LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
DIABLO CANYON UNIT 1	0 5 0 0 0 2 7 5	1 OF 1 1

TITLE (4) PRESSURIZER AND MAIN STEAM LINE CODE SAFETY VALVES FOUND OUTSIDE TECHNICAL SPECIFICATION SETPOINT TOLERANCE LIMITS DUE TO INDETERMINATE CAUSES

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 2	1 7	8 8	8 8	0 1 8	0 0	0 9	3 0	8 8	DIABLO CANYON UNIT 2	0 5 0 0 0 3 2 3
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 8 7

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (11)

[ ] 10 CFR _____

[X] OTHER (Specify in Abstract Below and in Text, NRC Form 366A) VOLUNTARY

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (AREA CODE)
STEPHEN D. WILSON, REGULATORY COMPLIANCE ENGINEER	8 0 5 5 9 5 7 3 5 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)

[X] YES (If yes, complete EXPECTED SUBMISSION DATE). [ ] NO

EXPECTED SUBMISSION DATE (15): MONTH 1 2 DAY 3 1 YEAR 8 8

ABSTRACT (16)

This voluntary LER is being submitted for information purposes only as described in Item 19 of Supplement Number 1 to NUREG-1022.

On February 17, 1988, with Unit 1 in Mode 1 (Power Operation), ten main steam line code safety valves were found outside of the required Technical Specification (TS) 3.7.1.1 tolerance band. All ten valves were readjusted and returned to service within the allowable TS action statement time limit.

On March 9, 1988, with Unit 1 in Mode 3 (Hot Standby), all three pressurizer code safety valves were found outside of the required TS 3.4.2.2 tolerance band. All three valves were adjusted and returned to service within the allowable TS action statement time limit.

The root cause of the pressurizer and main steam line code safety valve setpoint drift is not known.

PG&E will send the Unit 2 pressurizer code safety valves to an offsite test facility during the current refueling outage to set the lift setpoints on a live steam apparatus. A supplemental report will be submitted to report the testing results. This test is intended to remove variables in the testing process that may affect the lift setpoint testing and setting.

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I. Initial Conditions

Unit 1 was in Mode 3 (Hot Standby) for the pressurizer code safety valve testing. Unit 1 was in Mode 1 (Power Operation) at 87 percent power for the main steam line code safety valve testing.

II. Description of Event

A. Event:

1. Unit 1 second refueling outage pressurizer code safety valve testing

On March 9, 1988, with the unit in Mode 3 (Hot Standby), Surveillance Test Procedure (STP) M-77, "Safety and Relief Valve Testing," was performed on the pressurizer code safety valves (AB)(RV). STP M-77 specifies that testing be performed on the pressurizer safety valves in accordance with Mechanical Maintenance Procedure (MP) M-7.23, "Pressurizer Safety Valve Lift Point Setting Using Air Set Pressure Device." The testing on the pressurizer code safety valves was performed by Furmanite Corporation using an industry accepted Trevitest hydraulic assist testing methodology to predict the lift setpoint. The Trevitest apparatus is a hydraulic assist mechanism that is attached to the stem of the code safety valves. The device provides the extra force required to make the code safety valves lift with normal reactor coolant system pressure being applied to the valve. The extra force that is required to lift the valve is recorded and converted to a pounds per square inch measurement which can be added to the system pressure at the time of the test in order to obtain a predicted valve lift setpoint. All three pressurizer code safety valves were found to be outside Technical Specification 3.4.2.2 tolerance of +/- 1%. TS 3.4.2.2 requires that the pressurizer code safety valves be set at 2485 psig +/- 1% (ie., 2460.2 - 2509.8 psig). The results are as follows:

Valve	First Lift	% Tolerance Deviation
RCS-1-8010A	2525 psig	2% High
RCS-1-8010B	2358 psig	6% Low
RCS-1-8010C	2459 psig	2% Low

These valves were adjusted, retested with the Trevitest apparatus, and returned to service to the TS 3.4.2.2 tolerance band within the required TS action statement time. STP M-77 requires that the valves lift twice consecutively without adjustment within the required tolerance in order to declare the code safety valve operable.

