

# CATEGORY 1

## REGULATOR INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9706100099      DOC. DATE: 97/06/02      NOTARIZED: NO      DOCKET #  
 FACIL: 50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co.      05000335  
 AUTH. NAME      AUTHOR AFFILIATION  
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 STALL, J.A.      Florida Power & Light Co.  
 RECIPIENT NAME      RECIPIENT AFFILIATION

SUBJECT: LER 97-006-00: on 970501, operation was prohibited by TS due to inadequately tested degraded voltage sys. Revised Unit 1. ESFAS surveillance test procedure. W/970607 ltr.

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June 2, 1997

L-97-145  
10 CFR 50.73

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

Re: St. Lucie Units 1 and 2  
Docket No. 50-335  
Reportable Event: 97-006  
Date of Event: May 1, 1997  
Operation Prohibited by Technical Specifications  
Due to Inadequately Tested Degraded Voltage System

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

*JE22/1*

JAS/KWF

Attachment

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

9706100099 970602  
PDR ADDCK 05000335  
S PDR



**LICENSEE EVENT REPORT (LER)**

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

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 20565-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

ST. LUCIE UNIT 1

DOCKET NUMBER (2)

05000335

PAGE (3)

1 OF 7

TITLE (4)

Operation Prohibited by Technical Specifications Due to Inadequately Tested Degraded Voltage System

EVENT DATE (5)			LER NUMBER (8)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
5	1	97	97	006	0	6	2	97	St. Lucie Unit 2	05000389
									FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)										
	20.2201(b)	20.2203(a)(1)	20.2203(a)(2)(i)	20.2203(a)(2)(ii)	20.2203(a)(2)(iii)	20.2203(a)(2)(iv)	20.2203(a)(3)(i)	20.2203(a)(3)(ii)	20.2203(a)(4)	50.73(a)(2)(i)	50.73(a)(2)(viii)
POWER LEVEL (10)											
											73.71
											OTHER
											Specify in Abstract below or in NRC Form 368A

LICENSEE CONTACT FOR THIS LER (12)

NAME

K. W. Frehafer, Licensing Engineer

TELEPHONE NUMBER (include Area Code)

(561) 468-4284

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

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)

On May 1, 1997, Unit 1 was in Mode 1 at 100 percent power and Unit 2 was in Mode 6 and defueled for a refueling outage. As a result of the on-going review of the Unit 2 Engineered Safety Features Actuation System (ESFAS) Test Procedure for compliance with NRC Generic Letter 96-01, it was discovered that the Safety Injection Actuation Signal (SIAS) permissive contact for degraded voltage protection was not adequately tested as required by the Technical Specifications.

The cause of the event was inadequate surveillance test procedures which did not test the degraded voltage protection system SIAS permissive contact. This contact provides an ESFAS function which initiates load shed and Emergency Diesel Generator (EDG) start for a sustained degraded voltage condition.

The Unit 1 A EDG was declared inoperable, due to a missed surveillance, at approximately 0900 on 5/1/97. Testing of the degraded voltage system SIAS permissive was successfully performed at approximately 1630 on 5/1/97, and the 1A EDG was subsequently declared operable. Operability of the Unit 1 B EDG was demonstrated via a previous event where the degraded voltage permissive signal was provided by a Containment Isolation Actuation Signal (CIAS) contact. Testing of the Unit 2 degraded voltage system ESFAS permissives was satisfactorily completed May 9, 1997.

The Unit 2 ESFAS surveillance test procedure was revised to ensure the degraded voltage system SIAS permissive contact is tested. The Unit 1 ESFAS surveillance test procedure will be revised to ensure the degraded voltage system ESFAS permissive contacts are tested.

