

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

November 19, 1985

IE INFORMATION NOTICE NO. 85-89: POTENTIAL LOSS OF SOLID-STATE INSTRUMENTATION  
FOLLOWING FAILURE OF CONTROL ROOM COOLING

Addressees:

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

Purpose:

This information notice is to alert recipients of a potentially significant problem involving the loss of solid-state instrumentation following the failure of control room cooling. Actions taken by the licensee to mitigate the event also are discussed. It is expected that recipients will review this information for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On June 4, 1984, both units of the McGuire Nuclear Station were operating at 100% power with one of the two main control room ventilation units out of service for maintenance. At 8:02 p.m., the remaining chiller tripped on low oil level resulting in a total loss of main control room cooling. At approximately 8:45 p.m., as the control room temperature increased, numerous alarms on Unit 1 high reactor coolant loop C Tave were received, as well as alarms on Unit 1 pressurizer level. Attempts to restore the air conditioning were unsuccessful and at 9:00 p.m. the air conditioning was declared inoperable. At 10:00 p.m., the operators opened the doors between the control room and the computer room, which still had cooling available. Operators also opened the doors of the Westinghouse PCS 7300 cabinets, which contain the solid-state circuit cards generating the alarms. The licensee then used portable fans with ducting to provide cooling from the computer room to the PCS 7300 cabinets.

The required technical specification power reduction was started at 10:05 p.m. and terminated at 10:55 p.m. when one of the air conditioning units was returned to service. The solid-state instrumentation returned to normal following restoration of the air conditioning.

Discussion:

Before June 4, 1984, the McGuire Nuclear Station had experienced numerous printed solid-state circuit card failures with the Westinghouse PCS 7300 cabinets and associated solid-state protection system (SSPS). The card failures, which involved reactor trips and spurious instrument indications, were attributed, by the licensee, to overheating in the PCS 7300 cabinets. In some cases, the spurious instrumentation indications disappeared when adequate ventilation was provided to the cabinets; however, in other cases, continued erratic instrumentation indicated that the overheating had significantly shortened the life expectancy of the solid state components. The licensee also had previously reported that the air chillers develop oil level problems when loaded at less than full capacity. The heat load calculated during plant design was too large compared to the actual heat load resulting in oversized chillers.

Following the event, the licensee took temperature measurements inside the PCS 7300 cabinets and determined that with an ambient temperature of about 72°F the cabinets had internal temperatures of up to 125°F on the top rack. The McGuire operators estimate that the ambient temperature, during the event, reached 90°F before alternate cooling was provided. The licensee has rebalanced the airflow in the control area ventilation system to provide additional cooling to the PCS cabinets. Though the licensee's remedial actions to provide better normal cooling appear to have increased the reliability of the solid-state cabinets under design operating conditions, the safety concern following loss of all control room HVAC units remains.

The McGuire operators, alerted by prior experience, took prompt action to provide alternate cooling to the solid-state equipment during the event. Without such action, the possible loss of some instrumentation and erratic instrument readings may have made it difficult to bring the plant to a safe condition, such as hot shutdown. If no control room cooling is available to the solid-state cabinets, it may not be prudent to delay in going to a hot shutdown condition even though the plant technical specifications may allow appreciable time to achieve the shutdown. The failure rate of the instrumentation can be expected to increase as the control room temperature increases and the erratic instrumentation may cause a reactor trip at the same time that the instrumentation is unreliable or unavailable to assist the operators.

Loss of all control room cooling may be more likely than previously thought. In addition to the McGuire event, there has been recent identification of other reported possible common-mode HVAC failures at Browns Ferry and Limerick. Therefore, licensees should be alert for the possibility of the loss of control room cooling and the impact this may have on their solid-state instrumentation.

IN 85-89  
November 19, 1985  
Page 3 of 3

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

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

Technical Contact: James Stewart, IE  
(301)492-9061

Attachment: List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED  
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-88	Licensee Control Of Contracted Services Providing Training	11/18/85	All power reactor facilities holding an OL or CP
85-87	Hazards Of Inerting Atmospheres	11/18/85	All power reactor facilities holding an OL or CP; and fuel facilities
85-86	Lightning Strikes At Nuclear Power Generating Stations	11/5/85	All power reactor facilities holding an OL or CP
85-85	Systems Interaction Event Resulting In Reactor System Safety Relief Valve Opening Following A Fire-Protection Deluge System Malfunction	10/31/85	All power reactor facilities holding an OL or CP
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

OL = Operating License  
CP = Construction Permit