APS

A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear
Generating Station

10CFR50.73

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192-01154-DMS/RAS
September 28, 2004

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket No. STN 50-528, 50-529, 50-530
License No. NPF-41, NPF 51, NPF 74
Licensee Event Report 2004-009-00

Attached please find Licensee Event Report (LER) 50-528/2004-009-00 prepared and submitted pursuant to 10 CFR 50.73. This LER reports a condition in Units 1, 2, and 3 where voids in Emergency Core Cooling System containment sump piping may have prevented the fulfillment of the system safety function to remove residual heat and mitigate the consequences of a Loss of Coolant Accident.

In accordance with 10 CFR 50.4, a copy of this LER is being forwarded to the NRC Region IV Office and the Senior Resident Inspector. If you have questions regarding this submittal, please contact Daniel G. Marks, Section Leader, Regulatory Affairs, at (623) 393-6492.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

Terry L. Radtke
for DMS.

DMS/ras

IE22

Attachment

cc: B. S. Mallet, Region IV Administrator (all w/attachment)
N. L. Salgado, Sr. Resident Inspector
M. B. Fields, PVNGS Project Manager

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 5

4. TITLE

Emergency Core Cooling System Piping Voids May Have Prevented Fulfillment of Safety Function

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
									PVNGS Unit 2	05000529
07	30	2004	2004	- 009 -	00	09	28	2004	PVNGS Unit 3	05000530

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)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☐ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☒ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☒ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Daniel G. Marks, Section Leader, Regulatory Affairs	623-393-6492

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

14. SUPPLEMENTAL REPORT EXPECTED

☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR
12	30	2004

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

On July 30, 2004, Units 1, 2 and 3 were operating at approximately 100 percent power, when Control Room personnel were informed that a voided section of Emergency Core Cooling System (ECCS) suction piping might prevent the fulfillment of the safety function to remove residual heat and mitigate the consequences of a Loss of Coolant Accident. The voided ECCS piping sections could cause cavitation and/or air binding of the High Pressure Safety Injection and Containment Spray pumps.

Initial compensatory measures were implemented for control room operators to open the inboard containment sump isolation valves allowing 90 percent of the voided piping to fill during accident conditions. Engineering assessed the condition and concluded that initial compensatory measures would address the void in the ECCS suction piping such that the system with would perform its intended safety function. Subsequent measures were taken to return the containment sumps to their design configuration by filling the piping with borated water. These actions were completed in all three units on August 4, 2004. No similar events have been reported in the past three years.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station Unit 1	05000528	2004	-- 009	-- 00	2 OF 5

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

1. REPORTING REQUIREMENT(S):

This event is being reported pursuant to 10 CFR 50.73(a)(2)(v)(B) and (D) due to an air void in Emergency Core Cooling System suction piping from the containment sump that may have prevented the fulfillment of the system safety function to remove residual heat and mitigate the consequences of a Loss of Coolant Accident (LOCA). This condition existed in Units 1, 2, and 3. Initial event notification was made to the NRC headquarters operation officer on July 31, 2004 (reference ENS # 40913).

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

Emergency Core Cooling System (ECCS) [EIIS: BQ]

The emergency core cooling system (ECCS) is comprised of three functional systems: emergency core cooling (safety injection (SI)), residual heat removal (shutdown cooling, (SDC)) and containment heat removal (containment spray (CS)). During an event requiring ECCS actuation, a flow path is established to supply borated water from the refueling water tank (RWT) to the reactor coolant system (RCS) via the SI pumps and their respective supply headers.

The RWT supplies two ECCS trains by separate, redundant supply headers. Each header also supplies one train of the Containment Spray System. A motor operated isolation valve is provided in each header to allow the operator to isolate the RWT from the ECCS after the pump suction has been automatically transferred to the containment sump following depletion of the RWT during a loss of coolant accident (LOCA). The signal that places the sumps in service is a recirculation actuation signal (RAS) and is generated by a low level in the RWT. The RAS, in addition to opening the sump valves, also trips the Low Pressure Safety Injection pumps to ensure adequate net positive suction head (NPSH) to the HPSI and CS pumps.