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

FACILITY NAME (1)  ST. LUCIE UNIT 1	DOCKET  05000335	LER NUMBER (8)			PAGE (3)  2 OF 7
		YEAR 97	SEQUENTIAL - 006	REVISION - 0	

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

**DESCRIPTION OF THE EVENT**

On May 1, 1997, Unit 1 was in Mode 1 at 100 percent power and Unit 2 was in Mode 6 and defueled for a refueling outage. While performing a review of the Unit 2 Engineered Safety Features Actuation System (ESFAS) [EIS:JE] Test Procedure, 2-0400050, Rev. 22, for compliance with NRC Generic Letter (GL) 96-01, it was discovered that the Safety Injection Actuation Signal (SIAS) permissive contact for degraded voltage protection may not have been adequately tested in accordance with Technical Specifications. Failure of the contact would not allow the degraded voltage system to initiate load shed and Emergency Diesel Generator (EDG) start within the time specified in the Technical Specifications.

At the time of discovery, Unit 2 was in a mode where degraded voltage protection was not required. Engineering determined that the Unit 1 B train degraded voltage system was functional based on a previous event that demonstrated operability. However, the Unit 1 A EDG was declared inoperable and the ACTION statement for Technical Specification 3.8.1.1 was entered. The Unit 1 A train degraded voltage SIAS permissive contact was successfully tested and the 1A EDG was returned to service.

The degraded voltage protection system consists of a set of undervoltage relays, set to a higher voltage level than the loss of voltage relays, and two time delays. The first time delay is of a length of time sufficient to establish the existence of a degraded voltage condition. At the end of this delay, an alarm in the control room alerts operators to the degraded voltage condition. An interlock with the SIAS is included such that a subsequent SIAS will immediately separate the Class 1E power distribution system from the offsite power system and the EDGs are started and loaded. The second time delay is of a limited duration such that the permanently connected Class 1E loads will not be damaged by operation at reduced voltage for that time period. Following this delay, if not corrected, the Class 1E power distribution system is separated from the offsite power system and the EDGs are started and loaded.

The St. Lucie Unit 1 and 2 Technical Specifications include limiting conditions for operation, surveillance requirements, trip setpoints, and allowable values for the degraded voltage relays and associated time delay relays. Since the degraded voltage protection system is considered part of the loss of power protection system, it has been determined that the surveillance test requirements for the degraded voltage protection system should consist of functional verification every 18 months, during refueling.

The load shed and EDG start ESFAS function is tested by initiating a complete loss of power to the busses, which results in the first level of protection, the loss of voltage relays, initiating load shed and EDG start. Functioning of load shed is thus verified only for a complete loss of power. It was determined that the SIAS permissive contact that initiates load shed and EDG start for a sustained degraded voltage condition was not verified by test, which is contrary to the Technical Specifications requirements.

There are differences between the St. Lucie Units 1 and 2 degraded voltage protection systems. These differences and the identified test deficiencies are described below:



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

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL	REVISION	
ST. LUCIE UNIT 1	05000335	97	-- 006	-- 0	3 OF 7

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

**DESCRIPTION OF THE EVENT (continued)**

**Unit 1 description:**

The degraded voltage system for St. Lucie Unit 1 consists of 2 undervoltage relays (27-1 and 27-4), connected in a 2 out of 2 logic, with permissives for SIAS, Containment Isolation Actuation Signal (CIAS), and Main Steam Isolation Signal (MSIS). When both relays detect a degraded voltage condition with a coincident or subsequent SIAS, CIAS or MSIS, relay 27X4 is actuated, which initiates load shed and EDG starting. See Figure 1 for a simplified drawing:

Procedure 1-0970027 calibrates and tests the undervoltage relays. Both the degraded voltage relays are actuated together but the SIAS, CIAS, or MSIS permissive contacts are jumpered out and therefore not included in the testing. The Unit 1 ESFAS procedure 1-0400050 does not test the degraded voltage ESFAS permissives; during Loss Of Offsite Power (LOOP) and LOOP/ESFAS testing, a loss of voltage is initiated by opening the startup transformer circuit breakers, producing an immediate and total loss of voltage which is detected by other undervoltage relays.

