10 CFR 50.73

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102-06980-DCM/FJO
December 30, 2014

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

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 2**
Docket No. STN 50-529 / License No. NPF 51
Licensee Event Report 2014-002-00

Enclosed please find Licensee Event Report (LER) 50-529/2014-002-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports the completion of a plant shutdown required by plant Technical Specification Limiting Condition for Operation 3.1.5, Control Element Assembly (CEA) Alignment.

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.

Arizona Public Service Company makes no commitments in this letter. If you have questions regarding this submittal, please contact Mark McGhee, Department Leader Nuclear Regulatory Affairs, at (623) 393-4972.

Sincerely,

FOR DWIGHT C. MIMS

DCM/FJO/hsc

Enclosure

cc:

	M. L. Dapas	NRC Region IV Regional Administrator
	B. K. Singal	NRC NRR Project Manager
	M. M. Watford	NRC NRR Project Manager
	C. A. Peabody	NRC Senior Resident Inspector PVNGS

IE22
NRR

NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

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 and Information Collections Branch (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 Page 2 for required number of digits/characters for each block)

1. FACILITY NAME	2. DOCKET NUMBER	3. PAGE
Palo Verde Nuclear Generating Station (PVNGS) Unit 2	05000529	1 OF 5

4. TITLE

Technical Specification (TS) Required Plant Shutdown Due to a Dropped Control Element Assembly

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	6	2014	2014	- 002	- 00	12	30	2014	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
1	☐ 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)
10. POWER LEVEL	☐ 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)
100	☐ 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

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Mark McGhee, Department Leader Nuclear Regulatory Affairs	623-393-4972

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	JC	CL	C490	Y					

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☒ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☐ NO		2	26	2015

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

On November 6, 2014, at approximately 1116 Mountain Standard Time, Unit 2 was in Mode 1, 100 percent power, when control element assembly (CEA) 15 dropped fully into the core while the 88 other CEAs remained fully withdrawn. Operations entered Technical Specification (TS) Limiting Condition for Operation (LCO) 3.1.5, Condition A, for one CEA misaligned from its group which requires a power reduction and restoration of CEA alignment. An initial power reduction was performed in accordance with TSs and attempts to repair the problem were initiated. The CEA could not be aligned within the 2 hour TS time limit and TS LCO 3.1.5, Condition C was entered at 1316 which required entry into Mode 3 within 6 hours. The power reduction was continued and the reactor was manually shutdown at 1636 to comply with TSs.

The direct cause of the event was a failed upper gripper coil on the control element drive mechanism for CEA 15. The failed coil was replaced and Unit 2 was restarted and entered Mode 1 at 0332 on November 13, 2014. An event investigation is in progress and additional information will be provided in a supplement to this report.

In the previous 3 years, similar events related to malfunctions of control element drive mechanism control system equipment that resulted in a plant shutdown were reported in LERs 50-528/2011-004, 50-528/2011-005 and 50-530/2012-001.

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

1. REPORTING REQUIREMENT(S):

This Licensee Event Report is being submitted pursuant to 10 CFR 50.73 (a)(2)(i)(A) to report the completion of a plant shutdown required by plant Technical Specification (TS) Limiting Condition for Operation (LCO) 3.1.5, Control Element Assembly (CEA) Alignment, Condition C. The shutdown of Palo Verde Nuclear Generating Station (PVNGS) Unit 2 resulted when CEA 15 dropped fully into the core and could not be realigned with the other CEAs of its group within the time allowed by LCO 3.1.5, Condition A. The plant shutdown was completed within the time requirement of LCO 3.1.5, Condition C.

The initiation of the plant shutdown required by plant TSs was reported to the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 50.72 (b)(2)(i) on November 6, 2014, via the event notification system (EN 50600).

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

Each PVNGS reactor has 89 CEAs arranged in nine radially symmetric groups which include two shutdown groups, five regulating groups and two part strength groups. The shutdown and regulating CEAs provide the required reactivity worth for immediate reactor shutdown upon a reactor trip. The regulating CEAs also provide reactivity control during normal operation and transients. The part strength CEAs are used for control of axial power distribution and are not credited for shutting down the reactor. Full strength CEAs are installed in either 12-finger or 4-finger configurations. The dropped CEA 15 described in this report is a full strength 4-finger CEA in regulating group 5.

Each CEA is moved and held by its associated control element drive mechanism (CEDM) (EIIS: AA). The CEDM is an electromechanical device which uses induced magnetic fields, through lift and gripper electrical coils, to operate magnetic jacks to move, hold, and release the associated CEA. The CEDM coils are arranged in a "coil stack" in the CEDM housing installed on the reactor vessel head. Each CEDM is surrounded by a sheet metal cooling shroud producing an annulus through which air can flow. The air flow through the cooling shroud serves to remove heat from the CEDM.

