10 CFR 50.73

A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear Generating Station

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102-05785-DCM/REB
December 21, 2007

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 2007-006-00

Attached, please find Licensee Event Report (LER) 50-528/2007-006-00 which reports the completion of a shutdown required by Technical Specifications when Unit 1 entered Limiting Condition for Operation 3.7.5, Condition C for the Auxiliary Feedwater System.

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 E. Buzard, Section Leader, Regulatory Affairs, at (623) 393-5317.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

D. C. Mims

DCM/REB/gat

Attachment

cc:	E. E. Collins Jr.	NRC Region IV Regional Administrator
	M. T. Markley	NRC NRR Project Manager - (send electronic and paper)
	G. G. Warnick	NRC Senior Resident Inspector for PVNGS

IE22
NRR

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 06/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 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.

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Palo Verde Nuclear Generating Station (PVNGS) Unit 1	05000528	1 OF 6

4. TITLE
Required Shutdown due to Inoperable Steam Admission Bypass Supply Valve to Auxiliary Feedwater Pump

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
									None	
10	22	2007	2007	- 006 -	00	12	21	2007	FACILITY NAME: None	DOCKET NUMBER

9. OPERATING MODE: 1

10. POWER LEVEL: 100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☒ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Ray E. Buzard, Section Leader, Regulatory Affairs - Compliance	(623) 393-5317

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	BA	FSV	T020	Y					

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)*	☒ NO				

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

On October 15, 2007, while performing testing per procedure 73ST-9AF02, "AFA-P01 RECIRC FLOW-INSERVICE TEST," an Auxiliary Feedwater pump turbine steam admission bypass valve, SGA-UV-138A failed to close. The valve was declared inoperable, quarantined, and a troubleshooting game plan was developed and implemented. Troubleshooting and corrective maintenance efforts were unsuccessful in restoring the valve to an operable status within the Technical Specification (TS) required action time of 7 days; therefore a reactor shutdown was initiated at 03:11 hours and completed at 05:04 hours (upon entry to Operating Mode 3), on October 22, 2007 to comply with TS Limiting Condition for Operation (LCO) 3.7.5, Condition C.

The direct cause of the failure of SGA-UV-138A was the accumulation of iron oxide on the internal plunger assembly, causing excessive frictional forces between the plunger and the interior surfaces of the bonnet assembly. The root cause of the resultant reactor shutdown was ineffective implementation of the station event response and troubleshooting processes. Subsequent to the shutdown, the valve body and internals were replaced for valve SGA-UV-138A, the improper line slope upstream of the valve was corrected, and the valve was successfully retested utilizing procedure 73ST-9AF02.

There has been one previous LER submitted in the past 4 years reporting the failure to complete troubleshooting and repair of a similar valve due to similar causes, resulting in a unit shutdown required by TS.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station Unit 1	05000528	2007 --	006 --	00	2 OF 6

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

Note: All times listed in this event report are approximate and Mountain Standard Time (MST) unless otherwise indicated.

1. REPORTING REQUIREMENT(S):

This LER (50-528/2007-006-00) is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(A) to report the completion of a shutdown required by Technical Specifications (TS) Limiting Condition for Operation (LCO) 3.7.5, Condition C. Specifically, on October 22, 2007, at approximately 03:11 hours Palo Verde Nuclear Generating Station (PVNGS) Unit 1 control room operators (licensed) initiated a normal reactor shutdown due to an inoperable steam supply for the essential steam driven Auxiliary Feedwater (AF) pump turbine. The reactor shutdown was completed at 05:04 hours on October 22 when Mode 3, Hot Standby, was entered. The resident inspector was notified of the event, and at 09:27 hours an Event Notification System (ENS) call was made to report the event (ENS #43736).

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

System Description:
The AF system (EIIS Code: BA) provides an independent means of supplying feedwater to the steam generators (S/Gs) during normal shutdown, startup, and emergency or accident conditions. Additionally, the AF system functions to maintain water inventory for reactor decay heat removal during those phases of plant operation when the Main Feedwater (FW) system (EIIS Code: SJ) is unavailable.

