

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

July 10, 1985

IE INFORMATION NOTICE NO. 85-51: INADVERTENT LOSS OR IMPROPER ACTUATION
OF SAFETY-RELATED EQUIPMENT

Addressees:

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

Purpose:

This information notice is provided to alert licensees of potentially significant reactor safety problems that may be a byproduct of the normal practice of removing fuses or of opening circuit breakers for personnel protection during maintenance and plant modification activities. The reactor safety concern may result when the effects of electrical power interruption on all circuits powered by the fuse or breaker are not fully reviewed in advance. Errors in the review have resulted in unknowingly disabling safety systems and also have caused inadvertent actuation of safety systems. It is suggested that recipients review this information for applicability to their facilities and consider actions, if appropriate, to preclude similar problems 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:

At Susquehanna Unit 2 on July 9, 1984 with the plant at approximately 20% of full power electricians removed two dc-control power fuses for personnel protection during modifications involving the core spray isolation logic. The electricians believed that removing these fuses would provide the nearest local blocking-point protection needed while performing the modification. However, the fuses that were removed were considerably "upstream" of the local blocking point and the following situations resulted from this improper action:

1. Signals to start the pumps and position valves for the A loop of the core spray system were lost.
2. One of the diesel generators would not have received a "Start" signal from the Division 1 core spray logic that is provided for a loss-of-coolant accident (LOCA) condition associated with Unit 2.

3. The A and C instrumentation channels, sensing reactor water level and drywell pressure, were made inoperable. Because of this, the residual heat removal system and high pressure injection system would not have received an actuation signal from those channels in the event of an accident. However, the B and D channels remained functional.
4. A partial isolation signal for drywell cooling was generated.
5. The load shedding feature of the A and C 4160 V ac essential buses associated with Units 1 and 2 were disabled, and the instrument air compressors for Unit 2 would not have tripped if a LOCA condition had existed for Unit 2.

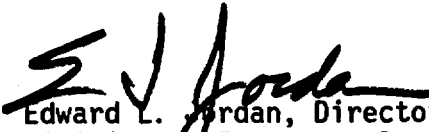
As a result of this event, the licensee instituted training sessions for personnel. The training sessions emphasized review and analysis of the circuits involved in all current and future construction work orders at the Susquehanna facility and included a human factors analysis focusing on the adequacy of the status switch features for the corespray system and other safety-related systems.

Discussion:

Following the event at Susquehanna Unit 2, the NRC conducted a search for other licensee event reports (LERs) from 1981 through 1984 that had similar cause and effect. This search resulted in the identification of five additional events which may be indicative that the problem is widespread. The events described in these reports are briefly summarized in Attachment 1. The event described above and those summarized in Attachment 1 illustrate how the practice of removing fuses may result in actuation or disabling of safety-related equipment during any mode of plant operation. At the time the fuses were removed, the involved plant personnel were unaware of the resulting actuation and inoperabilities. Similar situations could occur when electrical circuits are de-energized by operating circuit breakers for personnel protection.

The practice of de-energizing circuitry in order to provide plant personnel with appropriate protection is unavoidable. Corrective and preventive actions by licensees have emphasized the following items: identification of effects on plant equipment or systems, independent verification of the evaluation of effects, and utilization of the nearest local fuse or circuit breaker to minimize the number of systems affected.

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: V. D. Thomas, IE
(301) 492-4755

Attachments:

1. Earlier Events Similar to the One at Susquehanna
2. List of Recently Issued IE Information Notices

EARLIER EVENTS SIMILAR IN NATURE TO THE ONE
AT SUSQUEHANNA

Surry Station, September 1981

In this event, an electrician was attempting to remove a battery in the plant's smoke detector system. The electrician did not wish to leave energized wiring exposed and therefore he removed a line fuse. This action disabled the smoke detector panel that provides early detection of fires, thereby introducing the potential for damage of safety-related equipment.

