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RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 92-002-00:on 920306,lo-lo steam generator water level reactor trip initiated following trip of main feedwater pump.Caused by failure of power supply to speed sensing probes.Inverter replaced.W/920403 ltr.

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Gregory M. Rueger
Senior Vice President and
General Manager
Nuclear Power Generation

April 3, 1992

PG&E Letter No. DCL-92-076

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

Re: Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Licensee Event Report 1-92-002-00
Low-Low Steam Generator Water Level Reactor Trip Following a Main Feedwater Pump 1-1 Overspeed Trip Due to Failure of Power Supply to Speed Sensing Probes

Gentlemen:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed Licensee Event Report (LER) concerning a low-low steam generator water level reactor trip following a main feedwater pump (MFP) overspeed trip due to poor manufacturing/design of the inverter power supply for the MFP speed sensing probes.

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

Sincerely,

Gregory M. Rueger

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

DC1-92-EM-N010

Enclosure

5709S/85K/PJT/2246

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IE22
1/1

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 5

TITLE (4) LOW-LOW STEAM GENERATOR WATER LEVEL REACTOR TRIP FOLLOWING A MAIN FEEDWATER PUMP 1-1 OVERSPEED TRIP DUE TO FAILURE OF POWER SUPPLY TO SPEED SENSING PROBES

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)
03	06	92	92	- 0 0 2 -	0 0	04	03	92		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	1
POWER LEVEL (10)	1 0 0

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

__X__ 10 CFR 50.73(a)(2)(iv)

_____ OTHER - _____

(Specify in Abstract below and in text, NRC Form 366A)

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER AREA CODE	TELEPHONE NUMBER
MARTIN T. HUG, SENIOR REGULATORY COMPLIANCE ENGINEER	805	545-4005

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	
B	S L	I N V T	X 9 9 9	N							

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

ABSTRACT (16)

On March 6, 1992, at 1032 PST with Unit 1 in Mode 1 (Power Operation) at 100 percent power, a low-low steam generator water level reactor trip was initiated following the trip of a main feedwater pump (MFP). Plant operators initiated actions in accordance with plant procedures and stabilized the unit in Mode 3 (Hot Standby).

A four-hour, non-emergency report was made to the NRC on March 6, 1992, at 1213 PST, in accordance with 10 CFR 50.72(b)(2)(ii).

A detailed investigation was performed and interviews were conducted with personnel involved. The investigation concluded that the immediate cause of this event was failure of the nonsafety-related inverter power supply for the speed sensing probes on MFP 1-1, which resulted in the tripping of MFP 1-1 and a subsequent low-low steam generator water level reactor trip. The failure of the inverter was due to poor manufacturing and design.

The immediate corrective actions included replacement of the existing inverter and testing and inspection of the other MFP inverters and their transfer circuitry.

To prevent recurrence, a new design change has been implemented that provides for a separate power supply to each of the two speed probes on each MFP.

I. Plant Conditions

Unit 1 was in Mode 1 (Power Operation) at 100 percent power.

II. Description of Event

A. Summary:

On March 6, 1992 at 1032 PST, a reactor trip was initiated due to a low-low water level in Steam Generator 1-3 (SL)(SG) following the trip of Main Feedwater Pump 1-1 (SL)(P)(MFP).

B. Background:

None.

C. Event Description:

On March 6, 1992, while returning a lube oil cooler (SL)(CLR) to service on MFP 1-1, a licensed operator lifted a small grate to inspect the oil cooler transfer valve. After completing the inspection, the operator lowered the grating to approximately a 45-degree angle and let it fall closed. At that time, the feedwater pump local alarm sounded and the alarm for MFP 1-1 inverter undervoltage (UV) was observed to be flashing.

At 1029 PST, the control room received a "FWP 1-1 TURBINE SYS PROBLEM" alarm. This was the first indication in the control room of a problem with MFP 1-1. Since MFP 1-1 speed had increased, flow through the pump increased also. The digital feedwater control system (DFWCS) reduced the speed demand to MFP 1-2 due to the increased flow from MFP 1-1.

At 1031 PST, MFP 1-1 tripped. Indications from the vibration monitoring equipment on the pump indicated that the turbine tripped on overspeed. Operators immediately began reducing the unit load and stabilized it at approximately 50% power.

At approximately 1032 PST, the reactor (RCT)(AB) tripped due to a low-low SG 1-3 (RCT)(JC) water level and a feedwater isolation initiated due to a reactor trip coincident with a low Tavg. At approximately the same time, the MFP 1-2 tripped on high discharge pressure when the feedwater isolation occurred. Both motor driven Auxiliary Feedwater Pumps (AFWP) (BA)(P) started due to the loss of main feedwater.

