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OCT 16 2009

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Stop OP1-17
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2009-001-00
LICENSE NO. NPF-14
PLA-6571 **Docket No 50-387**

Attached is Licensee Event Report (LER) 50-387/2009-001-00. This event was determined to reportable under 10 CFR 50.73(a)(2)(v)(D) for a condition that could have prevented the fulfillment of a safety function required to mitigate the consequence of an accident. The High Pressure Coolant Injection (HPCI) system was declared inoperable due to failure of the HPCI turbine stop valve.

There were no actual consequences to the health and safety of the public as a result of this event.

No commitments are associated with this LER.

T. S. Rausch
Senior Vice President and Chief Nuclear Officer

Attachment

Copy: NRC Region I
Mr. R. R. Janati, DEP/BRP
Mr. F. W. Jaxheimer, NRC Sr. Resident Inspector
Mr. B. K. Vaidya, NRC Project Manager

IE22
NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2010

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 Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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
Susquehanna Steam Electric Station Unit 1	05000387	1 OF 4

4. TITLE

High Pressure Coolant Injection System Inoperable due to Turbine Stop Valve Failure

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
08	18	2009	2009	- 001 -	00	10	16	2009		05000
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

94.4%

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)
Brenda W. O'Rourke, Senior Engineer - Nuclear Regulatory Affairs	(570) 542-1791

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	BJ	ISV	S075	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 August 18, 2009, the Unit 1 High Pressure Coolant Injection (HPCI) turbine stop valve FV-15612 showed dual position indication following the performance of the weekly HPCI lube oil system preventive maintenance functional test. The stop valve should have indicated full closed at this time. Investigation confirmed that the valve stem was not in the full closed position. This is significant because the HPCI ramp generator will not reset if the stop valve is not fully closed. Without a functioning ramp generator, the HPCI system would likely experience 1 or 2 overspeed trips before the governor could successfully control turbine speed. At 0920 on August 18, 2009, the Unit 1 HPCI system was declared inoperable. The NRC was notified (via ENS 45273) in accordance with 10 CFR 50.72(b)(3)(v)(D) for an event or condition that could have prevented the fulfillment of a safety function required to mitigate the consequence of an accident.

The cause for the failure of the stop valve to fully close was due to general corrosion of the actuator piston bushing. This resulted in mechanical interference which inhibited stop valve movement. The cause of the accelerated corrosion in the area of the stop valve actuator piston was due to chronic through-seat leakage from the HPCI steam supply admission valve.

The stop valve was subsequently repaired and the Unit 1 HPCI system was declared operable on August 24, 2009. The seat leak on Unit 1 HPCI steam admission valve HV-155F001 will be repaired during the next Unit refueling outage. During the next scheduled Unit 2 HPCI system outage, the corroded parts on the Unit 2 HPCI stop valve will be replaced.

There were no actual adverse consequences to the health and safety of the public as a result of this event.

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NARRATIVE

CONDITIONS PRIOR TO EVENT

Unit 1 - Mode 1, 94.4 percent Rated Thermal Power

EVENT DESCRIPTION

On August 18, 2009, the Unit 1 High Pressure Coolant Injection (HPCI) [EIIS Code: BJ] turbine stop valve FV-15612 showed dual position indication following the performance of the weekly HPCI lube oil system preventive maintenance functional test (OP-152-001). The stop valve should have indicated full closed at this time. Investigation confirmed that the valve stem was not in the full closed position. The valve stem was found to be approximately one inch from full closed. During troubleshooting, the HPCI stop valve was subsequently stroked open and closed two additional times. On both occasions, the valve stroke movement was observed to be rough, but the valve fully closed on the second attempt. This is significant because the HPCI ramp generator will not reset if the stop valve is not fully closed. Under these conditions, the HPCI governor would demand maximum steam flow upon any turbine start. HPCI would likely experience 1 or 2 overspeed trips before the governor could successfully control turbine speed. As such, the Technical Specification (TS) Surveillance Requirement 3.5.1.13 response time of 30 seconds may not have been achieved during an actual emergency condition. Based on this conclusion, at 0920 on August 18, 2009, the Unit 1 HPCI system was declared inoperable. The NRC was notified (via ENS 45273) in accordance with 10 CFR 50.72(b)(3)(v)(D) for an event or condition that could have prevented the fulfillment of a safety function required to mitigate the consequence of an accident.

During valve disassembly, corrosion of the valve's actuator shaft and piston rod bushing were found. The valve disc was observed to be sticking to the bonnet ring. No signs of erosion, wearing, or washing on the valve's disc seat were found. Clearances between the bonnet guide and valve disc were within vendor recommended tolerances.

The HPCI turbine stop valve was subsequently repaired and successfully re-tested. At 1430 on August 24, 2009, the HPCI system was declared operable and TS LCO 3.5.1 was exited.

