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Michael J. Colomb
Plant Manager

August 22, 1996
JAFP-96-0323

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-96-009

Incorrect Time Delay Relay Installation for 'B'
Emergency Diesel Generator

Dear Sir:

This report was submitted in accordance with 10CFR50.73(a)(2)
(i).

There are no commitments associated with this report.

Questions concerning this report may be addressed to Mr. David
Burch at (315) 349-6311.

Very truly yours,

A handwritten signature in cursive script, appearing to read 'Michael J. Colomb'.

MICHAEL J. COLOMB

MJC:DEB:las

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

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NRC FORM 366 (4-95)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98 <small>ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 60.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20556-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.</small>	
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)					
FACILITY NAME (1) James A. FitzPatrick Nuclear Power Plant				DOCKET NUMBER (2) 05000333	
PAGE (3) 01 OF 06					
TITLE (4) Incorrect Time Delay Relay Installation for 'B' Emergency Diesel Generator					
EVENT DATE (5)			LER NUMBER (6)		REPORT DATE (7)
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
07	22	96	96	-- 009	-- 00
					MONTH DAY YEAR 08 22 96
OTHER FACILITIES INVOLVED (8)					
			FACILITY NAME N/A		DOCKET NUMBER 05000
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OPERATING MODE (9) N		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
		20.2201(b)		20.2203(a)(2)(v) <input checked="" type="checkbox"/>	
		20.2203(a)(1)		20.2203(a)(3)(i)	
		20.2203(a)(2)(i)		20.2203(a)(3)(ii)	
		20.2203(a)(2)(ii)		20.2203(a)(4)	
		20.2203(a)(2)(iii)		50.36(c)(1)	
		20.2203(a)(2)(iv)		50.36(c)(2)	
POWER LEVEL (10) 100				50.73(a)(2)(i) <input checked="" type="checkbox"/>	
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				50.73(a)(2)(v)	
				50.73(a)(2)(vii)	
				50.73(a)(2)(viii)	
				50.73(a)(2)(ix)	
				73.71	
				OTHER	
				Specify in Abstract below or in NRC Form 366A	
LICENSEE CONTACT FOR THIS LER (12)					
NAME Mr. David E. Burch, Senior Licensing Engineer				TELEPHONE NUMBER (Include Area Code) (315) 349-6311	
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)					
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
B	EK	MO	B076	N	
SUPPLEMENTAL REPORT EXPECTED (14)					
YES (If yes, complete EXPECTED SUBMISSION DATE).				X NO	
				EXPECTED SUBMISSION DATE (15)	
				MONTH DAY YEAR	
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)					
<p>On 7/22/96 at 2058 hours, with the plant operating at full power during the performance of surveillance testing, B Emergency Diesel Generator (EDG) failed to complete its startup sequence due to operation of its reverse power relay.</p> <p>Subsequent investigation revealed three Agastat relays in breaker cubicle 71-10602 were installed in incorrect locations, with the effect that the time delay for reverse power relay operation was reduced to 0.8 seconds (from a design value of 3.5 seconds). The governor booster pump for EDG D was also found to have failed. The combined effect of these two deficiencies led to the reverse power trip of EDG B.</p>					

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

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EVENT DESCRIPTION

On July 22, 1996, at 2058 hours, with the reactor operating at full power during the performance of surveillance testing, Emergency Diesel Generator (EDG) B [EK] failed to complete its startup sequence when the 71-10604 breaker, EDG B and D Tie Breaker, closed and immediately tripped. This was caused by operation of 93-32-1EDGB09, EDG B High Circulating Current Power Relay (reverse power relay). The reverse power relay becomes operational after a time delay established by 93-62-1EDGB12, EDG B High Circulating Current Interlock Relay.

During trouble shooting of the reverse power trip of EDG B it was determined that the wrong device was installed in the position which should have been occupied by relay 93-62-1EDGB12 since the as found time delay was 0.8 seconds, rather than the required 3.5 seconds. Subsequent investigation found three Agastat relays incorrectly located within breaker cubicle 71-10602, EDG B Feed to Emergency 4 KV Bus 10600. These relays were removed, calibrated and restored to their correct positions within the cubicle.

