

## PHILADELPHIA ELECTRIC COMPANY

LIMERICK GENERATING STATION

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April 11, 1990  
Docket No. 50-353  
License No. NPF-85

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

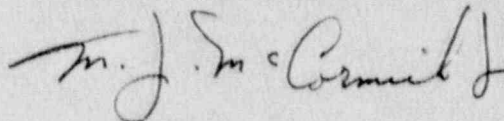
SUBJECT: Licensee Event Report  
Limerick Generating Station - Unit 2

This LER reports an inadvertent automatic actuation of the High Pressure Coolant Injection (HPCI) system and the Primary Containment and Reactor Vessel Isolation Control System (both are Engineered Safety Features). These actuations resulted from a spurious low reactor water level signal while Instrumentation and Controls technicians were performing a surveillance test which is not normally performed during reactor operations.

Reference:	Docket No. 50-353
Report Number:	2-90-006
Revision Number:	00
Event Date:	March 12, 1990
Report Date:	April 11, 1990
Facility:	Limerick Generating Station P.O. Box A, Sanatoga, PA 19464

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(iv).

Very truly yours,



WAR:cah

cc: T. T. Martin, Administrator, Region I, USNRC  
T. J. Kenny, USNRC Senior Resident Inspector, LGS

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## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Limerick Generating Station, Unit 2										DOCKET NUMBER (2) 0 5 0 0 0 3 5 3 1					PAGE (3) 1 OF 0 8	
TITLE (4) Inadvertent actuation of HPCI and PCRVICS resulting from a spurious low reactor water level signal when valving a reactor pressure transmitter into service.																
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 3	1 2	9 0	9 0	0 0 6	0 0 0	0 4	1 1	9 0					0 5 0 0 0			
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 8: (Check one or more of the following) (11)																
OPERATING MODE (9)		1		20.402(b)		20.406(e)		X		80.73(a)(2)(iv)		73.71(b)				
POWER LEVEL (10)		11010		20.406(a)(1)(i)		80.36(a)(1)				80.73(a)(2)(v)		73.71(e)				
				20.406(a)(1)(ii)		80.36(a)(2)				80.73(a)(2)(vii)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)				
				20.406(a)(1)(iii)		80.73(a)(2)(i)				80.73(a)(2)(viii)(A)						
				20.406(a)(1)(iv)		80.73(a)(2)(ii)				80.73(a)(2)(viii)(B)						
				20.406(a)(1)(v)		80.73(a)(2)(iii)				80.73(a)(2)(ix)						
LICENSEE CONTACT FOR THIS LER (12)																
NAME G. J. Madsen, Regulatory Engineer, Limerick Generating Station										TELEPHONE NUMBER 2 1 5 3 2 7 - 1 1 2 0 0						
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)												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)

On March 12, 1990, at 0311 hours, with the reactor at 100% power, an automatic actuation of the High Pressure Coolant Injection (HPCI) System and the Primary Containment and Reactor Vessel Isolation Control System (PCRVICS) occurred. The HPCI system did not inject into the reactor coolant system because the initiating spurious low reactor water level signal did not exist long enough to cause the system injection valves to open. Six valves in the Containment Atmospheric Sampling system closed in response to a Primary Containment, Group VI C, channel 'B', isolation signal. The spurious low reactor water level signal resulted from pressure spikes in the 'B' Channel Reactor Vessel Instrumentation. The pressure spikes occurred while Instrumentation and Controls (I&C) technicians were returning a pressure transmitter to service following completion of a calibration/functional surveillance test. Lessons learned training and procedure enhancements will help prevent a recurrence of this event. The reactor remained at 100% power and there were no adverse safety consequences resulting from this event. Within 13 minutes following the event initiation, reactor operators verified proper component and system responses, secured the HPCI system and reset the PCRVICS.



