

November 25, 2009

U.S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D.C. 20555-0001

Subject: **Docket No. 50-361**  
**Licensee Event Report No. 2009-003**  
**San Onofre Nuclear Generating Station, Unit 2**

Dear Sir or Madam:

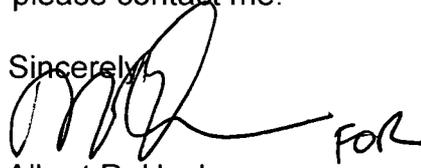
This submittal provides Licensee Event Report (LER) 2009-003 for a potential loss of Pressurizer Auxiliary Spray capacity pursuant to 10 CFR 50.73(a)(2)(v)(B) and 50.73(a)(2)(vii). Inservice Testing identified flow leakage through a check valve caused the auxiliary spray depressurization rate to be less than assumed for the licensing basis described in the Updated Final Safety Analysis Report (UFSAR).

The event is of a low safety significance and did not affect the health and safety of either plant personnel or the public.

This submittal also provides Part 21 notification of a manufacturer defect that caused the valve leakage.

If you require any additional information, please contact me.

Sincerely,

 for  
Albert R. Hochevar  
Station Manager

Unit 2 LER No. 2009-003

cc: E. E. Collins, NRC Regional Administrator, Region IV  
G. G. Warnick, NRC Senior Resident Inspector, San Onofre Units 2 & 3

**LICENSEE EVENT REPORT (LER)**

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

<b>1. FACILITY NAME</b> <b>San Onofre Nuclear Generating Station Unit 2</b>	<b>2. DOCKET NUMBER</b> <b>05000-361</b>	<b>3. PAGE</b> <b>1 OF 4</b>
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**4. TITLE**  
**Pressurizer Auxiliary Spray Failed Inservice Test**

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
<b>09</b>	<b>29</b>	<b>2009</b>	<b>2009-003-00</b>			<b>11</b>	<b>25</b>	<b>2009</b>		

<b>9. OPERATING MODE</b> <b>4</b>	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>										
<b>10. POWER LEVEL</b> <b>0</b>	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)							
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(x)							
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 73.71(a)(4)							
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(5)							
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(B)	<input checked="" type="checkbox"/> Part 21							
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)								
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)								
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(vii)								
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)								
	<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)(B)								

**12. LICENSEE CONTACT FOR THIS LER**

<b>NAME</b> Douglas R. Bauder, Plant Manager	<b>TELEPHONE NUMBER (Include Area Code)</b> (949) 368-4685
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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	AB	V		Y					

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

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

On September 29, 2009, with Unit 2 in Mode 4 for the Cycle 16 refueling outage, the Inservice Test (IST) determined that back leakage through Pressurizer [AB] Spray check Valve (MU-977) potentially prevented the Pressurizer Auxiliary Spray from meeting the residual heat removal licensing basis described in the UFSAR. The licensing basis conservatively assumes depressurization of the RCS within one hour for an initiating event with a Loss of Offsite Power (LOOP), a seismic event, and the single failure of an Emergency Diesel Generator (EDG).

The failure to meet the depressurization rate criteria under conservative assumptions does not affect the system response or results for analyzed Design Basis Accidents. The event has a low safety significance as other means are available to accomplish depressurization of the RCS for accident mitigation.

The cause of the check valve failure was a manufacturing defect. The swing arm hinge bushings were found backed out of the valve body and prevented free movement of disc swing arm assembly. The manufacturer had knurled the metal to fit the bushings into the body when an interference fit was required. MU-977 was repaired; the other similar valve on Unit 2 will be inspected prior to start up from the Cycle 16 refueling outage. Bushings on Unit 3 valves were previously replaced and the valves have continued to pass IST performance tests.

