



10 CFR 50.73

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102-07170-MLL/JYL/FJO  
February 5, 2016

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

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS) Unit 3  
Docket No. STN 50-530 / License No. NPF 74  
Licensee Event Report 2015-004-01**

Enclosed please find Licensee Event Report (LER) supplement 50-530/2015-004-01 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER supplement provides the causes and corrective actions determined for the previously reported event that resulted in a condition prohibited by Technical Specification (TS) Limiting Condition for Operation (LCO) 3.0.4, resulting from entry into an operating mode of applicability (Mode 4) while the associated actions required to permit continued operation under LCO 3.7.2 were not met due to an inoperable main steam isolation valve.

In accordance with 10 CFR 50.4, copies of this LER supplement 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/JYL/FJO/akf

Enclosure

cc: M. L. Dapas                      NRC Region IV Regional Administrator  
M. M. Watford                    NRC NRR Project Manager  
C. A. Peabody                    NRC Senior Resident Inspector for PVNGS

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**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.

<b>1. FACILITY NAME</b> Palo Verde Nuclear Generating Station (PVNGS) Unit 3	<b>2. DOCKET NUMBER</b> 05000530	<b>3. PAGE</b> 1 OF 6
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**4. TITLE**  
Condition Prohibited by Technical Specifications 3.0.4 and 3.7.2 Due to an Inoperable Main Steam Isolation Valve

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	01	2015	2015	004	01	02	05	2016	FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>			
1	<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)
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)(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		TELEPHONE NUMBER (Include Area Code)
LICENSEE CONTACT Mark McGhee, Department Leader, Nuclear Regulatory Affairs		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	P070	Y					

<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)

On August 13, 2015, at approximately 2106, the Unit 3 main steam isolation valve SGE-UV-181 (MSIV-181) B actuator train was declared inoperable and Technical Specification (TS) Limiting Condition for Operation (LCO) 3.7.2, Condition A, was entered due to a failed fitting on the air supply line. To correct the condition the failed fitting was replaced and an additional pipe support was installed on the air-line. Following retests, the MSIV-181 B actuator train was restored to operable status and LCO 3.7.2, Condition A, was exited on August 15, 2015, at approximately 1830. A similar air-line fitting failure had occurred on the Unit 3 MSIV-181 B actuator train on May 19, 2015. The investigation of this condition following the second failure determined the MSIV-181 B actuator train air-line configuration was modified in the spring 2015 Unit 3 refueling outage and was inoperable from the time Unit 3 entered Mode 4 on May 1, 2015, at 0258, following the outage because the air-line tubing was not adequately supported following the design change.

The cause of the failure was lack of adequate guidance to perform a walk down during the PVNGS design equivalent change (DEC) process. The lack of a local inspection of actual plant conditions resulted in the latent condition (i.e., vibratory displacement of the affected air-line combined with inadequate tubing support) remaining unnoticed prior to the component failure. Immediate corrective actions to replace the failed fittings and add additional support were completed on August 15, 2015. An additional corrective action will revise procedural guidance and associated documents.

No similar conditions have been reported by PVNGS in the last three years.



**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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](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.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REV NO.	
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	2015	- 004	- 01	2 OF 6

**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 Specification (TS) Limiting Condition for Operation (LCO) 3.0.4 due to entry into a mode of applicability (Mode 4) with an LCO not met and the conditional requirements of LCO 3.0.4 not met. This LER also reports a condition prohibited by TS LCO 3.7.2, Main Steam Isolation Valves (MSIVs), resulting from an inoperable MSIV actuator train for a period of time longer than allowed by the LCO.

On May 19, 2015, at 0423, the Unit 3 MSIV SGE-UV-181 (MSIV-181) B actuator train was declared inoperable due to an air leak on the air-line for the actuator controls. The air leak was corrected and the actuator train was restored to operable status on May 19, 2015, at 1540.

On August 13, 2015, at 2106, the Unit 3 MSIV-181 B actuator train was again declared inoperable due to a similar air leak on the air-line for the actuator controls. The air leak was corrected, an additional piping support was installed, and the actuator train was restored to operable status on August 15, 2015, at 1830. The May 19, 2015, event was initially determined to not be reportable because the actuator train was restored within the LCO 3.7.2 time limitations and no firm evidence was identified at that time to indicate the actuator train was inoperable prior to the time of discovery of the air leak. A review subsequent to the second failure determined the MSIV-181 B actuator train was inoperable from the time Unit 3 entered Mode 4 during plant startup following the Unit 3 spring refueling outage (3R18) on May 1, 2015, at 0258.

Per LCO 3.7.2, Condition A, an inoperable MSIV actuator train must be restored to 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. Because the inoperable condition of the MSIV-181 B actuator train was not identified during the May 2015 plant startup activities, the requirements of LCO 3.0.4 and LCO 3.7.2 were not met.