A meeting was held on July 23, 1996 to discuss the event and subsequent troubleshooting and corrective maintenance activities. From this, a plan of action was developed to ensure all equipment deficiencies had been identified and corrected prior to returning the system to service. Plant staff were concerned that the incorrect relay installation was not the sole cause of the failure to complete the starting sequence, since the pair, EDG B and EDG D had successfully started during numerous demands since 1990 (approximately 155 successful starts with the only other reverse power trip of EDG B having occurred in 1992). Subsequent testing demonstrated that startup time for EDG B was normal and approximately 0.5 second shorter than startup time for EDG D. Investigation revealed that 93GS-5D, EDG D Governor Booster Pump, had failed (the same component had been inoperable during the test in 1992 when EDG B tripped on reverse power). When this second problem was corrected, the EDGs were successfully post work tested and returned to service.

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EVENT CAUSE

The reverse power trip of EDG B is attributable to installation of the incorrect device for Agastat relay 93-62-1EDGB12 (a relay with a time delay of 0.8 second versus the design value of 3.5 second) in addition to failure of the governor booster pump for EDG D to operate.

The function of time delay relay 93-62-1EDGB12 is to inhibit the reverse power trip of EDG B during the period in which EDGs B and D, the pair of EDGs supplying 71-10600, 4160V Switchgear Distribution (Bus 10600), are being force paralleled (exchange of power between the machines is expected during the starting sequence and inhibition of the reverse power trip is required to ensure completion of force paralleling). Normal performance of this EDG pair has been such that they reach rated speed and voltage (so that no significant power is being exchanged) prior to the time delay relay timing out, so that reverse power trips of EDG B have not been observed during surveillance testing. When another fault has resulted in an abnormally slow starting sequence (two instances of failure of the governor booster pump for EDG D), the time delay relay has timed out while sufficient power was being exchanged to activate the reverse power relay to trip EDG B.

93-62-1EDGB12 was replaced by Modification D1-88-45 during early 1990. The controlling work document was Installation Specification, IS-E-07, Installation of Electrical Cable Terminations. One IS-E-07 Electrical Termination Summary Sheet was filled out for component numbers "93-62-1EDGB01 (RE), 93-62-1EDGB12 (RF), 93-52A-1EDGB01 (RJ)" for equipment number "10602." Identifications such as 93-62-1EDGB12 are the equipment identification in the Plant Equipment Database (PEDB), those such as "RF" are panel device numbers. Cable / Conductor numbers were then referred to by panel device location and conductor numbers (e.g., "RE-1, ZC-11"). The IS-E-07 Summary Sheet also lists an Applicable Wiring diagram (1.41-198F1-0, Wiring Diagram 4 KV Switchgear Breaker 10502 or 10602, in this instance). Review of drawing 1.41-198 showed that the PEDB to panel device linkages on the summary sheet were incorrect. Referring to drawing 1.41-198, component 93-62-1EDGB12 is assigned panel device number RE, 93-62-1EDGB01, EDG B Output Breaker Voltage Check Close Interlock Relay is assigned panel device RJ and 93-52A-1EDGB01, EDG B Output Breaker Trip Annunciator Interlock Relay is assigned to RF. From the as found condition, it is apparent that components were placed in the panel device locations specified on the summary sheet and cable connections made accordingly. Therefore, the cause of the incorrect relay installation appears to be transposition of information on the IS-E-07 summary sheet with insufficient review/verification of the information and field installation against plant drawings (Cause Code A) by plant engineering and maintenance personnel.

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Failure of 93GS-5D was the result of overheating of 93GS-5D(M), EDG D Governor Booster Pump Motor, caused by excessive friction between the right brush holder and the motor commutator. This was the result of the motor manufacturer installing the right brass brush holder too close to the motor commutator (Cause Code A). When an engine control relay was erroneously left in the latched position following preventive maintenance by plant personnel, subsequent energization of the control power for EDG D led to 93GS-5D(M) operating for an extended time (in excess of 15 minutes) causing internal damage to the motor due to overheating. During an EDG start sequence, 93GS-5D(M) normally operates for less than 2 seconds which is an insufficient time to lead to significant damage.

The effect of a device with a 3.5 second time delay being inserted in the location of 93-52A-1EDGB01 (plant drawings specify a 0.5 second time delay) is that control room annunciation of a trip of the EDG B output breaker would be delayed by 3 seconds. This delay is not significant. The effect of a device with a 0.5 second time delay being inserted in the location of 93-62-1EDGB01 (which requires a 0.8 second time delay) is that the EDG B output breaker would close 0.3 second sooner if there was a failure of EDG D to start and reach rated voltage. Again, the changed time delay is insignificant.

