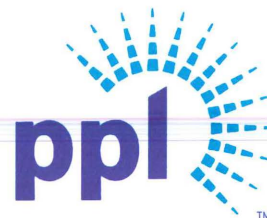


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AUG 17 2012



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

**SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2012-007-00
UNIT 1 LICENSE NO. NPF-14
PLA-6905**

Docket No 50-387

Attached is Licensee Event Report (LER) 50-387/2012-007-00, submitted for the Susquehanna Unit 1 unplanned shutdown on June 19, 2012.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(A) for a Technical Specification (TS) required shutdown and 10 CFR 50.73(a)(2)(ii)(A) for a degraded condition.

There were no actual consequences to the health and safety of the public as a result of this event and there are no regulatory commitments associated with this LER.

Please direct any questions regarding this report to Mr. Duane L. Filchner at (610)774-7819.

A handwritten signature in dark ink, appearing to read "Jeffrey M. Helsel", is written over a light blue circular stamp. The signature is fluid and cursive.

J. M. Helsel

Attachment: LER 50-387/2012-007-00

cc: NRC Region I
Mr. P. W. Finney, NRC Sr. Resident Inspector
Ms. C. J. Sanders, NRC Project Manager
Mr. L. J. Winker, DEP/BRP

NRC FORM 366 (10-2010)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB: NO. 3150-0104			EXPIRES:10/31/2013				
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)										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.resources@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 Susquehanna Steam Electric Station (SSES) Unit 1					2. DOCKET NUMBER 05000387			3. PAGE 1 OF 4				
4. TITLE Unplanned Shutdown due to Unidentified Drywell Leakage												
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		
06	19	2012	2012	- 007	- 00	08	17	2012	FACILITY NAME	DOCKET NUMBER 05000		
9. OPERATING MODE 1			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)									
10. POWER LEVEL 100%			<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(3)(ii) <input checked="" type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(ix)(A) <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(iv)(A) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 73.71(a)(4) <input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 73.71(a)(5) <input type="checkbox"/> 20.2203(a)(2)(v) <input checked="" type="checkbox"/> 50.73(a)(2)(i)(A) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input type="checkbox"/> OTHER <input type="checkbox"/> 20.2203(a)(2)(vi) <input type="checkbox"/> 50.73(a)(2)(i)(B) <input type="checkbox"/> 50.73(a)(2)(v)(D) Specify in Abstract below or in NRC Form 366A									
12. LICENSEE CONTACT FOR THIS LER												
FACILITY NAME D. L. Filchner, Senior Engineer - Nuclear Regulatory Affairs								TELEPHONE NUMBER (Include Area Code) (610) 774-7819				
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			
14. SUPPLEMENTAL REPORT EXPECTED <input checked="" type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input type="checkbox"/> NO						15. EXPECTED SUBMISSION DATE			MONTH	DAY	YEAR	
									10	19	2012	
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) On 6/15/2012, an increasing trend on the Unit 1 Containment Radiation Monitor (CRM) particulate channels was identified. Over the next 3 days Unit 1 unidentified drywell leakage continued to slowly rise. On 6/18/2012 a controlled shutdown was initiated and completed because of the unidentified drywell leakage. This event is reportable under 10CFR50.73(a)(2)(i)(A) as "the completion of any nuclear plant shutdown required by the plant's Technical Specifications" and 10CFR50.73(a)(2)(ii)(A) as "Any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded." On 6/19/2012 primary containment was entered to identify the source of the leak. The direct cause of the leak was a crack in the heat affected weld area of the weldolet joining the 4 inch diameter chemical decontamination pipe to the "1A" reactor recirculation pump suction line. Metallurgical examinations determined that the crack occurred due to cyclic fatigue. The preliminary cause of this through wall crack was fatigue failure due to cyclic vibration. The cyclic vibration was caused by operating the reactor recirculation pumps near the natural frequency of the decontamination flange assembly. The extent of this condition included all welds in the "1A" and "1B" reactor recirculation systems and connected system pipe welds. The immediate corrective action taken was to modify the chemical decontamination assembly connected to the reactor recirculation piping. This consisted of a redesigned 4 inch diameter chemical decontamination flange connection on both the "1A" and "1B" reactor recirculation pump suction lines. The length of the 4 inch diameter pipe was reduced from 6 inches to approximately 3.5 inches to produce a new configuration that is not susceptible to the cyclic fatigue caused by reactor recirculation pump vane passing frequency that is very close to the natural frequency of the assembly. There were no actual consequences to the health and safety of the public due to this event. At the time of the event, the Susquehanna Unit 2 reactor recirculation system piping and connected piping was determined to be capable of performing the required design function as part of the Reactor Coolant Pressure Boundary (RCPB). However, as a compensatory action, the Unit 2 reactor recirculation pump speed is limited to 1600 rpm to provide margin to the resonant frequency of the recirculation decontamination connection assemblies. There is no evidence of a leak from the Unit 2 RCPB and if a leak did occur it would be detected by the various drywell leakage monitoring systems prior to gross pipe failure, (i.e. leak before break.) The root cause, safety significance, and corrective actions will be provided in a supplement to this LER upon completion of the Root Cause Evaluation.												

