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

January 17, 1996
ST-HL-AE-5266
File No.: G26
10CFR50.73

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

South Texas Project
Unit 1
Docket No. STN 50-498
Licensee Event Report 95-013
Turbine Trip and Reactor Trip Due to Main Transformer Lockout

Pursuant to 10CFR50.73, South Texas Project submits the attached Unit 1 Licensee Event Report 95-013 regarding a turbine trip and reactor trip due to main transformer lockout. This event did not have an adverse effect on the health and safety of the public.

If you should have any questions on this matter, please contact Mr. S. M. Head at (512) 972-7136 or me at (512) 972-7239.

L. W. Myers
Plant Manager,
Unit 1

KJT/esh

Attachment: LER 95-013 (South Texas, Unit 1)

IE22
1/1

c:

Leonard J. Callan
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Thomas W. Alexion
Project Manager
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001 13H15

David P. Loveless
Sr. Resident Inspector
c/o U. S. Nuclear Regulatory Comm.
P. O. Box 910
Bay City, TX 77404-0910

J. R. Newman, Esquire
Morgan, Lewis & Bockius
1800 M Street, N.W.
Washington, DC 20036-5869

K. J. Fiedler/M. T. Hardt
City Public Service
P. O. Box 1771
San Antonio, TX 78296

J. C. Lanier/M. B. Lee
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

Central Power and Light Company
ATTN: G. E. Vaughn/C. A. Johnson
P. O. Box 289, Mail Code: N5012
Wadsworth, TX 77483

Rufus S. Scott
Associate General Counsel
Houston Lighting & Power Company
P. O. Box 61067
Houston, TX 77208

Institute of Nuclear Power
Operations - Records Center
700 Galleria Parkway
Atlanta, GA 30339-5957

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

Richard A. Ratliff
Bureau of Radiation Control
Texas Department of Health
1100 West 49th Street
Austin, TX 78756-3189

U. S. Nuclear Regulatory Comm.
Attn: Document Control Desk
Washington, D. C. 20555-0001

J. R. Egan, Esquire
Egan & Associates, P.C.
2300 N Street, N.W.
Washington, D.C. 20037

J. W. Beck
Little Harbor Consultants, Inc.
44 Nichols Road
Cohassett, MA 02025-1166

NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 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 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

LICENSEE EVENT REPORT (LER)

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

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
South Texas, Unit 1	05000 498	1 OF 6

TITLE (4)

Turbine Trip and Reactor Trip due to Main Transformer Lockout

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
										05000
12	18	95	95	-- 013 --	00	01	17	96	FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

20.2201(b)	20.2203(a)(2)(v)	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)(x)
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)	X 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	TELEPHONE NUMBER (Include Area Code)
Scott M. Head - Sr. Consulting Engineer	(512) 972-7136

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	AA	ROD	W120	N						

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X	YES (If yes, complete EXPECTED SUBMISSION DATE).	NO	08	30	96

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

On December 18, 1995, Unit 1 was in Mode 1 at 100% power. At approximately 0336 hours, a Backup Pilot Wire Monitoring Relay actuated and resulted in a lockout of the Unit 1 main and auxiliary transformers. This event tripped open the generator output breaker, the main turbine, the breakers for all four 13.8 kV auxiliary buses and caused loss of offsite power to the A Train Engineered Safeguards Features Bus. The main turbine trip resulted in a reactor trip. The plant was stabilized in Mode 3. Following the reactor trip, three control rods indicated a rod position of six steps from rod bottom. All other control rods had indication of their rod bottom lights illuminated. Human performance issues identified regarding this event involved compliance with Emergency Operating Procedures, notification timeliness and accuracy, and inappropriate manual starting of Train B and C Standby Diesel Generators. The root cause of the trip was improper maintenance performance that resulted in a pinched wire which grounded the A phase of the backup pilot wire current transformer when the cover was reinstalled during the Unit 1 refueling outage in the Spring of 1995. Root cause determination for the control rod insertion anomaly is subject of an ongoing investigation. Core physics analyses for this condition were performed and determined continued operation of Unit 1 is acceptable until the end of the current operating cycle. Corrective actions include repair of the grounded connection; reinforcement of management's expectations regarding control rod insertion indication, Emergency Operating Procedure usage and accuracy of notifications; training on lessons learned from this event; and procedure enhancements.

