

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9612020208 DOC. DATE: 96/11/27 NOTARIZED: NO DOCKET #
 FACIL: 50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co. 05000335
 AUTH. NAME AUTHOR AFFILIATION
 BENKEN, E.J. Florida Power & Light Co.
 STALL, J.A. Florida Power & Light Co.
 RECIPIENT NAME RECIPIENT AFFILIATION

SUBJECT: LER 96-015-00: on 961029, operation prohibited by Tech Specs occurred. Caused by inadequate procedure for isolating DC grounds. DC power restored, failed relay replaced & testing performed to determine root cause. W/961127 ltr.

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FPL

Florida Power & Light Company, P.O. Box 128, Fort Pierce, FL 34954-0128

November 27, 1996

L-96-312
10 CFR 50.73

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

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 96-015
Date of Event: October 29, 1996
Operation Prohibited by Technical Specifications
Due to Loss of Undervoltage Protection on Safety Related Electrical Bus

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,

J. A. Stall
Vice President
St. Lucie Plant

JAS/EJB

Attachment

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

9612020208 961127
PDR ADOCK 05000335
S PDR

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 (IT-R F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3160-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

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

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TITLE (4)
Operation Prohibited by Technical Specifications due to Loss of Undervoltage Protection on Safety Related Electrical Bus

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
10	29	96	96	015	00	11	27	96	N/A	
									N/A	

OPERATING MODE (9) 1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
POWER LEVEL (10) 100	20.2201(b)		20.2203(a)(2)(v)	X	50.73(a)(2)(i)	50.73(a)(2)(viii)				
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)	50.73(a)(2)(ix)				
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)	73.71				
	20.2203(a)(2)(ii)		20.2203(a)(4)		50.73(a)(2)(iv)	OTHER				
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A				
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)					

LICENSEE CONTACT FOR THIS LER (12)	
NAME Edwin J. Benken, Licensing Engineer	TELEPHONE NUMBER (Include Area Code) (561) 467 - 7156

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
X	JE	27	A348	Y						

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)		
YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO		MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On October 29, 1996, St. Lucie Unit 1 was operating in Mode 1 at 100 percent reactor power. While reviewing a Plant Work Order request, a utility licensed operator discovered that during the performance of a DC Ground Isolation Procedure on October 7, 1996, a step had been implemented which momentarily disabled DC control power to the undervoltage relay protection on the 1B3 4.16 KV emergency bus. The interruption of DC power, for several seconds, resulted in less than the minimum number of channels operable for undervoltage protection as required by the plant's Technical Specifications. The momentary DC power interruption to the relays also resulted in one Loss of Voltage relay and two undervoltage alarm relays remaining inoperable for approximately 10 days until their inoperability was discovered during a routine surveillance.

The loss of undervoltage protection was caused by an inadequate procedure for isolating DC grounds. Individual relay inoperability was caused by the momentary reduction and subsequent restoration of control voltage during performance of the above procedure.

Corrective actions include: 1) DC power was restored to the undervoltage relays immediately following the interruption on October 7, 1996. 2) The failed, Loss of Voltage relay was replaced and subsequent testing was performed which verified failure root cause. 3) Use of the DC Ground Isolation Procedure was restricted pending an upgrade and review for generic concerns. 4) Operating procedures are being upgraded to enhance overall technical adequacy. 5) An operability evaluation based on the failure mode of the relays was performed by FPL. No operability concerns were found. 6) Technical Specifications are being reviewed for possible improvement. 7) The event will be included in operator training.

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Event Background

Undervoltage protection for St. Lucie Unit 1 emergency buses consists of two levels of protection:

- a) For first level protection, each emergency 4160V bus (1A3 and 1B3) utilizes two undervoltage (UV) relays in a 2-out-of-2 coincident logic, for Loss of Voltage protection (relays 27-1 and 27-2). The undervoltage relays are set to trip at no less than 2900 volts with a time delay of approximately 1 second. The function of these relays is to initiate source disconnection, load shedding, diesel generator starting, and load sequencing on the affected bus.
- b) For second level protection, each emergency 4160V bus utilizes two sets of 2 undervoltage relays in a 2-out-of-2 coincident logic for degraded grid voltage detection (relays 27-5 and 27-6). The relays are set to actuate at no less than 3831 volts with a time delay of approximately 18 seconds. The function of these relays is the same as described in (a), above. Figure 1 shows a simplified drawing of the UV arrangement for the 1B3 4160V bus.

Two additional relays (27-3 and 27-4) are provided for alarm purposes only on the above 4160V buses. In addition to 4160V protection, each Class 1E 480 volt bus (1A2 and 1B2) is equipped with degraded voltage protection.

