



A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear  
Generating Station

**Dwight C. Mims**  
Senior Vice President  
Nuclear Regulatory and Oversight

Tel. 623-393-5403  
Fax 623-393-6077

Mail Station 7605  
P. O. Box 52034  
Phoenix, Arizona 85072-2034

102-06591-DCM/TNW/MAM/DFH  
September 11, 2012

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

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 1**  
**Docket No. STN 50-528**  
**License No. NPF- 41**  
**Licensee Event Report 2012-003-00**

Please find attached Licensee Event Report (LER) 50-528/2012-003-00 which reports a condition prohibited by Technical Specification (TS) 3.7.2 when a low accumulator nitrogen pre-charge pressure rendered a Main Steam Isolation Valve actuator train inoperable for a period greater than allowed by TS Limiting Condition for Operation (LCO) 3.7.2, Action A.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the Nuclear Regulatory Commission (NRC) Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact Mark McGhee, Operation Support Manager, Regulatory Affairs, at (623) 393-4972.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

A handwritten signature in cursive script that reads 'D.C. Mims'.

DCM/TNW/MAM/DFH

Enclosure

cc: E. E. Collins Jr. NRC Region IV Regional Administrator  
L. K. Gibson NRC NRR Project Manager (electronic / paper)  
M. A. Brown NRC Senior Resident Inspector for PVNGS

A member of the **STARS** (Strategic Teaming and Resource Sharing) Alliance

Callaway • Comanche Peak • Diablo Canyon • Palo Verde • San Onofre • South Texas • Wolf Creek

A handwritten signature in cursive script that reads 'JE22 NRR'.

**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.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> Palo Verde Nuclear Generating Station (PVNGS) Unit 1	<b>2. DOCKET NUMBER</b> 05000528	<b>3. PAGE</b> 1 OF 5
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<b>4. TITLE</b> Main Steam Isolation Valve Actuator Train Inoperable Due to Low Nitrogen Pre-Charge Pressure
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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
07	13	2012	2012	- 003 -	00	09	11	2012	FACILITY NAME	DOCKET NUMBER

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

<b>12. LICENSEE CONTACT FOR THIS LER</b>	
FACILITY NAME Mark McGhee, Operations Support Manager, Regulatory Affairs	TELEPHONE NUMBER (Include Area Code) 623-393-4972

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

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

On July 13, 2012, an engineering evaluation determined that the Unit 1 Main Steam Isolation Valve (MSIV) SGE-UV-180 'A' actuator train was inoperable for approximately 23 days (June 2 to June 25). The evaluation concluded that, due to a nitrogen leak on the accumulator, low nitrogen pre-charge pressure on the 'A' actuator train could have prevented the fast close feature on MSIV 180 using the 'A' actuator train. Technical Specification (TS) Limiting Condition of Operation (LCO) 3.7.2 Condition A allows one actuator train to be inoperable for up to 7 days; therefore, the duration of the condition was greater than allowed by Technical Specifications. The leak was discovered and corrected during a maintenance activity on June 25, 2012, and the accumulator nitrogen pre-charge pressure was restored to within specifications.

The root cause investigation determined that less than adequate monitoring of various alarm system features placed the Unit 1 MSIV 180 hydraulic fluid reservoir low level alarm in a condition where it could not alert plant operators to the degrading nitrogen pre-charge pressure condition. To prevent recurrence, actions will be implemented to record and trend levels in the MSIV and FWIV fluid reservoirs and to monitor accumulator pre-charge pressure to ensure timely discovery of a loss of pre-charge pressure affecting operability of the valves.

In the past three years, PVNGS has not reported a similar event to the NRC.

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**NARRATIVE**

All times are Mountain Standard Time and approximate unless otherwise indicated.

