



Palo Verde Nuclear
Generating Station

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10CFR50.73

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192-01100-WEI/SAB/DFH
February 7, 2002

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 1, 2 and 3
Docket No. STN 50-528, 50-529 and 50-530
License No. NPF-41, NPF-51 and NPF-74
Licensee Event Report 2001-005-00**

Attached please find Licensee Event Report (LER) 50-528/2001-005 -00 that has been prepared and submitted pursuant to 10CFR50.73. This LER reports a condition where APS did not meet the requirements of Technical Specification Surveillance Requirements (TSSR) 3.3.1.13 and 3.3.2.5.

In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the NRC Regional Office, NRC Region IV and the Senior Resident Inspector. If you have questions regarding this submittal, please contact Daniel G. Marks, Section Leader, Regulatory Affairs, at (623) 393-6492.

The corrective actions described in this LER are not necessary to maintain compliance with regulations. Arizona Public Service Company makes no commitments in this letter.

Sincerely,

WEI/SAB/DFH/kg
Attachment

cc: E. W. Merschhoff (all with attachment)
J. H. Moorman
J. N. Donohew

JE22

NRC FORM 366
(7-2001)

U.S. NUCLEAR REGULATORY COMMISSION

Estimated burden per response to comply with this mandatory information 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 Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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.

LICENSEE EVENT REPORT (LER)

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

1. FACILITY NAME Palo Verde Nuclear Generating Station Unit 1	2. DOCKET NUMBER 05000528	3. PAGE 1 OF 7
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4. TITLE
Inadequate Surveillance Test for Time Response Testing of HI Log Power Trip Function

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	DOCKET NUMBER
12	11	2001	2001	005	00	02	07	2002	Palo Verde Unit 2	05000529
									FACILITY NAME	DOCKET NUMBER
									Palo Verde Unit 3	05000530

9. OPERATING MODE	1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)								
		20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)					
10. POWER LEVEL	99	20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)					
		20.2203(a)(1)	50.36(c)(1)(i)(A)	50.73(a)(2)(iv)(A)	73.71(a)(4)					
		20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)					
		20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER Specify in Abstract below or in NRC Form 366A					
		20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)						
		20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)						
		20.2203(a)(2)(v)	X 50.73(a)(2)(i)(B)	50.73(a)(2)(vii)						
		20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)						
		20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)						

12. LICENSEE CONTACT FOR THIS LER

NAME Daniel G. Marks, Section Leader, Regulatory Affairs	TELEPHONE NUMBER (Include Area Code) 623-393-6492
--------------------------------------------------------------------	-------------------------------------------------------------

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

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

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On December 11, 2001, plant technicians discovered a procedural inadequacy in the method used for response time testing of the Plant Protection System Log Power Trip. This method did not meet Technical Specification Surveillance Requirements 3.3.1.13, and 3.3.2.5. All three Palo Verde Units were in Mode 1 when the Log Power Trip was declared inoperable. Since the Log Power Trip is not required in Mode 1 operation, no Limiting Condition for Operation Required Action was entered. Cause of the inadequate test method is attributed to inadequate documentation of the system design impact upon the time response testing requirements. Retest using an adequate test procedure was completed on December 21, 2001. The "As Found" response times were all acceptable and the log power channels were returned to operable status. The Surveillance Test Procedure will be updated with a note to reflect the need to conduct log power trip time response testing using the correct signal range.

There have been no previous similar licensee event reported in the last three years.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

1. REPORTING REQUIREMENT(S):

This LER (50-528/2001-005-00) is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B), to report a condition which was prohibited by the plant's Technical Specifications.

Specifically, the tests conducted by Technical Specification Surveillance Requirements 3.3.1.13 and 3.3.2.5, to verify reactor protection system response time of the logarithmic power channels is within limits, were inadequate.

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

The ex-core nuclear instrument (NI) (EIS: JC) system used at Palo Verde was supplied by Combustion Engineering (now Westinghouse).

The four logarithmic (log) power channels provide input to the four channels of the plant protection system (PPS) (EIS: JC). The primary function of the log power circuits is to provide reactor protection during very low power operation. The log power circuits provide reactor protection by monitoring the neutron flux level near the reactor vessel and providing an input to the PPS.

