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50-323 Diablo Canyon Nuclear Power Plant, Unit 2, Pacific Ga 05000323
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HARBOR,C.D. Pacific Gas & Electric Co.
POWERS,R.P. Pacific Gas & Electric Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 96-018-00:on 961121,4kV bus undervoltage protection relays may not meet specifications of TS.Cause unknown. Relays have been reset using pre-1991 calibration settings. W/961223 ltr.

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Robert P. Powers
Vice President–Diablo Canyon
Operations and Plant Manager

December 23, 1996

PG&E Letter DCL-96-236

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

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Licensee Event Report 1-96-018-00
4 kV Bus Undervoltage Protection Relays Out of Specification Due to Setpoint Drift Due to Unknown Cause

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.73(a)(2)(v)(D), PG&E is submitting the enclosed licensee event report (LER) regarding 4kV bus undervoltage protection relays out of specification due to setpoint drift due to unknown cause. The cause and corrective actions for this event are still under investigation and will be reported in a supplemental LER.

The health and safety of the public were not adversely affected by this condition.

Sincerely,

Robert P. Powers

cc: Steven D. Bloom
L. J. Callan
Stanley C. Ketelsen
Kenneth E. Perkins
Michael D. Tschiltz
Diablo Distribution
INPO

Enclosure

JER/2246/N0002007

1/1
IE22

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 6

TITLE (4) 4 kV Bus Undervoltage Protection Relays Out of Specification Due to Setpoint Drift Due to Unknown Cause

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)
11	21	96	96	- 0 1 8 -	0 0	12	23	96	Diablo Canyon Unit 2	0 5 0 0 0 3 2 3
										0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)
1	

POWER LEVEL (10): 1 0 0

____ 10 CFR 50.73(a)(2)(v)(D)

____ OTHER -

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

LICENSEE CONTACT FOR THIS LER (12)

Cary D. Harbor, Senior Regulatory Engineer	TELEPHONE NUMBER AREA CODE	805 545-4348

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)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
[Y] YES (If yes, complete EXPECTED SUBMISSION DATE)	[ ] NO		02	15	97

ABSTRACT (16)

On November 21, 1996, at 1900 PST, with Units 1 and 2 in Mode 1 (Power Operation) at 100 percent power, PG&E determined that trip setpoints for one or more of the six 4 kV vital bus undervoltage protection relays may not meet the specifications of Technical Specification Table 3.3-4.

Starting in 1991 (Unit 1) and 1992 (Unit 2), a design change established new calibration settings for these relays in order to preclude unnecessary automatic emergency diesels starts. Since that time, some relays were found to have drifted out of specification at their 18 month surveillance tests. PG&E had been trending the out of specification occurrences and considered them to be indicative of a repetitive problem. All six relays were subsequently tested over the period from November 21 through November 25, 1996, and one was found out of specification.

The relays have been reset using pre-1991 calibration settings. The root cause and long term corrective actions for this event are still under investigation and will be reported in a supplemental LER.

I. Plant Conditions

Units 1 and 2 have been in various modes and at various power levels with the conditions described below.

II. Description of Problem

A. Summary:

On November 21, 1996, at 1900 PST, with Units 1 and 2 in Mode 1 (Power Operation) at 100 percent power, PG&E determined that trip setpoints for one or more of the six 4 kV vital bus (EK) undervoltage protection relays (RLY, 27) may not meet the specifications of Technical Specification (TS) Table 3.3-4. All six relays were tested and one was found out of specification. PG&E has experienced repetitive setpoint drift on these relays since 1991 when the settings were changed to preclude unnecessary automatic emergency diesel generator starts.

B. Background:

The 4 kV vital buses are provided with undervoltage protection that will generate a loss of power emergency diesel generator (EDG)(DG) start in the event a loss of voltage or degraded voltage condition occurs. The EDGs provide a source of emergency power when offsite power is either unavailable or is insufficiently stable to allow safe unit operation. The first level undervoltage relays (FLURs) detect the loss of bus voltage (less than 69 percent bus voltage). The second level undervoltage relays (SLURs) provide a second level of undervoltage protection, which protects all Class 1E loads from short or long term degradation in the offsite power system.

TS 3.3.2, "Engineered Safety Features Actuation System Instrumentation," Table 3.3-3, functional unit 7.a.1) requires that the FLURs be operable in Modes 1, 2, 3, and 4. Table 3.3-4 functional unit 7.a.1) specifies that the FLURs must actuate within 10 seconds when the 4kV bus voltage decreases to greater than or equal to 2583 volts. If the relay does not actuate in the required time, the associated EDG must be declared inoperable and the appropriate TS 3.8.1.1 action statement followed. TS 3.8.1.1 action statement b. allows one EDG to be inoperable for up to 7 days. TS 3.8.1.1, action statement f. allows two EDGs to be inoperable for two hours. If the requirements of action statement b. or f. are not met, the unit must be placed in Hot Standby within 6 hours and in Hot Shutdown within the following 6 hours.

