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River Bend Station
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August 30 , 1994

U.S. Nuclear Regulatory Commission
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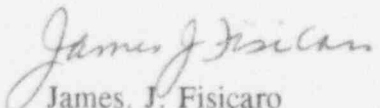
SUBJECT: River Bend Station - Unit 1
Docket No. 50-458
License No. NPF-47
Licensee Event Report 50-458/94-07-01
File Nos. G9.5, G9.25.1.3

RBG- 40852
RBF1-94-0021

Gentlemen:

In accordance with 10CFR50.73, enclosed is a supplement to a Licensee Event Report.

Very truly yours,


James. J. Fisicaro
Director - Nuclear Safety

JJF/kvm
Enclosure

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Licensee Event Report 50-458/94-07-01

August 30, 1994

RBG- 40852

RBF1-94-0021

Page 2 of 2

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ATTN: Administrator

NRC FORM 366 (5-92)		U.S. NUCLEAR REGULATORY COMMISSION				APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95				
LICENSEE EVENT REPORT (LER)						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) River Bend Station						DOCKET NUMBER (2) 05000-458		PAGE (3) 1 of 5		
TITLE (4) ESF ACTUATION DUE TO EPA BREAKER FAILURE										
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	DOCKET NUMBER
05	01	94	94	007	01	08	30	94	N/A	05000
									FACILITY NAME	DOCKET NUMBER
									N/A	05000
OPERATING MODE (9)		5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more (11))							
			20.402(b)			20.405(c)		X	50.73(a)(2)(iv)	
POWER LEVEL (10)		0	20.405(a)(1)(i)			50.36(c)(1)			50.73(a)(2)(v)	
			20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vii)	
			20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(viii)(A)	
			20.405(a)(1)(iv)			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 T.W. Gates, Supervisor - Nuclear Licensing						TELEPHONE NUMBER (Include Area Code) 504-381-4866				
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B	ED	BKR	G082	Y						
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) At 0339 and again at 1435 hours on May 1, 1994, with the reactor in Operational Condition 5 (Refueling), power to the reactor protection system (RPS) bus B was lost. When these events occurred, RPS bus B was being powered from its alternate power source. The loss of the alternate power source resulted from a trip of the electrical protection assembly (EPA) breakers 1C71*S003G and H. This transient caused a half-scam on RPS Channel B and resulted in various Engineered Safety Features actuations. This report is submitted pursuant to 10CFR50.73(a) (2) (iv) to document these ESF actuations. Proper plant response was verified and documented in accordance with Abnormal Operating Procedure, AOP-0010, "Loss of One RPS Bus". A failure of the electrical protection logic card of EPA breaker 1C71*S003G is the root cause of this event. The most likely cause of the logic card failure is damage that occurred during the performance of the EPA channel calibration and channel functional test surveillance. The original corrective actions included replacement of the faulty equipment and a revision to the surveillance procedure, STP-508-1600. The corrective actions added by this supplement include plans to replace the existing logic cards with new Generation III cards and the issuance of a new Operations Standing Order to effect more thorough trouble shooting of significant events. The logic card failure did not prevent the performance of the EPA breaker safety function to de-energize the RPS-B bus. All systems functioned in accordance with their design.										

NRC FORM 366A (5-92)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95	
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		FACILITY NAME (1) River Bend Station	DOCKET NUMBER (2) 05000-458

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

REPORTED CONDITION

At 0339 and again at 1435 hours on May 1, 1994, with the reactor in Operational Condition 5 (Refueling), power to the Reactor Protection System (RPS) (*JE*) bus (*BU*) B was lost. When these events occurred, RPS bus B was being powered from its alternate source as the normal source had been removed from service for maintenance purposes. The loss of this alternate power source resulted from a trip of the electrical protection assembly (EPA) breakers (*BKR*) 1C71*S003G and H. This transient caused a half-scam on RPS Channel B and resulted in the following ESF actuations:

- Division II nuclear steam supply shutoff system (NSSSS) (*JM*) isolation
- Standby gas treatment (*BH*) and annulus mixing (*BH*) train B start
- Fuel building charcoal ventilation treatment (*VG*) train B start
- Control building charcoal ventilation (*VI*) train B start
- Control building ventilation (*VI*) train B realignment
- Containment monitoring system hydrogen analyzer (*IK*) train B start

This report is submitted pursuant to 10CFR50.73(a) (2) (iv) to document these ESF actuations.

INVESTIGATION

The EPA breakers provide redundant protection (2 EPA breakers in series) to the RPS, and other essential circuits against overvoltage, undervoltage and underfrequency. The EPA breakers trip to disconnect downstream components from input power when the input power exceeds the overvoltage, undervoltage or underfrequency trip setpoints. The electrical protection logic card in the EPA breaker senses these aberrant conditions and trips the EPA breaker. A three second time delay is included in the trip logic to preclude unnecessary trips due to short-lived voltage and frequency transients. The RPS B bus was aligned to the alternate power source. In this condition, power line conditioner (PLC) 1RPS*XRC10B1 supplies the RPS B bus via EPA breakers 1C71*S003G and H.

