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## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8908040189 DOC.DATE: 89/07/27 NOTARIZED: NO DOCKET #  
 FACIL:STN-50-529 Palo Verde Nuclear Station, Unit 2, Arizona Publi 05000529  
 AUTH.NAME AUTHOR AFFILIATION  
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 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 89-001-01:on 890103,ESF actuation caused by loss of  
 power to Class 1E 4.6 kv busses.

W/8 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 7  
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:Standardized plant.

05000529

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NRR/DEST/MTB 9H	1 1	NRR/DEST/PSB 8D	1 1
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NRR/DLPQ/HFB 10	1 1	NRR/DLPQ/PEB 10	1 1
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NUDOCS-ABSTRACT	1 1	<del>REG FILE</del> 02	1 1
RES/DSIR/EIB	1 1	RES/DSR/PRAB	1 1
RGN5 FILE 01	1 1		
EXTERNAL: EG&G WILLIAMS,S	4 4	FORD BLDG HOY,A	1 1
L ST LOBBY WARD	1 1	LPDR	1 1
NRC PDR	1 1	NSIC MAYS,G	1 1
NSIC MURPHY,G.A	1 1		

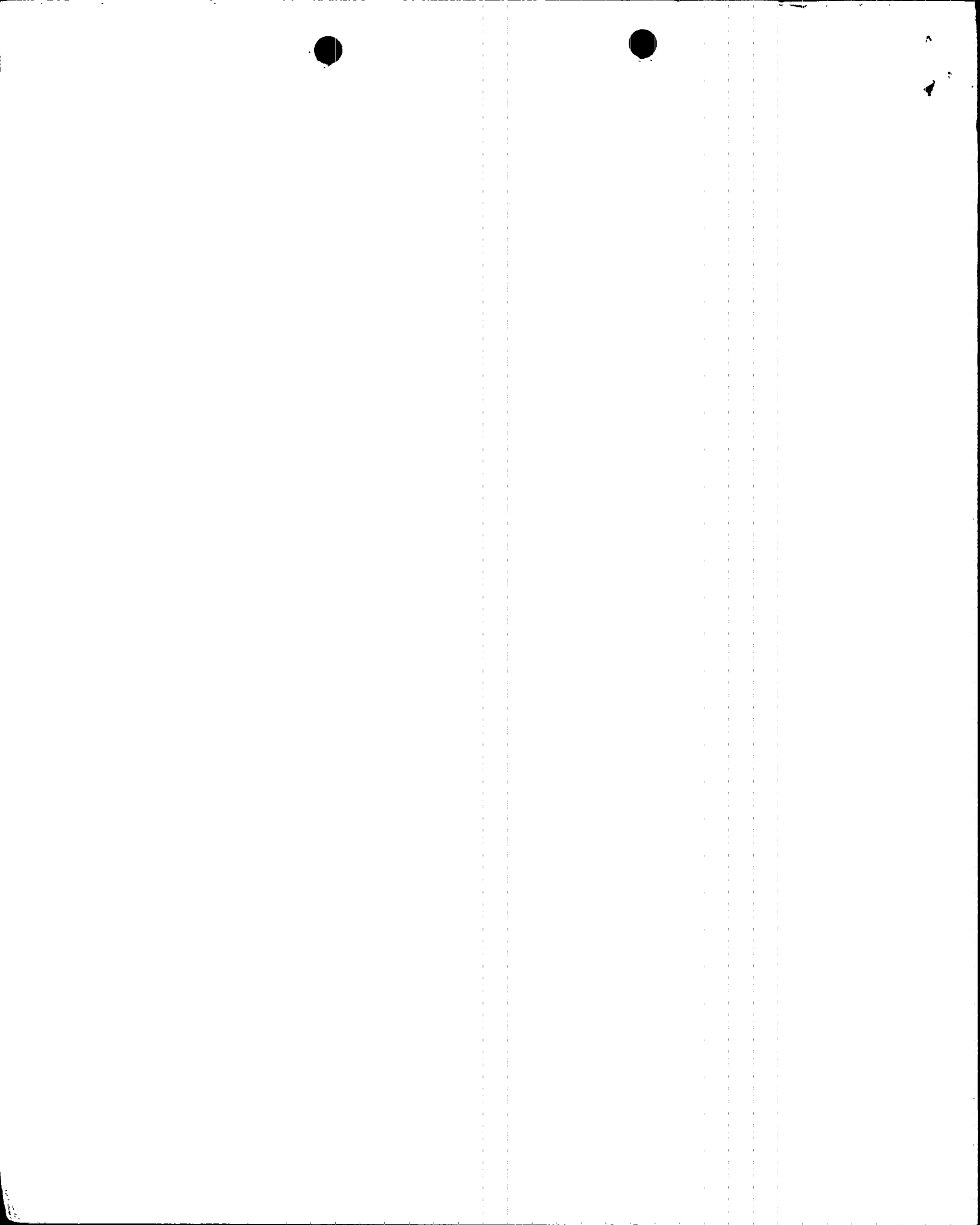
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Arizona Public Service Company