**Unit 2 description:**

The 4160V bus degraded voltage system for St. Lucie Unit 2 consists of 3 undervoltage relays (27N-A, 27N-B, and 27N-C), connected in a 2 out of 3 logic, with a SIAS permissive contact. When 2 of the 3 relays detect a degraded voltage condition and time out, without a coincident SIAS, an annunciator alarms in the control room to alert the operators to the degraded voltage condition. A subsequent SIAS will initiate an immediate load shed, EDG start, and load sequencing. See Figure 2 for a simplified drawing.

Procedure 2-0920020 calibrates and tests the undervoltage relays. This includes using the trip test pushbuttons for two relays at a time and observing a test light to indicate energization of the load shed bus, isolated during testing, to verify the logic. The SIAS contact is bypassed by a jumper and is not included in the testing. Procedure 2-0400053 tests the safeguards relays; however, the relays associated with the SIAS Group 7, which includes the degraded voltage permissive, are stated as being tested in accordance with OP 2-0400050, "Periodic Test of the Engineered Safety Features." Therefore, the interlock is not tested in this procedure. However, procedure 2-0400050, up to revision 22, did not test the degraded voltage interlock since during Loss Of Offsite Power (LOOP) and LOOP/ESFAS testing a loss of voltage is initiated by opening the startup transformer circuit breakers, producing an immediate and total loss of voltage which is detected by other undervoltage relays.

**CAUSE OF THE EVENT**

The cause of the event was inadequate ESFAS surveillance test procedures in that the SIAS permissive contact that initiates load shed and EDG start for a sustained degraded voltage condition was not verified by test. This latest issue was found as part of the continuing review of St. Lucie test and surveillance procedures against the plant Technical Specifications requirements as committed to in response to GL 96-01. St. Lucie has reported previous discoveries in the past. GL 96-01 recognized that surveillance



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL	REVISION	
ST. LUCIE UNIT 1	05000335	97	006	0	4 OF 7

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

**CAUSE OF THE EVENT (continued)**

procedures may not adequately test all required logic paths, and the industry as a whole has identified and reported problems found as a result of these reviews.

**ANALYSIS OF THE EVENT**

This event is reportable in accordance with 10 CFR 50.73(a)(2)(i)(B), as any operation prohibited by the plant's Technical Specifications.

Degraded voltage protection is a requirement instituted as a result of incidents at the Millstone and Arkansas Nuclear One plants. These events disclosed the possibility of degraded voltage conditions that could exist on plant emergency busses undetected by the loss of offsite power relays. Sustained operation at lower voltages could cause damage to safety related components. Branch Technical Position PSB-1 required the installation of a degraded voltage protection system that would prevent this occurrence, in addition to the loss of voltage relays.

PSB-1 also imposed requirements that the plant Technical Specifications be revised to include limiting conditions for operation, surveillance requirements, trip setpoints, and allowable values for the degraded voltage relays and associated time delay relays. The Technical Specifications for St. Lucie Units 1 and 2 incorporated the requirements for degraded voltage protection in accordance with PSB-1. Since the degraded voltage protection system is considered part of the loss of power protection system, it has been determined that the surveillance test requirements for the degraded voltage protection system should consist of functional verification every 18 months, during refueling.

Operability of the Unit 1 B train degraded voltage system was demonstrated via the event described in LER 335 96-007, where the degraded voltage permissive signal was provided by a CIAS contact. This resulted in load shed of the B train emergency busses and start of the 1B EDG. This constituted an acceptable test since performance of the Integrated Safeguards procedure demonstrates that a SIAS signal will initiate a CIAS signal. Therefore, credit was taken for an operable degraded voltage permissive signal.

Since surveillance testing had not been performed for the Unit 1 A train, the 1A EDG was declared inoperable, due to a missed surveillance, at approximately 0900 on 5/1/97. A Letter of Instruction was prepared to perform testing to verify the functioning of the SIAS permissive contact (LOI #1-LOI-I&C-18 ). The scope of the LOI test procedure was limited to verification of the SIAS permissive contact used in the degraded voltage actuation logic (as opposed to SIAS, CIAS and MSIS). Based upon review of the design basis for the degraded voltage circuit, the presence of the CIAS and MSIS permissive contacts is considered to be a conservative design feature, not required by the Technical Specifications; therefore, surveillance testing of the CIAS and MSIS permissive contacts is not required. Testing was successfully performed at approximately 1630 on 5/1/97, functioning of the SIAS permissive was verified, and the 1A EDG was declared operable.

