CATEGORY 7 REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS) ACCESSION NBR:9701060090 DOC.DATE: 96/12/23 NOTARIZED: NO DOCKET # FACIL:50-275 Diablo Canyon Nuclear Power Plant, Unit 1, Pacific Ga 05000275 50-323 Diablo Canyon Nuclear Power Plant, Unit 2, Pacific Ga 05000323 AUTHOR AFFILIATION AUTH.NAME HARBOR, C.D. Pacific Gas & Electric Co. Pacific Gas & Electric Co. POWERS, R.P. RECIP.NAME RECIPIENT AFFILIATION

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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.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR | ENCL | SIZE: TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

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**Pacific Gas and Electric Company** 

**Diablo Canyon Power Plant** P.O. Box 56 Avila Beach, CA 93424 805/545-6000

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,

A.K. Oatley for

**Robert P. Powers** 

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

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Enclosure

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### 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.



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# LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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# 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.

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| FACILITY NAME (1) |  |   | DOCKET NUMB   | ER (2)                                 |   |  |   | YEAR   |   | 51                                | ER NUMBER  | 1                             | REVISION  |  | PAGE            | (3)    |
| Diablo Canvon     | l Init 1   | 1   | 0151  | olo                                    | nlo   | 2  | 7   5   | 96   |   | 0                                 | 18   | +-                            |   | 4  | OF              | 6      |
| TEXT (17)         | FLU<br>1990<br>Unit<br>spec<br>notic<br>usec<br>1990 | IR calibration<br>6. All three U<br>2 FLURs we<br>cification (plac<br>ces were issu<br>d prior to 199<br>6. | checks<br>Init 1 FLI<br>re check<br>cing ED(<br>ed to ret<br>1. The F | were<br>URs<br>ed, a<br>G 2-2<br>urn f | e sta<br>wer<br>and<br>2 in a<br>the I<br>R rec | rted<br>e wit<br>the l<br>a TS<br>FLUF<br>calibi | on U<br>hin s<br>ast o<br>7 da<br>R sett<br>atior | nit 1 f<br>pecifi<br>ne ch<br>ly act<br>lings<br>ns we | the<br>ical<br>iecl<br>ion<br>bac<br>re o | nig<br>tion<br>ked<br>sta<br>ck t | ht of<br>. Sul<br>was<br>atus).<br>o the<br>pplete | No<br>ose<br>fou<br>De<br>val | vembe<br>quently<br>ind out<br>esign cl<br>lues that<br>on Nove | r 21,<br>/, the<br>of<br>hang<br>at we<br>embe | e<br>re<br>r 25 | ,<br>, |
| D.                | Inop<br>Non  | erable Struct   | ures, Co  | mpo                                    | onen  | ts, o  | r Sys   | tems   | tha                                       | at C                              | ontrit   | oute<br>-                     | ed to th  | e Ev   | ent:            |        |
| E.                | Date   | es and Approx   | kimate T  | imes                                   | s for   | Majo   | or Oc   | curre  | nce                                       | es:                               |  |                               |   |  |                 |        |
|                   | 1.   | November 2  | 1, 1996,  | 190                                    | 0 PS  | ST:  |   | E<br>4<br>re<br>o                                      | iver<br>kV<br>elay<br>f sp                | nt/d<br>′ un<br>⁄s v<br>þeci      | liscov<br>dervo<br>vere s<br>ificati               | ery<br>olta<br>sus<br>on.     | <sup>,</sup> date.<br>ge prot<br>pected                         | ectio<br>to be                                 | n<br>e ou       | t      |
|                   | 2.   | November 2  | 5, 1996:  |  |   |  |   | F  | LU<br>uts                                 | R fo<br>ide                       | or ED<br>TS s                                      | G 2<br>etp                    | 2-2 fou<br>oint lim   | nd to<br>iit.                                  | be              |        |
|                   | 3.   | November 2  | 5, 1996:  |  |   |  |   | T<br>pi<br>pi  | he<br>rote<br>re-'                        | 4 k<br>ecti<br>199                | V und<br>on re<br>1 val                            | der<br>lay:<br>ues            | voltage<br>s were<br>s.   | rese   | t to            |        |
| F.                | Othe   | er Systems or   | Second  | ary F                                  | =unc  | ctions   | s Affe  | ected:   | •   |                                   |  |                               |   |  |                 |        |
|                   | Non  | e.  |   |  |   |  |   |  |   |                                   |  |                               |   |  |                 |        |
| G.                | Meth   | nod of Discov   | ery:  |  |   |  |   |  |   |                                   |  |                               |   |  |                 |        |
|                   | The<br>surve<br>licen                                | problem was<br>eillance test t<br>ise amendme   | identifie<br>rending<br>nt reque                                      | d by<br>infor<br>st re                 | PG<br>mati<br>view                              | &E E<br>ion a<br>v.                              | ngin<br>s pai                                     | eering<br>rt of a                                      | g p<br>a 24                               | ers<br>I mo                       | onnel<br>onth r                                    | l re<br>efu                   | viewing<br>Ieling c   | )<br>ycie                                      |                 |        |
| Н.                | Ope  | rator Actions:  |   |  |   |  |   |  |   |                                   |  |                               |   |  |                 |        |
|                   | None   | e required.   |   |  |   |  |   |  |   |                                   |  |                               |   |  |                 |        |