**1. REPORTING REQUIREMENT(S):**

This Licensee Event Report (LER) is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) to report a condition prohibited by Technical Specifications (TS). Specifically, TS 3.7.2 requires that four Main Steam Isolation Valves (MSIV) and their associated actuator trains ('A' and 'B') be operable in Modes 1 through 4. TS 3.7.2 Limiting Condition for Operation (LCO) Condition A requires that with one MSIV with a single actuator train inoperable, the MSIV actuator train shall be restored to an operable status within 7 days. On July 13, 2012, an engineering evaluation determined that the 'A' actuator train for Unit 1 MSIV 180 was inoperable from June 2, 2012, to June 25, 2012, which is greater than the 7 days allowed by TS LCO 3.7.2, Condition A.

**2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):**

The Main Steam system (EISS Code: SB) contains two 28 inch main steam lines for each of the two steam generators. One MSIV is installed in each main steam line outside of, but close to, containment. The four MSIVs are downstream of the Main Steam Safety Valves (MSSVs), atmospheric dump valves, and auxiliary feedwater pump turbine steam supply valves to prevent those components from being isolated from the steam generators by MSIV closure. MSIV closure isolates each steam generator from the other, and isolates the steam generators from the downstream secondary steam loads such as the turbine, steam bypass valves, and auxiliary steam supplies.

Each MSIV is a 28-inch, double-disc, wedge type gate valve manufactured by the Anchor/Darling Valve Company. The actuation system on each MSIV is composed of two redundant pneumatic hydraulic actuator trains, "A" and "B". The instrumentation and controls of the two actuator trains on each MSIV are physically and electrically separate and redundant. Either actuator train can independently perform the safety function to fast close the MSIV on demand. The MSIVs fast close upon receipt of a Main Steam Isolation Signal (MSIS) (EISS Code: JE) from the Engineered Safety Features Actuation System (ESFAS). The MSIS is generated by high containment pressure, low steam generator pressure, or high steam generator level. The MSIVs fail closed on loss of power, and may also be actuated manually.

For each actuator train, a volume of hydraulic fluid is stored at high pressure in a nitrogen pressurized accumulator to provide the energy required for fast closure of the MSIV upon receipt of a MSIS. The accumulator contains a nitrogen gas pre-charge which is separated from the stored hydraulic fluid by an internal piston. The accumulators are filled to the desired hydraulic fluid level and pressure (5000-5400 psig) using the pneumatic hydraulic pump.

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The hydraulic pump provides pressurized hydraulic fluid to both actuator trains on an MSIV and is a pneumatically operated, positive displacement pump, powered from the instrument air system. The pump takes suction on the fluid reservoir and discharges to the hydraulic systems for both actuator trains to charge the accumulators with hydraulic fluid. The hydraulic pump is also used to provide motive power for routine slow opening and slow closing of the MSIV. The hydraulic fluid reservoir is used to make up for fluid system losses and is provided with a low level alarm. The annunciation of the hydraulic fluid reservoir low level alarm provides indication of a loss of hydraulic fluid or a loss of the nitrogen pre-charge pressure in the accumulator.

The actuation of the MSIV is controlled by the position of two four-way directional control valves that operate together to direct hydraulic fluid as needed to change valve position. One four-way valve controls the flow of hydraulic fluid to and from the pressurized accumulator while the other four-way valve controls the flow of hydraulic fluid to either side of the MSIV actuator hydraulic piston (bottom for opening, top for closing). Instrument air provides pilot air to the four way directional control valves to position them as needed for opening and closing the MSIV. An air reservoir is provided on each actuator train as a backup control air supply for positioning the hydraulic fluid control valves. This ensures the MSIVs can be closed following loss of instrument air system supply pressure.

3. INITIAL PLANT CONDITIONS:

During the period from June 2, 2012, through June 25, 2012, and the period from June 25, 2012, through the discovery date, July 13, 2012, Palo Verde Unit 1 was in MODE 1 (Power Operation) at 100 percent power at normal operating temperature and normal operating pressure. There were no other major structures, systems, or components that were inoperable that contributed to the event.

