



APR 15 2011

10CFR50.73

LR-N11-0117

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington DC 20555-001

LER 311/2011-001  
Salem Nuclear Generating Station Unit 2  
Facility Operating License No. DPR-75  
NRC Docket No. 50-311

Subject: 21SW122 Isolation Function Inoperable for Greater Than Allowed  
by Technical Specifications

This Licensee Event Report, "21SW122 Isolation Function Inoperable for Greater Than Allowed by Technical Specifications" is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR50.73 (a)(2)(i)(B).

There are no regulatory commitments contained in this letter.

Should you have any questions or comments regarding this submittal, please contact Mr. Howard Berrick at 856-339-1862.

Sincerely,

A handwritten signature in black ink, appearing to read "C. Fricker", is written over the word "Sincerely,".

Carl J. Fricker  
Site Vice President - Salem

Attachments (1)

JE22  
NRC

**APR 15 2011**

cc            Mr. W. Dean, USNRC - Administrator - Region I  
              Mr. R. Ennis, USNRC - Licensing Project Manager - Salem  
              USNRC Senior Resident Inspector - Salem (X24)  
              Mr. P. Mulligan, NJBNE Manager IV  
              Mr. H. Berrick, Salem Commitment Tracking Coordinator  
              Mr. L. Marabella, Corporate Commitment Tracking Coordinator

# LICENSEE EVENT REPORT (LER)

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](mailto: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.

<b>1. FACILITY NAME</b> Salem Generating Station - Unit 2	<b>2. DOCKET NUMBER</b> 05000311	<b>3. PAGE</b> 1 of 4
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**4. TITLE**  
21SW122 Isolation Function Inoperable Greater Than Allowed by Technical Specification

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
05	17	2010	2011	0 0 1	0	04	15	2011		DOCKET NUMBER

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§:</b> <i>(Check all that apply)</i>									
<b>10. POWER LEVEL</b>  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 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 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 checked="" 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 Howard Berrick, Senior Engineer, Salem Regulatory Assurance	TELEPHONE NUMBER (Include Area Code) (856) 339 -1862
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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
X	BI	FCV	-	Yes					

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

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

This report is being made in accordance with 10CFR50.73 (a)(2)(i)(B), "any operation ... prohibited by the plant's Technical Specification" for the containment integrity function of valve 21SW122 being inoperable for greater than one-hour, contrary to the requirements of TS 3.6.1.1. On May 17, 2010 at 0116 hours, while performing a high flow flush of the No. 21 Component Cooling Heat Exchanger (CCHX), the required Service Water (SW) flow range of 9000-10000 gpm could not be achieved. Technical Specification Action Statement (TSAS) 3.7.3 was entered. Containment integrity was not at issue as the 21SW122 valve appeared to have stroked closed. A team established to investigate the CCHX low SW flow issue determined that the 21SW122 valve was not controlling flow. The valve was declared inoperable on May 17 at 1005 hours and Containment Integrity TSAS 3.6.1.1 was entered. The No. 21 CCHX was isolated on May 17 at 1053 hours and TSAS 3.6.1.1 was exited. Troubleshooting activities identified that the shaft of the No. 21 CCHX inlet air operated valve 21SW122 had corroded to the point of complete severing at the stem to body interface. The valve stem was replaced and the valve returned to OPERABLE status on May 18, 2010. A past operability evaluation was completed on May 28, 2010. This evaluation concluded that the valve was INOPERABLE for the closed (Containment Integrity) direction. On February 16, 2011, during an NRC inspection of the 21SW122 repair and extent of condition reviews, it was discovered that the 21SW122 being inoperable greater than the TS allowed action time had not been reported in accordance with 10CFR50.73 (a)(2)(i)(B). The cause of the 21SW122 valve shaft failure was severe localized microbiologically influenced corrosion attack. Actions taken included replacement of all SW122 valve stems, identification of susceptible valves, procedure revisions and preventive maintenance task changes to remove the shaft for inspection.