Two motor generator sets are connected in parallel to a common bus. This common bus supplies 240 volt AC power through reactor trip switchgear (RTSG) (EIIS: AA) to the CEDMCS. The output from the RTSG is directed through 23 power switch assemblies. The

power switch assemblies contain silicon controlled rectifiers which convert the 3 phase AC input voltage to a stepped DC output voltage to the CEDM coils of all 89 CEAs. One power switch assembly provides power to operate the CEDM coils for four CEAS, with the exception of the power switch assembly for CEA 1 which powers only the coils for CEA 1. The operation of each CEDM coil is controlled by electronic logic circuits which determine the sequence to supply power to the coils. Under normal operating conditions, while a CEA is not in motion, the CEA is held by the upper gripper coil which is continuously energized at a low voltage level. The reactor protection system (RPS) (EIIS: JC) provides for rapid and reliable shutdown of the reactor to protect the core and the reactor coolant system pressure boundary from potentially hazardous operating conditions. Shutdown is accomplished by either manual or automatic generation of reactor trip signals which open the RTSG breakers and de-energize the CEDM coils, releasing the spring loaded magnetic jacks, allowing all CEAs to be inserted into the core by gravity.

3. INITIAL PLANT CONDITIONS:

On November 6, 2014, PVNGS Unit 2 was in Mode 1 (Power Operation), at 100 percent power, 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:

At 1116 on November 6, 2014, the Unit 2 control room received alarms and indications that CEA 15 of regulating group 5 had dropped from the fully withdrawn position to the fully inserted position. The 88 other CEAs were not affected and remained fully withdrawn. Operations personnel entered the CEDMCS malfunction abnormal operating procedure and entered the applicable Conditions for the following LCOs:

- 3.1.5 - Control Element Assembly (CEA) Alignment
- 3.1.7 - Regulating Control Element Assembly (CEA) Insertion Limits
- 3.2.1 - Linear Heat Rate (LHR)
- 3.2.3 - Azimuthal Power Tilt (Tq)
- 3.2.4 - Departure From Nucleate Boiling Ratio (DNBR)

TS LCO 3.1.5, Condition A, for one CEA misaligned from its group requires a plant power reduction and restoration of CEA alignment. The TS required power reduction was initiated at 1121 and completed at 1158. In parallel with the power reduction, plant personnel began efforts to diagnose and correct the CEDMCS malfunction.

Following initial troubleshooting and repair attempts it was concluded that CEA 15 could not be repaired and realigned with the other regulating group 5 CEAs within the 2 hour time limit

specified in TS LCO 3.1.5, Condition A. At 1316, TS LCO 3.1.5 Condition C was entered which requires entry into Mode 3 within 6 hours. Operations personnel continued the power reduction and performed a reactor shutdown in accordance with normal operating procedures by manually tripping the reactor at 1636 from 22 percent power. Following the plant shutdown, Operations personnel verified normal plant response and Unit 2 was stabilized in Mode 3 at normal operating temperature and pressure with all CEAs fully inserted and no actuations of plant engineered safety features systems. Additionally, all TS LCOs associated with the full insertion of CEA 15 were exited.

An investigation was initiated to determine and correct the cause of the dropped CEA. Troubleshooting activities performed in Mode 3 isolated the malfunction to the CEDM coil stack for CEA 15 on the reactor vessel head. A cooldown of the reactor coolant system was necessary to support the maintenance activities and Unit 2 entered Mode 5 at 1859 on November 7, 2014.

The faulty upper gripper CEDM coil on CEA 15 was replaced. Following completion of maintenance and retest activities, Unit 2 was restarted and entered Mode 1 at 0332 on November 13, 2014. An event investigation is in progress and the results will be provided in a supplement to this report.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

This event did not result in a potential transient more severe than those analyzed in the Updated Final Safety Analysis Report or result in the release of radioactive materials to the environment. There were no actual safety consequences as a result of this event and the event did not adversely affect the health and safety of the public.

The power reductions and subsequent plant shutdown performed for this event were conducted within the time limitations and power restrictions specified in the TSs, Core Operating Limits Report and abnormal operating procedures so that specified acceptable fuel design limits were not exceeded. The risk significance of this event was consistent with the probabilistic risk analysis for an uncomplicated reactor trip which has a conditional probability of core damage of 1.2E-7. This risk value is small in comparison to other postulated initiating events.

The condition would not have prevented the fulfillment of a safety function and the condition did not result in a safety system functional failure as defined by 10 CFR 50.73(a)(2)(v).

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NARRATIVE

6. CAUSE OF THE EVENT:

The direct cause of the event was a failed upper gripper coil on the CEDM for CEA 15 which resulted in unlatching and full insertion of the CEA.

An event investigation is in progress and additional information will be provided in a supplement to this report.

7. CORRECTIVE ACTIONS:

As an immediate corrective action, the failed upper gripper coil (Combustion Engineering, Model R5000) was replaced on November 8, 2014.

An event investigation is in progress and additional information will be provided in a supplement to this report.

8. PREVIOUS SIMILAR EVENTS:

In the previous three years, similar events related to malfunctions of CEDMCS equipment that resulted in a plant shutdown were reported in LERs 50-528/2011-004, 50-528/2011-005 and 50-530/2012-001. The corrective actions from these events would not have prevented this event.

LER 50-528/2011-004 reported an automatic trip of the RPS in response to a dropped CEA due to a loose terminal lug on the CEA power switch assembly.

LER 50-528/2011-005 reported a manual actuation of the RPS in response to a CEA subgroup that slipped during post-refueling low power physics testing due to an intermittent failure.

LER 50-530/2012-001 reported a manual actuation of the RPS in response to a deviation of CEA 57 when it stopped moving during low power physics testing.