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) Effects of the Westinghouse Generic Reactor Coolant System Flow Anomaly

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)
											South Texas, Unit 2	0 5 0 0 0 4 9 9
0 9	0 2	8 8	8 8	-	0 5 2	-	0 0	1 0	0 3	8 8		0 5 0 0 0

OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
1		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
0 1 3		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)	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
	AREA CODE
Charles A. 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	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
B											

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		1 2	3 0	8 8

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

On September 1, 1988, Westinghouse notified Houston Lighting & Power (HL&P) that their analysis of data obtained during initial full power operation of Unit 1 confirmed the existence of the flow anomaly similar to that identified in other Westinghouse four loop plants. The flow anomaly is a thermal-hydraulic instability in the reactor vessel which results in a slight decrease in coolant flow to certain areas of the reactor core. The Departure from Nucleate Boiling (DNB) penalty resulting from the anomaly exceeds the available generic margin. This condition was determined to be reportable and the NRC was notified on September 2, 1988, at 1950 hours. To regain sufficient DNB margin to offset the effect of the anomaly, Westinghouse has recommended that RCS flow be maintained above 400,000 gpm when operating at 100% power until further analysis can be completed. The operating procedure which monitors RCS flow has been revised and Westinghouse is continuing their analysis.

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

DESCRIPTION OF EVENT:

At the beginning of 1987, Westinghouse identified that a thermal-hydraulic flow instability known as the Reactor Coolant System (RCS) flow anomaly existed in some four loop plants of their design as described in WCAP-11528. The flow anomaly, believed to be multiple rotational flows in the lower reactor vessel plenum, causes coolant flow maldistributions in the core. The flow maldistribution results in increased coolant temperatures, local reductions in power, and a reduction in the margin to Departure from Nucleate Boiling (DNB). It is characterized by fluctuations in RCS flow, core exit temperatures, and reactor power, which are aperiodic in nature.

Houston Lighting & Power (HL&P) included testing during initial 100% power operation of Unit 1 specifically to determine the extent to which the flow anomaly might affect the South Texas Project Electric Generating Station. On September 1, 1988, Westinghouse notified HL&P that they had confirmed the existence of the flow anomaly. The penalty resulting from the anomaly exceeds the available generic margin. This condition was determined to be reportable and the NRC was notified pursuant to 10CFR50.72 on September 2, 1988, at 1950 hours.

HL&P collected data during startup testing which indicated that the flow anomaly may exist. However, it could not be confirmed at that time. To ensure that STP Unit 1 operated within the design basis, analysis was performed based upon the generic flow anomaly identified in WCAP-11528. It was determined at that time that the effects of the flow anomaly were bounded by the existing safety analysis.

Confirmation of the anomaly was made through an evaluation of plant data collected at 100 percent power. This data was collected by Westinghouse (W) personnel on August 20, 1988. W subsequently analyzed the data to characterize the instability. Based on a preliminary evaluation, they indicated that the available generic DNB margin would not fully offset the penalty due to the anomaly. However, RCS measured flow greater than that required by Technical Specification 3.2.5 (i.e., 395,000 gpm) could provide additional DNB margin. W initially recommended that RCS flow be maintained above 402,000 gpm. For RCS flows between 395,000 gpm and 402,000 gpm, they recommended that Unit 1 be restricted to power levels below 99%. The DNB margin associated with the increased RCS flow and/or power reduction, in combination with the generic DNB margin offsets the penalty associated with the instability until more detailed calculations can be performed.

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

Immediate corrective actions consisted of revising the operating procedure which addresses the monitoring of RCS flow. Requirements were added to maintain RCS flow at or above 402,000 gpm or reduce Unit 1 power to 99% for flows down to the Technical Specification limits. Based on additional calculations, W has now revised the recommended minimum RCS flow to 400,000 gpm for full power operation.

CAUSE OF EVENT:

The root cause of the event is believed to be the design of late generation W 4-loop Pressurized Water Reactors (PWRs). Topical report WCAP-11528 describes W efforts to understand and quantify the behavior of the instability. The topical report identifies the following factors as enhancing the hydraulic conditions for the development of the instability:

a.) pairing of reactor vessel inlet nozzles contributing to circumferentially non-uniform downward coolant velocities in the annular region between the reactor vessel and core support barrel,

b.) redesign of neutron pads and radial support keys contributing to low resistance coolant flow paths to vessel lower plenum region,

c.) non-symmetric die plate design and placement contributing to higher coolant flows to specific core quadrants,

d.) reduced structural density of lower plenum hardware contributing to reduced flow resistance in the plenum, and

e.) RCS loop flow imbalances contributing to non-uniform coolant flows in the lower plenum.

ANALYSIS OF EVENT

The STP Unit 1 safety analysis for fuel cycle 1 includes approximately 3% generic margin to DNB. W has estimated that the flow anomaly in STP Unit 1 reduces DNB margin by approximately 5%. Based on preliminary evaluations, HL&P can gain margin by maintaining RCS flow at or above 400,000 gpm. This margin increment plus the generic margin will offset the penalty imposed by the flow anomaly. Therefore, the flow anomaly has no safety significance.

This event is reportable pursuant to 10CFR50.73(a)(2)(v).

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CORRECTIVE ACTIONS

The following corrective actions are being taken to ensure that adequate DNB margin is maintained:

1. The operating procedure which monitors RCS flow has been revised to include the new W recommendations for flow rates.

2. W will complete a detailed analysis of the flow anomaly by November 30, 1988. The results of this analysis will be used as the basis for proposed revisions to Technical Specifications and procedures.

3. For Unit 2, W will continue to monitor RCS parameters through startup to characterize the flow anomaly. Corrective actions specific to Unit 2 will be identified at that time.

ADDITIONAL INFORMATION

There have been no previous reportable events regarding the RCS flow anomaly at the South Texas Project.

The Light company
Houston Lighting & Power

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

October 03, 1988
ST-HL-AE-2800
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 88-052 Regarding the Effects of the
Westinghouse Generic Reactor Coolant System Flow Anomaly

Pursuant to 10CFR50.73, Houston Lighting & Power (HL&P) submits the attached Licensee Event Report (LER 88-052) regarding the effects of the Westinghouse Generic Reactor Coolant System Flow Anomaly on the South Texas Project Electric Generating Station Unit 1. 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.

G. E. Vaughn
Vice President
Nuclear Plant Operations

GEV/BEM/nl

Attachment: LER 88-052

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