

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) RIVER BEND STATION	DOCKET NUMBER (2) 0 5 1 0 0 0 4 5 8	PAGE (3) 1 OF 0 5
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TITLE (4)
Loss of Shutdown Cooling due to Spurious EPA Breaker Trip

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)
12	11	87	87	033	0104	12	15	88				0 5 1 0 0 0
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OPERATING MODE (9) 4	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)										
POWER LEVEL (10) 0 0 1 0	20.402(b)	<input checked="" type="checkbox"/>	20.405(c)	<input checked="" type="checkbox"/>	50.73(a)(2)(iv)	<input type="checkbox"/>	73.71(b)	<input type="checkbox"/>			
	20.405(a)(1)(i)	<input type="checkbox"/>	50.38(c)(1)	<input type="checkbox"/>	50.73(a)(2)(v)	<input type="checkbox"/>	73.71(c)	<input type="checkbox"/>			
	20.405(a)(1)(ii)	<input type="checkbox"/>	50.38(c)(2)	<input checked="" type="checkbox"/>	50.73(a)(2)(vi)	<input type="checkbox"/>	OTHER (Specify in Abstract below and in Text, NRC Form 366A)	<input type="checkbox"/>			
	20.405(a)(1)(iii)	<input type="checkbox"/>	50.73(a)(2)(i)	<input type="checkbox"/>	50.73(a)(2)(vii)(A)	<input type="checkbox"/>					
	20.405(a)(1)(iv)	<input type="checkbox"/>	50.73(a)(2)(ii)	<input type="checkbox"/>	50.73(a)(2)(vii)(B)	<input type="checkbox"/>					
20.405(a)(1)(v)	<input type="checkbox"/>	50.73(a)(2)(iii)	<input type="checkbox"/>	50.73(a)(2)(ix)	<input type="checkbox"/>						

LICENSEE CONTACT FOR THIS LER (12)							TELEPHONE NUMBER				
NAME L.A. England - Director-Nuclear Licensing							AREA CODE 9 0 4 3 8 1 1 - 4 1 1 4 1 5				

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
B	E	D	G108	Y					

SUPPLEMENTAL REPORT EXPECTED (14)							EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
YES (if yes, complete EXPECTED SUBMISSION DATE)							<input checked="" type="checkbox"/> NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

At approximately 1030 on 12/11/87 with the unit in Cold Shutdown (Mode 4), a loss of the Division II Reactor Protection System (RPS) bus occurred due to the trip of normal power supply Electrical Protection Assembly (EPA) breaker C71-S003D. The loss of the RPS bus resulted in all required Division II isolations which caused a loss of RHR "A" shutdown cooling. The bus was re-energized from the alternate power source, all isolations reset and shutdown cooling restarted. The logic card in the EPA breaker was found to be malfunctioning and two integrated circuit (IC) chips were replaced. The Surveillance Test Procedure (STP) was successfully performed and the breaker was returned to service.

At approximately 1857 on 12/19/87 with the unit again in Mode 4 following a manual unit shutdown, a second trip of EPA breaker C71-S003D occurred. Again, the breaker logic card was found to be defective. Three integrated circuit (IC) chips were replaced, the STP successfully performed and the breaker was returned to service. The output voltage of the motor-generator set was subsequently increased slightly to help prevent recurrence.

In each case, the unit was already in cold shutdown and all safety systems functioned as designed. Following the first event shutdown cooling was restored within ten minutes by utilizing the alternate power supply. Therefore, there was no impact on the health and safety of the public as a result of these events.

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TEXT (if more space is required, use additional NRC Form 365A (1/17))

REPORTED CONDITION AND INVESTIGATION

At approximately 1030 on 12/11/87 with the plant in Cold Shutdown (Mode 4) and in the final stages of the first refueling outage, a loss of power occurred to the Division II Reactor Protection System (RPS) (*JC*) bus. Loss of the RPS bus resulted in all required system isolations and actuations including a loss of Residual Heat Removal System (RHR) (*BO*) "A" shutdown cooling due to the isolation of the shutdown cooling suction valve. Operations immediately took action to restore power to the bus from the alternate power supply. All isolations were reset and systems restored to their normal configurations. RHR "A" shutdown cooling was restored in approximately 10 minutes.

Loss of one RPS bus by design causes a half-scrum signal, automatic initiation of the associated trains of Standby Gas Treatment (*BH*) and Fuel Building Charcoal Ventilation (*BH*) systems, and isolation of various lines penetrating the primary containment, including the RHR shutdown cooling suction line.

Immediate investigation found that Electrical Protection Assembly (EPA) breaker (*52*) C71-S003D had tripped (General Electric Model 914E175). EPA breaker C71-S003D is one of two EPA breakers installed between the normal power supply to the RPS bus motor generator (MG) set (*MG*) and the RPS bus itself. Two other EPA breakers are also installed between the alternate bus power supply and the RPS bus. Alternate power is supplied from a divisional motor control center (*MCC*) through a power line conditioning transformer (*XMFR*). (There are a total of eight EPA breakers in use at River Bend Station, two on each of the normal and alternate power supplies on each of the two RPS buses.) The EPA breakers monitor power supply voltage and frequency and after a time delay trip on an over-voltage, under-voltage or under-frequency condition to insure that power to the RPS bus is maintained within the equipment design requirements. The RPS bus was being supplied from the normal power supply at the time of this event.

Troubleshooting the logic card within the EPA breaker which contains the trouble detection, timing and tripping circuits revealed that the logic card was defective. Two integrated circuit (IC) chips in the under-voltage section of the logic card were replaced, the Surveillance Test Procedure (STP) was successfully performed and the breaker was returned to service.

