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June 4, 2001

PG&E Letter DCL-01-065

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 1-2001-001-00
Automatic Emergency Diesel Generator Start Upon Loss of Startup Power Due to 230-kV Line Arcing in Heavy Smoke from Escaped Fire Caused by Inadequate Administrative Controls

Dear Commissioners and Staff:

PG&E is submitting the enclosed licensee event report regarding the start of the emergency diesel generators on Units 1 and 2 upon loss of 230-kV startup power. Protective relays deenergized the 230-kV lines when heat from a prescribed burn ignited nearby green brush in the transmission corridor and generated heavy smoke. The smoke caused a phase-to-phase arc of the 230-kV lines that triggered the protective relays.

This event was considered to be of very low risk significance 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

WEC/2246/N0002128

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 9

TITLE (4)

Automatic Emergency Diesel Generator Start Upon Loss of Startup Power Due to 230-kV Line Arcing in Heavy Smoke from Escaped Fire Caused by Inadequate Administrative Controls

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
04	05	2001	2001	- 0 0 1 -	0 0	06	04	2001	Diablo Canyon Unit 2	0 5 0 0 0 3 2 3

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (11)	
1	X	10 CFR 50.73(a)(2)(iv)(A)
POWER LEVEL (10)		OTHER
1 0 0	(SPECIFY IN ABSTRACT BELOW AND IN TEXT, NRC FORM 366A)	

LICENSEE CONTACT FOR THIS LER (12)

	TELEPHONE NUMBER	
	AREA CODE	
Roger Russell - Senior Regulatory Services Engineer	805	545-4327

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED	MON	DAY	YR
[ ] YES (If yes, complete EXPECTED SUBMISSION DATE)	[X] NO	SUBMISSION DATE (15)			

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

On April 5, 2001, at 1500 PDT, with Units 1 and 2 in Mode 1 (Power Operation) at 100 percent reactor power, the Emergency Diesel Generators (EDGs) on Units 1 and 2 started as designed when power was lost on the 230-kV startup power system. During a prescribed burn in Diablo Canyon, intense heat ignited nearby green brush and generated heavy smoke that accumulated near the 230-kV lines, causing a phase-to-phase arc. Protective relays functioned as designed to deenergize the lines. Units 1 and 2 remained in Mode 1 at 100 percent power during the event. At 1526 PDT, the shift manager made a Notification of Unusual Event (NUE) to the NRC due to the fire being out of control for greater than 15 minutes. By approximately 1535 PDT, the fire had self-extinguished. At 1615 PDT, the 230-kV lines were returned to service, and at 1645 PDT, startup power was returned to both units. At 1700 PDT, the NUE was terminated, and by 2226 PDT, all EDGs had been secured and placed in standby.

The cause of the event was inadequate administrative controls and Diablo Canyon Power Plant personnel oversight of California Department of Forestry (CDF) activities during cutting and burning of brush in the transmission corridor.

PG&E will develop procedural guidance to formalize the administrative control and oversight of CDF activities during cutting and burning operations.

TEXT

I. Plant Conditions

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

II. Description of Problem

A. Background

Vegetation Management Program

The cutting and burning of brush in Diablo Canyon is part of an ongoing vegetation management program that has been established at Diablo Canyon Power Plant (DCPP) to reduce the intensity of a fire that could occur in the vicinity of the 230- and 500-kV transmission lines that enter and exit the site. An informal agreement between the California Department of Forestry (CDF) and PG&E has allowed CDF to train fire crews in cutting and creating fire lines for over a decade on the land surrounding DCPP. The joint agreement has been considered to be a success by both parties.

A DCPP fire captain in the Safety and Fire Department is appointed as a liaison to interface with the CDF, principally the CDF Fire Captain. The DCPP Fire Captain provides oversight of CDF activities, including advising the CDF Fire Captain of PG&E's expectations regarding the cutting and burning of brush.

