Arizona Public Service Company
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

192-00923-JML/BAG/KR
March 15, 1995

JAMES M. LEVINE
VICE PRESIDENT
NUCLEAR PRODUCTION

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, D.C. 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 95-001-00

Attached please find Licensee Event Report (LER) 95-001-00 prepared and submitted pursuant to 10CFR50.73. This LER reports an entry into Techinical Specification 3.0.3 due to a degraded grid voltage condition. In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV. If you have any questions, please contact Burton A. Grabo, Section Leader, Nuclear Regulatory Affairs, at (602) 393-6492.

Sincerely,

James M. Levine

JML/BAG/KR/pv

Attachment

cc: L. J. Callan (all with attachment)
K. E. Perkins
K. E. Johnston
INPO Records Center

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LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Palo Verde Unit 1	0 5 0 0 0 5 2 8	1 OF 0 7

TITLE (4)

Entry Into TS 3.0.3 Due to Degraded Grid Voltage

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 NUMBERS
									N/A	0 5 0 0 0
0 2	1 5	9 5	9 5	- 0 0 1	- 0 0	0 3	1 5	9 5	N/A	0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL(10) 1 0 0		20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		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)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
Burton A. Grabo, Section Leader, Nuclear Regulatory Affairs	AREA CODE 6 0 2 3 9 3 - 6 4 9 2

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

At approximately 0850 MST on February 15, 1995, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) operating at approximately 100 percent power when Control Room personnel were notified by the Energy Control Center (ECC) personnel that the Palo Verde switchyard voltage had dropped below the administratively imposed limit of 525 kV for approximately 2.5 minutes at approximately 0625 MST (the lowest voltage reading observed by ECC was approximately 518 kV). Because of the potential for a double sequencing event (previously reported in LER 528/93-011-01), Unit 1 requires the switchyard voltage to be at or above 524 kV for both offsite circuits to be operable. For approximately 2.5 minutes, both offsite circuits were inoperable. In addition, both of the Class 1E Engineered Safety Features (ESF) buses were also considered inoperable and a Technical Specification Limiting Condition for Operation (TS LCO) 3.0.3 existed.

An investigation determined that the ECC personnel had not anticipated the severity of the Palo Verde switchyard voltage drop during the concurrent performance of two normal activities: lowering VARs and removing a transmission line from service. As corrective action, during the subsequent line outages required to complete the Salt River Project (SRP) transmission line construction, ECC and Unit 1 Control Room personnel were prepared for potential voltage drops and took appropriate precautionary actions.

There have been no previous similar events reported pursuant to 10CFR50.73.

1. REPORTING REQUIREMENT:

This LER 528/95-001-00 is being written to report an event that resulted in a condition prohibited by the plant's Technical Specifications (TS) as specified in 10 CFR 50.73(a)(2)(i).

Specifically, at approximately 0850 MST on February 15, 1995, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) operating at approximately 100 percent power when Control Room personnel (utility, licensed) were notified by the Energy Control Center (ECC) personnel (utility, nonlicensed) that the Palo Verde switchyard (FK) voltage had dropped below the administratively imposed limit of 525 kV for approximately 2.5 minutes at approximately 0625 MST (the lowest voltage reading observed by ECC was approximately 518 kV). Because of the potential for a double sequencing event (see Section 8 ADDITIONAL INFORMATION), Unit 1 requires the switchyard voltage to be at or above 524 kV for both offsite circuits (EA) to be operable. For approximately 2.5 minutes, both offsite circuits were inoperable. In addition, both of the Class 1E Engineered Safety Features (ESF) buses (EB) were also considered inoperable and a Technical Specification Limiting Condition for Operation (TS LCO) 3.0.3 existed.

2. EVENT DESCRIPTION:

On the morning of February 15, 1995, ECC personnel contacted Unit 1 Control Room (CR) personnel to lower VARs in order to lower the voltage on the offsite transmission network (i.e., grid). One method for ECC personnel to manage the grid voltage is to request Palo Verde CR personnel to raise or lower (boost or buck) VARs. Therefore, a request to lower VARs on a cool morning with a light grid load would be considered a normal activity for both ECC and CR personnel. Coincident with managing the grid voltage, the ECC personnel were preparing to remove power from both of the Westwing 525 kV transmission lines for personnel safety reasons to support the Salt River Project (SRP) construction of a new transmission line that would cross over the two Westwing lines. Removing a transmission line from service is also considered a normal activity for ECC personnel. However simultaneously removing both lines from service had not been performed previously by the onshift ECC crew.