C. Event Description:

During the 1991-1992 time period, design changes were issued to revise the settings for the FLURs to help preclude unnecessary automatic EDG starts. The new settings for the FLURs operated the devices on a different portion of their operating curve to slow down the relay's response to decreasing voltage. The setting change put the greater than 2583 volts relay activation point on the inverse time response curve at a steeply increasing part of the curve. This increased the relay sensitivity to voltage changes. Prior to 1991, the as-found calibration performance of the FLURs had been acceptable when the relay settings were on a portion of the response curve which was much flatter.

On October 5, 1994, Unit 2 FLUR 27-HH-B2 failed to meet its required actuation time of 10 seconds. The relay required approximately 19.2 seconds to actuate with a voltage of 2583 volts. The relay was recalibrated to be within its TS required tolerance and returned to service.

An investigation into the cause of the problem was initiated. By November 1994, PG&E design engineering could not identify the cause of the relay being outside of TS tolerance. Design Engineering did conclude that the drift of the relay was occurring only at the long time/high voltage end of the relay's response curve. Design Engineering concluded that based on the facts that (1) the SLURs would start the EDGs if the FLURs failed, (2) the FLURs had no past history of complete failure, and (3) the FLURS were functional for dead bus conditions, a trending program would be initiated to collect data to be used to determine the root cause. This problem had occurred during previous refueling outages since 1992 and PG&E Engineering had been trending the performance of the FLURs to determine the root cause.

In November 1996, during license amendment reviews for 24-month fuel cycles, the engineers involved in the trending program identified a concern with drift of the setpoints of the FLURs. On November 19, 1996, management requested an evaluation of the drift data. The review of the data from as early as the 1992 Unit 1 refueling outage indicated poor performance of the FLUR for degraded voltage for EDG start.

Although all the FLURs in both units had been calibrated and tested during the latest refueling outages (Unit 1 - October, 1995, Unit 2 - April, 1996), the trend data indicated that the relays could be outside of their TS required response times before their next scheduled calibration test.

FLUR calibration checks were started on Unit 1 the night of November 21, 1996. All three Unit 1 FLURs were within specification. Subsequently, the Unit 2 FLURs were checked, and the last one checked was found out of specification (placing EDG 2-2 in a TS 7 day action status). Design change notices were issued to return the FLUR settings back to the values that were used prior to 1991. The FLUR recalibrations were completed on November 25, 1996.

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

None.

E. Dates and Approximate Times for Major Occurrences:

1. November 21, 1996, 1900 PST: Event/discovery date. 4 kV undervoltage protection relays were suspected to be out of specification.

2. November 25, 1996: FLUR for EDG 2-2 found to be outside TS setpoint limit.

3. November 25, 1996: The 4 kV undervoltage protection relays were reset to pre-1991 values.

F. Other Systems or Secondary Functions Affected:

None.

G. Method of Discovery:

The problem was identified by PG&E Engineering personnel reviewing surveillance test trending information as part of a 24 month refueling cycle license amendment request review.

H. Operator Actions:

None required.

I. Safety System Responses:

None required.

III. Cause of the Problem

The cause of this event is under investigation and will be reported in a supplemental LER.

IV. Analysis of the Event

The EDGs provide a source of emergency power when offsite power is either unavailable or is insufficiently stable to allow safe unit operation. Undervoltage protection will generate an EDG start if a loss of voltage or degraded voltage condition occurs on the 4.16kV vital bus. The EDG start instrumentation and controls is required for the safety analyses engineered safety features (ESF) systems to function in any accident with a loss of offsite power.

The EDG start FLURs (one per bus) have an inverse time characteristic and will generate an EDG start signal with a 0.8 second time delay at 0 volts (dead bus) and a 10 second time delay at 2583 volts. In addition, each of the vital 4.16 kV buses has a separate pair of load shed FLURs. One load shed FLUR trips instantaneously at 2870 volts. The second has an inverse time characteristic and a delay of 4 seconds at no voltage and a 25 second delay with 2583 volts to prevent loss of operating loads during transient voltage dips, and to permit the offsite power sources to pick up the load.

The SLURs (two per vital bus) detect a lesser degree of bus voltage degradation (approximately 3800 volts) but have the same time delay (<10 seconds) as the FLURs in starting the EDG. The FLUR and SLUR contacts are parallel, and unless the voltage degraded rapidly, it is expected that the SLUR would start the EDG before the FLUR.

Both the FLUR and SLUR initiate load shed in addition to EDG start. Unless there is a zero voltage bus, the SLUR would initiate a DG start before the FLUR and similarly initiate load shed. Therefore, if the FLUR's 10 second time delay drifts outside its setpoint, this delay would not prevent the performance of any safety related functions.

Based on the above, the as-found out of tolerance measurements of the FLURs would have no impact on actuation of ESF or non-safety related equipment since the

SLURs would actuate in a time commensurate with safety analyses and design criteria.

Consequently, this event did not adversely affect the health and safety of the public.

V. Corrective Actions

A. Immediate Corrective Action:

The relays were all reset using the pre-1991 settings that had not caused repetitive problems with setpoint drift.

B. Corrective Actions to Prevent Recurrence:

Corrective actions to prevent recurrence are under investigation and will be reported in a supplemental LER.

VI. Additional Information

A. Failed Components:

None.

B. Previous LERs on Similar Problems:

None.