NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

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 4

TITLE (4)

ESF Actuation Due to Narrow Margin of Low Steam Generator Pressure Trip

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)
												0 5 0 0 0
0 4	0 6	8 6	8 6	–	0 2 7	–	0 0	0 5	0 6	8 6		0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	X 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)	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
	AREA CODE
William F. Quinn, Manager - Nuclear Licensing (Extension 4087)	6 0 2 9 4 3 1 - 7 2 0 0

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	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 1844 on April 6, 1986, Palo Verde Unit 1 was in Mode 5, (COLD SHUTDOWN), when an automatic Engineered Safety Feature (ESF) actuation of the Plant Protection System (PPS) occurred, and a Main Steam Isolation Signal (MSIS) was received. The PPS actuation and the MSIS was initiated by spurious low secondary side pressure channel trips on steam generator no. 2. The MSIS did not result in an ESF actuation due to electrical jumpers which had been installed in an ESF cabinet to support maintenance activities. Neither the PPS, nor the MSIS protective features are required to actuate on low steam generator pressure in Mode 5 or 6.

The root cause of this event was a transient induced by signal noise (equipment malfunction), such that, the low steam generator pressure channel trips which initiated this event was not caused by an actual loss of pressure condition. No failed components or systems contributed to this event.

As a corrective action, a procedure change is being implemented which will direct the installation of pressure signal simulators in Modes 5 and 6, when the secondary side of the steam generator may be at ambient pressure. The pressure signal simulators will allow a larger trip setpoint margin to be obtained, thereby minimizing the effect of pressure fluctuations induced by signal noise. The procedure change is currently in the review process.

IE22

NRC Form 366

1/1

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Palo Verde Unit 1	0 5 0 0 0 5 2 8	8 6	— 0 2 7	— 0 0	0 2 OF 0 4

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

At 1844 MST on April 6, 1986, Palo Verde Unit 1 was in Mode 5, (COLD SHUTDOWN), when an automatic Engineered Safety Feature (ESF)(JE) actuation of the Plant Protection System (PPS)(JE) occurred, and a Main Steam Isolation Signal (MSIS)(JE) was received. The PPS actuation and the MSIS were initiated by spurious low secondary side pressure channel trips on steam generator (SG)(AB) no. 2.

The purpose of the steam generator secondary side low pressure trips is to provide plant protection against an excessive reactor coolant cooldown in the event of an increase in heat removal by the secondary system. As the plant is cooled during shutdown, the pressure of the secondary side decreases. In order to prevent non-protective ESF actuations initiated by low steam generator pressure during cooldown, it is necessary to manually lower the trip setpoint of the steam generator low pressure trip, so that an adequate margin is maintained between the low steam generator pressure trip setpoint and the secondary side pressure of the steam generator.

During normal operations, and during cooldown, the margin between the low steam generator pressure trip setpoint and the actual steam generator pressure can be maintained at approximately 200 psi. However, when the steam generators are at ambient (atmospheric) pressure conditions, the maximum trip setpoint-to-process input margin which can be obtained is approximately 15 psi. The magnitude of the trip setpoint-to-process input margin is limited during ambient pressure conditions by the range of the pressure instruments. A trip setpoint margin of 15 psi coincides with an approximate .075 volt pressure instrument output. As a result of the narrow trip setpoint margin, relatively small amounts of signal noise on a pressure instrument channel may cause a spurious low steam generator pressure channel trip, and can initiate non-requisite actuations of ESF equipment.

Prior to the event,the steam generators were being maintained in an ambient pressure condition, with reactor trip switchgear (AA) breakers (BKR) "A", "B", and "C" open. Reactor trip switchgear breaker "D" was closed, in order to allow the performance of response time testing. The channel "B" steam generator pressure channel was in "bypass" because of difficulty experienced on the channel, when previous channel trips could not be manually reset following spurious low pressure trips. Pressure channels "A", "C" and "D" were available at all times during the event.

At 1844, steam generator no. 2 experienced a spurious low steam generator secondary side pressure trip on instrument channel "A", and moments later, on instrument channel "C". The spurious low pressure trips satisfied the minimum required ESF logic (2 of 4), and initiated a PPS actuation and an MSIS. As a result of the PPS actuation and the MSIS, reactor trip switchgear breaker "D" opened.

