



**Pacific Gas and
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PG&E Letter DCL-01-099

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82

Diablo Canyon Units 1 and 2
Licensee Event Report 1-2001-002-00
System Actuation: Unplanned Diesel Start Due to Loss of Startup Power

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.73(a)(2)(iv), PG&E is submitting the enclosed licensee event report regarding an unplanned system actuation when six emergency diesel generators started following a loss of voltage to the startup feeders.

This event was not considered risk significant and did not adversely affect the health and safety of the public.

Sincerely,

David H. Oatley

cc: Ellis W. Merschoff
David L. Proulx
Girija S. Shukla
Diablo Distribution
INPO

Enclosure

JMN/2246/N0002130

IE22

LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)

Diablo Canyon Unit 1

DOCKET NUMBER (2)

05000 275

PAGE (3)

1 OF 7

TITLE (4)

System Actuation

Unplanned Diesel Start Due to Loss of Startup Power

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
08	04	2001	2001	002	00	10	4	2001	Unit 2	0500-323
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)							
Mode 1			20.2201(b)			20.2203(a)(3)(ii)			50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
POWER LEVEL (10)			20.2201(d)			20.2203(a)(4)			50.73(a)(2)(iii)	50.73(a)(2)(x)
100%			20.2203(a)(1)			50.36(c)(1)(i)(A)		X	50.73(a)(2)(iv)(A)	73.71(a)(4)
			20.2203(a)(2)(i)			50.36(c)(1)(ii)(A)			50.73(a)(2)(v)(A)	73.71(a)(5)
			20.2203(a)(2)(ii)			50.36(c)(2)			50.73(a)(2)(v)(B)	OTHER Specify in Abstract below or in NRC Form 366A
			20.2203(a)(2)(iii)			50.46(a)(3)(ii)			50.73(a)(2)(v)(C)	
			20.2203(a)(2)(iv)			50.73(a)(2)(i)(A)			50.73(a)(2)(v)(D)	
			20.2203(a)(2)(v)			50.73(a)(2)(i)(B)			50.73(a)(2)(vii)	
			20.2203(a)(2)(vi)			50.73(a)(2)(i)(C)			50.73(a)(2)(viii)(A)	
			20.2203(a)(3)(i)			50.73(a)(2)(ii)(A)			50.73(a)(2)(viii)(B)	

LICENSEE CONTACT FOR THIS LER (12)

NAME

Roger Russell

TELEPHONE NUMBER (Include Area Code)

(805) 545-4327

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE

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

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On August 4, 2001, at 1522 PDT, with Units 1 and 2 in Mode 1 (Power Operation) at 100 percent power, all six emergency diesel generators started but did not load, as designed, when a loss of Startup Power occurred due to a tripped differential relay protecting the Unit 1 230/12kV Startup Transformer (SUT) 1-1. The differential relay tripped as a result of multiple phase to ground faults in the 12kV SUT 1-1 ground resistor fuse box that resulted in damage to the fuse box and the 12kV bus duct. During this event, both units remained at 100 percent power. This event constitutes a valid system actuation. In accordance with 10 CFR 50.72(b)(3)(iv)(A), an 8-hour non-emergency report was made to the NRC on August 4, 2001 at 1655 PDT.

The primary cause of this event was condensation (moisture) build-up inside the SUT 1-1 fuse box.

PG&E will develop and install modifications to minimize moisture build-up inside the fuse box.

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Diablo Canyon Unit 1	0	5	0	0	0	2	7	5	2001	-	0	0	2	-	0	0	2 OF 7

TEXT

I. Plant Conditions

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

II. Description of Problem

A. Background

During normal operation, the three 4160 V vital buses [EB] in each unit are powered from the auxiliary power system [EL] by the associated main generator. The 230kV system [EA] provides an alternate source of offsite power to the 4160 V System.

Oil Circuit Breakers (OCB) are used in the 230kV switchyard to connect and disconnect the 230kV system from the plant. The 230kV system provides power through OCB 212 to Startup Transformers (SUT) 1-1 and 2-1 (230kV to 12kV) [EA][XFMR]. SUTs 1-1 and 2-1 then distribute power to the Unit 1 and Unit 2 Startup Buses, respectively. The Unit 1 and Unit 2 Startup Buses then feed SUT 1-2 and SUT 2-2 (12kV to 4160 V) [EA][XFMR], respectively. SUTs 1-2 and 2-2 can then supply power to each unit's 4160 V vital and nonvital buses. Figure 1 provides additional detail of the startup power system.

Each unit has three emergency diesel generators (EDG) [EK](DG) that can supply power to the 4160 V vital AC buses. Each EDG automatically starts on a safety injection signal, degraded or loss of voltage on the associated vital bus, or undervoltage on the associated 4kV feeder from the startup bus.

