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SUBJECT: LER 87-025-01:on 871127,mods to turbine driven auxiliary feedwater pump isolation valves render pump inoperable.

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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 6

TITLE (4) Modifications to Steam to Turbine Driven Auxiliary Feedwater Pump Isolation Valves Render Pump Inoperable

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)
									Palo Verde Unit 2	0 5 0 0 0 5 2 9
1 1	2 7	8 7	8 7	0 2 5	0 1	0 1	0 7	8 8	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)	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)	X 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
John E. Malik, (Acting) Compliance Lead	6 0 2 3 9 3 - 3 5 2 7

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
X YES (If yes, complete EXPECTED SUBMISSION DATE)	NO		0 2	2 9	8 8

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

This is a supplement to LER 87-025-00.

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, non-licensed) in that the engineering evaluation did not address the full impact of the approved modification. Corrective action to prevent recurrence is under evaluation and will be addressed in a supplement to this report.

I: 4 2

1/1

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 1	0 2 OF 0 6

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

This is a supplement to LER 87-025-00.

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.

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Palo Verde Unit 1	0 5 0 0 0 5 2 8	8 7	— 0 2 5	— 0 1	0 3 OF 0 6

TEXT (If more space is required, use additional NRC Form 366A'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 affect on the pump operability.

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

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 exceeded the 72 hour T.S. limit at 0605 MST on October 17, 1987 and operated for approximately 43 days in a condition contrary to T.S. 3.7.1.2.

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 in a condition contrary to T.S. for approximately 12 days, from September 23 until October 5, 1987.

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.

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. The current procedural controls governing the activities of the engineers are generic in nature and rely on the knowledge and training of the specific engineer assigned. The controls are considered adequate and there were no procedural deficiencies or violations. Because of the nature of this event and the importance of ensuring a comprehensive corrective action plan is implemented, an investigation was conducted by the Shift Technical Advisor (STA) Group. The results of this evaluation and recommendations for corrective actions are currently being reviewed. The results of the review and subsequent implementation of the applicable corrective actions will be provided in a supplement to this report.

The only other system affected by this event was an actuation for input to the Emergency Response Facility Data Aquisition 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.

The investigation conducted by the STA Group (utility, non-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.

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TEXT (If more space is required, use additional NRC Form 366A'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. Pending final resolution of this issue, this incident will be reviewed by operations personnel 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.

As stated above a supplement will be submitted to this report providing the details of the investigation conducted by the STA Group.

Arizona Nuclear Power Project
P.O. BOX 52034 • PHOENIX, ARIZONA 85072-2034

192-00332-JGH/JEM/KCP
January 7, 1988

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

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 1
Docket No. STN 50-528
Licensee Event Report 1-87-025-00
File: 88-020-404

Attached please find Supplement No. 1 to Licensee Event Report (LER No. 87-025-00 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 J. E. Malik, (Acting) Compliance Lead at (602) 393-3531.

Very truly yours,

JG Haynes

J. G. Haynes
Vice President
Nuclear Production

JGH/JEM/KCP/kj

Attachment

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