

**LICENSEE EVENT REPORT (LER)**

FACILITY NAME (1) **Palo Verde Unit 3** DOCKET NUMBER (2) **05000530** PAGE (3) **1 OF 09**

TITLE (4) **MSSV Setpoints Out of Tolerance**

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)											
1	0	2	3	9	2	9	2	0	0	5	0	1	0	0	5	3	0	1	0	0	9
									N/A			0 5 0 0 0									
									N/A			0 5 0 0 0									

OPERATING MODE (9) **6**

POWER LEVEL (10) **0 0 0**

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.405(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.405(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(c)
<input type="checkbox"/> 20.405(a)(1)(ii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vi)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/> 20.405(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(vii)(A)	
<input type="checkbox"/> 20.405(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(vii)(B)	
<input type="checkbox"/> 20.405(a)(1)(v)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(viii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME **Thomas R. Bradish, Nuclear Regulatory Affairs, Manager**

TELEPHONE NUMBER **6 0 2 3 9 3 1 5 4 2 1**

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)

YES (If yes, complete EXPECTED SUBMISSION DATE)  NO

EXPECTED SUBMISSION DATE (15) **0 7 3 1 9 3**

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

On October 23, 1992, while Unit 3 was in Mode 6 (REFUELING) with the Reactor Coolant System at approximately 95 degrees Fahrenheit and at atmospheric pressure, an APS engineering evaluation of ASME surveillance testing results determined that eleven (11) of the twenty (20) Main Steam Safety Valves (MSSV) as-found relief settings were out of the tolerance limits specified in Technical Specification 3.7.1.1. The testing and adjustments were performed during the period of October 10 through October 23, 1992, while Unit 3 was in a scheduled refueling outage.

The MSSVs have been the subject of setpoint drift. The cause of the event is being investigated in accordance with the APS Incident Investigation Program. The results of this investigation and any corrective action to prevent recurrence will be included in a supplement to this LER which is expected to be submitted by July 31, 1993. This supplement will also include the results of the investigation identified in LER 528/92-004-01. As immediate corrective action, the MSSVs were disassembled, inspected, reworked (as required), reassembled, retested, and their lift setpoints were readjusted.

Previous similar events were reported in MSSV and PSV LERs 528/88-014-01, 528/89-007-02, 528/89-010-00, 529/89-002-00, 529/89-007-00, 529/90-004-01, 529/91-005-01, 530/91-001-01, and 528/92-004-01.

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**TEXT**

**I. DESCRIPTION OF WHAT OCCURRED:**

**A. Initial Conditions:**

On October 23, 1992, Palo Verde Unit 3 was in Mode 6 (REFUELING) with the Reactor Coolant System (RCS)(AB) at approximately 95 degrees Fahrenheit and at atmospheric pressure during a scheduled refueling outage.

**B. Reportable Event Description (Including Dates and Approximate Times of Major Occurrences):**

**Event Classification:** Condition Prohibited by the Plant's Technical Specifications.

Palo Verde Unit 3 is a two-loop pressurized water reactor (PWR). Each loop has a vertical U-tube steam generator (SG)(AB) with two outlet main steam lines (SB) per steam generator. Overpressure protection for the shell side of the steam generators and the main steam lines up to the inlet of the turbine (TRB) stop valve (SHV)(TA) is provided by twenty flanged, spring loaded, direct acting, ASME Code Main Steam Safety Valves (MSSV)(RV)(SB) which have open bonnets and discharge to the atmosphere. The MSSVs are mounted on each of the main steam lines upstream of the Main Steam Isolation Valves (MSIV)(ISV)(SB) but outside the Containment (CTMT)(NH). The opening pressure of the MSSVs is set in accordance with ASME Code and Technical Specification (TS) 3.7.1.1 requirements. The MSSVs are set to lift sequentially at 1250, 1290, and 1315 pounds per square inch gauge (psig).

The MSSVs are required by TS 4.7.1.1 and the ASME Code to be tested once per five years. This testing is being conducted at less than the five year interval in accordance with the corrective action for the previous out-of-tolerance relief settings in Units 1, 2, and 3 as reported in LERs 528/88-014-01, 528/89-010-00, 529/89-002-00, 529/89-007-00, 529/90-004-01, 529/91-005-01, 530/91-001-01, and 528/92-004-01. An enhanced preventive maintenance and testing program has been implemented wherein the MSSVs are removed for testing and sent to an offsite testing facility (Westinghouse Test Facility). The MSSVs are tested in accordance with approved procedures under elevated steam pressure conditions. Each MSSV is tested to determine its as-found lift setpoint. Following this testing, the MSSVs are disassembled, inspected, reworked (as required), reassembled, retested, and their lift setpoints are readjusted.