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TEXT (If more space is required, use additional NRC Form 306A's) (17)

Unit Conditions Prior to the Event:

Operating Condition: 1 (Power Operation)  
Power Level: 100%

Reactor vessel pressure/level recorder XR-42-2R623B had been declared inoperable since March 11, 1990 at 0515 hours because its calibration was suspect following repairs to correct a level alarm condition. Action 80A of Technical Specification 3.3.7.5, "Accident Monitoring Instrumentation" required the recorder to be restored to operable status within seven (7) days.

Description of the Event:

On March 12, 1990, at 0311 hours, an inadvertent automatic actuation of the High Pressure Coolant Injection (HPCI) (EIIS:BJ) System and the Primary Containment and Reactor Vessel Isolation Control System (PCRVICES) (EIIS:JM) occurred. These Engineered Safety Feature (ESF) actuations resulted from a spurious low reactor water level signal caused by pressure spikes in the 'B' channel reactor vessel instrumentation.

The event occurred when Instrumentation and Controls (I&C) technicians were returning reactor vessel pressure transmitter PT-42-203B to service by opening its isolation valve. The I&C technicians had successfully completed a calibration check of the pressure transmitter's input to recorder XR-42-2R623B and were following the instructions of Surveillance Test (ST) Procedure ST-2-042-462-2, "Accident Monitoring - Reactor Vessel Pressure Calibration/Functional Test (PT-42-203B, XR-42-2R623B)." Reactor operators in the Main Control Room (MCR) were alerted to the event by annunciators (EIIS:ANN) for Group VI PCRVICES, HPCI initiation and reactor level/pressure recorder in HI SPEED. In addition, a DIV II Redundant Reactivity Control System (RRCS) activation signal and a 'B' Channel Reactor Feedwater Pump (RFP) High Level Trip Signal were received. The reactor remained at 100% power and using redundant instrumentation, MCR operators immediately verified that the reactor vessel parameters were normal. The HPCI system reactor vessel injection valves did not open and the system was secured at 0318 hours. The trip of the 'B' channel of PCRVICES caused the six Group VI

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TEXT (if more space is required, use additional NRC Form 306A's) (17)

C valves of the Containment Atmospheric Sampling system (described later in the LER) to close. The isolation signal was reset at 0324 hours, in accordance with General Plant Procedure GP-8, "Primary and Secondary Containment Isolation Verification and Reset." The total time that HPCI operated in the minimum flow recirculation mode was seven minutes and the PCRVICS Group VI C isolation existed for thirteen minutes.

The valving of PT-42-203B into service by I&C technicians resulted in instrument channel 'B' pressure spikes (a sensed level transient) that lasted a total of approximately 840 milliseconds. During that period, wide range vessel level indication peaked in the positive direction at greater than +60 inches and peaked in the negative direction at -73.7 inches. Narrow range vessel level indication peaked in the positive direction at greater than +60 inches and peaked in the negative direction at 0 inches. The above instrumentation transient affected the 'B' instrument channel reference leg. The following level transmitters are installed on the 'B' channel reference leg and provide the automatic actuation signals listed below:

TRANSMITTER	RANGE	SETPOINT (inches)	FUNCTION
LT-42-2N080B	Narrow	+12.5 (DE)	AUTO Scram Channel B1
LT-42-2N004B	Narrow	+54 (IN)	CH 'B' RFP Trip
LT-42-2N081B	Wide	-38 (DE)	CH 'B' Group VI C Isolation
LT-42-2N402B	Wide	-38 (DE)	RRCS DIV II Trip
LT-42-2N091F	Wide	-38 (DE)/+54 (IN)	HPCI Start/HPCI Trip
LT-42-2N091B	Wide	-38 (DE)/+54 (IN)	HPCI Start/HPCI Trip

(DE) Decreasing  
(IN) Increasing

The instrumentation transient event caused the actions described below to occur (the affected instrument is identified in parentheses):

- Channel 'B' RFP Trip Signal was received. No RFP trip occurred as the logic requires two channels to actuate the trip logic. (LT-42-2N004B)
- DIV II RRCS Activation Signal was received. No RRCS trip occurred as the logic requires two channels to actuate the trip logic. (LT-42-2N402B)
- The HPCI Pump started and operated in the minimum flow recirculation mode. The HPCI system did not inject as the signal existed for only 140 milliseconds, which was not sufficient time