4. EVENT DESCRIPTION:

On June 25, 2012, Unit 1 plant operators declared MSIV 180 inoperable to support the replacement of the pneumatic hydraulic pump on MSIV 180. After the pump was replaced, plant mechanics reported the nitrogen pre-charge pressure for the 'A' actuator train accumulator was low. Mechanics located a small leak at a Swagelok fitting on a pressure transmitter for the 'A' actuator train of MSIV 180. The fitting was tightened and the nitrogen pre-charge pressure on the 'A' actuator train accumulator was restored to within specifications. Following completion of maintenance activities, Unit 1 operators declared MSIV 180 operable.

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Based on the nitrogen pre-charge pressure condition found on the 'A' actuator train accumulator for MSIV 180, an engineering evaluation was performed to determine if the loss of nitrogen pressure fell below the pressure requirements to fast close the MSIV with that actuator train. On July 13, 2012, engineering personnel completed the evaluation and determined that the slow nitrogen leak allowed pressure to fall below the minimum pressure required to ensure that the 'A' actuator train could fast close the MSIV on June 2, 2012. The evaluation concluded that the Unit 1 MSIV 180 'A' actuator train was inoperable for approximately 23 days (June 2 to June 25).

The root cause investigation team evaluating this event identified that during a maintenance task on MSIV 180, a mathematical error was made by maintenance technicians which resulted in overfilling the MSIV hydraulic fluid reservoir on October 31, 2011. With the additional hydraulic fluid in the reservoir, the fluid reservoir low level alarm did not annunciate as designed when the nitrogen pre-charge pressure decreased to an unacceptable value.

**5. ASSESSMENT OF SAFETY CONSEQUENCES:**

The safety function of the MSIVs is to fast close when a MSIS Engineered Safety Features Actuation System (ESFAS) actuation occurs. The fast close action prevents containment over pressurization and excessive reactor coolant system cool down following a main steam line break, main feedwater line break, or loss of coolant accident. The MSIS rapidly terminates steam flow and feedwater flow by isolating each steam generator.

There are four MSIVs, one on each main steam line. Each valve can be actuated from independent 'A' or 'B' actuator trains. Each actuator train performs completely redundant functions. This configuration ensures that a single failure of one MSIV actuator train will not result in the loss of the isolation function. During the period that MSIV 180 'A' actuator train was inoperable, the redundant MSIV 180 'B' actuator train was operable. Therefore, the main steam line was still capable of being isolated in the event that a MSIS occurred.

This event would not have resulted in a transient more severe than those analyzed in the updated Final Safety Evaluation Report Chapters 6 and 15. The condition did not result in any challenges to the fission product barriers or result in any releases of radioactive materials, and did not adversely affect plant safety or the health and safety of the public. The condition would not have prevented the fulfillment of any safety function of structures or systems as defined by 10 CFR 50.73(a)(2)(v).

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**6. CAUSE OF THE EVENT:**

The direct cause was that there was no alarm from the hydraulic fluid reservoir alarm system to alert operators to a degrading condition.

The root cause was determined to be less than adequate monitoring of various alarm system features placed the MSIV 180 hydraulic fluid reservoir low level alarm in a condition where it could not alert plant operators to the degrading nitrogen pre-charge condition before exceeding the time allowed by TS LCO 3.7.2.

**7. CORRECTIVE ACTIONS:**

As an immediate action, the MSIVs and Feedwater Isolation Valves (FWIVs) for all three units were inspected for system leaks and verified to have the proper pre-charge and hydraulic fluid reservoir level.

To prevent recurrence, actions will be implemented to record and trend levels in the MSIV and FWIV fluid reservoirs and to monitor accumulator pre-charge pressure to ensure timely discovery of a loss of pre-charge pressure affecting operability of the valves.

The following additional actions are planned for implementation:

- Revise MSIV and FWIV maintenance procedures to provide clear instruction on how to adjust hydraulic fluid reservoir level. This action will include providing guidance in the procedure for proper performance of the calculation and verification of the calculation.
- Revise work instructions for maintenance on MSIV and FWIV accumulator pressure instrumentation to ensure consistent maintenance practices during these activities.

**8. PREVIOUS SIMILAR EVENTS:**

PVNGS has not reported a similar event in the past three years.