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SUBJECT: LER 96-007-00:on 961119,surveillance test deficiencies were found during GL 96-01 review leading to TS 3.0.3 entries. Caused by increase in scope of required testing.Supplement will be submitted.W/961217 ltr.

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Palo Verde Nuclear
Generating Station

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192-00984-GRO/DGM/KR
December 17, 1996

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

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Unit s 1, 2, and 3
Docket Nos. STN 50-528, 50-529, and 50-530
License Nos. NPF-41, NPF-51, and NPF-74
Licensee Event Report 96-007-00

Attached please find Licensee Event Report (LER) 96-007-00 prepared and submitted pursuant to 10CFR50.73. This LER reports Technical Specifications 3.0.3 entries due to surveillance test deficiencies found during the Generic Letter 96-01, "Testing of Safety Related Logic Circuits" review. 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 Daniel G. Marks, Section Leader, Nuclear Regulatory Affairs, at (602) 393-6492.

Sincerely,

Gregg R. Overbeck

GRO/DGM/KR/kr

Attachment

cc: L. J. Callan (all with attachment)
K. E. Perkins
K. E. Johnston
INPO Records Center
300054

IE22 1/

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 8

TITLE (4)
Surveillance Test Deficiencies Found During GL 96-01 Review Lead to TS 3.0.3 Entries

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
									Palo Verde Unit 2	0 5 0 0 0 5 2 9
1 1	1 9	9 6	9 6	- 0 0 7	- 0 0	1 2	1 7	9 6	Palo Verde Unit 3	0 5 0 0 0 5 3 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
Daniel G. Marks, 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)

On November 19, 1996, at approximately 1125 MST, Palo Verde Units 2 and 3 were in Mode 1 (POWER OPERATION), when Control Room personnel entered Technical Specification Limiting Condition for Operation (TS LCO) 3.0.3 due to noncompliance with the operability requirements of TS LCO 3.3.2. Control Room personnel invoked the provisions of TS Surveillance Requirement (SR) 4.0.3 to allow up to 24 hours to permit the completion of the missed surveillance. The surveillance was satisfactorily completed within the 24 hours. Control Room personnel exited TS LCO 3.0.3 at approximately 1921 MST on November 19, 1996. The Unit 1 surveillances had been completed within the required surveillance interval during the recent refueling outage. On December 4, 1996, at approximately 1315 MST, Palo Verde Units 1, 2, and 3 were in Mode 1, when Control Room personnel entered TS LCO 3.0.3 due to noncompliance with the operability requirements of TS LCO 3.3.1. Control Room personnel invoked the provisions of TS SR 4.0.3. The surveillance was satisfactorily completed within the 24 hours. Control Room personnel exited TS LCO 3.0.3 by 0056 MST on December 5, 1996 in the three units.

An investigation team performing the requested actions related to Generic Letter (GL) 96-01, "Testing of Safety Related Logic Circuits" concluded that in both cases the surveillance procedures did not meet the TS testing requirements. Similar deficiencies discovered during the ongoing GL 96-01 review of safety systems will be included in a supplement to this LER.

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

1. REPORTING REQUIREMENT:

This LER 529/96-007-00 is being written to report events that resulted in a condition prohibited by the plant's Technical Specifications (TS) as specified in 10 CFR 50.73(a)(2)(i)(B).

Specifically, at approximately 1125 MST on November 19, 1996, Palo Verde Units 2 and 3 were in Mode 1 (POWER OPERATION), operating at approximately 100 percent power when Control Room personnel (utility-licensed operators) declared both trains of Auxiliary Feedwater (AFW) (BA) Engineered Safety Features Actuation System (ESFAS) (JE) instrumentation (AFAS-1 and AFAS-2) inoperable due to exceeding the specified surveillance interval including the maximum allowable extension of 25 percent as specified in TS Surveillance Requirement (SR) 4.0.2, and entered TS Limiting Condition for Operation (LCO) 3.0.3. Control Room personnel invoked the provisions of TS SR 4.0.3 to allow up to 24 hours to permit the completion of the missed surveillance prior to commencing a plant shutdown to comply with TS LCO 3.0.3. The surveillance was satisfactorily completed within the 24 hours. Control Room personnel exited TS LCO 3.0.3 at approximately 1921 MST on November 19, 1996. The Unit 1 surveillances had been completed within the required surveillance interval during the recent refueling outage.

