UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

August 17, 2006

NRC INFORMATION NOTICE 2006-18: SIGNIFICANT LOSS OF SAFETY-RELATED ELECTRICAL POWER AT FORSMARK, UNIT 1, IN SWEDEN

ADDRESSEES

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

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to alert addressees of a significant incident that occurred at the Forsmark Nuclear Power Station, Unit 1 (Forsmark-1), in Sweden involving the loss of several safety-related electrical busses. It is expected that addressees 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

Forsmark-1 is a 1020 Megawatt electric boiling-water reactor designed by ASEA-Atom which began commercial operation in 1980. On July 25, 2006, a significant incident occurred at Forsmark-1 in which, through a complex series of events, a short circuit in the switchyard led to the loss of two out of the four trains of safety-related alternating current (AC) and direct current (DC) power due to a common mode failure. This event is significant in that it could have caused the common mode failure in all four trains and therefore, could have resulted in the loss of all four trains of safety-related AC and DC power.

The event began when an arc and a two phase short circuit occurred when a breaker was opened in the 400 kV switchyard to support maintenance. The electrical transient dropped the voltage to about 30 percent of nominal voltage and the unit was disconnected from the grid. In addition, the electrical transient caused a brief increase in voltage on the main generator. This sudden overvoltage caused two of the four electrical inverters to fail and consequently disabled two emergency diesel generators (EDGs) from powering the corresponding buses as expected. The remaining two EDGs were able to start automatically and provide power to the batteries.

The reactor successfully scrammed and all control rods inserted. The control room staff were challenged by the absence of control room indications associated with the two trains of power supply that were lost. The event was further complicated by the actuation of the containment spray and emergency cooling systems. After restoring power, the operators were able to secure the containment spray and emergency cooling systems.

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Investigation is currently in progress by the licensee for Forsmark-1 regarding the cause of the switchyard electrical transient and its resulting complex effects on the plant. The Swedish Nuclear Power Inspectorate categorized the event under the International Nuclear Event Scale (INES) as a level 2 event.

DISCUSSION

Abnormal overvoltage conditions from the grid or other sources could lead to failures of critical electrical and electronic components including electrical inverters unless they are protected. The sensitivity and the response of the components to overvoltage condition could vary depending upon the characteristics of the electrical transient and the source of the overvoltage. Capability to identify such potential vulnerabilities and preparations to implement compensatory actions could reduce the challenges for the control room operators.

CONTACT

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

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