

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Palo Verde Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 5 2 8	PAGE (3) 1 OF 0 4
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TITLE (4)
Operator Error During Feedwater Transient Results in a Reactor 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	1	1	0	8	7	8	7	0	0	3	0	0	0	2	0	6	8	7	N/A	0 5 0 0 0
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)																				

OPERATING MODE (9) 1	POWER LEVEL (10) 0 4 0	20.402(b)	20.405(a)(1)(i)	20.405(a)(1)(ii)	20.405(a)(1)(iii)	20.405(a)(1)(iv)	20.405(a)(1)(v)	20.405(c)	50.36(e)(1)	50.36(e)(2)	50.73(a)(2)(i)	50.73(a)(2)(ii)	50.73(a)(2)(iii)	50.73(a)(2)(iv)	50.73(a)(2)(v)	50.73(a)(2)(vii)	50.73(a)(2)(viii)(A)	50.73(a)(2)(viii)(B)	50.73(a)(2)(ix)	73.71(b)	73.71(c)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
											<input checked="" type="checkbox"/>												

LICENSEE CONTACT FOR THIS LER (12)

NAME Thomas R. Bradish, Compliance Supervisor (Ext. 6936)	TELEPHONE NUMBER AREA CODE: 6 0 2 9 3 2 - 5 3 0 0
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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
X	E	L	I	M	W	1	2	0	N

SUPPLEMENTAL REPORT EXPECTED (14)

<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

At 0906 on January 10, 1987 Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) operating at 100 percent power when a Reactor Power Cutback (RPCB) occurred due to a load rejection. The loss of load occurred when both of the generator output breakers opened. The RPCB reduced reactor power to approximately 40 percent. A feedwater control system transient was initiated by the load rejection and RPCB. A reactor trip occurred at 0910 due to high steam generator level in steam generator #2.

The cause of the generator output breaker trip was determined to be a malfunction in a logic chip in the subsynchronous relay. The cause of the reactor trip was determined to be a cognitive personnel error by a control room operator (utility licensed) controlling feedwater flow.

The root cause of the chip malfunction is under investigation. Also the 1 of 2 trip logic of the sub-synchronous relays will be reviewed to determine the feasibility of utilizing 2 of 2 trip logic rather than 1 of 2 trip logic.

As corrective action for the reactor trip, a night order was issued prior to resumption of power operation which discussed the desirable strategy to follow during a feedwater transient.

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

At 0906 on January 10, 1987, Palo Verde Unit 1 was in Mode 1 (POWER OPERATION) operating at 100 percent power when a reactor (RCT) power cutback occurred due to a load rejection. The loss of load occurred when both of the main generator (TB) output breakers (EL)(BKR) opened. All Steam Bypass Control System Valves (JI)(PCV) opened as designed and steam generator (AB)(SG) pressure was stabilized. Reactor power was stabilized at approximately 40 percent. After an initial steam generator level decrease, levels in both steam generators began to increase. A control room operator (licensed utility) took manual control of both master feedwater controllers (JB) and stabilized the steam generator levels. The operator then returned the master controllers to the automatic position. Levels in both steam generators again began to increase. The operator then placed the steam generator #2 economizer and downcomer valve (FCV) controllers (JB) into manual, prior to decreasing valve position demand to minimum. At 0910 on January 10, 1987, approximately 15 seconds after the steam generator #2 valves were taken to manual, a Reactor Trip and a Main Steam Isolation (JE) occurred, due to high steam generator #2 level.

Control room operators (licensed utility) monitored plant safety functions and stabilized the plant using atmospheric dump valves (ADV)(SB) and the motor driven auxiliary feedwater (BA) pump (P). All systems required to actuate due to the Main Steam Isolation Signal responded as required.

The generator trip and Reactor Power Cutback were initiated when the generator output breakers PL-915 and PL-918 opened. The breakers will open when either sub-synchronous relay (RLY) 1A or 1B is actuated. After the generator trip, the 1A relay was found flagged (lockout indication still tripped) and the 1B relay was found in the normal no trip condition. The 15.5 Hz relay module (which actuates the 1A relay) was also found flagged. The sub-synchronous relay protects the generator from sub-synchronous currents.