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Susquehanna Steam Electric Station Unit 1	05000387	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 4
		2012	- 007	- 00	

NARRATIVECONDITION PRIOR TO THE EVENT

Unit 1 – Mode 1, 100 percent Rated Thermal Power

There were no inoperable structures, systems, or components that contributed to this event.

EVENT DESCRIPTION AND TIMELINE

A chronological timeline or sequence of events leading up to and immediately following the event follows:

On 06/15/2012, Operations personnel identified an increasing trend on the Unit 1 Containment Radiation Monitor (CRM) particulate channels. Over the next 3 days, Unit 1 unidentified drywell leakage continued to slowly rise. An Adverse Condition Monitoring Plan was developed for monitoring the leakage rate, and an Operational Decision Making (ODM) document was developed to drive conservative actions.

On 06/19/2012, a controlled Unit 1 shutdown was initiated prior to reaching ODM limits because the unidentified drywell leakage increased at a higher than expected rate. A low power containment entry was performed to identify the source of the leak which was a through wall leak in the "1A" reactor recirculation pump suction line decontamination flange.

On 06/19/2012 at 1720 hours, Event Notification (EN) 48036 was made to the NRC in accordance with 10 CFR 50.72(b)(2)(i), "the initiation of any nuclear plant shutdown required by the plant's Technical Specifications" and 10 CFR 50.72(b)(3)(ii)(A) "any event or condition that results in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded." As such, this Licensee Event Report is being submitted in accordance with 10 CFR 50.73(a)(2)(i)(A) and 10 CFR 50.73(a)(2)(ii)(A).

CAUSE OF THE EVENT

The direct cause of the through wall leak was a crack in the heat affected weld area of the connection (weldolet) joining the 4 inch diameter chemical decontamination pipe to the "1A" reactor recirculation pump suction line. Based on metallurgical examinations, the outside diameter (OD) initiated crack was due to cyclic fatigue.

The preliminary cause of the through wall crack is cyclic fatigue due to vibration caused by operating the reactor recirculation pumps near the decontamination flange assembly natural frequency. The normal operating speed range for the reactor recirculation pumps correlates to a 5x vane pass frequency of 122 Hz to 135 Hz. The configuration of the reactor recirculation pump suction line decontamination flanges is such that its natural frequency is 135.8 Hz. Having the 4 inch pipe natural frequency near the pump 5x frequency results in vibration accelerations that are greatly magnified, relatively large bending moments, and stresses at the weldolet connection that may exceed the endurance limit of the material which can lead to fatigue failure.

