

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

## REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8804180445 DOC.DATE: 88/04/12 NOTARIZED: NO DOCKET #  
 FACIL:STN-50-528 Palo Verde Nuclear Station, Unit 1, Arizona Publi 05000528  
 AUTH.NAME AUTHOR AFFILIATION  
 SHRIVER,T.D. Arizona Nuclear Power Project (formerly Arizona Public Serv  
 HAYNES,J.G. Arizona Nuclear Power Project (formerly Arizona Public Serv  
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 87-025-02:on 871127,turbine driven auxiliary feedwater  
 pump isolation valve mods rendered pump inoperable.  
 W/8 ltr.

DISTRIBUTION CODE: IE22D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 8  
 TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:Standardized plant.

05000528S

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INTERNAL: ACRS MICHELSON	1 1	ACRS MOELLER	2 2
AEOD/DOA	1 1	AEOD/DSP/NAS	1 1
AEOD/DSP/ROAB	2 2	AEOD/DSP/TPAB	1 1
ARM/DCTS/DAB	1 1	DEDRO	1 1
NRR/DEST/ADS 7E	1 0	NRR/DEST/CEB 8H	1 1
NRR/DEST/ESB 8D	1 1	NRR/DEST/ICSB 7	1 1
NRR/DEST/MEB 9H	1 1	NRR/DEST/MTB 9H	1 1
NRR/DEST/PSB 8D	1 1	NRR/DEST/RSB 8E	1 1
NRR/DEST/SGB 8D	1 1	NRR/DLPQ/HFB 10	1 1
NRR/DLPQ/QAB 10	1 1	NRR/DOEA/EAB 11	1 1
NRR/DREP/RAB 10	1 1	NRR/DREP/RPB 10	2 2
NRR/DRIS/SIB 9A	1 1	NRR/PMAS/ILRB12	1 1
REG FILE 02	1 1	RES TELFORD,J	1 1
RES/DE/EIB	1 1	RES/DRPS DIR	1 1
RGN5 FILE 01	1 1		
EXTERNAL: EG&G GROH,M	4 4	FORD BLDG HOY,A	1 1
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

TOTAL NUMBER OF COPIES REQUIRED: LTTR 47 ENCL 46



**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1) <b>Palo Verde Unit 1</b>										DOCKET NUMBER (2) <b>0 5 0 0 0 5 2 8</b>										PAGE (3) <b>1 OF 0 7</b>	
TITLE (4) <b>Modifications to Steam to Turbine Driven Auxiliary Feedwater Pump Isolation Valves Render Pump Inoperable</b>																					
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)							
									<b>Palo Verde Unit 2</b>					<b>0 5 0 0 0 5 2 9</b>							
<b>1</b>	<b>1</b>	<b>2</b>	<b>7</b>	<b>8</b>	<b>7</b>	<b>0</b>	<b>2</b>	<b>5</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>8</b>	<b>8</b>	<b>N/A</b>				
OPERATING MODE (9) <b>1</b>			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)																		
POWER LEVEL (10) <b>1 0 0</b>			20.402(b)				20.406(e)				60.73(a)(2)(iv)				73.71(b)						
			20.406(a)(1)(i)				60.36(c)(1)				60.73(a)(2)(v)				73.71(c)						
			20.406(a)(1)(ii)				60.36(c)(2)				60.73(a)(2)(vi)				OTHER (Specify in Abstract below and in Text, NRC Form 365A)						
			20.406(a)(1)(iii)				60.73(a)(2)(i)				60.73(a)(2)(viii)(A)										
			20.406(a)(1)(iv)				60.73(a)(2)(ii)				60.73(a)(2)(viii)(B)										
			20.406(a)(1)(v)				60.73(a)(2)(iii)				60.73(a)(2)(ix)										
LICENSEE CONTACT FOR THIS LER (12)																					
NAME <b>Timothy D. Shriver, Compliance Manager</b>												TELEPHONE NUMBER <b>6 0 2 3 9 3 - 2 5 2 1</b>									
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																					
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC					
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) (18)

This is a supplement to LER 87-025-01.

