



September 13, 1994

L-94-239
10 CFR 50.73

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

Re: St. Lucie Unit 2
Docket No. 50-389
Reportable Event: 94-006 Revision 1
Date of Event: July 14, 1994
Trip Circuit Breaker Failure due to a Broken Piece
of Phenolic Block Lodged in the Trip Latch Mechanism
Results in a Technical Specification Required Shutdown.

The attached Licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,

DASager
D. A. Sager
Vice President
St. Lucie Plant

DAS/JWH/kw

Attachment

cc: Stewart D. Ebnetter, Regional Administrator, USNRC Region II
Senior Resident Inspector, USNRC, St. Lucie Plant

DAS/PSL #1203-94

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9409210247 940913
PDR ADCK 05000389
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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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) St. Lucie Unit 2	DOCKET NUMBER (2) 05000389	PAGE (3) 1 OF 6
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TITLE (4) Trip Circuit Breaker Failure due to a Broken Piece of Phenolic Block Lodged in the Trip Latch Mechanism Results in a Technical Specification Required Shutdown.

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
7	14	94	94	--006--	1	9	13	94	N/A	
									N/A	

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 100		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)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
		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 Edward E. Lyons, Shift Technical Advisor	TELEPHONE NUMBER (Include Area Code) (407) 465-3550 x3151

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	AA	BKR	G080	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 15 single-spaced typewritten lines) (16)

On 7/14/94, Unit 2 utility licensed Reactor Operators commenced the Reactor Protective System periodic logic matrix test. While testing the fourth logic matrix (AC matrix), Trip Circuit Breaker (TCB) Five failed to open. TCB-5 had opened three times previously on demand from other matrix tests. Following several attempts to open TCB-5, it was declared out of service. The reactor was shut down to repair or replace TCB-5.

The cause of the failure of TCB-5 to trip has been identified as obstruction of motion on the trip latch lever due to a broken piece of insulating material. A small piece of broken phenolic insulating material approximately 1/4 inch square in size was found lodged between the trip latch lever and the access slot in the base for the trip latch. The phenolic fragment was found to have originated from the cutoff switch used in the breaker anti-pump circuitry, which is physically located directly above the trip latch mechanism. Upon further inspection, it was determined that a screw used in the assembly of the cutoff switch had become loose. This screw holds the switch to the mounting block and if loose will allow the two halves of the switch to separate when the breaker is operated. This most likely led to switch misalignment and breakage of the phenolic block.

Corrective Actions include: 1) Electrical Maintenance (EM), FPL Engineering and a GE representative inspected the remaining Unit 2 TCBs and the MG Set Output Breakers with satisfactory results. 2) EM will inspect Unit 1 TCBs during the next scheduled quarterly maintenance and the MG Set Output Breakers during the next scheduled periodic maintenance. 3) EM has incorporated the inspection of the cutoff switch phenolic block and screw into Unit 1 & 2 periodic maintenance procedures.

NRC FORM 366A (5-92)

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

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				94	--006--	1	

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

DESCRIPTION OF THE EVENT:

On 7/14/94 at 0200, Unit 2 utility licensed Reactor Operators commenced OP 2-1400059, Reactor Protective System Periodic Logic Matrix Test. At 0230, while testing the fourth logic matrix (AC matrix) of the Reactor Protective System (RPS)(EHC:JC), Trip Circuit Breaker (TCB) Five (See Figure One)(EHC:AA) failed to open. TCB-5 had just opened three times previously on other matrix tests.

The utility licensed Senior Reactor Operator attempted to open TCB-5 locally with the local pushbutton, the emergency pushbutton and by pulling the breaker fuses. All attempts were unsuccessful. The Reactor Trip pushbutton for channel MA TCBs 1 and 5 was depressed without success. At 0330 TCB-5 was declared out of service. TCBs 1, 2 and 6 were opened at 0418, which opened the series breaker and the parallel supply path to the Control Element Drive Mechanism bus (EHC:AA) on the "A" side.

At 0740 a reactor shut down was commenced in order to repair or replace TCB-5. The TCBs and the CEA Bus Motor Generator (MG) Set Output Breakers (EHC:ED) are General Electric (GE) Type AK 2-25. TCB-5 was replaced and the remaining Unit 2 TCBs and MG Set Output Breakers were inspected satisfactorily. Unit 2 was then restored to 100% steady state power operations.

Upon subsequent review of this event, it has been determined that this event required entry into the Action statement for Technical Specification 3.3.3.1. The Action statement required repairing the breaker, placing the affected channel in a trip condition, or a shutdown to Mode 3 within six hours. The actual plant shutdown took seven and one-half hours.

