



10CFR 50.73

November 11, 2016

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

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

Subject: Licensee Event Report (LER) 2-16-001

Enclosed is a Licensee Event Report concerning a condition prohibited by Technical Specifications (TS) resulting from a pipe leak in the High Pressure Service Water 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 have been 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 Jim Armstrong, Site Regulatory Assurance Manager, at 717-456-3351.

Sincerely,

A handwritten signature in black ink, appearing to read "P. Navin", written over a white background.

Patrick D. Navin
Plant Manager
Peach Bottom Atomic Power Station

PDN/dnd/IR 2704854

Attachment

cc: US NRC, Administrator, Region I
US NRC, Senior Resident Inspector
R. R. Janati, Commonwealth of Pennsylvania
S. Gray, State of Maryland
B. Watkins, PSE&G, Financial Controls and Co-owner Affairs

CCN: 16-102



LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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 and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by 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.

1. FACILITY NAME Peach Bottom Atomic Power Station Unit 2	2. DOCKET NUMBER 05000277	3. PAGE 1 OF 4
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4. TITLE
Leak in High Pressure Service Water Pipe Results in Condition Prohibited by Technical Specifications

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
09	12	16	2016	- 001	- 0	11	11	16	Peach Bottom APS Unit 3	05000278
									FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE		11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)								
1	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
10. POWER LEVEL		<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)					
100%	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)						
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)						
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)						
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(ii)						
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A						

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT James M. Armstrong, Regulatory Assurance Manager	TELEPHONE NUMBER (Include Area Code) 717-456-3351
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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
B	BI	PSP	Unkwn	N					

14. SUPPLEMENTAL REPORT EXPECTED <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR

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

On 9/12/16, an engineering evaluation concluded that a flaw identified on a 1" diameter stainless steel pipe associated with the High Pressure Service Water (HPSW) System could have failed during a seismic event. Failure of the pipe would cause flooding of the '2C' Residual Heat Removal (RHR) pump room and impact operation of equipment in the room if needed during a design basis event. The 1" diameter pipe supplies sample water to the '2C' HPSW radiation monitor sample pump. The flaw was identified on 8/16/16 when a 120 drop per minute leak was observed. The leak was the result of a crack located in the pipe at the toe of a fillet weld connecting the pipe to a coupling on an 18" diameter pipe that returns HPSW water to the plant discharge canal.

There were no actual consequences as a result of the leak. The pipe was replaced and the equipment was returned to service.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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		YEAR	SEQUENTIAL NUMBER	REV NO.
Peach Bottom Atomic Power Station Unit 2	05000-277	2016	- 001	- 0

NARRATIVE

Unit Conditions Prior to the Event

Unit 2 and Unit 3 were both operating in Mode 1 at approximately 100% rated thermal power. There were no structures, systems or components out of service that contributed to this event.

Description of Event

The High Pressure Service Water (HPSW) system (EIS: BI) is a safety-related system that provides cooling water to four heat exchangers in the Residual Heat Removal (RHR) system (EIS: BO) during post-accident conditions. The HPSW system consists of four 4,500 gpm pumps that normally draw water from the Conowingo Pond. The system can also be lined up to draw water from the Emergency Cooling Tower (ECT) (EIS: BS) in the event that suction from the pond becomes unavailable. Water is pumped to the RHR heat exchangers, each of which is located in a watertight room. Water exits the heat exchangers through 14" diameter pipes. Those pipes from the 'A' and 'C' heat exchangers combine into an 18" diameter line, which later combines with an 18" diameter line from the 'B' and 'D' heat exchanger into a 24" diameter line that goes to the plant discharge canal. On the 18" diameter return line from the 'A' and 'C' heat exchangers, there is a pipe connection for a line to the HPSW radiation monitor sample pump. The line is a 1" diameter Schedule 40S (0.133" wall thickness) Type 304 stainless steel pipe that was installed as part of a 1994 modification. The line is connected to the 18" diameter HPSW line with a socket weld connection to a half-coupling. The 1" pipe has a short span from the half-coupling to a rigid support on the wall, with two small valves in the span.

