

P.O. Box 1700 Houston, Texas 77001 (713) 228-9211

December 20, 1990 ST-HL-AE-3657 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 90-025 Regardi 3 Reactor Trip Due to a Generator Ground Fault Relay Actuation Caused by a Stator Coil End Turn Failure

Pursuant to 10CFR50.73, Houston Lighting & Power Company (HL&P) submits the attached Licensee Event Report (LER 90-025) regarding a reactor trip due to a generator ground fault relay actuation caused by a stator coil end turn 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 Manager Nuclear Licensing

RAD/sgs

Attachment: LER 90-025 (South Texas, Unit 1)

(F2C

A1/LER025U1.L01

2280111 ADOCK A Subsidiary of Houston Industries Incorporated

Houston Lighting & Power Company South Texas Project Electric Generating Station

001

Regional Administrator, Region IV Nuclear Regulatory Commission 611 Ryan Plaza Drive, Suite 1000 Arlington, TX 76011

George Dick, Project Manager U.S. Nuclear Regulatory Commission Washington, DC 20555

J. I. Tapia Senior Resident Inspector c/o U. S. Nuclear Regulatory Commission P. O. Box 910 Bay City, TX 77414

J. R. Newman, Esquire Newman & Holtzinger, P.C. 1615 L Street, N.W. Washington, DC 20036

R. P. Verret/D. E. Ward Central Power & Light Company P. O. Box 2121 Corpus Christi, TX 78403

J. C. Lanier/M. B. Lee City of Austin Electric Utility Department P.O. Box 1088 Austin, TX 78767

R. J. Costello/M. T. Hardt City Public Service Board P. O. Box 1771 San Antonio, TX 78296 ST-HL-AE-3657 File No.: G26 Page 2

Rufus S. Scott Associate General Counsel Houston Lighting & Power Company P. O. Box 61867 Houston, TX 77208

