

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9003230219      DOC. DATE: 90/03/16      NOTARIZED: NO      DOCKET #  
 FACIL: 50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylvania      05000387  
 AUTH. NAME      AUTHOR AFFILIATION  
 RYDER, T.S.      Pennsylvania Power & Light Co.  
 STANLEY, H.G.      Pennsylvania Power & Light Co.  
 RECIPIENT NAME      RECIPIENT AFFILIATION

SUBJECT: LER 90-007-00: on 900215, HPCI turbine stop valve failure to open properly.

DISTRIBUTION CODE: IE22T      COPIES RECEIVED: LTR      ENCL      W/9      ltr.      SIZE: 6  
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	NRR/DST/SRXB 8E	1		1	<u>REG FILE</u> 02	1		1
	RES/DSIR/EIB	1		1	RGN1 FILE 01	1		1
EXTERNAL:	EG&G WILLIAMS, S	4		4	L ST LOBBY WARD	1		1
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NOTES:		2		2				

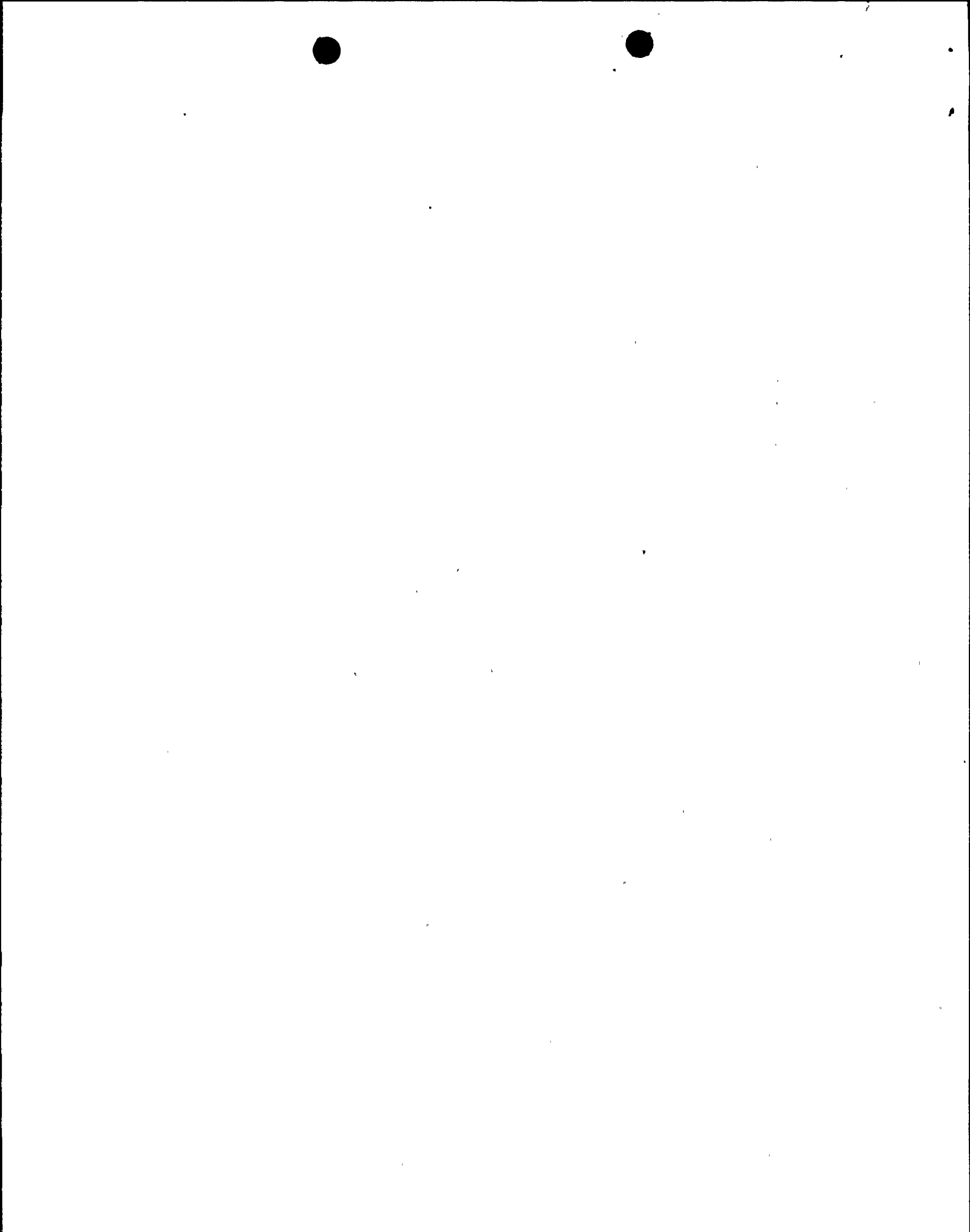
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Pennsylvania Power & Light Company

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March 16, 1990


U.S. Nuclear Regulatory Commission  
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SUSQUEHANNA STEAM ELECTRIC STATION  
LICENSEE EVENT REPORT 90-007-00  
FILE R41-2  
PLAS -418

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Docket No. 50-387  
License No. NPF-14

Attached is Licensee Event Report 90-007-00. This report is being made pursuant to 10CFR50.73(a)(2)(v), in that HPCI was determined to be inoperable resulting in the loss of a single train safety system.