**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 (EISS Code: SB) is installed in each main steam line outside of, but close to, containment in the main steam support structure building. The four MSIVs are downstream of the main steam safety valves (EISS Code: SB), atmospheric dump valves (EISS Code: SB), and auxiliary feedwater (EISS Code: BA) pump turbine steam supply valves to prevent those components from being isolated from the steam generators by MSIV closure. Closure of MSIVs isolates each steam generator from the other and isolates the steam generators from the downstream secondary

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE		
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	YEAR	SEQUENTIAL NUMBER	REV NO.	3 OF 6		
		2015	- 004	- 01			

**NARRATIVE**

steam loads and piping such as the main turbine, steam bypass valves, and auxiliary steam supplies. The MSIV isolation function ensures termination of steam flow from the unaffected steam generator following a high energy line break event and supports mitigation of a steam generator tube rupture event.

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 safety related 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 which occurs upon receipt of a main steam isolation signal (MSIS) (EIS Code: JE) from the engineered safety features actuation system. The MSIS is generated by high containment pressure, low steam generator pressure, or high steam generator water level. The MSIVs fail in the closed position on loss of control power, and may also be actuated manually.

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

The common hydraulic pump provides pressurized hydraulic fluid to both actuator trains on an MSIV and is a pneumatically operated positive displacement pump powered by the instrument air (EIS Code: LD) system. The pump takes suction on a common hydraulic fluid reservoir and discharges to the hydraulic systems for each actuator train to charge the accumulators with hydraulic fluid. The hydraulic pump is also used to provide motive power during normal operations for slow opening and slow closing of the MSIV.

The actuation of the MSIV is controlled by the position of two four-way 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 from the pressurized accumulator to the MSIV actuator or the fluid reservoir 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 via a manifold block to the four-way control valves that open and close the MSIV. An air reservoir is provided on each actuator train as a backup control air supply for positioning the hydraulic fluid control valves. The air reservoirs ensure the MSIV can be closed following loss of instrument air system supply pressure. The MSIV air system components are interconnected by 3/8-inch stainless steel tubing using fittings.

TS LCO 3.7.2 requires that all four MSIVs and their associated actuator trains shall be operable when the unit is in Modes 1, 2, 3, and 4 except when all MSIVs are closed and deactivated. According to Condition A, a single inoperable actuator train must be restored to operable status within 7 days. If this cannot be accomplished, Condition E requires that the MSIV be immediately declared inoperable and Condition F is entered. If the MSIV cannot be restored to operable status in 4 hours according to Condition F, the unit must be placed in Mode 2 within 6 hours per Condition G.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	YEAR	SEQUENTIAL NUMBER	REV NO.	4 OF 6
		2015	- 004	- 01	

**NARRATIVE**

**3. INITIAL PLANT CONDITIONS:**

On August 13, 2015, PVNGS Unit 3 was in Mode 1 (Power Operation), at 100 percent power, normal operating temperature, and normal operating pressure. There were no other structures, systems, or components out of service that contributed to these events.

**4. EVENT DESCRIPTION:**

In April 2015, during the 3R18 refueling outage, a design change was implemented on the Unit 3 MSIV-181 B actuator train. The design change modified the MSIV-181 B actuator train air supply line configuration by installing a new type of swivel fitting in the line. The modification facilitates MSIV actuator assembly by replacing rigid fittings in the air supply lines with swivel fittings.

During the plant startup activities following the 3R18 refueling outage, the following mode changes were made in Unit 3:

- Entered Mode 4 at 0258 on May 1, 2015
- Entered Mode 3 at 1506 on May 1, 2015
- Entered Mode 2 at 0141 on May 3, 2015
- Entered Mode 1 at 1400 on May 3, 2015

On May 19, 2015, at 0423, the Unit 3 control room received alarms when the hydraulic accumulator pressure for MSIV-181 B actuator train unexpectedly dropped below 5000 psig. Operations personnel declared the B actuator train inoperable and entered LCO 3.7.2, Condition A. Local inspection revealed an air leak on the control air-line for the B actuator train due to a cracked fitting which had sheared so the air-line was completely disconnected. The MSIV-181 A actuator train was not affected by the air leak and remained capable of performing the safety function to close the MSIV if demanded. The failed fitting was replaced, retests were satisfactorily completed, and the B actuator train was restored to operable status on May 19, 2015, at 1540.

On August 13, 2015, at 2106, a similar air-line leak occurred on the Unit 3 MSIV-181 B actuator train and operations personnel declared the B actuator train inoperable and entered LCO 3.7.2, Condition A. In this case, an operator identified an air leak on the same fitting which had been replaced following the May 19, 2015, air leak event. The fitting was cracked but not sheared as before and when the operator isolated the leak by closing an upstream air isolation valve, the air pressure bled down causing the MSIV-181 B hydraulic accumulator to depressurize. The MSIV-181 A actuator train was not affected by this air leak and remained capable of performing the safety function to close the MSIV if demanded.

