

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Diablo Canyon Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 2 7 5 1	PAGE (3) 1 OF 7
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TITLE (4) **Technical Specification 3.4.2.2 Not Met During Pressurizer Safety Valve Surveillance Testing Due to Random Setpoint Spread**

EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)										
MON	DAY	YR	YR	SEQUENTIAL NUMBER			REVISION NUMBER		MON	DAY	YR	FACILITY NAMES		DOCKET NUMBER (S)						
10	10	95	95	0	1	6	0	1	9	19	97			0	5	0	0	0		
														0	5	0	0	0		

OPERATING MODE (9) **6** THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)

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

10 CFR 50.73(a)(2)(i)(B)
 OTHER - _____
 (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

Vickie Backman, Senior Regulatory Services Engineer	TELEPHONE NUMBER
	AREA CODE 805 NUMBER 545-4289

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)														
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS
X	A	B	R	V		C	7	1	0	Y				

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 (16)

On October 10, 1995, with Unit 1 in Mode 6 (Refueling) and the reactor core offloaded, Technical Specification (TS) 3.4.2.2 was identified as not met during the previous cycle when two out of three Unit 1 pressurizer code safety valve (PSV) setpoints were found outside the TS tolerance of 2485 psig, plus or minus 1 percent during testing conducted at the Westinghouse Service Center (WSC) test facility in Beaumont, California.

The Unit 1 PSVs were reset at the WSC test facility to the required tolerance using Surveillance Test Procedure M-77, "Safety and Relief Valve Testing."

PG&E believes the cause of the PSV setpoints being outside the TS tolerance is random setpoint spread due to instability of the upper spring washer movement during valve actuation.

PG&E has enhanced the PSV maintenance activities and offsite testing procedures resulting in improved performance of the PSVs. PG&E investigated a design change to the PSV upper spring washer; however, PG&E will not implement this design change based upon concerns regarding the effects upon the valve performance characteristics. PG&E will develop a license amendment request to revise the PSV lift setting.



2

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)					PAGE (3)	
		YEAR	-	SEQUENTIAL NUMBER	-	REVISION NUMBER	2	OF 7
Diablo Canyon Unit 1	0 5 0 0 0 2 7 5	95	-	0 1 6	-	0 1	2	OF 7

TEXT (17)

I. Plant Conditions

Unit 1 was in Mode 6 (Refueling) with the reactor core offloaded at the time of discovery.

II. Description of Problem

A. Summary:

On October 10, 1995, with Unit 1 in Mode 6 during the Unit 1 seventh refueling outage (1R7), Technical Specification (TS) 3.4.2.2 was identified as not met for the previous cycle when two out of three Unit 1 pressurizer code safety valves (PSV)(AB)(RV) found outside the TS tolerance of 2485 psig, plus or minus 1 percent tolerance during testing conducted at the Westinghouse Service Center (WSC) test facility.

The Unit 1 PSVs were reset at the WSC test facility to the required tolerance following multiple lifts to characterize the valve specific lift setting distribution.

B. Background:

TS 3.4.2.2 requires that all PSVs shall be operable with a lift setting of 2485 psig; plus or minus 1 percent with the lift setting pressure corresponding to ambient conditions of the valve at nominal operating temperature and pressure.

Surveillance Test Procedure (STP) M-77, "Safety and Relief Valve Testing," requires that the PSVs be verified for lift point setting by testing a determined group in order to meet the requirements of the ASME Boiler and Pressure Vessel Code, Section XI. STP M-77 requires that the valves lift twice consecutively without adjustment within the required tolerance in order to declare them operable.

The WSC test methodology for obtaining the as-found lift settings consists of placing the PSV in an environmentally controlled room and heating the ambient air to the temperature conditions typical at Diablo Canyon Power Plant (DCPP). The loop seal is also heated to simulate the piping temperature conditions at DCPP. Testing is accomplished by the addition of steam at a defined ramp rate. Steam is added until physical evidence of stem movement is visible on the remote data acquisition display screen. The data are then reviewed to ascertain "first discernible stem movement" and the pressure at which it took place.

C. Event Description:

During the Unit 1 sixth refueling outage (1R6) in 1994, all three PSVs were tested at the WSC. The valves were then returned to the plant, installed, and declared operable without any additional adjustment of the setpoints until the safeties were checked at WSC in October 1995.