PALO VERDE NUCLEAR GENERATING STATION  
P O BOX 52034 • PHOENIX, ARIZONA 85072-2034

192-00503-JGH/TDS/JEM  
July 27, 1989

U. S. Nuclear Regulatory Commission  
NRC Document Control Desk  
Washington, D.C. 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 2  
Docket No. STN 50-529 (License NPF-51)  
Licensee Event Report 89-001-01  
File: 89-020-404

Attached please find Supplement Number 1 to Licensee Event Report (LER) No. 89-001-00 prepared and submitted pursuant to the requirements of 10CFR 50.73. In accordance with 10CFR 50.73(d), we are herewith forwarding a copy of this report to the Regional Administrator of the Region V Office.

If you have any questions, please contact T. D. Shriver, Compliance Manager at (602) 393-2521.

Very truly yours,

*J. G. Haynes*

J. G. Haynes  
Vice President  
Nuclear Production

JGH/TDS/JEM/kj

Attachment

cc: W. F. Conway (all w/a)  
D. B. Karner  
E. E. Van Brunt, Jr.  
J. B. Martin  
T. J. Polich  
M. J. Davis  
A. C. Gehr  
INPO Records Center

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## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)  
Palo Verde Unit 2

DOCKET NUMBER (2)

0 5 0 0 0 5 2 9 1 OF 0 6

PAGE (3)

TITLE (4)

ESF Actuation Caused by Loss of Power to Class 1E 4.16 kv Busses

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		DOCKET NUMBER(S)							
0	1	0	3	8	9	8	9	0	0	1	0	7	2	7	8	9	N/A	0 5 0 0 0 0
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)															
1			20.402(b) X 50.73(a)(2)(iv) 73.71(b)															
POWER LEVEL (10)			20.406(a)(1)(i) 50.38(c)(1) 73.71(c)															
1 0 0			20.406(a)(1)(ii) 50.38(c)(2) OTHER (Specify in Abstract below and in Text, NRC Form 366A)															
			20.406(a)(1)(iii) 50.73(a)(2)(i) 50.73(a)(2)(vii)(A)															
			20.406(a)(1)(iv) 50.73(a)(2)(ii) 50.73(a)(2)(vii)(B)															
			20.406(a)(1)(v) 50.73(a)(2)(iii) 50.73(a)(2)(ix)															

## LICENSEE CONTACT FOR THIS LER (12)

NAME  
Timothy D. Shriver, Compliance Manager

TELEPHONE NUMBER

AREA CODE  
6 0 2 3 9 3 - 2 5 2 1

## 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
C	E1A	X1F1M1R	W11210	Y					

## SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) ☒ NO

EXPECTED SUBMISSION DATE (15)

MONTH DAY YEAR

## ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

At 1940 MST on January 3, 1989, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION) at approximately 100 percent power when a total loss of offsite power to the class 1E 4.16 kv busses 2E-PBA-S03 and 2E-PBB-S04 occurred. The loss of power (LOP) to busses 2E-PBA-S03 and 2E-PBB-S04 generated an Engineered Safety Features (ESF) signal which automatically started both "A" and "B" Diesel Generators. The diesel generators started satisfactorily and assumed the loads on the 4.16 kv class 1E busses.