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Plant: San Onofre Nuclear Generating Station (SONGS) Unit 2  
 Event Date: September 29, 2009  
 Reactor Vendor: Combustion Engineering  
 Mode: Mode 4  
 Power: 0 percent

On September 29, 2009 (Event Date), with Unit 2 in Mode 4 for the Cycle 16 refueling outage, a scheduled Inservice Test (IST) at SONGS Unit 2 determined that the as-found back leakage through Pressurizer [AB] Spray check valve (MU-977) potentially prevented the Pressurizer Auxiliary Spray from effectively meeting the licensing basis for residual heat removal described in the Updated Final Safety Analysis Report (UFSAR).

UFSAR Section 5.4.7.2.5, "Plant Cooldown to Shutdown Cooling System Initiation Conditions," states the auxiliary spray will depressurize the Reactor Coolant System (RCS) within one hour to shutdown cooling entry conditions (376 psia, 350 degrees F). The SONGS design basis for Branch Technical Position RSB 5-1, "Design Requirements of the Residual Heat Removal System," conservatively assumes the auxiliary spray will meet the one hour requirement five hours after an initiating event with a Loss of Offsite Power (LOOP), a seismic event, and the single failure of an Emergency Diesel Generator (EDG). The failure to meet the depressurization rate criteria under conservative assumptions does not affect the system response or results for analyzed Design Basis Accidents. Unit 3 continued to operate at 100 percent power and was unaffected by this event.

This LER is being submitted in accordance with 10CFR50.73(a)(2)(v)(B), as a condition which could have prevented the fulfillment of the safety function to remove residual heat, and 50.73(a)(2)(vii), as a single condition causing two independent trains or channels to become inoperable.

### Background

The Pressurizer provides pressure control for the RCS by increasing the pressure when the system is started, decreasing the pressure when the system is shutdown, and maintaining the RCS pressure at 2250 psia during normal operating conditions. Pressure is increased by energizing submerged heaters at the bottom of the Pressurizer, and pressure is decreased by spraying subcooled water from the RCS cold-legs through a nozzle into the top of the Pressurizer. Normal spray alignment is from the RCS cold-legs, driven by the dynamic head of the Reactor Coolant Pumps (RCPs) through two Pressurizer spray control valves.

In a LOOP event, the RCPs de-energize and the normal spray flow is not available. The RCS enters a natural circulation cooldown, with the auxiliary spray manually initiated via the charging pumps to depressurize the RCS. The auxiliary spray flow path connects to the normal spray flow path before entering the Pressurizer. Two parallel path, air operated, pressurizer spray control valves are designed to fail closed, but are not qualified to close during a seismic event. The seismically qualified Pressurizer Spray Check Valves, MU-977 and MU-976, located downstream of each pressurizer spray control valve, prevent diversion of the auxiliary spray flow back through the pressurizer spray control valves to the RCS. Both normal pressurizer spray lines connect to a single Pressurizer spray line downstream of the pressurizer spray check valves; therefore leakage through either check valve, MU-977 or MU-976, affects both paths.

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**Description of the Event**

The IST Check Valve Test Closed (CVTC) of the pressurizer spray check valves is conducted in Mode 4 by measuring the depressurization rate of the pressurizer with auxiliary spray. A steady state depressurization rate is established using the auxiliary spray with the main pressurizer spray control valves closed. Then each main pressurizer spray control valve is opened and the depressurization rate is measured. Reverse flow leakage of auxiliary spray flow through the corresponding main pressurizer spray valve check valve reduces the depressurization rate. To pass the test, the depressurization rate must be sufficient to support entry to shutdown cooling entry conditions within the required one hour.

When pressurizer spray check valve MU-977 was tested on September 29, 2009 by opening the pressurizer spray control valve, the established steady state RCS depressurization rate decreased below the acceptable value, indicating diversion of the auxiliary spray flow through check valve MU-977, and failure of the valve to pass the IST. A second charging pump was started to further assess the amount of back leakage through MU-977. The depressurization rate with two charging pumps supplying auxiliary spray flow resulted in the depressurization rate increasing to about 3.6 psi/minute, which was still below the approximately 5 psi/minute acceptance criteria given in the IST-CVTC. The corresponding check valve on the other train, MU-976, did not leak significantly and passed the IST-CVTC with a conservative margin.

