

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8707090480 DOC. DATE: 87/07/02 NOTARIZED: NO DOCKET #  
 FACIL: STN-50-529 Palo Verde Nuclear Station, Unit 2, Arizona Publi 05000529  
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 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 87-010-00: on 870604, actuation of reactor protection sys  
 initiated reactor trip. Caused by malfunction of mechanical  
 interlock on digital volt meter display on FWCS test panel.  
 Interlock control bars realigned. W/870702 ltr.

DISTRIBUTION CODE: IE22D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 6  
 TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: Standardized plant. M. Davis, NRR: 1Cy.

05000529

	RECIPIENT ID CODE/NAME	COPIES LTTR ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR ENCL
	PD5 LA	1 1	PD5 PD	1 1
	LICITRA, E	1 1	DAVIS, M	1 1
INTERNAL:	ACRS MICHELSON	1 1	ACRS MOELLER	2 2
	AEOD/DOA	1 1	AEOD/DSP/ROAB	2 2
	AEOD/DSP/TPAB	1 1	DEDRO	1 1
	NRR/DEST/ADE	1 0	NRR/DEST/ADS	1 0
	NRR/DEST/CEB	1 1	NRR/DEST/ELB	1 1
	NRR/DEST/ICSB	1 1	NRR/DEST/MEB	1 1
	NRR/DEST/MTB	1 1	NRR/DEST/PSB	1 1
	NRR/DEST/RSB	1 1	NRR/DEST/SGB	1 1
	NRR/DLPQ/HFB	1 1	NRR/DLPQ/QAB	1 1
	NRR/DOEA/EAB	1 1	NRR/DREP/RAB	1 1
	NRR/DREP/RPB	2 2	NRR/PMAS/ILRB	1 1
	NRR/PMAS/PTSB	1 1	REG FILE 02	1 1
	RES DEPY GI	1 1	RES TELFORD, J	1 1
	RES/DE/EIB	1 1	RGN5 FILE 01	1 1
EXTERNAL:	EG&G GROH, M	5 5	H ST LOBBY WARD	1 1
	LPDR	1 1	NRC PDR	1 1
	NSIC HARRIS, J	1 1	NSIC MAYS, G	1 1

NOTES: 1 1

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Palo Verde Unit 2										DOCKET NUMBER (2) 0 5 0 0 0 5 2 9				PAGE (3) 1 OF 15		
TITLE (4) A Reactor Trip Occurred Due to a Malfunction in the Feedwater Control 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 NAMES				DOCKET NUMBER(S)			
06	04	87	87	010	000	07	02	87	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)				<input checked="" type="checkbox"/> 50.73(a)(2)(iv)				73.71(b)		
		20.405(a)(1)(i)				50.36(c)(1)				<input type="checkbox"/> 50.73(a)(2)(v)				73.71(c)		
		20.405(a)(1)(ii)				50.36(c)(2)				<input type="checkbox"/> 50.73(a)(2)(vii)				<input checked="" type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)		
		20.405(a)(1)(iii)				50.73(a)(2)(i)				<input type="checkbox"/> 50.73(a)(2)(viii)(A)				Special Report 2-SR-87-019		
		20.405(a)(1)(iv)				50.73(a)(2)(ii)				<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
		20.405(a)(1)(v)				50.73(a)(2)(iii)				<input type="checkbox"/> 50.73(a)(2)(ix)						
LICENSEE CONTACT FOR THIS LER (12)																
NAME T. R. Bradish, Compliance Supervisor (Ext. 6936)										TELEPHONE NUMBER AREA CODE 610 2 319 31-15101010						
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPD		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPD						
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 fifteen single space typewritten lines) (16)

At approximately 1259 MST on June 4, 1987, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION) at 100 percent power when the automatic actuation of the reactor protection system initiated a reactor trip due to a low level condition in steam generator 2. Immediately following the reactor trip, auxiliary feedwater actuation signals 1 and 2 were received. At 1300 a containment isolation actuation signal and a safety injection actuation signal were received due to a low pressurizer pressure condition. All safety systems and components operated as designed.

The steam generator and reactor coolant system (RCS) parameters stabilized and all Engineered Safety Features actuations were reset by 1353. This submittal also provides Special Report 2-SR-87-019 for an emergency core cooling system actuation and the injection of water into the RCS.

The root cause of the reactor trip was the malfunction of the mechanical interlock on the digital volt meter display select push-buttons on a Feedwater Control System (FWCS) test panel. A slight misalignment of an interlock control bar resulted in the neutron flux and downcomer flow signals being shorted together when the downcomer flow push-button was depressed and the neutron flux push-button did not automatically reset as designed. This caused erratic FWCS behavior and eventually resulted in the reactor trip. As immediate corrective action the interlock control bars were realigned.