3. INITIAL PLANT CONDITIONS:

On July 30, 2004, Units 1, 2 and 3 were in Mode 1 (POWER OPERATION), operating at approximately 100 percent power. There were no major structures, systems, or components that were inoperable upon identification of the condition that contributed to

the event. There were no failures of components with multiple functions involved in this event.

4. CHRONOLOGY OF RELEVANT EVENTS:

On July 30, 2004, at approximately 0700 Mountain Standard Time (MST), Units 1, 2 and 3 were operating at approximately 100 percent power, when engineering personnel [utility, non-licensed] informed control room personnel [licensed] that a concern had developed regarding a voided section of ECCS suction piping and that the condition was being evaluated for its impact on the fulfillment of the safety function to remove residual heat and mitigate the consequences of a LOCA. Based on the information provided by engineering, control room personnel entered the operability determination process.

Specifically, piping sections between the closed containment sump isolation motor operated valves (inside containment) and the associated train sump recirculation check valves (downstream of outboard containment sump isolation motor operated valves) were void of water. Upon identification, operations and engineering personnel were concerned that during a RAS, the trapped volume of air between the isolation valves and the downstream check valve could potentially enter the operating HPSI and CS pumps causing cavitation, air binding of the pumps, or possibly, a hydraulic transient. The volume of air in the containment sump piping was calculated to be approximately 100 cubic feet per train, with 90 cubic feet of the volume existing between the inboard and outboard containment sump isolation valves. The remaining 10 cubic feet existed between the outboard containment isolation valve and the downstream check valve.

By July 30, 2004 at approximately 1750 MST, operations and engineering personnel had concluded the system would be able to perform its safety function, provided that the inboard containment sump isolation valves were opened upon a CS actuation (allowing the 90 cubic feet section of the sump piping between the inboard and outboard isolation valves to fill during post-accident conditions) and an engineering calculation that the remaining 10 cubic feet void would not result in an unacceptable void fraction forming in the HPSI / CS pump suction piping and pump.

Control room personnel were briefed on the need to perform the manual operator action to open the inboard ECCS sump isolation valves upon a CS actuation, in accordance

with the Functional Recovery and LOCA procedures which were revised to implement the described compensatory measures.

Subsequent evaluation determined the ECCS pump suction lines and RAS sumps could be filled with borated water to restore the design configuration and the applicable operating procedure was revised to fill the lines.

By August 4, 2004, all three unit ECCS sumps and suction lines had been filled in accordance with the revised operating procedure. The Functional Recovery and LOCA procedures were then revised to remove the initial compensatory measure of manually opening the inboard containment sump isolation valves upon a CS actuation.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

This condition did not result in any challenges to the fission product barriers or result in any offsite releases and therefore, there were no actual adverse safety consequences as a result of this condition. However, APS is currently investigating the condition to determine the potential consequences of the condition and will report the results of the investigation in a supplement to this LER.

6. CAUSE OF THE EVENT:

APS is currently investigating the condition to determine the potential consequences of the condition and will report the results of the investigation in a supplement to this LER.

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event.

7. TRANSPORTABILITY:

This condition is common to Units 1, 2 and 3. APS is currently investigating the condition and will determine the extent of the condition and will report the results of the investigation in a supplement to this LER.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station Unit 1	05000528	2004	-- 009	-- 00	5 OF 5

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

8. CORRECTIVE ACTIONS:

Prompt actions to correct the condition included revising operating procedures and filling the voided lines with borated water to return the plant to the design configuration.

A significant event investigation was initiated to evaluate:

Adequacy of as-found condition (testing and analysis)

Root Cause and Extent of Condition

Adequacy of station response (operability determination, corrective action, 50.59)

Review of processes against lessons learned (50.59, corrective action process)

Human Performance Evaluation

APS has contracted with a testing organization to perform testing of the performance of these systems when subjected to varying degrees of fluid void fraction. The test will identify possible performance degradation as a result of the voided containment sump condition and will identify any permanent performance degradation that could have occurred.

The results of these testing and investigative activities will be reported in a supplement to this LER.

9. PREVIOUS SIMILAR EVENTS:

There have been no previous similar events in the past three years that had a similar failure mechanism or that should have been prevented by previously implemented corrective actions.