An OD initiated crack, approximately 3 inches long, was identified just below the weldolet to 4 inch pipe transition weld. The crack was located in the heat affected zone of the connection (weldolet) joining the 4 inch diameter chemical decontamination pipe to the "1A" reactor recirculation pump suction line. In addition, inside diameter (ID) initiated cracks were identified in the weldolet.

Metallurgical lab analysis results were that the crack was caused by fatigue. The crack OD length was approximately 3 1/8 inches and the ID length was 2 5/8 inches. This is the length of the through wall portion of the crack which originated from the pipe OD. The crack was not caused by intergranular stress corrosion cracking (IGSCC), however indications of IGSCC were found in the weld unrelated to the crack.

Upon completion of the root cause evaluation for this event, the root cause will be provided in a supplement to this LER.

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NARRATIVE

ANALYSIS/SAFETY SIGNIFICANCE

Actual Consequences:

The actual safety consequences of this event are minimal. An orderly shutdown of the Unit 1 reactor commenced when unidentified leakage reached approximately 1.1 gpm. The shutdown was performed well before the unidentified drywell leak rate reached the Technical Specification (TS) 3.4.4 limit of 5 gpm.

Potential Consequences:

The potential safety consequence of this event is that, if not corrected, this leak could have progressed to the point of reaching critical crack size. Reaching the critical crack size would have resulted in a PRA initiating event such as a scram or mid sized loss of coolant accident (LOCA). This could have resulted in an emergency plan entry for excessive drywell leakage and may have resulted in reactor coolant system loss through a 4 inch pipe. However, this potential consequence is unlikely to have occurred. There is significant margin between the 5 gpm maximum unidentified drywell leakage allowed by TS 3.4.4 and the leakage expected prior to reaching the critical crack size.

Upon completion of the root cause evaluation, the actual safety significance and any potential consequences will be included in a supplement to this LER.

CORRECTIVE ACTIONS TAKEN

An immediate corrective action taken was to modify the chemical decontamination assembly connected to the reactor recirculation piping. This consisted of a redesigned 4 inch diameter chemical decontamination flange connection on both the "1A" and "1B" reactor recirculation pump suction lines. The length of the 4 inch diameter pipe was reduced from 6 inches to approximately 3.5 inches to produce a new configuration that is not susceptible to the cyclic fatigue caused by reactor recirculation pump vane passing frequency that is very close to the natural frequency of the assembly. This modification also eliminated the IGSCC that were identified during metallurgical examinations.

Extent of condition inspections were performed to provide assurance that similar reactor recirculation and reactor water cleanup system piping has not been similarly affected. The inspections were completed, no vibration related issues were identified, and no additional fatigue flaws were identified in the expanded scope population.

An in-service leak test was conducted in accordance with the requirements of ASME Section XI at a test pressure of 1035 psig to ensure pressure boundary integrity of the modified decontamination flange connections.

As left impact resonance tests were performed on the "1A" and "1B" reactor recirculation suction pipe decontamination flanges utilizing a test acceptance criteria for natural frequency greater than or equal to 150 Hz.

As a compensatory action for SSES Unit 2, the Unit 2 reactor recirculation pump speed is limited to 1600 rpm to provide margin to the resonant frequency of the reactor recirculation decontamination connection assemblies.

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

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NARRATIVECORRECTIVE ACTIONS PLANNED

Completion of the critical flaw size analysis to determine the continued growth crack size at which application of design basis loads would have resulted in failure.

Additional corrective actions determined during completion of the root cause evaluation will be included in a supplement to this LER.

PREVIOUS SIMILAR EVENTS

There are no Susquehanna LER's related to TS required shutdown due to unidentified drywell leakage or reactor recirculation system leakage.

Industry Operating Experience (OE20348) for a similar event at Hope Creek LER 354/2005-002-00 was reviewed to ensure an understanding of the causes and actions taken. The investigation, inspection, and repair activities performed by SSES are consistent with those performed by Hope Creek.