**Cause of the Event**

Pressurizer spray check valve MU-977 was disassembled and found to have an Original Equipment Manufacturer (OEM) defect.

Valve MU-977 is a Flowserve (Anchor Darling) 4 inch class 1515 pound Quality Class I swing check valve, with an internally balanced disc design. Two of these valves are installed in each of the SONGS units. The valves originally had an internal counterweight contained in a separate compartment on the same shaft with the disc. The valves were previously modified to remove the counterweights as the additional frictional drag on the hinge arm bearing surfaces tended to prevent the valve from seating. The shaft runs through both compartments and is supported by three sleeve bushings: one under the valve cover at the disc, one in the middle body between the two compartments, and one in the body at the end of the counterweight compartment.

MU-977 was opened and inspected; the disc / actuator assembly was found open a fraction of an inch off the seat. It took considerable force to move the assembly and the shaft remained bound in any position it was moved to. The counterweight body end bushing was found backed out about 1/2 in. to 5/8 in. and the middle body bushing was backed out about 1/16 in. The middle body bushing position interfered with the hinge arm, preventing free movement of the shaft. When the valve end cover was placed back on the valve and torqued down, the as-found condition was duplicated.

The bushings were installed by the original manufacturer and have not been replaced, or found loose in previous inspections of MU-977. The bushings are designed to be an interference fit, with the body bushing diameter exceeding the body bushing hole diameter by 0.001 in. The body bushing was removed and the diameter measured 0.002 in. smaller than the body hole. It is likely the bushing was knurled to raise the metal to fit into the body, to make up the interference fit, instead of using a larger bushing. The bushing eventually worked its way out of the body and prevented free movement of the hinged swing arm.

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**Corrective Action**

Unit 2 valve MU-977 was overhauled and a new body bushing was installed. The other valve on Unit 2, MU-976, retains the OEM bushings and will be inspected prior to restart from the Unit 2 Cycle 16 refueling outage. The bushings in the Unit 3 valves were previously replaced (refitted in 2001, see below) and have continued to pass the ISTs.

**Safety Significance**

There is a low safety significance to the check valve failure and potential subsequent loss of the auxiliary pressurizer spray depressurization capability. The licensing basis for the design of the system for residual heat removal does not credit other components which supply alternative methods of reducing RCS temperature and pressure. As described in UFSAR Section 5.4, in addition to the 144,000 gallon Seismic Category I condensate tank, SONGS has an additional 200,000 gallons of condensate maintained in a Seismic Category II tank, and other non-credited water supplies that would provide for an extended initial cooldown period. These additional water supplies would allow for the RCS to be brought to conditions allowing shutdown cooling to be initiated without the need for pressurizer auxiliary spray. The pressurizer vent system is also available to reduce system pressure, and may be used in response to the LOOP event or Design Basis Accident scenarios. The availability of these systems to provide depressurization minimizes the safety significance of this event.

**Operating Experience**

All four valves have undergone modifications and part replacements to reduce seat leakage. Of the four valves, only Unit 2 MU-977 has exhibited significant leakage in recent tests, and as a result it was scheduled to be replaced during the Unit 2 Cycle 17 refueling outage. The other valve in Unit 2, has not given any recent indications of degraded performance. In 1997, after failing its CVTC, the body bushing in Unit 3 MU-977 was found backed out 1/16 inch and was replaced, along with the end cap bushing. The bushings were also replaced in Unit 3 valve MU-976, although they had not backed out at that time. Subsequently, inspections of Unit 3 MU-976 in 1999 and 2001 found the bushings were backing out after replacement, due to an inadequate interference fit, which has been rectified. After the bushings were refitted in 1999 and 2001, the bushings have remained seated, and have not caused any test failures.