Similarly, at approximately 1315 MST on December 4, 1996, Palo Verde Units 1, 2, and 3 were in Mode 1, operating at approximately 100 percent power when Control Room personnel declared the four channels of the reactor protection system (RPS) (JC) reactor trip breakers inoperable due to exceeding the maximum allowable surveillance interval, and entered TS LCO 3.0.3. Control Room personnel invoked the provisions of TS SR 4.0.3. The surveillance was satisfactorily completed within the 24 hours. Control Room personnel exited TS LCO 3.0.3 by 0056 MST on December 5, 1996 in the three units.

2. EVENT DESCRIPTION:

Prior to the events, on January 10, 1996, NRC issued Generic Letter No. 96-01 (GL 96-01), "Testing of Safety-related Logic Circuits," which requested that all addressees compare electrical schematic drawings and logic diagrams for the reactor protection system, emergency diesel generator (EK) load shedding and sequencing, and actuation logic for the ESF systems against plant surveillance test procedures to ensure that all portions of the logic circuitry, including the parallel logic, interlocks, bypasses, and inhibit circuits, are adequately covered in the surveillance procedures to fulfill the TS requirements. An APS engineering team (other

utility personnel) was created to perform the requested action specified in GL 96-01.

A. NOVEMBER 19, 1996 TS LCO 3.0.3 ENTRY

An additional letter was issued on March 27, 1996 from the NRC to the Nuclear Energy Institute (NEI) summarizing the results of a workshop regarding GL 96-01. The workshop provided an opportunity for the NRC to clarify their position and to respond to industry concerns regarding GL 96-01. Specifically related to the November 19th event was a response to Question 32 located in enclosure 3 of the letter. Question 32 was stated as follows:

> Frequently, an ESF signal is used to preclude inadvertent operator action (for instance, precludes an operator from stopping a SI pump until SI is reset). Do these seal-in contacts need to be tested if the failure of those seal in contacts do not affect the safety function of the system or component? (and if they are not referenced in TS).

Answer 32 of the letter was stated as follows:

> IEEE 279[-1971, "IEEE Standard Criteria for Protection Systems for Nuclear Power Generating Stations"], Section 4.16 requires that protective functions go to completion once initiated and seal-in circuits are generally provided to meet this requirement. Therefore, seal-in circuits perform a safety function and should be tested as part of the ESF logic.

During the GL 96-01 review process, on November 6, 1996, APS Engineering personnel (other utility personnel) determined that this clarification provided the basis necessary to increase the scope of TS equipment associated with the ESFAS instrumentation and that the ESFAS lockout relays were not being tested on a quarterly basis as required by TS SR 4.3.2.1, ESFAS instrumentation. An evaluation was initiated in accordance with the APS Corrective Action Program.

At Palo Verde, lockout relays are designed to seal in actuations to ensure that they proceed to completion even if the initiating condition clears. This is a requirement of IEEE-279-1971, section 4.16, "Completion of Protective Action Once It Is Initiated." The ESFAS lockout relays are tested every 18 months. The Plant Protection System (PPS) (JC) also uses lockout relays on each of the four initiation paths for every ESFAS function except AFAS-1 and AFAS-2. When an initiation path is tripped, the trip condition must be cleared and a keylocked reset pushbutton

TEXT

pressed to reset the initiation path. The PPS lockout relays are tested every quarter. The initial condition under evaluation was not considered an OPERABILITY concern because the redundant lockout relays in the PPS system were being tested quarterly. Further evaluation was pursued to verify that the testing of the PPS lockout relays met the necessary requirements.

As previously stated, AFAS-1 and AFAS-2 do not have PPS lockout relays in order to prevent reactor coolant system (AB) overcooling or steam generator (SG), (AB) overfilling during an AFAS actuation. The AFAS-1 and AFAS-2 provide essential auxiliary feedwater to intact SG(s) following a main steam line (SB) break or loss of main feedwater (SJ). If the difference between SG pressures is greater than 185 psi, the system will not feed the low pressure SG. AFAS-1 and AFAS-2 are unique in that the actuation signals are either "in" or "reset" after the actuation signal clears. When SG level increases to 40.8 percent, the valves which feed the SG will close unless Control Room personnel have overridden them. All other ESFAS signals must be reset manually after the parameter returns to within normal values to operate the equipment or the equipment must be manually overridden by Control Room personnel.