No equipment actuations were expected, or occurred, as a result of the MSIS because of electrical jumpers which had been installed in the Nuclear Steam Supply System Engineered Safety Feature Actuation System (NSSS-ESFAS)(JE) cabinets, in order to allow the performance of maintenance activities. The availability of the MSIS related equipment and the PPS protective feature initiated by low steam generator pressure is not required in Mode 5. Therefore, with the exception of the spurious pressure trips, all safety-related components and systems, including the PPS and MSIS related equipment, performed as expected during this event.

Investigation into this event established that at ambient pressure, spurious low steam generator pressure channel trips and fluctuating channel inputs had occurred previously, and that they had been noted immediately prior to this event. Although spurious steam generator pressure channel trips have occurred previously, the necessary coincidence of channel trips required to initiate an ESF actuation has occurred at only one time prior to this event, and was reported in a separate LER (85-086).

Immediately after the event, it was demonstrated that an actual low pressure or vacuum condition did not exist in steam generator no. 2. This determination was based upon the fact that there was no condenser vacuum, steam generator blowdown, or reactor cooldown occurring at the time of the event, and that when the steam generator atmospheric dump valves (ADV)(SB)(PCV) were opened, no change in steam generator pressure was indicated. This verified that an actual loss of pressure condition did not exist in the steam generator, and that the low pressure trips received were spurious.

The root cause of this event was a transient induced by signal noise (equipment malfunction), such that, the spurious low steam generator pressure trips which were received on the secondary side of steam generator no. 2, and which resulted in actuation of the PPS and an MSIS, were not the result of an actual low pressure condition. Other factors which contributed to this event were: the lack of any annunciated warning to alert the operators of an imminent trip on low steam generator pressure, since the low steam generator pressure pre-trips are already in an alarmed condition when the steam generators are at ambient pressure; and the more pronounced effect of instrument channel signal noise which exists when the steam generators are at ambient pressure, because of the narrow trip setpoint margin and the relative magnitude of the spurious pressure indication fluctuations induced by signal noise. No inoperable or failed structures, components, or systems, personnel errors, unusual characteristics of the workplace, or procedural deficiencies contributed to this event.

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Palo Verde Unit 1	0 5 0 0 0 5 2 8	8 6	— 0 2 7	— 0 0	0 4 OF 0 4

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

As a corrective action, a procedural change will be made which will minimize the effect of signal noise on the steam generator pressure channels when the steam generators are at ambient pressure. The procedural change will direct the installation of pressure signal simulators in Modes 5 and 6, when the steam generators are at ambient pressure, in order to prevent further occurrence of similar events. The pressure signal simulators will allow a larger trip setpoint margin to be obtained, thereby minimizing the effect of pressure indication fluctuations induced by signal noise. This change will also be implemented for Unit 2 (Docket No. 50-529).

Since the low steam generator pressure indications were spurious, and not indicative of an excessive reactor coolant cooldown, there was no threat to the safe operation of the plant or the safety of the public during this event. Had the plant been in a mode where protection against an excessive reactor coolant cooldown was required, the safe operation of the plant and the safety of the public would have been ensured by the automatic actuation of the appropriate PPS and MSIS equipment, as demonstrated during this event.

An event involving an ESF actuation, as described above, was reported in LER 85-086. The corrective action for this previous event was to investigate the feasibility of installing a permanent plant modification, which would allow the ESF actuations which accompany a low steam generator pressure trip to be bypassed when the plant is in an operational mode where the trip is not required. Following evaluation of this permanent modification, it was determined that it would be prudent to proceed with the installation of pressure signal simulators and the procedural changes described herein, in lieu of the permanent hardware change.

Arizona Nuclear Power Project
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May 6, 1986
ANPP-36517-EEVB/PGN/98.05

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

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 1
Docket No. STN 50-528 (License NPF-41)
Licensee Event Report - 86-027-00
File: 86-020-404

Dear Sirs:

Attached please find Licensee Event Report (LER) No. 86-027-00 prepared and submitted pursuant to 10 CFR 50.73. In accordance with 10 CFR 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 me.

Very truly yours,

E. E. Van Brunt, Jr.
Executive Vice President
Project Director

EEVB/PGN/rw
Attachment

cc: J. B. Martin (all w/a)
R. P. Zimmerman
A. L. Hon
E. A. Licitra
A. C. Gehr
INPO Records Center

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