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10CFR 50.73

May 6, 2011

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Peach Bottom Atomic Power Station (PBAPS) Unit 2
Facility Operating License No. DPR-44
NRC Docket Nos. 50-277

Subject: Licensee Event Report (LER) 2-11-01

Enclosed is a Licensee Event Report concerning a condition involving an inoperability of the Unit 2 High Pressure Coolant Injection (HPCI) system. In accordance with NEI 99-04, the regulatory commitment contained in this correspondence is to restore compliance with the regulations. The specific methods that are planned to restore and maintain compliance are discussed in the LER. If you have any questions or require additional information, please do not hesitate to contact us.

Sincerely,

Garey L. Stathes
Plant Manager
Peach Bottom Atomic Power Station

GLS/djf/IR 1188457 / 1195100 / 1195115

Attachment
cc: US NRC, Administrator, Region I
US NRC, Senior Resident Inspector
R. R. Janati, Commonwealth of Pennsylvania
S. Grey, State of Maryland
P. Steinhauer, PSE&G, Financial Controls and Co-owner Affairs
INPO Records Center

CCN: 11-39

IE22
NRR

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
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4. TITLE

High Pressure Coolant Injection System Inoperable due to Leaking Cooling Water Header Relief Valve

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
03	16	2011	11	- 001 -	00	05	06	2011	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

1

10. POWER LEVEL

100%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☒ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☒ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
PBAPS Unit 2, James M. Armstrong, Regulatory Assurance Manager	717-456-3351

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	BJ	RV	C710	Y					

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On 3/16/11, licensed operations personnel declared the High Pressure Coolant Injection (HPCI) system inoperable as a result of the discovery of voiding in a portion of the HPCI pump discharge piping while the HPCI system suction was aligned to the Suppression Pool. It was determined that the leak was from the HPCI cooling water header relief valve (RV-2-23B-066). When HPCI was aligned to the Suppression Pool as the suction source, this leakage was sufficient to create voids in the HPCI discharge piping. The relief valve was replaced and HPCI was declared operable on 3/18/11. A subsequent laboratory analysis of the relief valve was performed. Although the cause could not be definitively determined, the cause of the unexpected failure could be the introduction of fine particulate, such as iron oxide, between the disc outside diameter and nozzle bore.

There was no actual safety consequence associated with this event. There were no previous similar events identified.

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NARRATIVE

Unit Conditions Prior to the Discovery of the Event

Unit 2 was in Mode 1 operating at 100% rated thermal power when this condition was discovered on 3/16/11. In preparation for planned testing of the Containment Suppression Pool high level instruments that initiate transfer of the High Pressure Coolant Injection (HPCI) suction sources, the suction source for the Unit 2 HPCI (EIIS: BJ) system had been transferred from the normal source (i.e., the Condensate Storage Tank (CST)) to the Containment Suppression Pool source. There were no other structures, systems or components out of service that contributed to this event.

Description of the Event

On 3/16/11 at approximately 1647 hours, licensed operations personnel declared the HPCI system inoperable as a result of the discovery of voiding in a portion of the HPCI pump discharge piping while the HPCI system suction was aligned to the Suppression Pool.

The voiding had been discovered as a result of the performance of a surveillance test (ST-O-023-350-2, HPCI Valve Alignment and Filled and Vented Verification) that was performed subsequent to the HPCI suction source transfer from the CST to the Suppression Pool (SO 23.7.B-2, Transfer Of HPCI Pump Suction From CST To Torus), which occurred earlier on 3/16/11. As a result of the voiding of a portion of the HPCI discharge piping, licensed operations personnel directed that the HPCI suction source be returned to the normal CST source. Once the HPCI suction was returned to the CST, ST-O-023-350-2 was re-performed and it was verified that the HPCI discharge piping was filled and vented satisfactorily. HPCI, although now available for operation, would remain inoperable pending resolution of the HPCI discharge pipe voiding concern when aligned to the safety-related Suppression Pool suction path.

The inoperability of the HPCI system was reported to the NRC on 3/17/11 at 0001 hours (EN #46677).

On 3/17/11, it was identified that a HPCI system cooling water header relief valve (RV-2-23B-066) had been leaking through, thereby allowing the HPCI discharge pipe to void when aligned to the Suppression Pool suction source. The relief valve (EIIS: RV) was replaced on 3/18/11. Subsequent to testing, HPCI was declared operable on 3/18/11.

Analysis of the Event

This report is being submitted pursuant to:

10CFR 50.73(a)(2)(v)(D) – Loss of System Safety Function – Since it is possible that a water hammer event could have caused damage to the HPCI system discharge piping during a design basis event, it was determined that a loss of the function of HPCI had occurred.

