A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear Generating Station

Dwight C. Mims
Senior Vice President
Nuclear Regulatory and Oversight

Tel. 623-393-5403
Fax 623-393-6077

Mail Station 7605
P. O. Box 52034
Phoenix, Arizona 85072-2034

102-06598-DCM/TNW/MAM/DCE
October 23, 2012

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-79
Licensee Event Report 2012-001-01

Enclosed, please find Licensee Event Report (LER) supplement 50-530/2012-001-01 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 involving a manual actuation of the Unit 3 reactor protection system during post-refueling low power physics testing.

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. If you have questions regarding this submittal, please contact Mark McGhee, Operations Support Manager, Regulatory Affairs, at (623) 393-4972.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

FOR D.C. MIMS

DCM/TNW/MAM/DCE/hsc

Enclosure

cc: E. E. Collins Jr. NRC Region IV Regional Administrator
L. K. Gibson NRC NRR Project Manager for PVNGS (electronic)
M. A. Brown NRC Senior Resident Inspector for PVNGS

IE22
NRR

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

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 Section (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.

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 3	05000530	1 OF 5

4. TITLE

Unit 3 Manual Reactor Trip During Low Power Physics Testing

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
04	15	2012	2012	- 001 -	01	10	23	2012	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE

2

10. POWER LEVEL

0

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)
Mark McGhee, Operations Support Manager, 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

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 April 15, 2012, at approximately 12:16 Mountain Standard Time, Unit 3 was manually tripped during low power physics testing (LPPT) following completion of its 16th refueling outage. An automatic control element drive mechanism timer module (ACTM) was installed on each control element drive mechanism (CEDM) during the refueling outage to minimize the occurrence of slipped or dropped control element assemblies (CEAs) resulting from CEDM or control system (CEDMCS) abnormalities. Regulating CEA group 1 was being inserted during a reactor coolant system (RCS) boron dilution test directed by the LPPT procedure. During the insertion, the ACTM for CEA 57 stopped movement of the CEA and actuated related alarms. Control room staff stopped insertion of regulating CEA group 1 and RCS dilution. Power increased, approaching the LPPT procedural limit of 0.5% power because of the residual RCS dilution effect. The control room staff manually tripped the reactor to comply with the procedural power limit. The root cause of the manual reactor trip was the LPPT procedure did not provide contingency direction to insert other CEA groups to compensate for the RCS dilution. To prevent recurrence, the station will incorporate appropriate contingencies in the LPPT procedure to stabilize reactor power during reactivity manipulations if abnormal conditions with CEAs are encountered.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	2012	-- 001	-- 01	2 OF 5

NARRATIVE

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)(EIIS: JC) that occurred while the reactor was critical.

This event was reported to the Nuclear Regulatory Commission (NRC) on April 15, 2012, via the event notification system report number 47837.

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

The control element drive mechanism control system (CEDMCS) (EIIS: AA) provides control signals and motive power to the coils of the magnetic jacks in the 89 control element drive mechanisms (CEDMs) (EIIS: AA) which move, hold, and release the control element assemblies (CEAs) (EIIS: AA). The CEAs absorb neutrons to control reactivity.

Two motor/generator sets are connected in parallel to supply 240 VAC, 3 phase power through the reactor trip switchgear (RTSG) (EIIS: AA). The output from the RTSG is directed through power switch assemblies. The power switch assemblies contain silicon controlled rectifiers (SCRs) which convert the 3 phase, AC input voltage to a stepped DC output voltage. The conversion is controlled by electronic circuits in the power switch assembly and in the CEDMCS subgroup logic housing. These control circuits determine the sequence to supply power to the CEDM coils.

The control circuits for each CEA were modified during the Unit 3 refueling outage which commenced in March, 2012. Part of the modification included replacement of CEA timer cards with automatic CEDM timer modules (ACTMs). The ACTM controls the sequencing of the coil voltages to the CEDM and monitors for CEDMCS abnormalities such as inadequate holding currents and high coil currents. The ACTM initiates rapid automatic action to hold the CEA in position, and generates alarms both locally and in the Control Room in response to slight variations from expected values for monitored conditions. These automatic actions minimize the occurrence of dropped or slipped CEAs.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	2012	-- 001	-- 01	3 OF 5

NARRATIVE

The reactor protection system (RPS) (EIIS: JC) provides a rapid and reliable shutdown of the reactor to protect the core and the reactor coolant system (RCS) (EIIS: AB) pressure boundary from potentially hazardous operating conditions. Shutdown is accomplished by either manual or automatic generation of reactor trip signals. The trip signals open the RTSG breakers, which de-energize the CEDM coils and allow all CEAs to drop into the core by the force of gravity.

