

The Light company

Houston Lighting & Power

South Texas Project Electric Generating Station P. O. Box 289 Wadsworth, Texas 77483

May 8, 1991

ST-HL-AE-3771

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

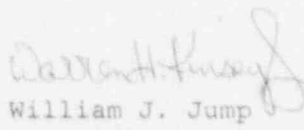
Licensee Event Report 91-011

A Technical Specification Required Shutdown

Due to Failure of a Feedwater Isolation Valve Solenoid

Pursuant to 10CFR50.73, Houston Lighting & Power Company (HL&P) submits the attached Licensee Event Report (LER 91-011) regarding a Technical Specification required shutdown due to failure of a Feedwater Isolation Valve solenoid. 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 me at (512) 972-7205.

For 
William J. Jump
Manager,
Nuclear Licensing

SDP/kmd

Attachment: LER 91-011 (South Texas, Unit 1)

LER91121001.U1

A Subsidiary of Houston Industries Incorporated

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Houston Lighting & Power Company
South Texas Project Electric Generating Station

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Revised 01/29/91

L4/NRC/

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): South Texas, Unit 1	DOCKET NUMBER (2): 0 5 0 0 0 4 9 8 1	PAGE (3): 1 OF 0 6
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TITLE (4):

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(S)	DOCKET NUMBER(S)	
0 4	0 8	9 1	9 1	0 1 1	0 0 0	5 0	8 9	1		0 5 0 0 0	

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 3. (Check one or more of the following): (11)									
OPERATING MODE (9): 1	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)					
	20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(ix)	73.71(d)					
	20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(iv)	OTHER (Specify in Abstract below and on Text NRC Form 366A)					
	20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(iv)(A)						
	20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(iv)(B)						
POWER LEVEL (10): 0 7 7	20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(ix)						

LICENSEE CONTACT FOR THIS LER (12):

NAME: Charles Ayala - Supervising Licensing Engineer	TELEPHONE NUMBER: 5 1 2 9 7 2 - 8 6 2 8
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13):

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14):

YES (If yes, complete EXPECTED SUBMISSION DATE:)	X NO	EXPECTED SUBMISSION DATE (15):

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

On April 8, 1991, Unit 1 was in Mode 1 at 77% power. At 2205 hours, an operability test was performed on the Train D Feedwater Isolation Valve (FWIV). The valve stroked as required; however, one of the two redundant solenoid valves which actuates the feedwater valve failed. Since the conditions of Technical Specification 3.7.1.7 for Modes 1 and 2 could not be met, a plant shutdown was initiated and a Notification of Unusual Event (NOUE) was declared. The NRC was notified at 0023 hours on April 9, 1991. The FWIV was secured and tagged at 0650 hours and Unit 1 was brought to Mode 3 at 0803 hours. The cause of this event was failure of one of two redundant FWIV solenoid valves to operate due to hydraulic fluid polymerization. Corrective actions include eliminating the major source of moisture entry into the hydraulic system, flushing the hydraulic system and replacing the hydraulic fluid, revision of Preventive Maintenance activities and plant modifications to add clean-up skids and relocate the solenoid valves.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104
EXPIRES 8/31/85

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
South Texas, Unit 1	0500049891	011	00	0	2	OF	06

TEXT (If more space is required, use additional NRC Form 368A's) (17)

DESCRIPTION OF EVENT:

On April 8, 1991, Unit 1 was in Mode 1 at 77% power. At 2205 hours during the performance of the Feedwater System Valve Operability Test, the Steam Generator 1D Feedwater Isolation Valve (FWIV) failed the partial stroke test. The alternate FWIV 1D operability verification test was performed which determined the FWIV's train A solenoid dump valve (1 of 2 redundant solenoid dump valves in each FWIV) was not operating. The hydraulic fluid system pressure was lowered and the solenoid was verified to be deenergizing as expected, except the train A solenoid dump valve failed to function. Technical Specification 3.7.1.7 for Modes 1 and 2 require the valve to be restored to operable status within 4 hours; otherwise, be in HOT STANDBY within the next 6 hours. The valve could not be restored to operable status and a Notification of Unusual Event (NOUE) was declared. The NRC was notified at 0023 hours. The FWIV was secured at 0650 hours and Unit 1 was brought to HOT STANDBY (Mode 3) at 0803 hours.