A causal evaluation for the May 19, 2015, fitting failure was in progress when the August 13, 2015, failure occurred. A metallurgical report concluded that the May 19, 2015, event occurred due to fatigue failure of an air-line fitting. Elevated vibrations observed on the air-line tubing during the investigation of the first fitting failure were later attributed to an unsupported tubing span in exceedance of the engineering specification. Additional walk downs on the other MSIV and feedwater isolation valve (FWIV) actuator train air-lines in all three units confirmed that the elevated vibrations and inadequate tubing support existed only in the Unit 3 MSIV-181 B actuator train.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE		
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	YEAR	SEQUENTIAL NUMBER	REV NO.	5 OF 6		
		2015	- 004	- 01			

**NARRATIVE**

Following the first fitting failure and upon discovery of the vibratory displacement of the affected air-line combined with inadequate tubing support, a vibration analysis was performed to assess the impact of the as-found configuration on the air-line tubing for the Unit 3 MSIV-181 B actuator train. Modifications to the tubing with installation of additional supports were planned; however, they were not implemented prior to the second fitting failure on August 13, 2015.

The scope of the initial causal evaluation was expanded to evaluate both failures following the August 13, 2015, event. The investigation confirmed the failed fitting was the new swivel fitting (manufacturer: Parker Hannifin Corporation, part number: 6-6 F6X-S) that had been installed during the 3R18 refueling outage. The use of the new swivel type fitting was approved via the PVNGS simplified design equivalent change (DEC) process which did not include a walk down. The lack of adequate guidance to perform a local inspection of actual plant conditions during the DEC process resulted in the latent condition (i.e., vibratory displacement of the affected air-line combined with inadequate tubing support) remaining unnoticed prior to the component failure. The failed fitting was replaced and the design was modified to install an additional pipe support on the air-line tubing to restrict line movement and resultant fatigue of the line components. Retests were satisfactorily completed and the MSIV-181 B actuator train was restored to operable status on August 15, 2015, at 1830.

The May 19, 2015, event was initially determined to not be reportable because the actuator train was restored within the LCO 3.7.2 time limitations and no firm evidence was identified at that time to indicate the actuator train was inoperable prior to the time of discovery of the air leak. A review subsequent to the second failure determined the MSIV-181 B actuator train was inoperable from the time Unit 3 entered Mode 4 during plant startup following the 3R18 refueling outage on May 1, 2015, at 0258.

**5. ASSESSMENT OF SAFETY CONSEQUENCES:**

This event did not result in a potential transient more severe than those analyzed in the Updated Final Safety Analysis Report (UFSAR) or result in the release of radioactive materials to the environment. There were no actual safety consequences as a result of this event and the event did not adversely affect the health and safety of the public.

The nuclear safety risk associated with the subject condition was minimal. The MSIVs are credited in the PVNGS probabilistic risk assessment (PRA) model to mitigate main steam line breaks and feedwater line breaks. A bounding analysis was performed assuming Unit 3 MSIV-181 was unable to close during the time period between April 21, 2015 (i.e., the design change installation date during the 3R18 refueling outage), and August 15, 2015 (i.e., the restoration completion date after the second fitting failure). In addition, the at-power PRA model was used as a surrogate to model the risk associated with the shutdown conditions during the specified time period, which is bounding. The other MSIVs always had at least one actuator train available to support their closure during the specified time period, and the unavailability of one of two MSIV accumulators has a minimal impact on the reliability of an MSIV to close. The incremental conditional core damage and large early release probabilities associated with this condition using a bounding analysis were less than 6E-8 and 2E-9, respectively. This increase in risk is characterized as "very small" per NRC Regulatory Guide 1.174.

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	YEAR	SEQUENTIAL NUMBER	REV NO.	6 OF 6
		2015	- 004	- 01	

**NARRATIVE**

The event would not have prevented the fulfillment of a safety function; and, the condition did not result in a safety system functional failure as defined by 10 CFR 50.73 (a)(2)(v).

**6. CAUSE OF THE EVENT:**

The cause of the failure was lack of adequate guidance to perform a walk down during the DEC process. The lack of a local inspection of actual plant conditions resulted in the latent condition (i.e., vibratory displacement of the affected air-line combined with inadequate tubing support) remaining unnoticed prior to the component failure.

To assess the extent of condition, the other MSIV and FWIV actuator train air-lines were inspected in all three units for elevated vibrations and no other MSIV or FWIV was found to have elevated vibrations on the air-lines.

**7. CORRECTIVE ACTIONS:**

Immediate corrective actions for the failures which occurred on May 19, 2015, and August 13, 2015, replaced the failed fittings. Following the second air leak on August 13, 2015, a corrective action to add additional support for the air-line tubing for the Unit 3 MSIV-181 B actuator train was implemented at the same time the failed fitting was replaced.

An additional corrective action will revise procedural guidance and associated documents.

**8. PREVIOUS SIMILAR EVENTS:**

No similar conditions have been reported by PVNGS in the last three years.