At approximately 1959 MST on January 3, 1989 a Notification of Unusual Event (NUE) was declared due to the loss of both offsite power sources to the in-plant class 1E busses. The NUE was terminated at approximately 1648 MST on January 4, 1989 after offsite power was restored to one of the class 1E 4.16 kv busses.

The loss of power (LOP) was caused by a reduced impulse withstand voltage rating due to rain saturation of contamination on the ESF transformer bushings, and a possible ground potential rise attributed to lightning in the area. This allowed a fault to initialize at the ESF transformer bushings. The contamination is a build up of mineral deposits from misting of the cooling towers. Two bushings on each transformer failed due to the fault and were replaced.



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104  
EXPIRES: 8/31/88

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Palo Verde Unit 2	05000529	89	001	01	02	OF	06

TEXT (If more space is required, use additional NRC Form 366A's) (17)

## I. DESCRIPTION OF WHAT OCCURRED:

## A. Initial Conditions:

At 1940 MST on January 3, 1989, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION) at approximately 100 percent power.

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

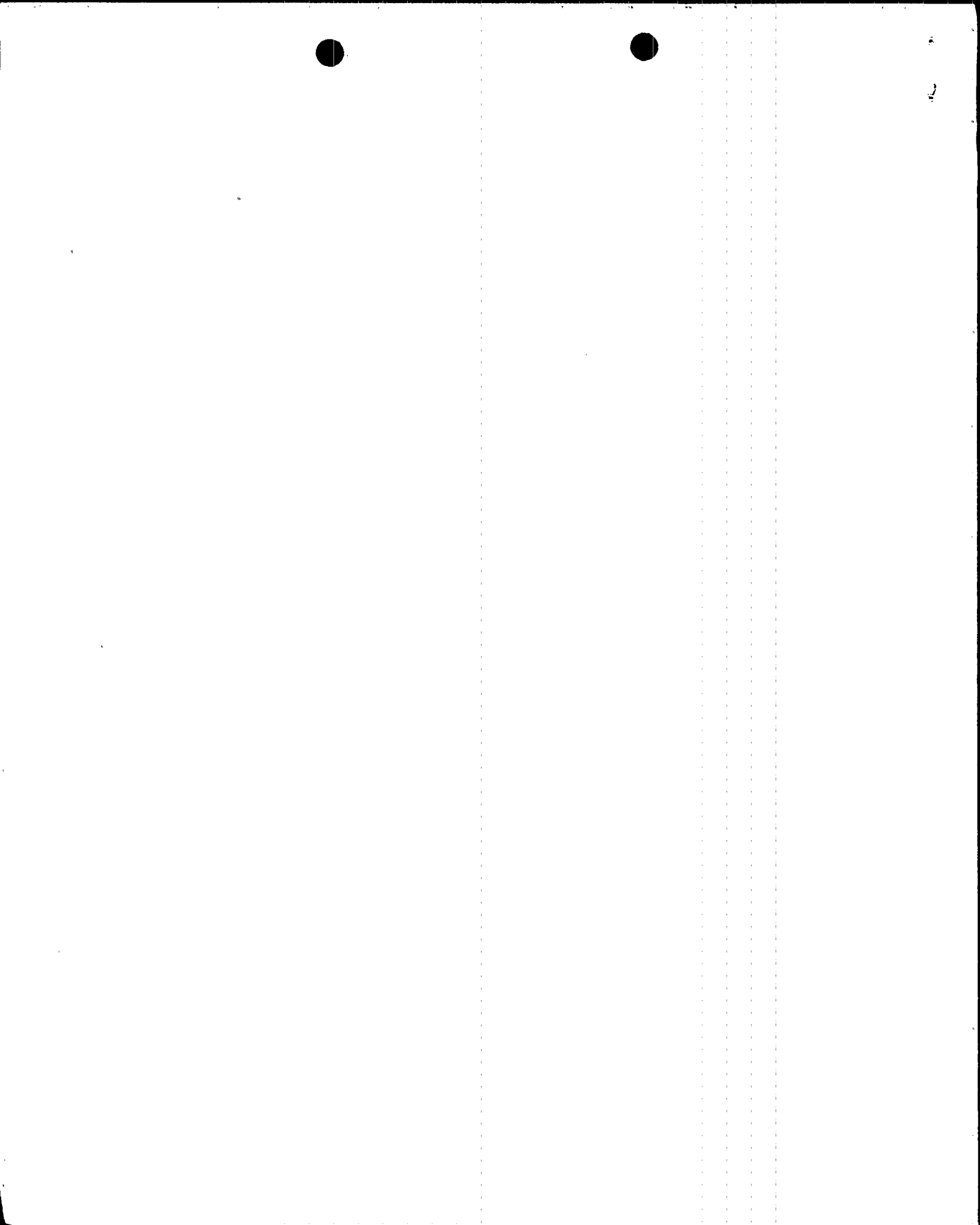
Event Classification: An event or condition that resulted in an automatic actuation of an Engineered Safety Feature (ESF)(JE).