CAUSE OF THE EVENT:

The cause of the failure of TCB-5 to trip has been identified as obstruction of motion on the trip latch lever. A small piece of broken phenolic insulating material approximately 1/4 inch square in size was found lodged between the trip latch lever and the access slot in the base for the trip latch. When the breaker was called upon to trip, electrically or manually, the phenolic piece restricted the motion of the trip latch lever such that the breaker mechanism would not operate. Upon the removal of the phenolic fragment, the breaker immediately tripped open and was subsequently found to operate freely during manual open and close operations.

The phenolic fragment was found to have originated from the cutoff switch (See Figure Two) used in the breaker anti-pump circuitry, which is physically located directly above the breaker trip latch mechanism. The cutoff switch operates mechanically each time the breaker is opened or closed.

Upon further inspection, it was determined that a screw used in the assembly of the cutoff switch had become loose. This screw holds the switch to the mounting block and if loose will allow the two halves of the switch to separate when the breaker is operated. This most likely led to switch misalignment and breakage of the phenolic block.

The potential root causes of the loose screw and phenolic material breakage are either a manufacturing defect or inadvertent damage during maintenance. A search of industry maintenance records did not indicate any similar type failures and has been determined by FPL Engineering and GE to be a first time event.

The root cause for not entering the Technical Specification Action statement was due to a personnel error on the part of Operations Management.

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

ANALYSIS OF THE EVENT:

This event was submitted voluntarily for industry informational purposes. However, upon subsequent review of this event, it has been determined that this event required entry into the action statement for Technical Specification 3.3.3.1. Therefore this event is reportable under 10CFR50.73.a.2.i as: "The completion of any nuclear plant shutdown required by the plant's Technical Specifications," and as "Any operations prohibited by the plant's Technical Specifications." The Action statement required repairing the breaker, placing the affected channel in a trip condition, or a shutdown to Mode 3 within six hours. The actual plant shutdown took seven and one-half hours.

The St. Lucie Unit 2 Technical Specifications Section 3/4.3.1 "Reactor Protective Instrumentation" requires a minimum of four operable channels for continued operation in modes 1 and 2. Each Reactor Trip Breaker channel is comprised of two TCBS and a common actuation trip logic path, for a total of four channels. (See Figure One) The Action statement associated with this specification is that with the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, STARTUP and or POWER OPERATION may continue provided the TCBS of the inoperable channel are placed in the tripped condition within 1 hour, otherwise, be in at least HOT STANDBY within 6 hours. The BASES for this specification is to ensure that for the RPS instrumentation and bypasses: 1) the associated reactor trip will be initiated when a parameter monitored by each channel or combination reaches its setpoint, 2) the specified coincidence logic is maintained, 3) sufficient redundancy is maintained to permit a channel to be out of service for testing or maintenance, and 4) sufficient system functional capability is available from diverse parameters.

To comply with the intent of the TCB action statement operators opened TCB-6, the breaker in series with TCB-5, and TCB-1. This ensured that these RPS trip paths were placed in the fail safe condition, and that the safety function for these trip paths was carried out. Therefore the following was guaranteed: 1) the initiation of a reactor trip on a valid condition, 2) RPS actuation logic of 1/2 channels, 3) equipment redundancy while TCB-5 was repaired, 4) all diverse RPS measurement channels were available and 5) immediate access for root cause analysis and repair of TCB-5. As an additional measure, TCB-2 was opened.

The Updated Final Safety Analysis Report (UFSAR), Section 7.2 and Failure Analysis Table 7.2-5, analyzes the condition described in this report, a Trip Circuit Breaker failing closed. Specifically, the RPS is designed so that any single failure within the system does not prevent proper protective action at the system level. The wiring in the system is grouped so that no single fault or failure, including either an open or shorted circuit, negates the protective system operation. The UFSAR states that if one of two series redundant TCBS in one of two parallel redundant paths to supply power to the CEAs will not open on a trip signal due to mechanical binding, the inherent compensating provision is that the series redundant breaker can interrupt power on the affected trip path, and the RPS trip logic is unaffected. The method of detection for this fault is the monthly RPS Logic Matrix test.

Therefore, the health and safety of the public were not affected during this event.