Testing was successfully performed on both A and B trains of the Unit 2 degraded voltage system SIAS permissive contacts as of May 9, 1997. This completes the GL 96-01 reviews for Unit 2. The Unit 1 reviews will be completed by the end of the Fall 1997 Unit 1 Cycle 15 refueling outage.





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

FACILITY NAME (1)	DOCKET	LER NUMBER (8)			PAGE (3)
		YEAR	SEQUENTIAL	REVISION	
ST. LUCIE UNIT 1	05000335	97	006	0	5 OF 7

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

**ASSESSMENT OF SAFETY SIGNIFICANCE**

In general, surveillance procedures for St. Lucie Units 1 and 2 provide for calibration and test of the degraded voltage detection relays, time delay relays, and the relay logic. Although the degraded voltage protection ESFAS permissive contacts had not been specifically tested during past ESFAS test surveillances, testing has been satisfactorily performed that verifies the operability of these contacts. Therefore, this condition had no adverse affect on the protection of the health and safety of the public.

**CORRECTIVE ACTIONS**

1. Testing of the Unit 1 A train degraded voltage protective system ESFAS functions was successfully demonstrated on May 1, 1997.
2. The Unit 2 ESFAS Test Procedure (2-0400050) was revised to incorporate testing of the SIAS interlock with degraded voltage protection. Testing of the degraded voltage protection SIAS interlock for both Unit 2 trains was completed on May 9, 1997.
3. The Unit 1 ESFAS Test Procedure (1-0400050) will be revised to incorporate testing of the SIAS degraded voltage protection permissive contacts.

**ADDITIONAL INFORMATION**

LER 389 96-007-0 describes the discovery of a failure to adequately test the MSIS Actuation Logic during GL 96-01 reviews.

LER 389 96-006-0 describes the discovery of a failure to adequately test Auxiliary Feedwater Actuation Logic during GL 96-01 reviews.

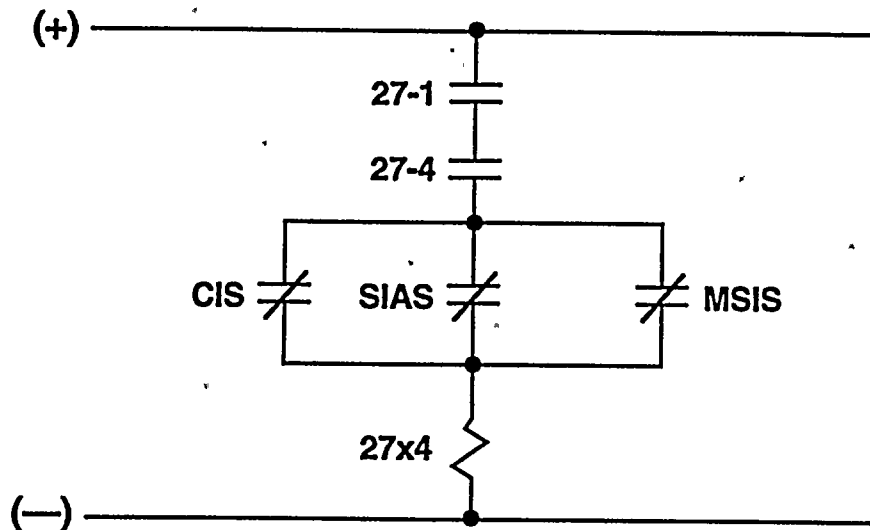
LER 389 96-005-0 describes the discovery of a failure to adequately test the Reactor Trip Breakers during GL 96-01 reviews.

