

James A. FitzPatrick
Nuclear Power Plant
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Harry P. Salmon, Jr.
Resident Manager

February 25, 1993
JAFP-93-0109

United States Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: 93-002-00 - Identification of
Relay Room Ventilation System
Single Failure Non-Compliance

Dear Sir:

This report is submitted in accordance with 10CFR50.73(a)(2)(ii)(B).

Questions concerning this report may be addressed to Mr. David
Holliday at (315) 349-6359.

Very truly yours,

A handwritten signature in dark ink, appearing to read 'Harry P. Salmon, Jr.'.

HARRY P. SALMON, JR.

HPS:DAH:tld

Enclosure

cc: USNRC, Region I
USNRC Resident Inspector
INPO Records Center

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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 600 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TITLE (4) Identification of Relay Room Ventilation System Single Failure Non-Compliance																	
EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)								
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES				DOCKET NUMBER(S)				
0 1	2 7	9 3	9 3	0 0 2	0 0 0	2 2	6 9	2					0 5 0 0 0				
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 2. (Check one or more of the following) (11)															
N																	
POWER LEVEL (10)		20.402(b) 20.405(c) 50.73(a)(2)(i) 73.71(b)															
0 0 0		20.405(a)(1)(i) 50.36(a)(1) 50.73(a)(2)(i) 73.71(c)															
		20.405(a)(1)(ii) 50.36(a)(2) 50.73(a)(2)(ii) OTHER (Specify in Abstract below and in Text, NRC Form 366A)															
		20.405(a)(1)(iii) 50.73(a)(2)(i) 50.73(a)(2)(iii)(A)															
		20.405(a)(1)(iv) 50.73(a)(2)(ii) 50.73(a)(2)(iii)(B)															
		20.405(a)(1)(v) 50.73(a)(2)(iii) 50.73(a)(2)(iv)															
LICENSEE CONTACT FOR THIS LER (12)																	
NAME Mr. David Holliday, Senior Licensing Engineer										TELEPHONE NUMBER							
										AREA CODE 3 1 5 3 4 9 7 6 3 5 9							
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																	
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC								
SUPPLEMENTAL REPORT EXPECTED (14)										EXPECTED SUBMISSION DATE (15)		MONTH		DAY		YEAR	
YES (If yes, complete EXPECTED SUBMISSION DATE)										NO							

ABSTRACT (Limit to 1800 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

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The plant was operating at 32 percent power approximately 17 days after ending an extended outage. In 1980 an additional relay and an interlock circuit was added between the Relay Room carbon dioxide fire suppression (CARDOX) system [KQ] and the Relay Room [NA] Ventilation System [VI] as part of a modification recommended by Branch Technical Position (BTP) APCSB 9.5-1, Appendix A (Guidelines for Fire Protection for Nuclear Power Plants). On 1/25/93, during a design effort to modify the ventilation system, Engineering determined there was a potential non-conformance in the existing ventilation system control circuit violating the single failure criterion in that a spurious actuation of components in the CARDOX control system could result in shutdown of redundant fans and dampers in the ventilation system. The non-conformance was verified by Engineering on 1/27/93. James A. FitzPatrick Operations and the NRC Resident Inspector were notified the same day. Alarm Response Procedures were revised on 2/3/93 to take compensatory actions upon spurious actuation. A Reasonable Assurance of Safety to continue operation was prepared and approved on 2/4/93. The cause of the condition has been determined to be design error (Cause Code B) by the engineers involved in the BTP-9.5-1, Appendix A interlock modification in 1980.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

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Description

The plant was operating at 32 percent power approximately 17 days after ending an extended outage. On January 25, 1993, during a design effort to modify the Relay Room [NA] Ventilation System [VI], Engineering determined there was a potential non-conformance in the existing ventilation system control circuit violating the single failure criterion described in IEEE Standard 279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations. A description of the ventilation system design basis and a short chronology follows:

The Relay Room Ventilation System operates independent of other plant heating, air conditioning and ventilation services and ensures uninterrupted operation during normal, shutdown, and design basis accident (DBA) conditions. The Relay Room is served by two full capacity redundant units each consisting of air handling-cooling units, recirculation exhaust fans, and dampers. During a DBA, the Relay Room outside air intake and exhaust butterfly valves are closed (either remotely from the Control Room or manually in the ventilation Equipment Room) and the recirculation exhaust fans operate in the recirculation mode only.

The safety-related functions of the ventilation system are to:

- (a) manually shut outside air intake and exhaust butterfly valves based upon intake duct radiation or Control Room radiation,
- (b) to cool the Relay Room using air handling units fed from the Emergency Service Water System [BI], and
- (c) to provide ventilation using recirculation exhaust fans.

In 1980 an additional relay and an interlock circuit was added between the Relay Room carbon dioxide fire suppression (CARDOX) system [KQ] and the ventilation system as part of a modification recommended by Branch Technical Position APCSB 9.5-1, Appendix A (Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976), dated August 23, 1976, Section D.4(i) and committed to in the James A. FitzPatrick Fire Protection Review Safety Evaluation Report, dated August 1, 1979. The 1980 modification implemented an automatic isolation of the Relay Room Ventilation System (to stop the air handling unit exhaust fans and close their associated dampers) upon CARDOX initiation so that the CO₂ concentration would be maintained.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENT'S REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

On January 25, 1993, during a design effort to modify the Relay Room Ventilation System, Engineering determined there was a potential non-conformance in the existing ventilation system control circuit violating the single failure criterion. The non-conformance was confirmed by Engineering on January 27, 1993. James A. FitzPatrick Operations and the NRC Resident Inspector were notified the same day. Alarm Response Procedures were revised on February 3, 1993, to take compensatory actions upon spurious actuation. A Reasonable Assurance of Safety to continue operation was prepared and approved on February 4, 1993.

A concern is that spurious discharge of the Relay Room carbon dioxide fire suppression (CARDON) system [KQ], or misoperation (seismic or electrical) of a single motorized cam switch (TM) or a relay (PE1 - an electro-mechanically latching relay with mercury wetted contacts) in the CARDON control system could result in shutdown of redundant fans and dampers in the Relay Room Ventilation System. The shutdown of the ventilation system would result in isolation of the Relay Room, and a resultant increase in temperature due to the heat load of the local equipment.

Cause

The cause of the condition has been determined to be design error (Cause Code B) by the engineers involved in the BTP-9.5-1, Appendix A interlock modification in 1980. The error was not providing adequate independent control circuits so that separation between redundant ventilation systems and the non-safety related CO₂ system could be maintained.

Analysis of Event

This event is reportable under the provisions of 10CFR50.73 (a)(2)(ii)(B) since the circuits did not meet the design bases, specifically the single failure criteria. The control circuitry and equipment configurations in the existing ventilation system design have been reviewed considering the safety functions of the system. The original Relay Room CARDON Control Panel (76CO2-PNL4) and the auxiliary panel (76CO2-PNL4X) added in 1980 were designed, purchased and installed to withstand design basis seismic events. The panels are listed as QA Category M (non-safety-related), seismic class 1 in the Master Equipment List.

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

The potential non-conformances in the existing ventilation system design are specifically as follows:

- 1) Both Relay Room CARDOX Control Panels (76CO2-PNL4 and 76CO2-PNL4X) are supplied with a single, common, 125VDC source of power.
- 2) The electro-mechanical relay PE1 (76CO2-PNL4) is actuated by either a push-button switch located on the fire protection panel or by a pneumatic pressure release plunger actuated by CO₂ manual discharge.
- 3) A mercury wetted contact from PE1 is used to actuate auxiliary relay PE2 (76CO2-PNL4X). PE1 and PE2 contacts interlock with control circuits for the Relay Room ventilation air handling units exhaust fans and their associated dampers, and an exhaust damper.
- 4) Contacts from PE1 are used to actuate Division II components, and contacts from PE2 are used to actuate Division I components. One exhaust damper remains open to allow air displaced by CO₂ to escape.

