



Palo Verde Nuclear
Generating Station

William E. Ide
Vice President
Nuclear Production

TEL (623) 393-6116
FAX (623) 393-6077

10CFR50.73(a)(2)(i)(B)

Mail Station 7602
P.O. Box 52034
Phoenix, AZ 85072-2034

192-01063-WEI/AKK/DGM/RJH
April 6, 2000

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
Docket No. STN 50-528
License No. NPF-41
Licensee Event Report 2000-002-00**

Attached please find enclosed Licensee Event Report (LER) 50-528/2000-002-00 that has been prepared and submitted pursuant to 10CFR50.73. This LER reports a condition where a degraded solder connection caused one of four channels of the reactor protective system (RPS) instrumentation to become inoperable. A review of plant process data indicated there is firm evidence to suggest that the failed RPS channel was inoperable for approximately 32 hours and that a technical specification LCO required action was not met. No commitments are made to the NRC in this submittal.

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

Sincerely,

WEI/AKK/DGM/RJH/kg

Attachment

cc: E. W. Merschoff (all with attachment)
J. H. Moorman
M. B. Fields
INPO Records Center

NRC FORM 366 (6-1998)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)		Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an 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.

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TITLE (4)

Degraded Solder Joint Causes Inoperability of Channel D Plant Protection System

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 NAME	DOCKET NUMBER
03	08	2000	2000	002	00	04	07	2000	N/A	
									N/A	

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
		<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(2)(v)	<input checked="" type="checkbox"/> X	<input type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)				
POWER LEVEL (10)	100	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(x)				
		<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(iii)	73.71				
		<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iv)	OTHER				
		<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(1)		<input type="checkbox"/> 50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A			
		<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(vii)					

LICENSEE CONTACT FOR THIS LER (12)

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

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	JC	JS	E146	Y					

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 15 single-spaced typewritten lines) (16)

On March 8, 2000, at approximately 2327 mountain standard time (MST), Unit 1 was operating at approximately 100 percent power when control room personnel received multiple pre-trip alarms on channel "D" variable overpower trip (VOPT) in the reactor protection system (RPS). Upon discovery, control room personnel placed channel "D" RPS in bypass to comply with Technical Specification (TS) LCO 3.3.1, REQUIRED ACTION A.1. The cause of the alarms was determined to be a broken solder connection (cold solder joint) on the excore linear calibrate switch which supplies a linear signal to channel "D" RPS. A review of plant process data revealed firm evidence to suggest that RPS VOPT channel "D" had been inoperable for approximately 32 hours and 1 minute. As a result, compliance with TS LCO 3.3.1 REQUIRED ACTION A.1 was not met.

There was no loss of a safety function in that 3 out of 4 RPS VOPT channels remained operable.

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

I. REPORTING REQUIREMENT(S):

This LER (50-528/2000-002-00) is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B) to report an event that resulted in a condition prohibited by the plant's Technical Specifications (TS).

Specifically, on March 8, 2000, at approximately 2327 Mountain Standard Time (MST), control room personnel (utility licensed operator) received multiple pre-trip alarms on Channel "D" reactor protection system (RPS)(EIS: JC) variable overpower trip (VOPT). At approximately 0017 MST on March 9, 2000, control room personnel declared RPS channel "D" VOPT inoperable to comply with TS LCO 3.3.1 REQUIRED ACTION A.1. Subsequent review by control room personnel determined that the RPS channel "D" VOPT parameter had been inoperable for approximately 32 hours and 1 minute, and that compliance with (TS) 3.3.1, to place the channel in trip or bypass within one hour, had not been met, resulting in a condition prohibited by Technical Specifications.

II. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) OR COMPONENT(S):

The purpose of the RPS (EIS: JC) is to initiate a reactor trip to protect against violating the core specified acceptable fuel design limits and breaching the reactor coolant pressure boundary (RCPB) during anticipated operational occurrences (AOOs). The RPS is separated into four distinct channels. Three of the four measurement channels are necessary to meet the redundancy and testability of 10 CFR 50, Appendix A, GDC 21. The fourth channel provides additional flexibility by allowing one channel to be removed from service (trip channel bypass) for maintenance or testing while still maintaining a minimum two-out-of-three logic. With one channel in bypass, no single additional failure in the RPS can either cause an inadvertent trip or prevent a required trip from occurring.

The primary function of the Variable Over Power-High Trip (VOPT) is to protect the reactor core during positive reactivity addition excursions. The Variable Over Power-High Trip provides protection against core damage during an "Uncontrolled CEA Withdrawal From Low Power (AOO)" event.