On November 27, 1987 at approximately 0220 MST, with Palo Verde Unit 2 in Mode 1 (POWER OPERATION) at 100 percent power, the Turbine Driven Auxiliary Feedwater Pump (BA)(P) did not achieve rated speed during the monthly operability surveillance test.

An investigation found that the "open" limit switch (SB)(33) setpoints for the "B" and "A" train isolation valves (SB)(ISV) were adjusted on October 14 and 15, 1987, respectively, to prevent the valve internals from impacting on the backseat. This was done in accordance with an approved engineering evaluation which did not provide corresponding adjustments to the "ramp up" limit switches (SB)(33), therefore preventing the pump from achieving rated speed. Following these adjustments, the pump was returned to operable status, contrary to Technical Specification 3.7.1.2. Ongoing investigation determined that valves had been returned to operable status contrary to T.S. 3.6.3.

As immediate corrective action the limit switches were readjusted, operability tests conducted on November 27, 1987, and the investigation expanded to include Units 1 and 3. Preliminary evaluations identified the root cause as cognitive personnel error (utility, licensed) in that the engineering evaluation did not address the full impact of the approved modification. Corrective action to prevent recurrence is addressed in this report supplement.

## 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 1	05000528	87	025	02	02	OF	07

TEXT (If more space is required, use additional NRC Form 368A's) (17)

This is a supplement to LER 87-025-01.

On November 27, 1987 at approximately 0220 MST, with Palo Verde Unit 2 in Mode 1 (POWER OPERATION) at 100 percent power, the Turbine Driven Auxiliary Feedwater Pump (BA)(P) did not achieve its rated speed during the performance of 42ST-2AF02, "Auxiliary Feedwater Pump AFA-P01 Operability Test." The Operations personnel (utility, licensed) notified the Shift Supervisor (utility, licensed), who declared the pump inoperable under the requirements of Technical Specification (T.S.) 3.7.1.2.

Upon initiation of an Auxiliary Feedwater Actuation Signal (AFAS), the pump initially operates at approximately 400 rpm with steam supplied through a bypass valve (SB)(ISV) for either the "A" or "B" Train Steam Supply (2SGAUV0134A or 2SGAUV0138A, respectively). The pump will achieve rated speed (3560 rpm) after the corresponding steam supply isolation valve (2SGAUV0134 or 2SGAUV0138)(SB)(ISV) reaches a predetermined open position setting and generates a "ramp up" signal to the pump governor valve (BA)(FCV). Upon receipt of the "ramp up" signal, the governor valve opens to allow sufficient steam flow to bring the pump up to rated speed.

During the performance of the surveillance test, the pump did not achieve rated speed when steam was supplied from the "A" Train Steam Supply utilizing the "A" Train Steam Supply Isolation Valve (2SGAUV0134). Immediately following this test the pump was successfully operated with steam supplied by the "B" Train Steam Supply utilizing "B" Train Steam Supply Isolation Valve (2SGAUV0138), indicating a possible malfunction of isolation valve 2SGAUV0134.

Initial troubleshooting conducted in accordance with approved work authorizing documents revealed that the "ramp up" limit switch (SB)(33) for 2SGAUV0134 was set at approximately 90 percent of the valve's full open position, while the "open" limit switch (SB)(33) was set at approximately 65 percent. When operated, the valve coasted to an open position of approximately 80 percent of full travel, which was insufficient to actuate the "ramp up" limit switch and allow the pump to achieve rated speed. It was determined that the "open" limit switch settings for steam supply isolation valves 2SGAUV0138 and 2SGAUV0134 had been previously adjusted in accordance with an approved engineering evaluation (EER) intended to address the inherent coasting of the valve and prevent excessive impact when backseating. The engineering evaluation directed that the "open" limit switch setting for each valve be adjusted in 5 percent increments between 60 and 100 percent of full travel, such that the valve would open as far as possible without coasting into the backseat. The evaluation conducted to address the coasting of the valve into the backseat also recommended alternative resolutions other than the setting adjustments described above. These recommendations are documented in Plant Change Request 87-13-SG-019 and are being evaluated.



