50-275/323-OLA-2
I-MFP-129

MFP Exhibit 129
8/21/93 DOLLIE FEIGEL 026.1429
Repte

137813

Pacific Gas and Electric Company

77 Beale Street
San Francisco, CA 94106
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Gregory M. Rueger
Senior Vice President and
General Manager
Nuclear Power Generation

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'93 OCT 28 P5:48

October 15, 1992

PG&E Letter No. DCL-92-224

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 Units 1 and 2
Licensee Event Report 1-92-010-00
Valve SI-2-8923A Failed Stroke Test Due To Personnel Error

Gentlemen:

PG&E is submitting the enclosed voluntary Licensee Event Report (LER) regarding the failure of motor-operated valve SI-2-8923A to fully stroke during valve testing. This LER is submitted for information purposes only as described in Item 19 of Supplement 1 to NUREG-1022.

This event did not adversely affect the health and safety of the public.

Sincerely,

Gregory M. Rueger

cc: Ann P. Hodgdon
John B. Martin
Philip J. Morrill
Harry Rood
CPUC
Diablo Distribution
INPO

DC2-92-EM-N026

Enclosure

1068S/85K/JCN/2246

NUCLEAR REGULATORY COMMISSION
Docket No. 50-275-OLA Official Exh. No. MFP-129
In the matter of PACIFIC GAS and ELECTRIC Co
Staff IDENTIFIED ✓
Applicant RECEIVED ✓
Intervenor ✓ REJECTED
Contention Ann Riley & Assoc's DATE 8-21-93
Other Witness
Reporter Dollie Feigel

9401060316 930821
PDR ADOCK 05000275
Q PDR

NOV 3 1992

LICENSEE EVENT REPORT (LER)

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

TITLE (4) VALVE SI-2-8923A FAILED STROKE TEST DUE TO PERSONNEL ERROR

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 (8)
06	02	92	92	- 0 1 0 -	0 0	10	15	92	DIABLO CANYON UNIT 2	0 5 0 0 0 3 2 3
										0 5 0 0 0

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)
1	1 0 0	_____ 10 CFR _____ X OTHER - VOLUNTARY REPORT (Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	TELEPHONE NUMBER
DAVID P. SISK, SENIOR REGULATORY COMPLIANCE ENGINEER	805	545-4720

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	
A	B Q	V	L 2 0 0	Y							

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (if yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (16)

This voluntary Licensee Event Report (LER) is submitted for information purposes only as described in Item 19 of Supplement 1 to NUREG-1022.

On June 2, 1992, while performing current trace ("signature") testing, valve SI-2-8923A would not fully open on the third and subsequent attempts to stroke the valve.

An investigation determined that the worm cartridge bearing locknut and setscrew had not been adequately tightened. The root cause of this event was personnel error during the assembly of the motor actuator spring pack. This resulted in the locknut unscrewing itself from the worm shaft, allowing the worm shaft to pull away from the spring pack. This caused the torque switch to be pulled in the open direction. Personnel have been briefed on the critical safety importance of Limitorque operators and the need for attention to detail in all aspects of Limitorque valve operator maintenance. Maintenance procedures have been revised to include instructions for inspecting Limitorque valve actuator locknuts for tightness.

I. Plant Conditions

Units 1 and 2 were in Mode 1 (Power Operation) at 100 percent power.

II. Description of Event

A. Summary:

On June 2, 1992, while performing NRC Generic Letter 89-10 current trace ("signature") testing, motor-operated valve (MOV) SI-2-8923A (BQ)(V) would not fully open on the third and subsequent attempts to stroke the valve.

An investigation determined that the worm cartridge bearing locknut and setscrew had not been adequately tightened. This resulted in the locknut unscrewing itself from the worm shaft, allowing the worm shaft to pull away from the spring pack. This caused the torque switch to be pulled in the open direction. With the torque switch open, the valve stroked until the torque bypass switch opened at about 35 percent of valve stem travel.

B. Background:

New parts for replacement spring packs were obtained prior to the Unit 2 fourth refueling outage (2R4) in order to "preassemble" the spring packs for use during the outage. All 11 spring packs that were preassembled for use in 2R4 were assembled by the same individual.

C. Event Description:

On June 2, 1992, during a special test to obtain an NRC Generic Letter 89-10 current trace ("signature") following a packing adjustment, MOV SI-2-8923A successfully stroked (closed and then opened) and then failed to open completely on the third stroke. The MOV did close on the third stroke; however, valve movement stopped at approximately 35 percent of travel in the open direction.

A similar failure was identified that occurred previously during post-maintenance testing after overhaul of MOV SI-2-8805B (BQ)(V) during 2R4. Both SI-2-8805B and SI-2-8923A were part of a group of 11 Unit 2 Limitorque valves with SMB-00 actuators that had spring packs replaced during 2R4 as part of a program responding to a valve actuator spring pack relaxation problem previously experienced at Diablo Canyon Power Plant (DCPP). The 11 preassembled spring packs for this group of MOVs were assembled by the same individual.

