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 AUTH. NAME AUTHOR AFFILIATION
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 LEVINE, J.M. Arizona Public Service Co. (formerly Arizona Nuclear Power
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 92-004-00: on 920619, Unit 2 & Unit 3 loss of power ESFAS.
 Caused by moisture intrusion in sliced section of one of
 Phase A cables. Phase A cable A respliced & megged.
 W/920716 ltr.

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 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: Standardized plant.

05000529

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JAMES M. LEVINE
VICE PRESIDENT
NUCLEAR PRODUCTION

192-00795-JML/TRB/KR
July 16, 1992

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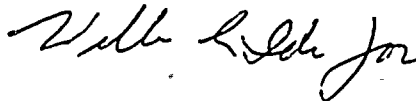
Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 2
Docket No. STN 50-529 (License No. NPF-51)
Licensee Event Report 92-004
File: 92-020-404

Attached please find Licensee Event Report (LER) 92-004 prepared and submitted pursuant to 10CFR50.73. This LER reports a Unit 2 Train A Loss of Power (LOP) Engineered Safety Feature Actuation System (ESFAS) actuation, and a Unit 3 Train B LOP ESFAS actuation which occurred following a cable fault downstream of a startup transformer. In accordance with 10CFR50.73(d), a copy of this supplement is being forwarded to the Regional Administrator, NRC Region V.

If you have any questions, please contact T. R. Bradish, Compliance Manager, at (602) 393-5421.

Very truly yours,



JML/TRB/KR

Attachment

cc: W. F. Conway (all with attachment)
J. B. Martin
D. H. Coe
INPO Records Center

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Palo Verde Unit 2	DOCKET NUMBER (2) 05000529	PAGE (3) 1 OF 08
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TITLE (4) Unit 2 and Unit 3 Loss of Power (LOP) ESFAS

EVENT DATE (5)			LER NUMBER (6)		REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES
06	19	92	92	004	00	07	16	92	Palo Verde Unit 3
									DOCKET NUMBER(S) 05000530
									N/A
									05000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)									
OPERATING MODE (9) 1		20.402(b)		20.405(c)		<input checked="" type="checkbox"/> 50.73(a)(2)(iv)		73.71(b)	
POWER LEVEL (10) 100		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)	
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(vii)(A)			
		20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(vii)(B)			
		20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)			

LICENSEE CONTACT FOR THIS LER (12)									
NAME Thomas R. Bradish, Compliance Manager								TELEPHONE NUMBER 602 393-5421	

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)									
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)						EXPECTED SUBMISSION DATE (15)		MONTH		DAY		YEAR	
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO													

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)													
<p>At approximately 0520 MST on June 19, 1992, Palo Verde Units 2 and 3 were in Mode 1 (POWER OPERATION) operating at approximately 100 percent power when Palo Verde Unit 2 experienced a Train A Loss of Power (LOP) Engineered Safety Feature Actuation System (ESFAS) actuation, and Unit 3 experienced a Train B LOP ESFAS actuation. A fault downstream of a startup transformer (NAN-X01) resulted in a loss of offsite power to the Unit 2 Train A and Unit 3 Train B Class 1E 4.16 kV buses. The Unit 2 Train A Emergency Diesel Generator (EDG) and the Unit 3 Train B EDG started and loaded per design. The safety systems required to functioned performed as designed. There were no other ESFAS actuations and none were required. Units 2 and 3 continued to operate normally at 100 percent power throughout the event.</p> <p>The cause of the fault downstream of NAN-X01 was moisture intrusion in a spliced section of one of the Phase A cables located within a manhole between NAN-X01 and Unit 3's Train B non-Class 1E 13.8 kV Switchgear Bus, which resulted in a phase-to-ground fault on Phase A and a current differential between Phase A and Phases B and C. APS Engineering has determined that the moisture intrusion occurred due to inadequate application of heat shrink insulating material during the original cable installation in 1981 by Bechtel personnel. As corrective action, the faulted section of spliced cable was replaced.</p> <p>There have been no previous similar events reported pursuant to 10CFR50.73.</p>													

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I. DESCRIPTION OF WHAT OCCURRED:

A. Initial Conditions:

At 0520 MST on June 19, 1992, Palo Verde Units 2 and 3 were in Mode 1 (POWER OPERATION) operating at approximately 100 percent power.

B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):

Event Classification: An event or condition that resulted in an automatic actuation of an Engineered Safety Feature (ESF)(JE).

