



10 CFR 50.73

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102-06822-DCM/NTA
February 03, 2014

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

Dear Sirs:

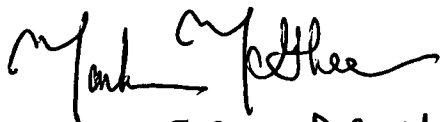
Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 3**
Docket No. STN 50-530 / License No. NPF 74
Licensee Event Report 2013-002-00

Enclosed please find Licensee Event Report (LER) 50-530/2013-002-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports a condition prohibited by Technical Specification (TS) Limiting Conditions for Operation (LCO) 3.2.1, Linear Heat Rate, and TS LCO 3.2.4, Departure from Nucleate Boiling Ratio.

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 D.C. MIMS

DCM/NTA/hsc

Enclosure

cc:	M. L. Dapas	NRC Region IV Regional Administrator
	J. K. Rankin	NRC NRR Project Manager PVNGS
	A. E. George	NRC NRR Project Manager
	M. A. Brown	NRC Senior Resident Inspector PVNGS

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digits/characters for each block)

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 infocollections.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOF-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.

1. FACILITY NAME

Palo Verde Nuclear Generating Station (PVNGS) Unit 3

2. DOCKET NUMBER

05000530

3. PAGE

1 OF 6

4. TITLE

Condition Prohibited by Technical Specifications During Dropped Control Element Assembly Recovery

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
12	03	2013	2013 -	002	- 00	02	03	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	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)
	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
10. POWER LEVEL 40	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> OTHER
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME

Mark McGhee, Department Leader Nuclear Regulatory Affairs

TELEPHONE NUMBER (Include Area Code)

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	MANUFACTURER	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 December 03, 2013, at approximately 0130, Unit 3 was in Mode 1 at 40 percent power recovering from a dropped Control Element Assembly (CEA) when the Required Action Completion Times of Technical Specification (TS) Limiting Condition for Operation (LCO) 3.2.1, Linear Heat Rate (LHR), and TS LCO 3.2.4, Departure from Nucleate Boiling Ratio (DNBR), were exceeded. Condition C of both LCO 3.2.1 and LCO 3.2.4 requires power to be ≤ 20 percent within six hours if the Completion Time of Condition A is not met. During response to the event, the LHR and DNBR LCOs were inappropriately exited and the Completion Time of Condition C was exceeded by 12 minutes. This condition was identified during a post-event review of plant data by plant personnel on December 15, 2013.

The cause of exceeding the required action completion times was the operating crew inappropriately exited LCO 3.2.1 and LCO 3.2.4 prior to fully understanding and reconciling instrument and alarm discrepancies.

Planned corrective actions will revise procedure 40DP-90P02 "Conduct of Shift Operations" to add guidance and actions for Operations personnel prior to exiting a LCO. The revised guidance will require independent review of decisions to exit LCOs. A case study of this event will be developed and presented to licensed operators and shift technical advisors during Licensed Operator Continuing Training. Also, procedure 40A0-9ZZ11 "CEA Malfunctions" will be revised to incorporate lessons learned from this event.

No similar events have been reported to the NRC by PVNGS in the prior three years.

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NARRATIVE

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

1. REPORTING REQUIREMENT(S):

This Licensee Event Report (LER) is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specification (TS) Limiting Condition for Operation (LCO) 3.2.1, Linear Heat Rate (LHR) and TS LCO 3.2.4, Departure From Nucleate Boiling Ratio (DNBR). When LHR and DNBR limits are exceeded, Condition A for both LCO 3.2.1 and LCO 3.2.4 requires LHR and DNBR to be restored within one hour. If the required action for Condition A is not met, then Condition C of LCO 3.2.1 and LCO 3.2.4 requires thermal power to be reduced to ≤ 20 percent within six hours.

On December 03, 2013, while recovering from a dropped Control Element Assembly (CEA), Unit 3 exceeded the required action completion time of Condition C of LCO 3.2.1 and LCO 3.2.4 by 12 minutes. This condition was identified during a post-event review of plant data by plant personnel on December 15, 2013.

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

Each PVNGS reactor has 89 CEAs which are 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 69 described in this report is a full strength 4-finger CEA.

Each CEA is moved and held by its associated Control Element Drive Mechanism (CEDM). Each CEDM is actuated to hold, insert or withdraw the CEA depending on the signal output from the Control Element Drive Mechanism Control System (CEDMCS) (EIS: AA).

Limits on CEA alignment and operability have been established and all CEA positions are monitored and controlled during power operation to ensure that power distribution and reactivity limits are preserved. LCO 3.1.5 requires that CEAs be aligned within 6.6 inches of the other CEAs within their respective group.