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TEXT (If more space is required, use additional NRC Form 356A's) (17)

for completion of the initiation logic including opening of the HPCI system reactor injection valves. (LT-42-2N091F and LT-42-2N091B)

- D. The Containment Atmospheric Sample Lines, PCRVICES Group VI C, Channel 'B' Isolation Valves (SV-26-290B, SV-26-290D, SV-57-232, SV-57-234, SV-57-250, SV-57-281) closed. (LT-42-2N081B)

Note that the HPCI pump did not receive a trip signal on the increasing level transient as LT-42-2N091B and LT-42-2N091F do not provide the complete logic for a trip actuation.

In addition, a half reactor scram (Auto Scram Channel 'B') signal did not occur from LT-42-2N080B. The narrow range level was below the scram setpoint for only 180 milliseconds. The response time of LT-42-2N080B is 320 milliseconds. Therefore, the signal did not exist for sufficient time for the transmitter to respond.

A four (4) hour notification was made to the NRC at 0455 hours on March 12, 1990, in accordance with 10 CFR 50.72(b)(2)(ii) because the event resulted in the automatic actuation of the HPCI system and the PCRVICES which are ESFs. Accordingly, this report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv).

#### Consequences of the Event:

There was no release of radioactive material to the environment and the reactor remained at 100% power during this event. There were no adverse consequences due to the ESF actuations that occurred.

The HPCI system initiated as designed and would have injected to the reactor vessel if an actual low-low water level had existed.

The Group VI C, Channel 'B' Isolation Signal provided close signals to the following Group VI C valves: SV-26-290B & D (Containment Leak Detection Radiation Monitor); SV-57-232/234/250/281 (DIV II Containment Atmospheric Sampling System (Isolation B)).

- A. The Containment Leak Detection Radiation Monitor (20S182) Inlet/Outlet Lines were isolated by the closing of SV-26-290B/D. This resulted in 20S182 being unavailable for thirteen minutes. The remaining three Leakage Detection Systems as described in Technical Specification 3.4.3.1 were available for use if the

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

monitor could not be returned to service and an accident had occurred.

- B. Containment Combustible Gas Analyzer (20S205) was isolated for thirteen minutes by the closing of the following valves:

SV-57-232	Drywell Sample,
SV-57-234	Drywell Sample,
SV-57-234	Suppression Pool ATMOS Sample, and
SV-57-250	Sample Return.

The redundant Containment Combustible Gas Analyzer (20S206) was available with adequate sample points for use if the analyzer could not be returned to service and an accident had occurred.

- C. The Drywell Sample Lines to the Post Accident Sampling System (PASS) were also isolated for thirteen minutes by the closing of SV-57-232 and SV-57-234. The PASS is used following an accident. Under an accident condition, the isolation signal would have been bypassed and the valves reopened in accordance with the procedure used to obtain a PASS sample.

#### Cause of the Event:

The valving of PT-42-203B into service by I&C technicians in accordance with ST-2-042-462-2 resulted in pressure spikes on the channel 'B' reactor vessel instrumentation reference leg. These spikes caused the associated level transmitters to sense a high and then a low-low level causing the Sample Lines (Group VI C, Channel 'B') isolation; the HPCI start, the 'B' Reactor Feedpump High Level Trip Signal and the DIV II-RRCS Activation Signal.

A Root Cause Analysis, that included a Human Performance Evaluation, identified two additional causal factors which led to this event. Communications between the I&C technicians, shift superintendents and I&C group supervisors were less than adequate and job planning was less than adequate.

