NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Calvert Cliffs Nuclear Power Plant, Unit 1	0 5 0 0 0 3 1 7	1 OF 0 3

TITLE (4)
HPSI Injection Leg's Flow Imbalanced

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)
1 2	1 5	8 4	8 4	0 1 6	0 0	0 1	1 4	8 5		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)							
POWER LEVEL (10)	0 0 0		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)
			20.405(a)(1)(i)		50.36(c)(1)	X	50.73(a)(2)(v)		73.71(c)
			20.405(a)(1)(ii)		50.36(c)(2)	X	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)	X	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)
Larry F. Basso, Engineer	3 0 1 2 6 0 - 4 9 8 6

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

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

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

At 0550 during the performance of Surveillance Test STP-0-67, the High Pressure Safety Injection (HPSI) system injection legs' flows were outside of Technical Specification 4.5.2.h requirement of 170 ± 5 gpm to each loop. A similar event occurred on Unit 2 on June 14, 1984 at 0400. Other similar events were reported under LERs 50-317/83-64. The throttle valves' limit switches were adjusted to obtain proper flow rates.

Improperly set limit switches caused the flow imbalance. Limit switches were improperly set because of the identified difference in throttle valve stem travel when the valves open without line flow (no-flow condition) as opposed to opening the valves coincident with HPSI pump actuation (flow condition). This difference was observed when the valves' stem travel was measured, with a micrometer, in the flow and no-flow conditions. In the no-flow condition, the valves do not repeatedly return to the same position and travel further than in the flow condition. Limit switch adjustments made over the past year based on no-flow stem travel measurements had induced errors in valve position setting. No-flow measurements will not be relied on to perform limit switch adjustments. Refinement of measurement technique was developed to reduce the variance in the stem travel data. This variance in the past may have also induced errors in valve setting. Additional testing was performed to identify other variables affecting valve stem travel and consequent system flow characteristics.

A change to the existing Technical Specification is being sought such that a minimum additive flow rate for the lowest three (3) injection leg flows and a maximum for all four (4) legs will be specified.

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NRC Form 366
(9-83)

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Calvert Cliffs, Unit 1	0 5 0 0 0 3 1 7	8 4	— 0 1 6	— 0 0	0 2 OF 0 3

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

At 0550 with Unit 1 in **MODE** 5, the High Pressure Safety Injection (HPSI) system (EIIS BQ) individual injection leg flow rates were found to be outside the allowable limits of Technical Specification 4.5.2.h during performance of Surveillance Test STP 0-67-1. Six (6) of the eight (8) flow rates were outside of the 170 ± 5 gallons per minute (GPM) specification. Additionally, on Unit 2 on 6-14-84 at 0400 during STP 0-67-2 in which seven (7) injection leg flow rates were outside the specification. Other similar events were reported under LERs 50-317/83-64 and 50-318/83-64. The throttle valves' (EIIS 20) limit switches were adjusted to obtain the proper flow rates on both units.

The cause of the flow imbalance was improperly set throttle valve limit switches. It was determined that the limit switches were improperly set because of the recently identified difference in the amount of throttle valve stem travel when the valves were opened prior to establishing flow (termed the no-flow condition) as opposed to opening the valves coincident with HPSI pump actuation (termed the flow condition). This difference was attributable to the motor-operated valves' motor coast and operator gear slop after the "open" limit switch actuated to deenergize the motor to stop the valve at its previously set position. In the no-flow condition, the valves do not repeatedly return to their set position and always open further than in the flow condition. Over the past 12 months, limit switch adjustments have been made based on no-flow valve position measurements inducing errors in the valves' settings. These no-flow measurements will no longer be relied on to perform limit switch adjustments on either unit.

A problem with the method used to accurately determine valve position was also recently identified. Valve position is determined by taking a micrometer measurement from the top of the bevel gear housing to the top of the valve stem. Neither the top of the bevel gear housing nor that of the valve stem are finely machined surfaces. The micrometer placement, therefore, is very critical to obtain consistent valve position measurements as stem travel measurement variance of only tens of mils significantly affects flow balance results. The measurement technique has been refined to eliminate this variable. Though, in the past, this may have also induced errors in setting valves.

Additional testing was performed on Unit 1 to determine what effect valve packing gland tightness has on each valve in the flow and no-flow conditions. It was determined from this testing that packing gland tightness has no effect on valve stem travel in the flow condition but does affect travel in the no-flow condition. For purposes of normal HPSI system operation, the flow condition is the only concern since a Safety Injection Actuation Signal (SIAS) alone would cause the valves to open and the HPSI pump to start simultaneously. If there was a loss of off-site power coincident with an SIAS, the pump would be sequenced on five (5) seconds after the valves began to open. This case presented the need for further testing to determine the effects of the "sequenced" condition. The outcome of the test showed no significant difference between the sequenced and the flow conditions relative to final injection leg flows. Nevertheless, a design change to place the throttle valves' open signal on the same sequenced step as the HPSI pump start signal has been initiated to eliminate any concern about system performance during the sequenced condition.

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Calvert Cliffs, Unit 1	0 5 0 0 0 3 1 7	8 4	— 0 1 6	—	0 3 OF 0 3

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

When the above mentioned design change is implemented, the flow condition will be the only mode of system operation. Testing has shown that under flow conditions, valve stem travel is repeatable and, as previously mentioned, packing tightness has no effect on valve stem travel. Therefore, as packing loosens with time and valve operation, it will not effect valve travel and hence, injection leg flow rates. Since the only maintenance performed on the Unit 2 throttle valves was to tighten packing, as a maintenance record search showed, and the valves were adjusted under flow conditions, there is reasonable assurance the valves will return to the correct position when required.

Concerning the safety implications of this event, given the limiting small break Loss of Coolant Accident (LOCA), assuming the worst single failure and the lowest combination of three injection leg flows, and crediting no flow from the Chemical Volume and Control System (CVCS) (EIIS CB), the flow reaching the core would have fallen short of the 495 GPM assumed in the small break LOCA analysis. However, the hot full power moderator temperature coefficient, the peak linear heat rate, and the axial shape index have been significantly less adverse than those assumed in the accident analysis and it is likely that some CVCS flow would exist. A specific small break LOCA calculation using the most adverse conditions that existed throughout cycle life might, therefore, show acceptable results for peak clad temperature. Such a calculation was not performed. Finally, NRC test programs have shown that significant conservatism exists in the mandated LOCA methodology.

A change to the specification is being sought such that a minimum additive flow rate for the lowest three (3) injection leg flows and a maximum additive flow rate for all four (4) legs will be specified.

BALTIMORE GAS AND ELECTRIC COMPANY

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BALTIMORE, MARYLAND 21203

NUCLEAR POWER DEPARTMENT
CALVERT CLIFFS NUCLEAR POWER PLANT
LUSBY, MARYLAND 20657

January 14, 1985

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Docket No. 50-317
License No. DPR 53

Dear Sirs:

The attached LER 84-16 is being sent to you as required by 10 CFR 50.73.

Should you have any questions regarding this report, we would be pleased to discuss them with you.

Very truly yours,

L. B. Russell
Plant Superintendent

LBR/LFB/pah

cc: Dr. Thomas E. Murley
Director, Office of Management Information
and Program Control

Messrs: A. E. Lundvall, Jr.
J. A. Tiernan

IE22
1/1