III. INITIAL PLANT CONDITIONS:

On March 8, 2000, at approximately 2327 MST, Unit 1 was operating at approximately 100 percent power (POWER OPERATION) with all four channels of RPS operable. Reactor Protective System (RPS) equipment was available and operating at the time of the VOPT channel "D" failure. There were no other structures, systems, or components that were inoperable at that time that contributed to this event.

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IV. EVENT DESCRIPTION:

On March 8, 2000, at approximately 2327 MST, control room personnel (utility: licensed operators) received two pre-trip alarms on RPS Channel "D" VOPT, which cleared immediately. At approximately 2331 MST two additional pre-trips on Channel "D" VOPT were received. Control room personnel reviewed plant process data and determined that there was a discrepancy between the linear power signal on channel "D" VOPT and channels A, B and C VOPT. At approximately 0017 MST on March 9, 2000, Control Room personnel declared channel "D" inoperable and placed parameters 1, 3 and 4 on channel "D" in bypass to comply with TS LCO 3.3.1 REQUIRED ACTION A.1.

Control room personnel conducted an evaluation of the linear power plots and determined that there was no significant change to linear power, which was stable at approximately 99.5%. Operations review of VOPT setpoints revealed that channels A, B and C were stable while channel "D" was out of range low. A review of plant process data indicated that channel "D" VOPT experienced a step change downward just after the performance of surveillance testing which was completed on March 7, 2000.

A subsequent review of plant data concluded that there was firm evidence to suggest channel "D" VOPT was inoperable for approximately 32 hours and 1 minute. As a result, compliance with the 1 hour required action statement of LCO 3.3.1 had not been met.

V. SAFETY CONSEQUENCES:

APS' evaluation of the safety consequences of this event included the effect of the failure on the Variable OverPower-High Trip (VOPT) safety function to protect the reactor core during positive reactivity addition excursions. The Variable Over-Power-High trip provides protection against core damage during an "Uncontrolled CEA Withdrawal From Low Power, (AOO)."

The unit 1 event resulted in the loss of one RPS channel (channel "D") with three diverse RPS channels remaining to monitor reactivity excursions and protect the plant. With three diverse channels of RPS available, the estimated likelihood to initiate a plant transient is not significant. For this event, there was no impact on mitigating systems.

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Based on the short exposure time, the availability of mitigating systems, and the low likelihood of transient initiation, there was no significant increase in safety consequences as a result of this event.

This event did not constitute a condition that would have prevented the fulfillment of a safety function as described by 10CFR50.73(a)(2)(IV) and is therefore not a safety system functional failure (SSFF).

VI. CAUSE OF THE EVENT

An investigation of this event was commenced and is being completed in accordance with the site corrective action program. Although the investigation has not been completed, preliminary investigation results indicate that this event was caused by equipment failure of the excore nuclear instrumentation linear calibrate switch. This failure is considered a maintenance rule functional failure (MRFF) and will be tracked and evaluated under the maintenance rule program. The apparent cause of failure is attributed to a broken solder connection (cold solder joint) on the output side of the excore linear calibrate switch (EIS: HS)(S5-D4-C1) which supplies a linear signal to channel "D" RPS.

Further examination of the switch indicated that the solder had completely broken loose from the electrical wire, such that the wire was simply hooked through the connection loop on the switch. The apparent cause of the broken solder connection is currently under review. At this time, there is no evidence to suggest that the solder connection failure was the result of a manufacturing defect or that the operational life expectancy of this component exceeded manufacturer recommendations or specifications.

The operational effects of the solder connection were limited to the output signal of the RPS VOPT, channel "D". No other plant output parameters were affected.

A transportability review is currently underway for the RPS cabinets in Units 2 and 3.

Since the investigation has not been completed at this time, a supplemental LER will be submitted if substantial information is subsequently identified that would significantly change a reader's perception of the event, or if there are substantial changes in the corrective actions described in this LER.

VII. CORRECTIVE ACTIONS:

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Immediate corrective actions were taken to re-solder the loose connection and return the module to service.

Engineering evaluation of the root cause of the solder connection failure is still under investigation at this time and additional corrective actions may be initiated as a result of the final evaluation.

VIII. PREVIOUS SIMILAR EVENTS:

No previous similar events (involving degraded or broken solder connections specific to this equipment) have been reported pursuant to 10CFR50.73 in the past three years.