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**NARRATIVE**

**PLANT AND SYSTEM IDENTIFICATION**

Westinghouse – Pressurized Water Reactor (PWR/4)

Service Water System / Valve 21SW122 {BI/FCV}

\* Energy Industry Identification System {EIIIS} codes and component function identifier codes appear as {SS/CCC}

**IDENTIFICATION OF OCCURRENCE**

Event Date: May 17, 2010

Discovery Date: February 16, 2011

**CONDITIONS PRIOR TO OCCURRENCE**

Salem Unit 2 was in Operational Mode 1 at 100% reactor power.

**DESCRIPTION OF OCCURRENCE**

On May 17, 2010 at 0116 hours, while performing a high flow flush of the No. 21 Component Cooling Heat Exchanger (CCHX), the required Service Water (SW) flow range of 9000-10000 gpm could not be achieved. The maximum flow achieved was 7000 gpm. Technical Specification Action Statement (TSAS) 3.7.3 was entered for Modes 1-4. With only one component cooling water loop OPERABLE, the TS required action is to restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. The information available at the time was that 21SW122 (21 CCHX service water inlet) valve had stroked closed and there was no containment integrity issue.

Valve 21SW122 {BI/FCV} has a safety function in the open direction to control SW flow to the CCHX and a safety function in the closed direction to ensure containment integrity by conserving SW flow for nuclear required services and to limit or prevent water hammer on restart of SW pumps following a Loss of Coolant Accident with Loss of Offsite Power to maintain containment integrity.

An event response team (ERT) was established on dayshift to investigate the CCHX low SW flow issue. The team determined that the 21SW122 valve was not controlling flow and was declared inoperable. On May 17, 2010 at 1005 hours TSAS 3.6.1.1 was entered. Without primary CONTAINMENT INTEGRITY, restore CONTAINMENT INTEGRITY within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. The 21 CCHX was isolated on May 17, 2010 at 1053 hours and the TSAS 3.6.1.1 was exited. Subsequent review by the ERT identified that the valve shaft for the 21SW122 had corroded to the point of complete severing at the stem body interface. The valve stem was replaced and the valve returned to OPERABLE status on May 18, 2010

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**NARRATIVE**

**DESCRIPTION OF OCCURRENCE (cont'd)**

A past operability evaluation was completed on May 28, 2010. The evaluation concluded that the valve could be considered OPERABLE in the open direction, but was considered INOPERABLE for the closed direction. The last successful operation of this valve occurred on April 3, 2010, therefore the valve can be considered operable up to April 3, 2010. As such, the 21SW122 was inoperable from April 3, 2010 until the 21 CCHX was isolated on May 17, 2010. Therefore the containment integrity function of the 21SW122 was inoperable for greater than one-hour, contrary to the requirements of TS 3.6.1.1. On February 16, 2011, during an NRC inspection of the 21SW122 repair and extent of condition reviews, it was discovered that the 21SW122 being inoperable greater than the TS allowed action time had not been reported.

This report is being made in accordance with 10CFR50.73 (a)(2)(i)(B), "any operation ... prohibited by the plant's Technical Specification."

**CAUSE OF OCCURRENCE**

The cause of the 21SW122 valve shaft failure was severe localized microbiologically influenced corrosion (MIC) attack. The extent of the shaft corrosion was not identified during valve internal inspections activities since the work order instructions and the maintenance procedure did not require a full disassembly of the valve. The cause for the failure to submit the LER within 60 days is under investigation and is being tracked in PSEG's corrective action program.

**PREVIOUS OCCURRENCES**

A review of LERs for Salem Units 1 and 2 back to 2007 identified no previous occurrences of Service Water valve shaft failures due to localized microbiologically influenced corrosion attack. Salem Unit 2 LER 311/2009-002-00 was issued for a failed partially open 22 CCHX manual outlet valve, 22SW356. The apparent cause of the event was the failure of all four (4) gearbox-to-valve mounting bolts. The corrective actions associated with this event were specific to the previous event and would not have prevented the current event from occurring.