At approximately 1940 MST on January 3, 1989, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION) when a complete loss of offsite power to the 4.16 kv class 1E busses (BU)(EB) 2E-PBA-S03 and 2E-PBB-S04 occurred. The loss of power (LOP) was caused by a reduced impulse withstand voltage rating due to rain saturation of contamination on the ESF transformer bushings, and a possible ground potential rise attributed to lightning in the area. This allowed a fault to initialize at the ESF transformer bushings. The contamination is a build up of mineral deposits from misting of the cooling towers. ESF Service Transformer Normal Supply Breakers (BKR)(EA) 2E-NAN-S03A and 2E-NAN-S04A tripped on Instantaneous Overcurrent and Phase Differential which caused a LOP to the class 1E busses 2E-PBA-S03 and 2E-PBB-S04.

Due to the LOP on class 1E busses 2E-PBA-S03 and 2E-PBB-S04 an ESF LOP signal was generated which load shed the busses and automatically started the "A" and "B" Emergency Diesel Generators (DG)(EK). The DG's started and assumed the loads on 2E-PBA-S03 and 2E-PBB-S04 as designed. Technical Specification (T.S.) Limiting Condition for Operation (LCO) 3.8.1.1 ACTIONS "a" and "d" were entered at 1940 MST on January 3, 1989.

The loss of both offsite power sources to the in-plant class 1E busses led to the declaration of a Notification of Unusual Event (NUE) at approximately 1959 MST on January 3, 1989 in accordance with approved Emergency Plan Implementing Procedures. At approximately 2010 MST on January 3, 1989 the appropriate state and local agencies were notified via the Notification and Alert Network (NAN). The Nuclear Regulatory Commission (NRC) Operations Center was notified at approximately 2034 MST on January 3, 1989 via the Emergency Notification System (ENS). The NUE was reported in Special Report 2-89-001 on January 9, 1989.

Following the LOP load shed the Control Room Operators (utility, licensed) identified that the supply breaker for non-class 1E 480





## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

volt Motor Control Center (MCC)(EC)(NHN-M72) was open due to a lockout relay (86)(EA) trip. Protective Relaying and Control (PR&C) personnel (utility, non-licensed) inspected the breaker and found no tripped flags and no indication of a problem in the breaker. The Shift Supervisor (utility, licensed) directed the operator to reset the 86 lockout and close the breaker. The breaker closed as designed, and no additional problems were experienced with the breaker.

Troubleshooting and rework of the ESF transformers was conducted in accordance with approved work control documents. It was identified that two bushings on each transformer were damaged and the bushings were replaced. The ESF transformers were not damaged. After satisfactory completion of appropriate retests, ESF transformer 2E-NBN-X04 was energized from offsite power at approximately 1438 MST on January 4, 1989. At approximately 1646 MST on January 4, 1989, transformer 2E-NBN-X04 was paralleled with "B" diesel generator and offsite power was restored to class 1E bus 2E-PBB-S04.