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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

|                       |   |  |   | \  |  |   |   |   |  |   |   |   |   |  |                      |    |
|-----------------------|---|--|---|--|--|---|---|---|--|---|---|---|---|--|----------------------|----|
| FACILITY NAME (1)     |   | DOCKET NUMBER  | 1 (2)   |  |  |   | YEAR  | <u> </u>                                  | L<br>S   | ER NUMBE  | R (6)   | T REV   | ISION   |  | PAGE (               | 3) |
| Diable Or             |   |  |   |  | 1 1  | ₋⊦  |   | -   |  | NUMBER  |   | N.  | VBER  | ~  |                      |    |
| Diabio Ca             |   | 01510  | 1010  | 2  |  | 5   | 90  | -   | 0  | 1 8   | -   | 10  | 0   | 5  |                      | 0  |
|                       | I. Safety System Re<br>None required.   | sponses  |   |  |  |   |   |   |  |   | -   |   |   |  |                      |    |
| III. <u>C</u>         | Cause of the Problem  |  |   |  |  |   |   |   |  |   |   |   |   |  |                      |    |
|                       | The cause of this event<br>supplemental LER.  | is under   | invest  | igati  | on ai  | nd  | will  | be  | rep  | ortec   | l in  | а   |   |  |                      |    |
| IV,                   | Analysis of the Event   |  |   |  |  |   |   |   |  |   |   |   |   |  |                      |    |
|                       | The EDGs provide a sou<br>unavailable or is insuffic<br>protection will generate<br>condition occurs on the<br>is required for the safety<br>function in any accident   | urce of er<br>ciently sta<br>an EDG<br>4.16kV v<br>/ analyse<br>with a lo                | nergei<br>ible to<br>start if<br>ital bui<br>s engii<br>ss of c | ncy j<br>allo<br>a lo<br>s. T<br>neer<br>ffsite      | oowe<br>w sa<br>ss of<br>he E<br>ed s<br>e pov                 | er w<br>fe u<br>f vo<br>DO<br>afe<br>wer  | vhen<br>unit<br>oltag<br>3 sta<br>ety fe<br>r.  | ope<br>ope<br>art i<br>eatu               | fsite<br>erat<br>or d<br>nst<br>ure:                 | e pov<br>tion.<br>egrac<br>rume<br>s (ES                      | ver<br>Un<br>ded<br>nta<br>F)                     | is ei<br>derv<br>volt<br>tion<br>syste                      | ther<br>olta<br>age<br>and<br>ems               | ge<br>I con<br>to                                | trols                | 6  |
|                       | The EDG start FLURs (or<br>generate an EDG start s<br>a 10 second time delay a<br>nas a separate pair of lo<br>at 2870 volts. The seconds<br>seconds at no voltage an<br>operating loads during the<br>to pick up the load. | one per b<br>signal with<br>at 2583 v<br>bad shed<br>nd has a<br>nd a 25 s<br>ransient v | us) ha<br>olts. I<br>FLUR:<br>n inver<br>econd<br>voltage       | ve a<br>sec<br>n ac<br>s. O<br>se t<br>dela<br>e dip | in inv<br>cond<br>Iditio<br>Ine lo<br>ime (<br>ay wi<br>es, ar | vers<br>tim<br>n, o<br>cha<br>ith<br>nd t | se ti<br>each<br>d she<br>aract<br>258<br>to pe | me<br>elay<br>ed l<br>eri:<br>3 vo<br>erm | ch<br>y al<br>f the<br>FLU<br>stic<br>olts<br>iit th | aract<br>t 0 vo<br>e vita<br>JR tri<br>and<br>to pi<br>he off | eris<br>Its<br>I 4.<br>ps<br>a d<br>revo<br>fsite | stic a<br>(dea<br>16 k<br>insta<br>lelay<br>ent le<br>e pov | and<br>d bi<br>V bi<br>anta<br>of<br>oss<br>wer | will<br>us) a<br>uses<br>neou<br>4<br>of<br>sour | and<br>Susly<br>Cces |    |
| -<br>(<br>f<br>t      | The SLURs (two per vita<br>approximately 3800 volton<br>FLURs in starting the ED<br>the voltage degraded rap<br>pefore the FLUR.  | al bus) de<br>ts) but ha<br>DG. The<br>pidly, it is                                      | tect a<br>ve the<br>FLUR<br>exped                               | less<br>san<br>and<br>cted                           | er de<br>ne tir<br>SLL<br>that                                 | egr<br>me<br>JR<br>the                    | ee o<br>dela<br>cont<br>e SL                    | of bi<br>ay (<br>tact<br>UR               | us<br>(<1)<br>(s a<br>( wo                           | voltag<br>0 sec<br>ire pa<br>buld s                           | ge (<br>on(<br>arali<br>star                      | degr<br>ds) a<br>lel, a<br>t the                            | ada<br>is th<br>ind<br>ED                       | tion<br>Ie<br>unle<br>G                          | SS                   |    |
| l<br>a<br>i<br>s<br>f | 3oth the FLUR and SLU<br>a zero voltage bus, the S<br>nitiate load shed. There<br>setpoint, this delay would<br>functions.  | R initiate<br>SLUR wo<br>efore, if th<br>d not pre                                       | load s<br>uld inil<br>ne FLL<br>vent th                         | iate<br>IR's<br>Ie pe                                | in a<br>a D(<br>10 s<br>erfori                                 | ddi<br>G s<br>eco<br>mai                  | ition<br>start<br>ond<br>nce                    | to<br>bef<br>tim<br>of a                  | ED<br>fore<br>e d<br>any                             | G sta<br>e the<br>lelay<br>v safe                             | art.<br>FLl<br>drif<br>ty r                       | Unle<br>JR a<br>ts ou<br>relate                             | ess<br>ind s<br>utsic<br>ed                     | ther<br>simil<br>le its                          | e is<br>arly<br>s    |    |
| E                     | 3ased on the above, the<br>vould have no impact or  | as-found<br>actuatio   | d out o<br>n of E   | f tol<br>SF c  | erano<br>pr no   | ce<br>n-s                                 | mea<br>safet                                    | isur<br>y re                              | rem<br>elat  | nents<br>led ei   | of I<br>quij                                      | lhe F<br>omer   | FLU<br>nt si                                    | Rs<br>nce  | the                  |    |