The log power detectors generate electrical pulses when struck by neutrons. The number of pulses is proportional to the number of neutron strikes; consequently, the pulses are proportional to reactor power. The pulses are routed through a preamplifier to signal conditioning circuits in the nuclear instrumentation safety channel assembly.

A bistable comparator card in the PPS system compares the output of the NI drawer to an adjustable setpoint. If the log power level exceeds the technical specification PPS reactor trip setpoint, which is less than or equal to 0.011 percent neutron rated thermal power (NRTP), a reactor trip signal is generated. The log power trip protects the integrity of the fuel cladding and helps protect the reactor coolant pressure boundary in the event of an unplanned criticality from a shutdown condition. In Modes 2, 3, 4, and 5, with the reactor trip circuit breakers closed and the control element assembly (CEA) (EIS: AA) Drive System capable of CEA withdrawal, log power trip protection is required for CEA withdrawal events originating when logarithmic power is less than,

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1E-4 percent (0.0001 percent) NRTP. For events originating above this power level, other trips provide adequate protection. In Modes 3, 4, and 5, with the reactor trip circuit breakers closed, the log power trip also provides protection for boron dilution events.

The NI drawer contains the circuits necessary to convert the detector pulses to signals that represent log power. The NI drawer also contains test circuits, which allow testing of the NI drawer and preamps. The test circuits produce test signals that simulate various log power levels.

The electronics circuits in the NI drawer have two modes of operation. At lower power levels where fewer pulses are generated by the detectors, the electronic circuits operate in the Log Count Rate (LCR) Mode. As power level increases, and the number of pulses increase, the circuit changes mode and enters the Mean Square Voltage (MSV) Mode. The mode change occurs as power exceeds approximately 0.4 percent. It is the output of the LCR card that determines when the mode change occurs. Since the LCR card determines when the mode change occurs, the response time of the LCR card affects the system response time for inadvertent criticality events that begin in the LCR range; including when the setpoint is in the MSV range.

If a sudden increase in power originates at a power level above the LCR range, the response time of the LCR card and mode change circuits is no longer a concern. However, with the technical specification log power reactor trip setpoint presently used at Palo Verde, a log power trip signal will be initiated at less than or equal to 0.011 percent power. That is, a reactor trip signal would be initiated in the LCR range; prior to reaching the MSV range. Therefore, Palo Verde response time testing of the log power channels must be conducted in the LCR range.

3. INITIAL PLANT CONDITIONS:

On December 11, 2001, Units 1, 2, and 3 were in Mode 1 (Power Operation), at approximately 99 percent power. Other than the condition reported herein, there were no structures, systems or components that were inoperable at the start of the event that contributed to the event.

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4. EVENT DESCRIPTION:

On December 11, 2001, while preparing to replace a failed Mean Square Voltage (MSV) card in Unit 2 Channel "D" Log Power Drawer, Instrumentation and Control (I&C) Maintenance and Engineering personnel determined the response time test was inadequate for testing the log power trip function.

Further evaluation revealed the response time test method tested the MSV portions of the log power circuits but did not test the response time of the Log Count Rate (LCR) portions of the log power circuits.

Due to the inadequate response time testing, all four log power channels, in each of the three Palo Verde units were declared inoperable. Since the Limiting Condition for Operation (LCO) of the log power trip is not applicable during Mode 1 operation, no LCO required actions were entered.

Retesting of all TS log power reactor trip response times, with a revised procedure, was completed in all three units on December 21, 2001. The "As Found" response times were all acceptable and the log power channels were returned to operable status.

The following discussion details a historical perspective of the response time testing leading to discovery:

The initial time response testing for the log power trip was performed during the pre-operational phase testing in Unit 1. As prescribed by the vendor (Combustion Engineering), the test was performed by connecting a function generator (external test equipment) to simulate pulses from the neutron detectors. The function generator simulated power levels that were just below, and just above, the TS log power reactor trip setpoint and measured the time for the trip to occur. At that time, the TS log power reactor trip setpoint was in the MSV range at approximately 0.8 percent power.