After an EDG has started, if the vital bus is energized the EDG will continue to run but not connect to its vital bus. In the event of a sustained undervoltage condition on the vital buses, the EDGs automatically connect to their associated bus. Required vital loads will then sequence onto the bus.

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TEXT

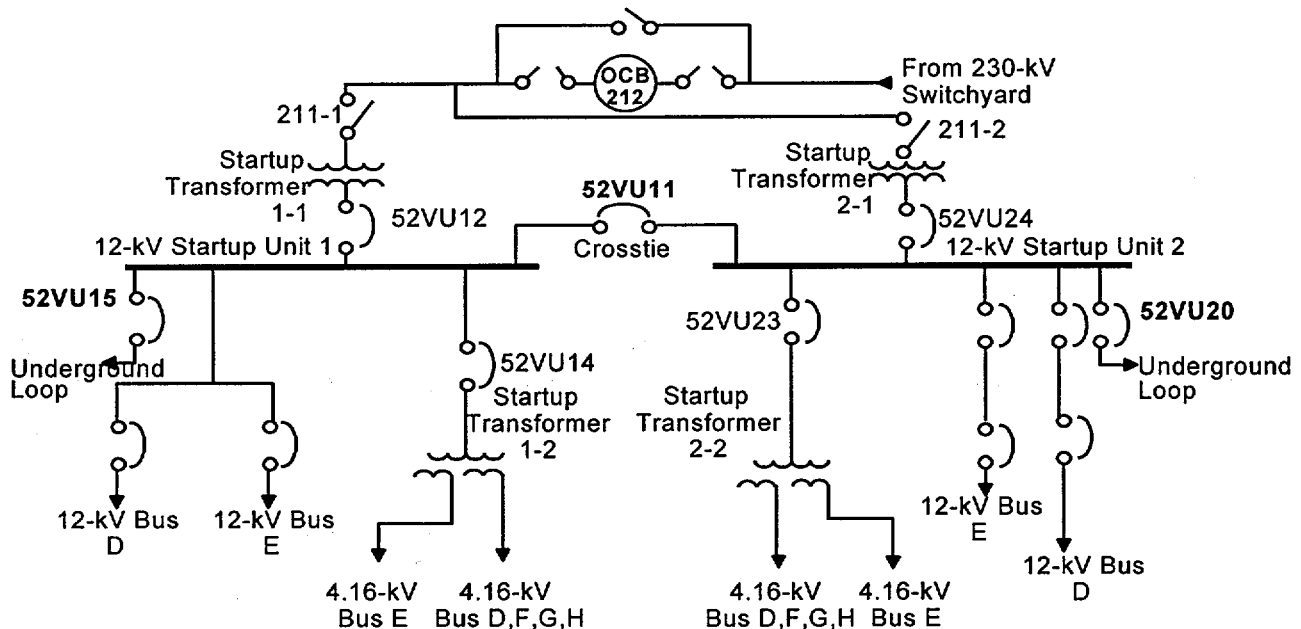


Figure 1: Startup Power Diagram

B. Event Description

On August 4, 2001, at approximately 1500 PDT both units were at 100% power when a trip of 12kV Startup Bus Breaker 52VU15 supplying the 12kV underground electrical loop that supplies power to the non power-block loads occurred.

While Operations personnel were investigating the problem with the underground loop, a small explosion was heard outside of the north end of the Unit 1 turbine building. Subsequent investigation determined that an electrical ground in the 12kV SUT 1-1 grounding transformer fuse box caused a ground in the associated 12kV bus section, ultimately damaging the 12kV SUT 1-1 grounding transformer fuse box and fuse holders. At 1522 PDT, OCB 212 opened, resulting in a loss of 230kV power to both units.

All six EDGs started automatically, as designed, when power was lost to the 4kV Startup feeders to the vital busses. The EDGs did not load, as designed, because vital power was available for the duration of the event from the auxiliary transformers, which were being fed from the main generator output of each unit. By 1615 PDT on August 4, 2001, all six EDGs were secured and returned to automatic by Operations.

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TEXT

Power was restored to the Unit 2 Startup bus at 0513 PDT on August 5, 2001. The Unit 2 Startup Bus was not connected to the 12kV Underground Distribution System (UGDS) when the fault occurred, did not experience the effects of the Unit 1 fault, and was electrically independent from Unit 1 prior to the event. Therefore no testing was performed on the Unit 2 Startup Bus prior to restoration of power.

At 1122 PDT on August 6, 2001, power was restored to the Unit 1 Startup Bus by closing the cross-tie breaker 52VU11 from Unit 2's SUT 2-1. To ensure no damage occurred to the Unit 1 Startup bus, the entire bus, interconnecting cables, potential transformers, and 12kV/4 kV SUT 1-2 were successfully meggered and hi-potted to 20.4kV prior to restoration of power.