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

DESCRIPTION OF EVENT:

On December 18, 1995, Unit 1 was in Mode 1 at 100% power. At approximately 0336 hours, a ground fault occurred on one of the main transmission lines from the South Texas Project Electric Generating Station switchyard. The ground fault cleared when a protective breaker opened in the line. When the transmission line fault cleared, a Backup Pilot Wire Monitoring Relay actuated and resulted in a lockout of the Unit 1 main and auxiliary transformers. This event tripped open the generator output breaker, the main turbine, the breakers for all four 13.8 kV auxiliary buses and caused loss of offsite power to the A Train Engineered Safeguards Features Bus. The main turbine trip resulted in a reactor trip. The loss of electrical power to all Unit 1 auxiliary buses caused a loss of all reactor coolant pumps. The A Train Standby Diesel Generator started and loaded on its Engineered Safeguards Features Bus as expected. All Auxiliary Feedwater Pumps started to supply feedwater to the Steam Generators as expected. Main Feedwater Isolation Valves closed on an expected Feedwater Isolation signal as designed.

The loss of power resulted in loss of indication of voltage and current from offsite power to all Unit 1 auxiliary and standby buses when read from Main Control Board Panel CP010. With only the A Train Standby Diesel Generator running, the B and C Train Standby Diesel Generators were manually started to ensure power was available to all three Engineered Safeguards Features Buses. Subsequently, it was determined that only indication to panel CP010 had been lost and that Trains B and C Engineered Safeguards Features Buses had remained energized from offsite power. The B and C Train Standby Diesel Generators did not load their respective Engineered Safeguards Features Buses and were secured.

During verification that the control rods had fully inserted, it was noted that the digital rod position for control rods F10, C9 and N7 each indicated a rod position of six steps from rod bottom with their respective rod bottom lights not lit. All other control rods had indication of their rod bottom lights illuminated. This condition was considered as all rods fully inserted. Subsequently, during plant stabilization, control rod N7 indicated the fully inserted position.

The partial loss of offsite power caused normal letdown to isolate, which resulted in transfer of Charging Pump suction to the Refueling Water Storage Tank due to a low level in the Volume Control Tank. This provided a source of boration to the Reactor Coolant System. Normal letdown was restored at 0357 hours but the Charging Pump suction remained aligned to the Refueling Water Storage Tank to provide a boration flowpath for maintaining xenon free shutdown margin.

The Main Steam Isolation Valves were closed to limit cooldown. Main Steam Isolation Valve 1B Control Room indication showed the valve was not fully closed. Approximately nine minutes later, the valve indicated fully closed and it was subsequently determined that it had fully closed initially. An adjustment was made to the valve limit switch to correct the indication.

At approximately 0350 hours, the Pressurizer Power Operated Relief Valves automatically cycled three times. Auxiliary spray flow was subsequently used to control pressurizer pressure. Natural circulation of the Reactor Coolant System was verified.

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

DESCRIPTION OF EVENT (CONTINUED):

The electrical buses supplying power to the Reactor Coolant Pumps were reenergized at approximately 0450 hours. At approximately 0511 hours, Reactor Coolant Pump 1A was restarted followed by Reactor Coolant Pump 1D approximately eleven minutes later. This reestablished forced Reactor Coolant System flow and restored normal pressurizer spray capability.

At approximately 0603 hours, normal offsite power was restored to the A Train Engineered Safety Features Bus and the A Train Standby Diesel Generator was placed in cooldown.

At approximately 0610 hours, a Shutdown Margin verification was performed and Reactor Coolant System boron concentration was determined to be greater than the xenon free required value.

Investigation of the Unit 1 main transformer condition determined that one wire on the backup pilot wire current transformer for the A phase on Main Transformer 1B was pinched between the cover and the seating surface. This condition grounded the current transformer windings to the main transformer casing and, coupled with the line fault on the A phase of the transmission line from the South Texas Project Electric Generating Station, setup the conditions which led to the reactor trip.

Other equipment problems providing operator challenges occurred during this event:

1. The protection circuits did not trip the Startup Feed Pump on low net positive suction head and required manual trip of the pump from the Control Room.

2. Steam Generator Feed Pump #13 could not be placed on its turning gear.

3. The supply breaker to Load Center 12J1 failed during reenergization.

4. The Fire Protection Computer audible alarm continued to sound in the Control Room during this transient until the computer was rebooted.

Human performance issues involving this event were identified:

1. Management expectations regarding compliance with Emergency Operating Procedures were not met. Although control rod position indications received following the reactor trip required emergency boration, this action was not taken.

2. Management notification of the reactor trip was not timely.

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

DESCRIPTION OF EVENT (CONTINUED):

3. Accuracy of the notification of this event to the Nuclear Regulatory Commission did not meet expectations.

4. Manually starting Train B and C Standby Diesel Generators was inappropriate.

A Human Performance Post-Trip Review Team was formed to investigate and evaluate the human performance issues. This team focused on the sequence of events and procedures used to respond to the transient. The Team determined that reasonable technical decisions were made in handling a complex transient. Some examples were found where procedures and their usuage did not meet management's expectations. Actions identified to enhance performance and better define management expectations are listed as Corrected Actions in this report.