INPO Records Center 1100 Circle 75 Parkway Atlanta, GA 30339-3064

Dr. Joseph M. Hendric 50 Bellport Lane Bellport, NY 11713

D. K. Lacker Bureau of Radiation Control Texas Department of Health 1100 West 49th Street Austin, TX 78756-3189

Revised 10/08/90

CALLETY MARKETIC DOCKET NUMBER (2) PART IS South Texas, Unit 1 0 [5 [0 [0] 0] 4 [5] 8 1 OF 0] 4 TYPE (4) Reactor Trip Due to a Cenerator Ground Fault Relay Actuation Caused by a Stator Coil End Turn Failure DOCKET NUMBER (2) TVPE (4) A Stator Coil End Turn Failure VENT DATE (3) LEP NUMBER (2) MONTH Dare Vian TEMORT DATE (7) DOLET NUMBER (2) O [5 [0 [0] 0] 0] Dare Vian TEMORT DATE (7) Dare Vian TEMO	NRC F019 (4.63)	. 364			ALC: N	*******	-					LIC	ENS	SE	E	EV	E	чT	RE	PORT	(1	ER)			UI		APPR	LA REC ROVED RES B	OME			(155-104) (M
Partial Lie Reactor Trip Due to a Generator Ground Fault Relay Actuation Caused by a Stator Coil End Turn Failure Executor Facility Due to a Generator Ground Fault Relay Actuation Event Dark (b) Executor Facility Due to a Generator Ground Fault Relay Actuation Event Dark (b) Executor Facility Due to a Generator Ground Fault Relay Actuation MONTH Dark (b) Executor Facility Due to a Generator Ground Fault Relay Actuation MONTH Dark (b) Executor Facility Due to a Generator Ground Fault Relay Actuation MONTH Dark (b) Executor Facility Due to a Generator Ground Fault Relay Actuation MONTH Dark (b) Executor Facility Due to a Generator Ground Fault Relay Actuation Difference Image: State (c) Relation State (c) Difference Difference Image: State (c) Power Image: State (c) State (c) Image: State (c) Power Image: State (c) State (c)	FACILITY	NAME I	t)	-	(execute	and the second	-				-	LOR IN COLORS		-	-	-	-		i reșelinișe		-		1000		NUN	BER.	(2)			1	FAC	1 5
This Reactor Trip Due to a Generator Ground Fault Relay Actuation Caused by a Stator Coll End Turn Failure Event bare (b)		Seu	ith	T	ext	8.8	U	nit	1														0	16	10	0	0	1 41	5:8	1	OF	014
EVENT DATE (B) LEE NUMBER (B) REPORT DATE (T) DTHER FACILITY FAMES DOE FT FAUMER (B) MONTH DA VEAR VEAR VEAR VEAR DOE FT FAUMER (B)	TITLE (4	Res	icti	0T	TI	rip	D	ue	to											lt Re	11	ay Actu	ati	lor	1	Arrest		An or other		-	- k	koosi okenny
1 1 2 4 9 9 0 0 1 2 2 9 0 1 0 1 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	E V.						4	ERNU	MBER	(6)				. 61.6	POI				T			OTHE	REAG	C11.17	188 1	NVOL	VED	181				
1 1 2 4 9 0 9 0 1 2 0 9 0 1 1 0 1 1 2 0 9 0 1 1 1 1 1 1 1 20 402101 20 402101 20 402101 20 402101 20 402101 20 402101 20 402101 20 402101 20 402101 20 402101 20 402101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20 400101 20	MONTH	DAY	YE	ή.Đ.	ΥĒ	4.6		NU AR	ENTIG. SIBER	1	\$1 14	E VIBLORI URIAN P	MON	T.H.	Γ	Dist.1	Τ	YES	(.F)			FACILITYN	AMES					RETN	UMBE	R1-81.		
DEFENSIONE MODE IN 1 THIS REPORT IS 5.03MUTTED FURSUANT TO THE REQUIREMENTS OF 10 CFR 5. CHarle one of the following: (17) POWER IN LEVEL 1 0 40.0216 20.0016 X B0.7346121(W/L 72.73(D) POWER IN LEVEL 1 0 40.0216 X B0.7346121(W/L X B0.7346121(W/L 72.73(D) POWER INFORMATION 20.406(W/L B0.354671 B0.35471 B0.35671 B0.35671 B0.35671 B0.35671 B0.35671 B0.35711 B0.35671 B0.35711 B0.35711 B0.35711 B0.3571			1							T	T				T												0	1611	010	10	1	1.1.
MODEL (B) 20.402(b) 20.406(c) X B0.73(c)(2)(c) 72.3 (b) POWER LIVED 1.0.0 20.406(c) 20.406(c) X B0.73(c)(2)(c) B0.73(c)(2)(c) 72.3 (b) 20.406(c) 20.406(c) 20.406(c) X B0.73(c)(2)(c) B0.73(c)(2)(c) 72.3 (b) 20.406(c) 20.406(c) 80.73(c)(2)(c) B0.73(c)(2)(c) B0.73(c)(2)(c) B0.73(c)(2)(c) 72.7 (c) 72.7 (c) 20.406(c) 20.406(c)(1)(c) 80.73(c)(2)(c) B0.73(c)(2)(c) B0.73(c)(2)(c) B0.73(c)(2)(c) 72.7 (c) 72.7 (c) 72.7 (c) 20.406(c)(1)(c) 20.406(c)(1)(c) 80.73(c)(2)(c) B0.73(c)(2)(c) B0.73(c)(1)(c) B0.73(c)(1)(c) <td< td=""><td>1 1</td><td>2 4</td><td>9</td><td>0</td><td>9</td><td>0</td><td>ente</td><td>0</td><td>2 5</td><td>-</td><td>- (</td><td>0,0</td><td>1</td><td>2</td><td>2</td><td>10</td><td>1 15</td><td>f</td><td></td><td colspan="5"></td><td colspan="3"></td><td colspan="3">0 15 10 10</td><td colspan="2">1011</td></td<>	1 1	2 4	9	0	9	0	ente	0	2 5	-	- (0,0	1	2	2	10	1 15	f										0 15 10 10			1011	