The FWIV's are hydraulically operated with a nitrogen charge in the cylinder. When the valve is required to open, hydraulic fluid (FYRQUEL GT) is applied to the lower cylinder causing a piston to rise, thus opening the valve. The rising piston compresses the nitrogen in the upper portion of the cylinder. When an isolation signal is received, two dump valves, aligned in parallel, open, allowing hydraulic fluid to drain back to a reservoir. The compressed nitrogen then drives the valve closed. Two redundant dump valves are provided to comply with single failure criteria.

On April 6, 1991, some difficulties were encountered in verifying the train A solenoid valve function during performance of the surveillance for FWIV 1D. Because of this and previous FWIV problems, Plant Management decided to perform the surveillance for FWIV 1D on a daily basis to ensure valve operability. The intent was to determine if a chemical breakdown of the hydraulic fluid (as previously described in a 10CFR21 Report submitted on April 11, 1990) contributed to this event.

FWIV Hydraulic fluid sampling is performed on a monthly basis. AKZO, the manufacturer of FYRQUEL GT, was contacted for the hydraulic fluid test results from a sample drawn on March 19, 1991. The results were received on April 10, 1991 and revealed that the hydraulic fluid sample had a high acid content in FWIV 1B and a high moisture content in FWIV 1D. There were no previous indications from recent analyses of a chemical breakdown of the hydraulic fluid. AKZO literature on chemical activity states that the fluid hydrolyzes slowly at ambient temperatures when exposed to alkali or acid conditions. These conditions were presumably present and it was concluded that fluid destabilization was occurring at various degrees throughout the system but the activity was accelerated within the solenoid valve.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES 6/31/85

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
South Texas, Unit 1	0500049891	011	00	0	3	OF	06

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

DESCRIPTION OF EVENT (Continued):

When the train A solenoid valve was disassembled, subsequent to the event, critical areas of the solenoid valve's pilot seats and orifices were found blocked by polymerized hydraulic fluid. This condition is similar to the condition identified in the April 11, 1990 10CFR21 Report in which the polymerization was determined to be a byproduct of the degradation of the FYRQUEL GT fluid caused by moisture intrusion into the hydraulic reservoir coupled with elevated temperature. The polymerization prevented the pilot from unseating when the solenoid coil was deenergized.

During the investigation of the 10CFR21 event it was discovered that a source of moisture intrusion into the hydraulic reservoir was due to venting of the reservoir to eliminate vapor binding of the air-operated pumps. A breather valve designed to prevent reservoir overpressurization did not allow air flow into the reservoir through the desiccant filters which would have removed moisture. The air pumps would draw a vacuum in the reservoir and become vapor-locked. Compensatory actions established were removal of the internals of the breather valve to allow constant venting of the reservoir through the desiccant filter, performing an operability test once a week and fluid sampling once a month.

On April 9, 1991, the desiccant filters for the FWIV 1B and 1D hydraulic skids were determined to be saturated with moisture and contaminants and no longer effective in taking the moisture out of makeup air drawn into the hydraulic system. Subsequently, all the desiccant filters on Units 1 and 2 were replaced and all the Unit 1 and 2 hydraulic fluid reservoirs were sampled and analyzed. The FWIV 1B hydraulic fluid was replaced.

On April 11, 1991, the work to replace the train A and B solenoid valves and to flush and replace the hydraulic fluid was completed. After satisfactory completion of post maintenance tests, FWIV 1D was declared operable.

CAUSE OF EVENT:

The steam generator 1D Feedwater Isolation Valve solenoid dump valves failed to operate as a result of hydraulic fluid polymerization. The hydraulic fluid FYRQUEL GT is rated for 150 degrees fahrenheit. The FYRQUEL hydraulic fluid polymerizes at elevated system temperatures. Moisture accelerates the polymerization. The expected maximum temperature for the fluid near the solenoid coil assembly is 175 degrees fahrenheit and near the orifice the expected maximum temperature is 153 degrees fahrenheit. At critical areas of the solenoid valve, polymerization accelerates due to the valve's internal heat and prevents the pilot from unseating when the solenoid coil is deenergized. This effect was identified in the 10CFR21 reports of April, 1990 wherein compensatory measures were identified.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES 8/31/85

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TEXT (If more space is required, use additional NRC Form 360A's) (17)

Contributing causes to this event are as follows:

1. The fluid sample analysis results for the March 19 sample were not known for twenty days.
2. The status of the desiccant filters were part of the auxiliary operator checks; however, depletion of the desiccant filter was not detected. The color change indicative of desiccant depletion did not occur in the manner illustrated on the desiccant canister label.
3. The vendor manual gives no periodicity for replacing the desiccant filters.