All of the pressurizer code safety valves were removed during Mode 6 (Refueling) for inspection, maintenance, and leak testing. No unusual characteristics were noted that could explain the valves lifting outside of the TS tolerance criteria. The valves were reinstalled and tested in place on the pressurizer when the unit reentered Mode 3 (Hot Standby) following the Unit 1 second refueling outage. Adjustments to the setpoints of the valves were required to be within the +/- 1% criterion because the valves had been set cold on a test stand with nitrogen gas pressure.

2. Previous pressurizer code safety valve testing

The Trevitest method for testing code safety valves has been used previously in the Units 1 and 2 first refueling outages. The reliability of this test method was verified by PG&E at Wyle Laboratories in 1986 using a live steam test apparatus. The testing showed that the Trevitest apparatus predicted lift setpoint compared favorably with the actual lift setpoint when tested on the live steam apparatus.

On August 30, 1986, with the unit in Mode 3, the pressurizer code safety valves were tested during the Unit 1 first refueling outage. A summary of those results are listed below:

Valve	First Lift	Second Lift	% Second Lift Tolerance Deviation
RCS-1-8010A	2747 psig	2555 psig	3% High
RCS-1-8010B	3028 psig	2494 psig	1% High
RCS-1-8010C	2661 psig	2438 psig	2% Low

After a review of the test data, it was concluded that the first lift data were incorrect since the loop seal had not been drained prior to testing the valves. The Trevitest rig was not capable of accurately predicting the lift setpoint because there is not as much stem rise when passing water as opposed to a steam medium. When water moves through the seat area, very little valve stem displacement occurs because of the different physical properties of liquid and steam. After the loop seal cleared during the first test, steam entered the valve seat area, and a larger valve stem displacement occurred. This larger stem displacement at an elevated hydraulic test pressure resulted in an inaccurately high predicted lift setpoint. This event was previously reported in LER 1-86-018-00.

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On March 4, 1987, with the unit in Mode 3, the Trevitest method was used to test the pressurizer code safety valves on Unit 2 during its first refueling outage. A summary of those results are listed below:

Valve	Lift Setpoint	% Tolerance Deviation
RCS-2-8010A	2450 psig	2% Low
RCS-2-8010B	2516 psig	2% High
RCS-2-8010C	2501 psig	1% High

In summary, the testing data from the last three outages have not produced a clear trend as to whether valves will be out of tolerance in either the high or low direction. There have been no visual indications of defects that could explain the behavior of valves with predicted lift setpoints outside of their TS limits.

3. Unit 1 second refueling outage main steam line code safety valve testing

On February 17, 1988, with the unit in Mode 1, STP M-77 was performed on the main steam line code safety valves (SB)(RV) using the Trevitest test device. Ten code safeties were found to be outside their TS 3.7.1.1 tolerance of +/- 1% as specified in TS Table 3.7-2. The results were as follows:

Valve	First Lift	% Tolerance Deviation
RV-3	1050 psig	1.4% Low
RV-8	1034 psig	4.1% Low
RV-9	no lift	-------
RV-10	1071 psig	2.9% Low
RV-12	no lift	-------
RV-13	no lift	-------
RV-14	1074 psig	2.6% Low
RV-59	1063 psig	1.4% Low
RV-60	1104 psig	1.3% High
RV-223	no lift	-------

Four of the above valve tests are annotated as no lift. During the lift testing of these valves the test director determined that the lift setpoints were clearly outside of the acceptance criteria band high and terminated the test. All valves were reset and tested until they were within TS 3.7.1.1 criterion.

An estimate of the lift setpoint of the four valves designated as "no lift" has been made. The method used to arrive at this estimate is as follows. The set pressure at which the test was terminated was determined from the Trevitest chart data. The adjustment required to make the valves lift on subsequent tests was recorded on the surveillance test data sheet. The number of turns on the adjusting nut for the code safety valves can be correlated to pressure (psig). The number of turns on the adjusting nut (calculated in psig) was then added to the pressure at which the tests were terminated. This method provides an estimated system pressure the code safety valves would have lifted. The results of this prediction are shown below:

Valve	Predicted lift setpoint	% Tolerance Deviation
RV-9	1180	8% High
RV-12	1177	9% High
RV-13	1153	6% High
RV-223	1179	6% High

RV-9, RV-12, RV-13, and RV-223 were disassembled and inspected to determine a mode of failure. No failure mechanism could be identified. A metallurgical analysis was performed on the disc of RV-223 to determine if any bonding phenomenon could be associated with the high lift setpoint of the valves. No such conclusion was reached and the analysis did not indicate abnormalities with the disc material.