**SAFETY CONSEQUENCES AND IMPLICATIONS**

There was no actual safety consequences associated with this event since we did not have a Loss of Coolant Accident (LOCA) with a Loss of Offsite Power (LOOP) during the period of April 3 to May 17, 2010. The potential consequential impact to Containment integrity was evaluated, and concluded that there was no impact to Containment integrity, as discussed below.

Following a LOOP or LOCA/LOOP, the SW pumps stop, and then are automatically restarted some finite time later. To prevent column separation in the Containment Fan Coil Unit (CFCU) discharge piping and thus potential waterhammer, SW accumulator tanks are provided to automatically inject water to maintain the CFCU piping water solid until the SW pumps are restarted. Failure of the 21SW122 to close will divert flow away from the CFCUs, and thus could adversely impact the evaluations of the CFCU portion of the SW System during the initial transient period with the SW accumulators injecting flow or during steady-state conditions once the SW pumps restart and are up to full speed.

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**NARRATIVE**

**SAFETY CONSEQUENCES AND IMPLICATIONS (contd)**

There are two potential concerns during the transient period with the SW122 valve failing to close. First, prior to SW pump restart following a LOOP or LOCA/LOOP, diversion of SW accumulator injection flow away from the CFCUs could result in column separation, and thus potential waterhammer and loss of integrity to the CFCU piping. However, there are two check valves in series (SW51 & SW532) between the CFCU supply header and each of the two nuclear headers. These check valves will prevent SW accumulator injection flow from being diverted from the CFCUs. The double check valve arrangement protects against a single failure of either of the valves. The second concern during the transient period is that when the SW pumps restart following a LOCA/LOOP, the open CCHX flow path will reduce header pressure, potentially resulting in flashing in the CFCU discharge piping. When the SW pumps stop, the stagnant water in the CFCU coils continues to heat up due to CFCU fan coast down, and then eventually gets pushed out via the SW accumulator injection flow and SW pump restart. The associated transient analyses are based upon the most limiting single failures with respect to saturation pressure margin. A review of these analyses determined that although failure of the 21SW122 to close reduces the inlet pressure to the CFCUs, it also increases the backpressure in the SW discharge header, with the net result being an increase in the saturation pressure margin.

The SW system steady-state hydraulic analysis was reviewed for potential impact, with the concern being the potential for flashing in the CFCU discharge piping. Evaluation of the limiting single failure in which 21 CCHX is isolated (failure of the 2B vital bus) with the 21 CCHX flow path open showed there was still positive pressure margin in the CFCU discharge piping based on the maximum SW temperature and minimum river level seen during the period of 4/3/10 to 5/17/10. Therefore, the SW System was capable of performing its design function during steady-state or transient period with a failure of 21SW122 to close.

A review of this event determined that a Safety System Functional Failure (SSFF) as defined in NEI 99-02, Regulatory Assessment Performance Indicator Guidelines, did not occur. There was no condition that could have prevented the fulfillment of a safety function of a system needed to mitigate the consequences of an accident.

**CORRECTIVE ACTIONS**

1. Valves 11, 21 and 22 SW122 valve shafts have been replaced. A preventative maintenance (PM) corrective action was issued to replace the shafts and disc pins on a 2R frequency. Additionally, the PM procedure was revised to inspect the removed valve shaft for pitting corrosion and MIC.
2. All remaining susceptible SW valves (i.e., SW58 (5 per station), SW72 (5 per station), SW534 (2 per station) and SW535 (2 per station)) have been identified and corrective actions are in place to inspect and replace valve shafts, as necessary.
3. A cause evaluation is in progress for the late reporting of this event. The corrective actions associated with the late reporting will be documented in the PSEG Corrective Action Program.

**COMMITMENTS**

No commitments are made in this LER.