Troubleshooting of the 1A relay revealed that a logic chip used for conditioning an electrical signal was not operating properly. The chip is part of a Westinghouse tex relay model number F2. The root cause of the chip problem is under investigation. Also, the 1 of 2 trip logic of the relays will be reviewed to determine the feasibility of utilizing 2 of 2 trip logic rather than 1 of 2 trip logic.

The feedwater control system transient was initiated by the load rejection and reactor power cutback. After the initial SG level decrease, in response to the decreased steam demand and resultant shrink, SG levels began increasing. This was expected since both main feed pumps were running and steam demand had decreased. However, concern by the operator that the FWCS could not return SG level resulted in taking manual control of both steam generator levels by placing each feedwater control system master controller in manual.

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

Following level stabilization, the operator returned the master controller to automatic. With the master controller in automatic, the levels in both steam generators began increasing again. Based on indications of increasing SG level trends the operator placed the steam generator #2 economizer and downcomer valve controllers in manual. The automatic controller had been maintaining the economizer at approximately 15% open but the manual controller demand was set at approximately 45%, so when the controller was switched to manual, the economizer valve opened from approximately 15% to 45% admitting a relatively large influx of water to steam generator #2. The operator began closing the economizer valve but steam generator levels had already increased beyond the trip setpoint and a reactor trip and main steam isolation occurred.

The automatic setting of the master controller controls feedwater independently with no dependence on the manual control demand settings for the economizer and downcomer valves or the feedwater pumps. As an operator switches from automatic control to manual control the valves open or close to the manual control demand settings. The operator should have reduced the demand to the economizer valve controller to approximately the same open position as the setting on the automatic controller prior to placing the controller in manual. This would have prevented the large influx of water to the steam generator.

Analysis of Temporary Data Acquisition System plots (TDAS) shows that the feedwater control system was responding to level control inputs properly while it was in automatic. The noted increases in SG levels were normal and were not indicative of a control problem. However, the indications available to the control room operator of SG level trends make evaluation of Feedwater Control System (FWCS) Response to dynamic conditions difficult since the speed of the trend charts responds slower than the actual FWCS level control inputs.

The root cause of the reactor trip was a cognitive personnel error by the control room operator (utility licensed). Before taking manual control of the economizer valve the operator should have reduced the demand setting. The operator realized that the feedwater control demand settings must be matched prior to placing them in manual and attempted to accomplish this, however, analysis of TDAS plots indicates that the demands were not properly matched at the time of the transfer. The operator was performing a task that was not directly controlled by an approved procedure. However, instruction provided during training courses coupled with the guidelines referenced below are considered adequate to perform this task. No unusual characteristics of the work location contributed to the error.

To prevent recurrence a night order was issued prior to resumption of power operation which discussed the preferred response during a feedwater transient. In addition, data from previous Reactor Power Cutback events will be analyzed along with data from this event in order to develop a more formal set of guidelines for operator actions during this type of event. These guidelines will be incorporated into existing procedures as appropriate.

Additionally, recommendations of methods to improve the indications used by the operators to evaluate these types of events have been submitted for evaluation.

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TEXT (If more space is required, use additional NRC Form 365A's) (17)

All other control room operator (utility licensed) actions during this event were proper and in accordance with approved procedures. The events described above were identified by control room alarms or through subsequent evaluations.

There were no structures, components or systems that were inoperable at the start of the event which contributed to the event. No component failures other than as described above, occurred as a result of this event.

All safety systems and components operated as designed, core cooling was maintained at all times, 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.

All potential safety concerns resulting from this event have been evaluated and properly dispositioned prior to the return of the Unit to power operation. Should other concerns or information pertinent to this event be discovered, a supplement to this report will be issued.

Similar Reactor Trips initiated by an operator error during feedwater system control have been reported previously in LERs 528-86-024, 528-86-061, and 529-86-025.



Arizona Nuclear Power Project

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ANPP-00140-JGH/TDS/JHT/96.03

February 6, 1987

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
Licensee Event Report 87-003-00
File: 87-020-404

Dear Sirs:

Attached please find Licensee Event Report (LER) No. 87-003-00 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 T. R. Bradish, Compliance Supervisor at (602) 932-5300 Ext. 6936.

Very truly yours,

J. G. Haynes
Vice President
Nuclear Production

JGH/JHT/cld

Attachment

cc: O. M. DeMichele (all w/a)
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