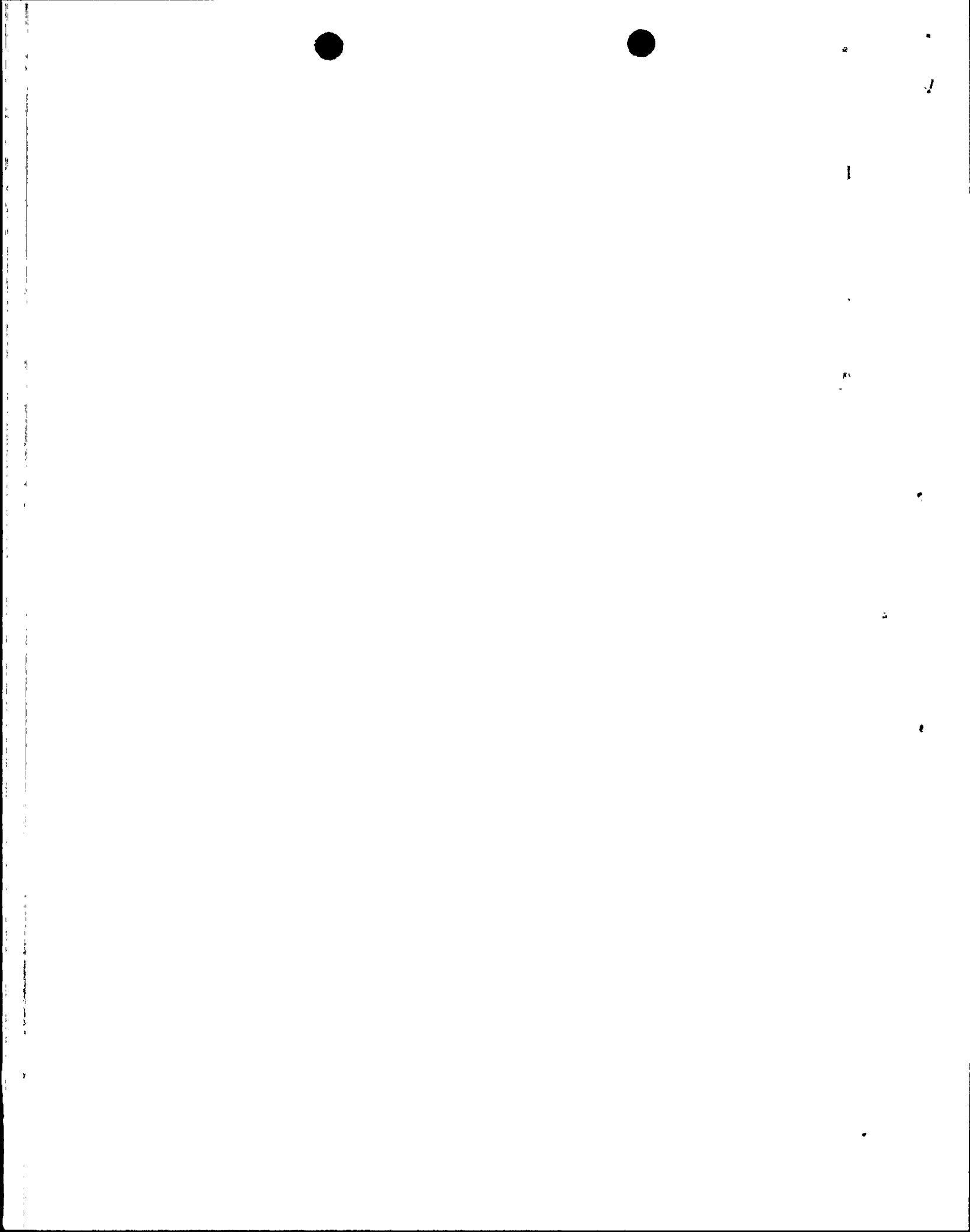
## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

TEXT (If more space is required, use additional NRC Form 368A's) (17)

