactor facilities holding an OL or CP
85-17 Sup. 1	Possible Sticking Of ASCO Solenoid Valves	10/1/85	All power reactor facilities holding an OL or CP
85-79	Inadequate Communications Between Maintenance, Operations, And Security Personnel	9/30/85	All power reactor facilities holding an OL or CP; research and nonpower reactor facilities; fuel fabrication and processing facilities
85-78	Event Notification	9/23/85	All power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit