

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

October 17, 1994
JAFP-94-0500

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

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: LER-94-006:

EQ Concerns Possibly Affecting Safety Related
Electrical Switchgear in the Turbine Building

Dear Sir:

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

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

Very truly yours,

HARRY P. SALMON, JR.

HPS:DAH:tlc

Enclosure

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

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LICENSEE EVENT REPORT (LER)

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH
THIS INFORMATION COLLECTION REQUEST: 50.0 HRS.
FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO
THE INFORMATION AND RECORDS MANAGEMENT BRANCH
(MNNB 7714), U.S. NUCLEAR REGULATORY COMMISSION,
WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK
REDUCTION PROJECT (3150-0104), OFFICE OF
MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)
James A. FitzPatrick Nuclear Power Plant

DOCKET NUMBER (2)
05000333

PAGE (3)
01 OF 07

TITLE (4)
EQ Concerns Possibly Affecting Safety Related Electrical Switchgear in the

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 NAME N/A	DOCKET NUMBER 05000	
09	16	94	94	006	00	10	17	94	FACILITY NAME N/A	DOCKET NUMBER 05000	
OPERATING MODE (9)		N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
POWER LEVEL (10)		75	20.402(b)			20.405(c)			50.73(a)(2)(iv)		73.71(b)
			20.405(a)(1)(i)			50.36(c)(1)			50.73(a)(2)(v)		73.71(c)
			20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vii)		OTHER
			20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(viii)(A)		
			20.405(a)(1)(iv)			X	50.73(a)(2)(ii)			50.73(a)(2)(viii)(B)	
			20.405(a)(1)(v)			50.73(a)(2)(iii)			50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME, Mr. David Holliday, Senior Licensing Engineer

TELEPHONE NUMBER (Include Area Code)
(315) 349-6359

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)			
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On 09/16/94, the plant was operating at 75 percent power in a steady state condition. Engineering discovered two incorrect assumptions in two EQ Program analyses performed in 1981. One assumption was that two safety-related electrical switchgear rooms located within the Turbine Building were "sealed". A recent walkdown revealed ventilation openings which could provide a path for steam to enter the two rooms during a high energy line break (HELB) in the Turbine Building or a Main Steam Line Break (MSLB) in the Steam Tunnel. The second assumption was that no safety-related components required to mitigate a HELB or MSLB were located in the Turbine Building (except for those located within the "sealed" rooms). One ventilation control panel in the Turbine Building contains controls for safety-related unit cooler fans in one of the two switchgear rooms. Plant operators closed three fire dampers, essentially "sealing" the two rooms while not degrading room cooling or fire protection. Cooling equipment for the switchgear room associated with the exposed control panel was declared inoperable for a short while, resulting in a seven day shutdown LCO. Control circuits were isolated from the exposed control panel early the next day (09/17/94), allowing an exit from the LCO. An action plan was developed to determine and implement short term and long term resolutions. The cause was determined to be personnel error.

LICENSEE EVENT REPORT (LER)

TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
James A. FitzPatrick Nuclear Power Plant	05000333	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	02 OF 07
		94	006	00	

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EVENT DESCRIPTION

On September 16, 1994, the plant was operating at 75 percent power in a steady state condition. Engineering had been reviewing analyses supporting the Equipment Qualification Program while performing corrective actions as a result of NRC Information Notice 92-52, Barriers and Seals Between Mild and Harsh Environments. On September 16, 1994, Engineering discovered that two incorrect assumptions were made in two EQ Program analyses performed by an architect engineering organization in 1981.

One assumption was that two safety-related electrical switchgear [EB] rooms located within the Turbine Building [NM] were "sealed". This assumption meant that no components in those rooms would be exposed to a harsh environment during a high energy line break (HELB) in the Turbine Building or a Main Steam Line Break (MSLB) in the Steam Tunnel. A recent walkdown revealed two Turbine Building Ventilation [VK] openings in the walls surrounding the two switchgear rooms that were not accounted for in the EQ Program analyses. Each of the openings has a fire damper which closes upon initiation of the carbon dioxide (CO₂) fire suppression system in its respective room. One additional normally open fire damper which could provide a path for steam to enter the two rooms during a HELB in the Turbine Building or a MSLB was found during a subsequent drawing review.

The second assumption was that no safety-related components which might be needed during a HELB in the Turbine Building or a MSLB were located in the Turbine Building, except for those located within the "sealed" switchgear rooms. One ventilation control panel located in the Turbine Building contains electrical controls for safety-related cooling equipment in one of the two switchgear rooms. The control panel is located on the North wall just outside the switchgear room and could be exposed to the harsh HELB or MSLB environment, possibly affecting electrical circuits controlling unit cooler fans for the one switchgear room. The electrical controls for the unit cooler fans in the other switchgear room would not be affected by a HELB or MSLB because the controls are located in the Control Room [NA].