At approximately 1033 PST, a unit trip automatically initiated and all 12 and 4kV busses transferred to startup power. At approximately the same time, Diesel Generator (EK)(DG) 1-1 started automatically.

At 1213 PST, a four-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(ii).

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

None.

E. Dates and Approximate Times for Major Occurrences:

1. March 6, 1992; 1031 PST: MFP 1-1 tripped.

2. March 6, 1992; 1032 PST: Event/Discovery date. Unit 1 reactor trip due to SG 1-3 low-low water level.

3. March 6, 1992; 1213 PST: A four-hour, non-emergency report was made to the NRC in accordance with 10 CFR 50.72(b)(2)(ii).

F. Other Systems or Secondary Functions Affected:

1. DG 1-1 started during the event but, by design, did not load.

2. Following the reactor trip, three of the 10 percent steam dump valves (SB)(PCV) (PCV 19, 20, and 21) cycled off their seats for approximately 1 to 2 minutes. An investigation determined that these valves lifted due to a high sensitivity setting, which was subsequently reduced to a lower sensitivity setting.

3. The DFWCS performed as designed. As a result of the overspeed transient of MFP 1-1, the DFWCS reduced speed demand to MFP 1-2. Following the trip of MFP 1-1, the DFWCS increased demand to the feedwater control valves. The DFWCS was not able to prevent the reactor trip on low-low SG water level because the operable pump (MFP 1-2) could not deliver sufficient water to maintain SG water level.

G. Method of Discovery:

The event was apparent to the control room operators due to control room alarms and indications.

H. Operator Actions:

Operators immediately began reducing power upon the loss of MFP 1-1. The plant was stabilized in Mode 3 following the reactor trip.

I. Safety System Responses:

1. The reactor trip breakers (AA)(BKR) opened.

2. The control rod drive mechanisms (CRDM) (AA)(DRIV) allowed the control rods to drop into the reactor.

3. The main turbine (TA)(TRB) and generator (TB)(GEN) tripped.

4. Both motor-driven and turbine-driven AFW pumps (MO)(BA)(P) started automatically and delivered water to all SGs as required.

5. DG 1-1 started but, by design, did not load.

III. Cause of the Event

A. Immediate Cause:

The reactor tripped on SG 1-3 low-low water level following the trip of MFP 1-1.

B. Root Cause:

The root cause of this event is poor manufacturing and design of the inverter. Results of the event investigation showed that this type of inverter has experienced similar failures in the past. After troubleshooting and repair by the vendor and plant technicians, the inverter failed again. As a result, design modifications were made to correct the cause of these failures, but subsequent failures were experienced from other causes.

C. Contributory Cause:

The design of the power supply to the MFP speed probes included an automatic transfer to the power supply for MFP 1-2. The transfer scheme utilized relays to accomplish the switching. One of the relays had a small piece of insulating debris lodged between one of the contact surfaces, which prevented a successful transfer.

IV. Analysis of the Event

A. Safety Analysis:

Inadvertent loss of all main feedwater flow is a condition II event described in the Final Safety Analysis Report (FSAR) Update. This type of event has been analyzed in FSAR Section 15.2.8, "Loss of Normal Feedwater." The analysis shows that following a loss of normal feedwater, the AFW system is capable of removing the stored and residual heat, thus preventing either over-pressurization of the RCS

or loss of water from the reactor core. Since the AFW system functioned as designed, the health and safety of the public were not adversely affected, and there were no adverse consequences or safety implications resulting from this event.

V. Corrective Actions

A. Immediate Corrective Actions:

The immediate corrective actions included replacement of the failed inverter and extensive testing and inspections of the other MFP inverters.

B. Corrective Action to Prevent Recurrence:

A design change for the inverters was developed to provide a separate power supply to each of the two speed probes on each MFP.

VI. Additional Information

A. Failed Components:

Inverter model number IYFW11 (Abacus Controls Inc., Model No. 452-4-125-M-NMN) failed.

B. Previous LERs on Similar Problems:

LER 1-90-002. Manual Reactor Trip due to Main Feedwater Pumps Tripping. The root cause of this event was unknown. However, the most probable cause was either a non-repeatable Solid State Protection System (SSPS) card failure or an inadvertent actuation caused by I&C technicians working on the SSPS racks. There was no corrective action taken to prevent recurrence; however, a precautionary measure was taken to replace SSPS cards A213 and A517. This precautionary measure would not have prevented this event.