

The Light company

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

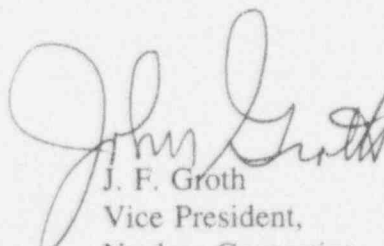
October 20, 1994
ST-HL-AE-4912
File No.: G26
10CFR50.73

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 94-015
Reactor Trip and Turbine Trip due to
Low-Low Steam Generator Level

Pursuant to 10CFR50.73, Houston Lighting & Power submits the attached Unit 1 Licensee Event Report 94-015 regarding a reactor trip and turbine trip due to low-low Steam Generator level. This event did not have an adverse effect on the health and safety of the public, but clearly does not meet the standards for expected operational performance.

If you should have any questions on this matter, please contact Mr. J. M. Pinzon at (512) 972-8027 or me at (512) 972-8664.


J. F. Groth
Vice President,
Nuclear Generation

JMP/pas

Attachment: LER 94-015 (South Texas, Unit 1)

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Houston Lighting & Power Company
South Texas Project Electric Generating Station

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C:

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

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 77404-910

J. R. Newman, Esquire
Newman, Bouknight & Edgar, P.C.
STE 1000, 1615 L Street, N.W.
Washington, DC 20036

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

G. E. Vaughn/C. A. Johnson
Central Power and Light Company
P. O. Box 2121
Corpus Christi, TX 78403

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

LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH
THIS INFORMATION COLLECTION REQUEST: 50.0 HRS.
FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO
THE INFORMATION AND RECORDS MANAGEMENT BRANCH
(MNR 7714), U.S. NUCLEAR REGULATORY COMMISSION,
WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK
REDUCTION PROJECT (3150-0104), OFFICE OF
MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

South Texas Unit 1

DOCKET NUMBER (2)

05000 498

PAGE (3)

1 OF 5

TITLE (4)

Reactor Trip and Turbine Trip due to Low-Low Steam Generator Level

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
09	20	94	94	-- 015 --	00	10	20	94	FACILITY NAME	DOCKET NUMBER
										05000
										05000
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)		100	20.402(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
			20.405(a)(1)(iii)		50.73(a)(2)(i)				50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
			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

Jairo Pinzon - Staff Engineer

TELEPHONE NUMBER (Include Area Code)

(512) 972-8027

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs

SUPPLEMENTAL REPORT EXPECTED (14)

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		11	17	94

ABSTRACT (Limit to 1400 spaces, i.e., approximately 1 1/2 single-spaced typewritten lines) (16)

On September 20, 1994, Unit 1 was in Mode 1 at 100% power. At 0105 hours, Unit 1 received an automatic reactor/turbine trip due to Steam Generator 1C low-low level. Immediately prior to the unit trip, efforts were in progress to reduce Reactor Power and Turbine Load following the unanticipated trip of the #13 Steam Generator Feedwater Pump. The cause of this event was that management expectations, procedural guidance, training, and personnel experience placed initial emphasis on expected plant response rather than actual plant conditions. This event was initiated when Steam Generator Feedwater Pump tripped on overspeed due to a failed speed feedback device (Tachometer Pack) in the speed control circuits. Contributing causes were determined to be inadequate communications and the Start-up Feedwater Pump recirculation valve not closing due to a coarse gain misadjustment on the flow controller card in the Miscellaneous Analog Cabinet. Corrective actions include discussing managements expectations regarding the use of all indications for proper equipment operations and crew communications with the involved crew, revising the off-normal procedure, replacing a failed speed sensor, ensuring proper operation of the Start-up Feedwater Pump Recirculation Valve, developing a scenario similar to this event for the simulator and including this event into Operators lessons-learned training.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNEB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
South Texas, Unit 1	05000 498	94	-- 015 --	00	2 OF 5

TEXT (If more space is required, use additional copies of NRC Form 34(A) (17))

DESCRIPTION OF EVENT:

On September 20, 1994 Unit 1 was in Mode 1 at 100% power. At approximately 0105 hours, Unit 1 experienced a reactor trip on low-low Steam Generator level approximately four minutes after the loss of a Steam Generator Feedwater Pump.

At approximately 0101 hours, the plant computer recorded the Steam Generator Feedwater Pump 13 speed in the alert range high. Four seconds later, a speed high alarm was received. Two seconds later, Steam Generator Feedwater Pump 13 tripped due to overspeed.

Following the Steam Generator Feedwater Pump trip, initial actions contained in the "Loss of Feedwater Flow or Control" procedure were performed. As expected, the motor-driven Start-up Feedwater Pump started automatically and was verified running. A Feedwater Booster Pump was started to ensure sufficient suction pressure for Start-up Feedwater Pump operation and Turbine Generator output was reduced slightly to ensure adequate margin existed between 100% operation and the current feedwater pump configuration.

Approximately one minute later, attempts were still in progress to match steam flow and feedwater flow. Steam Generator level continued to decrease with a steam flow-feedwater flow mismatch. Further analysis of the situation identified that the Start-up Feedwater Pump Recirculation Valve had not closed (indicated intermediate-position on the Main Control Board). As a result, feedwater to the Steam Generators was diverted to the Deaerator. This did not allow sufficient feedwater flow to maintain Steam Generator level. Within two minutes, it was determined that generator load must be decreased to approximately 900 MWe, the main turbine controls were placed in manual, and the load reduction rate was increased in order to decrease steam flow to less than feedwater flow. As load was reduced, the steam dumps modulated open due to a Temperature average-Temperature reference mismatch. Due to automatic rod insertion, steam dumps modulated in the closed direction, reducing steam flow below feedwater flow, and Steam Generator C level appeared to stabilize at approximately 37%. Upon closure of the dump valves, steam generator level shrunk below the low-low Steam Generator level trip setpoint (33%) and the reactor tripped.