NRC FORM 366A (5-92)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
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TEXT CONTINUATION					
FACILITY NAME (1)		DOCKET NUMBER (2)	LER NUMBER (6)		PAGE (3)
James A. FitzPatrick Nuclear Power Plant		05000333	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
			94	006	00
03 OF 07					
TEXT (If more space is required, use additional copies of NRC Form 366A) (17)					
<u>DESCRIPTION (continued)</u>					
<p>After discovering the incorrect assumptions, engineering evaluated if there would be any adverse affect on the ventilation system or fire protection system in two electrical switchgear rooms if the three fire dampers in the ventilation ducts leading into those rooms were manually closed. This action would essentially "seal" the two switchgear rooms and isolate them from the Turbine Building environment. Engineering determined that the fire dampers and ventilation ductwork were structurally sound; the heat removal capability was adequate; and the fire protection system would not be adversely affected. Engineering developed a temporary modification and, on the evening of the day of the discovery (September 16, 1994), the three fire dampers were manually closed by plant operators.</p> <p>Since the controls for the safety-related cooling equipment in the one electrical switchgear room could not be readily isolated from the Turbine Building environment, the cooling equipment for the one switchgear room associated with the exposed control panel was declared inoperable for a short while, resulting in a seven day shutdown LCO. Engineering developed a temporary modification and the safety-related unit cooler fan control circuits were isolated from the exposed ventilation control panel by plant operators early the next day (September 17, 1994), allowing an exit from the LCO.</p> <p>An action plan has been developed to determine and implement short term and long term resolutions and to ensure no other safety-related equipment is adversely affected.</p>					
<u>EVENT CAUSE</u>					
<p>The cause of this condition appears to be personnel error (Cause Code A) by engineering organizations in 1981.</p> <p>The condition was discovered by site engineering while reviewing analyses supporting the Equipment Qualification Program. These reviews were recommended corrective actions as a result of evaluating NRC Information Notice 92-52, Barriers and Seals Between Mild and Harsh Environments. The corrective actions involved reviewing EQ Program analyses, beginning with key safety-related areas (such as the Reactor Building [NG]) first.</p>					

LICENSEE EVENT REPORT (LER)

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MHBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)		DOCKET NUMBER (2)		LER NUMBER (6)			PAGE (3)
James A. FitzPatrick Nuclear Power Plant		05000333		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	04 OF 07
				94	006	00	

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

ANALYSIS

The EQ Program related condition was reportable under the provisions of 10CFR 50.73 (a)(2)(ii)(B) since the condition appeared to be outside the plant design basis. Specifically, certain electrical components located in the electrical switchgear rooms in the Turbine Building may not have been able to perform their intended safety-related functions during a HELB in the Turbine Building or a MSLB in the Steam Tunnel.

After the discovery of the incorrect assumptions, two temporary modifications were prepared to close the fire dampers and isolate the unit cooler fan control circuits. An analysis was prepared by engineering which evaluated the continued operation of the plant until the effects of the HELB or MSLB on the subject components could be evaluated further. The analysis, which was approved on September 24, 1994, showed that isolating the switchgear rooms from the Turbine Building ventilation system would not adversely affect the safety-related components or the fire protection system inside those rooms. The analysis also showed that no other components needed to mitigate a HELB in the Turbine Building or a MSLB would have been subjected to a harsh environment, except for the unit cooler fan controls on the one ventilation control panel.

The analysis summarized the effects of the postulated HELB. The Turbine Building HELB scenarios contained in the 1981 analyses postulated a maximum pressure in the areas near the Electric Bays of 0.7 psi. This is based on assumptions that automatic isolations of the large breaks would occur within 60 seconds or less, manual isolations would occur within ten minutes for smaller breaks, and the smoke vents in the Turbine Building roof and the Turbine Building exterior wall panel leakage would limit the Turbine Building interior space pressure to this value. The pressure spike for all breaks would be reached and decay within 20 seconds following the break.

To support the analyses, the three fire dampers, the floor drain piping in the switchgear rooms, and the ventilation ducts that passed through the switchgear rooms required further evaluation of their ability to withstand the short pressure spikes associated with a HELB in the Turbine Building or a MSLB. The evaluations concluded:

- a. Three fire dampers would form a pressure boundary between the Turbine Building and the switchgear room atmosphere. These fire dampers will prevent the steam from passing through openings in the walls into those rooms. An Engineering analysis confirmed the structural integrity of the fire dampers.

LICENSEE EVENT REPORT (LER)

TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
James A. FitzPatrick Nuclear Power Plant	05000333	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	05 OF 07
		94	006	00	

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

ANALYSIS (Continued)

- b. The floor drain system was evaluated and the results concluded that the small size and long length of the drain pipe, combined with the relatively short duration of the most limiting HELB, would not create a harsh environment in the switchgear rooms. It would be unlikely that steam would come back up through the drain pipe system.
- c. Several ventilation ducts from the Turbine building pass through the switchgear rooms without communicating with the air space in those rooms. The concern was the integrity of this ductwork due to the elevated pressure in the Turbine Building. A review of plant documents and design standards shows the sheetmetal ducts in the Turbine Building and two switchgear rooms to be high velocity, high pressure ducts. In addition to meeting the design standards, the original purchase specification required the ductwork wall thickness be increased by two gages. The two gage thickness increase provides more rigidity and increased air tightness. The ducts in the two switchgear rooms are seismically supported, with shorter spans between supports. It was concluded the ducts would maintain their integrity throughout the most limiting pressure transient.

