



BRUCE J. RASH
Vice President Nuclear
Engineering/Regulatory

**Palo Verde
Nuclear Generating Station**
5801 S Wintersburg Road
Tonopah, AZ 85354
Mail Station 7602
Tel 623 393 7362

102-08375-BJR/LMW
February 3, 2022

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

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Unit 3
Docket No. STN 50-530 / License No. NPF 74
Licensee Event Report 2021-001-00**

Enclosed please find Licensee Event Report (LER) 50-530/2021-001-00 that has been prepared and submitted pursuant to 10 CFR 50.73. This LER reports an automatic reactor protection system actuation in Unit 3 that occurred on December 6, 2021.

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 Michael DiLorenzo, Department Leader, Regulatory Affairs, at (623) 393-3495.

Sincerely,

Rash, Bruce
(Z77439)

Digitally signed by Rash,
Bruce (Z77439)
DN: cn=Rash, Bruce (Z77439)
Date: 2022.02.03 15:54:33
-07'00'

BJR/LMW

Enclosure

cc: S. A. Morris NRC Region IV Regional Administrator
S. P. Lingam NRC NRR Project Manager for PVNGS
L. N. Merker NRC Senior Resident Inspector for PVNGS

1. Facility Name Palo Verde Nuclear Generating Station (PVNGS) Unit 3 2. Docket Number 05000530 3. Page 1 OF 4

4. Title Unit 3 Reactor Trip During Control Element Assembly Alignment Activities

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	06	2021	2021	001	00	02	03	2022	Facility Name	05000
									Facility Name	05000

9. Operating Mode : 1 10. Power Level 100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<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)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

Other (Specify here, in Abstract, or in NRC 366A).

12. Licensee Contact for this LER

Licensee Contact: Michael DiLorenzo, Department Leader Nuclear Regulatory Affairs Phone Number (Include Area Code): 623-393-3495

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable To IRIS	Cause	System	Component	Manufacturer	Reportable To IRIS
B	AA	JS	E146	Y					

14. Supplemental Report Expected No Yes (If yes, complete 15. Expected Submission Date) 15. Expected Submission Date Month Day Year

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On December 6, 2021, at approximately 1203 Mountain Standard Time, Unit 3 reactor automatically tripped due to receipt of a low departure from nucleate boiling ratio trip signal. At the time of the trip, control element assembly alignment was taking place. In response to the reactor trip, all control element assemblies inserted fully into the reactor core.

The Unit 3 reactor trip was the result of a slipped control element assembly. An electrical short was identified within a control element drive mechanism control system power switch assembly. This short caused a lowering of the operating voltage at the input terminals of the control element drive mechanism control system cabinets. The lowered voltage caused current to go below minimum required holding current and resulted in a slipped control element assembly. Safety-related electrical power remained energized from off-site power sources and the reactor coolant pumps continued to provide forced circulation through the reactor. Decay heat was removed by the steam bypass control system and main feedwater system. Required systems operated as expected.

At the time of the trip, PVNGS Units 1 and 2 were operating at 100 percent power. Neither unit was impacted by the event. No similar events have been reported by PVNGS in the last three years.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form
<https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

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, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: oir_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Palo Verde Nuclear Generating Station	05000-530	2021	001	00

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)(iv)(A) to report an automatic actuation of the Reactor Protection System (RPS) followed by a reactor trip in Unit 3 on December 6, 2021. This event was reported to the NRC on December 6, 2021, via the Event Notification System (ENS 55626).

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

Reactor Protection System (RPS) (EIS Code: JC): The system's functions are to protect the core Specified Acceptable Fuel Design Limits and Reactor Coolant System (RCS) (EIS Code: AB) pressure boundary for incidents of moderate frequency, and to provide assistance in limiting initial conditions for certain infrequent events and limiting faults. The RPS consists of four independent, redundant channels and includes a number of sensors, calculators (including the core protection calculators (CPCs) (EIS: JC)), logic circuits, and supporting equipment that monitor nuclear steam supply system (EIS: AB) parameters. The RPS ensures the reactor is rapidly and reliably shut down to protect the fission product barriers and assist the Engineered Safety Features Actuation System (ESFAS) (EIS: JE) in accident mitigation.

The RPS actuation causes simultaneous trips of the four reactor trip switchgear breakers (EIS: AA) which are aligned in a selective two of four configuration to de-energize the control element drive mechanisms (CEDMs) (EIS: AA) so that all control element assemblies (CEAs) (EIS: AA) are released to insert into the reactor core (EIS: AC) and shut down the reactor. When a CEA slips into the reactor core, it results in a penalty factor calculated by the control element assembly calculators (CEACs). The CEACs pass the penalty factor to the CPCs, which may generate a low departure from nucleate boiling ratio (LO DNBR) trip signal. The LO DNBR trip signal is one of several reactor trip signals that can be initiated by the RPS. The CPCs and CEACs are part of the RPS.