POWART 1 0 20.408(c) X 60.73(c)(2(c) 73.71(c) 20.408(c) 30.408(c) 30.408(c) 30.408(c) 30.71(c) 73.71(c) 20.408(c) 30.408(c) 30.408(c) 30.201(c) 30.71(c) 73.71(c) 20.408(c) 30.408(c) 30.301(c) 30.201(c) 30.71(c) 73.71(c) 20.408(c) 30.408(c) 30.301(c) 30.73(c) 30.71(c) 73.71(c) 20.408(c) 30.408(c) 30.73(c) 30.73(c) 30.73(c) 30.74(c) 20.408(c) 30.408(c) 80.73(c) 30.73(c) 30.74(c) 30.74(c) 20.408(c) 30.408(c) 80.73(c) 30.73(c) 30.74(c) 30.74(c) 20.408(c) 30.408(c) 80.73(c) 80.73(c) 30.74(c) 30.74(c) 20.408(c) Charles Ayala - Supervising Licensing Engineer 10.2 9.7.2 - 8.6.2.8 2.8 Cause system Component is is cause system component is is B T_J G E N				1	7 85	S PEP	ORT	18.5.	BHITT	ED P	URS	UANT	TO TH	1.0	110	WIRI	E M E	NTE	OF IS	CFR 5 1	chi	elk pox or mor	6010	10 10	ilpas in	gi) (13	1					Acres and a com
LEVEL 100 20.406 (a)(1)(a) 90.56 (a)(2) 60.73 (a)(2)(a) 60.73 (a)(2)(a) 000 and in Text. ARC Form 100 20.406 (a)(1)(a) 80.73 (a)(2)(a) 60.73 (a)(2)(a)<	NR.	MODE (8)				20.402(b)							20.406.(c)							X 80.73(a)(21(iv)							73.71(b)					
NON 20 400 (BITTIO) 80 39 (P(2) B0 73 (B(2) (P(0))					20.406(#11110)						60.961e1(1)							50.73(a)(21(v)						73.73(e)								
P0 406 (artistical) B0 73 (a) (2) (c) B0 73 (a) (a) (a) (a) B0 73 (a) (a) B0 73 (a) (a)					\$0.35(e)(2) 50.73(e)							60.73(a)(2)(vi	11(2) tvii:																			
20 40% (a)111(1) BD 73 (a) (2)1(0) BD 73 (a) (2)1(1) LUCEMBEE CONTACT FOR THIS LER (12) TELEPHONE NUMBER TELEPHONE NUMBER TELEPHONE NUMBER TELEPHONE NUMBER TELEPHONE NUMBER ANAME COMPLETE ONE LIVE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT 13) COMPLETE ONE LIVE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT 13) CAUSE SYSTEM COMPONENT MANUFAC TO NERDS MENDALER B T J G E N W 1 2 0 Y B UPPLEMENTAL REPORT EXPECTED 144 EXPECTED B UPPLEMENTAL REPORT EXPECTED 144	Present				50.73(a)(2)(i) 50.71							50.73(a)(2)(vii)(A)																				
LICENSEE CONTACT FOR THIS LER 1121 NAME Charles Ayala - Supervising Licensing Engineer Complete One Line for each component failure described in this report 131 CAUSE SYSTEM COMPONENT NANUEAC REPORTABLE CAUSE SYSTEM COMPONENT NANUEAC REPORTABLE B T J G E N W 1 2 0 Y B UPPLEMENTAL REPORT EXPECTED 14 EXPECTED SUPPLEMENTAL REPORT EXPECTED 14 EXPECTED SUPPLEMENTAL REPORT EXPECTED 14							-	\$0.73(a)(2)(a)							80.73(e1(2)(viii)(8)																	
TELEPHONE NUMBER COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT 13: CAUSE SYSTEM COMPONENT CAUSE SYSTEM COMPONENT MERORTABLE TO NERDS MERORTABLE B T J IG E N W 1 2 0 Y BUPPLEMENTAL REPORT EXPECTED ING BUPPLEMENTAL REPORT EXPECTED ING BUPPLEMENTAL REPORT EXPECTED ING BUPPLEMENTAL REPORT EXPECTED ING	-				1	20 4	05 14	111114					deres in the	California de	-	-	-				1.	80.73(s)(2)(s)								-		
Charles Ayala - Supervising Licensing Engineer COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT 13 CAUSE SYSTEM COMPONENT MANUFAC DEPORTABLE CAUSE SYSTEM COMPONENT MANUFAC DEPORTABLE B T J G E N W 1 2 0 Y B T J G E N W 1 2 0 Y B UPPLEMENTAL REPORT EXPECTED 114 EXPECTED SUBMISERO MC.VTH DAY YEAR			-	http://www.com	-			-					ICEN	SEE.	1.00	DNT A	10	FOR	THIS	LER (12)			-			-						
Charles Ayala - Supervising Licensing Engineer 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 MENOPARISE B T J G E N W 1,2,0, Y B UPPLEMENTAL REPORT EXPECTED 114 EXPECTED SUPPLEMENTAL REPORT EXPECTED 114 EXPECTED SUPPLEMENTAL REPORT EXPECTED 114 EXPECTED SUPPLEMENTAL REPORT EXPECTED 114	NAME																							100	11.1	-	78.64	EPH (IN	ENUR	VE E FI	-	
CAUSE SYSTEM COMPONENT MANUFAC DEPORTABLE TO NORDS CAUSE SYSTEM COMPONENT TURER TO NORDS TO NORDS B T J G E N W 1 2 0 Y EUPPLEMENTAL REPORT EXPECTED 114 EXPECTED SUBMISSION DAY		Cha	rl	8.8	Ay	yalı	a	- S	upe	rvi	1.8	ing	Lic		ne	ir	8	Er	igin	neer				1	1	2	9	7	2 .	8	6	2 8
CAUSE DISTEM COMPONENT TURER TO NPRDS B T_JJ G_E_N W_12_2 Y I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I		-						0.01	APLETI	E ON	1.1	518 1 24	I LAC	H D	:OM	PON	EN1	FAI	LURE	DESCRIBI	13	IN THIS REP.	TRO	131	nie teens							
BUPPLEMENTAL REPORT EXPECTED 114	181/AC	SYSTEM	0	DMP.	DIVE	NT.			4.C 91									¢	AUSE	SYSTEM		COMPONENT										
EXPECTED SUBMISSION	В	TJJ		G	E	N	W	11	20			Y						1		1		1.1.1		1	1							
EXPECTED SUBMISSION		1		1	1	1		1	1	1			Arences							1		1.1.1	-	1	1	1	_			-		
keening DAYE IS			-	-			-	81	PPLEN	ENT	AL	REPORT	EXP	108	ED.	114												1	WC NT	-	DAY	YEAR
	XIVI	8 (If yes	ситри	114 2	xee	C780	s.c.#i	Hissic	N DAT	e/				-		34									-DA	TE II	E.		014	3	ø	911

