



A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear  
Generating Station

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ID#: 102-06128-DCM/RAB/TNW/DFH  
February 1, 2010

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 2009-001-00**

Enclosed, please find Licensee Event Report (LER) 50-530/2009-001-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports a manual actuation of the reactor protection system (reactor trip) in response to a loss of instrument air to the containment building.

In accordance with 10 CFR 50.4, copies of this LER are being forwarded to the NRC Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact Ray Buzard, Section Leader, Regulatory Affairs, at (623) 393-5317.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

DCM/RAB/TNW/DFH/gat

Enclosure

cc: E. E. Collins Jr. NRC Region IV Regional Administrator  
J. R. Hall NRC NRR Project Manager - (send electronic and paper)  
R. I. Treadway NRC Senior Resident Inspector for PVNGS

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<b>NRC FORM 366</b> (9-2007)	<b>U.S. NUCLEAR REGULATORY COMMISSION</b>	APPROVED BY OMB: NO. 3150-0104	EXPIRES: 08/31/2010
<b>LICENSEE EVENT REPORT (LER)</b>  (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 Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@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**  
 Manual Reactor Trip Due to a Loss of Instrument Air to the Containment Building

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
12	03	2009	2009	- 001 -	00	02	01	2010	FACILITY NAME	DOCKET NUMBER
										05000
										05000

<b>9. OPERATING MODE</b>  1	<b>10. POWER LEVEL</b>  100	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§:</b> (Check all that apply)							
		<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 checked="" 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 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 Ray Buzard, Section Leader, Regulatory Affairs	TELEPHONE NUMBER (Include Area Code) 623-393-5317
-----------------------------------------------------------------	------------------------------------------------------

**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	LD	PDSV	1223	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
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**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On December 3, 2009, at approximately 04:31, Mountain Standard Time, Unit 3 control room operators initiated a manual reactor trip from approximately 100 percent rated thermal power in response to a loss of instrument air (IA) to the containment building. The loss of IA caused a closure of the reactor coolant pump (RCP) seal bleed off isolation valve, redirecting RCP seal bleed off from the volume control tank (VCT) to the reactor drain tank (RDT). To prevent overfilling and breaching the RDT rupture disc, plant operators initiated a manual reactor trip. After tripping the reactor, all four RCPs were tripped and RCP seal bleed off was secured. Forced circulation was restored at 10:58 when a temporary modification was installed which aligned nitrogen to the IA system. No automatic engineered safety feature (ESF) actuations occurred during the event and none were required. All safety related buses remained energized from normal offsite power during and following the reactor trip.

A solenoid coil failure on instrument air containment isolation valve (3JIAAUV0002) caused a loss of IA to the containment building. Consequently, the RCP seal bleed off isolation valve to the VCT closed which redirected RCP seal bleed off to the RDT and led plant operators to the decision to manually trip the reactor. The failed solenoid valve coil was replaced prior to restarting Unit 3 on December 5, 2009.

Palo Verde Nuclear Generating Station reported a manual reactor trip of unit 2 in LER 529-2003-001-00 where instrument air was lost. The failure mechanism of the previous event was not similar to this event, and as such, the corrective actions for that event would not have prevented this event.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

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

1. REPORTING REQUIREMENT(S):

This LER is being submitted pursuant to 10 CFR 50.73 (a)(2)(iv)(A) to report a manual actuation of the reactor protection system (RPS). This event was reported to the NRC on the Emergency Notification System (ENS) on December 3, 2009, at 07:14. (ENS 45537)

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

The reactor protection system (RPS) (EIS: JC) consists of sensors, calculators, logic, and other equipment necessary to monitor selected nuclear steam supply system (NSSS) conditions and to effect reliable and rapid reactor shutdown (reactor trip). The system's functions are to protect the core specified acceptable fuel design limits and reactor coolant system (RCS) (EIS: AB) pressure boundary for incidents of moderate frequency, and to provide assistance in limiting conditions for certain infrequent events and limiting faults. A manual reactor trip is also provided as part of the RPS to permit the operator to trip the reactor.

