



CARY D. HARBOR
Vice President Nuclear
Regulatory/Oversight

Palo Verde
Nuclear Generating Station
5801 S Wintersburg Road
Tonopah, AZ 85354
Mail Station 7605

102-08497-CDH/LMW
October 11, 2022

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

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Units 1 and 3**
Docket No. STN 50-528 and 50-530
License No. NPF-41 and NPF-74
Licensee Event Report 2022-001-00

Enclosed, please find Licensee Event Report (LER) 50-528/2022-001-00, that has been prepared and submitted pursuant to 10 CFR 50.73. This LER provides the cause and corrective actions for reported specified system actuations that occurred in Units 1 and 3 on August 14, 2022.

In accordance with 10 CFR 50.4, copies of this LER supplement 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,

Harbor, Cary
(Z16762)

Digitally signed by
Harbor, Cary (Z16762)
Date: 2022.10.11
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CDH/LMW

Enclosure

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

NRC FORM 366 (08-2020)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB: NO. 3150-0104		EXPIRES: 08/31/2023				
 LICENSEE EVENT REPORT (LER) (See Page 3 for required number of digits/characters for each block) (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/)											
1. Facility Name Palo Verde Nuclear Generating Station (PVNGS) Unit 1					2. Docket Number 05000528		3. Page 1 OF 5				
4. Title Units 1 and 3 Emergency Diesel Generator Actuation on Loss of Offsite Power to Class 4.16 kV Buses											
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	
08	14	2022	2022	001	00	10	11	2022	PVNGS Unit 3	05000530	
									Facility Name	Docket Number	
										05000	
9. Operating Mode: 1/1					10. Power Level: 100/100						
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)					
<input type="checkbox"/> Other (Specify here, in Abstract, or in NRC 366A).											
12. Licensee Contact for this LER											
Licensee Contact Michael DiLorenzo, Department Leader, 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		
C	EA	XFMR	W120	Y							
14. Supplemental Report Expected						15. Expected Submission Date			Month	Day	Year
<input checked="" type="checkbox"/> No		<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)									
16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)											
<p>On August 14, 2022, at 1702 Mountain Standard Time, a valid actuation of the emergency diesel generators (EDGs) for Palo Verde Nuclear Generating Station (PVNGS) Unit 1 B-train and Unit 3 A-train occurred due to an undervoltage condition on their respective 4.16 kilovolt (kV) Class 1E buses. Both EDGs started and loaded as designed, including associated train essential spray pond pumps and the Unit 1 B-train auxiliary feedwater pump.</p> <p>The loss of power to the Unit 1 and Unit 3 Class 1E buses and resulting component actuations were the result of startup transformer NAN-X02 tripping offline. Unit 1 and Unit 3 both entered Technical Specification (TS) Limiting Condition for Operation (LCO) 3.8.1, Condition A, for one required offsite circuit inoperable. In addition, both units also entered TS LCO 3.8.9, Condition A, for the loss of the Class 1E bus, which was exited when the EDGs started and restored power to their respective Class 1E buses. TS LCO 3.8.1, Condition A, was exited by both units on August 15, 2022.</p> <p>The direct cause of the undervoltage condition and the EDG and pump actuations was startup transformer NAN-X02 tripping offline due to the opening of the NAN-X02 startup transformer 525 kV breakers and 13.8 kV breakers due to protective relay actuation. The apparent cause of the event was attributed to water intrusion into the 2E-NAN-S05A cubicle as the result of a heavy rainstorm and high winds, in combination with degraded weatherstripping and conductor insulating boots that are not waterproof.</p> <p>No similar events have been reported by PVNGS in the last three years due to the same initial cause.</p>											

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

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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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: aira_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	05000-528	2022	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 a valid automatic actuation of the circuitry that starts the emergency diesel generator (EDG) (EIS: EK) for Unit 1 and Unit 3 following an undervoltage condition on the affected Class 1E bus for each unit on August 14, 2022. The event included actuations of the associated essential spray pond (SP) pumps (EIS: BS) and the Unit 1 B auxiliary feedwater (AF) pump (EIS: BA). This event was reported to the NRC on August 14, 2022 via the event notification system (ENS 56044).

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

The safety related equipment for each Palo Verde Nuclear Generating Station (PVNGS) unit is powered by one of two load groups (A-train and B-train). Either of the associated trains can provide power for safe plant shutdown. Each alternating current (AC) train includes one Class 1E 4.16 kilovolt (kV) bus (EIS: EB).