  
H.G. Stanley  
Superintendent of Plant - Susquehanna

TSR/mjm

cc: Mr. W. T. Russell  
Regional Administrator, Region I  
U.S. Nuclear Regulatory Commission  
475 Allendale Road  
King of Prussia, PA 19406

Mr. G. S. Barber  
Sr. Resident Inspector  
U.S. Nuclear Regulatory Commission  
P.O. Box 35  
Berwick, PA 18603-0035

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*TSR*  
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LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) **Susquehanna Steam Electric Station - Unit 1** DOCKET NUMBER (2) **0 5 0 0 0 3 8 7** PAGE (3) **1 OF 0 5**

TITLE (4) **HPCI Turbine Stop Valve Failure to Open Properly**

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)
0	2	1 5 9 0	0 9 0	0 0 7	0 0	0 3	1 6	9 0		0 5 0 0 0

OPERATING MODE (9) **1**

POWER LEVEL (10) **0 9 7**

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

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.406(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.406(a)(1)(i)	<input type="checkbox"/> 50.38(c)(1)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.406(a)(1)(ii)	<input type="checkbox"/> 50.38(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/> 20.406(a)(1)(iii)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
<input type="checkbox"/> 20.406(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.406(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME **T.S. Ryder - Power Production Engineer** TELEPHONE NUMBER **7 1 7 5 4 2 - 3 2 3 5**

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)

YES (If yes, complete EXPECTED SUBMISSION DATE)  NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (18)

On February 15, 1990 with Unit 1 operating in Condition 1 at 97% power, during performance of a quarterly High Pressure Coolant Injection (HPCI) flow surveillance test, the HPCI Stop Valve did not open. Technical Staff recommended that HPCI should not be restored to OPERABLE status without first correcting the HPCI Stop Valve response. Based on this recommendation, at 1730 hours on the same day, HPCI was declared INOPERABLE. The cause of this event is believed to be high balance chamber pressure seen in the HPCI Stop Valve in conjunction with the magnitude of the hydraulic and steam forces that existed when the HPCI flow surveillance test was run. The event has been determined to be reportable per 10CFR50.73(a)(2)(v) in that the loss of HPCI is a loss of a single train safety system. Since the remaining Emergency Core Cooling (ECCS) systems required by Technical Specification 3.5.1 were OPERABLE, the Unit was assured of adequate core cooling in the event of a loss of coolant accident. There were no safety consequences or compromise to the public health or safety during the time that HPCI was INOPERABLE. On February 16, 1990, Maintenance personnel reset the adjustment screws for the HPCI Stop Valve balance chamber. Based on the HPCI Stop Valve opening in subsequent testing, Technical Staff recommended no further balance chamber pressure adjustments and that HPCI should be declared OPERABLE. At 0640 hours on February 16, HPCI was restored to OPERABLE status. General Electric SIL 480, HPCI Startup Transient Improvement, will be implemented as a modification on Unit 1 in order to prevent recurrence of this problem. Unit 1 HPCI Stop Valve performance will continue to be monitored before and after SIL implementation.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)  Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2)  0   5   0   0   0   3   8   7   9   0   -   0   0   7   -   0   0	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
					0   2	OF 0   5

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

DESCRIPTION OF EVENT

On February 15, 1990 with Unit 1 operating in Condition 1 at 97% power, a quarterly High Pressure Coolant Injection (HPCI, EIIS Code: BJ) flow surveillance test was being performed following completion of routine Instrument & Control (I&C) Department planned maintenance (PM's). The flow test resulted in two unsatisfactory HPCI runs due to HPCI Stop Valve performance problems encountered. The first run was under cold temperature conditions (Cold Start), and the second was a Warm Start (so called because steam flow from the original run has resulted in increased temperatures to the various HPCI components).

A review of the General Electric Transient Analysis and Recording System (GETARS) computer plots of various HPCI parameters including valve position was conducted following the surveillance test by Technical Staff. The plots indicated that the HPCI Stop Valve main disc did not open. Technical Staff recommended that HPCI should not be restored to OPERABLE status without first correcting the HPCI Stop Valve response. Based on this recommendation, at 1730 hours on the same day, HPCI was determined to be INOPERABLE resulting in the inadvertent loss of a single train safety system.