ANALYSIS OF EVENT:

Completion of a plant shutdown required by Technical Specifications is reportable pursuant to 10CFR50.73(a)(2)(i)(A). The principle function of the FWIV's is to isolate feedwater flow to the steam generator in the event of a high energy line break. Closure of the valve effectively terminates the addition of feedwater to an affected steam generator, limiting the mass and energy release for a steam or feedwater line breaker and minimizing the positive reactivity effects of the Reactor Coolant System cooldown associated with the blowdown.

In the event FWIV 1D could not be closed when required, feedwater flow could be secured by closure of the feedwater regulator valve or tripping of the feedwater pumps. Both of these actions are automatically initiated by the Engineered Safety Features Actuation System (ESFAS). In addition, if the break occurred outside containment, isolation could be accomplished by the feedwater check valve.

CORRECTIVE ACTIONS:

The following corrective actions have been or are being taken as a result of this event:

1. The train A and B FWIV 1D solenoid valves have been removed and replaced; the hydraulic fluid reservoir cleaned, and new fluid installed.
2. The FWIV 1B hydraulic fluid, which demonstrated a high acid content, was replaced.
3. The remaining Unit 1 and 2 hydraulic fluid reservoirs were sampled and analyzed and found to be within specification.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

4. The Unit 1 and Unit 2 desiccant filters for each FWIV have been replaced. Preventive Maintenance activities have been generated to inspect the filters on a weekly basis and replace the filters on a quarterly basis.
5. The Vendor Technical Manual for the FWIV assembly has been reviewed to assure components which require monitoring or replacing are evaluated for inclusion in plant surveillance of preventive maintenance activity.
6. The turnaround time on offsite hydraulic fluid laboratory analysis by vendor laboratories has been expedited. Analysis results will be obtained within 5 to 7 working days. In addition, HL&P has requested a telephone report in the event analysis results exceed threshold values.
7. Other hydraulic actuators at STPEGS which use FYRQUEL hydraulic fluid and desiccant filters are the main steam PORV's (atmospheric steam dump valves). Preventive Maintenance documents for these valves will be issued by August 8, 1991, to ensure the desiccant filters are inspected and replaced periodically.

CORRECTIVE ACTIONS TAKEN TO PREVENT RECURRENCE

As previously reported, to address FWIV failures due to fluid breakdown HL&P has evaluated improvements to the design of the FWIV. Plant modifications have been initiated to modify the valves such that the fluid will not break down. The intent of the plant modifications is to maintain the chemical fluid within specifications and to remove a heat source from the solenoid. Unit 1 and 2 hydraulic clean-up skids will be installed by July 31, 1991 to maintain particulate and moisture clean-up.

The Solenoid dump valves will be relocated outside the warm region of the FWIV yoke. This modification provides additional means to channel heat away from the solenoid valve. The valves are scheduled to be modified during the fourth refueling outage for Unit 1 and the second refueling outage for Unit 2. These are the next refueling outages for each unit.

ADDITIONAL INFORMATION:

Each STPEGS Unit uses four (4) 18" Main Feedwater Isolation Valves (MFIVs) which were purchased from and provided directly to STPEGS by WKM during initial plant construction.

The Solenoid-Actuated Pilot-Operated Dump Valve(s) model number 27700-77 is manufactured by Valcor and supplied to STPEGS by WKM.

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES 8/31/85

FACILITY NAME (1) South Texas, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 4 9 8 9 1	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
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TEXT (If more space is required, use additional NRC Form 365A's) (17)

The FYRQUEL GT hydraulic fluid is manufactured by AKZO. There have been two previous events reported, (LER 90-002; dated February 2, 1990 and 10CFR21 Report; dated April 11, 1990), where the degradation of the FYRQUEL GT hydraulic fluid was identified as the cause of failure of the solenoid valve and hence affected the operability of the FWIV.

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