LER 335 96-007 describes the incident where the degraded voltage permissive signal was provided by a CIAS contact.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

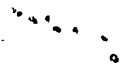
FACILITY NAME (1) ST. LUCIE UNIT 1	DOCKET 05000335	LER NUMBER (6)			PAGE (3) 6 OF 7
		YEAR 97	SEQUENTIAL 006	REVISION 0	

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



A CONTACT FROM 27x4 INITIATES  
4.16KV LOAD SHED AND EDG START

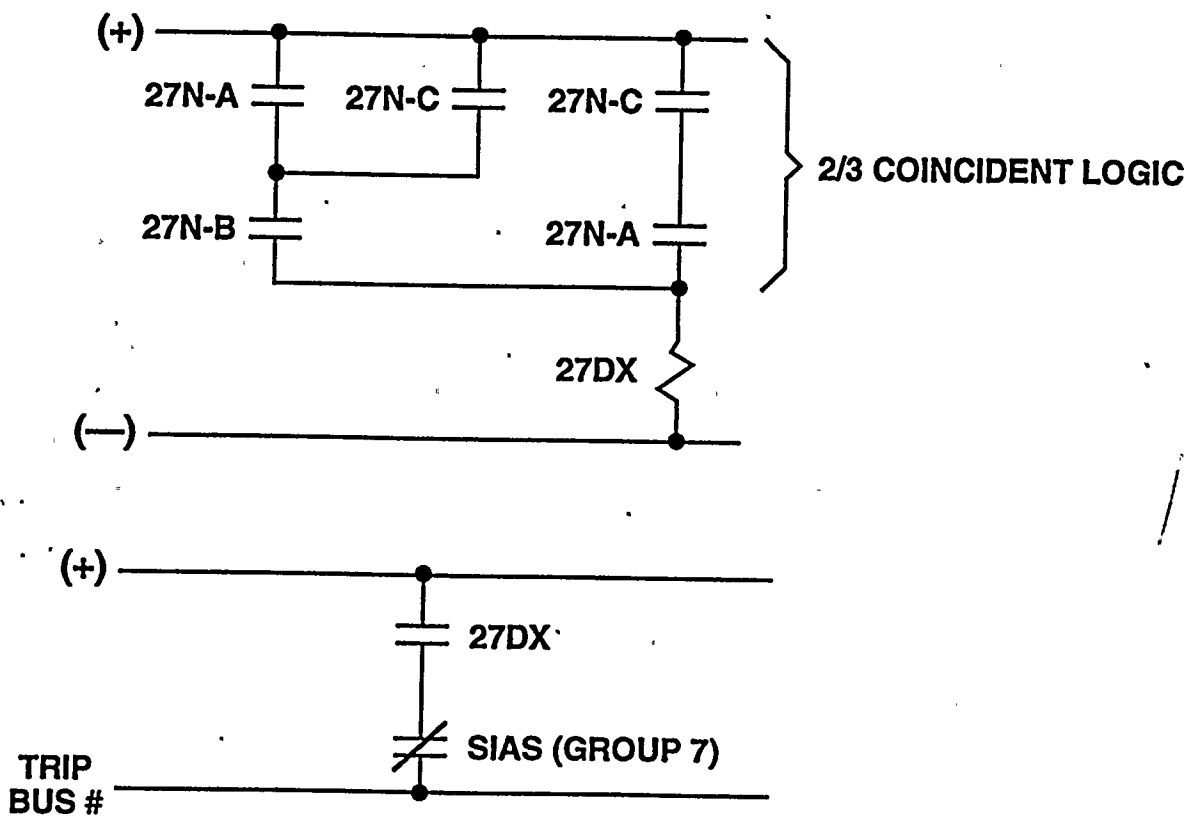
Figure 1  
Unit 1 Degraded Voltage Protection Scheme



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1) St. Lucie Unit 1	DOCKET 05000335	LER NUMBER (6)			PAGE (3) 7 OF 7
		YEAR 97	SEQUENTIAL - 006	REVISION - 0	

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



# ENERGIZING THIS BUS INITIATES LOAD SHED AND EDG START

Figure 2  
Unit 2 Degraded Voltage Protection Scheme