The preferred and alternate power sources for each load group is offsite 525 kV AC power (EIS: EK) and is supplied via the 13.8 kV secondary windings from two of the three startup transformers (EIS: EA) to six 13.8 kV intermediate buses. Each unit receives 13.8 kV power from two of the intermediate buses. Class 1E 4.16 kV safety load group power is provided from the associated intermediate bus engineered safety feature (ESF) transformers. The standby power supply for each safety load group consists of one EDG (EIS: EK), including its auxiliary and fuel systems. The standby power supply functions as a source of AC power for safe plant shutdown in the event of loss of preferred power and for post-accident operation of ESF loads.

3. INITIAL PLANT CONDITIONS:

On August 14, 2022, PVNGS Units 1, 2 and 3 were 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 August 14, 2022, at 1702, a valid loss of power (LOP) actuation occurred due to an undervoltage condition on the Unit 1 B-train and Unit 3 A-train Class 1E buses which resulted in an automatic actuation of the circuitry that starts the Unit 1 B-train EDG and Unit 3 A-train EDG. The undervoltage condition on the Units 1 and 3 Class 1E 4.16 KV buses resulted from startup transformer NAN-X02 tripping offline. Both EDGs started and loaded as designed. The EDG actuations were accompanied by the start of associated train essential SP pumps in both units. The Unit 1 B-train EDG actuation was also accompanied by the start of the Unit 1 B-train auxiliary feedwater pump, as required for the undervoltage condition. By design, actuation of the Unit 3 A-train steam-driven auxiliary feedwater pump was not required in response to the EDG actuation.



LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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Palo Verde Nuclear Generating Station	05000-528	2022	001	00
<p>At 1702 on August 14, both Units 1 and 3 entered Technical Specification (TS) Limiting Condition for Operation (LCO) 3.8.1, Condition A for one required offsite circuit inoperable and TS LCO 3.8.9, Condition A for the loss of the Class 1E bus. Both units exited TS LCO 3.8.9, Condition A within one minute, after the Unit 1 B-train and Unit 3 A-train EDGs started and restored power to their respective Class 1E buses. Unit 1 exited TS LCO 3.8.1, Condition A on August 15 at 1905 after realigning the electrical path for offsite power to the B-train Class 1E bus from startup transformer NAN-X01. Unit 3 exited TS LCO 3.8.1, Condition A on August 15 at 1446 after realigning the electrical path for offsite power to the A-train Class 1E bus from startup transformer NAN-X03.</p> <p>Unit 2 Class 1E buses and required offsite circuits were unaffected by the NAN-X02 startup transformer trip because the unit was not aligned to the NAN-X02 startup transformer. The redundant Unit 1 A-train and Unit 3 B-train Class 1E buses were also unaffected by the event and remained energized by startup transformers NAN-X03 and NAN-X01, respectively.</p> <p>Annunciators in the control rooms indicated startup transformer NAN-X02 tripped offline, resulting in a loss of power to the Unit 1 B-train and Unit 3 A-train class buses. Upon receipt of the annunciators in Units 1 and 3 control rooms and the associated automatic start of the Unit 1 B-train and Unit 3 A-train EDGs, an Auxiliary Operator was dispatched to the switchyard to conduct a walkdown of the NAN-X02 startup transformer and surrounding areas. The Auxiliary Operator reported damage to the 2E-NAN-S05A cubicle consisting of the exterior metal panels being deformed and indications of an arc flash event.</p> <p>The NAN-X02 startup transformer fault initiated from the 2E-NAN-S05A cubicle. This fault caused relays to actuate which caused the 13.8 kV bus feeder breaker, all startup transformer NAN-X02 13.8 kV breakers and related 525 kV breakers to trip while initiating the 525 kV breaker failure logic. This resulted in tripping the startup transformer NAN-X02 offline.</p> <p>When startup transformer NAN-X02 tripped offline, the result was a loss of power on the Unit 1 B-train and Unit 3 A-train Class 1E buses. Due to the loss of power on the Class 1E buses, the Unit 1 B-train and Unit 3 A-train EDGs automatically started and restored power to their respective buses. Plant equipment responded as expected. Both of the units' associated SP pumps started in support of the actuations, as expected. In addition, the Unit 1 B-train AF pump automatically started, as expected. The Unit 1 B-train AF pump was not needed for steam generator level control and no AF valves repositioned. The Unit 1 B-train AF pump did not supply feedwater to the steam generators.</p> <p>At the time of the event, weather conditions were notable. On-site station personnel reported heavy rain and high winds during this time. Wind speeds were documented over 20 miles per hour (mph) and peaked at approximately 50 mph during this event.</p> <p>The direct cause of the loss of power to the Unit 1 B-train and Unit 3 A-train Class 1E buses was the opening of the NAN-X02 startup transformer 525 kV and 13.8 kV breakers due to protective relay actuation. The apparent cause of the loss of power was water intrusion into the 2E-NAN-S05A cubicle as the result of a heavy rainstorm and high winds, in combination with degraded weatherstripping and conductor insulating boots that are not waterproof.</p> <p>A contributing cause to the loss of power to the Unit 1 B-train and Unit 3 A-train Class 1E buses was a deferral of the preventative maintenance task that inspects the weatherstripping and insulating boots on the 2E-NAN-S05 switchgear cubicle, which was delayed due to the COVID-19 pandemic.</p>				

