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10CFR50.73

Palo Verde Nuclear  
Generating Station

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102-055~~69~~<sup>704</sup>-CE/SAB/JAP/DFH  
September 20, 2006

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 2005-001-02**

Attached please find supplemental Licensee Event Report (LER) 50-528/2005-001-02 prepared and submitted pursuant to 10 CFR 50.73. The original LER reported an event that resulted in the actuation of one of the Unit 1 emergency diesel generators, and the subsequent Technical Specification required unit shutdown. This LER supplement contains updated information related to the cause of the event and corrective actions.

In accordance with 10 CFR 50.4, a copy of this LER is being forwarded to the NRC Region IV Office and the Senior Resident Inspector. Substantive revisions to the LER are identified by side bars in the left hand margin. If you have questions regarding this submittal, please contact James A. Proctor, Section Leader, Regulatory Affairs, at (623) 393-5730.

Arizona Public Service Company makes no commitments in this letter.

Sincerely,

CE/SAB/DLK/gt

Attachment

cc: B. S. Mallet, Region IV Administrator (all w/attachment)  
G. G. Warnick, Sr. Resident Inspector  
M. B. Fields, PVNGS Project Manager

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**LICENSEE EVENT REPORT (LER)**

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by Internet e-mail to infocollects@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.

<b>1. FACILITY NAME</b> Palo Verde Nuclear Generating Station (PVNGS) Unit 1	<b>2. DOCKET NUMBER</b> 05000528	<b>3. PAGE</b> 1 OF 7
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**4. TITLE**  
Actuation of an Unit 1 Emergency Diesel Generator (EDG) and Plant Shutdown required by TS

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	
02	06	2005	2005	- 001 -	02	09	20	2006	FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b> 1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§:</b> (Check all that apply)									
<b>10. POWER LEVEL</b> 100	<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)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input checked="" 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 checked="" 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 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**

<b>FACILITY NAME</b> James A. Proctor, Section Leader, Regulatory Affairs	<b>TELEPHONE NUMBER (Include Area Code)</b> 623-393-5730
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**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
X	EA	BU	G080	Y					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b> <input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO	<b>15. EXPECTED SUBMISSION DATE</b>	MONTH	DAY	YEAR
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**ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)**

All times referenced are approximate and Mountain Standard Time.

On February 6, 2005, at 22:19 a valid actuation of the PVNGS Unit 1 Train "B" Emergency Diesel Generator (EDG) occurred as a result of under-voltage on its respective safety bus (1E-PBB-S04). EDG "B" started and loaded as designed to energize 1E-PBB-S04. The loss of power to the safety bus was the result of a fault associated with a 13.8KV load breaker cubicle which caused the breaker for the normal power supply to switchgear 1E-NAN-S06 to trip open on over-current. The PVNGS Fire Department and Auxiliary Operators responded to a report of smoke and upon arrival found no fire. The Fire Department verified the fire was completely extinguished and there were no secondary fires. Unit 1 entered Technical Specification Limiting Condition for Operation (LCO) 3.8.1, Condition "A," for one (of two) required offsite circuits inoperable. Various other Technical Specifications LCO's were momentarily entered and exited for 1E-PBB-S04 being de-energized for approximately 7 seconds. On February 9, 2005 at 03:12 Unit 1 was shutdown to meet the TS LCO 3.8.1, Condition "H." No Emergency Plan declaration was made and none was required. Unit 1 was at approximately 100 percent power, at normal operating temperature and pressure prior to and following the EDG actuation. No other engineered safety feature actuations occurred and none were required. The event did not adversely affect the safe operation of the plant or the health and safety of the public.

Previous similar events have been reported in LERs 50-528/2004-006, 50-529/2004-003-00 and 50-530/2003-004.

## LICENSEE EVENT REPORT (LER)

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Palo Verde Nuclear Generating Station Unit 1	05000528	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 7
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## 17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

## 1. REPORTING REQUIREMENT(S):

Pursuant to 10 CFR 50.73(a)(2)(iv)(A) and 10 CFR 50.73(a)(2)(i)(A), this LER reports an event that resulted in the valid automatic actuation of one of the Unit 1 Emergency Diesel Generators (EDGs) [EIS Code: EB] and the completion of a reactor shutdown required by Technical Specifications.

Pursuant to 10 CFR 50.72, Arizona Public Service Company (APS) made notification of these events to the NRC Headquarters Operations Officer on February 7, 2005 (reference ENS # 41379) and on February 9, 2005 (reference ENS # 41389).