When the incorrect assumptions were discovered, there was also a concern at that time that not all safety-related electrical equipment required to mitigate a HELB in the Turbine Building or a MSLB had been analyzed to withstand a harsh environment. Subsequent research and evaluations proved that all the required components had been analyzed, except for those on the one exposed ventilation control panel. This concern has been resolved and is no longer valid.

Further analyses will be performed to evaluate the environmental conditions in the switchgear rooms prior to September 16, 1994, with the fire dampers open and the rooms partially exposed to the Turbine Building HELB or MSLB environment. Preliminary discussions with ventilation engineers indicate the two switchgear rooms would not be subjected to the full extent of the harsh environment of the Turbine Building. The small size of the ventilation openings, the relatively short duration of the transient (20 seconds), the large size and normally cool temperature of switchgear rooms before the HELB, and the fact that the normal air supply is drawn from outside the Turbine Building would tend to limit the steam excursion into the two switchgear rooms.

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TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
James A. FitzPatrick Nuclear Power Plant	05000333	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	06 OF 07
		94	006	00	

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

ANALYSIS (continued)

The exposed ventilation control panel is a standard electrical enclosure. Although drip proof, some penetration of humid air is probable. Subsequent condensation of the HELB or MSLB steam after the Turbine Building cooled off could possibly cause short circuits, most probably occurring some time after the steam break had been isolated. Total failure of both unit cooler fan control circuits for the one switchgear room would be even less likely. In any case, heat buildup in the switchgear rooms would be slow enough to allow operators to shut off excess loads and reduce the heat loading. The controls for the unit cooler fans in the redundant switchgear room would remain unaffected since they are located in the Control Room.

The major safety-related components required to mitigate a HELB or a MSLB which might have been adversely affected include 600 volt circuit breakers and associated control circuits for the following:

- 71-12506 Feeder to Motor Control Centers 252 & 254
- 71-12508 Feeder to Motor Control Centers 251 & 253
- 71-12510 Emergency Service Water [BI] Pump "A" Motor
- 71-12606 Feeder to Motor Control Centers 262 & 264
- 71-12608 Feeder to Motor Control Centers 261 & 263
- 71-12610 Emergency Service Water Pump "B" Motor
- 71MCC-251 West Electrical Switchgear Room Unit Cooler Fans
- 71MCC-252 Emergency Service Water "A" Isolation Valves
Safety Related Pump Room "A" [MK] Exhaust Fans
- 71MCC-262 Emergency Service Water "B" Isolation Valves
Safety Related Pump Room "B" Exhaust Fans
East Electrical Switchgear Room Unit Cooler Fans

In conclusion, based on preliminary reviews, the safety consequences appear to be minimal due to the short duration of the pressure spikes and the small openings into the switchgear rooms. Any detrimental effects of the steam or condensation on the above components would most likely occur after most of the initial mitigating actions, including steam line isolation, have been performed.

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TEXT CONTINUATION

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
James A. FitzPatrick Nuclear Power Plant	05000333	94	006	00	07 OF 07

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

CORRECTIVE ACTIONS

1. An event such as this is less likely to occur today due to the additional administrative controls which have been implemented since the 1981 EQ Program analyses were performed. The plant has an on-site EQ Program administrator who evaluates components and their environmental qualifications. This continuous, on-site administration was instrumental in reviewing the NRC Information Notice, determining corrective actions, comparing the assumptions in the original analyses with information obtained through plant walkdowns and other sources, and identifying the inaccurate assumptions made in the original 1981 analyses.
2. A temporary modification was prepared and the three fire dampers were closed on September 16, 1994, essentially "sealing" the two switchgear rooms. Another temporary modification was prepared and the unit cooler fan control circuits were isolated on September 17, 1994.
3. An engineering analysis was prepared and approved on September 24, 1994 to determine the effect of the deviation on nuclear safety, to document the deviation, and to justify plant operation with the fire dampers closed and the unit cooler fan control circuits bypassed.
4. An action plan was prepared and issued on September 16, 1994 to perform further reviews, to analyze the effects of the postulated HELBs on the switchgear rooms with the fire dampers open, to check other EQ program operating experiences, and to check other EQ program documents for similar concerns.
5. Further analyses will be performed to evaluate the environmental conditions in the switchgear rooms with the fire dampers open and the rooms partially exposed to the HELB or MSLB environments. Estimated completion date: February 17, 1995.

Additional Information

Failed Components: None

Previous Similar Events: None

Related Industry Experience: NRC Information Notice 92-52, Barriers and Seals Between Mild and Harsh Environments