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5. ASSESSMENT OF SAFETY CONSEQUENCES:

There were no inoperable structures, systems or components at the time that contributed to this event. The EDGs responded as designed to the undervoltage condition on their respective safety buses. Essential SP and AF pumps actuated as required for the LOP.

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 as described by 10 CFR 50.73(a)(2)(v), nor did it result in a safety system functional failure.

6. CAUSE OF THE EVENT:

The direct cause of the loss of power to the Unit 1 B-train and Unit 3 A-train Class 1E buses was the opening of the NAN-X02 startup transformer 525 kV and 13.8 kV breakers due to protective relay actuation, causing the loss of power condition and the subsequent EDG and pump actuations. The apparent cause of the 2E-NAN-S05A fault was determined to be water intrusion into the switchgear cubicle as a result of the heavy rainstorm and high winds in combination with degraded weatherstripping and conductor insulating boots that are not waterproof.

In addition, the loss of power to the Unit 1 B-train and Unit 3 A-train Class 1E buses was caused, in part, by the deferral of a preventative maintenance (PM) task to perform an inspection and cleaning on the 13.8 kV outdoor switchgear 2E-NAN-S05. The PM task was initially scheduled for completion during the Unit 2 refueling outage in the Spring of 2020 but was deferred due to the global COVID-19 pandemic, which resulted in insufficient personnel availability to complete the scheduled work during that outage timeframe.

7. CORRECTIVE ACTIONS:

Immediate corrective actions were taken to restore offsite power to Unit 1 B-train and Unit 3 A-train Class 1E buses. Alternate supply power was provided from startup transformers NAN-X01 and NAN-X03, respectively, through their associated intermediate buses to the class buses.

In addition, transformer and cable testing were performed, the non-class 1E 13.8 kV outdoor switchgear cubicle 2E-NAN-S05A was inspected and it was determined the damage was caused by a fault. Repairs were made to the cubicle frame and panels. A water-resistant insulating wrap was applied to the conductor connections prior to re-installation of the insulating boots. Weatherstripping and conductor connection insulating boots and Tye-wraps were replaced. Replacement of the degraded weatherstripping and addition of silicone self-fusing tape to the protruding portion of the conductors minimize the potential of water intrusion into 2E-NAN-S05 and associated conductors under PVNGS postulated weather conditions. Replacing the weatherstripping and Tye-wraps corrected the event condition. In addition, the weatherstripping and Tye-wraps will be inspected during the next routine PM activity in April 2023.

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8. PREVIOUS SIMILAR EVENTS:

No EDG or ESF actuations resulting from water intrusion into the 13.8 kV switchgear cubicles have been reported by PVNGS in the past three years.

However, there have been similar sequences of events with different direct causes in which a startup transformer was de-energized, causing two units to experience a loss of power on a single Class 1E electrical bus, resulting in the automatic start of the associated EDGs, essential SP pumps and an AF pump.

PVNGS experienced a partial loss of offsite power event involving the loss of power to class buses in February 2011 as well as two additional partial loss of offsite power events involving the loss of power to class buses within the past year. The three most recent events are being further evaluated to determine if there are any common factors shared between the events. The cause of each referenced previous PVNGS event is as follows:

- February 2011 – A cable splice failure between the NAN-X02 startup transformer and normally supplied bus, Unit 2 NAN-S05
- October 2021 – An electrical contact event resulting in an electrical fault on the NAN-X02 startup transformer
- May 2022 – An error was introduced during a design modification performed in March 2017

Although PVNGS has had similar events involving the loss of power to the class buses, the cause of each event was different. Therefore, it is concluded there have been no repeat occurrences of loss of power to class bus events at PVNGS.

The corrective actions from the previous LER events would not have prevented the event which is the subject of this report.

There have been other events at PVNGS involving water intrusion, but these have not directly caused a similar event as discussed in this report.