On November 24, 1990, Unit 1 was in Mode 1 at 100% power. At 1448 hours, the generator running ground fault relay actuated due to a stator coil end turn failure which initiated an automatic reactor trip. All systems responded as expected with no Engineered Safety Features actuations. Initial internal inspection of the generator revealed damage to the end turn of stator coil #20 at the turbine end. The ground fault relay actuation was due to electrical arcing from the failed stator coil end turn to the stator cooling water system manifold. Further testing and inspections are planned to identify the cause of the failure and appropriate corrective actions. A supplemental report will be submitted following return of the generator to operation and completion of associated testing.

A1/LER025U1.L01

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

US NUCLEAR REGULATORY COMMISSION APPROVED DMB ND 3160-0104

EXPIDER BOXEME

PROFESSION ADDRESS	THE REPORT OF A DESCRIPTION OF A	-	-	-	-		-	-	-	-		-						_		
PACILITY N	IAME (9)	00	K)KI	TN	UMB	ERG	21		-	T		1.8	R N UN	IBER I	R.		T	14	G1 (3	L.
										F	YEAR		REGUI	NTIAL	-	PLE V ID IC. N. LINTE E	24		T	
	South Texas, Unit 1	0	15	11	1	0	0	4	91	8	910	-	01	2 :	5	0 10	0	2	OF	0 4
TEXT IF man	e apace la required, une additional N/RC Form 3864 27 (17)	-										denner				descent descent	all reasons			

DESCRIPTION OF EVENT:

NEC Form JBEA

On November 24, 1990, Unit 1 was in Mode 1 at 100% power. At 1448 hours, the generator running ground fault relay actuated which initiated an automatic reactor trip. All systems responded as expected. The only abnormal conditions noted during the event were a rise in generator stator cooling water tank pressure and drop in generator hydrogen pressure. No Engineered Safety Features actuations occurred. The NRC was notified at 1735 hours.

Initial internal inspection of the generator revealed a damaged area at the end turn of bottom stator coil #20, at the turbine end, which is located between the nine and ten o'clock positions when viewed from the turbine end.