Unit 2 HPCI stop valve FV-25612 is also susceptible to a similar failure mechanism. There are no immediate operability concerns because test data indicates that the valve has closed fully over the last 120 days. While there is corrosion present on the valve's actuator cover, actuator piston bushing area, and stem, the actuator cover is dry and there currently is no suspected through-seat leakage from the Unit 2 HPCI steam admission valve HV-255F001.

CAUSE OF THE EVENT

The cause for the failure of the Unit 1 HPCI turbine stop valve to fully close was due to general corrosion of the actuator piston bushing. This resulted in mechanical interference which inhibited stop valve movement. The cause of the accelerated corrosion in the area of the stop valve actuator piston was due to chronic through-seat leakage from the HPCI steam supply admission valve (HV-155F001). This valve is located immediately upstream of the stop valve and is normally closed. The upstream side of this valve is subjected to main steam at reactor pressure. Leakage through the steam admission valve seat resulted in moisture on top of the vertically-mounted stop valve actuator below.

In August 2006, the Unit 1 HPCI turbine stop valve experienced a failure of its rod bushing due to excessive corrosion. At that time, the investigation noted the presence of excessive water during valve disassembly, but did not address the source of the water. The investigation concluded that the cause of the excessive corrosion was failure to perform the recommended valve overhaul within the vendor recommended 10 year frequency.

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ANALYSIS/SAFETY SIGNIFICANCE

The design basis of the HPCI is to ensure that the reactor core is adequately cooled to meet the design bases in the event of a small break in the reactor coolant pressure boundary and loss of coolant that does not result in rapid depressurization of the reactor vessel. This permits the plant to be shut down while maintaining sufficient reactor vessel water inventory until the pressure vessel is depressurized. The HPCI system continues to operate until the reactor vessel pressure is below the pressure at which Low Pressure Coolant Injection (LPCI) operation or Core Spray (CS) system operation can maintain core cooling. The HPCI controls automatically start the system and bring it to design flowrate of 5,000 gpm within 30 seconds from the receipt of a reactor pressure vessel low water level signal or a high drywell pressure signal.

The HPCI turbine stop valve is a Schutte & Koerting globe type stop valve with a Miller hydraulic cylinder type actuator. The configuration of the stop valve is unique to the HPCI application, so this condition is limited to the Unit 1 FV-15612 and Unit 2 FV-25612 turbine stop valves. The stop valve is full closed while the system is in standby. Upon receipt of a system initiation, the valve is fully opened to permit steam flow to the HPCI turbine by filling the cylinder with oil supplied by the aux oil pump. Upon receipt of a HPCI turbine trip signal, a relay valve rapidly ports oil from the hydraulic cylinder, allowing the valve to be closed by a compression spring in the cylinder. Limit switches on the stop valve initiate a governor ramp generator which regulates the startup transient. When the stop valve is full closed, the ramp resets.

Actual Consequences

The actual consequences of this event resulted in 107.47 hours of unplanned unavailability for Unit 1 HPCI System. It was concluded that a reasonable expectation existed that the HPCI system could have performed its intended safety function. Although the TS mandated HPCI system response time of 30 seconds may not have been achieved, the HPCI turbine would ultimately be able to inject flow into the reactor vessel. The open function of the stop valve was not affected by this condition.

During this event, the Reactor Core Isolation Cooling, CS, LPCI and the Automatic Depressurization System were available to provide inventory makeup to the reactor core in the event of a loss of coolant accident.

Potential Consequences

The HPCI ramp generator resets to idle when the turbine stop valve is fully closed. This prepares the governor to restart the HPCI turbine. Without the ramp generator being reset, the governor would demand full open (i.e., maximum steam flow) when the turbine starts. Past experience without the ramp generator indicates that it is likely the HPCI turbine would experience 1 or 2 overspeed trips before the governor was able to control turbine speed. As such, the design basis system response time of 30 seconds may not have been achieved for HPCI system starts initiated during actual emergency conditions.

Based upon the above discussion, the actual and potential safety significance of this event was minimal. There was no impact to the health and safety of the public.

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CORRECTIVE ACTIONS

Completed Actions -

- Disassembled and inspected the Unit 1 FV-15612. The valve was subsequently repaired and the Unit 1 HPCI system was returned to OPERABLE status on August 24, 2009.

Planned Corrective Actions -

- Revise the PM frequency for the Unit 1 and Unit 2 HPCI stop valves from a 10-year to a 6-year frequency.
- Replace corroded parts on the Unit 2 HPCI stop valve FV-25612 during the next scheduled Unit 2 HPCI system outage.

Planned Corrective Actions to Prevent Recurrence –

- Repair the seat leak on Unit 1 HPCI steam admission valve HV-155F001.
- Revise the HPCI system monitoring plan to identify valve degradation prior to the 6-year PM frequency.

ADDITIONAL INFORMATION

Failed Component Information:

Component: HPCI Turbine Stop Valve, Model # 68-XC-71
Manufacturer: Schutte & Koerting

Previous Similar Events: LER 387/2006-005-00 – Unit 1 HPCI Safety Function Compromised, dated October 25, 2006.