PHILADELPHIA ELECTRIC COMPANY
PEACH BOTTOM ATOMIC POWER STATION
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PEACH BOTTOM—THE POWER OF EXCELLENCE

D. M. Smith
Vice President

June 5, 1989
Docket No. 50-277

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

SUBJECT: Licensee Event Report
Peach Bottom Atomic Power Station - Unit 2

This LER concerns the Inoperability of the High Pressure Coolant Injection (HPCI) System as a result of incorrect wiring of an analog isolator recently installed in the HPCI System flow controller loop.

Reference:	Docket No. 50-277
Report Number:	2-89-009
Revision Number:	00
Event Date:	05/05/89
Report Date:	06/05/89
Facility:	Peach Bottom Atomic Power Station RD 1, Box 208A, Delta, PA 17314

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

Sincerely,

Q Gray for Doug Smith

cc: T. P. Johnson, USNRC Senior Resident Inspector
W. T. Russell, USNRC, Region I

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1/1

bcc: ANI Library
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NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

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TITLE (4) High Pressure Coolant Injection (HPCI) System Inoperable Resulting From A Flow Controller Analog Isolator Wired Incorrectly

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)
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0 5	0 5	8 9	8 9	0 0 9	0 0	0 6	0 5	8 9		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)			
	N	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 0 4	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
T. E. Cribbe, Regulatory Group	7 1 7 4 5 6 - 7 0 1 4

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)

On 5/5/89, at 0330 hours while performing High Pressure Coolant Injection (HPCI) operability testing at 150 psig reactor pressure, it became apparent that the system was not responding properly. A lack of control over HPCI turbine governor valve position was observed. The governor valve was in the full open position with system flowrate exceeding 6000 gpm. System flowrate was reduced to 5000 gpm by throttling Motor Operated Valve MO-23-21 (Test Return Line to the Condensate Storage Tank). Attempts to take manual control by placing the flow controller in manual were not effective. At 0400, 5/5/89 the HPCI turbine was manually tripped and subsequently declared inoperable at 0410. Investigation revealed that the input leads to a recently installed Analog Isolator in the HPCI flow control loop were reversed. The wiring discrepancy was corrected, Surveillance Test Procedure ST 10.1 "HPCI Flow Rate at 150 psig Steam Pressure" completed satisfactorily and HPCI declared operable at 2130, 5/5/89. The root cause of this event was failure to adhere to instructions. The applicable work groups will review this event, with emphasis placed on strict procedural adherence, not relying on industry standard practices and attention to detail. Programmatic and policy enhancements will be made to the modification installation and acceptance testing process to help prevent recurrence of this event. No previous similar LERs were identified.

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

Requirements for the Report

This LER is being submitted pursuant to 10CFR50.73 (a)(2)(v) to report conditions with the potential to prevent the High Pressure Coolant Injection (HPCI) (EIIS:BJ) System from fulfilling its design safety function.

Unit Status at Time of Event

Unit 2 was in the Startup Mode. HPCI operability testing was being performed at 150 psig Reactor Pressure Vessel (RPV) (EIIS:RCT) pressure. Unit 3 was in the Refuel Mode with the core offloaded. There were no systems or components that were inoperable at the start of the event that contributed to the event.