The main steam line code safety valves are constantly exposed to live steam during power operation. There is no liquid loop seal upstream of the valves as there is with the pressurizer code safety valves.

4. Previous main steam line code safety valve testing

The Trevitest method for testing code safety valves has been used previously in the Units 1 and 2 first refueling outages. On August 29, 1986, twenty main steam line valves were tested during the Unit 1 first refueling outage. A summary of those results are listed below:

Setpoint	Number of Valves within Tolerance Range					
	1%	2%	3%	4%	5%	6%
1065	2		1			1
1078	1	1	1	1		
1090	1	3				
1103	1	3				
1115	4					
TOTALS	9	7	2	1		1

Of the eleven valves that lifted out of the acceptance criterion of +/- 1%, three valves lifted lower than the set pressure and 8 valves lifted higher than the set pressure (during the February 17, 1988, test, five valves lifted higher than specification and 5 valves lifted lower than specification). It should be noted that during the August 29, 1986 test, RV-9 and RV-223 lifted within the +/- 1% acceptance criterion. RV-12 and RV-13 lifted at +4% and +2%, respectively, during the same test. RV-7 lifted at +6% during the August 29, 1986 test. It was removed and found to have rust on the sliding internals. During the February 17, 1988, Trevitest lift setpoint test it lifted within TS 3.7.1.1 acceptance criterion.

A comparison of the August 29, 1986, data and the February 17, 1988, data do not reveal any consistent patterns. Valve setpoint drift appears to be neither consistently high nor low for any particular valve. The data are inconclusive with regard to setpoint drift.

On March 4, 1987, the Trevitest method was used to test the twenty main steam line safety valves on Unit 2 during its first refueling outage. A summary of those results are listed below:

Setpoint	Number of Valves within Tolerance Ranges				
	1%	2%	3%	4%	5%
1065	3	1			
1078	2		1	1	
1090	2	1		1	
1103	1		3		
1115	2	1		1	
TOTALS	10	3	4	3	

Ten main steam line code safety valves were outside of TS 3.7.1.1 criterion. Nine valves were high out of tolerance and only one code safety valve was low. These data are in contrast to the Unit 1 data, which show high and low out of tolerance measurements fairly equally distributed for the main steam line code safety valves.

B. Inoperable structures, components, or systems that contributed to the event:

None

C. Dates and approximate times for major occurrences:

1. February 17, 1988: Ten main steam safety valves were outside the technical specification tolerance band. The valves were readjusted and retested to confirm they were within the acceptance criterion.

2. March 9, 1988: Three pressurizer safety valves were found outside their technical specification tolerance band and were readjusted and retested to be within the acceptance criterion.

D. Other systems or secondary functions affected:

None

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E. Method of discovery:

During performance of STP M-77.

F. Operator actions:

None required

G. Safety system responses:

None

III. Cause of the Event

A. Immediate cause:

The code safety valves did not lift within TS 3.4.2.2 and TS 3.7.1.1 tolerance bands of +/- 1%.

B. Root cause:

1. Pressurizer code safety valves

The root cause for this event is pending results of the Unit 2 testing and discussions with the valve manufacturer following the testing.

The following are preliminary conclusions regarding root cause:

a. The adjustments required for the setpoints on the pressurizer safety valves are due to the inherent valve characteristics based on industry experience with mechanical code safety valves.

b. Based on the data taken, there does not appear to be any evidence to identify any particular root cause (the data are scattered and random).

c. A contributory cause may be temperature effects during testing of the safety valves. The pressurizer code safety valves' upstream loop seal has to be drained prior to testing with the trevitest apparatus. The time delay associated with draining the loop seal and lifting the safety valve may increase the valve internals temperature due to live steam being applied under the valve disc.

2. Main steam line code safety valves

The root cause of the four sticking valves and the six valves that experienced setpoint drift has not been determined. "Self welding" of the disc and seat was considered as a possible root cause, but was rejected due to these parts being made of dissimilar metals and the inspection and metallurgical analysis did not detect any evidence of this phenomenon occurring.