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## 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 (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Palo Verde Unit 2	0 5 0 0 0 5 2 9	8 7	— 0 1 0	— 0 0	0 2	OF 0 5

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

At approximately 1259 MST on June 4, 1987, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION) at 100 percent power when the automatic actuation of the Reactor Protection System (RPS)(JC) initiated a Reactor (RCT) Trip due to a low level condition in steam generator 2 (SG)(AB). The cause of the low level condition in SG 2 was a malfunction in the feedwater control system (FWCS)(SJ). Immediately following the reactor trip, auxiliary feedwater actuation signals (AFAS)(JE) 1 and 2 were received. At 1300 a containment isolation actuation signal (CIAS)(JM) and a safety injection actuation signal (SIAS)(BQ) were received due to a low pressurizer (PZR)(AB) pressure condition.

The actuations of the RPS, AFAS, CIAS and SIAS represent automatic actuations of engineered safety features (ESF)(JE). The actuations were annunciated (ANN) and responded to by utility licensed operators in the control room (NA). All safety systems and components operated as designed.

Plant conditions were stabilized in Mode 3 (HOT STANDBY) and all ESF actuations were reset by approximately 1353. The duration of this event was approximately 53 minutes. There were no structures, systems or components that were inoperable at the start of this event which contributed to the event. There were no unusual characteristics at the work location that contributed to this event.

Prior to the event, the FWCS system engineer and an I&C technician (both utility non-licensed) were performing work on FWCS 2 under an authorized work document. They were observing various FWCS 2 parameters using the digital volt meter (DVM)(EI) display select push-button in a FWCS cabinet. The display select push-buttons are mechanically interlocked such that when a push-button is depressed the previously depressed push-button is mechanically reset. After observing the average neutron flux on the DVM display, the system engineer depressed the downcomer flow select push-button however, the neutron flux select push-button did not reset as designed. As a result of this malfunction, the neutron flux and downcomer flow signals were shorted together. This caused the economizer valves (V) on both SGs and feedwater pump (P) speeds to oscillate. Feedwater control systems 1 and 2 were both affected since the neutron flux signal supplies input signals to both feedwater control systems.

When the operators observed the decreasing steam generator levels and the FWCS oscillations, they immediately instructed the system engineer and the I&C technician to stop all work and not to perform any additional system push-button manipulations. The FWCS was then observed by the operators (utility-licensed) to determine if the system had stabilized. Although initially it appeared as if the FWCS was recovering, SG levels continued to drop and the FWCS oscillations continued. The operators then took manual control of the FWCS however, the reactor trip occurred a few seconds later when SG 2 level decreased to the RPS trip setpoint. The level in both SGs continued to decrease until the AFAS 1 and 2 were received.

## 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	0 5 0 0 0 5 2 9	8 7	- 0 1 0	- 0 0	0 3	OF 0 5

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

An investigation determined that the cause of the FWCS malfunction was a slight misalignment of the interlock control bars for the push-buttons. The misalignment was such that an interlock control bar did not lift high enough to reset the neutron flux push-button when the downcomer flow push-button was depressed. This resulted in a short between the neutron flux and downcomer flow signals. This caused erratic FWCS behavior and eventually resulted in the reactor trip. The cause of the misalignment of the interlock control bars has been attributed to the tight clearance necessary for proper push-button action, normal wear on the nylon cams on the push-buttons and the frequent use of these push-buttons during testing.

As immediate corrective action, the interlock control bars were realigned. As corrective action to prevent recurrence, caution placards have been placed on the FWCS test panels in all three units. The caution placards instruct personnel to use a test push-button to reset a depressed push-button before another push-button is depressed. The test push-buttons have no effect on system function and will not affect system operation in the event of an improper reset.

A review of the temporary data acquisition system (TDAS) plots revealed that both of the economizer valves were oscillating in the open direction just prior to the reactor trip. The economizer valves began closing approximately 10 seconds after the reactor trip when a reactor trip override signal was received. This feedwater flow, in conjunction with a steam bypass control system (SBCS)(JI) quick open on all 8 SBCS valves (V), caused the reactor coolant system (RCS)(AB) temperature decrease and the resultant pressurizer pressure decrease to below the SIAS/CIAS setpoint. This resulted in the automatic actuation of the ESF equipment associated with the SIAS/CIAS signals.

In accordance with approved procedure, a Notification of Unusual Event (NUE) was declared at approximately 1305 due to the SIAS/CIAS ESF actuations. The NUE was terminated at approximately 1311. The following is a time line showing the sequence of events.

