The Light company
Houston Lighting & Power South Texas Project Electric Generating Station P. O. Box 289 Wadsworth, Texas 77483

October 9, 1990
ST-HL-AE-3587
File No.: G26
10CFR50.73

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

South Texas Project Electric Generating Station
Unit 1
Docket No. STN 50-498
Licensee Event Report 90-021 Regarding
Unplanned Engineered Safety Features (ESF)
Actuations and Reactor Shutdown Due to an Inverter Failure

Pursuant to 10CFR50.73, Houston Lighting & Power (HL&P) Company submits the attached Licensee Event Report (LER 90-021) regarding ESF actuations and subsequent reactor shutdown due to an inverter failure. This event did not have any adverse impact on the health and safety of the public.

If you should have any questions on this matter, please contact Mr. C. A. Ayala at (512) 972-8628 or myself at (512) 972-8530.

M A McBurnett

M. A. McBurnett
Manager
Nuclear Licensing

RAD/amp

Attachment: LER 90-021 (South Texas, Unit 1)

IE22
1/1

cc:

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Revised 10/08/90

NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
South Texas, Unit 1	0 5 0 0 0 4 9 8	1 OF 0 4

TITLE (4)
Unplanned Engineered Safety Features Actuations
and Reactor Shutdown Due to an Inverter 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 NAMES	DOCKET NUMBER(S)
0 9	0 9	9 0	9 0	— 0 2 1	— 0 0	1 0	0 9	9 0		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	1 0 0	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
		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 (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 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	TELEPHONE NUMBER
C. A. Ayala - Supervising Licensing Engineer	AREA CODE 5 1 2 — 9 7 2 - 8 6 2 8

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	E F	I N V T	E 2 0 9	Yes							

SUPPLEMENTAL REPORT EXPECTED (14)

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

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

On September 9, 1990, Unit 1 was in Mode 1 at 100% power. At 0822 hours, the inverter which feeds the Class 1E AC vital distribution panel DP002 failed. This caused Engineered Safety Features actuations of the Control Room, Reactor Containment Building and Fuel Handling Building HVAC systems due to a loss of power to their respective radiation monitors. Troubleshooting activities were extensive and could not be completed within the twenty-four hour action statement of Technical Specification 3.8.3.1. At 0822 hours on September 10, 1990, a shutdown of Unit 1 commenced. The cause of this event was failure of a power filter capacitor which interrupted power to the inverter controller card and blew two main power fuses. Corrective actions include replacement of the DC to DC converter board which will be returned to the manufacturer for analysis, trending and analysis of measurements taken from the DC to DC converter boards of similar inverters, and revision of the maintenance manual.

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

DESCRIPTION OF EVENT:

On September 9, 1990, Unit 1 was in Mode 1 at 100% power. At 0822 hours power was lost to the Class 1E 120 Volt AC vital distribution panel DP002 due to failure of its associated inverter. This caused Engineered Safety Features (ESF) actuations of Control Room, Reactor Containment Building and Fuel Handling Building HVAC systems due a to loss of power to their respective radiation monitors. At 0826 hours power to distribution panel DP002 was restored from its alternate power supply. Technical Specification 3.8.3.1 requires that a plant shutdown be initiated if distribution panel DP002 is not re-energized from its associated DC bus within 24 hours. Troubleshooting activities were extensive and could not be completed within the twenty-four (24) hour action statement of the Technical Specification. At 0822 hours on September 10, 1990 a shutdown of Unit 1 commenced and the NRC was notified of a Notification of Unusual Event. The unit reached Mode 3 at 1406 hours on September 10, 1990.

Inspection of the inverter revealed two blown fuses and a damaged filter capacitor on the motherboard. The motherboard provides a connection point for various inverter circuit cards. The DC to DC converter board which supplies power to several inverter circuit cards was removed and bench tested. Voltage measurements taken on the converter board were found higher than expected. The converter board, capacitor and fuses were replaced. At approximately 1700 hours on September 11, 1990, the inverter was started and operated within specifications. The Notification of Unusual Event was terminated at 1937 hours on September 11, 1990.

Several items delayed troubleshooting of the inverter. During reinstallation of the motherboard on September 9, 1990, a jack was improperly connected which was not detected until September 11, 1990. In addition, discussions with the manufacturer revealed that a vital step necessary for troubleshooting was omitted from the vendor maintenance manual.

A review of preventative maintenance documents and thermography surveys performed in the past did not reveal any trends which would indicate impending failure of components. As a result of previous failures on a DC to DC converter board, corrective actions were identified to measure and adjust the output voltages (LER 89-20, Unit 1). The preventative maintenance procedures were revised to require voltage measurements and adjustment during outages.

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South Texas, Unit 1	0 5 0 0 0 4 9 8	9 0	— 0 2 1	— 0 0	0 3 OF 0 4

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

CAUSE OF EVENT:

The cause of this event was due to failure of the 24VDC power filter capacitor which interrupted power to the inverter controller circuit card and blew two main power fuses. One possibility for this capacitor failure may be due to the high output voltages noted on the DC to DC converter board. Additional corrective measures are being taken to evaluate the cause of the failure.

ANALYSIS OF EVENT:

Unplanned actuation of Engineered Safety Feature systems is reportable pursuant to 10CFR50.73(a)(2)(iv). The Control Room Envelope, Fuel Handling Building and Reactor Containment Building HVAC systems actuated as required. Had a radiological release occurred during this event, these systems would already be in their safest mode. While any unnecessary challenge of an ESF system is undesirable, actuation of these systems represents a minimal hazard since it could not cause, worsen, or prevent mitigation of an accident.

Distribution panel DP002 was not re-energized from its associated DC bus within the twenty-four Technical Specification action statement, however, distribution panel DP002 was restored within four minutes of the inverter failure from its alternate power supply. A plant shutdown was required by Technical Specification 3.8.3.1 and was completed. This is reportable pursuant to 10CFR50.73(a)(2)(i)(A).

CORRECTIVE ACTIONS:

1. The DC to DC converter board, filter capacitor and fuses were replaced. The DC to DC converter board will be returned to the manufacturer for analysis by October 31, 1990. Any problems identified will be evaluated and appropriate corrective actions will be taken promptly.

2. Voltage measurements will be taken from the DC to DC converter boards of similar inverters on a periodic basis. This data will be analyzed and trended. Engineering will evaluate the data and provide recommendations for revision of the preventative maintenance activities. The evaluation will be completed no later than September 1, 1991.

3. If generic implications are identified as a result of the evaluations above then a revised LER will be submitted.

4. The maintenance manual was revised to include the missing step.

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

ADDITIONAL INFORMATION:

The failed inverter is a 25KVA, single phase 120 volt AC unit manufactured by Elgar Corporation. The model number is UPS 253-1-112.

Four such inverters are installed in each unit at STPEGS. Two of these inverters supply vital AC distribution for nuclear and primary system instrumentation and control in each unit.

Three previous events have been reported regarding the failure of components on the DC to DC converter board.

LER 88-021 (Unit 1)
Inverter failure which caused numerous ESF actuations.

LER 89-023 (Unit 2)
Non-safety related inverter failed causing a turbine and reactor trip.

LER 89-020 (Unit 1)
Inverter failure which caused numerous ESF actuations.

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