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On September 19, 1992, Unit 3 was shut down for a planned refueling outage. During the refueling outage, the MSSVs were removed and sent to the offsite testing facility for scheduled testing. On October, 23, 1992, APS Engineering personnel (utility, non-licensed) completed a review of data obtained for the MSSV testing conducted at the offsite testing facility from October 10 through October 23, 1992. Based upon a review of the actual test results, eleven (11) of twenty (20) MSSVs as-found relief settings were out of tolerance. None of the MSSV as-found relief settings were below specification; eleven (11) were above specification. The maximum deviation from the setpoint for the as-found settings was 3.35 percent high. The as-found settings for seven (7) valves were greater than one percent but less than two percent high, two (2) valves were greater than two percent but less than three percent high, and two (2) valves were greater than three percent high. Setpoint and as-found data for these valves has been tabulated in Section V. of this report.

Since eleven of the twenty MSSV as-found relief settings were outside the TS limit, it is assumed that one or more of these valves were outside the TS limit during operation. Therefore, it is assumed that the OPERABILITY requirements and the associated ACTIONS were not met for TS 3.7.1.1.

- C. Status of structures, systems, or components that were inoperable at the start of the event that contributed to the event:

Other than the MSSVs described in Section I.B, no structures, systems, or components were inoperable which contributed to the event.

- D. Cause of each component or system failure, if known:

Not applicable - no component or system failures were involved.

- E. Failure mode, mechanism, and effect of each failed component, if known:

Not applicable - no component failures were involved.

- F. For failures of components with multiple functions, list of systems or secondary functions that were also affected:

Not applicable - no component failures were involved.



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- G. For a failure that rendered a train of a safety system inoperable, estimated time elapsed from the discovery of the failure until the train was returned to service:

Not applicable - no failures were involved which rendered a train of a safety system inoperable.

- H. Method of discovery of each component or system failure or procedural error:

Not applicable - there have been no component or system failures or procedural errors identified.

- I. Cause of Event:

The MSSVs and Pressurizer Safety Valves (PSV)(RV)(AB) have been subject to setpoint drift as reported in LERs 528/88-014-01, 528/89-007-02, 528/89-010-00, 529/89-002-00, 529/89-007-00, 529/90-004-01, 529/91-005-01, 530/91-001-01, and 528/92-004-01. APS has implemented an enhanced preventive maintenance and testing program as described in Sections I.B and III.B. The cause of the setpoint drift is being investigated in accordance with the APS Incident Investigation Program. This investigation is expected to be completed by June 30, 1993. The next Unit 2 refueling outage will be the first opportunity for APS to retest and reinspect MSSVs that were initially tested and rebuilt in accordance with the enhanced testing program. The results of this investigation will be included in a supplement to this LER which is expected to be submitted by July 31, 1993. This supplement will include the results of the investigation identified in LER 528/92-004-01.

During the last Unit 3 refueling outage, the Unit 3 MSSVs were tested in place using the Furmanite Trevitest method described in previous LERs. The MSSVs were removed and tested during this refueling outage as part of the enhanced preventive maintenance and testing program for MSSVs described in Sections I.B and III.B. Unit 3 is currently in the third refueling outage.

During MSSV disassembly and inspection, although most exhibited seat wear and some of the MSSVs had steam cut seats, no discs were replaced. No galling between the disc holder and disc guide was observed as it was in the Unit 1 valves (LER 528/92-004-01). No obvious additional information relating to the setpoint drift of these valves was immediately obtained from this testing.



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J. Safety System Response:

Not applicable - there were no safety system responses and none were necessary.

K. Failed Component Information:

Although there were no failed components associated with this event the following data is provided for information:

MSSVs

Manufacturer: Dresser Valve and Controls Division  
Dresser Industries, Inc.

Model No: 6" 3707R Consolidated Main Steam Safety Valves Type 3700

II. ASSESSMENT OF THE SAFETY CONSEQUENCES AND IMPLICATIONS OF THIS EVENT:

As described in Section I.B, the MSSVs are intended to provide overpressure protection for the secondary side from the steam generators and main steam lines up to the turbine stop valves. The MSSVs ensure that steam generator pressure remains below 110 percent of design pressure and the RCS pressure remains below the acceptance criteria of 120 percent of design pressure for large feedwater line breaks, for Control Element Assembly (ROD)(AA) ejections and 110 percent of design pressure for all other overpressurization events.