At approximately 1648 MST on January 4, 1989 the NUE was terminated due to offsite power being restored to one class 1E 4.16 kv bus.  
LCO 3.8.1.1 ACTION "d" was then exited.

At approximately 1808 MST on January 4, 1989, transformer 2E-NBN-X03 was energized from offsite power. At approximately 1925 MST on January 4, 1989, transformer 2E-NBN-X03 was paralleled with "A" diesel generator and offsite power was restored to class 1E bus 2E-PBA-S03. LCO 3.8.1.1 ACTION "a" was then exited.

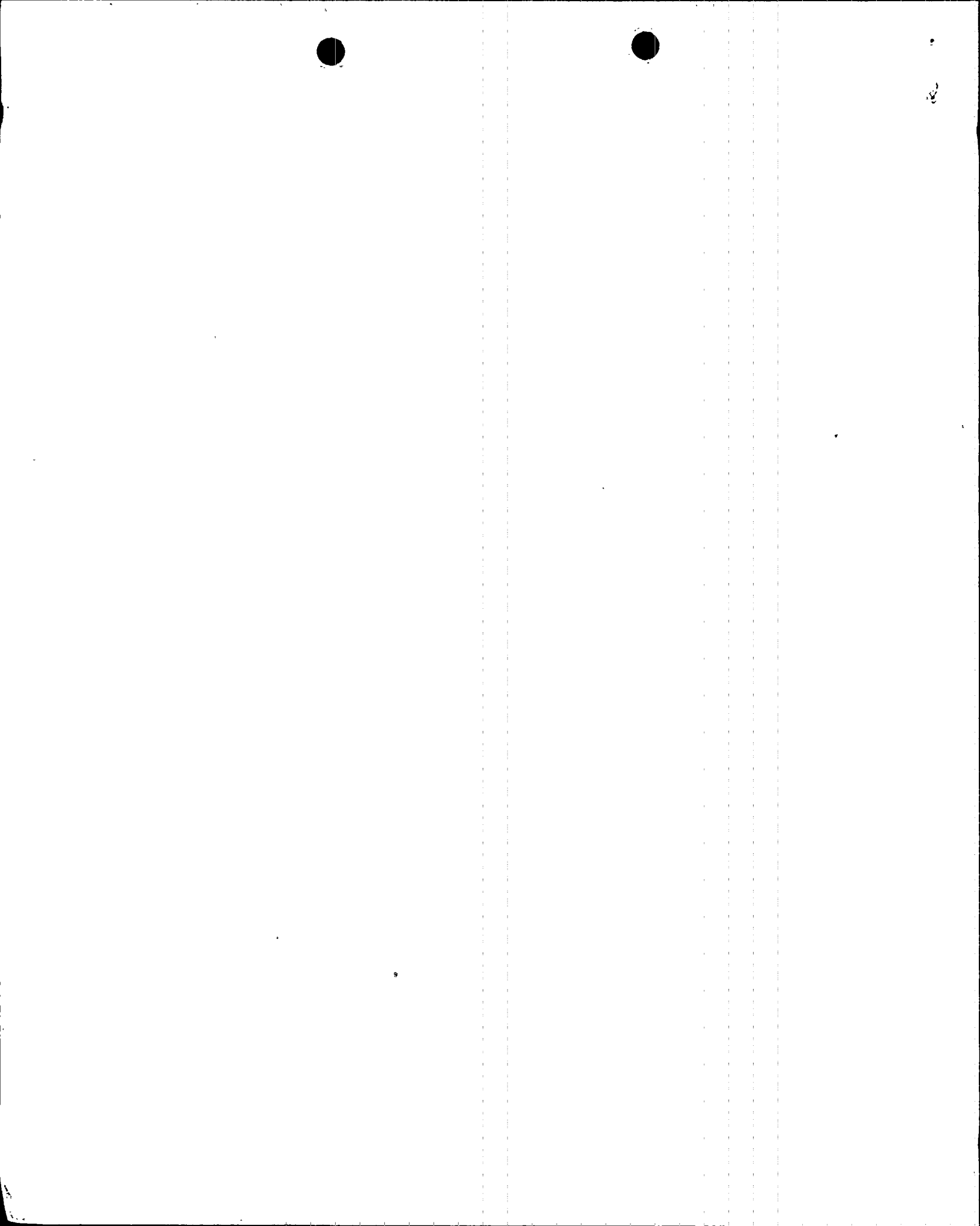
The response of the Operations staff to the LOP and their subsequent recovery actions were both appropriate and timely. There were no operator errors that contributed to the event.