On November 19, 1996, APS Engineering personnel determined that the quarterly surveillances for AFAS-1 and AFAS-2 lockout relays were not being satisfied since there were no redundant lockout relays for AFAS in the PPS system. It was also determined that only Units 2 and 3 were affected because the Unit 1 surveillances were completed within the required surveillance interval during the recent refueling outage. APS Engineering personnel informed Control Room personnel in both Units 2 and 3, and at approximately 1125 MST on November 19, 1996, Control Room personnel declared both trains of AFW ESFAS instrumentation inoperable due to exceeding the specified surveillance interval of TS SR 4.3.2.1 including the maximum allowable extension of 25 percent as specified in TS SR 4.0.2, and entered TS LCO 3.0.3. Control Room personnel invoked the provisions of TS SR 4.0.3 to allow up to 24 hours to permit the completion of the missed surveillance prior to commencing a plant shutdown to comply with TS LCO 3.0.3. The AFAS-1 and AFAS-2 lockout relays were tested satisfactorily under a corrective maintenance work document. The Plant Review Board approved the test results crediting a satisfactory completion of SR 4.3.2.1 within the 24 hours. Control Room personnel exited TS LCO 3.0.3 at approximately 1921 MST on November 19, 1996. There were no safety system responses and none were necessary.

TEXT

B. DECEMBER 4, 1996 TS LCO 3.0.3 ENTRY

During the GL 96-01 review process, on December 4, 1996, APS Engineering personnel determined that an approved surveillance procedure may not independently verify the reactor trip breaker undervoltage and shunt trips as specified in TS SR 4.3.1.1. The surveillance procedure testing method ensured that each of the trip coils of the two respective trip circuits successfully trip the reactor trip breakers. However, the testing method did not independently verify that both the undervoltage and shunt trip initiating circuit contacts change state. The contacts are designed to energize the shunt trip and de-energize the undervoltage coils to trip the reactor trip breakers.

On December 4, 1996, APS Engineering personnel determined that the 18-month surveillances for the reactor trip breakers were not being satisfied since the surveillance test did not demonstrate proper operation of the entire logic for both the undervoltage and shunt trips. APS Engineering personnel informed Control Room personnel in the three units, and at approximately 1315 MST on December 4, 1996, Control Room personnel entered TS LCO 3.0.3 due to noncompliance with TS LCO 3.3.1, Reactor Protection Instrumentation. Control Room personnel invoked the provisions of TS SR 4.0.3 to allow up to 24 hours to permit the completion of the missed surveillance prior to commencing a plant shutdown to comply with TS LCO 3.0.3. The reactor trip breakers were tested satisfactorily under a corrective maintenance work document. The Plant Review Board approved the test results crediting a satisfactory completion of SR 4.3.1.1 within the 24 hours. Control Room personnel exited TS LCO 3.0.3 by 0056 MST on December 5, 1996 in the three units. There were no safety system responses and none were necessary.

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

The ESFAS lockout relays were tested in Units 1, 2, and 3 and no failures were found. A review of corrective maintenance history revealed only one instance where a lockout relay had failed (Unit 1 in 1990). The relay would not energize following testing. The relays are designed as fail safe, therefore, no failures have occurred that would have prevented an ESF actuation lock-in. If an ESFAS signal cleared prior to completing the actuation, and if a lockout relay failed to ensure that the signal is not automatically reset once it was initiated, some of the affected safety related equipment would stop movement to the actuated position, and the sequencer would stop sequencing. If the ESFAS signal returned, the same equipment would resume to its actuated position, and the sequencer would resequence.

TEXT

The reactor trip breakers' undervoltage and shunt trip initiating circuits for the RPS, Supplementary Protection System (SPS) and the manual trip were tested in Units 1, 2, and 3 and no failures were found. The testing deficiency could not have resulted in a loss of safety function without an additional failure that would have been detectable by existing test procedures. A failure of one of the redundant trip initiating circuits in each channel could have been present and remained undetected as long as the other redundant trip circuit remained operable to allow the reactor trip breaker to function properly during the quarterly channel functional test. If all of the reactor trip breakers were assumed to have one of the redundant trip initiating devices fail, a failure of the remaining trip device in two of the four reactor trip breakers would be required for a loss of safety function.