APS Engineering has completed a preliminary review of the as-found condition of the MSSV setpoints and determined that, for the design basis accidents, the MSSVs would have prevented system pressure from exceeding 110 percent of steam generator design pressure (peak analyzed pressure was approximately 108 percent of steam generator design pressure) and the sequential lifting scheme would have ensured that steam generator integrity would not be compromised. Furthermore, if an event occurred in which the MSIVs remained open, overpressure protection could have been automatically provided by the Steam Bypass Control System (JI). In addition, it should be noted that secondary side pressure is monitored by Reactor Operators (utility, licensed) in the Control Room (NA), and manual overpressure protection is provided by remote operation of the Atmospheric Dump Valves (ADV)(PCV)(SB) from the Control Room.

The Bounding Anticipated Operational Occurrence for overpressure events at Palo Verde is a Loss Of Condenser (SG) Vacuum (LOCV). The LOCV event is the limiting event for a decrease in heat removal by the secondary





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system. APS Engineering performed a preliminary LOCV analysis to determine if the as-found condition for the MSSVs and the PSVs could have resulted in the steam generator pressure or RCS pressure exceeding the limit of 110 percent of design pressure. The analysis used the as-found MSSV and PSV setpoints. The assumptions used for this analysis are similar to assumptions used in the previous MSSV setpoint tolerance calculations described in the LERs discussed in Section IV. The peak RCS pressure reached during the analysis was 2712 psia, which remained below the limit of 2750 psia. The peak steam generator pressure reached during the analysis was 1358 psia, which remained below the limit of 1375 psia.

The assumptions made in this LOCV analysis are similar to the assumptions made in the Updated FSAR. The analysis in the Updated FSAR estimates that RCS pressure will reach approximately 2742 psia. Three additional assumptions, each supported by either tests or analyses, have been made to limit the RCS peak pressure increase. These assumptions are summarized below:

- 1) The High Pressurizer (AB) Pressure Trip (HPPT) response time was changed to 0.5 seconds from 1.15 seconds. Surveillance testing for the three units has shown that the HPPT trip response time is consistently less than 0.3 seconds. An assumed response time of 0.5 seconds is therefore conservative.
- 2) The surge line friction form loss factor was reduced to 3.0 from 3.9 to reflect actual Palo Verde design. This change was analytically justified in a calculation performed by ABB - Combustion Engineering in May 1989.
- 3) In previous analyses, the PSVs were assumed to open to 70 percent of the nominal area opening at the setpoint pressure. In this analysis, the PSVs are assumed to open to 100 percent (modeled in the CESEC code as 0.99 of the nominal area opening) at the setpoint pressure. This operation of the PSVs is justified based on the test data presented in ABB-Combustion Engineering Topical Report CEN-227 "Summary Report on the Operability of Pressurizer Safety Valves in CE Designed Plants." This report was accepted by the NRC for use at Palo Verde in Supplement 8 of the Safety Evaluation Report (NUREG-0857).

The assumptions used for the preliminary analysis are similar to the assumptions used in previous MSSV setpoint tolerance calculations described in the LERs discussed in Section IV. If the results of the final analysis are significantly different than the preliminary analysis, the results of the final analysis will be discussed in a supplement to this report. Based on the preliminary results of the



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analyses described above, there were no safety consequences or implications resulting from this event.

III. CORRECTIVE ACTION:

A. Immediate:

Following the testing, the MSSVs were disassembled, inspected, reworked (as required), reassembled, retested, and their lift setpoints were readjusted. Seven (7) original Unit 3 valves were returned to the Unit; thirteen (13) were replaced with pre-tested spares that had been included in the preventive maintenance program.

A tracking system, using individual serial numbers, has been implemented to facilitate trending test results as the valves are not necessarily returned to the same location.

B. Action to Prevent Recurrence:

The cause of the setpoint drift is being investigated in accordance with the APS Incident Investigation Program. The investigation is expected to be completed by June 30, 1993. The results of this investigation and any corrective action to prevent recurrence will be included in a supplement to this LER which is expected to be submitted by July 31, 1993. The supplement to this LER will include the results of the inspection identified in LER 528/92-004-01. No supplement to LER 528/92-004-01 will be issued.

APS has submitted an amendment to the TS to increase the tolerance on the MSSV setpoints (161-03587-WFC/JST, dated November 13, 1990).