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

## Onsite Power System [EIS Codes: EA, EB &amp; EC]

Offsite sources of power provide preferred power to the three units through the secondary windings of three startup transformers. The onsite power system of each unit is divided into two separate systems: the non-Class 1E power system and the Class 1E power system which is divided into two separate load groups. Power is supplied to the auxiliaries at 13.8 kV, 4.16 kV, and 480V levels. The onsite power system includes the Class 1E power system which provides auxiliary alternating current (ac) and direct current (dc) power for equipment used to shut down the reactor safely following a design basis event. The Class 1E busses of each unit must be energized in order to provide preferred or standby power to the safety-related loads of each unit.

## Standby Power Supply [EIS Code: EK]

The standby power supply for each safety-related load group consists of one EDG, complete with its accessories and fuel storage and transfer 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 engineered safety feature (ESF) loads.

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3. INITIAL PLANT CONDITIONS:

All times are approximate and Mountain Standard Time.

On February 6, 2005, at 22:19, Unit 1 was in Mode 1 (POWER OPERATION), operating at approximately 100 percent power.

There were no major structures, systems, or components that were inoperable at the start of the event that contributed to the event. There were no failures that rendered a train of a safety system inoperable and no failures of components with multiple functions involved.

4. EVENT DESCRIPTION:

On February 6, 2005, at 22:19 a valid actuation of the Palo Verde Nuclear Generating Station (PVNGS) Unit 1 Train "B" EDG occurred as a result of under-voltage on its respective safety bus (1E-PBB-S04). EDG "B" started and loaded as designed to energize 1E- PBB-S04. The loss of power to the safety bus was the result of a fault associated with 13.8KV breaker 1E-NAN-S06J cubicle which caused breaker 1E-NAN-S06H (normal power supply), to trip open on over-current. This action resulted in the de-energization of 1E-NAN-S06, 1E-NAN-S04, and 1E-PBB-S04. Circuit breaker 1E-NAN-S06J (Emergency Operations Facility and Technical Support Center power supply) was also found in an open state. Unit 1 was at approximately 100 percent power, at normal operating temperature and pressure prior to and following the EDG actuation. No other ESF actuations occurred and none were required. No major equipment was inoperable prior to the event that contributed to the event.

The PVNGS Fire Department and Auxiliary Operators responded to a report of smoke and upon arrival found no fire. The Fire Department verified the fire was completely extinguished and there were no extensions (secondary fires).

Unit 1 entered Technical Specification Limiting Condition for Operation (LCO) 3.8.1, Condition "A," for one (of two) required offsite circuits inoperable. Various other

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Technical Specifications LCO's were momentarily entered and exited for 1E-PBB-S04 being de-energized for approximately 7 seconds. On February 9, 2005 at 01:04 the control room staff initiated a boration to commence the unit shutdown. At 03:12 on February 9, 2005 the reactor was shut down to meet the TS LCO 3.8.1, Condition "H." At 14:30 Unit 1 entered Mode 4 (HOT SHUTDOWN) and on February 10, 2005 at 01:05 Unit 1 entered Mode 5 (COLD SHUTDOWN). No Emergency Plan declaration was made and none was required.

5. ASSESSMENT OF SAFETY CONSEQUENCES:

The event did not result in any challenges to the fission product barriers or result in the release of radioactive materials. Therefore, there were no adverse safety consequences or implications as a result of this event and the event did not adversely affect the safe operation of the plant or health and safety of the public.

The condition would not have prevented the fulfillment of any safety function and did not result in a safety system functional failure as defined by 10CFR50.73(a)(2)(v).

The event did not result in a transient more severe than those analyzed in the updated Final Safety Evaluation Report Chapters 6 and 15. The event did not have any nuclear safety consequences or personnel safety impact.

6. CAUSE OF THE EVENT:

The direct cause of the 1E-NAN-S06 power failure was an electrical fault in cubicle "J" within the bus side primary disconnect assembly (PDA) compartment above the circuit breaker. This electrical fault initiated as a "C" phase to ground fault and transitioned to a three phase to ground fault. The electrical fault was terminated when the normal bus feeder circuit breaker 1E-NAN-S06H opened due to protective relaying.

The investigation was unable to determine the actual root cause because of the extent of damage to the "C" phase PDA porcelain bottle. The most probable root cause, based on

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the evidence and facts reviewed during the investigation, was the "C" phase PDA porcelain bottle sustained damage in 1992 during an electrical fault in the rear of switchgear cubicle 1E-NAN-S06J. The porcelain bottle damage that may have ensued probably resulted in the electrical "C" phase to ground initiated on February 6, 2006.