Based on previous testing, the adjustments required for the setpoints on the main steam safety valves are due to the inherent valve characteristics based on industry experience with mechanical code safety valves. Based on the data taken, there does not appear to be evidence to identify any particular root cause for the setpoint drift problem.

IV. Analysis of the Event

Westinghouse Electric Corporation has provided PG&E with a technical assessment of plant safety of the past Diablo Canyon Unit 1 operation with the steam generator and pressurizer safety lift tolerances being greater than the 1% allowed by the DCPP Technical Specifications. The technical assessment evaluated non-LOCA and LOCA accidents for operation of the code safety valves as they were found during surveillance testing. The non-LOCA acceptance criteria were judged by Westinghouse to be met with the code safety valves out of tolerance. The LOCA safety assessment used a reference plant that bounds the characteristics of DCPP Units 1 and 2. The assessment concluded that the reference plant's analysis is more limiting than DCPP even when operating outside the Technical Specification tolerances of the steam generator safety valve setpoints and no 10 CFR 50 limits were violated. The technical assessment concluded that there was no significant impact on the safety of the plant if it was assumed that the unit operated with the code safety valves in the as-found condition. Therefore, there were no safety consequences or implications that resulted from this event.

V. Corrective Actions

A. Immediate corrective actions:

1. Pressurizer code safety valves

a. The valves were leak tested and reinstalled.

2. Main steam line code safety valves

a. The valves that were outside of the TS 3.7.1.1 tolerance band were readjusted and retested to within the acceptance criterion.

B. Corrective actions to prevent recurrence:

1. Pressurizer code safety valves

a. The valves were removed, disassembled, and inspected for signs of damage. No failure mechanism or irregularities were noted. All sliding surfaces were inspected for galling or wear.

b. During the current Unit 2 refueling outage, the pressurizer safety valves will be removed and tested at an offsite test facility for setpoint verification. The test at an offsite test facility is to simulate plant conditions in which the valve is intended to operate. This test is intended to control variables in the testing process in order to improve reliability of setpoint repeatibility.

2. Main steam line code safety valves

a. The four valves that did not lift were removed, disassembled, and inspected for determination of the root cause of failure to meet the acceptance criterion. No failure mechanism was identified that could explain the performance of the valves. Potential corrective actions will be discussed with the manufacturer.

VI. Additional Information

A. Failed components:

None

B. Previous LERs on similar events:

LER 1-86-018-00 Pressurizer Code Safety Valves Found Outside Technical Specification Limits During Surveillance Testing.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
DIABLO CANYON UNIT 1	0 5 0 0 0 2 7 5	8 8	— 0 1 8	— 0 0	1 1 OF 1 1

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

This voluntary LER was submitted when the Unit 1 pressurizer code safety valves were found outside of Technical Specification limits during the Unit 1 first refueling outage. This was the first time the Trevitest hydraulic apparatus had been used by PG&E to test code safety valves at Diablo Canyon. The insensitivity of this test to predict lift setpoints with the liquid loop seal in place was not understood during the first test. Procedures were revised to require loop seal draining prior to testing the pressurizer code safety valves. No root cause or corrective actions could be established for the generic industry problem of setpoint drift of the code safety valves.

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Pacific Gas and Electric Company

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James D. Shiffer
Vice President
Nuclear Power Generation

September 30, 1988

PG&E Letter No. DCL-88-229

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

Re: Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Unit 1 and 2
Licensee Event Report 1-88-018-00
Pressurizer and Main Steam Line Code Safety Valves Found Outside Technical Specification Setpoint Tolerance Limits Due to Indeterminate Causes

Gentlemen:

PG&E is submitting the enclosed voluntary Licensee Event Report concerning pressurizer code safety valves and main steam line safety valves with lift setpoints found outside Technical Specification limits during surveillance testing. This report is being submitted for information purposes only as described in Item 19 of Supplement Number 1 to NUREG-1022.

This event has in no way affected the public's health and safety.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. D. Shiffer

cc: J. B. Martin
M. M. Mendonca
P. P. Narbut
B. Norton
H. Rood
B. H. Vogler
CPUC
Diablo Distribution
INPO

Enclosure

DC2-88-MM-N029
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