On 8/16/16, at approximately 0830 hours, in PBAPS Unit 2, a 120 drop per minute leak was identified on the 1" pipe to the '2C' HPSW radiation monitor sample pump. Inspection determined that the leak was from a crack in the pipe located at the toe of the weld to the half-coupling on the 18" diameter HPSW return line from the 'A' and 'C' RHR heat exchangers. The crack was approximately 1" long and located between the 11:00 o'clock and 2:00 o'clock positions on the pipe.

Due to the length of the crack, the structural integrity of the pipe was questionable. If the pipe were to shear at the crack location, it was estimated that 77 gpm would flow through the opening into the 'C' RHR room. As a result of the identified condition, the following equipment was declared inoperable at 1500 hours on 8/16/16:

- One low pressure ECCS injection subsystem per TS 3.5.1.A due to flooding potential in the 'C' RHR room
- One RHR suppression pool cooling subsystem per TS 3.6.2.3.A due to flooding potential in the 'C' RHR room
- One RHR suppression pool spray subsystem per TS 3.6.2.4.A due to flooding potential in the 'C' RHR room
- One RHR drywell spray subsystem per TS 3.6.2.5.A due to flooding potential in the 'C' RHR room
- One HPSW subsystem per TS 3.7.1.A due to through-wall leak in ASME Class 3 piping



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- The emergency heat sink per TS 3.7.3.B due to potential for loss of inventory (applies to both Units 2 and 3)

The pipe was replaced and the affected equipment was restored to an operable status on 8/18/16 at 0610 hours. The elapsed time from the discovery of the failure to when the equipment was returned to service was approximately 45 hours and 40 minutes.

Analysis of the Event

Initial evaluation of the flaw could not determine if the pipe would have failed during a seismic event. More detailed modeling of the pipe from its connection on the 18" diameter HPSW line to the first anchor point on the wall determined that seismic stresses could have caused the crack to propagate and result in a complete fracture of the pipe. This conclusion was reached on 9/12/16 and is considered to be the time at which a reportable event was identified. It is unknown at what time the crack developed into the as-found condition, however it is likely that it existed for a period of time greater than the TS required completion time for the systems to be restored to an operable status (7 days for each condition). Since the condition existed for a period of time longer than the TS required completion time, the condition resulted in a condition prohibited by TS and is being reported pursuant to 10CFR 50.73(a)(2)(i)(B).

Cause of the Event

To determine the cause of the crack, the section of the pipe and the socket weld were sent to an off-site lab for failure analysis. The cracking initiated at the toe of the weld on the outer diameter of the pipe and propagated in one general direction through the pipe wall. The fracture surface was examined by scanning electron microscopy and had transgranular features which are typical of fatigue. There were no material anomalies at the fracture origins and the weld appeared to be of generally good quality. The analysis concluded that the leak was caused by fatigue cracking caused by cyclic loading conditions, such as vibration.

The pipe was anchored to the wall a short distance from its connection to the 18" diameter HPSW line. This design did not adequately account for vibration in the HPSW line, which resulted in bending stresses in the 1" pipe at the toe of the fillet weld connection to the half coupling. In addition, a 2:1 weld was not used with the socket weld. The current standard for fillet welds on small bore piping subject to vibration is to use a weld with a length to depth ratio of 2:1 in order to mitigate stress from vibration. A contributing cause is that the pipe appeared to have been slightly distorted in the downward direction.

Corrective Actions

The pipe was replaced between the 18" HPSW pipe and the first valve. A 2:1 weld was utilized at the socket to mitigate vibration impacts. The configuration of the 1" pipe is used at a total of 16 locations at the plant for the supply and return lines for radiation monitors for the HPSW system. All were visually inspected to determine if similar flaws existed on the other lines. No flaws were identified. Non-



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NARRATIVE

destructive examinations have been scheduled to obtain additional information on the condition of the piping.

Previous Similar Occurrences

Since the modification in 1994 that installed the radiation monitors and associated piping, there have been no other documented cases of leakage from this piping.