CAUSE OF EVENT

The cause of this event is believed to be high balance chamber pressure seen in the HPCI Stop Valve in conjunction with the magnitude of the hydraulic and steam forces that existed when the HPCI flow surveillance test was run.

An explanation of the forces associated with the opening of the HPCI Stop Valve is necessary to understand the cause. Refer to the attached drawing which illustrates the valve design. There are multiple forces affecting the valve's ability to open. Forces which act to keep the valve closed are: (1) the spring force, (2) frictional force, (3) weight of the disc, and (4) balance chamber steam force associated with steam flowing through the pilot valve. Forces which act to open the valve are: (1) the hydraulic force of the control oil acting on the main cylinder piston, and (2) steam force of the steam lifting up on the main disc once the main disc has started to open.

Because the spring force, frictional force, and weight of the disc are of relatively small magnitude and are essentially constant with time, they can be ignored in this discussion. This leaves the following variable forces: balance chamber force acting to keep the valve closed and the hydraulic and steam forces acting to open the valve. Balance chamber force is directly related to balance chamber pressure. Balance chamber pressure is dependent on (1) adjustment screw settings which control the amount of steam entering into the

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

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FACILITY NAME (1)  Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2)  0 5   0   0   0   3   8   7	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9   0	-   0   0   7	-   0   0	0   3	OF 0   5

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balance chamber, and (2) component temperatures. Experience has shown that balance chamber pressure can vary as much as 30 psig when conditions change from cold to hot. The hydraulic force is dependent on control oil conditions. This force can vary as oil temperature, control oil valve position, and other factors change within the control oil system for HPCI. The steam force acting to open the valve is variable dependent on steam pressure existing under the main disc as it just begins to leave the closed position.

The establishment of an optimum balance chamber pressure is desirable to accommodate both HPCI Cold and Warm Starts. If the adjustment screws in the balance chamber are set to allow too low a pressure, the main disc could open with undesirably high force, particularly on Cold Starts in which temperature hasn't helped raise balance chamber pressure. Conversely, if the settings allow too high a balance chamber pressure, the HPCI Stop Valve could possibly not open, particularly on Warm Starts in which temperature has helped raise pressure to the point where the opening forces cannot overcome the balance chamber force.

In the event of February 15, 1990, HPCI Stop Valve balance chamber pressure had not changed appreciably from the previous quarterly flow surveillance test in which the valve operated satisfactorily. It is believed that the control oil system dependent hydraulic force was lower than on the previous surveillance or the steam forces were different at the same measured balance chamber pressure with the end result that the stop valve main disc did not open when tested.

REPORTABILITY/ANALYSIS

The event has been determined to be reportable per 10CFR50.73(a)(2)(v) in that the inoperability of HPCI is a loss of a single train safety system. Technical Specification 3.5.1 requires that, provided Core Spray (CS, EIIS Code: EM), Low Pressure Coolant Injection (LPCI, EIIS Code: BO), Automatic Depressurization (ADS, EIIS Code: Not Listed), and Reactor Core Isolation (RCIC, EIIS Code: BN) Systems are OPERABLE, with HPCI System INOPERABLE, HPCI shall be restored to OPERABLE status within 14 days or the Unit shall be in at least HOT SHUTDOWN within the next 12 hours and reactor steam dome pressure shall be reduced to less than or equal to 150 psig within the following 24 hours. This action statement had been entered at 0700 hours when HPCI was removed from service for the I&C PM's. Since the remaining Emergency Core Cooling (ECCS) systems required by T/S 3.5.1 were OPERABLE, the Unit was assured of adequate core cooling in the event of a loss of coolant accident. There were no safety consequences or compromise to the public health or safety during the time that HPCI was inoperable.

In accordance with the guidance provided in NUREG 1022 Supplement 1 Items 14.1 and 14.10, the required submission date for this report was determined to be March 19, 1990.

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 RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		0	0	7	0	0 4 OF 0 5