At approximately 0520 MST on June 19, 1992, Palo Verde Unit 2 experienced a Train A Loss of Power (LOP) Engineered Safety Feature Actuation System (ESFAS) (JE) actuation, and Unit 3 experienced a Train B LOP ESFAS actuation. This resulted from a loss of offsite power to the Unit 2 Train A and Unit 3 Train B Class 1E 4.16 kV buses (EB)(BU). The Unit 2 Train A Emergency Diesel Generator (EK) (EDG) and the Unit 3 Train B EDG started and loaded per design. The safety systems required to functioned performed as designed. Units 2 and 3 entered Technical Specification Limiting Condition for Operation (TS LCO) 3.8.1.1 ACTION a which states that two physically independent circuits from the switchyard to the onsite Class 1E distribution system shall be OPERABLE. There were no other ESFAS actuations and none were required. Units 2 and 3 continued to operate normally at 100 percent power throughout the event.

Immediately prior to the LOP ESFAS actuations, Startup Transformer (NAN-X01) (EA)(XFMR) phase winding ground differential trip alarms (ALM) came into the Units 1, 2, and 3 Control Rooms (NA). The NAN-X01 breakers 925 and 928 were observed to be open, indicating that the source of the fault current (i.e., NAN-X01) had been isolated. [NOTE: see the figure on page 8.]

Unit 2's Train A non-Class 1E 13.8 kV Switchgear Buses (NAN-S03 and NAN-S05) were deenergized as a result of the NAN-X01 breakers 925 and 928 opening. This resulted in the loss of offsite power to the Train A 4.16 kV Class 1E bus (PBA-S03) and a Train A LOP ESFAS actuation. The ESF signal automatically load shed the Train A Class 1E bus and started the Train A Emergency Diesel Generator (EDG). The Train A EDG started and assumed the loads as designed. Unit 2 Control Room personnel (utility, licensed) entered Technical Specification Limiting Condition for Operation (TS LCO)

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3.8.1.1 ACTION a when one circuit from the switchyard to the onsite Class 1E distribution system was declared inoperable.

The NAN-X01 breakers 925 and 928 opening also deenergized Unit 3's Train B non-Class 1E 13.8 kV Switchgear Buses (NAN-S04 and NAN-S06). This resulted in the loss of offsite power to the Train B 4.16 kV Class 1E bus (PBB-S04) and a Train B LOP ESFAS actuation. The ESF signal automatically load shed the Train B Class 1E bus and started the Train B EDG. The Train B EDG started and assumed the loads as designed. The Unit 3 Control Room personnel (utility, licensed) entered TS LCO 3.8.1.1 ACTION a when one circuit from the switchyard to the onsite Class 1E distribution system was declared inoperable.

There were no other ESFAS actuations and none were required. The safety systems for Units 2 and 3 responded as expected for a loss of offsite power scenario as discussed in Section I.J. Units 2 and 3 continued to operate normally at 100 percent power throughout the event.

At approximately 1733 MST, Unit 2 Control Room personnel reenergized the Train A non-Class 1E 13.8 kV Switchgear Buses (NAN-S03 and NAN-S05) from the alternate supply breaker feed from Startup Transformer NAN-X02. At approximately 2039 MST, Unit 3 Control Room personnel reenergized the Train B non-Class 1E 13.8 kV Switchgear Buses (NAN-S04 and NAN-S06) from the alternate supply breaker feed from Startup Transformer NAN-X03. At approximately 2133 MST, Unit 2 exited TS LCO 3.8.1.1 ACTION a when offsite power was restored to Train A 4.16 kV Class 1E bus (PBA-S03) from NAN-X02. At approximately 2339 MST, Unit 3 exited TS LCO 3.8.1.1 ACTION a when offsite power was restored to the Train B 4.16 kV Class 1E bus (PBB-S04) from NAN-X03.

- C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Not applicable - no structures, systems, or components were inoperable at the start of the event which contributed to this event.

- D. Cause of each component or system failure, if known:

An investigation of this event was conducted in accordance with the APS Incident Investigation Program. As part of the investigation, a root cause of failure analysis of the fault was performed by APS Engineering personnel (utility, nonlicensed). There was no indication of visible damage or alarms for NAN-X01. APS Engineering determined that the Startup Transformer NAN-X01-

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related fault was due to a phase-to ground fault on a Phase A cable. The Phase A cable minimum acceptable insulation resistance was low when megged, and the Phase B and C cables megged within the acceptance range. There was no indication of a phase-to-phase fault. The fault was discovered at a spliced section in the cable located within a manhole between NAN-X01 and Unit 3's Train B non-Class 1E 13.8 kV Switchgear Bus (NAN-S06).

The investigation determined that moisture intrusion occurred in a spliced section of one of the Phase A cables located within a manhole between NAN-X01 and Unit 3's Train B non-Class 1E 13.8 kV Switchgear Bus (NAN-S06), resulting in a phase-to-ground fault on Phase A and a current differential between Phase A and Phases B and C. This resulted in the actuation of the transformer phase winding ground differential trip.