CAUSE OF EVENT:

The cause of this event was a grounded connection on the A phase of the Main Transformer 1B backup current transformer for the HCB differential relay. The condition resulted in the current transformer sensing a differential in line current when the fault in the transmission line from the South Texas Project Electric Generating Station cleared. This differential caused actuation of the Pilot Wire Monitoring Relay.

The root cause of the trip was improper maintenance performance that resulted in a pinched wire which grounded the A phase of the backup pilot wire current transformer when the cover was reinstalled during the Unit 1 refueling outage in the Spring of 1995.

Root cause determination for the control rod insertion anomaly is subject of an ongoing investigation and will be included in a supplemental report.

The cause of the failure to emergency borate the reactor was misdiagnosis of the post-trip rod position and the belief by the operating crew that all rods were fully inserted.

ANALYSIS OF EVENT:

Reactor Trips and Engineered Safeguards Features Actuations are reportable pursuant to 10CFR50.73 (a)(2)(iv). The reactor was brought to an orderly shutdown. All Engineered Safeguards Features functioned as designed. There were no adverse safety or radiological consequences of this event.

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

ANALYSIS OF EVENT (CONTINUED):

Following the reactor trip, the Reactor Coolant System average temperature reached a low of 554 degrees. This was the result of Auxiliary Feedwater being inserted to the Steam Generators to establish natural circulation. The Shutdown Margin remained satisfied during this event, greater than 271 ppm over the mininum required boron concentration.

The failure of control rods F10, C9 and N7 to fully insert was investigated. These control rods did insert to the six step position from rod bottom (approximately 4 inches) as indicated by digital rod position indication.

Followup testing determined that this condition was repeatable. An additional rod failed to fully insert at core location N-9 stopping at six steps from rod bottom. There were no indications that the rods were having any difficulty during insertion except in the bottom of the guide tube dash pot region. Rod drop traces did not indicate any significant decrease in rod speed until dashpot entry and did not indicate any evidence of loose parts. Rod drop times of the affected rods were consistent with startup testing performed in the Spring of 1995 and well within Technical Specification requirements. The affected rods were manually inserted to rod bottom further supporting there was no indication of loose parts.

Control rods exhibiting this problem were all in high burnup fuel assemblies, approximately 43,000 MWD/MTU. The service life of the affected control rods is six cycles which is approximately half of their design life (15 years) .

A safety evaluation for this condition determined that the affected rods were capable of performing their safety function for reactivity control and for shutdown and that there was no impact on Shutdown Margin. This safety evaluation conservatively assumed that all rod control cluster assemblies in the high burnup fuel assemblies, which represents 32 of the total 57 rod control cluster assembles, would not insert below 12 steps from rod bottom following a reactor trip. Core physics analyses for this condition were performed and determined continued operation of Unit 1 is acceptable until the end of the current operating cycle.

A review of Industry Operating Experience of control rod insertion anomalies indicated several potential causes including foreign material, degraded control rod, corrosion products and guide tube bowing. Root cause determination for the control rod insertion anomaly observed following the Unit 1 reactor trip is subject of an ongoing investigation.

The last occasion of rod drop testing in Unit 1 was successfully completed during the Spring 1995 refueling outage. In addition, all rods demonstrated proper insertion indications during the Unit 1 reactor scram that occurred on August 29, 1995.

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

CORRECTIVE ACTIONS:

1. The grounded connection on the A phase of the Main Transformer 1B backup current transformer for the HCB differential relay was repaired.

2. A faulty pressure switch in the loss of suction protection instrumentation on the Startup Feed Pump was found and repaired.

3. Lessons learned from this event were discussed with maintenance personnel involved in the root cause of this event.

4. Guidance was issued to reinforce management's expectations regarding control rod insertion indication, Emergency Operating Procedure usage and accuracy of notifications to regulatory agencies. On-Shift Licensed Operators were briefed by management regarding this reinforced guidance prior to assuming shift duties.

5. Training information regarding the lessons learned from this event will be issued to operations and maintenance personnel by February 1996.

6. Licensed Operator training will be enhanced by May 1996 with special emphasis on procedure usage, reactivity management issues, accuracy of notifications to offsite agencies and expected response to the rod position indication during this event.

7. A plan of action to determine the root cause of the control rod insertion anomaly and to monitor this condition will be developed by February 1996.

8. The Reactor Trip Response procedure will be revised by May 1996 to provide specific criteria for supporting decision making and diagnosis of conditions.

9. The Emergency Operating Procedures Users Guide will be revised by May 1996 to include specific criteria when alternate step performance can be authorized regarding Emergency Operating Procedures.

10. An effectiveness evaluation of the Event Review process will be completed by April 1996.

ADDITIONAL INFORMATION:

One Licensee Event Report had been previously submitted by the South Texas Project to the Nuclear Regulatory Commission within the last three years regarding a reactor scram and partial loss of offsite power due to a main transformer failure. Licensee Event Report 94-007 attributed the cause to the failure of a capacitor within the pilot wire relay.