- 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 that contributed to the event.

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

The cause of the failure of the bushings was due to a reduced impulse withstand voltage rating due to rain saturation of contamination of the ESF transformer bushings, and a possible ground potential rise attributed to lightning in the area. This allowed a fault to initialize at the ESF transformer bushings. The contamination is a build up of mineral deposits from misting of the cooling towers.



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

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TEXT (If more space is required, use additional NRC Form 368A's) (17)

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

The failed bushings created a line to ground fault and caused the transformer supply breakers to trip open creating the LOP to the class 1E 4.16 kv busses.

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

Not applicable - the failed bushings do not have multiple functions.

- G. For 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 safety system trains were rendered inoperable due to this event.

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

The failed bushings were identified during troubleshooting/rework of the ESF transformers.

- I. Cause of Event:

The cause of the event has been determined to be a reduced impulse withstand voltage rating due to rain saturation of contamination on the ESF transformer bushings, and a possible ground potential rise attributed to lightning in the area. This allowed a fault to initialize at the ESF transformer bushings. The contamination is a build up of mineral deposits from misting of the cooling towers.

- J. Safety System Response:

The following safety systems actuated in response to the LOP. These responses are in accordance with system design.

1. Diesel Generators A and B
2. Control Room Essential Ventilation A and B
3. All essential battery chargers and voltage regulators re-energized.
4. Auxiliary Feedwater Pump B
5. Essential Cooling Water Pumps A and B
6. Essential Spray Pond Pumps A and B
7. Essential Chillers A and B
8. Battery Room Essential Exhaust Fans A and B
9. Condensate Transfer Pumps A and B
10. Diesel Generator Essential Ventilation Units A and B



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

## K. Failed Component Information:

The failed bushings are manufactured by Westinghouse and are style #234C115G05.

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

Throughout the event, the plant remained stable at approximately 100 percent power. Diesel Generators A and B started and assumed all safety related loads as required. The event did not result in any challenges to fission product barriers or result in any releases of radioactive materials. Therefore, there was no threat to the health and safety of the public.

## III. CORRECTIVE ACTIONS:

## A. Immediate:

Two failed bushings on each transformer were replaced. The transformers were inspected/tested and found not to be damaged before re-energizing them.