Event Description

On October 17, 1996, Operating Procedure 1-0010125A, Data Sheet 38, "Functional Test of Degraded Grid Voltage," was performed at St. Lucie Unit 1. During the test, undervoltage relay 27-2 (EISS:JE), for the 1B3 4160 volt emergency bus (EISS:EB), failed to respond to a test signal as required. In accordance with plant Technical Specification 3.3.2.1, Action b, the channel was placed in a tripped condition within one hour and Maintenance personnel were notified. The associated 2X-2 timing relay (EISS:JE) for undervoltage relay 27-2 was subsequently replaced on October 18, 1996, and the Functional Test of Degraded Grid Voltage was completed. During the performance of the functional test, two additional relays (2X-3 and 2X-4) (EISS:EB), which provide an alarm function only, failed to operate properly, and their repair was scheduled to be completed at a later date upon receipt of parts from the vendor.

On October 29, 1996, St. Lucie Unit 1 was operating in Mode 1 at 100 percent reactor power. A utility senior licensed operator was reviewing a Plant Work Order (PWO) request for the repair of the 1B3 4160 volt bus undervoltage alarm relays 2X-3 and 2X-4, which had failed to operate during the previous degraded grid relay surveillance. The work order required the momentary removal of a fuse in the circuit that provides 125 volt DC control power to all degraded and undervoltage relays associated with the 1B3 electrical bus.

During his review of the plant work order, the licensed operator questioned the Technical Specification (TS) implication of removing DC control power to the bus relays and discovered that removal of the supply fuse had the same effect as opening the 125 volt DC feeder breaker (Bkr. 60208) (EISS:EJ) to the relays. Opening of this feeder breaker is performed as part of Off Normal Operating Procedure (ONOP) 1-0960030, "DC Ground Isolation."

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DESCRIPTION OF THE EVENT Continued

In step 8.4.8 of the above procedure, 1B DC bus breaker 60208 is momentarily opened and then closed to facilitate locating a DC ground. When breaker 60208 is opened, the undervoltage and degraded voltage relays on the 1B3 bus will not function to load shed the bus and start the 1B Emergency Diesel Generator (EIS:EK). This condition existed for a short period of time (several seconds) on October 7, 1996, when step 8.4.8 of ONOP 1-0960030 was last performed.

St. Lucie Unit 1 Technical Specifications require that 2 Loss of Voltage and 2 Degraded Voltage channels be operable on each 4.16 KV emergency bus. An Action Statement is provided in the event that 1 of the 2 Loss of Voltage or Degraded Voltage channels is inoperable, which allows continued operation if the channel is placed in trip. The performance of step 8.4.8 of ONOP 1-0960030, on October 7, 1996, constituted a condition for which TS 3.0.3 was applicable, in that the step resulted in the momentary inoperability of all Degraded and Loss of Voltage channels, and therefore less than the minimum number of channels operable specified for undervoltage protection on the 1B3 emergency bus. Continued operation with this condition is not allowed by TS 3.3.2.1 Limiting Condition for Operation or related Action Statements. Operations personnel performing the DC Ground Isolation procedure on October 7, 1996, were not aware that the procedural step resulted in this condition.

A subsequent evaluation concluded that the failure mode for relays 2X-2, 2X-3 and 2X-4 was caused by a failure of the relays to "reset" following a momentary reduction and restoration of control voltage, such as occurred during the momentary opening and closing of 125 volt DC supply breaker 60208, on October 7, 1996. The condition of the relays was subsequently discovered during performance of the Degraded Gid Voltage Functional surveillance on October 17 and 18, 1996.

CAUSE OF THE EVENT

The failure to maintain the minimum channels operable requirement for undervoltage protection on the 1B3 4160 volt emergency bus was caused by a procedural inadequacy, in that the DC Ground Isolation Procedure directed the opening of DC breaker 60208 which supplied power to the subject relays. Additionally, the breaker description contained in the procedure was not sufficient for operators to determine that performance of the step would disable undervoltage protection for the emergency bus. The level of technical review and verification for the above procedure was therefore not sufficient to ensure that its implementation did not adversely impact the Limiting Conditions for Operation as required by the plant's Technical Specifications. This procedure has been an approved and utilized document since 1976.

The failure of the Loss of Voltage timing relay 2X-2 and alarm relays 2X-3 and 2X-4 was caused by the momentary reduction in control voltage when DC supply breaker 60208 was opened and then closed. A User Notification Notice issued on October 18, 1996, by the vendor, National Technical Systems (NTS) discusses a potential failure mode for this type of relay (AGASTAT DSC Timing Relay) if the control voltage is reduced to below 85 percent of rated voltage and then immediately restored.

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CAUSE OF THE EVENT Continued

The failure mode is such that the timing relay "locks up" and will not function properly until the operating voltage (DC) is completely interrupted (voltage decays to zero) and then restored to its normal value. As a result of the User Notification, an investigation was initiated to determine if the relays had been subjected to the condition described in the notice. It was determined that the relays had been subject to a rapid voltage fluctuation, as described in the notice, during the performance of the DC Ground Isolation Procedure on October 7, 1996. The failure mode was duplicated by FPL during bench testing of the 2X-2 timing relay subsequent to replacement.