The instrument air system (IA) (EIS: LD) provides a continuous supply of compressed, oil free, filtered, dry air for the operation of pneumatic instrumentation and pneumatic actuators.

IA is provided to the containment (EIS: NH) building through a single two inch instrument air line. This line includes a containment isolation check valve, which is located inside containment, and a normally open solenoid operated containment isolation valve (3JIAAUV0002) outside of the containment. Power to the solenoid operated valve is from Class 1E 125 VDC. The solenoid operated valve is normally energized and open. It fails closed on a loss of power and will automatically close on a containment spray actuation signal (CSAS). Manual operation and indication of the valve position is located in the control room.

Valve 3JIAAUV0002 is manufactured by the Target Rock Corporation. When de-energized, the spring force maintains the disc in the closed position. The valve uses differential pressure acting on the disc to exert a force in the same direction as a spring and therefore

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sealing the disc against its seat. When the solenoid coil is energized, the magnetic force acting on the solenoid plunger lifts the plunger, stem, and disc against the combined spring and pressure force, opening the valve.

Major components affecting plant operation with the closure of 3JIAAUV0002 while at power are:

- RCP seal bleed-off isolation valve to the VCT closes, redirecting RCP seal bleed-off from the VCT to the RDT.
- RCP seal bleed-off isolation valve to the RDT fails open to allow RCP seal bleed-off to be directed to the RDT through the RCP seal bleed-off safety relief valve.
- RCP seal injection flow control valves fail open.
- RDT outlet containment isolation valve closes removing the operators' ability to pump the RDT.
- Letdown flow to the regenerative heat exchanger isolation valves close isolating letdown.
- Steam generator (SG) #1 blowdown containment isolation valve closes stopping SG blowdown.
- SG #2 blowdown containment isolation valve closes stopping SG blowdown.
- Pressurizer main spray control valves close using auxiliary spray to control reactor coolant system (RCS) pressure.

3. INITIAL PLANT CONDITIONS:

Palo Verde Unit 3 was in Operating Mode 1 (Power Operations) at approximately 100 percent thermal power at the initiation of this event. There were no other major structures, systems, or components that were inoperable at the start of the event that contributed to the event.

4. EVENT DESCRIPTION:

On December 3, 2009, at 03:19, Unit 3 operators received an alarm on PKA-M41, Class 1E 125 VDC bus. The alarm cleared at 03:29 after an area operator reset the ground device. At 03:40, control room operators received multiple RCP seal bleed-off alarms and noted the

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RCP seal bleed-off isolation valve to VCT was in an intermediate position and then went fully closed. Operators recognized that the reactor drain tank level and pressure were rising due to RCP seal bleed-off flow being directed to the RDT through a safety relief valve and entered the abnormal operating procedures for the plant condition. At 03:54, the crew attempted to align the RDT containment isolation valve to pump the RDT down but the valve would not open. At 04:05, control room operators noted the instrument air containment isolation valve position indication was no longer lit and the steam generator containment blowdown isolation valves were closed, leading operators to enter 40AO-9ZZ06, Loss of Instrument Air which directs operators to isolate the letdown system and enter 40AO-9ZZ05, Loss of Letdown.

At approximately 04:30 the Shift Manager (SM) and Control Room Supervisor (CRS) evaluated tripping the reactor to prevent overflow of the RDT and/or a breach of the RDT through its rupture disc. The CRS briefed the crew on tripping the reactor, tripping all RCPs, isolating seal bleed-off and completing standard post trip actions (SPTAs). Operators tripped the reactor at 04:31, secured all RCPs and isolated seal bleed-off at 04:32. This was necessary as seal bleed-off can only be isolated with the RCPs secured. At approximately 04:41 the crew completed the SPTAs and entered 40EP-9EO07, Loss of Offsite Power/Loss of forced Circulation.