Description of Event

On 5/5/89, at 0330 hours while performing ST 10.1, "HPCI Flow Rate at 150 psig Steam Pressure", it became apparent that the system was not responding properly to flow control signals. It was observed that the flow controller (EIIS:TC) had no control over HPCI governor valve (EIIS:SCV) position and, consequently, no control over turbine (EIIS:TRB) speed or system flowrate. Instruments installed to monitor flow controller input and output during stability testing indicated proper flow controller operation. However, with a flow controller setpoint of 5000 gpm, the turbine governor valve remained fully open and system flowrate exceeded 6000 gpm. System flowrate was reduced to 5000 gpm by throttling MO-23-21 (Test Return Valve (EIIS:TV) to the Condensate Storage Tank). In a further attempt to establish manual control, the flow controller was placed in manual and signal output reduced toward zero. No change in governor valve position or turbine speed occurred. When the output signal on the flow controller scale dropped below zero the turbine governor valve closed rapidly with a corresponding decrease in turbine speed. Flow controller output was then increased to re-establish turbine speed above 2200 rpm. At 0400 on 5/5/89 after confirming lack of control in both automatic and manual flow control modes the HPCI turbine was tripped and subsequently declared inoperable at 0410. Investigation revealed that the input leads to an Analog Signal Isolator (EIIS:IB) recently installed in the HPCI flow control loop were reversed (see attachment). This reversed input to the Analog Isolator resulted in an output which provided a full open signal to the HPCI turbine governor valve whenever the flow controller setpoint exceeded zero. The wiring discrepancy was corrected, ST 10.1 was completed satisfactorily and HPCI was declared operable at 2130 on 5/5/89 (HPCI was inoperable for 17 hours and 20 minutes).

Cause of the Event

The root cause of this event was failure to follow installation instructions during the implementation of Modification 5061. This modification installed an analog signal isolator which provides electrical isolation for the HPCI flow controller. The following is a discussion of the cause of this event and those additional errors which contributed to the failure to identify the wiring discrepancy:

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

EVENT CAUSE

Improper Installation - The installation error (by a contract journeyman electrician) resulted in a discrepancy in the configuration of the analog isolator. The polarity was reversed between the flow controller and the ramp generator (EIIS:GEN). The causes of this discrepancy were:

(1) Making field connections using the industry standard practice of color matching (black to black, etc) in lieu of point to point as specified in the installation instructions. Polarity reversal occurred at this point.

(2) Applying the industry standard practice of positive (+) to black and negative (-) to white when bench wiring the isolator without regard to the external wiring color convention. Peach Bottom does not utilize a wire color standard.

CONTRIBUTING ERRORS

(1) Inadequate Inspection - Post installation inspection was inadequate due to the failure of the Quality Control (QC) inspector to verify that the wiring installation was in accordance with the work instructions and drawing.

(2) Inadequate Field Wiring Check - The Field Installation Engineer used color coding to perform the point to point wiring check and therefore, failed to identify the installation errors. Communications used during the check were not specific with regard to wire number, cable number, terminal point, etc.

(3) Inadequate Modification Acceptance Test (MAT) - The MAT utilized Surveillance Procedure SI-2F-23-82-XXCO "Calibration Check of HPCI Flow Instruments" to verify the instrument loop from flow controller to ramp generator and signal converter. The SI lifted leads BB145 and BB146 during the test and applied the input directly to the isolator "IN" terminals. As a result the leads with reversed polarity (between BB145/BB146 and the isolator) were not functionally checked. In summary the SI procedure did not provide sufficient overlap of tested components to assure the required portions of the loop were tested.

Analysis of Event

No actual safety consequences occurred as a result of this event.

The HPCI surveillance test fulfilled its purpose in identifying lack of turbine governor valve control and subsequently resulted in a declaration of inoperability. Reactor pressure was approximately 170 psi at the time of the event with Low Pressure Injection (EIIS:BO), Automatic Depressurization (ADS) and Reactor Core Isolation Cooling (RCIC) (EIIS:BN) Systems operable. The HPCI system is designed to satisfy a small break at higher pressures. It is unlikely HPCI modifications would be performed at power. But, if this event had occurred at a higher pressure RCIC and ADS would have been available to provide core cooling and if required reduce reactor pressure to allow the Low Pressure Injection Systems to initiate.

Corrective Actions

The following corrective actions have been taken:

(1) Supervisory personnel associated with implementation of modifications have been briefed on this event.

(2) The specific individuals involved in the installation, inspection, and testing of the isolator have been counseled on this event and the significance of the errors committed.

(3) Installation Checklists for open electrical modifications have been changed to require the Site Lead Man (Job Foreman) to verify correct installation of the work prior to QC inspection.

(4) Since December 1988, a significant effort has been made to assure the adequacy of installed and ongoing PBAPS modifications. The results have provided confidence that the adequacy of these modifications is assured.