During the year, CDF crews cut and stack brush into "windrows" that run vertically up the slopes of Diablo Canyon. The first step in windrow preparation is to clear the brush from a series of alternating strips running up the sides of the canyon and pile it onto intervening uncut strips. To preclude the erosion of steep slopes at the very edge of ravines, brush is normally not cut on steep slopes.

In the second step (occurring several months later), CDF crews remove the dry brush from atop the strips of uncut brush and pile it into the previously cleared strips. The green brush underneath is then cut and piled onto the strips of dry brush. This results in a pattern of parallel rows of brush (windrows) that are separated by strips of newly cleared ground. After sufficient time is allowed for drying and when the temperature, wind, and humidity conditions are appropriate, the windrows are burned.

To minimize the potential for the unplanned spread of fire, the prescribed burns are generally scheduled and conducted during spring when the

surrounding brush and chaparral are green and will not sustain a fire. To control the rate at which a fire consumes a windrow, CDF crews are directed to begin at the top of the windrow that is furthest downwind. Starting downwind minimizes the potential for the fire to jump from windrow to windrow. Burning from the top of the canyon to the bottom of the canyon reduces the chimney effect, which would cause the fire to burn too rapidly. The process is repeated, top to bottom, downwind to upwind, until all windrows are burned.

Permitting, Coordination, and Notification

In his liaison capacity, the DCPP Fire Captain routinely coordinates and plans prescribed burns with DCPP operations and scheduling personnel. Scheduling personnel review plant activities for the upcoming weeks and advise the DCPP Fire Captain of days that prescribed burns would impose the least risk to the plant.

Before prescribed burns are conducted, the County of San Luis Obispo Air Pollution Control District (APCD) must approve a Smoke Management Plan (SMP).

Administrative Procedure OM8.ID1, "Fire Loss Prevention," requires that a Hot Work Permit be obtained in order to conduct a prescribed burn. The procedure also requires a Special Instruction Sheet be provided which must be followed in conducting the burn.

In accordance with the Special Instruction Sheet, the Supervisor at the Diablo Canyon Control Center (switching center for the 230– and 500-kV switchyards at DCPP), the Operations Shift Manager, and the Security Watch Commander must be notified prior to commencing a prescribed burn.

Emergency Diesel Generators

Each DCPP unit has three emergency diesel generators (EDGs)[EK][DG], which supply power to the 4.16-kV vital AC buses [EA][BU] whenever power is either unavailable, or voltage degrades below the point at which required loads would become inoperable. EDGs automatically start on a safety injection (SI) signal, degraded or loss of voltage on the associated vital bus, or undervoltage on the 230-kV startup power system.

After an EDG has started, if the vital bus is deenergized, it will automatically supply power to its associated bus. If the vital bus is not

deenergized, the EDG will continue to run, but not connect, to its vital bus.

During normal operation, the 4.16-kV vital buses are powered from the auxiliary power system. The 230-kV system provides an alternate source of offsite power to the 4.16-kV system. The 230-kV system provides power to Startup Transformers (SUT)[EA][XFMR] 1-1 and 2-1 (230 kV to 12 kV), which feeds SUT 1-2 and 2-2 (12 kV to 4,160 V), respectively. SUTs 1-2 and 2-2 then supply power to each vital bus.

B. Event Description

During the year 2000, CDF crews had cut approximately 10 acres of brush and piled it into windrows on a southwest-facing hillside in the vicinity of the 230-kV transmission lines. The windrows were divided into two areas, east and west, which were separated by a ravine. A 230-kV transmission line tower is on the east side of the ravine. Brush cut from the ravine was also piled at the base of the ravine creating a third area that was included in the prescribed burn to be conducted in early 2001.

On January 1, 2001, the DCPP Fire Captain asked the PG&E Transmission Line Supervisor if the 230-kV lines would be deenergized for scheduled maintenance any time during the first four months of 2001. The Fire Captain was informed that there were no scheduled outages for that period. Had there been, the controlled burns in the vicinity of the lines would have been scheduled during the time the lines were deenergized.