The Core Protection Calculator/Control Element Assembly Calculator (CPC/CEAC)(EIS: JC) system monitors reactor core conditions and is an integral part of the plant protective system that provides LHR and DNBR trip signals to the Reactor Protection System (RPS) (EIS: JC). The CPC/CEAC system trip signals are provided to the RPS whenever the high LHR or low DNBR limits are exceeded during reactor operation.

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Each CEAC receives CEA position input data for all CEAs (EIS: AA) and compares CEA positions to verify CEA insertion and alignment limits are maintained and provides penalty factors to the CPCs when CEA deviations are detected. The CPCs also compute penalty factors for CEA group deviations. These penalty factors are then used in the CPC calculations of LHR and DNBR to adjust for impacts on core power distribution from CEA deviations such that LHR and DNBR margins are reduced as CEA deviations increase.

The Core Operating Limit Supervisory System (COLSS) is a digital computer based monitoring program used to monitor plant parameters associated with the TS power distribution LCOs for LHR, DNBR, Axial Shape Index (ASI), and Azimuthal Power Tilt (AZTILT). These LCO requirements ensure the reactor core conditions assumed in the safety analyses and in the design of the low DNBR and high LHR reactor trip functions are not exceeded. The COLSS function is to monitor reactor core conditions and to provide indications and alarms to aid the operator in monitoring of core conditions within the limitations provide by the related LCOs. To do so, COLSS uses inputs of in-core reactor power detectors, CEA position data and reactor coolant system thermal/hydraulic properties to determine core power distribution and thermal performance. The COLSS program runs independently on both the Plant Computer (PC) and Core Monitoring Computer (CMC) which each provide redundant indications of the core power distribution parameters.

The COLSS programs continually calculate DNBR power operating limit (POL), LHR POL, ASI, plant power, and AZTILT and compare the calculated values to limits and initiate alarms when the LCO values are exceeded. When COLSS power distribution alarms are received the operators are required to implement alarm response procedure guidance to ensure the requirements of the LCOs are met.

For a dropped CEA event with a single full strength 4-finger CEA, acceptable results are ensured by the initial thermal margin preserved by compliance with the TS power distribution LCOs which are monitored by the COLSS programs. This event does not rely upon CEA position penalty factors used within the calculations in the CPCs.

3. INITIAL PLANT CONDITIONS:

On December 02, 2013, at approximately 1830, Unit 3 was in Mode 1 (Power Operation) at 100 percent power and normal operating temperature and pressure. There were no structures, systems, or components out of service that contributed to the event.

4. EVENT DESCRIPTION:

On December 02, 2013, at 1830, the Unit 3 control room received alarms and indications that CEA 69 of Regulating Group 2 had dropped and fully inserted into the core. In response, the guidance of Abnormal Operating Procedure (AOP) 40AO-9ZZ11 "CEA

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Malfunctions" was implemented and a power reduction to <80 percent was initiated to comply with LCO 3.1.5 Condition A. The following LCO Conditions were entered:

- 3.1.5 - CEA Alignment, Condition A
- 3.1.7 - CEA Insertion Limits/Power Dependent Insertion Limit Alarm, Condition D
- 3.2.1 - Linear Heat Rate (LHR), Condition A
- 3.2.3 - Azimuthal Tilt, Condition B
- 3.2.4 - Departure From Nucleate Boiling Ratio (DNBR), Condition A

In parallel with the power reduction, plant personnel began efforts to diagnose and correct the CEDMCS malfunction. At 1915, plant power was stabilized at approximately 79 percent.

At 1930, Condition C of both LCO 3.2.1 and LCO 3.2.4 were entered due to LHR and DNBR not being restored to within limits within one hour. Condition C of both LCO 3.2.1 and LCO 3.2.4 requires power to be ≤ 20 percent within six hours if the Completion Time of Condition A is not met. At 2030, Unit 3 entered LCO 3.1.5, CEA Alignment, Condition C, which requires entry into Mode 3 in six hours, due to the two hour Required Action Completion Time of Condition A not being met.

At 2100, Operations personnel evaluated COLSS data for the LHR POL and DNBR POL using the redundant indications from both the PC and CMC COLSS programs. The COLSS POL values from the PC indicated unacceptable values and COLSS POL values from the CMC indicated acceptable values at greater than 80 percent power which exceeded the current plant power level of 79 percent. During this time, multiple procedures were being implemented including the AOP and 72ST-9RX03 "DNBR/LHR/AZTILT/ASI With COLSS Out of Service" which provides alternate methods to evaluate compliance with the power distribution requirements using CPC data. Using 72ST-9RX03, it was determined that LHR and DNBR requirements were met based on CPC data. Based upon the acceptable POL values indicated on CMC COLSS and the results of the 72ST-9RX03 assessment of LHR and DNBR using CPC data it was determined the LHR and DNBR limits were met and the conditions of LCO 3.2.1 and LCO 3.2.4 were exited. Post-event review determined that use of 72ST-9RX03 with COLSS in service was not an appropriate method to evaluate compliance with power distribution requirements for this type of event.

