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102-07347-MLL/RAC
October 10, 2016

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

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 2**
Docket No. STN 50-529 / License No. NPF 51
Licensee Event Report 2016-001-00

Enclosed please find Licensee Event Report (LER) 50-529/2016-001-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports a condition prohibited by Technical Specification Limiting Condition for Operation 3.7.2, Main Steam Isolation Valves (MSIVs). PVNGS identified a low nitrogen pre-charge pressure on the MSIV train A accumulator on August 9, 2016 due to nitrogen leakage. Engineering evaluation determined that the MSIV train A accumulator had been inoperable greater than the 7-day Required Action Completion Time.

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.

Arizona Public Service Company makes no commitments in this letter. If you have questions regarding this submittal, please contact Mark McGhee, Nuclear Regulatory Affairs Department Leader, at (623) 393-4972.

Sincerely,

MLL/RAC/akf

Enclosure

cc:	K. M. Kennedy	NRC Region IV Regional Administrator
	S. P. Lingam	NRC NRR Project Manager for PVNGS
	C. A. Peabody	NRC Senior Resident Inspector PVNGS

**LICENSEE EVENT REPORT (LER)**(See Page 2 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 and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to 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.

1. FACILITY NAME

Palo Verde Nuclear Generating Station (PVNGS), Unit 2

2. DOCKET NUMBER

05000529

3. PAGE

1 OF 6

4. TITLE

Main Steam Isolation Valve Actuator Train Inoperable due to Low Nitrogen Pre-Charge Pressure

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	09	2016	2016	- 001	- 00	10	10	2016	FACILITY NAME	DOCKET NUMBER
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
1			<input type="checkbox"/> 20.2201(b)	<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)(A)		
			<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
			<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
			<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)		
10. POWER LEVEL 100			<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
			<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)		
			<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)		
			<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)(D)		<input type="checkbox"/> 73.77(a)(2)(i)		
			<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)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)		
			<input type="checkbox"/> 50.73(a)(2)(i)(C)		<input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A					

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT

Mark McGhee, Department Leader, Nuclear 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
D	SB	TBG	S958	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 9, 2016, Technical Specification (TS) Limiting Condition for Operation (LCO) 3.7.2, Condition A was entered for Unit 2 main steam isolation valve SGE-UV-171 (MSIV 171) train A actuator to perform a nitrogen pre-charge check. The check identified low nitrogen pre-charge pressure on the train A accumulator. An engineering evaluation determined that the MSIV 171 train A actuator was inoperable since July 30, 2016 due to a nitrogen leak on the accumulator. This inoperability period exceeded the 7-day required action completion time for one MSIV actuator train. The MSIV 171 train A actuator was restored to operable status and LCO 3.7.2, Condition A was exited on August 9, 2016. The accumulator leak was repaired on October 5, 2016. Insufficient monitoring, trending, and understanding of reservoir hydraulic fluid level trends in relation to the nitrogen pre-charge required for MSIV operability led to the extended inoperability period. Operator training will be revised to improve understanding of the system and the limitations of the hydraulic fluid level alarm. Additional corrective actions will revise procedures to provide enhanced rigor for the control of operations condition monitoring thresholds for an MSIV to ensure appropriate response times. Maintenance procedures will also be revised to provide more explicit guidance to minimize the potential for leaks. In the past 3 years, PVNGS has not reported a similar event to the NRC.

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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 and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to 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.

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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 the Technical Specifications (TS). Specifically, TS 3.7.2 requires four operable main steam isolation valves (MSIVs) and their associated actuator trains (A and B) in Modes 1 through 4. Condition A of TS Limiting Condition for Operation (LCO) 3.7.2 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. If not, LCO 3.7.2, Condition E, requires the MSIV to immediately be declared inoperable and, if in Mode 1, Condition F requires the inoperable MSIV be restored to operable status within 4 hours. If Condition F is not met, Condition G requires the Unit to be placed in Mode 2 within 6 hours.