On March 1, 2001, the DCPP Fire Captain began coordination with DCPP operations and scheduling personnel to determine which days in March would be best for conducting prescribed burns and pose the least risk to the plant. The days of March 26, 28, and 30 were selected.

On March 7, 2001, PG&E requested authorization from the APCD to conduct a prescribed burn. The APCD requested a SMP be completed and submitted to support authorization to conduct controlled burning. The SMP was approved on March 22, 2001, authorizing controlled burning, in accordance with the SMP, to be conducted from March 26, 2001, through April 30, 2001.

On March 22, 2001, the DCPP Fire Captain notified the Diablo Canyon Control Center, the DCPP operations shift managers, and the security watch commanders of the prescribed burns to be conducted on March 26, 28, and 30, 2001.

TEXT

On March 23, 2001, the DCPP Fire Captain was informed by the Diablo Canyon Control Center that the prescribed burn on March 26, 2001, could not be conducted because of work on the 230-kV lines between the Mesa Substation and DCPP. The planned burn was cancelled.

On March 26, 2001, the Diablo Canyon Control Center approved prescribed burns on March 28 and 30, 2001.

On March 28, 2001, the CDF Fire Captain cancelled the prescribed burn for the day because gale-force winds were predicted. The DCPP Fire Captain worked with DCPP work scheduling personnel and the Diablo Canyon Control Center to schedule an additional burn for April 5, 2001, since a minimum of 2 days was needed to complete the prescribed burns.

On March 30, 2001, a Hot Work Permit was issued by the DCPP Safety and Fire Protection Department. The permit was valid through April 29, 2001. Under the direction of the CDF Fire Captain, the CDF crews successfully burned the 5 acres west of the ravine.

On April 3, 2001, the DCPP Fire Captain obtained approval from the Diablo Canyon Control Center to conduct a prescribed burn on April 5, 2001, for windrows near the 230-kV transmission lines. Required notifications to the Diablo Canyon Control Center, the DCPP operations shift managers, and the security watch commanders were subsequently made.

On April 5, 2001, the 5 acres of windrows east of the ravine were to be burned. There was a west wind forecast for the day, so the CDF crews started at the windrows closest to the tower (the most downwind spot) and burned top to bottom creating a buffer area between the perimeter of the intended burn area and the bordering green area. Because the windrow material burned slowly, the fire crews worked through lunch, but did not complete the hillside burns until approximately 1430 PDT.

The remaining material to be burned was the dry brush piled in the ravine. Along the east side of the ravine (directly above the cut-and-piled brush) was an area of uncut, green brush. Above that, there was an area partially cleared of brush (only the first step of the windrow preparation process had been completed, leaving dry brush on top of uncut brush).

The CDF Fire Captain decided at this point to start the ravine burn at the bottom end of the brush pile. This decision was based on the burns being

TEXT

behind schedule, the CDF Fire Captain's belief that the ravine burn would be delayed a year if not completed on April 5, and there only being 45 minutes remaining until the normal quitting time for the CDF crews. The CDF Fire Captain did not notify PG&E of the change in plans.

At 1445 PDT, the CDF fire crew set fire to the lower end of the dry brush piled in the ravine. Due to the large amount of fuel in the ravine, the environmental conditions, and the steep terrain at the edges of the ravine, a chimney effect was created when the dry brush was ignited. The fire rapidly grew in intensity, drying the green, uncut brush above. The uncut brush ignited because of direct flame contact from the fire in the ravine and then spread to ignite the partially cleared area above.

At 1510 PDT, the 230-kV transmission lines automatically deenergized when heavy, black smoke from the burning green brush caused a phase-to-phase arc across the lines. All six EDGs (1-1, 1-2, 1-3, 2-1, 2-2, and 2-3) started but did not connect to their vital buses since the buses remained energized from auxiliary power. DCPP Units 1 and 2 remained in Mode 1 at 100 percent power during the event, with power to station auxiliaries being supplied from the main generators. At 1520 PDT, DCPP operations personnel entered Technical Specification (TS) 3.8.1 action statement A.1 (SR 3.8.1.1 – Verification of Offsite Power Sources). At 1526 PDT, the Shift Manager declared a Notification of Unusual Event due to prescribed burn being out of control for greater than 15 minutes.