Following restoration of startup power to both units, the next priority was to restore the portion of the UGDS that supplied power to the water treatment system. The water treatment system provides make-up water to the condensate storage tanks (CST) for both units. After overlapping megger and hi-pot testing of the portion of the UGDS feeding the water treatment system, power was restored on August 6, 2001, at 1322 PDT. After successful testing of the remaining segment of the UGDS, power was restored to the entire UGDS at 0041 on August 7, 2001.

The normal startup power configuration of powering Unit 1 busses from SUT 1-1 was restored on August 22, 2001, at 1548 PDT following completion of inspection and repair work.

- C. Inoperable Structures, Components, or Systems that Contributed to the Event

None

- D. Other Systems or Secondary Functions Affected

The trip of the 12kV Startup Bus feeder breaker caused the loss of nonessential site loads important to the normal functioning of the site. These include the Administration, Training, and Maintenance Buildings, and support facilities. Power production support facilities that lost power included backup service air compressors and condensate storage tank (CST) makeup from the plant water treatment system.

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TEXT

E. Method of Discovery

On-shift operators received numerous alarms associated with the 12kV ground and underground loop breaker trip. The loss of Startup Power and automatic start of the six EDGs were immediately apparent to plant operators due to numerous control room annunciators.

F. Operator Actions

In response to the EDG starts and loss of startup power, operators performed the following:

- Verified offsite power was operable
- Secured steam generator blowdown overboard
- Cross tied service air to instrument air
- Secured the EDGs
- Cross tied inside and outside fire water loops
- Re-closed OCB 212
- Restored Unit 2 Startup power
- Cross tied Unit 1 and Unit 2 Startup Buses

G. Safety System Responses

The EDGs started, as designed, upon the loss of startup power. The EDGs did not load, as designed, due to vital and nonvital power being available from the auxiliary transformers, which were being fed from the generator output of each associated unit.

III. Cause of the Problem

A. Root Cause

The primary cause of this event was condensation (moisture) build-up inside the SUT 1-1 fuse box. PG&E believes that the excess moisture was caused by the relatively warm air in the bus ducting drawing cold atmospheric air up through a louver/filter assembly in the bottom west side of the fuse box.

When the surface salt accumulation on the east phase vertical bus bar had reached a critical level, an arc flashed along the top of the insulator between the insulator clip assembly lower bolt and the backing plate of the enclosure. The ionization and increasing heat of the air in the enclosed fuse box degraded the air's insulating properties which allowed the arc to

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TEXT

become self-sustaining, resulting in a rapid pressurization of the fuse box that caused the fuse box doors to blow open and damage the SUT 1-1 fuse box.

B. Contributory Cause

None

IV. Analysis of the Event

The 230kV system is designed to provide an immediate source of offsite power in the event that the auxiliary power system is lost. However, the EDGs are credited as the Class I emergency power source and would be relied upon for emergency power in the event that both offsite power sources were lost.

Although the EDGs automatically started as a result of the 230kV startup power system being deenergized, they did not supply power to the vital buses since power was still being supplied from the auxiliary power system. If anyone of the vital 4kV buses had become de-energized during the event, its associated EDG would have automatically connected to the bus. Because of the location of the SUT 1-1 fuse box and its distance from the auxiliary transformers, the main bank transformers, and the 500kV lines, the event posed no threat to the 500kV power system.

Therefore, this condition was considered to be of very low risk significance and did not adversely affect the health and safety of the public.

This event does not represent a safety system functional failure.

V. Corrective Actions

A. Immediate Corrective Actions

- Power to the Unit 2 Startup Bus was restored at 0513 PDT on August 5, 2001. No testing was performed on the Unit 2 Startup Bus prior to restoration of power because the Unit 2 Startup Bus was not connected to the 12kV UGDS when the fault occurred, did not experience the effects of the Unit 1 fault, and was electrically independent from Unit 1 prior to the event.
- To ensure no damage occurred to the Unit 1 Startup Bus, the entire bus, interconnecting cables, potential transformers, and 12kV/4 kV SUT 1-2 were successfully meggered and hi-potted to 20.4kV.

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TEXT

- Power to the Unit 1 Startup Bus was restored at 1122 PDT on August 6, 2001, by closing the cross-tie breaker 52VU11 from Unit 2's SUT 2-1.

B. Corrective Actions to Prevent Recurrence

PG&E will develop and install modifications to minimize moisture build-up inside the fuse box.

VI. Additional Information

A. Failed Components

None

B. Previous Similar Events

LER 1-2000-004-00, dated June 13, 2000, identified a unit trip, followed immediately by a turbine trip and automatic reactor trip. The cause of the unit trip was an electrical phase-to-phase fault on the 12kV bus supplied by Auxiliary Transformer 1-1. The cause of the electrical fault was believed to be associated with long-term degradation, and/or inadequate preventive maintenance (PM) exacerbated by a marginal design. The corrective actions included a new PM program and upgrades to the 4kV and 12kV nonsegregated buses on both units. Neither of these actions would have prevented this event.