The plant responded to the reactor trip as expected. Auxiliary Feedwater actuated on low Steam Generator level and Feedwater Isolation actuated on low average temperature coincident with a reactor trip.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
South Texas, Unit 1	05000 498	94	-- 015 --	00	3 OF 5

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

CAUSE OF EVENT:

The cause of this event was that management expectations, procedural guidance, training, and personnel experience placed initial emphasis on expected plant response rather than actual plant conditions.

When the Steam Generator Feedwater Pump 13 tripped, the initial actions contained in the "Loss of Feedwater Flow or Control" procedure were performed. These actions, which included verifying the Start-up Feedwater Pump had automatically started and starting a Feedwater Booster Pump, emphasized responding to the initiating event rather than actual plant conditions. Licensed Operator training and previous similar experience resulted in placing emphasis on expecting the Steam Generator levels to return to normal within a short period of time. The improper procedure emphasis and training caused a delay (90 seconds) in proper diagnoses which prevented averting a low-low Steam Generator level reactor trip.

Additional contributing causes:

1. Upon recognition of the need to decrease turbine load, inadequate communications delayed the actual reduction in turbine load.
2. This event was initiated when Steam Generator Feedwater Pump 13 tripped on overspeed. The cause was determined to be a failed speed feedback device (Tachometer Pack) in the turbine speed control circuits. The speed control circuits require a speed feedback signal to balance its output and maintain the desired speed. The feedback device failed in such a way that the speed signal provided to the controls was lower than the actual running speed of the machine. With this false running speed signal, the control circuits demanded more speed (opened the low pressure governor valve) in an attempt to bring the failed speed signal up to match the speed demand signal. The controller continued to increase the machine's actual speed until the electrical overspeed setpoint was reached.
3. The cause of the Start-up Feedwater Pump Recirculation Valve not closing was a coarse gain misadjustment on the flow controller card in the Miscellaneous Analog Cabinet. The loop gain was reduced to 0.78 on March 21, 1994, in response to a hunting problem identified earlier that month. The hunting problem was solved by reducing the loop gain. The gain setting reduction to 0.78 prevented full closure of the valve, as required, when suction flow increased above 7000 gallons per minute. As a result, the valve remained approximately 61% open for the duration of the event. A review of data shows that the valve was passing approximately 2500 gallons per minute (or 6% of rated feedwater flow), which correlates with the observed feedwater flow/steam flow mismatch a few minutes into the transient.

Additional investigation into the misadjustment problem is ongoing. A supplement to this Licensee Event Report will be submitted by November 17, 1994, documenting the results of the investigation and any necessary corrective actions.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
South Texas, Unit 1	05000 498	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 5
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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

ANALYSIS OF EVENT:

Reactor Trips and Engineered Safety Features actuations are reportable pursuant to 10CFR50.73(a)(2)(iv). All Engineered Safety Features systems functioned as designed. Auxiliary Feedwater actuated on low Steam Generator level and Feedwater Isolation actuated on low average temperature average coincident with a reactor trip. There were no adverse safety or radiological consequences of this event.

CORRECTIVE ACTIONS:

The following corrective actions have been taken or will be taken as a result of this event:

1. Management expectations regarding the use of all indications for proper equipment operation and crew communications were discussed with the involved crew.
2. The off-normal procedure, "Loss of Feedwater Flow or Control", was revised to respond to actual plant conditions and stabilize the plant to permit event analysis.
3. The failed speed sensor was replaced. A design modification to replace the Feedwater Pump Turbine speed controls is scheduled to be implemented during the next refueling. This modification also eliminates this sensor and similar ones from the control circuit. This modification was implemented in Unit 2 during the last refueling outage.
4. The Start-Up Feedwater Pump Recirculation Valve control circuit was calibrated and the valve was stroked to ensure proper operation. Additional investigation into the misadjustment problem is ongoing. A supplement to this Licensee Event Report will be submitted by November 17, 1994, documenting the results of the investigation and any necessary corrective actions.
5. A scenario similar to this event is being developed for use on the simulator. This will be completed by July 31, 1995. This date coincides with the installation and operation of a new simulator which can support the modeling of this scenario.
6. This event will be included in Operator lessons-learned training by February 28, 1995. Although using all indications to verify successful equipment operation and the use of adequate crew communications is continuously emphasized, lessons-learned training will re-emphasize these topics.

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South Texas, Unit 1	05000 498	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 5
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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

ADDITIONAL INFORMATION:

Previous events that have been reported by the South Texas Project to the Nuclear Regulatory Commission within the last three years regarding a reactor trip as a result of low Steam Generator level were:

- Unit 2 Licensee Event Report 92-003 regarding a reactor trip on February 24, 1992. The cause of that event was attributed to rainwater intrusion through the expansion joints in the Turbine Generator Building roof and into the Electro-hydraulic Control cabinet.
- Unit 2 Licensee Event Report 93-004 regarding a reactor trip due to low Steam Generator water level. The cause of that event was determined to be ineffective action to correct failures of the Start-up Steam Generator Feedwater pumps, Steam-Driven Feedwater pumps and Feedwater Isolation Bypass valves. The failure to effectively correct the root cause of these problems resulted in unnecessary loss of availability and reduced unit reliability.
- Unit 1 Licensee Event Report 94-009 regarding a manual reactor trip due to low Steam Generator water level. The cause of that event was an I/P convertor failure in the control loop for the 1D feedwater regulating valve.