By approximately 1535 PDT, the dry brush had been consumed and the fire self- extinguished.

At 1615 PDT, personnel in the 500-kV Switchyard indicated the 230-kV lines had been re-energized and at 1633 PDT, DCPP Operations personnel exited TS 3.8.1 Action Statement A.1 (SR 3.8.1.1 – Verification of Offsite Power Sources). At approximately 1633 PDT, the Unit 1 12-kV startup bus reenergized. At 1700 PDT, the Shift Manager reported the Notification of Unusual Event was terminated.

As the EDGs had run unloaded for greater than 1 hour, Surveillance Test Procedure M-9A, "Diesel Generator Routine Surveillance Test," required that they be loaded to a minimum of 1.3 MW for a minimum of 1 hour. Accordingly, operating personnel loaded the EDGs one at a time, per unit, and by 2226 PDT, all six EDGs had been loaded, secured, and placed in standby.

TEXT

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

There were no inoperable structures, components, or systems. All systems functioned as designed.

D. Other Systems or Secondary Functions Affected

No other systems or secondary functions were affected.

E. Method of Discovery

The event was immediately known to licensed plant operators by alarms and indications received in the control room.

F. Operator Actions

Control room operators received alarms, monitored the plant for stable operation, and restored power to the startup buses when the 230-kV power system was returned to service.

G. Safety System Responses

The EDGs started as designed. There were no other safety system responses.

III. Cause of the Problem

A. Immediate Cause

The 230-kV power system protective relays deenergized the incoming 230-kV transmission lines upon sensing the phase-to-phase line fault.

B. Root Cause

The cause of the event was poor communications between PG&E and CDF and inadequate planning and administrative controls over CDF activities during the cutting and burning operations. The CDF fire crews made decisions and performed activities that were contrary to PG&E's expectations.

C. Contributory Cause

None.

IV. Analysis of the Event

The 230-kV system is designed to provide an immediate source of offsite power in the event that the 500-kV 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 are lost.

Although the EDGs automatically started as a result of the 230-kV startup power system being deenergized, they did not supply power to the vital buses since power was still being supplied to the vital buses from the auxiliary power system. If the auxiliary power system had become inoperable during the event, the EDGs would have automatically powered the vital buses. Because of intervening green brush and previously burned areas that presented a buffer to the fire, there was no threat the to 500-kV 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

The fire self-extinguished upon consuming the cut brush in the partially cleared area and upon reaching the surrounding perimeter of green brush. Fire crews monitored the burn until it self-extinguished.

B. Corrective Actions to Prevent Recurrence

PG&E will develop procedural guidance to formalize the administrative control and oversight of CDF activities during cutting and burning operations. As a minimum, the procedural guidance will address the following key elements:

- Advance planning for CDF cutting and burning operations, including contingencies for additional burn days when burns are cancelled.
- Appropriate communications between the DCPP and CDF fire captains and between the DCPP Fire Captain and the Control Room.

TEXT

- PG&E expectations for CDF cutting, stacking, and burning operations.

VI. Additional Information

A. Failed Components

None.

B. Previous Similar Events

In 1991, a DCPP nonconformance report (DC0-91-SS-N099) was initiated to address PG&E having declared a Notification of Unusual Event resulting from a controlled burn that had jumped the fire lines due to a change in wind direction. The corrective actions to prevent recurrence included adding additional requirements to an administrative procedure regarding: (a) minimum training requirements for individuals involved in the burn; (b) a requirement to implement minimum resource requirements (personnel, equipment, communications, etc.) specified in a prescription for burning; and (c) the review and approval process for burn prescriptions. The corrective actions taken for the 1991 event would not have precluded the event of April 5, 2001, as described in this LER.