The following corrective actions are planned:

(1) This event will be reviewed with construction, inspection, test, and plant personnel associated with the implementation of modifications and MATs by 6/30/89. Emphasis will be placed on:

- Strict adherence to procedures/instructions
- Wiring color standards are not to be relied upon at Peach Bottom
- Wire tags are to be used as a construction aide only and not to be used to determine the final terminal point prior to inspection.
- Attention to detail regardless of apparent simplicity of the the installation.

(2) Construction Division Procedure, CD 5.3 "Procedure for the Installation of Electrical Equipment" will be revised to require the Site Lead Man to verify the correct installation of the work prior to QC inspection. A planned issue date of 7/31/89 has been assigned.

(3) Modification process enhancements will be made to further ensure that when an SI or other standard test is to be used to functionally test an electrical installation, the test adequately encompasses the components required to be tested.

(4) Personnel performing wire checks will be instructed in use of proper communications practices when performing wire checks or other similar tasks.

Previous Similar Events

No previous similar LERs associated with the installation of modifications that were the result of inadequate craftsmanship, inspection or testing were identified.

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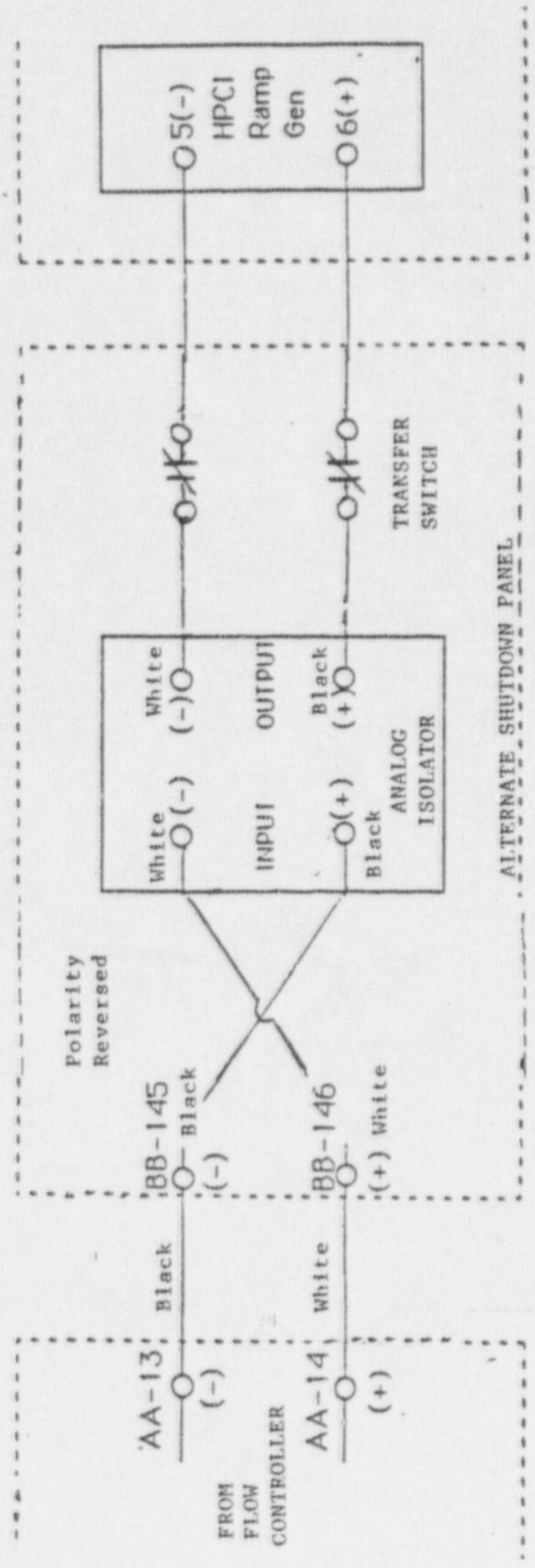
TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

ATTACHMENT 1



SIMPLIFIED HPCI FLOW CONTROL

LOOP DIAGRAM (Partial)

*U.S. GPO: 1988-520-589/00070