In accordance with the requirements of their safety-related functions discussed above, the fans, air-handling units, and dampers for Relay Room Ventilation System supply and exhaust ducts are safety-related circuits. However, the Relay Room CARDOX System is a non-safety-related system (consistent with the design requirements for fire protection systems). As such, a failure of the PE1 contacts during a Design Basis Accident (DBA), which may be assumed in single failure analysis, could result in the Relay Room Ventilation System failing to perform safety functions (b) and (c) described in the event description section. Furthermore, a failure of the non-safety-related CARDOX initiation circuit (push-button switch, timer, etc.) would result in a similar scenario by actuating the PE1 contacts.

A review of calculations associated with the total cooling load for the Relay Room indicate loss of ventilation would result in a maximum temperature rise of 1.55 degrees per minute, and a resultant maximum steady state temperature of 140 degrees.

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH T-4-3
INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD
COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS
AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR
REGULATORY COMMISSION, WASHINGTON, DC 20455, AND TO
THE PAPERWORK REDUCTION PROJECT (3150-0) OFFICE
OF MANAGEMENT AND BUDGET, WASHINGTON, D.C. 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

This rate of temperature rise would not prevent the safety related components in the Relay Room from performing their initial safety related functions in the event of a DBA. Thus, the postulated loss of the ventilation to the Relay Room would not be expected to cause any loss of safety related function or margin of safety in initially responding to a DBA.

Actuation of the CARDOX system or of relay PE1 would cause multiple alarms in the HVAC Equipment Room and the Control Room. Shutdown of the ventilation system would be sensed by low air flows to the Relay Room air handling units and indicated by an annunciator alarm in the Control Room.

The present design does not meet single failure criteria to satisfy the FSAR design basis for the Relay Room Ventilation System. However, it has been concluded that the plant can operate in a safe manner based upon the existing alarms, and implementation of Alarm Response Procedures which direct personnel to complete appropriate compensatory actions.

The existing alarms, slow temperature rise, and procedural compensatory actions provide a reasonable assurance of the ability to restore the Relay Room Ventilation System in a timely fashion.

The other areas protected by CARDOX were also reviewed for potential single failure of the CARDOX system interlock and potential affect on the associated ventilation system. Each of the areas is equipped with a single ventilation system, which is interlocked with a single CO₂ panel. Misoperation of any single device, including false mechanical operation, electrical fault, or physical actuation of a single switch would result in inoperability of the single ventilation system for each particular area. The panels are fed from a 125V DC system, but the systems require power to actuate the interlocks. Therefore, although a single failure could negate the interlock feature for multiple rooms, no single electrical failure could shut off the ventilation for more than one associated area.

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TEXT (If more space is required, use additional NRC Form 386A's) (17)

Corrective Actions

1. Design control procedures have been developed based on Regulatory Guide 1.64-1973 and ANSI-N45.2.11-1974, Quality Assurance Requirements for Design of Nuclear Power Plants, which include design input summary checklists and guidelines for independent review to ensure that failure effects, redundancy, diversity, and separation requirements are considered and incorporated into the design of modifications. Completed: April, 1989.
2. Alarm Response Procedures were revised to direct operating personnel to complete certain compensatory actions, such as resetting the PE1 relay and ventilation dampers, upon a spurious actuation of the CARDOX system or the PE1 relay. Completed: February 3, 1993.
3. A Reasonable Assurance of Safety evaluation was prepared and approved addressing continued plant operation. Completed: February 4, 1993.
4. An evaluation will be completed to determine the need (if any) for long term resolutions. Completion Date: April 1, 1993.

Additional Information:

Failed Component: None

Similar Events: No other LERs concerning violation of single failure criteria have been submitted.