10 CFR 50.73

A subsidiary of Pinnacle West Capital Corporation

Palo Verde Nuclear Generating Station

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102-06536-DCM/RAB/TNW/MAM/DCE
June 21, 2012

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 2011-005-01

Enclosed please find Licensee Event Report (LER) supplement 50-528/2011-005-01 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 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,

D. C. Mims

DCM/TNW/DCE/hsc

Enclosure
cc: E. E. Collins Jr. NRC Region IV Regional Administrator
L. K. Gibson NRC NRR Project Manager for PVNGS (electronic / paper)
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 1	05000528	1 OF 5

4. TITLE

Unit 1 Manual Reactor Trip due to Slipped Control Element Assemblies

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
11	22	2011	2011	- 005 -	01	06	21	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 Department Leader, 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
X	JD	JS	E146	Y					

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 November 22, 2011, at approximately 1925 Mountain Standard Time, during the performance of post-refueling low power physics testing, the Unit 1 reactor was manually tripped as required by the control element assembly (CEA) malfunction abnormal operating procedure after a subgroup of four CEAs slipped greater than 6.6 inches. An intermittent failure of a power switch assembly (PSA) which provides electrical power to the control element drive mechanisms (CEDMs) resulted in the CEA slippage. After troubleshooting was completed, the power switch assembly was replaced. Retesting was completed on November 24, 2011.

The root cause was determined to be latent organizational weaknesses with the modification and corrective action processes that delayed installation of automatic CEDM timer modules (ACTMs) which would minimize the occurrence of dropped or slipped CEAs. The corrective action to prevent recurrence is to install the ACTM modification during subsequent refueling outages in each of the units. This modification was successfully installed in Unit 3 during the 16th refueling outage completed in April, 2012. LER 50-528/2011-004-00 reported a prior similar event.

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station (PVNGS) Unit 1	05000528	2011	-- 005	-- 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 November 22, 2011, via the event notification system (EN 47472).

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 reactor's 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 sequencing of voltage to each CEDM that powers the magnetic jacks to move or hold the CEAs is provided by a CEA timer card for each CEDM.

A modification to CEDMCS is in progress that will replace the CEA timer card for each CEDM with an automatic CEDM timer module (ACTM). This module 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. By holding an affected CEA in position, the automatic action of the ACTM allows troubleshooting and diagnosis at the earlier stages of CEDMCS performance problems and minimizes the occurrence of dropped or slipped CEAs.

The RPS 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

NARRATIVE

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.

The core protection calculator/control element assembly calculator (CPC/CEAC)(EIIS: JC) system monitors reactor core conditions to provide CEA withdrawal prohibit signals to the CEDMCS and provides an accurate, reliable means of initiating a reactor trip. The CPC/CEAC system is an integral part of the plant protection system in that it provides low departure from nucleate boiling ratio (Lo DNBR) and high local power density (Hi LPD) trip signals to the RPS. Trip signals are provided to the RPS whenever the calculated value of DNBR or Hi LPD exceeds the related setpoint during reactor operation.

Each CEAC receives reed switch position transmitter inputs for all CEAs. The CEACs compare the positions of all CEAs within each CEA subgroup and determine penalty factors based upon CEA deviations within a subgroup. The CPCs also compute penalties for CEA group out-of-sequence and subgroup deviation conditions.

Low power physics testing 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. The low power physics testing procedure provides direction to invoke the low power physics testing special test exceptions under Technical Specification (TS) 3.1.10 that suspends certain limiting conditions for operation (LCOs), including LCO 3.3.3 which normally requires two channels of CEACs to be OPERABLE and LCO 3.1.5, CEA Alignment. Both channels of CEACs are inoperable during low power physics testing. The CPCs will not generate reactor trips based on CEA alignment deviations while CEACs are inoperable.

3. INITIAL PLANT CONDITIONS:

On November 22, 2011, Palo Verde Unit 1 was in Mode 2 (Start-up), at less than 1 percent power and at normal operating temperature and normal operating pressure. The reactor was critical and post-refueling low power physics testing was in progress. CEACs were inoperable at the time of the event as directed by the low power physics testing procedure. There were no other structures, systems, or components inoperable at the time of the event that contributed to the event.

4. EVENT DESCRIPTION:

On November 22, 2011, at 1921, CEA regulating group (RG) 2 was being inserted into the reactor while performing post-refueling low power physics testing during the plant start-up following refueling outage 1R16. At that time, the control room staff noted that the four CEAs

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station (PVNGS) Unit 1	05000528	2011	-- 005	-- 01	4 OF 5

NARRATIVE

in RG 2, subgroup 17, slipped approximately 11 to14 inches below subgroup 18 CEAs, also in RG 2.

In response to the deviation between the RG 2 subgroups, the control room staff manually tripped the reactor as directed by the abnormal operating procedure, CEA Malfunctions, for CEA subgroup deviations greater than 6.6 inches. An automatic trip was not generated by the CPCs because CEACs were inoperable for performance of the testing.

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 event did not result in a transient more severe than those already analyzed in the PVNGS Updated Final Safety Analysis Report Chapter 15. The transient did not cause a violation of safety limits or the specified acceptable fuel design limits. Because the primary and secondary system pressures stayed below the respective safety valve opening setpoints, design pressures were not challenged.

There were no inoperable structures, systems, or components at the time of the event that contributed to this event. The event did not result in any challenges to the fission product barriers or result in the release of radioactive materials. There were no actual safety consequences as a result of this condition. The condition does not represent a reportable safety system functional failure under 10 CFR 50.73 (a)(2)(v).

6. CAUSE OF THE EVENT:

The direct cause of the slipped CEAs was an intermittent failure of a power switch assembly (Model System 80 manufactured by Electro-Mechanics, INC) which provides electrical power to the control element drive mechanisms.

The root cause was determined to be legacy latent organizational weaknesses that existed at the station that were identified and addressed in the station's response to the NRC Confirmatory Action Letter CAL 4-07-004A.

The weaknesses affected the modification and corrective action processes and contributed to cancellation of the modification to install the ACTMs in 1994. In response to continued CEDMCS equipment reliability challenges, the ACTM modification was re-

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
		YEAR	SEQUENTAL NUMBER	REVISION NUMBER	
Palo Verde Nuclear Generating Station (PVNGS) Unit 1	05000528	2011	-- 005	-- 01	5 OF 5

NARRATIVE

initiated in 2003 but active work was not commenced until 2009 as part of the equipment reliability improvement initiatives in response to CAL 4-07-004A.

7. CORRECTIVE ACTIONS:

After troubleshooting was completed, the power switch assembly was replaced. Retesting was completed on November 24, 2011. Unit 3 was subsequently restarted and entered Mode 1 on November 27, 2011.

The corrective action to prevent recurrence is to complete installation of the ACTM modification during the next refueling outage in each of the units. The ACTM modification was successfully installed in Unit 3 during the refueling outage completed in April, 2012.

The latent organizational weaknesses that cancelled and delayed installation of the ACTM modification prior to 2009 were addressed by corrective actions in key performance areas in response to CAL 4-07-004A. Those corrective actions substantially improved plant equipment performance with respect to resolution of long standing equipment problems, corrective action effectiveness, and decision making.

8. PREVIOUS SIMILAR EVENTS:

LER 50-528/2011-004-00 reported an automatic trip of the Unit 1 reactor that occurred on August 6, 2011, which resulted from a dropped CEA (37) caused by a loose terminal lug on the corresponding CEA power switch assembly. The corrective action is to install the ACTM modification during the refueling outage in the spring of 2013.