The test method used in the initial pre-operational phase testing verified that the LCR portion of the circuit was functioning since the output of the LCR card was required to enter the MSV mode. However, the test method did not measure the response time of the LCR circuits. The test method used during pre-operational phase testing used external test equipment, and was difficult to perform. Due to the difficulty in test

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performance, the test method was changed for pre-operational testing in Units 2 and 3. This new method was also incorporated into the periodic response time testing used in the operations phase Surveillance Test Procedure 36ST-9SB42, "Plant Protection System Bistable and Bistable Relay Response Time Test."

The revised surveillance test used built-in test features provided by the design of the NI drawer. The test involved changing the position of the log calibrate test switch to simulate a change in log power from approximately 0.14 percent power to approximately 1.4 percent power. The simulated inputs were appropriate to test the log power trip setpoint because the simulated inputs were in the MSV range. However, the test method did not verify the response time of the LCR circuits. When the log calibrate switch is set to the MSV positions, a test signal is generated that forces the NI drawer into the MSV mode. In this test condition, the LCR card is no longer required to initiate the mode change from LCR to MSV mode, which is contrary to its normal operating condition. During normal operation, the output of the LCR card causes the mode change to occur.

In January of 1988, a change to the technical specification log power reactor trip setpoint occurred. The log power trip setpoint was reduced from approximately 0.8 percent power to less than or equal to 0.011 percent power. This reduction in setpoint placed the log power setpoint in the LCR range. The response time test procedure (36ST-9SB42) was revised to test in the LCR range which required moving the log calibrate switch to a new position. This test method was acceptable and was used for several test performances; however, was not used on all channels in all units.

Between 1991 and December 2001, additional changes were made to the test method. Test signals were injected in the MSV range to initiate the response time testing for the log power trip.

In December of 2001 a retest evaluation was performed to support the replacement of a failed MSV card in Unit 2, Channel "D" NI drawer. Maintenance Engineering and I&C Maintenance personnel determined that it was not necessary to perform response time testing for the replacement MSV card. This determination was based on the fact that the log power setpoints are in the LCR range and the response time of the MSV card is not a factor in determining the response time of the log power trip. However, it was also determined that the response time testing method performed the response time testing in the MSV range and not the LCR range as required.

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5. ASSESSMENT OF SAFETY CONSEQUENCES:

Retesting of all TS log power reactor trip response times, with a revised procedure, was performed in all three units. The "As Found" response times were all acceptable. This provides reasonable assurance that the response times of the log power trips had been within specifications even though previous tests were inadequate. Additionally, channel functional tests are regularly performed via Surveillance Test Procedure, 36ST-9SE06, "Log Power Functional Test," and instrument correlation is performed shiftly by plant operators. These tests demonstrate the Excore Nuclear Instrumentation System Safety Channels for Log Power are operable. Since these tests validate the Log Power circuit was functioning, there is reasonable assurance that the LCR circuit would have always provided the required protection. Therefore, there were no safety consequences.

Since all four channels were demonstrated to be operable in all three units, the condition is not a loss of safety function as defined by 10 CFR 50.73(a)(2)(ix)(A).

No automatically or manually initiated safety system actuations occurred and none were required.

6. CAUSE:

The dual mode used in the circuit design is somewhat unique and plant personnel did not recognize the impact of the two separate circuits on the response time testing methodology. Numerous changes to the test methods and setpoint were implemented and in each case an opportunity to recognize the need to test the time response of the LCR circuit was missed. Collectively, the cause of the inadequate test method is attributed to inadequate documentation of the system design impact upon the time response testing requirements for the system.

7. CORRECTIVE ACTIONS:

Surveillance Test Procedure, 36ST-9SB42 has been revised to correct the test method of the Log Power Trips. Retesting of all channels in all three units was completed on December 21, 2001, and the log channels were returned to operable status.

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To prevent recurrence, a note will be added to the Surveillance Test Procedure, 36ST-9SB42 to reflect the need to conduct log power trip time response testing using the LCR range.

8. PREVIOUS SIMILAR EVENTS:

There have been no previous similar licensee events reported in the last three years.

9. ADDITIONAL INFORMATION:

None