The lower limit of 60 percent of full travel was established to ensure that a steam flow sufficient to operate the pump under full load would be achieved. The engineering evaluation addressed the setting for the "open" limit switch located on rotor #1, but did not address the effect this change would have on the functions of other limit switches installed in the valve, such as the "ramp up" limit switch located on rotor #3. A work order was written to implement the engineering evaluation, and the "open" limit switch setting for valve 2SGAUV0134 was adjusted to approximately 65 percent of full open. The "open" limit switch for isolation valve 2SGAUV0138 was adjusted to approximately 78 percent of the full open position, with the "ramp up" limit switch left at a setting of approximately 90 percent. Following these adjustments, isolation valves 2SGAUV0138 and 2SGAUV0134 were satisfactorily tested for valve position and stroke time in accordance with ASME Section XI requirements and returned to service on October 14 and 15, 1987, respectively. Since the engineering evaluation did not indicate that the work performed could affect operation of the pump, additional testing was determined not to be necessary. During subsequent testing on October 31, 1987 the pump was satisfactorily tested with steam supplied from the "B" Train Steam Supply through isolation valve 2SGAUV0138, in accordance with the monthly functional surveillance test. The next scheduled monthly surveillance test was conducted on November 27, 1987, at which time the pump was declared inoperable as described above. During subsequent troubleshooting on November 27, 1987 a second attempt was made to operate the pump utilizing isolation valve 2SGAUV0138, but in this instance the valve did not generate the required "ramp up" signal, exhibiting the same characteristics as valve 2SGAUV0134. Because of the close proximity of the original switch settings on valve 2SGAUV0138, it is assumed that the expected variance in the distance the valve coasted open permitted the pump to successfully pass the surveillance testing on October 31, 1987, but not achieve rated speed on November 27, 1987.

As immediate corrective action, in accordance with an authorized work document, the "open" limit switch settings for isolation valve SGUAV0134 was adjusted to approximately 70 percent of full open. The "open" limit switch setting for isolation valve 2SGAUV0138 was left at its original setting, since this setting prevented the valve from striking the backseat while allowing it to open to approximately 95 percent. The corresponding "ramp up" limit switches for both valves were then adjusted and each valve was tested to verify generation of the required "ramp up" signal, with satisfactory results. The pump was then tested in accordance with the applicable T.S. requirements and verified to operate utilizing both the "A" and "B" Train Steam Supplies. As a prudent measure a second engineering evaluation was initiated to establish any final adjustments needed to ensure actuation of the "ramp up" limit switch and proper operation of the pump. Based upon the results of this evaluation, additional adjustments were made to the limit switch settings, however these additional actions had no effect on the pump operability.



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO-3150-0104

EXPIRES: 8/31/88

FACILITY NAME (1)  Palo Verde Unit 1	DOCKET NUMBER (2)  0 5 0 0 0 5 2 8 8 7 — 0 2 5 — 0 2	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

At approximately 1503 MST on November 29, 1987, the Palo Verde Unit 2 Turbine Driven Auxiliary Feedwater Pump was declared operable, following satisfactory completion of testing. Based on the time and date of discovery, the event duration was approximately 61 hours, allowing Palo Verde Unit 2 to remain in Mode 1 throughout the event. The investigation showed, however, that the pump had the potential to be in an inoperable condition since 0605 MST on October 14, 1987, when steam supply isolation valve 2SGAUV0138 was taken out of service for the initial adjustment of the open limit switch. Based on this date, Palo Verde Unit 2 operated for approximately 46 days with the steam supply valves improperly adjusted as described herein.

Upon identification of the event in Unit 2 the Shift Supervisor (utility, licensed) notified control room personnel (utility licensed) in Units 1 and 3 of the potential impact on those units.

