

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, DC 20555-0001

March 11, 2009

NRC INFORMATION NOTICE 2009-03: SOLID STATE PROTECTION SYSTEM CARD
 FAILURE RESULTS IN SPURIOUS SAFETY
 INJECTION ACTUATION AND REACTOR TRIP

ADDRESSEES

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and who have certified that fuel has been permanently removed from the reactor vessel, as well as licensees and certificate holders of nuclear fuel cycle facilities.

PURPOSE

The Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of an event at North Anna Power Station, Unit 2, involving a solid state protection system (SSPS) card failure that resulted in a spurious actuation of the "B" train safety injection (SI) and a reactor trip. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

On June 29, 2007, North Anna Power Station, Unit 2, experienced a spurious actuation of the "B" train SI caused by a Zener diode failure on a "B" train SSPS card. The spurious SI caused main feedwater system isolation, a turbine trip, and a reactor trip, along with emergency core cooling system water flow into the reactor coolant system (RCS). Because of the nature of the failure, the licensee could not reset from the control room the actuation signal for some "B" train SI equipment, which resulted in overfilling the pressurizer and multiple actuations of a pressurizer power-operated relief valve (PORV) to limit RCS pressure. RCS inventory from the PORV discharged to the pressurizer relief tank (PRT), rupturing one of the PRT rupture disks, which allowed RCS water to reach the containment basement.

Plant personnel successfully defeated the malfunctioning SI logic train and terminated the SI. The licensee reset and deenergized the malfunctioning "B" train SI logic by placing the SSPS into TEST, locally delatching some relays, and deenergizing the circuit by pulling fuses. Procedures did not address manually resetting the partial SI in the presence of the SSPS card failure. The SSPS card failure was mitigated by securing and resetting the SI signal using operator knowledge and the information in several different procedures that were not specifically developed to address the inability to reset a SI signal.

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The licensee determined that the most probable cause of the diode failure on the “B” train SSPS card was either age-related degradation or a random failure. The diode failed as a short circuit actuating certain “B” train master relays and resulting in the invalid actuation of the “B” train SI. This same failure also prevented “B” train SI from being reset from the control room, which required operations and maintenance staff to take local actions. A contributing cause of the failure was that the licensee had not implemented a program to detect and correct age-related degradation of the SSPS cards.

Licensee corrective actions for this event included (1) establishing a preventive maintenance program to remove, test, and repair these cards, along with cards in other sensitive systems, at periodic intervals, (2) developing an abnormal operating procedure to reset SI locally, and (3) implementing life-cycle management for SSPS cards.

Additional information is available in the document “North Anna Power Station – NRC Special Inspection Report 05000339/2007009,” dated August 27, 2007, which can be found on the NRC’s public Web site in the Agencywide Documents Access and Management System (ADAMS), under Accession No. ML072410359. See also North Anna Power Station, Unit 2, Licensee Event Report 50-339/2007-003-00, dated August 27, 2007 (ADAMS Accession No. ML072480671).

DISCUSSION

The SSPS card failure at North Anna resulted in a complicated reactor trip response that required manual actions outside the control room to secure SI flow and restore other equipment that actuated from the signal. This event revealed the lack of procedure guidance to reset the SI after SSPS card failure, which was an obstacle to mitigating the event. Power reactor licensees rely on circuit cards such as SSPS cards being operable in systems as specified in technical specifications. Industry operating experience shows that circuit cards are susceptible to age-related component failures. Power reactor licensees can address this by establishing periodic preventive maintenance of circuit cards. Similarly, licensees and certificate holders of fuel cycle facilities are required to perform inspection, testing, calibration, and maintenance of certain systems and components as delineated in applicable sections of Title 10 of the *Code of Federal Regulations*, Parts 70 and 76.

CONTACT

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contacts listed below or the appropriate project manager in the Office of Nuclear Reactor Regulation (NRR).

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Note: NRC generic communications may be found on the NRC public Web site, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.

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