Investigation and recovery teams were formed to evaluate the failure and implement corrective actions. An inspection of the generator was performed. The following was observed:

- A significant amount of the stator coil cooling water inlet header box was missing, presumably vaporized or melted by electrical arcing.
- The teflon hose which connects the stator cooling water distribution header to the coil was damaged.
- The cooling water manifold nipple associated with the failed stator coil was eroded away from the inside, presumably by an electrical arc.
- There was no damage on the adjacent manifold nipples on either side of the eroded nipple.

The Westinghouse generator end turn construction is designed to rigidly connect all the end turns together to preclude excessive vibration of individual turns. During the week of November 26, 1990, Westinghouse personnel performed end turn impact tests on both Unit 1 and Unit 2 generators. The purpose of these impact tests was to determine the natural frequency of the generator end turn assembly with respect to the 120 Hz resonant frequency of each assembly. The general acceptance criteria for the impact test is an end turn natural resonance frequency above 130 Hz. The Unit 2 test was performed to determine the condition of that unit and also to provide a baseline for the Unit 1 test. The impact test results showed that the Unit 2 turbine end natural frequency was 135 Hz and the Unit 1 turbine end natural frequency was 110 Hz. Exciter end impact testing was not performed, since prior Westinghouse experience indicated that exciter end natural frequencies are substantially higher than turbine end natural frequencies. Westinghouse personnel interpreted the impact test results as being "excellent" for Unit 2 and "unacceptable" for Unit 1. The Unit 1 end turn

A1/LER025U1.L01

LICENSEF EVENT R24	ORT (LER) TEXT CONTINU	ATION		GULATORY COMMISSION OME NO. 3150-0104 31/85
FACILITY NAME (1)	DOCKET NUMBER (2)	L	ER NUMBER (6)	PAGE (3)
	비원 영영 가슴 가지	7 E & H	SEQUENTIAL REVISION	
South Texas, Unit 1	0 15 0 0 0 4 9 8	9 10 -	0125 -010	0 1 3 05 0 14

DESCRIPTION OF EVENT: (cont'd)

resonance below 120 Hz sugg sts that the end turn assembly has already passed through the natural resonant frequency and has been subjected to vibration. This assumption is validated by the Unit 1 visual observations, which reveal significant end turn "dusting", "greasing", and broken blocking and lacing. These conditions are all confirmations of end turn vibration. By contrast, the Unit 2 visual observations reveal no signs of end turn vibration, as was confirmed by the impact testing.

CAUSE OF EVENT :

The ground fault relay actuation was due to electrical arcing from the stator coil end turn to the stator cooling water system manifold. testing and inspections are necessary before the cause of the failure can be conclusively determined.

ANALYSIS OF EVENT:

Unplanned reactor protection system actuation is reportable pursuant to 10CFR50.73(a)(2)(iv). The reactor tripped as required and plant equipment operated as expected. There was no safety injection actuation. There were no adverse radiological or safety consequences as a result of this event.

CORRECTIVE ACTION:

Additional testing and inspections are scheduled to determine if other latent damage exists in the generator. The generator will require extensive disassembly including removal of the rotor in order to effectively replace the failed stator coil. In addition, repair of the stator winding blocking and lacing is scheduled to raise the generator end turn natural frequency to an acceptable level.

Upon completion of the recovery effort and return of the generator to operation, a supplemental report will be issued. This report is currently scheduled to be completed by April 30, 1991.

A1/LER025U1.L01

NRC Form 366A	ninger alle ander solleren stattet i annen eine besondersetter	US NUCLEAR REG	DULATORY COMMISSION							
LICENSEE EVENT REPOR	LICENSEE EVENT REPORT (LER) TEXT CONTINU									
FACILITY NAME (1)	DOCKET NUMBER (2)	LER NULWER IS	PAGE (3)							
	15,623,40,0991	VEAR SEQUENTIAL REVISION NUMBER NUMBER								
South Texas, Unit 1	0 5 0 0 0 4 9 8	910 - 01 2 5 - 0 p	0 4 OF 0 4							
TEXT IN more spece is required, use additional NRC Form 3064 ¥/(17)	the second s	And the statement of a side of the set of the set of the set of	and the second second second second second							

ADDITIONAL INFORMATION:

.

There have been no previous events at STPEGS regarding a stator coil end turn failure which resulted in a generator ground fault and subsequent reactor trip.

The generator is a 1500 MVA, 4 pole, 1800 RPM machine with water cooled stator and hydrogen cooled rotor manufactured by Westinghouse.