An engineering evaluation determined the train A actuator for Unit 2 MSIV SGE-UV-171 (MSIV 171) was inoperable from July 30, 2016, to the discovery date, August 9, 2016, which is greater than the total required action completion time allowed by TS LCO 3.7.2, Conditions A, E, F, and G or 7 days and 10 hours.

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

The main steam system (EISS code: SB) includes 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, 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 for 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 a 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 an 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 a 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 (EISS code: LD). The pump takes suction on the shared 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 hydraulic fluid reservoir low level alarm provides an indication of a loss of hydraulic fluid or a loss of nitrogen pre-charge pressure in the accumulator. The alarm does not ensure that sufficient nitrogen remains in the accumulator.

In order to verify that adequate nitrogen pre-charge pressure exists in the accumulator, the operators perform a pre-charge check. The pre-charge check process renders the associated actuator train inoperable because the hydraulic fluid must be discharged from the accumulator. Pre-charge checks are performed in response to low level alarms in the hydraulic fluid reservoir and may be performed in response to identified nitrogen leakage.

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 and top for closing). Instrument air provides the pilot air to the four-way directional control valves to position them as needed for opening and closing of 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 a loss of instrument air system supply pressure.

3. INITIAL PLANT CONDITIONS:

During the period from July 30, 2016 through August 9, 2016, PVNGS Unit 2 remained in Mode 1 (Power Operation) at 100 percent power at normal operating temperature and pressure. No other major structures, systems, or components were inoperable that contributed to the event.

4. EVENT DESCRIPTION:

On October 7, 2015, nitrogen leakage was identified on Unit 2 MSIV 171. Because the specific location of the leak was not identified, operations personnel established a monitoring activity that required shiftly logging of MSIV 171 hydraulic fluid reservoir level. Low level in the reservoir provides only an indirect indication of a potential loss of adequate nitrogen pre-charge in an accumulator. Operations personnel selected a perceived conservative hydraulic fluid reservoir level threshold to take action, prior to reaching the alarm setpoint, to ensure the known nitrogen leakage did not result in excessive nitrogen loss impacting operability.

On July 4, 2016, the area operator logs documented the hydraulic fluid level in the MSIV 171 reservoir level trend first reached the level threshold established in the monitoring activity and subsequently cleared the threshold several hours later. The logs document the level trend did not reach the threshold

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again until July 25, 2016, after which the level continued to exceed the monitoring threshold. The low level alarm had not been reached.

On August 9, 2016, Operations personnel declared MSIV 171 train A accumulator inoperable to perform a planned nitrogen pre-charge check to address the lowering hydraulic fluid reservoir level. The check revealed lower nitrogen pre-charge on the train A accumulator than is required to perform the fast close function of the MSIV. The nitrogen pre-charge was restored, and the valve actuator train was declared operable.

A subsequent engineering evaluation determined the nitrogen pre-charge in MSIV 171 train A accumulator was below that required to perform the MSIV fast close function for an approximately 9.5-day period between July 30, 2016 and August 9, 2016. Therefore, the MSIV train A actuator was inoperable for greater than the time allowed by the conditions of TS LCO 3.7.2.

The investigation identified the nitrogen leakage was occurring at the bottom tube fitting of the pressure transmitter on the train A accumulator. The fitting was replaced previously on November 13, 2015, to correct nitrogen leakage. Subsequent to the fitting replacement, MSIV 171 low hydraulic fluid level alarms were received in the Unit 2 control room on December 11, 2015 and February 23, 2016, and the hydraulic fluid level for MSIV 171 reached the low level monitoring threshold on March 30, 2016. For each of these cases, a timely nitrogen pre-charge check was performed restoring operability within LCO 3.7.2 requirements.