ANALYSIS OF THE EVENT

This event is reportable under the requirements of 10 CFR 50.73 (a) (2) (i) (B), as "any operation or condition prohibited by the plant's Technical Specifications." TS 3.3.2.1 states "The Engineered Safety Features actuation System (ESFAS) instrumentation channels and bypasses shown in Table 3.3-3 shall be OPERABLE with their trip set points set consistent with the values shown in ...Table 3.3-4." TS Table 3.3-3 specifies a total of two channels per bus for 4.16 KV Loss of Voltage and two channels per bus for 4.16 KV Degraded Voltage. With the number of OPERABLE channels one less than the total number of channels, TS Action 12 allows operation to proceed until performance of the next channel functional test, provided the inoperable channel is placed in trip within one hour. The momentary opening of breaker 60208 on October 7, 1996, during the performance of ONOP 1-0960030 resulted in a temporary condition (lasting several seconds) during which no undervoltage relay protection was operable for the 1B3 4.16 KV emergency bus. This condition is not allowed by plant Technical Specifications.

On October 17, 1996, Operators performing the Functional Test of Degraded Grid Voltage surveillance found Loss of Voltage relay 27-2 to be inoperable due to a failure of the 2X-2 timing relay. In accordance with TS requirements, the channel was placed in the trip condition within 1 hour. On October 18, 1996, the timing relay (2X-2) was replaced and the Functional Test of Degraded Grid Voltage was completed satisfactorily.

During the time that DC power was removed from the 1B3 4160 volt bus undervoltage relays on October 7, 1996, offsite power remained available and "Train A" undervoltage protection remained unaffected. Undervoltage relays at the 480 volt level were not affected by the DC power interruption.

During the period that undervoltage relay 27-2 was inoperable, between October 7, 1996, and October 18, 1996, "B Train" undervoltage protection remained available through Degraded Voltage relays 27-5 and 27-6 on the 1B3 4160 volt bus.

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ANALYSIS Continued

This protection consists of two undervoltage time delay relays, in a 2-out-of-2 coincident logic for degraded grid voltage detection. The relays are set to actuate under degraded bus voltage conditions with a time delay of approximately 18 seconds. With the exception of the time delay, the function of the Degraded Voltage relays is the same as for 1B3 4160 bus Loss of Voltage relays 27-1 and 27-2, which have an actuation delay of approximately 1 second. In addition, during the above period, undervoltage protection continued to be provided through relays located at the 480 volt emergency buses. The 480 volt protective relays are interlocked with an engineering safeguards actuation signal (ESFAS) to ensure adequate starting voltages during accident conditions. Offsite power remained available throughout the stated times of this event.

Based on the above, the protection of the health and safety of the public was not adversely affected by the event.

CORRECTIVE ACTIONS

1. DC control power was immediately restored to the undervoltage relays for the 1B3 4160 volt bus following the momentary interruption on October 7, 1996.
2. Undervoltage relay 2X-2 was replaced on October 18, 1996. Subsequent testing was performed by FPL which confirmed that a sudden reduction and restoration of control voltage was the cause of the relay failure.
3. Undervoltage alarm relays 2X-3 and 2X-4 will be reset at the next available opportunity when St. Lucie Unit 1 is in Mode 4 or below. DC power must be fully removed to reset the alarm relays.
4. The St. Lucie Unit 1 DC Ground Isolation Procedure, ONOP 1-0960030, was changed to restrict the opening of the DC supply breaker to the 4160 KV emergency bus protective relays. Senior management concurrence must now be obtained prior to performing this step. Additionally, the procedure is currently being upgraded and thoroughly reviewed to ensure that the performance of electrical switching which impacts Technical Specification equipment is properly identified. As an interim measure, engineering concurrence is required for the performance of any section of the procedure prior to the completion of the above procedure upgrade. Similar restrictions have been placed on the Unit 2 DC Ground Isolation Procedure, ONOP 2-0960030.
5. St. Lucie Plant Operating procedures are continuing to be upgraded as a part of an overall plan to improve operational performance. The goal of the procedure upgrade program is to ensure that operating procedures are technically accurate, implementable and free of errors. The process for procedure upgrade is designed to ensure that the technical reviews and subcommittees associated with the upgrade are commensurate with the detail and subject matter contained within the procedure.

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CORRECTIVE ACTIONS Continued

6. FPL performed an operability evaluation based on the receipt of a User Notification from the relay vendor describing the failure mode associated with the undervoltage relays. The evaluation concluded that there were no design basis conditions or AC system transients that would cause the failure of the subject relays. From the information contained in the vendor's bulletin, additional guidance has been developed and is being incorporated into the appropriate plant procedures.
7. The Technical Specification requirements associated with the loss of undervoltage relay protection are being assessed for improvement.
8. This event will be included for review in licensed operator training.

Failed Components

Component: AGASTAT Timing Relay
 Manufacturer: Amerace Electronic Components
 Model: DSCXX0125DPAXAA

Previous Similar Events

LER 95-001 describes an ESFAS actuation (load shed) during the replacement of an undervoltage relay on the 1A3 4160 volt bus. The failure of the undervoltage relay during this event was determined by the vendor to be caused by relay aging.

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FIGURE 1
1B3 4160 BUS
UNDER VOLTAGE PROTECTION-SIMPLIFIED