Both the day shift ECC personnel and the Unit 1 night shift CR personnel coordinated the effort to remove the Westwing lines from service. Telephone communications were established between the ECC and Unit 1 CR personnel prior to and during this evolution. Palo Verde switchyard voltage was approximately 529 kV and MVARs were flowing into the Palo Verde switchyard from the Westwing lines. Units 1 and 3 were in a "buck" condition, absorbing approximately 100+ MVARs. At approximately 0623 MST, the Westwing 1 line was deenergized and within a few seconds a

Palo Verde low switchyard voltage alarm came in at the ECC, indicating approximately 525.5 kV. At approximately 0625 MST, the Westwing 2 line was deenergized and the Palo Verde switchyard voltage dropped below 525 kV. The ECC computer system recorded the Palo Verde switchyard voltage to have dropped to approximately 521.2 kV. ECC personnel observed an instantaneous drop in switchyard voltage to a low of approximately 518 kV. At that time, ECC personnel requested Unit 1 CR personnel to raise the VARs by 100 MVARs in order to restore Palo Verde switchyard voltage. Unit 1 CR personnel coordinated the effort to raise VARS with Unit 3 CR personnel and the Palo Verde switchyard voltage returned to approximately 528 kV. At the time of the event, Unit 2 was in its fifth refueling outage with the core (AC) offloaded to the spent fuel pool (ND). The coordination effort between the unit CR personnel took approximately 2.5 minutes which accounts for the switchyard voltage drop lasting approximately 2.5 minutes.

When the degraded grid condition (i.e., less than 525 kV) was reported to Unit 1 CR personnel by ECC personnel via the ongoing telephone communication at approximately 0625 MST, Unit 1 CR personnel apparently did not understand the magnitude of the voltage drop. A nominal drop in grid voltage would be the expected result following the deenergization of a transmission line and boosting VARs as requested by ECC personnel would be the normal response activity by CR personnel. At the time of the event, Unit 1 night shift CR personnel were not aware that a degraded grid condition requiring additional action had occurred.

ECC guidance was in place at the time of the event to ensure that the Palo Verde switchyard voltage is maintained within the administratively imposed limits and that ECC personnel are to take immediate action to restore Palo Verde switchyard voltage and to promptly notify Unit 1 CR personnel if and when voltage deviates from the acceptable limits. The guidance also provides for four daily reviews (0300, 0900, 1500, 2100 MST) of the Palo Verde 525 kV bus voltage and for ECC notification to advise Unit 1 CR personnel of any anomalies.

At approximately 0850 MST, ECC personnel notified Unit 1 CR personnel to relay specific low voltage levels and times (06:24:58 to 06:27:29) that the switchyard voltage drop had occurred to ensure accurate log entries. Based on the information provided by ECC, in accordance with an approved procedure, CR personnel entered and exited TS LCO 3.8.1.1 ACTION d for two offsite circuits inoperable.

At the time of the event, a new degraded grid voltage procedure was in the review and approval process which provided required actions to be performed if a degraded grid voltage condition occurred. Calculations demonstrate that Unit 1 requires the switchyard voltage to be at or above 524 kV, while Units 2 and 3 require the switchyard voltage to be at or above 518 kV. This difference is due to additional loads [e.g.,

Water Reclamation Facility (MB)] supplied from Unit 1. The procedure pending approval would have required an entry into TS LCO 3.0.3 since the potential for a double sequencing event exists and, in addition to both offsite circuits being inoperable, the power to both trains of equipment or systems powered by the Class 1E ESF buses would be interrupted. A subsequent entry into TS LCO 3.0.3 was made and exited by Unit 1 Control Room personnel. Unit 3's requirement for switchyard voltage was satisfied throughout the event. Prior to the procedure becoming effective on February 17, 1995, a night order providing similar instruction was issued as an interim measure.

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

As previously reported in LER 528/93-011-01 dated February 6, 1995, safety analyses calculations do not explicitly incorporate postulated ESF time delays associated with the full initiation of a required ESF system which may occur during a double sequencing scenario. Specifically, the current Updated Final Safety Analysis Report (UFSAR) 6.3.3.2.1.2 language with respect to loss of coolant accident (LOCA) analyses states that the actual time delay for safety injection (BP/BQ) flow from the time the safety injection actuation signal (SIAS) (JE) setpoint is reached until pump flow is delivered to the reactor coolant system (RCS) (AB) will not exceed 29 seconds following a SIAS. UFSAR 15.1.5.3.C (Large Steam Line Break during Full Power Operation with Concurrent Loss of Offsite Power) states that within 30 seconds of a SIAS, the operable high pressure safety injection (HPSI) pump is loaded on the emergency diesel generator (EDG) (EK) and reaches full speed, and the HPSI valves are fully open and the operable HPSI delivers full flow. The double sequencing scenario would cause an interruption in the HPSI flow when the loadshed occurred due to the undervoltage relays dropping out and not resetting, resulting in a time delay greater than 30 seconds.

In addition, safety analyses calculations do not explicitly incorporate postulated ESF time delays associated with the full initiation of required ESF system(s) which may occur during a double sequencing scenario. For example, UFSAR 15.1.5.3 shows for steam line (SB) break scenarios that HPSI pumps reach full speed (safety injection flow begins) 30 seconds after a SIAS is generated. The time delay associated with double sequencing during a steam line break would exceed the assumed 30 second time delay.