- E. Failure mode, mechanism, and effect of each failed component, if known:

[NOTE: Startup Transformer NAN-X01 normally supplies offsite power to the Unit 2 Train A non-Class 1E 13.8 kV Switchgear Buses (NAN-S03 and NAN-S05) from the Z winding, and to the Unit 3 Train B non-Class 1E 13.8 kV Switchgear Buses (NAN-S04 and NAN-S06) from the Y winding.]

The cable fault resulted in the Unit 2 non-Class 1E 13.8 kV Intermediate Switchgear Bus NAN-S05 and Unit 3 non-Class 1E 13.8 kV Intermediate Switchgear Bus NAN-S06 experiencing a zero sequence voltage, and neutral amperage (amp) increasing on the 525 kV and the 13.8 kV Y winding sides of NAN-X01. At approximately 0520 MST, the 525 KV switchyard (FK) circuit breakers PL925 and PL928 opened and isolated NAN-X01. This was immediately followed by the opening of Unit 3's Train B non-Class 1E 13.8 kV Intermediate Switchgear Bus NAN-S06 normal supply breaker NAN-S06C (resulting in a loss of power to Unit 3's NAN-S06 and NAN-S04) and Unit 2's Train A non-Class 1E 13.8 kV Intermediate Switchgear Bus NAN-S05 normal supply breaker NAN-S05D (resulting in a loss of power to Unit 2's NAN-S03 and NAN-S05).

- F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no failures of components with multiple functions were involved.

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- G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures that rendered a train of a safety system inoperable were involved.

- H. Method of discovery of each component or system failure or procedural error:

The cable fault located at the spliced area was discovered during an Engineering investigation immediately following the event. There were no procedural errors which contributed to this event.

- I. Cause of Event:

An investigation of this event was conducted in accordance with the APS Incident Investigation Program. As part of the investigation, a root cause of failure analysis of the spliced cable was performed by an APS laboratory. As discussed in Section I.E, the evaluation has determined that the failure mechanism is moisture intrusion in the spliced section of one of the Phase A cables located within a manhole between NAN-X01 and Unit 3's Train B non-Class 1E 13.8 kV Switchgear Bus (NAN-S06), which resulted in a phase-to-ground fault on Phase A and a current differential between Phase A and Phases B and C. Based on the information obtained from the APS laboratory, APS Engineering has determined that the moisture intrusion occurred due to inadequate application of Raychem heat shrink insulating material during the original cable installation in 1981 by Bechtel personnel (contractor, nonlicensed) (SALP Cause Code A: Personnel Error).

- J. Safety System Response:

Following the loss of offsite power to Unit 2's Train A and Unit 3's Train B Class 1E 4.16 kV buses, the respective Train A and Train B Emergency Diesel Generators started and energized their Train A and Train B ESF buses within the Technical Specification time requirement. Both Unit 2 and Unit 3's load sequencers initiated a Load Shed signal and subsequently resequenced the following safety systems on the respective buses as required by design:

Control Room Essential Ventilation (VI), Diesel Generator Essential Ventilation (VJ), Essential Battery Chargers and Voltage Regulators reenergized (BYC)(EI), Containment Normal Air Handling Units (AHU)(NH) restarted, Control Element Drive Mechanism Normal Air Handling Units (AHU)(AA)

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restarted, Auxiliary Feedwater Pump (P)(BA), Essential Cooling Water Pumps (P)(BI), Essential Spray Pond Pumps (P)(BI), and Essential Chillers (CHU)(KM).

K. Failed Component Information:

Not applicable - no component failures were involved.

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

As part of the investigation, it was determined that no safety limits were violated and that the event (i.e., loss of offsite power) is bounded by previous analyses contained in the Updated Final Safety Analysis Report Chapters 6 and 15. The Unit 2's Train A and Unit 3's Train B Emergency Diesel Generators started properly and assumed the loads on the respective trains of the Class 1E 4.16 kV buses. The safety systems required to functioned performed as designed.

The event in Unit 2 and 3 did not result in any challenges to fission product barriers or result in any releases of radioactive materials. There were no safety consequences or implications as a result of the events. The events did not adversely affect the health and safety of the public.

III. CORRECTIVE ACTION:

A. Immediate:

APS Operations personnel (utility, nonlicensed) quarantined Startup Transformer NAN-X01 and informed senior plant management.

Transformer oil analysis and doble and electrical meggar testing revealed that no damage to the transformer had occurred as a result of the event.

A visual inspection of the Phase A cable disclosed physical damage (i.e., burn marks). The Phase A cable was respliced and megged.

B. Action to Prevent Recurrence:

During the next NAN-X01 outage, APS Engineering will perform additional testing to determine if other cables were inadequately spliced. APS regards this to be an isolated event and that had the cable been spliced appropriately, this event would not have occurred. Therefore, no additional action is being taken.

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IV. PREVIOUS SIMILAR EVENTS:

No other previous events have been reported pursuant to 10CFR50.73 where a faulted section of spliced cable resulted in a loss of offsite power.

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