The licensee attributed the cause of this event to personnel error in that the electrician did not realize that removing the line fuse would disable the smoke detector panel. Corrective action taken to prevent recurrence of this event was to revise the labeling of the smoke detector battery chargers and associated circuit panels with a caution tag.

Oyster Creek Station, December 1981

While performing maintenance activities to repair a faulty electromatic relief valve pressure switch, dc-control power fuses were removed, resulting in the inoperability of one trip system in the automatic depressurization system (ADS). The licensee reported that the cause of the loss of ADS trip system redundancy was the removal of the power fuses by plant personnel, without realizing the consequences on the ADS control logic circuitry. However, had a plant condition been present that required the operation of the ADS, the redundant trip system would have actuated the four remaining relief valves to depressurize the reactor system.

To prevent recurrence of this reportable occurrence, the licensee incorporated it in the required reading program for Shift Operations Supervisors and Instrument Department Personnel. Additionally, the power fuses that defeat the redundancy of the ADS have been identified with a warning label.

Sequoyah Unit 1, September 1982

This licensee reported that during modifications to train "B" of the solid-state protection system (SSPS), the power fuses were removed to facilitate work on the output relays. This caused the train "B" reactor heat removal (RHR) suction valve to close rendering that system inoperable. A review of the drawings associated with the SSPS showed that the power supply to the output relays also supplied power to a relay that operates the RHR suction valve. When this relay is de-energized, the valve automatically closes. The operator immediately returned the system to normal operating conditions.

A change was made to the facility work plan covering SSPS modification to inform operators that removal of the power fuses isolates the associated train of the RHR suction valve. The licensee also reports that caution signs were placed near the location of the fuses in the SSPS cabinets.

Diablo Canyon Unit 1, May 1983

The event at Diablo Canyon Unit 1 during May 1983 was similar to the events discussed above, in that personnel at the plant removed power fuses to perform work activity. This action resulted in disabling of radiation monitoring equipment.

To prevent recurrence, plant personnel have been instructed to ensure that all effects on plant equipment are known and recognized before approving clearances for work activity.

Susquehanna Unit 1, April 1984

This earlier event at Susquehanna Unit 1 also was caused by removing power fuses for personnel protection. Plant personnel removed two fuses associated with the primary containment isolation logic for Unit 2 to perform a modification for the logic circuitry. This resulted in the actuation of a false high drywell pressure signal, which, in turn, actuated the common control room emergency outside air supply and standby gas treatment systems. The licensee later discovered that an improperly placed wire jumper in conjunction with fuse removal actually caused the false actuation. Subsequently, the wire jumper was installed properly.

To prevent recurrence of this event, the subject work activity and associated wiring error were reviewed with the work crew involved. During this review the licensee also instructed personnel to review and verify circuitry before de-energizing power sources to equipment scheduled for maintenance or modification.

LIST OF RECENTLY ISSUED
 IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-50	Complete Loss Of Main And Auxiliary Feedwater At A PWR Designed By Babcock & Wilcox	7/8/85	All power reactor facilities holding an OL or CP
85-49	Relay Calibration Problem	7/1/85	All power reactor facilities holding an OL or CP
85-48	Respirator Users Notice: Defective Self-Contained Breathing Apparatus Air Cylinders	6/19/85	All power reactor facilities holding an OL or CP, research, and test reactor, fuel cycle and Priority 1 material licensees
85-47	Potential Effect Of Line-Induced Vibration On Certain Target Rock Solenoid-Operated Valves	6/18/85	All power reactor facilities holding an OL or CP
85-46	Clarification Of Several Aspects Of Removable Radioactive Surface Contamination Limits For Transport Packages	6/10/85	All power reactor facilities holding an OL
85-45	Potential Seismic Interaction Involving The Movable In-Core Flux Mapping System Used In Westinghouse Designed Plants	6/6/85	All power reactor facilities holding an OL or CP
85-44	Emergency Communication System Monthly Test	5/30/85	All power reactor facilities holding an OL
85-43	Radiography Events At Power Reactors	5/30/85	All power reactor facilities holding an OL or CP

OL = Operating License
 CP = Construction Permit