At approximately 1708 MST, on November 27, 1987, with Unit 1 in Mode 6 (REFUELING) at 0 percent power the control room personnel (utility, licensed) were notified by the Unit 2 Shift Supervisor of a potential misadjustment of the limit switches associated with the turbine driven auxiliary feedwater pump. Based upon the notification, the Unit 1 Shift Supervisor (utility, licensed) initiated an investigation to determine if a similar condition existed in Unit 1. As a result of this investigation, the "open" limit switch setting for the Unit 1 "B" Train Steam Supply Isolation Valve (1SGUAV0138) was found to have been adjusted as described in the Unit 2 event on September 23, 1987. The "A" Train Steam Supply Isolation Valve (1SGAUV0134) had been adjusted on November 9, 1987. Upon reaching this determination, Unit 1 Control Room personnel (utility, licensed) declared the Turbine Driven Auxiliary Feedwater Pump inoperable at 0330 MST on November 29, 1987. Palo Verde Unit 1 was in Mode 6 (REFUELING) at 0 percent power at the time of discovery, therefore necessary corrective actions were designated as Mode 4 restraints. As immediate corrective action, work documents have been implemented to adjust the "ramp up" limit switch for each of the affected valves, thereby ensuring proper operation of pump. The applicable surveillance testing requirements shall be met prior to declaring the affected equipment operable.

Unit 1 entered Mode 5 on October 5, 1987, therefore, Palo Verde Unit 1 operated for approximately 12 days (from September 23, when the initial adjustments were made, until October 5, 1987) with the steam supply valves improperly adjusted as described herein.

Following notification of the event in Palo Verde Unit 2, the Unit 3 Control Room Shift Supervisor (utility, licensed) determined that the corresponding Unit 3 valves had been adjusted in accordance with approved work documents implemented on September 4, 1987. These work documents implemented the original engineering evaluation utilized in Units 1 and 2 for adjusting the "open" limit switch on rotor #1, but included additional guidance for setting rotor #3 such that it would operate in tandem with rotor #1. Therefore the valves and pump were operable. As a prudent measure, however, switch settings were verified and minor adjustments made.





## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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Palo Verde Unit 1	0 5 0 0 0 5 2 8	8 7	0 2 5	0 2	0 5	OF	0 7

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

The root cause of the subject event is attributed to a cognitive personnel error, in that the personnel (utility, licensed) responsible for the engineering evaluation initially used to adjust the open limit switch settings for the steam supply valves did not address the impact that this action would have on the ability of the valves to generate the "ramp up" signal required for proper operation of the pumps.

Because of the complex nature of this event and the importance of ensuring that a comprehensive corrective action plan is implemented, an investigation was conducted. The results of this investigation and the corrective actions to be implemented are discussed below:

1. The Limitorque limit switch settings were not included in the design basis documents available to the System Engineer (utility-licensed); therefore, the modification was not perceived as a "design change." The following corrective actions will be implemented:
  - a. Procedures utilized for controlling modifications to Limitorque limit switch setpoints will be revised as appropriate to ensure that the design change process is utilized.
  - b. Additional training will be provided to System Engineers on the new procedural requirements.
  - c. An audit or evaluation will be conducted to determine if other design base changes have been made using the Engineering Evaluation Request process.
  - d. Limitorque limit switch settings will be included in design data base.
  - e. An evaluation will be conducted to ensure that necessary design parameters are included in the design data base.
2. A concern was identified with the adequacy of the System Engineers qualifications and training. The following corrective actions will be implemented:
  - a. Procedural controls establishing the qualification requirements for System Engineers will be evaluated and revised as appropriate.
  - b. Enhanced System Engineer training and testing will be conducted.
  - c. System Engineer job/task requirements will be evaluated and modified where necessary.



## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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

3. Following the modification described herein, Auxiliary Feedwater Pump retest requirements were not adequate. The following corrective actions will be implemented:
- Retest guidelines will be revised to provide more specific direction for retest.
  - The use of the administrative control procedures for design changes and/or modifications to Limiting Conditions for Operation (LCO) limit switch setpoints will assure that retest requirements are specified by an engineering organization.
  - Through review of or briefing on the event described herein, System Engineers, Planner/Coordinators, Shift Technical Advisors, and Shift Supervisors will be made aware of the importance of properly determining retest requirements.

The only other system affected by this event was an actuation for input to the Emergency Response Facility Data Acquisition Display System (ERFDADS), which is located on the same rotor as the "ramp up" limit switch. The limitations imposed by this event on ERFDADS had no safety impact because the system is not required for safe shutdown of the unit. The corrective actions taken to adjust the valve operation also corrected this input.