Analysis of the Event, continued

10CFR 50.73(a)(2)(i)(B) – Condition Prohibited by Technical Specifications – Since there exists evidence that RV-2-23B-066 had likely failed in January 2011, it was determined that HPCI was inoperable for a time period greater than the 14 days allowed by Technical Specification 3.5.1, Emergency Core Cooling Systems (ECCS) – Operating, Required Action C.2. Therefore, this condition is considered to have been prohibited by the Technical Specifications.

There were no actual safety consequences or actual water hammer events associated with this event.

The HPCI system is designed to flood the reactor during design basis events involving loss of cooling to the reactor core. The HPCI system is designed with two suction flow paths: the CST and the Suppression Pool flow paths. Normally, HPCI is aligned in the standby mode to the CST during plant operations. Transfer to the Suppression Pool suction source occurs during design basis events only if there is CST low water level or Suppression Pool high water level. No credit for the CST is taken in the plant safety analyses.

The RV-2-23B-066 is the relief valve for the 2" HPCI cooling water header. The cooling water header tap comes off the HPCI booster pump discharge and provides regulated cooling flow to HPCI system components (e.g., HPCI lube oil cooler). The leakage through the seat of RV-2-23B-066, during standby conditions, was approximately 7 gpm of water into the floor drain and provided input into the Unit 2 Reactor Building sump.

During design basis events, HPCI normally starts first with its suction source aligned to the CST. In this configuration, there would have been no voiding concerns on the HPCI discharge piping due to the much higher elevation of the CST suction source versus the water elevation in the Suppression Pool. Although leakage would have occurred through the RV-2-23B-066 seat, there would not have been voiding in the HPCI discharge piping. This was validated by pump, valve and flow surveillances that were completed using the CST as the suction source. Therefore, for design basis events with HPCI aligned from the normal CST suction source, there would be no significant impact as a result of the RV-2-23B-066 condition. However, for certain design events (e.g. loss-of-offsite-power occurrences, station blackouts, anticipated transient without scram), HPCI may be required to restart for these events. If HPCI restarted while aligned to the CST, there would be no HPCI performance impact as a result of the RV-2-23B-066 condition. If the suction source had been transferred to the Suppression Pool, then the HPCI discharge piping could be drained of water to the Reactor Building sump while the system is in standby and not running. If the system was required to restart, then a water hammer condition could exist and the ability for HPCI to perform its intended design function for restart could not be assured due to potential loss of piping integrity.

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Analysis of the Event, continued

HPCI was determined to be inoperable from approximately 1/20/11 to 3/18/11 when HPCI was declared operable by Operations personnel following the replacement of RV-2-23B-066. Subsequent investigation determined that RV-2-23B-066 had been recently replaced as a preventive maintenance task performed on 1/19/11. Based on trending performed on water inputs into the Unit 2 Reactor Building sump, it was identified on 1/25/11 that there had been an increasing trend of water input into the sump that began on approximately 1/20/11. Subsequent to the HPCI inoperability identified on 3/16/11, it was determined that the HPCI RV-2-23B-066 likely began leaking on 1/20/11 and was contributing to the rise in the Reactor Building sump pump-out rate. During this time period, the Reactor Core Isolation Cooling (RCIC) system and the Automatic Depressurization System (ADS) were both operable to support high pressure cooling requirements for design basis events.

As a result of the relief valve failure in the open position, an Engineered Safety Feature (ESF) leak had been occurring. During design basis events, this leak may have exceeded the allowable 5 gpm assumption in the plant safety analysis. Although this leakage exceeded the ESF leakage requirements assumed in the Alternate Source Term (AST) radiological analysis, an engineering evaluation determined that off-site doses, for design basis events, would remain below the limits required by 10CFR 50.67.

Cause of the Event

The cause of the inoperability of HPCI was due to a leaking relief valve on the HPCI cooling water header. Once identified as leaking on 3/17/11, the relief valve was removed, bench-tested and determined to not be functioning properly. Additional laboratory testing was performed on the relief valve. Although the cause could not be definitively determined, the cause of the unexpected failure could be the introduction of fine particulate, such as iron oxide, between the disc outside diameter and nozzle bore. The diametrical clearance between the disc outside diameter and nozzle bore measured 0.007". While no particulate was observed on the disc or nozzle, scoring and scuff marks on the disc outside diameter and nozzle bore suggest some interference might have been present.

The 1" relief valve is supplied by Anderson-Greenwood-Crosby (model no. 1 X 1.5 JMB-C-E).

Corrective Actions

The HPCI cooling water header relief valve (RV-2-23B-066) was replaced. Appropriate testing ensured that there were no leaks and the HPCI system was returned to an operable status on 3/18/11. Additional corrective actions are being pursued in accordance with the corrective action program.

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NARRATIVE

Previous Similar Occurrences

There were no previous LERs identified involving HPCI inoperabilities caused by a failure of the HPCI cooling water header relief valve.