Low power physics testing (LPPT) is conducted during Mode 2 following refueling outages to verify reactor core operating characteristics are consistent with design predictions and to provide assurance the core can be operated as designed.

3. INITIAL PLANT CONDITIONS:

On April 15, 2012, Palo Verde Unit 3 was in Mode 2 (Start-up). The reactor was critical and post-refueling low power physics testing was in progress. Reactor power was below the point-of-adding-heat (0.005 – 0.1% power) and the reactor coolant system (RCS) was at normal operating temperature and normal operating pressure. There were no other structures, systems, or components inoperable at the time of the event that contributed to the event.

4. EVENT DESCRIPTION:

During LPPT on April 15, at 11:25, a dilution of RCS boron concentration began at a rate of 80 gallons per minute in support of the testing. As directed by the LPPT procedure, regulating CEA group 3 was inserted to offset the dilution and keep reactor power level constant. Regulating CEA group 1 insertion commenced after regulating CEA group 3 had been inserted to the lower group stop position, approximately 5 inches withdrawn.

At 12:13, while inserting CEA regulating group 1, CEA 57 deviated from its sub-group when it stopped moving. The "CEA Group 1 Minor Deviation" alarm was received and CEA regulating group 1 insertion and the RCS dilution were stopped; however, the residual positive reactivity in the core resulted in a reactor power increase which approached the power limit (0.5%) set forth in the LPPT procedure. The LPPT procedure did not provide contingency direction to insert other CEA groups to compensate for the RCS dilution. In response, the reactor was

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	2012	-- 001	-- 01	4 OF 5

NARRATIVE

manually tripped at 12:16, at which time reactor power was 0.5% as indicated on log power channels.

Following the reactor trip, all CEAs fully inserted into the core. Plant systems operated as expected, and this event was diagnosed as an uncomplicated reactor trip. Safety related busses remained energized from offsite power during the event and the offsite power grid was stable. Unit 3 was stabilized in Mode 3 feeding Steam Generators with the non-essential auxiliary feedwater pump.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

This condition did not adversely affect plant safety or the health and safety of the public. This event did not result in a transient more severe than those already analyzed in the PVNGS Updated Final Safety Analysis Report Chapter 15. The condition did not cause a violation of safety limits or the specified acceptable fuel design limits. The condition did not result in any challenges to the RCS pressure boundary or other fission product barriers. The safety limits for departure from nucleate boiling ratio and fuel peak centerline temperature were not exceeded as a result of this event.

This event would not have prevented the fulfillment of a safety function to safely shutdown the reactor and did not result in a safety system functional failure as described by 10 CFR 50.73(a)(2)(v).

6. CAUSE OF THE EVENT:

The root cause of the manual reactor trip was the LPPT procedure did not provide contingency direction to insert other CEA groups to compensate for the RCS dilution.

A contributing cause was the ACTM modification impacts on the operation of CEDMCS were not identified during the design phase. Additionally, the process for addressing impacts of the modification did not identify the appropriate stakeholders that could have identified the needed procedure contingencies.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station (PVNGS) Unit 3	05000530	2012	-- 001	-- 01	5 OF 5

NARRATIVE

7. CORRECTIVE ACTIONS:

As an interim measure, the LPPT procedure was revised to provide contingency direction to insert regulating CEA group 5 in the event planned CEA insertion could not continue.

To prevent recurrence, the station will incorporate appropriate contingencies in the LPPT procedure to stabilize reactor power during reactivity manipulations if abnormal conditions with CEAs are encountered.

Changes to the design modification and project management processes will also be implemented to ensure necessary stakeholders participate in the design modification process. The changes are intended to ensure impacts of the modification are consistently addressed.

8. PREVIOUS SIMILAR EVENTS:

The station has not experienced prior manual trips related to the recently installed ACTM modification.

Installation of the ACTM modification was a corrective action related to events reported in LERs 50-528/2011-005-00 and 50-528/2011-004-00.