The AF system is comprised of two separate, yet similar systems: essential and non-essential. The essential system is designed to withstand, and remain operable during and after, a safe shutdown earthquake (SSE), and is powered from the class 1E electrical distribution system. It consists of one motor driven pump (AFB-P01), one turbine driven pump (AFA-P01), and their associated valves, controls, and instrumentation. The motor driven pump (AFB-P01) was unaffected by the condition identified in this LER. The non-essential system is composed of a motor driven pump (AFN-P01), which is class 1E powered, but portions of its associated valves, controls, and instrumentation are powered from the non-class 1E electrical distribution system, since this system is not designed for seismic considerations. The non-essential motor driven pump (AFN-P01) was also unaffected by the condition identified in this LER.

Valve Description:
The AF pump turbine steam admission bypass valve, SGA-UV-138A, is a bolted bonnet, stainless steel 125Vdc, single pilot assisted solenoid operated valve (SOV) Model 98F-001 manufactured by the Target Rock Corporation. It is a normally closed valve (fails closed on loss of power) and is required to open upon receipt of an Auxiliary Feedwater Actuation

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

Signal (AFAS). This bypass valve provides the initial motive force in order to get the turbine up to approximately 900 rpm and stabilize the lubrication/hydraulic control subsystems prior to the six inch main steam admission valve, SGA-UV-138, opening. The system has a redundant steam supply to the turbine consisting of a bypass valve and main steam admission valve (SGA-UV-134A and 134). The AF pump turbine steam admission bypass valves also function as Containment Isolation Valves (CIV). Operation of these valves is tested, including the position indication, in accordance with in-service testing program requirements.

3. INITIAL PLANT CONDITIONS:

Palo Verde Unit 1 was in Operating Mode 1 (Power Operations), at approximately 100 percent power at the time of this event. Troubleshooting was being performed on SGA-UV-138A to address a failure to close condition. The continued inoperability of SGA-UV-138A resulted in the TS required shutdown. No additional equipment or components were inoperable at the time of the event that contributed to this condition.

4. EVENT DESCRIPTION:

On September 17, 2007, while performing testing per procedure 73ST-9AF02, "AFA-P01 RECIRC FLOW-INSERVICE TEST," SGA-UV-138A failed to open. A troubleshooting plan was developed and the valve was disassembled and the direct cause of the failure was established through visual inspection and chemical analysis. After disassembling the valve, it was found that the upper plunger assembly was bound inside the bonnet assembly. Force was required to remove the internal assembly and inspection revealed the presence of a large quantity of foreign material preventing free motion of the plunger. The foreign material and the plunger surface were examined. The foreign material was determined to be primarily iron oxides (magnetite and hematite) although traces of chromium, nickel, manganese and other materials were detected. The valve internal wear was not significant and there was no sign of the valve material exhibiting internal corrosion. The valve internals are comprised of materials that are resistant to corrosion. The internals were replaced and the valve was tested, inspected again, and retested satisfactorily and returned to operable status. Valve testing frequency was increased to monthly (from quarterly) to monitor valve operation.

On October 15, 2007, while performing increased frequency testing per procedure 73ST-9AF02, "AFA-P01 RECIRC FLOW-INSERVICE TEST," SGA-UV-138A failed to close in the tested configuration upon receipt of a signal from the handswitch; the valve did open as required earlier in the test. The valve was declared inoperable, quarantined, and a troubleshooting plan was developed and implemented. The valve internals were removed and inspected and an iron oxide coating was observed on the plunger to a lesser degree than that observed following the September 17 event. A sample of the iron oxide coating was analyzed and determined to be of the same

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

constituency as the sample analyzed following the September 17, 2007 event. Troubleshooting was commenced and enacted over a 6-day period, during which a variety of potential causes and issues were investigated. Potential corrective maintenance success paths were established as potential causal factors were identified. It was not until the 6th day of troubleshooting that station personnel determined that the slope of the steam line upstream of the valve was not in accordance with design to allow condensation to drain away from the valve. By that time, the corrective actions to properly slope the steam line could not be completed to restore the valve to an operable status within the remaining time of the TS required action. As a result, operations personnel commenced a reactor shutdown which was completed on October 22, 2007 to comply with TS LCO 3.7.5, Condition C.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

There was no actual impact to the health and safety of the public that occurred during the time period when SGA-UV-138A was inoperable. SGA-UV-138A did open upon receipt of the open signal from the handswitch during the test and, as such, the function of supplying the motive force to start the AF pump turbine was not compromised. Later in the performance of the same procedure, SGA-UV-138A failed to close upon receipt of the closed signal from the handswitch, therefore its containment isolation function was compromised. The loss of the containment isolation function for SGA-UV-138A (1 inch valve) is within the bounding analysis for containment isolation, which is an Atmospheric Dump Valve (12 inch valve) stuck open.