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (5)						PAGE (3)	
		YEAR	-	SEQUENTIAL NUMBER	-	REVISION NUMBER	3	OF	7
Diablo Canyon Unit 1	0 5 0 0 0 2 7 5	95	-	0 1 6	-	0 1	3	OF	7

TEXT (17)

On October 10, 1995, with Unit 1 in Mode 6, TS 3.4.2.2 was identified as not met during the previous cycle when the setpoints for two out of three Unit 1 PSVs were determined to be outside the 2485 psig, plus or minus 1 percent tolerance during testing conducted at the WSC test facility. The two valves tested high at +1.97 percent.

PSV lift setpoint has been recognized as an industry-wide problem. PG&E has participated in extensive investigative test programs, both jointly with the Nuclear Steam Supply System (NSSS), Westinghouse Owners Group (WOG), and independently. The results of the industry investigations are documented in WCAP-12910, "Pressurizer Safety Valve Set Pressure."

PG&E completed its pressurizer safety valve test program. A summary of the program results are as follows: The program consisted of participation in the WOG testing and additional independent valve testing to help determine the root cause of the measured setpoint drift. The most significant contributor identified was the inherent repeatability of the valve setpoint between successive tests under controlled conditions or random setpoint spread.

PG&E believes the large deviations in set pressure are a result of the interaction of the spring, the upper spring washer, and the nose of the adjusting bolt (see sketch, page 7) as they pivot. In a standard valve, the lower spring washer pivots around its seating surface on the lower spindle boss. The upper washer pivots in a similar manner, but it is seated against the rounded nose of the adjusting bolt. As the spring compresses, the forces compressing the spring are not evenly distributed on the washers. This is due to the machining of the spring coils at both ends of the spring to make them flat. This results in the first coil on either end being tapered. As the spring compresses, the forces are distributed around the washer in relation to the thickness of the coil. Consequently, more of the load is transferred to the thicker section of the spring resulting in the spring forces being biased and minute buckling of the spring. In addition, the rounded seating surfaces on both ends allows the spring to assume various shapes as it actuates.

A prototype valve with a modified upper spring washer was developed and tested in order to reduce the minute buckling and pivoting that takes place in the standard valve arrangement. The valve with the modified washer was comparison tested to the standard valve. Testing was performed under identical environmental conditions for both valves. No adjustments were made to either valve type throughout the tests. The standard valve demonstrated a standard deviation (67 percent) of 22.5 psi. The magnitude of this value is nearly equal to the TS tolerance of 24.8 psi. The prototype valve demonstrated a standard deviation (67 percent) of 11.4 psi. PG&E has developed a design change package to implement the modified upper spring washer.

On September 7, 1995, PG&E received a request for additional information regarding an NRC concern for certification testing of the modified valve design in accordance with the requirements of NUREG 0730, Item II.D.1. Based upon discussions with the



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Diablo Canyon Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 2 7 5	LER NUMBER (6)	PAGE (3)						
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">YEAR</td> <td style="width: 15%;">SEQUENTIAL NUMBER</td> <td style="width: 15%;">REVISION NUMBER</td> </tr> <tr> <td style="text-align: center;">95</td> <td style="text-align: center;">- 0 1 6</td> <td style="text-align: center;">- 0 1</td> </tr> </table>	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	95	- 0 1 6	- 0 1	4 OF 7
YEAR	SEQUENTIAL NUMBER	REVISION NUMBER							
95	- 0 1 6	- 0 1							

TEXT (17)

NRC Staff, additional assurance that the PSV's performance is not altered by the design change was recommended. Due to the unavailability of a domestic facility with the capability to perform the recommended valve testing, PG&E has deferred installing PSVs with the modified design.

Additional Information Subsequent to Above Event:

Recent valve performance confirms improved PSV valve repeatability. Results from Unit 2 seventh refueling outage (2R7) and Unit 1 eighth refueling outage (1R8) are as follows:

Unit 2 Valve #	As Found (first lift)	Additional Lifts
2-RCS-8010A	+1.4%	Lifted within tolerance without adjustment
2-RCS-8010B	within 1%	Lifted within tolerance without adjustment
2-RCS-8010C	within 1%	Lifted within tolerance without adjustment
Unit 1 Valve #	As Found (first lift)	Additional Lifts
1-RCS-8010A	within 1%	Lifted within tolerance without adjustment
1-RCS-8010B	within 1%	Lifted within tolerance without adjustment
1-RCS-8010C	-2%	Lifted within tolerance without adjustment

The above results confirm the improved performance of the PSVs; therefore, no additional corrective actions are required.

D. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

E. Dates for Major Occurrences:

October 10, 1995: Event/discovery date. Two out of three PSVs identified to be outside the required TS 3.4.2.2 tolerance.