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

CORRECTIVE ACTIONS:

- 1) Electrical Maintenance has replaced TCB-5.
- 2) Electrical Maintenance, FPL Engineering and a GE representative inspected the remaining Unit 2 TCBs and the MG Set Output Breakers with satisfactory results.
- 3) Electrical Maintenance will inspect Unit 1 TCBs during the next scheduled quarterly maintenance and the MG Set Output Breakers during the next scheduled periodic maintenance.
- 4) Electrical Maintenance has incorporated the inspection of the cutoff switch phenolic block and screw into Unit 1 & 2 periodic maintenance procedures.
- 5) FPL Engineering will evaluate the use of a locking material on the cutoff switch phenolic block screw to prevent its backing out.
- 6) Operations performed OP 2-1400059, Reactor Protective System Periodic Logic Matrix Test, with satisfactory results and declared TCB-5 operable at 0315 on 7/15/94.
- 7) Lessons learned from this event have been shared on the INPO Nuclear Network.
- 8) The Site Vice President and Plant General Manager have reviewed this event with Operations Management and other key site personnel. The need for strict adherence to Technical Specifications has been emphasized.
- 9) Operations Management have been made aware that other sources within the Nuclear Division are available to aid in their decision making process when events arise that involve complex or previously unencountered situations.

ADDITIONAL INFORMATION:

Failed Components:

TCB-5, Model: General Electric Type AK 2-25

Previous Similar Events:

There are no previous similar LERs at PSL involving TCBs that did not open when required.

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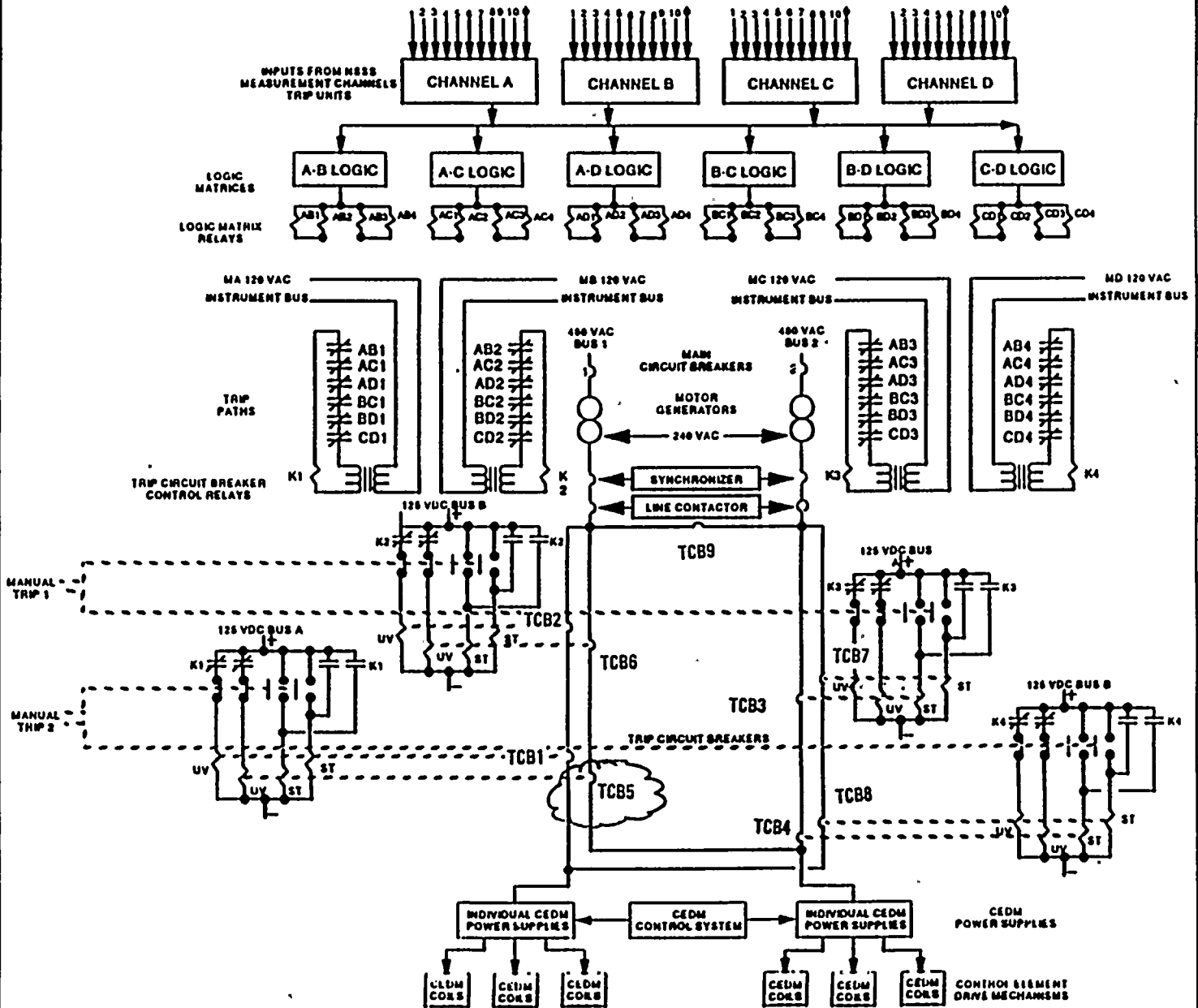