Due to the tendency toward setpoint drift exhibited by these valves and NRC Information Notice 89-90, in 1991, APS started an enhanced preventive maintenance and testing program for MSSVs. Starting with the Unit 2 1991 refueling outage, MSSVs have been sent to an offsite test facility so that the valves could be tested, disassembled, inspected, reworked (as required), reassembled, retested, and have their lift setpoints readjusted. It should be noted that the twenty (20) Unit 3 MSSVs were removed during the current Unit 3 outage and shipped to the offsite testing facility.

All twenty (20) Unit 2 MSSVs will be removed and shipped to the offsite testing facility during the current (March 1993) Unit 2 refueling outage. Six (6) of these valves will be reinstalled in

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Unit 2 following maintenance and testing. The other fourteen (14) MSSVs will be replaced with pre-tested spares that have previously been included in the preventive maintenance program. Seven (7) of the Unit 2 MSSVs had been removed, sent offsite, tested, and placed into the preventive maintenance program during the last Unit 2 refueling outage. All four (4) Unit 2 PSVs are also scheduled for shipment to the offsite testing facility for testing, inspection, and rework as required.

**IV. PREVIOUS SIMILAR EVENTS:**

MSSV and PSV LERs 528/88-014-01, 528/89-007-02, 528/89-010-00, 529/89-002-00, 529/89-007-00, 529/90-004-01, 529/91-005-01, 530/91-001-01, and 528/92-004-01 describe events where MSSVs were out of the tolerance limits specified in TS 3.7.1.1 and PSVs were out of the tolerance limits specified in TS 3.4.2.2. Corrective action for these MSSV and PSV events include readjustment of the valves and an administrative reduction of the five year testing interval, as described in Sections I.B and III.B.

Previous corrective actions could not have prevented these events because they would not affect the tendency toward setpoint drift exhibited by the MSSVs and PSVs as described in the previous LERs.

**V. ADDITIONAL INFORMATION**

The Unit 3 PSVs were also tested during the current refueling outage and the as-found setpoints were within the required tolerance of TS 3.4.2.2. The PSVs were tested, disassembled and reworked (as required), reassembled, retested, and had their lift setpoints adjusted in accordance with the preventive maintenance program. No problems were noted. Setpoint and as-found data for these valves has been tabulated below.

Main Steam and Pressurizer Safety Valve Test Results  
September 1992, Unit 3 Refueling Outage

<u>MSSV Tag Number</u>	<u>Setpoint (Tolerance)</u>	<u>As Found Pressure</u>	<u>Variance %</u>
PSV0554	1250 psig (1238-1262)	1280 psig	+2.4
PSV0555	1290 (1278-1302)	1313	+1.78
PSV0556	1315 (1302-1328)	1320	+0.38
PSV0557	1315 (1302-1328)	1318	+0.23
PSV0558	1315 (1302-1328)	1333	+1.37
PSV0559	1315 (1302-1328)	1324	+0.68



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Main Steam and Pressurizer Safety Valve Test Results (cont)  
September 1992, Unit 3 Refueling Outage

<u>MSSV Tag Number</u>	<u>Setpoint (Tolerance)</u>	<u>As Found Pressure</u>	<u>Variance %</u>
PSV0560	1290 psig (1278-1302)	1297 psig	+0.5
PSV0561	1250 (1238-1262)	1265	+1.2
PSV0572	1250 (1238-1262)	1257	+0.5
PSV0573	1290 (1278-1302)	1297	+0.5
PSV0574	1315 (1302-1328)	1359	+3.35
PSV0575	1315 (1302-1328)	1345	+2.28
PSV0576	1315 (1302-1328)	1327	+0.99
PSV0577	1315 (1302-1329)	1338	+1.75
PSV0578	1290 (1278-1302)	1289	0.00
PSV0579	1250 (1238-1262)	1291	+3.28
PSV0691	1315 (1302-1328)	1333	+1.37
PSV0692	1315 (1302-1328)	1333	+1.37
PSV0694	1315 (1302-1328)	1341	+1.98
PSV0695	1315 (1302-1328)	1327	+0.99

<u>PSV Tag Number</u>	<u>Setpoint (Tolerance)</u>	<u>As Found Pressure</u>	<u>Variance %</u>
PSV0200	2485 psig (2460-2509)	2500 psig	+0.60
PSV0201	2485 (2460-2509)	2499	+0.56
PSV0202	2485 (2460-2509)	2504	+0.76
PSV0203	2485 (2460-2509)	2479	-0.24