During the three shifts preceding this event, I&C technicians were involved in troubleshooting activities associated with the reactor vessel pressure/level recorder XR-42-2R623B. The status of troubleshooting activities was not adequately communicated. Based upon these communications, the night Shift Superintendent believed



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TEXT (If more space is required, use additional NRC Form 388A's) (17)

that the calibration/functional tests needed to be performed and had been deferred due to the shift I&C technicians workload. He requested that the night shift technicians perform the surveillance test procedure ST-2-042-462-2. In preparation for this task, the I&C technicians did not fully explain the risks of performing this surveillance test to the shift supervision and did not consult with I&C supervision prior to performing the work. The Human Performance Evaluation concluded that if the job had been deferred to Monday for management consultation, as planned, performance of the test may have been avoided by a determination that the test was not necessary.

The I&C technicians performed the valving in accordance with accepted valving practice and the "CAUTIONS" provided in procedure ST-2-042-462-2. As trained, the technicians were aware that the valving could affect other instruments sharing the same sensing line (Reactor Scram/PCRVICS/Emergency Core Cooling System/RRCS/RFP Trip), especially when performing the valving at full reactor pressure. In addition, procedure ST-2-042-462-2 provides the following "CAUTION" prior to valving out (Step 6.1.1) and return to service (Step 7.1.3) of PT-42-203B: "Moving valves too quickly can induce signal transients into other instrumentation." Cognizant of this precaution, the I&C technician at PT-42-203B slowly opened the transmitter isolation valve while a second I&C technician stationed in the MCR observed XR-42-2R623B in order to warn the other technician of any perturbations. In addition, the technicians verified that the calibration tap of PT-42-203B was full of water prior to returning the transmitter to service. This ensured no air was left in the calibration tap from the calibration activity. This was done in order to minimize a pressure transient when valving the instrument into service.

Procedure ST-2-042-462-2 is written to be performed during all plant conditions. However, due to the known potential impact associated with valving this instrument into service while the plant is at power, procedure ST-2-042-462-2 is normally scheduled for outage conditions. Since conditions may warrant the performance of this procedure at power, the cautions concerning valving were included. Any time that this type of valving activity is necessary to be performed during reactor operation, there is a known possibility that a similar instrumentation transient can occur regardless of technician care or procedure guidance.

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Corrective Actions:

After observing the alarms annunciate, MCR operators immediately verified that reactor vessel parameters were normal. The MCR operators also verified the initiating cause and proper system automatic responses. Within thirteen minutes following the event initiation, the HPCI system was secured and the PCRVICS Group VI C isolation signal was reset in accordance with procedure GP-8, "Primary and Secondary Containment Isolation Verification and Reset." Following this event, recorder XR-42-2R623B was declared operable at 1750 hours on March 13, 1990.

Actions Taken to Prevent Recurrence:

The following actions are being taken to help enhance the administrative controls over reactor instrumentation valving activities during power operations.

- 1) Procedure ST-2-042-462-2 and the equivalent Unit 1 procedure will be revised to include an additional sign-off step alerting the shift supervisor of the potential for instrumentation transients due to valving during reactor operations. These procedures are expected to be revised by April 30, 1990.
- 2) Other I&C procedures with a similar potential of causing instrumentation transients due to valving during reactor operations will be reviewed and appropriate sign-offs added to resolve generic concerns. This task will be completed during the next scheduled periodic review of those procedures.
- 3) The event will be discussed at an I&C group meeting stressing the importance of supervisory involvement when valving instrumentation with the reactor operating.
- 4) An Operations Training Bulletin will be issued describing this event, its consequences and the lessons learned regarding the risks associated with performing surveillances on reactor vessel instrumentation during reactor operations.



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Previous Similar Occurrences:

ESF actuations resulting from spurious reactor level signals during instrument valving activities have occurred previously (LERs 1-84-07, 1-85-37 and 1-85-39). However, each of these events occurred during reactor shutdown periods and did not involve performance of unnecessary surveillances. The corrective actions for these previous occurrences included instrument design modifications, valve labeling, procedure enhancements and I&C technician training. However, these actions could not have prevented the spurious reactor level signal reported in this LER.

## Tracking Codes:

A7 Failure to properly communicate