FIGURE ONE - RPS FUNCTIONAL DIAGRAM (TRIPPED CONDITION)

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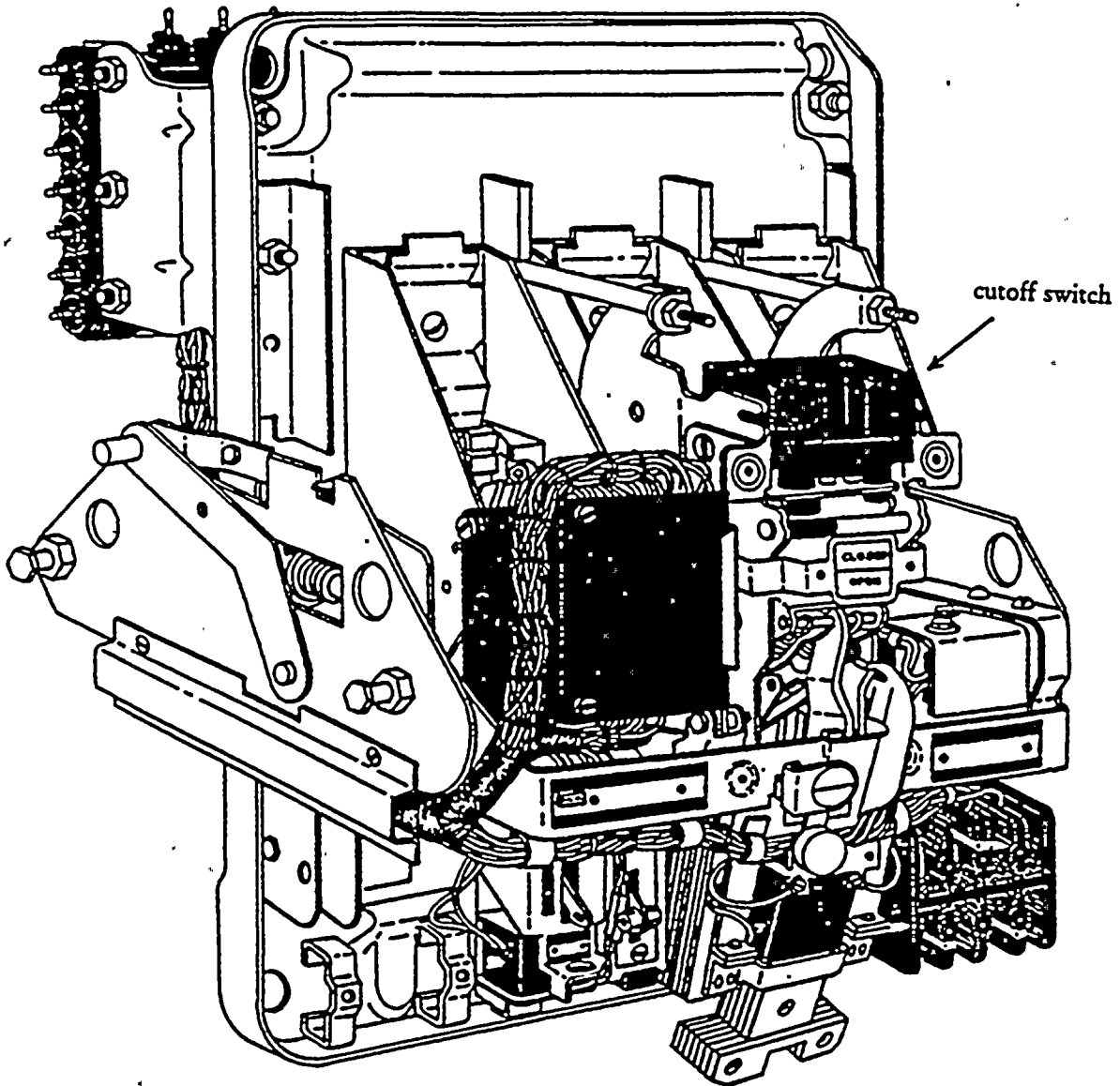


FIGURE TWO
GE AK-2-25 CIRCUIT BREAKER
(FRONT COVER REMOVED)