Also, UFSAR 6.3.3.2.1.2 indicates for a large break LOCA that the actual time delay (for safety injection pump flow) will not exceed 29 seconds following a SIAS. The double sequence scenario would cause an interruption in the HPSI flow when loadshed occurred due to the undervoltage relays dropping out and not resetting. The resulting time delay for providing safety injection pump flow would therefore exceed

the 29 seconds specified in the UFSAR. In addition, the UFSAR LOCA analyses assume a loss of offsite power for safety injection pumps (except containment spray pumps) and therefore is not susceptible to the double sequencing scenario. However, this analyses does not necessarily bound a LOCA in a double sequence scenario.

LOCA analyses do not credit safety injection pump flow until the safety injection tanks are empty. UFSAR Table 6.3.3.2-1 indicates that SI pump flow is credited a minimum of 55.8 seconds after the break and a maximum of 224.1 seconds after the break, for those breaks analyzed. Estimates for reestablishing HPSI flow in a double sequencing scenario are approximately 51 to 57 seconds for the LOCA which credits flow at 55.8 seconds. However, details are not provided in this table regarding the time delay when the SIAS signal is generated to facilitate a detailed calculation of actual delay time between SIAS signal and full safety injection flow. The event did not result in any challenges to the fission product barriers or result in any releases of radioactive materials. This event did not adversely affect the safe operation of the plant or the health and safety of the public.

4. CAUSE OF THE EVENT:

An investigation was performed in accordance with the APS Corrective Action Program. The investigation determined that the ECC personnel had not anticipated the severity of the Palo Verde switchyard voltage drop during the concurrent performance of two normal activities: lowering VARs and removing a transmission line from service (SALP Cause Code X: Other). Simultaneously removing both transmission lines from service had not been performed previously. No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to this event. There were no procedural or personnel errors which contributed to this event.

5. STRUCTURES, SYSTEMS, OR COMPONENTS INFORMATION:

Although two of the five offsite 525 kV transmission lines were removed from service to allow for the construction of a new 525 kV transmission line, there are no indications that any structures, systems, or components were inoperable at the start of the event which contributed to this event. No failures of components with multiple functions were involved. No failures that rendered a train of a safety system inoperable were involved. There were no safety system actuations and none were required.

6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE:

During the subsequent line outages required to complete the SRP transmission line construction, ECC and Unit 1 CR personnel were

prepared for potential voltage drops. Both Westwing transmission lines remained deenergized during the day, however, only the Westwing 1 line was reenergized at night and deenergized in the morning until the construction was completed. In addition, ECC personnel ensured that minimal VAR transfer on the energized Westwing 1 line existed prior to deenergization in order to manage the grid perturbation, and maintained the grid voltage such that the deenergization of the Westwing 1 line did not cause the Palo Verde switchyard voltage to drop below the administratively imposed limit of 525 kV.

Following the event, APS personnel met with the ECC operations shift supervisor to reiterate that continued operation of the Palo Verde units depends on maintaining the Palo Verde switchyard voltage within the administratively imposed limits, and to reinforce the requirement for ECC to immediately notify Palo Verde Unit 1 in the event that the administratively imposed limit is not met.

The new degraded grid voltage procedure which provides required actions to be performed by Control Room personnel if a degraded switchyard voltage condition occurs became effective on February 17, 1995.

A night order has been issued with expectations that future ECC communication be directed to the Control Room Supervisor and requiring enhanced unit logging for ECC communications.

A data point on the Unit 1 Plant Monitoring System computer (IO) has been activated to display the voltages for the five transmission lines if and when voltage falls below the setpoint, and subsequently, when voltage is restored.

7. PREVIOUS SIMILAR EVENTS:

No other previous events have been reported pursuant to 10CFR50.73 where a TS LCO 3.0.3 entry has been attributed to degraded grid voltage.

8. ADDITIONAL INFORMATION:

As previously reported in LER 528/93-011-01, at switchyard voltages below 99.5 percent, a Unit 1 trip resulting from a Safety Injection Actuation System actuation, coincident with low switchyard voltages, would result in sequencing of ESF equipment on preferred offsite power. The Class 1E degraded voltage relays would detect a sustained degraded voltage due to the fast bus transfer on non-Class 1E loads from the auxiliary transformer to the startup transformers. The relays would actuate to strip the ESF equipment from the preferred offsite source and resequence it on to the emergency diesel generator. This "double sequencing" causes an interruption in equipment credited with specific response time in the Updated Final Safety Analysis Report Chapter 6 and

TEXT

Chapter 15 safety analysis, and has been determined to be unanalyzed. The Voltage Regulation Improvement Project has been tasked with developing the recommendations for final resolution to ensure that plant vulnerability to this scenario is minimized. Evaluations and scheduling of these recommendations are underway to address this condition.