To assess extent of condition, the other MSIV and feedwater isolation valve (FWIV) actuator train pneumatic fittings were inspected in all three units for leakage. A small nitrogen leak was identified on Unit 1 FWIV 174, and a nitrogen pre-charge check was performed concluding the nitrogen pre-charge was adequate. A work order was issued to resolve the equipment issue in accordance with the corrective action program. Operations personnel have also established a shiftily monitoring activity for this valve prior to completion of the work order to ensure timely actions are taken.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

This event would not have resulted in a transient more severe than those analyzed in the Updated Final Safety Analysis 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 safety function of the MSIVs is to fast close when an MSIS ESFAS actuation occurs. The fast close action prevents containment overpressurization and excessive reactor coolant system cooldown 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.

During the 9.5-day period that MSIV 171 train A actuator was not capable of performing its fast close function, the redundant MSIV 171 train B actuator was capable of fast closing the MSIV in the event that an MSIS occurred. No other MSIV actuator trains were declared inoperable in Unit 2 during that time period.

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The nuclear safety risk associated with the subject condition was minimal. The MSIVs are credited in the PVNGS probabilistic risk assessment model to mitigate main steam and feedwater line breaks. The unavailability of one of two accumulators on an MSIV has a minimal impact on the reliability of an MSIV to close. Each Unit 2 MSIV, including MSIV 171, had at least one actuator train available to support their closure during the specified time period. However, a bounding analysis was performed assuming one MSIV was unable to close for a time period greater than 9.5 days. The incremental conditional core damage and large early release probabilities associated with this bounding condition were less than 6E-8 and 2E-9, respectively. This increase in risk is characterized as "very small" per NRC Regulatory Guide 1.174.

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).

6. CAUSE OF THE EVENT:

The event resulted from a delay in performing the pre-charge check to address the low accumulator hydraulic fluid level trend, which did not meet expectations for timely response after reaching the level monitoring threshold.

The cause of the extended inoperability period was insufficient monitoring, trending, and understanding of MSIV reservoir hydraulic fluid level trends in relation to the nitrogen pre-charge required for an MSIV to be operable.

The cause of the nitrogen leakage from the fitting was inadequate guidance for the installation and restoration of the tubing fittings.

7. CORRECTIVE ACTIONS:

As an immediate action, the nitrogen pressure for the MSIV 171 train A accumulator was restored.

An interim measure was instituted to perform periodic verifications of the hydraulic fluid reservoir levels on Unit 2 MSIV 171 with higher level thresholds to ensure more timely verification of accumulator pre-charge pressure until the nitrogen leak was repaired.

The leaking fitting on MSIV 171 train A accumulator was replaced and the nitrogen leak was corrected on October 5, 2016.

To correct the extended inoperability period, operator training will be revised to improve understanding of the system and the limitations of the hydraulic fluid level alarm. Additional corrective actions will revise procedures to provide enhanced rigor for the control of operations condition monitoring thresholds for an MSIV to ensure appropriate response times.

To correct the equipment issue, the applicable maintenance procedure will be revised to provide explicit requirements including leakage criteria, thread sealant specifications, and assembly practices.

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8. PREVIOUS SIMILAR EVENTS:

PVNGS has not reported a similar event in the past 3 years. LER 50-529/2012-003-00 identified a similar condition where a gradual loss of nitrogen pre-charge pressure resulted in a violation of TS LCO 3.7.2. The evaluation of the 2012 condition determined the hydraulic fluid level alarm setpoint, which is intended to be an indicator of nitrogen loss, may not be capable of ensuring that the nitrogen pre-charge in the accumulators is sufficient to perform the MSIV actuator fast close function under all conditions. The corrective actions implemented weekly hydraulic fluid level trending to ensure timely discovery of a loss of nitrogen condition affecting operability of an MSIV accumulator. The corrective actions did not prevent the event in this LER because they did not include actions to ensure an understanding of the limitations of reservoir monitoring and the need for timely verification of nitrogen pre-charge pressure. Specifically, hydraulic fluid level is an indication of nitrogen leakage but not an indication of adequate nitrogen pre-charge.