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

4. CAUSE OF THE EVENT:

Independent investigations of these events are being conducted in accordance with the APS Corrective Action Program. As part of the investigations, a determination of the cause of the events has been performed.

The surveillance testing procedures for RPS and ESFAS instrumentation were developed based on requirements specified in the Palo Verde TS, corresponding TS bases, IEEE 279-1971, and IEEE 338-1975, "IEEE Standard Criteria for the Periodic Testing of Nuclear Power Generating Station Class 1E Power and Protection Systems". These standards require system testing from sensor to actuated devices.

The seal-in function of the lockout relays was not included in the testing program because it was not in the signal path from the sensor to the actuated device. APS' position has been that the lockout relays had no safety function, and therefore were not TS equipment. The proper operation of the lockout relay was verified every 18 months during shutdown under a preventative maintenance (PM) program. Since the lockout relays were not included in the TS surveillance testing for the ESF automatic actuation logic, the refueling interval was considered sufficient to maintain the reliability of the relays. Information provided by the NRC as clarification to GL 96-01 stated that the seal-in circuit performs a safety-related function and should be included in the ESF logic testing.

TEXT

Based on this clarification, APS Engineering personnel determined that the lockout relays should be considered part of the ESF automatic actuation logic, and therefore were required to be tested in accordance with TS LCO 3.3.2, ESFAS instrumentation. The cause of the event was attributed to an increase in the scope of required testing following clarification provided by the NRC related to GL 96-01 (SALP Cause Code X: Other).

Current Palo Verde TS require independent verification of the undervoltage and shunt trips for the reactor trip breakers, not the SPS, RPS initiating logic, or the manual trip. There is no specific TS requirement for independent testing of redundant parallel circuits within a channel. Therefore, it would not have been obvious to the procedure writer that the surveillance test should encompass the entire actuating circuit, from the initiating contacts down to the trip coils, not just for the reactor trip breakers. Based on the intent of GL 96-01 and the potential for incomplete testing of safety systems as presented by GL 96-01, APS Engineering personnel took the conservative position that the surveillance test did not demonstrate proper operation of the entire logic for both the undervoltage and shunt trips (SALP Cause Code X: Other).

A previous review of Information Notice (IN) 93-15, "Inadequate Logic Testing of Safety-related Circuits" performed by APS personnel on June 3, 1993, provided an opportunity to discover the testing deficiency. IN 93-15 discusses inadequate testing of the trip functions at a Westinghouse plant. There are significant differences between the Westinghouse and ABB-Combustion Engineering (ABB-CE) RPS designs. In addition, the Westinghouse TS have specific surveillances to test both the automatic contacts and manual trip switch contacts for the undervoltage and shunt trips. The APS review of IN 93-15 determined that the Palo Verde design does not use an automatic shunt trip relay, and therefore, the Palo Verde design was different than the design described in the IN. The review concluded that IN 93-15 did not apply to Palo Verde.

No unusual characteristics of the work location (e.g., noise, heat, poor lighting) directly contributed to these events. There were no personnel or procedural errors which contributed to these events.

5. STRUCTURES, SYSTEMS, OR COMPONENTS INFORMATION:

Although the RPS and ESFAS instrumentation was declared inoperable for a lapsed surveillance requirement, there were no component or system failures involved in these events. No failures of components with multiple functions were involved. No failures that rendered a train of a safety system inoperable were involved.

TEXT

6. CORRECTIVE ACTIONS TO PREVENT RECURRENCE:

Independent investigations of these events are being conducted in accordance with the APS Corrective Action Program. Actions to prevent recurrence are being developed based upon the results of the investigations and will be tracked to completion under the PVNGS Commitment Action Tracking System (CATS). These actions include modifying surveillance test procedures as necessary to comply with the Technical Specifications.

The GL 96-01 review of the protective systems will continue to determine if other testing discrepancies exist. If other discrepancies are discovered, or if information is developed which would significantly change the readers' understanding of the events, a supplement will be submitted.

7. PREVIOUS SIMILAR EVENTS:

Although there have been previous events reported pursuant to 10CFR50.73 within the last three years for missing TS surveillance requirements, the causes discussed in the previous events have not been similar to these events. Therefore, the corrective actions of the previous events would not have prevented these events.