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| ĺ                 |  | LICENSEE EVENT REPORT (LER) TEXT CONTINUATION  |  |  |  |  |  |  |  |  |  |  |
|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|
| FACILITY NAME (1) |  | DOCKET NUMBER (2)<br>YEAR SEQUENTIAL REVISION<br>NUMBER NUMBER   |  |  |  |  |  |  |  |  |  |  |
| Diablo Ca         | nyon   | Unit 1 0 5 0 0 0 2 7 5 96 - 0 1 8 - 0 0 6 ° 6  |  |  |  |  |  |  |  |  |  |  |
|                   | SLU<br>crite   | Rs would actuate in a time commensurate with safety analyses and design ria.                                       |  |  |  |  |  |  |  |  |  |  |
|                   | Consequently, this event did not adversely affect the health and safety of the public. |  |  |  |  |  |  |  |  |  |  |  |
| V.                | <u>Cor</u>   | rective 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.               | Addi   | itional Information  |  |  |  |  |  |  |  |  |  |  |
|                   | A.   | Failed Components:   |  |  |  |  |  |  |  |  |  |  |
|                   |  | None.  |  |  |  |  |  |  |  |  |  |  |
|                   | В.   | Previous LERs on Similar Problems:   |  |  |  |  |  |  |  |  |  |  |
|                   |  | None.  |  |  |  |  |  |  |  |  |  |  |
|                   |  |  |  |  |  |  |  |  |  |  |  |  |
|                   |  |  |  |  |  |  |  |  |  |  |  |  |
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