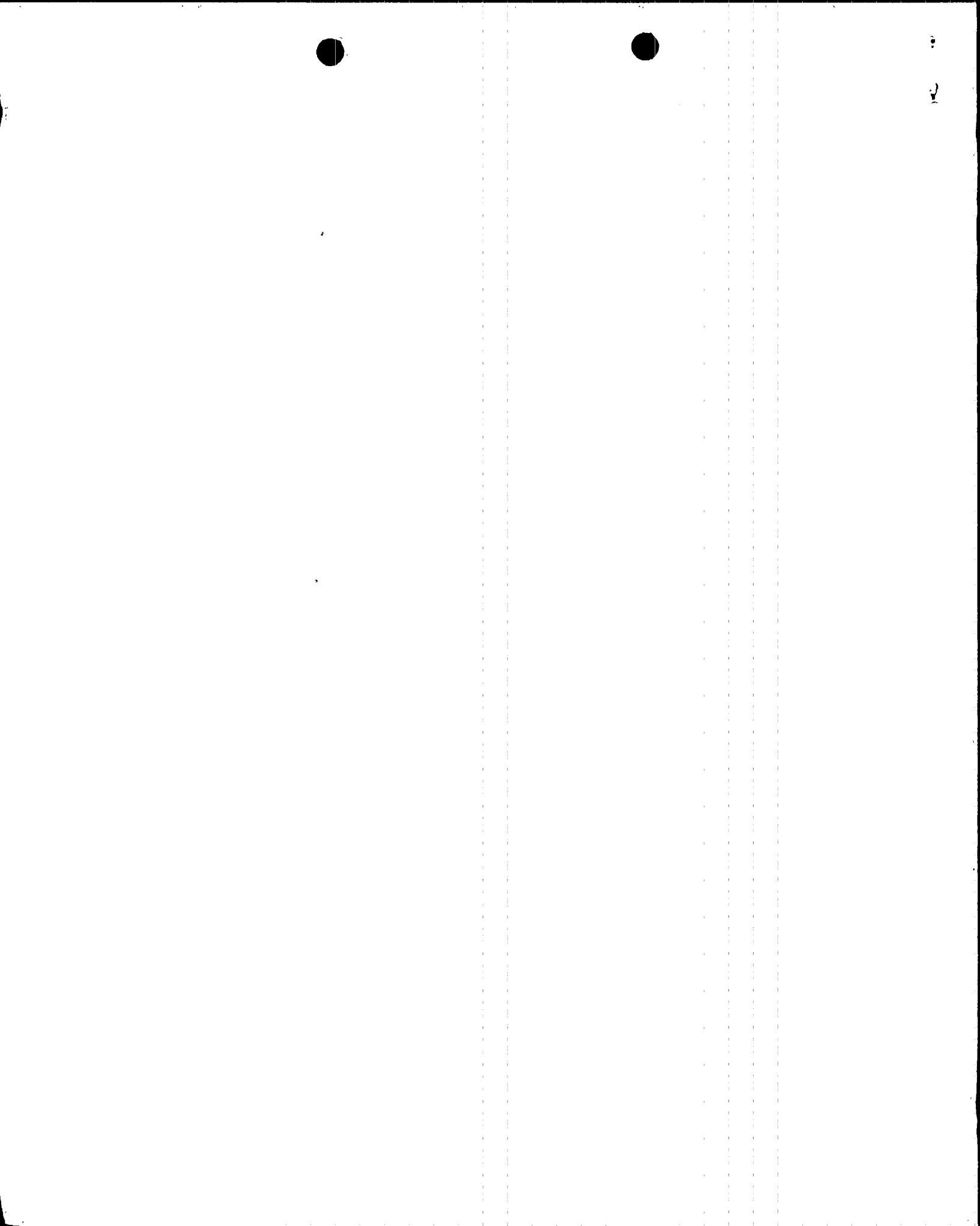
## B. Action to Prevent Recurrence:

Several corrective actions have been or will be implemented, in all three (3) PVNGS units, to prevent recurrence. They include:

- Installation of a drip loop on each conductor leading to the 15 kv bushings of each ESF transformer has been completed in all three PVNGS units.
- The bushings on each ESF transformer in all three PVNGS units were cleaned.
- Creepage extenders have been installed on the ESF transformer high side bushings in Unit 2. In Units 1 and 3 creepage extenders have been installed on one ESF transformer and will be installed on the other ESF transformers during the present outages.
- A program will be implemented for routine washing of all bushings, insulators and other porcelain devices subject to cooling tower drift. This program is expected to be implemented by August 31, 1989.

## IV. PREVIOUS SIMILAR EVENTS:

There have not been any previous similar events reported. Other events reporting a LOP to class 4.16 kv busses involved various causes (i.e.,



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

personnel error, equipment malfunction). No previous LOP event was caused by a reduced impulse withstand voltage rating due to rain saturation of contamination on the ESF transformer bushings. Therefore, no previous actions to prevent recurrence could have prevented this event.