During investigation of the event, a significant difference was identified in the hardness of valve actuator worm shafts originally supplied in the actuators and new worm shafts obtained from Limitorque. The harder material makes it more difficult to deform the worm shaft threads when securing the locknut with the locknut setscrew. The new, harder worm shafts used were obtained between 1989 and 1991. A total of 16 actuators in Unit 2 had worm shafts replaced (11 preassembled spring packs and five worm shafts replaced during overhauls).

Unit 1 valve actuator spring packs had been similarly replaced during the Unit 1 fourth refueling outage (1R4). A total of 16 actuators had spring packs replaced with "preassembled" spring packs and 10 actuators had worm shafts replaced during overhauls. Unit 1 preassembled spring packs were assembled by five different individuals.

Inspection of five Unit 1 valve actuators with preassembled spring packs confirmed all five locknuts were tight, although one locknut setscrew was loose.

Other inspections performed were as follows:

- Four actuators on Unit 1 and two actuators on Unit 2 that had their worm shafts replaced during overhaul were inspected and none were found to have loose locknuts or setscrews.

- Thirteen original spring packs removed from Unit 1 and Unit 2 during 1R4 and 2R4 were inspected and none were found to have loose locknuts or setscrews.

- Three actuators on Unit 1 and two actuators on Unit 2 that still have original spring packs installed were inspected and none were found to have loose locknuts, although one had a loose locknut setscrew.

Actuator inspections were based on the impact of the identified failure mechanisms on each valve's safety function as described in Section IV below.

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

None.

E. Dates and Approximate Times for Major Occurrences:

1. June 2, 1992: Event/discovery date. During valve testing, MOV SI 2-8923A would not fully open.

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

On June 2, 1992, while performing current trace ("signature") testing, DCPP personnel observed that MOV SI-2-8923A would not fully open on the third and subsequent attempts to stroke the valve.

H. Operators Actions:

None required.

I. Safety System Responses:

None required.

III. Cause of the Event

A. Immediate Cause:

An investigation determined that the worm cartridge bearing locknut and setscrew had not been adequately tightened. This resulted in the locknut unscrewing itself from the worm shaft and allowing the worm shaft to pull away from the spring pack. This caused the torque switch to be pulled in the open direction. With the torque switch open, the valve stroked until the torque bypass switch opened at about 35 percent of valve stem travel.

B. Root Cause:

The root cause of this event is personnel cognitive error during the assembly of the 11 Unit 2 valve actuator spring pack assemblies preassembled for 2R4. The individual did not adequately tighten or secure the worm shaft locknut and setscrew in place.

C. Contributory Cause:

1. Maintenance procedures did not include adequate instructions for tightening the setscrew or the worm shaft locknut.

2. The vendor changed the material hardness of the worm shaft, thereby limiting the effectiveness of the setscrew in deforming worm shaft threads for securing the locknut.

IV. Analysis of the Event

The safety function affected by the potentially degraded MOVs is the ability of a particular valve to open or be repositioned if necessary to support a safe plant shutdown.

A review of failure data, inspection data, and Limitorque valve designs narrowed the suspect group of valves at DCPP to those with SMB-00 and SB-00 size actuators that have had the worm replaced by maintenance personnel at DCPP.

SMB-000 actuators were excluded from the suspect valve list, as they have never been disassembled at DCPP. These valves that were received directly from Limitorque have been determined to be acceptable due to their current operational history and the adequacy of the vendor locknut and setscrew assembly process.

SMB-0, SMB-1, SMB-2, and SMB-3 actuators have been excluded from the suspect valve list based on a DCPP Electrical Maintenance analysis of the actuator design. Specifically, if the locknut on these actuators were loose and became spatially altered along the worm shaft, the MOVs would still be able to open or close as designed. This is due to the actuator design as well as the MOV torque switch reference which is independent of the locknut position.

Valves SI-2-8923A and SI-2-8805B were part of a worm/spring pack preassembly program for valve actuators not receiving an overhaul during 2R4.

Based on the identified valve actuator failure mechanism, the following conditions need to be addressed to ensure all safety functions are met by the suspect MOVs:

Condition 1:

All normally open (NO) valves that are required to close to perform their intended safety function must be capable of closing.

Condition 2:

All normally closed (NC) valves that need to open to satisfy their intended safety function must be capable of opening.

Condition 3:

All suspect valves required to open after an inadvertent closing, which are required for post-LOCA recirculation (BP) changeover or auxiliary feedwater (BA) initiation, must be able to close and reopen. (Note: valves with power removed or valves required for restoring "normal" system function are not considered in this scope.)