Forced circulation was restored at 10:58 when a temporary modification was installed which aligned nitrogen to the IA system and RCP 1A was started.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

The instrument air system is not required to achieve a safe reactor shutdown or to mitigate the consequences of an accident. Pneumatically operated valves that have a safety function and may be required to operate to ensure safe shutdown of the plant following an accident or to mitigate the consequences of an accident, use a safety related check valve to isolate their safety related pneumatic backup supply from the non-safety related instrument air system. Other pneumatically operated valves that have a safety function are designed to fail to a safe position upon loss of instrument air and do not require a continuous air supply under emergency or abnormal conditions. This event resulted in a loss of forced circulation and natural circulation was used to control heat removal following the trip. Operators verified all

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safety function status checks were satisfactory after the trip per 4OEP-9E07, Loss of Offsite Power/Loss of Forced Circulation, which includes heat removal.

The RCP seals were challenged prior to the trip by redirecting RCP seal bleed-off to the RDT, and post trip when RCP seal bleed-off was isolated after the RCPs were secured. Engineering evaluated the RCP seals and concluded that no RCP seal operating parameter nor vendor criteria were exceeded. The shaft seals for all four RCPs were determined to have been within their design envelope during the transient. The evaluation also concluded that no further action or corrective maintenance was required prior to returning the seals to operation.

The event did not result in a transient more severe than those previously analyzed in the PVNGS UFSAR, Chapter 15. The reactor trip was not automatically initiated as a result of any of the categories defined in UFSAR Section 15.0.1.2. The Specified Acceptable Fuel Design Limits and reactor coolant system pressure limit were not exceeded. Equipment and systems assumed in UFSAR Chapter 15 were functional and performed as required. No automatic engineered safety feature (ESF) actuations occurred during the event; and, all safety related buses remained energized from normal offsite power during and following the reactor trip.

There were no actual safety consequences as a result of this condition. The condition would not have prevented the fulfillment of the 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 this event was a failure of a coil in solenoid valve 3JIAAUV0002 which isolated instrument air to the containment building. The loss of instrument air to the containment building caused the RCP seal bleed off isolation valve to the VCT to close and led plant operators to the decision to manually trip the reactor, secure all RCPs and secure RCP seal bleed-off.

In addition to the coil failure, a weakness was identified with procedures 40AL-9RK3A, Panel B03A Alarm Response and 40AO-9ZZ06, Loss of Instrument Air, which did not provide

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adequate guidance to control room operators to allow for an earlier diagnosis of a loss of instrument air to the containment building.

7. CORRECTIVE ACTIONS:

Immediately following the event, the coil in the failed solenoid valve was replaced. An extent of condition review was performed of solenoid valves that were from the same lot number as the failed solenoid valve. Three valves were found installed in the power plant with the same lot number; but, those valves are normally de-energized and closed and are, therefore, not subjected to conditions similar to the failed coil. The damaged coil was sent to an offsite laboratory for further evaluation.

The following additional corrective actions were or will be implemented for all three units:

- Procedure 40AO-9ZZ06, Loss of Instrument Air, was revised providing instructions to plant operators on required actions when instrument air is lost to the containment building.
- Procedure 40AL-9RK3A will be revised to provide the operator additional information to aid in diagnosis of a loss of instrument air to the containment building in a timely manner.
- Licensed Operator Training and Simulator Training will revise lesson plans to provide additional training on a loss of instrument air to the containment building event.

8. PREVIOUS SIMILAR EVENTS:

Palo Verde Nuclear Generating Station reported a manual reactor trip of unit 2 in LER 529-2003-001-00 when a pressurizer spray valve positioner failed causing the maximum amount of air through the positioner. This resulted in a pressure drop in the instrument air system which affected components similar to this event. However, the cause of the previous event was not similar to this event. As such, the corrective actions for that event would not have prevented this event.