The Unit was shut down in accordance with the TS when repairs and testing for valve SGA-UV-138A were not completed within the 7 days permitted by LCO 3.7.5, Condition A.

The event did not result in any challenges to the fission product barriers or result in the release of radioactive materials. Therefore, there were no adverse safety consequences or implications as a result of this event and the event did not adversely affect the safe operation of the plant or health and safety of the public.

The event did not result in a transient more severe than those analyzed in the updated Final Safety Evaluation Report Chapters 6 and 15. The event did not have any nuclear safety consequences or personnel safety impact.

The condition would not have prevented the fulfillment of any safety function and did not result in a safety system functional failure as defined by 10 CFR 50.73(a)(2)(v). The train 'B' and 'N' Auxiliary Feed pumps remained operable and available throughout the 7 day LCO time.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station Unit 1	05000528	2007 --	006 --	00	5 OF 6

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

6. CAUSE OF THE EVENT:

The direct cause of the failure of SGA-UV-138A was the accumulation of iron oxide on the internal plunger assembly, causing excessive frictional forces between the plunger and the interior surfaces of the bonnet assembly. The valve was subject to the accumulation and migration of iron oxide corrosion products from the Main Steam System (EIIS Code: SB) because of the combination of an improper steam supply line slope upstream of the valve and no (main or pilot) seat leakage through the valve. As a result of the improper slope, condensate and iron oxide corrosion products present in the Steam Generating System were prevented from draining towards the six-inch header and the downstream steam trap SGN-M24, and instead accumulated in the one-inch line immediately upstream of SGA-UV-138A. The iron oxide corrosion products accumulating in the valve body upstream side were transported into the bonnet region via a mechanism of continuous condensation of the steam vapor filling the bonnet, draining and replenishment through a 0.046 inch equalizing port in the side of the valve plug.

The root cause of the shutdown was ineffective implementation of the station event response and troubleshooting processes. Following a similar TS required shutdown of Unit 2 in 2006 (see Section 8 below), Policy Guide (PG) 1502-01, Site Duty Manager and Management Issues Response Team (IRT) Implementation, was developed and issued for use on July 13, 2007. Following this event on October 15, PG-1502-01 was implemented in conjunction with the Systematic Troubleshooting procedure, 01DP-9ZZ01. Initially, troubleshooting efforts were focused on repair and recovery, and a success path was identified that restored the function of the valve. Upon further review, the cause and corrective actions identified were determined to be inadequate to prove the function of the valve would not be compromised again from the same failure mechanism. Troubleshooting efforts were broadened to consider original installation of the system, and resultantly identified that the slope of the steam line was not in accordance with the original design. However, by that time, the corrective actions to properly slope the steam line could not be completed to restore the valve to an operable status within the remaining time of the TS required action.

7. CORRECTIVE ACTIONS:

The valve body and internals were replaced for valve SGA-UV-138A and the valve was successfully retested utilizing procedure 73ST-9AF02.

The AF steam admission bypass valves on all three units at PVNGS were inspected to determine if the line slope was in conformance with the original design. The slope of the lines for SGA-UV-138A and SGA-UV-134A were found to be in conformance with original design on Unit 2, but did not conform to the original design for the lines on Units 1 and 3. The slopes of the lines for Unit 1 were corrected by maintenance personnel

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station Unit 1	05000528	2007 --	006 --	00	6 OF 6

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

prior to restart of the unit. PVNGS Unit 3 is currently shutdown for its 13th refueling outage, and the slope of the affected lines will be corrected before restart of Unit 3.

PG-1502-01 will be benchmarked with stations and/or industries that have been recognized as having strengths or best practices. Results from this benchmarking will be incorporated into a change management plan for the site organization IRT.

A problem solving and decision making model will be incorporated into the troubleshooting procedure, 01DP-9ZZ01. Training on the revised troubleshooting procedure will be developed and implemented for site personnel who will utilize the troubleshooting procedure.

8. PREVIOUS SIMILAR EVENTS:

LER 50-529/2006-001-01 reported a shutdown of Unit 2 required by TS based on the failure to complete repairs on a similar AF pump turbine steam admission bypass valve, due to a different direct cause, but a similar root cause. As a result of that event, corrective actions were identified to prevent recurrence, including a formalization of the IRT with PG-1502-01 for entry into time dependent TS LCOs. However, implementation of the formalized response process during this event was inadequate to preclude this shutdown.