Effect of Condition on Safety Function

Regarding Condition 1:

All suspect NO MOVs will close upon demand, if normally in the open position. This is based on the nature of the failure mechanism. Specifically, should the "close" torque switch setting change based on a spatial alteration of the locknut, it would result in closing the valve beyond its designed, full-closure position. However, evaluation has determined that the suspect MOVs will not fail to perform their closure function under these circumstances and will not be significantly damaged in the process of closing.

Therefore, the suspect MOVs that may have loose locknuts have been determined to be capable of performing their intended safety function.

Regarding Condition 2:

All suspect NC MOVs that are required to open as described in Condition 2 above, except CS-1-8994A (BE)(V), CS-2-8994B (BE)(V), and FW-1-FCV-95 (SJ)(V) have been inspected and repaired as necessary. There was one MOV in Unit 1 found with a loose setscrew and three MOVs found in Unit 2 with loose locknuts and setscrews, but in all cases the MOV locknuts were sufficiently tight to perform their function. MOVs CS-1-8994A and CS-2-8994B have an electrical bypass installed on their "open" torque switches to ensure that full opening occurs even if they have a loose locknut. These MOVs could not be stroke tested at power. MOV FW-1-FCV-95 is capable of performing its intended safety function based on the information obtained through the use of monitoring instrumentation. MOV FW-1-FCV-95 has extensive diagnostic instrumentation installed on it. Any change in the torque switch performance would be identified by the review of the instrumentation, well before the valve would lose its ability to perform its intended safety function.

Regarding Condition 3:

All suspect valves required to open after an inadvertent closing as described in Condition 3 above have been inspected and repaired as necessary. Therefore, they are no longer considered suspect.

For the period prior to completion of these inspections, these MOVs were evaluated assuming loose locknuts existed on their worm shafts. Loose locknuts on these MOVs would result in a condition where the "close" torque switches would not stop the valve from closing at the designed closure position.

The evaluation for this condition was performed with respect to the closure forces which would be exerted by the valve motors on the MOVs, assuming the associated locknuts were loose. The results of this evaluation showed that the suspect MOVs would not bind in their respective seats as a result of being closed beyond the design closure position, had the valves been required to be reopened.

Additionally, Operating Procedure OP O-22, "Emergency Operation Of Motor Operated Valves," provides guidance for opening an MOV in the event it is unable to be reopened due to a tripped thermal overload device during that MOV's closure stroke.

Summary

Based on the evaluations performed on the suspect valves, the inspections, and the use of temporary electrical bypasses on "open" torque switches, all suspect valves were determined to be capable of performing their specified safety function(s).

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

V. Corrective Actions

A. Immediate Corrective Actions:

1. Valve SI-2-8923A spring pack was disassembled, the worm bearing tightened, setscrew tightened, and the actuator was reassembled and satisfactorily tested.

2. An action plan to inspect other valve actuators was developed and issued. Inspections were performed as described above.

B. Corrective Actions to Prevent Recurrence:

1. Maintenance Procedure (MP) E-53.10J, "SMB-00 Overhaul/Repair," has been revised to include specific instructions for inspecting valve actuator locknuts for correct tightness during each disassembly.

2. Tailboards have been held with the Limitorque crews on the critical safety importance of Limitorque operators and addressing attention to detail on all aspects of Limitorque valves. Additionally, maintenance procedure revisions were discussed, including the basis for the changes.

3. Unit 2 valves - SI-2-8974A (BQ)(V), SI-2-8974B (BQ)(V), CS-2-8992 (BE)(V), and CS-2-8994B will be inspected during the Unit 2 fifth refueling outage (2R5) for loose locknuts or set screws.

4. Inspection (and repair as necessary) of the spring pack from valve CS-1-8994A (BE)(V) will be completed during 1R5.

5. Inspections (and repairs as necessary) of the spring pack/worm gear assembly of valves SI-1-8821A (BQ)(V), SI-1-8821B (BQ)(V) and RHR-1-FCV-641B (BP)(V) have been completed.

6. Inspections (and repairs as necessary) of the spring pack/worm gear assembly of valves SI-2-8821A and SI-2-8823B (BQ)(V) have been completed.

VI. Additional Information

A. Failed Components:

Valve SI-2-8923A, suction isolation for SI Pump 2-1, Limitorque Model number SMB-00-15, ID: P VOM SI-2-8923A.

B. Previous LERs on Similar Problems:

LER 83-014, dated November 1, 1983, reported the operational malfunction of Limitorque valve operators due to the installation of a non-standard torque switch mounting screw due to personnel error. Maintenance procedures were revised to prevent recurrence of this event. The lessons learned from the 1983 event did not prevent the most recent malfunction due to personnel assembly error in that the lack of adequate direction for tightening the setscrew or worm shaft locknut was not addressed at that time.