The CEDM Control System (CEDMCS) (EIS: AA) provides drive signals that coordinate the application of power to the coils of the magnetic-jack CEDM. The CEDMs position and hold the CEAs during rod motion or steady-state. CEDMCS controls the direction, rate, and duration of CEA motion either automatically or manually and can move CEAs individually or as groups.

The power-electronics consist of power switch assemblies (PSAs) which are the interface between CEDMCS logic and the motor generator sets. Each PSA coordinates up to four CEDMs, with four coils per CEDM, totaling to 23 PSAs per CEDMCS.

The Guide Tube Wear Program was created to accommodate the possible wear on the CEA fingers and their associated guide tubes which could result from CEA vibrations caused by coolant flow when fully withdrawn. The program modifies the CEA position as a function of cycle burnup.

Engineered Safety Features Actuation System (ESFAS) (EIS: JE): The system provides initiating signals to components requiring automatic actuation. These actuating signals are generated when monitored variables reach levels that require protective action. The system performs its function by initiating ESFAS equipment if select abnormal conditions are detected. The setpoints for the actuation signals are selected to minimize the consequences of design basis accidents, which include a fuel handling accident, fire/smoke, and loss of power.



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		YEAR	SEQUENTIAL NUMBER	REV NO.
Palo Verde Nuclear Generating Station	05000-530	2021	001	00

3. INITIAL PLANT CONDITIONS:

On December 6, 2021, Palo Verde Unit 3 was in Mode 1 (Power Operation) at 100 percent power, normal operating temperature and normal operating pressure. There were no inoperable structures, systems, or components at the time that contributed to this event.

4. EVENT DESCRIPTION:

On December 6, 2021, at approximately 1203, the Unit 3 control room staff were aligning CEAs in support of Guide Tube Wear Program activities. While positioning a part strength CEA (Subgroup 8, CEA 33), full strength CEA 57 slipped. The CEAC system detected the slippage of CEA 57 and inserted a penalty factor into the CPC. The penalty factor was large enough to cause the RPS to generate a LO DNBR reactor trip signal. All CEAs inserted and all safety systems functioned as required.

Unit 3 was stabilized in Mode 3. The reactor coolant pumps continued to provide forced circulation through the reactor. Decay heat was removed by the steam bypass control system and main feedwater system. Required systems operated as expected.

On December 8, 2021, Subgroup 8 PSA was replaced. Unit 3 entered Mode 1 on December 9, 2021.

At the time of the trip, PVNGS Units 1 and 3 were operating at 100 percent power. Neither unit was impacted by the event.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

There were no inoperable structures, systems, or components at the time that contributed to this event. In response to the reactor trip, all CEAs inserted fully into the core. Safety-related electrical power remained energized from off-site power sources and reactor coolant pumps continued to provide forced circulation through the reactor. Decay heat was being removed by the steam bypass control system and main feedwater system. Required systems operated as expected. There was no actuation of essential spray pond or auxiliary feedwater pumps.

This event did not result in any challenges to the fission product barriers or result in the release of radioactive materials.

This event did not prevent the fulfillment of a safety function nor did it result in a safety system functional failure as described by 10 CFR 50.73 (a)(2)(v).

6. CAUSE OF THE EVENT:

The direct cause of the reactor trip was an electrical ground within the CEDMCS PSA for Subgroup 8, CEA 33. This short, which shunted current to ground, caused a lowering of the operating voltage at the input terminals of the CEDMCS cabinets. The lowered voltage caused current to go below minimum required holding current and resulted in the slip of CEA 57. The cause of the electrical ground occurring within the PSA was determined to be a burr on the heat sink around a silicone controlled rectifier mounting hole. This caused a thinning of the insulator washer



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Palo Verde Nuclear Generating Station	05000-530	2021	001	00

creating a path to ground when energized.

7. CORRECTIVE ACTIONS:

The affected Subgroup 8 PSA was replaced. The entire Unit 3 CEDMCS is scheduled for replacement with a digital system in fall of 2022.

In the event additional information is received that results in substantial changes in the corrective actions planned, PVNGS will submit a supplement to this LER.

8. PREVIOUS SIMILAR EVENTS:

On May 23, 2018, the PVNGS Unit 2 control room received a reactor protection system alarm for LO DNBR and an automatic reactor trip occurred as a result of a dropped CEA. The trip occurred coincident with maintenance on CEDMCS fuses and fuse caps. The cause of the dropped CEA and resulting Unit 2 trip was a CEDMCS lower logic assembly misalignment that caused difficulty seating circuit cards. Maintenance activities adversely affected card edge connections of the circuit card that led to a dropped CEA. Corrective actions restored the circuit cards to a fully seated position. This event was reported in LER 05000529-2018-001-00.

The corrective actions from the listed event would not have prevented the subject 2021 event.