An investigation conducted by the Shift Technical Advisor (STA) Group (utility, non-licensed and licensed) subsequently identified a concern regarding the operability of the steam isolation valves pursuant to the requirements of T.S. 3.6.3 and 4.6.3.5 for containment isolation. While the steam isolation valves met the surveillance requirements for testing in accordance with T.S. 4.0.5 and were functionally operable as containment isolation valves, operation of the valves with the "ramp up" switches improperly adjusted was determined to be contrary to T.S. 3.6.3, in addition to 3.7.1.2 as described above. It was further noted that during the corrective actions taken to readjust the "ramp up" limit switches in Unit 2 on November 27, 1987, the shift supervisor (utility, licensed) did not recognize T.S. 3.6.3 as applicable for this event, and did not comply with the required ACTIONS specified for T.S. 3.6.3. This was identified as a cognitive personnel error for Unit 2 only.

T.S. 4.6.3.5 requires that the steam isolation valves be demonstrated operable as required by T.S. 4.0.5 (i.e., Section XI testing of the AMSE Boiler and Pressure Vessel Code) and the surveillance requirements associated with those Limiting Conditions for Operation (LCO) pertaining to each valve or system in which it is installed (i.e., T.S. 3.7.1.2). Valves secured in their actuated position are considered operable pursuant to this specification. For the steam isolation valves, the actuated position under accident conditions is open.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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Palo Verde Unit 1	0500052887	87	025	02	07	OF 07

TEXT (If more space is required, use additional NRC Form 368A's) (17)

With a steam isolation valve inoperable, T.S. 3.6.3 ACTION 1 requires that at least one isolation valve be maintained operable in each affected penetration (NH)(PEN) that is open and that either the inoperable valve be restored within 4 hours, or the affected penetration be secured with a closed valve (deactivated automatic or manual) or a blind flange within 4 hours, or that the Unit be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN within the following 30 hours. Inasmuch as the steam isolation valves are the only isolation valves in their respective penetrations, compliance with the requirements of T.S. 3.6.3 requires that the affected steam isolation valve be secured in its open position (i.e., operable pursuant to T.S. 4.6.3.5) or a manual valve (BA)(ISV) downstream of both the "A" and "B" train isolation valves is secured in a closed position. These T.S. requirements are confusing and appear to be inconsistent with the containment isolation basis for T.S. 3/4.6.3

The root cause of this event regarding compliance with T.S. 3.6.3 is cognitive personnel error, contributed to by the inconsistencies identified above for T.S. 3.6.3 and 4.6.3.5. As corrective action, a Technical Specification change will be pursued to clarify the requirements of T.S. 3.6.3 and 4.6.3.5, and to establish alternative actions for the steam isolation valves consistent with T.S. 3.7.1.2. This incident will be reviewed by operations personnel (utility, licensed) in all three Units.

There were no structures, systems or components other than those described above that were inoperable at the start of the event that contributed to the event. There were no unusual characteristics of the work location that directly contributed to the event. There were no manually or automatically initiated safety system responses associated with this event. Had a situation arisen that required the use of the turbine driven auxiliary feedwater pump, the motor driven essential and non-essential auxiliary feedwater pumps were available. As a result, this event had no adverse impact on the health and safety of the public.

No similar events involving the conditions and actions described above have been reported.





## Arizona Nuclear Power Project

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

192-00363-JGH/TDS/DAJ

April 12, 1988

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

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 1  
Docket No. STN 50-528 (License NPF-41)  
Licensee Event Report 1-87-025-02  
File: 88-020-404

Attached please find Supplement No. 2 to Licensee Event Report (LER) No. 1-87-025-01 prepared and submitted pursuant to the requirements of 10CFR 50.73(d). We are herewith forwarding a copy of this report to the Regional Administrator of the Region V Office.

If you have any questions, please contact T. D. Shriver, Compliance Manager at (602) 393-2521.

Very truly yours,

J. G. Haynes  
Vice President  
Nuclear Production

JGH/TDS/DAJ/kj

Attachment

cc: O. M. DeMichele (all w/a)  
E. E. Van Brunt, Jr.  
J. B. Martin  
T. J. Polich  
R. C. Sorensen  
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