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

This event was discovered during the routine scheduled testing of the Unit 1 PSVs conducted offsite at the WSC.

H. Operator Actions:



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)						PAGE (3)	
		YEAR	-	SEQUENTIAL NUMBER	-	REVISION NUMBER	5	OF	7
Diablo Canyon Unit 1	0 5 0 0 0 2 7 5	95	-	0 1 6	-	0 1	5	OF	7

TEXT (17)

None.

I. Safety System Responses:

None.

III. Cause of the Problem

A. Immediate Cause:

The PSVs did not lift within their TS tolerance band of plus or minus 1 percent.

B. Root Cause:

The cause of the setpoint change was determined to be the random setpoint spread.

C. Contributing Cause:

A contributing cause of the measured random setpoint spread is the set pressure deviation characteristic of the valve due to minute movement of the upper spring washer. PG&E has found that a more rigidly restrained upper spring washer can reduce the setpoint deviation during controlled testing.

IV. Analysis of the Event

The most limiting transient that results in the actuation of the PSVs is a Condition II transient. The FSAR Update Chapter 15 acceptance limit for Condition II transients is 110 percent of design pressure (2750 psia).

PG&E reanalyzed the FSAR Update loss of load/turbine (TRB) trip (LOL/TT) transient without reactor coolant system (RCS)(AB) pressure control at beginning of life using the as-found Unit 1 PSV setpoints tested during 1R7. This transient is the limiting FSAR Update Condition II transient for RCS overpressure protection. The RETRAN code was used to perform this analysis. The RETRAN model has been benchmarked against DCCP test data and the FSAR Update LOL/TT transient analysis results. The RETRAN results show that the peak RCS pressure is 2739.9 psia, which is 10.1 psi lower than 110 percent of the design RCS pressure (2750 psia). Therefore, it can be concluded that the Unit 1 PSVs with the as-found setpoints can operate normally and provide adequate protection to prevent the RCS from over-pressurization.

Therefore, the health and safety of the public were not adversely affected by this event.



-
2

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)				PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			OF
Diablo Canyon Unit 1	0 5 0 0 0 2 7 5	95	- 0 1 6	- 0 1	6		7

TEXT (17)

V. Corrective Actions

A. Immediate Corrective Actions:

Unit 1 PSVs were reset at the test facility to the required tolerance using STP M-77 following multiple lifts to characterize the valve specific lift setting distribution.

B. Corrective Actions to Prevent Recurrence:

1. This condition has been recognized as an industry-wide problem. PG&E has participated in extensive investigative test programs, both jointly with the WOG, and independently. The results of these investigations confirm the adequacy of present test methods and that adequate margin exists to accommodate the identified random setpoint characteristics of the valves.
2. PG&E identified a design revision to the upper spring washer that, based upon preliminary testing, reduces the random setpoint variance of the valve by approximately 50 percent under controlled test conditions. Based upon discussions with the NRC staff, additional assurance that the PSV's performance is not altered by the design change was recommended. Due to the unavailability of a domestic facility with the capability to perform the recommended valve testing and acceptable performance demonstrated during recent testing, PG&E will not implement the modified design.
3. PG&E has sufficient spare PSVs such that the valves to be tested may be replaced with pretested valves during refueling outages. These valves have been dimensionally verified to be within manufacturer's tolerances and additionally machined to match critical dimensional tolerances as close as practical. PG&E believes that the additional maintenance activities performed on the PSVs has resulted in increased performance of the PSVs.
4. A license amendment request will be developed to revise the PSV lift setting.

VI. Additional Information

A. Component: Pressurizer Code Safety Valve
 Manufacturer: Crosby Valve and Gauge Company
 Model Number: HB-BP-86

B. Previous LERs on Similar Problems:

Voluntary LER 1-88-018 was submitted regarding PSVs found outside TS limits during refueling outages. No root cause or corrective actions could be established for the generic industry problem of setpoint drift of the PSVs. Therefore, the corrective actions taken for LER 1-88-018 did not prevent this event.



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Diablo Canyon Unit 1	0 5 0 0 0 2 7 5	95	- 0 1 6	- 0 1	7 OF 7

TEXT (17)

LER 1-94-009 was submitted regarding PSVs found outside TS limits during 1R6. The root cause of this event was determined to be random setpoint spread. No corrective action to prevent recurrence was required because this inherent characteristic of the valve was within the analysis basis of DCP. However, a prudent action to replace the PSV upper spring washer was recommended. The implementation of this prudent action has been deferred until NRC concerns regarding valve performance can be acceptably resolved.