At 2232, Condition C of LCO 3.2.3, AZTILT, was entered when it was determined that PC and CMC COLSS AZTILT values remained in excess of limits. The assessment of AZTILT identified that AZTILT limits had been exceeded but power was not reduced below 50 percent within the 4 hours allowed by Condition B. Condition C requires that power be reduced to ≤ 20 percent in six hours if the Completion Time of Condition B is not met. At 2330, a power reduction was initiated to lower power to less than 50 percent power. At 0033, LCO 3.2.3 Condition C was exited when power was reduced to less than 50 percent.

Personnel performing CEDMCS troubleshooting determined the individual CEA breaker (ICB) for CEA 69 was tripped. At approximately 0130, work to replace the affected

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CEDMCS power switch assembly and reclose the ICB was completed and withdrawal of CEA 69 was commenced. At 0135, LCO 3.2.3 Condition B was exited when measured AZTILT improved following the start of CEA 69 withdrawal.

On December 03, at 0142, CEA 69 was fully withdrawn in accordance with the dropped CEA withdrawal restrictions of the AOP and the alignment of Regulating Group 2 CEAs was restored to within limits. With realignment of CEA 69, Conditions A and C of LCO 3.1.5 were exited and the power reduction was stopped with plant power at approximately 38 percent. Also, the PC and CMC COLSS Master Alarms cleared indicating that LHR POL and DNBR POL limits were met on both computer systems. At 0233, AZTILT was restored to <5 percent.

Condition D of LCO 3.1.7 was exited on December 03, at 0353, following successful completion of the required surveillance test for the Power Dependent Insertion Limit Alarm for Regulating Group 2 CEAs. Plant power was held at approximately 35 percent until 0737 on December 03, 2013, when power ascension began and Unit 3 reached 100 percent power on December 5, 2013.

On December 15, 2013, during post-event review of plant data, Engineering personnel determined plant power exceeded the COLSS LHR and DNBR POLs for the duration of the dropped rod event and the LHR and DNBR POL limits were not met until the dropped CEA was restored and realigned with its group. Based upon this information it was determined that LCO 3.2.1 Condition C and LCO 3.2.4 Condition C Required Action Completion Times were exceeded by 12 minutes during the dropped rod recovery. Compliance with the LHR and DNBR POLs was restored at 0142 on December 3, 2013.

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.

Based on an engineering evaluation of margin to the LHR and DNBR Specified Acceptable Fuel Design Limits (SAFDLs), the failure to meet the required completion times of LCO 3.2.1 Condition C and LCO 3.2.4 Condition C during the dropped CEA 69 event had low safety significance. Although the actual time for restoration of LCO 3.2.1 and LCO 3.2.4 exceeded the six hour allowance by 12 minutes, reactor power reduction was promptly started and was continued down to approximately 38 percent power by the time the six hour completion time expired which established significant LHR and DNBR margin such that there was no challenge to the SAFDLs. A post-event evaluation was performed by Nuclear Analysis engineering to assess the safety significance by modeling the CEA 69 drop event using the Simulate-3 physics code with actual power level data. This evaluation concluded that the

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initial power reduction to 80 percent in the first hour provided sufficient margin to the SAFDLs for the duration of the event.

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).

6. CAUSE OF THE EVENT:

The cause of exceeding the required action completion times was Operations personnel did not fully understand and reconcile instrument and alarm discrepancies associated with LHR and DNBR POLs. The lack of understanding resulted in inappropriately exiting the Conditions of LCO 3.2.1 and LCO 3.2.4 when both LHR and DNBR POLs were exceeded.

7. CORRECTIVE ACTIONS:

The following corrective actions are planned:

- Revise procedure 40DP-9OP02 "Conduct of Shift Operations" to add guidance and actions for Operations personnel prior to exiting a LCO. The revised guidance includes an independent decision making review by a Senior Reactor Operator (SRO) or Shift Technical Advisor (STA).
- Develop a case study of this event and the decisions to exit the Conditions of LCO 3.2.1 and LCO 3.2.4 prior to complying with these LCOs.
- Present the case study to Licensed Operators and STAs.
- Procedure 40A0-9ZZ11 "CEA Malfunctions" will be revised to incorporate lessons learned from the event.

If information is subsequently developed that significantly affects a reader's understanding or perception of this event, a supplement to this LER will be submitted.

8. PREVIOUS SIMILAR EVENTS:

No similar conditions related to compliance with power distribution limits TS LCOs have been reported by PVNGS.