The failure of 93GS-5D(M) in 1992 provided an opportunity to discover the incorrect relay installation in the EDG B breaker control circuitry. In the 1992 event, it was initially determined that EDG D had slow engine acceleration (because of the failed governor booster pump) and slow speed control response (due to speed gain and stability adjustments of the speed control system being at less than optimal settings). It was felt that these were the sole causes of the reverse power trip of EDG B. Successful testing of the EDG pair subsequent to correcting the problems with EDG D, along with the previous satisfactory performance history of the EDG pair, led personnel to believe no other problems existed with the system.

During the current event, voltage checks within the 71-10602 breaker cubicle during initial troubleshooting generated unexpected results. Investigation of these results led to discovery of the incorrectly located relays.

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EVENT ANALYSIS

Approximately 155 successful starts of B and D EDGs had occurred since 1990. An equipment failure evaluation of the EDG D Governor Booster Pump Motor determined the motor was most likely damaged on June 19, 1996. Although this pair of EDGs were successfully started four times between June 19, 1996 and July 22, 1996, this event is being reported since the Booster Pump Motor may have failed at any time between June 19, 1996 and July 22, 1996.

There was also a successful start on July 23, 1996 of EDGs B and D after EDG B had tripped on reverse power and prior to relocation of the EDG B relays or replacement of EDG D Governor Booster Pump Motor. This indicates that even with the as-found condition identified on July 23, 1996 the pair of EDGs may have functioned as required following a loss of power to the 71-10600 bus.

Technical Specification 3.9.B.3 provides a seven day allowed outage time for one pair of EDGs provided that specified compensatory actions are taken. Therefore, it is conservatively assumed that this event resulted in operation in a condition prohibited by plant Technical Specifications which is being reported under 10 CFR 50.73(a)(2)(i).

CORRECTIVE ACTIONS

The following corrective actions are planned or have been performed to prevent recurrence of a similar event.

1. Devices 93-62-1EDGB01, 93-62-1EDGB12 and 93-52A-1EDGB01 were calibrated and placed in their correct locations within the 10602 breaker cubicle. (complete)
2. All devices replaced by modification D1-88-145 were verified to be in the correct locations. (complete)
3. 93GS-5D(M) was replaced. (complete)
4. The event in which the engine control relay was left latched following preventative maintenance was discussed at a tailgate meeting with electrical maintenance personnel. Additionally, a step was added to the preventative maintenance procedure to verify that the relay is left unlatched. (complete)
5. This event will be reviewed with electrical maintenance and Quality Control personnel, highlighting the need for correct self checking, attention to detail, and use of plant drawings when available while performing reconnections. (QC complete, Maintenance - due 9/16/96)
6. This event will be reviewed with Design Engineering personnel, highlighting the need for correct self-checking, attention to detail, performance of field walk-downs and use of plant drawings when preparing modification installation instructions. (Due 9/16/96)

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7. A sample of modifications installed after 1986 will be reviewed to determine if there are other instances where multiple components were replaced with the potential for devices to be incorrectly located without subsequent detection by pre-operative or periodic testing. (Due 11/30/96)
8. Maintenance and testing programs for the EDG Governor Booster Pump Motors will be evaluated for any necessary changes to incorporate lessons learned as a result of this event. (Due 11/30/96)

ADDITIONAL INFORMATION

A. Failed Component Identification:

Plant Component Number: 93GS-5D(M)

Type: Motor, Electric

Manufacturer: John Barnes Corporation

NPRDS Code: B076

Model: GC684

Previous LERs in which multiple engineered safety features were inoperable due to unrelated causes:

84-002 Containment Cooling Inoperative

- Residual Heat Removal Service Water Pump C was inoperable due to a mechanical failure. Emergency Service Water Pump B became inoperable due to a design error, which made the redundant containment cooling systems inoperable.

84-012 Simultaneous HPCI and RCIC System Inoperability

- Reactor Core Isolation Cooling was found to be inoperable due to an installation error in its isolation circuitry. High Pressure Coolant Injection was then found to be inoperable due to cracking of the stop valve stem.

85-003 Redundant Emergency Diesel Generator Systems Inoperable

- Problems with 'A' Emergency Service Water Pump Overcurrent Trip Device alignment and calibration made ESW Pump A and EDG A and C inoperable. An unassociated problem with EDG D engine start relay made redundant system inoperable.

96-004 Multiple Safety Relief Valve Pilot Solenoid Failures Due to Foreign Materials, Vendor Deficiencies and Procedural Errors