SEQUENCE OF EVENTS

TIME	ACTION
12:57:16	Feedwater Panel Push-Buttons Activated- Feedwater Oscillations Initiated
12:59:36:000	Low S/G #2 Level Channel C RPS Trip
12:59:36:206	Low S/G #2 Level Channel D RPS Trip
12:59:36:266	Channel A Trip Circuit BKR Trip
12:59:36:267	Channel B Trip Circuit BKR Trip

## 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	0 5 0 0 0 5 2 9	8 7	— 0 1 0	— 0 0	0 4	OF	0 5

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

12:59:36:275	Channel D Trip Circuit BKR Trip
12:59:36:276	Channel C Trip Circuit BKR Trip
12:59:36:319	Master Turbine Trip
12:59:36:390	Low S/G #2 Level Channel B RPS Trip
12:59:37:199	Low S/G #2 Level Channel D ESFAS Trip
12:59:37:214	Low S/G #2 Level Channel A ESFAS Trip
12:59:37:220	Low S/G #2 Level Channel B ESFAS Trip
12:59:37:245	Low S/G #2 Level Channel C ESFAS Trip
12:59:37:287	Low S/G #2 Level Channel A RPS Trip
12:59:37:359	Low S/G #1 Level Channel B ESFAS Trip
12:59:37:385	Low S/G #1 Level Channel B RPS Trip
12:59:37:395	Low S/G #1 Level Channel C ESFAS Trip
12:59:37:402	Low S/G #1 Level Channel C RPS Trip
12:59:37:410	Low S/G #1 Level Channel A RPS Trip
12:59:37:411	Low S/G #1 Level Channel D ESFAS Trip
12:59:37:436	Low S/G #1 Level Channel D RPS Trip
12:59:58:056	Low S/G #1 Level Channel A ESFAS Trip
13:00:00:851	Low PRZ Press Channel C Trip
13:00:00:973	Low PRZ Press Channel B Trip
13:00:01:400	Low PRZ Press Channel D Trip
13:00:01:608	Low PRZ Press Channel A Trip
13:01:00	Operator Manually Isolated Flow to Both SG's
13:05	NUE Declared
13:11	NUE Terminated
13:34:15	AFAS-1 Reset
13:34:48	AFAS-2 Reset
13:53	SIAS/CIAS Signals Reset

The Sequence of Events (SOE) alarm processing program (IQ) runs on the Plant Monitoring System (PMS)(ID) with the highest priority. SOE alarm times are considered to be accurate. Non-SOE alarms are accumulated in memory buffers. As PMS Central Processing Unit (CPU) time becomes available the buffered data is output to the alarm (ALM) typer. For that reason the times associated with information received from the non-SOE alarm typer may not reflect actual times of the events.

This LER also provides Special Report 2-SR-87-019 which is being submitted to satisfy the requirements of Technical Specification (T.S.) 3.5.2 ACTION Statement b and T.S. 6.9.2 for the emergency core cooling system injection of water into the RCS. This is the second actuation cycle to date and the injection nozzle factor has not exceeded 0.70.

## 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	87	010	00	05	OF	05

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

Operator (utility-licensed) actions during this event were proper, and in accordance with approved procedures. All safety systems and components operated as designed with the exception of the push-buttons described above, and no fission product boundaries were challenged; therefore, this event did not adversely affect the safe operation of the plant or the health and safety of the public.

No similar reactor trips have been reported. Should other pertinent information regarding this event be discovered, a supplemental report will be issued. All other potential concerns regarding this event were evaluated and properly dispositioned prior to Unit restart.



## Arizona Nuclear Power Project

P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

192-00240-JGH/TRB/MJC

July 2, 1987

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


Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 2  
Docket No. 50-529  
Licensee Event Report 87-010-00  
File: 87-020-404

Dear Sirs:

Attached please find Licensee Event Report (LER) No. 87-010-00 prepared and submitted pursuant to 10CFR 50.73. In accordance with 10CFR 50.73(d), we are herewith forwarding a copy of the LER to the Regional Administrator of the Region V Office.

If you have any questions, please contact T. R. Bradish, Compliance Supervisor at (602) 393-5000, Ext. 6936.

Very truly yours,

  
for J. G. Haynes  
Vice President  
Nuclear Production

JGH/MJC/cld

Attachment

cc: O. M. DeMichele (all w/a)  
E. E. Van Brunt, Jr.  
J. B. Martin  
R. P. Zimmerman  
R. C. Sorenson  
E. A. Licitra  
A. C. Gehr  
INPO Records Center

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