NRC FORM 366A (5-82)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 5/31/95		
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The investigation of the initial event identified a failed relay (*74*), B21*K149B (relay for the balance-of-plant isolation), as the potential cause for the EPA breaker trip. While the relay did fail, it was subsequently determined not to be the root cause of the loss of power to RPS bus B. This conclusion was based on the number of protective devices between the 1B21*K149B relay and the EPA breaker, and the fact that the second EPA breaker trip at 1435 occurred after the relay had been replaced.

Further investigation identified a failure of the electrical protection logic card of EPA breaker 1C71*S003G. As the EPA breaker 1C71*S003H is in series and downstream of the failed EPA breaker 1C71*S003G, 1C71*S003H would trip by design when power was interrupted by the 1C71*S003G trip. The cause of the equipment failure is indeterminate. The operability of these EPA breakers had been recently verified by the performance of STP-508-1600, EPA Channel Calibration and Channel Functional Test. This surveillance was performed on April 21, 1994 and did not indicate any abnormalities. The EPA Channel Calibration and Channel Functional Test on EPA breakers 1C71*S003G and H was re-performed after this event on May 3. As-found data showed 1C71*S003G had a failed card. Overvoltage, undervoltage, and underfrequency trip setpoints on both EPA breakers were within Technical Specification limits; however, the electrical protection logic card in 1C71*S003G demonstrated an unacceptable repeatability for the undervoltage trip voltage setpoint and the underfrequency time delay setpoint. Testing of the underfrequency trip delay resulted in instantaneous trips (without the nominal delay period of approximately 3 seconds) in 3 out of 7 tests. This condition could trip the EPA breaker on a PLC tap change or other frequency transient.

The most likely cause of the EPA breaker electrical protection logic card failure is that the electrical protection logic card was damaged during the performance of STP-508-1600 on April 21, 1994. The damage probably occurred due to moving electrical connections with the electrical protection logic card energized and inadvertent shorting of the electrical connections. Such a transient could damage the sensitive logic card components.

ROOT CAUSE

The root cause of the loss of RPS bus B is equipment failure. The EPA breakers 1C71*S003G and H tripped due to an intermittent failure of the EPA logic card underfrequency trip timer in 1C71*S003G. The cause of the equipment failure is indeterminate; however, the most likely cause is that the EPA logic card was damaged during surveillance testing.

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The causal factors associated with this event are:

- Inadequate precautions in STP-508-1600. Revision 9 of STP-508-1600 allowed the test leads to be moved while the EPA logic card was energized. This provided an opportunity to damage the EPA Logic card during the performance of this STP.
- The initial root cause determination (that relay 1B21*K149B caused the EPA breaker to trip) was incorrect.

A review of previously submitted LERs identified four reported ESF actuations due to EPA breaker trips. These are LERs 85-006, 86-024, 87-033, and 90-015. LERs 85-006, 86-024, and 87-033 are similar to this event as their root causes were associated with failures of the EPA logic card. The event documented in 90-015 is not similar to this event since the root cause was the failure of the trip coil in an EPA breaker. A detailed discussion of recurring EPA card failures is provided in LER 87-033. The corrective action described in 87-033 includes numerous circuitry modifications. These modifications were intended to enhance the card's reliability and to minimize spurious trips. These design enhancements resulted from a concerted effort by River Bend personnel and General Electric, the EPA breaker vendor.

CORRECTIVE ACTION

1. Revise STP-508-1600 so that the EPA logic card is de-energized when moving test leads. This action has been completed.
2. Replace the EPA Logic card in 1C71*S003G. This action has been completed.
3. Operations Department Standing Order #111, "Guidance for Requesting Technical Assistance from System Engineering," has been issued to invoke a more conservative threshold for requesting further technical expertise for significant events.
4. The EPA breakers will be modified by replacing the existing logic cards with new Generation III logic cards. According to the vendor, these enhanced cards will provide substantially improved operational reliability by enhancing noise rejection and minimizing setpoint drift. The Generation III cards will be installed by the end of RF6. In addition, voltage monitoring connections have been added to the power leads of EPA breakers G and H. These connections will facilitate the monitoring of voltage conditions and potential transients that will enable more effective root cause evaluations if problems recur.

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SAFETY ASSESSMENT

The safety function of the EPA breaker electrical protection logic card is to de-energize the RPS bus in the event of an overvoltage, undervoltage or underfrequency condition. The card failure observed allowed the EPA breaker to trip with a zero time delay. The nature of this and previous card failures does not prevent the EPA breakers from tripping when required to perform their intend safety function. Furthermore, the breaker trip discussed in this LER would have had no operational impact if the RPS B bus had been in its normal alignment.

The half-scram and all isolations were reset and the systems were returned to their normal configurations. Proper plant response was verified and documented in accordance with Abnormal Operating Procedure, AOP-0010, "Loss of One RPS Bus".

NOTE: Energy Industry Identification System Codes are identified in the text as (*XX*).