At approximately 1857 on 12/19/87 with the unit again in Mode 4 following a manual unit shutdown, power was again lost to the Division II RPS bus. Investigation again revealed that the C71-S003D EPA breaker had tripped. Again, all required system isolations and actuations occurred. Power was restored to the RPS bus from the alternate power supply, all isolations were reset and systems were returned to their normal configurations.

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

Following this occurrence, Gulf States Utilities (GSU) Engineering worked closely with Maintenance during troubleshooting. It was determined that the under-frequency and the over-voltage sections of the logic card were functioning properly. However, the output signals from the detector circuit in the under-voltage section of the logic card to the timing circuit were very erratic. It was determined that the solid-state (IC chip) timer circuit could be made to give a false under-voltage trip signal at voltages as high as 119.8 volts. The lower allowable voltage limit per the River Bend Station Technical Specifications is 115 volts. The measured output voltage from the MG set was at approximately 119.8 volts following the EPA breaker trip.

Additionally, during the performance of STP-508-1600 "EPA 18 month channel calibration" on 12/17/87, the logic card on EPA breaker C71-S003A on the normal power supply to the Division I RPS bus was found to exhibit similar characteristics as the failures reported here.. However, this failure did not result in a spurious trip or a loss of power to the Division I RPS bus. This failure was also reworked, the STP successfully performed and the EPA breaker was returned to service.

CORRECTIVE ACTION

Following the first trip occurrence on 12/11/87, only two of the three IC chips which comprise the under-voltage timing and tripping circuit were replaced. Following the second trip, and for additional assurance, all three IC chips were replaced on the logic board, including the two previously replaced. This made significant improvement in the stability of the timer and trip circuits at the 119.8 volt setting of the MG set. To further gain additional margin of assurance against spurious under-voltage trips, the output voltage of the MG set was increased to approximately 121 volts which is consistent with the setting of the Division I RPS bus MG set. Following these corrective actions, the STP was successfully performed and the system was returned to normal operation.

It should be noted that similar occurrences were previously addressed by LERs 85-006 and 86-024. In each case, the logic cards were reworked by replacing defective IC chips. Additionally, two Modification Requests (MRs) were implemented to improve the reliability of the breakers. MR 86-0604 removed a trip indication status LED which was suspected to be overloading the trip output chip. MR 87-0008 was written to make further improvements by replacing all IC components with ones which were hand-selected and tested to provide optimum logic card performance. It was felt at that time that these two modifications would be adequate to prevent recurrence of the spurious trips. However, since these modifications were implemented, the two occurrences reported here indicate that the corrective actions previously taken were not entirely adequate to prevent recurrences or to reduce the frequency of spurious trips to an acceptable level.

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TEXT (If more space is required, use additional NRC Form 388A's) (17)

Therefore, GSU Engineering is currently working with General Electric (GE) to devise additional improvements. A three step approach is being utilized. A short term plan has been developed which consists of two parts. The first part is to increase the output voltage of the motor-generator sets to 123.5 volts. This has been determined by GE to be the optimum setting and is the mid-point of the Technical Specification allowable voltage range. This change will be implemented by 4/29/88. The second part of the short term plan is to make minor modifications to the circuit board. It has been determined that by changing the value of a capacitor and a resistor on the circuit board, the circuitry is more stable and less likely to false trip. The engineering and parts procurement for this modification will be complete by 12/31/88. Spare boards will then be modified and used to replace those currently in service during the second refueling outage which is scheduled for the second quarter of 1989.

The intermediate range plan calls for extensive engineering evaluation of the present design and may result in more extensive modifications to the circuit board within the EPA Breakers. Another aspect of the intermediate range plan is to investigate the feasibility of providing additional local indication or computer monitoring of the breakers to aid in troubleshooting. Finally, a long term plan would involve the opening of discussions between GSU and GE concerning an overall redesign of the EPA Breakers.

The intermediate and long term plans are presently on hold. Operation of the EPA breakers will be observed following implementation of the short term plan and the intermediate and long range plans will be pursued only if the short term plan proves to require further action. However, it is presently believed that the changes described under the short term plan will be adequate to correct the problems described in this LER.

SAFETY ASSESSMENT

In both events, the unit was already in cold shutdown and all safety systems functioned per their design. Following the first event, shutdown cooling was restored within ten minutes by utilizing the alternate power supply. Prior to the second event shutdown cooling was not in service since the unit was in process of restarting. Reactor core cooling was being maintained with Reactor Water Cleanup (*CE*) which was restored within 11 minutes.

The nature of the failures which occurred in these cases as discussed previously in LER 86-024, do not prevent the EPA breaker from tripping when required to perform their intended function. In addition, these spurious trips place the unit in the fail-safe condition by providing a half-scrum and isolations upon tripping.

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TEXT (If more space is required, use additional NRC Form 368A's (17))

Therefore, there was no significant impact on the health and safety of the public as a result of these events.

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



GULF STATES UTILITIES COMPANY

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U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Gentlemen:

River Bend Station - Unit 1
Docket No. 50-458

Please find enclosed Licensee Event Report No. 87-033 Revision 1 for River Bend Station - Unit 1. This revision is being submitted pursuant to 10CFR50.73 to provide an update on planned corrective actions.

Sincerely,

J. E. Booker by *je*

J. E. Booker
Manager-River Bend Oversight
River Bend Nuclear Group

3/15 TFP
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JEB/TFP/PDG/DAS/ch

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