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CORRECTIVE ACTIONS

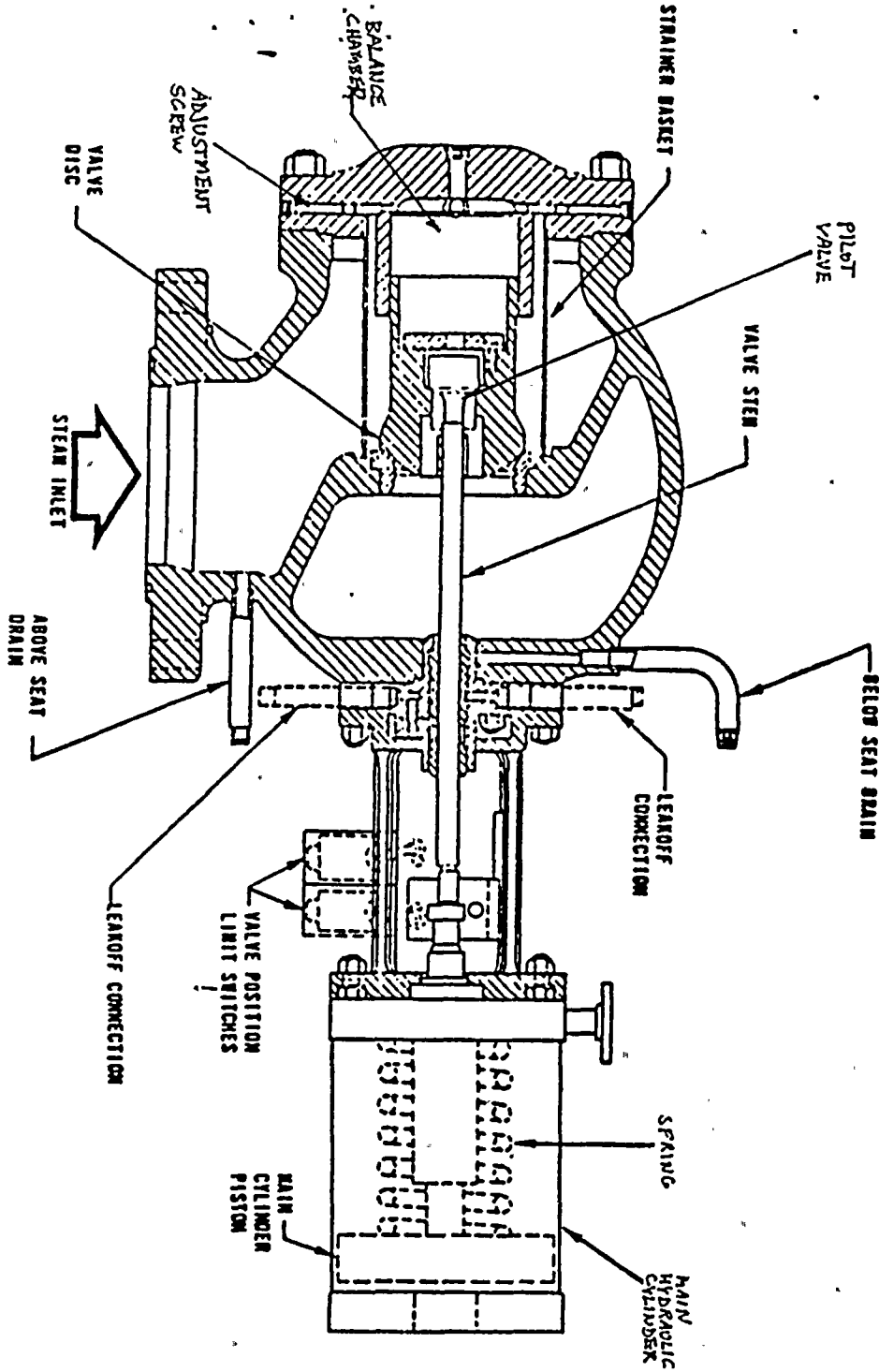
On February 16, 1990, Maintenance personnel reset the adjustment screws for the HPCI Stop Valve balance chamber to ensure stop valve opening. The HPCI Stop Valve opened on the subsequent Cold Start and Hot Start testing and the surveillance test was successfully completed. Technical Staff reviewed the GETARS plots for the two runs and recommended no further balance chamber pressure adjustments and that HPCI should be declared OPERABLE. At 0640 hours on February 16, 1990, HPCI was restored to OPERABLE status.

General Electric SIL 480, HPCI Startup Transient Improvement, will be implemented as a modification on Unit 1 in order to prevent recurrence of the problem. This modification is scheduled to be completed during the Unit 1 fifth refueling outage (September - November, 1990). Implementation of the SIL will allow the Control Valve downstream of the HPCI Stop Valve to be fully closed instead of open at the time the HPCI Stop Valve is beginning to open. Since steam flow through the pilot valve and under the main disc will be minimized when the Control Valve is closed, enhanced HPCI Stop Valve performance is expected to be achieved independent of balance chamber adjustment screw settings. This modification has been already implemented on Unit 2 with resultant improved HPCI Stop Valve performance. Unit 1 HPCI Stop Valve performance will continue to be monitored before and after SIL implementation.

ADDITIONAL INFORMATION

Failed Component Identification: Not applicable

Previous Similar Events: Three previous events were identified involving HPCI Stop Valve performance as affected by balance chamber pressure at Susquehanna. The stop valve main disc opened in all of these previous events. Therefore they were determined not to have affected operability, and as such were not reportable. As part of our long term actions, these events will be included in the evaluation of the HPCI Stop Valve problem.



WPC1 TURBINE STOP VALVE FY-15812