7. TRANSPORTABILITY:

Circuit breaker 1E-NAN-S06J is located in an outdoor 13.8 KV GE switchgear enclosure. There are the following similar GE switchgear enclosures at PVNGS:

Twelve (4/unit) outdoor 13.8 KV Non-1E switchgear enclosures (E-NAN-S03/4/5/6); 37 breaker cubicles.

Six (2/unit) indoor 13.8 KV Non-1E switchgear enclosures (E-NAN-S01/2); 66 breaker cubicles.

Six (2/unit) indoor 4.16 KV 1E switchgear enclosures (E-PBA/B-S03/4); 81 breaker cubicles.

Six (2/unit) indoor 4.16 KV Non-1E switchgear enclosures (E-NBN-S01/2); 51 breaker cubicles.

Note, indoor 13.8 KV switchgear enclosure AE-NAN-S07 has a different bus structure and the five respective vacuum circuit breakers are racked in horizontally; hence initial indications are this failure is not transportable to AE-NAN-S07.

Contamination with tracking - Inspection of other bus side PDAs in 1E-NAN-S06 cubicles and the line (load) side PDAs in cubicle 1E-NAN-S06K found reasonably clean conditions (low contamination to contribute to tracking) and no degraded conditions. The outdoor enclosures are the most challenged by dust and are cleaned each refueling cycle. Based on the condition of the PDAs inspected in 1E-NAN-S06, contamination is not deemed an immediate transportability concern.

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High resistance connection - A review of industry operating experience (IOE) found very few occurrences of PDA failure. The applicable IOE identified high resistance overheating of the connection between PDA fingers and circuit breaker bushing due to old hardened grease, misalignment and missing silver plating. The fingers within the interior of the bus and line PDAs in the outdoor 13.8 KV switchgear are inspected and cleaned each refueling cycle as per maintenance procedure 32MT-9ZZ91, "Inspection/Cleaning 13.8 KV and 4.16 KV Switchgear." Proper PDA finger and circuit breaker stab contact is validated during circuit breaker alignment as per maintenance procedure 32MT-9ZZ33, "Maintenance of Medium Voltage Circuit Breakers Type AM-13.8-1000." Based on these procedure actions, there is reasonable assurance of a good circuit breaker bushing to PDA fingers connection; therefore PDA high resistance connections are not deemed an immediate transportability concern. Industry operating experience indicates thermography may be utilized to find primary disconnect high resistance by detecting the related heat on an adjacent sheet metal compartment wall/cover.

Cracked porcelain - Industry operating experience (IOE) consolidated and reviewed found no incident of PDA porcelain failure. If PDA cracked porcelain is the most probable cause for this failure; the probability of more PDAs with cracked porcelain at PVNGS is very low based on no failures of this type identified during IOE. Therefore PDA cracked porcelain is not deemed an immediate transportability concern.

Water Intrusion - No evidence of water intrusion was found; no rain occurred just prior to or during the event; no water intrusion was found due to rain during switchgear restoration/repair; and no condensation was found in the "J" cubicle when walked down during rain on February 24, 2005.

## 8. CORRECTIVE ACTIONS:

The following corrective actions were completed to address problems associated with the direct cause:

Temporary modifications were installed to supply power to the Emergency Operations Facility and the Technical Support Center.

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The switchgear cubicle and components in 1E-NAN-S06J were inspected. 1E-NAN-SO6J was reworked to the approved original design specifications. The cubicle was repaired and the damaged components were repaired and or replaced.

The following actions were taken to address the most probable root cause:

A review was performed to identify switchgear previously subjected to a three phase to ground fault – five were identified. Work orders were initiated to clean and inspect the exterior of the line and bus PDAs in the affected switchgear. Two work orders have been successfully completed. The other three work orders are scheduled to be completed during future refueling outages.

The switchgear preventive maintenance bases were revised and steps were added to procedure 32MT-9ZZ91, "Inspection/Cleaning 13.8 KV and 4.16 KV Switchgear" to periodically inspect and clean the PDA bottle ceramics.

9. PREVIOUS SIMILAR EVENTS:

Switchyard and extra high voltage grid events that have affected PVNGS have been reported in LERs 50-528/2004-006-00, 50-529/2004-003-00 and 50-530/2003-004-00. However, these previous events or conditions did not involve the same underlying concern or reason as this event, such as the same root cause, failure, or sequence of events. There have been no previous similar events in the past three years that had a similar failure mechanism or that should have prevented this event from previously implemented corrective actions.