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PG&E Letter DCL-13-112

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

10 CFR 50.73

Docket No. 50-323, OL-DPR-82
Diablo Canyon Unit 2
Licensee Event Report 2-2013-005-01, "Unit 2 Reactor Trip due to Lightning Arrester Flashover"

Dear Commissioners and Staff;

Pacific Gas and Electric Company (PG&E) is submitting the enclosed Licensee Event Report supplement in accordance with 10 CFR 50.73(a)(2)(iv)(A) identifying the initiation of a reactor trip from the reactor protection system as a result of a 500 kV lightning arrester flashover.

PG&E makes no new or revised regulatory commitments (as defined by NEI 99-04) in this report.

This event did not adversely affect the health and safety of the public.

Sincerely,

Barry S. Allen

J8L3/4486/50573100
Enclosure
cc: Marc L. Dapas, NRC Region IV
Thomas R. Hipschman, NRC Senior Resident Inspector
Jennivine K. Rankin, NRR Project Manager
INPO
Diablo Distribution

NRC FORM 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 10/31/2013

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@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 an 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.

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Unit 2 Reactor Trip due to Lightning Arrester Flashover

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
07	10	2013	2013	- 5 -	1	11	21	2013	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

1

10. POWER LEVEL

100

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

- ☐ 20.2201(b)
- ☐ 20.2201(d)
- ☐ 20.2203(a)(1)
- ☐ 20.2203(a)(2)(i)
- ☐ 20.2203(a)(2)(ii)
- ☐ 20.2203(a)(2)(iii)
- ☐ 20.2203(a)(2)(iv)
- ☐ 20.2203(a)(2)(v)
- ☐ 20.2203(a)(2)(vi)
- ☐ 20.2203(a)(3)(i)
- ☐ 20.2203(a)(3)(ii)
- ☐ 20.2203(a)(4)
- ☐ 50.36(c)(1)(i)(A)
- ☐ 50.36(c)(1)(ii)(A)
- ☐ 50.36(c)(2)
- ☐ 50.46(a)(3)(ii)
- ☐ 50.73(a)(2)(i)(A)
- ☐ 50.73(a)(2)(i)(B)
- ☐ 50.73(a)(2)(i)(C)
- ☐ 50.73(a)(2)(ii)(A)
- ☐ 50.73(a)(2)(ii)(B)
- ☐ 50.73(a)(2)(iii)
- ☑ 50.73(a)(2)(iv)(A)
- ☐ 50.73(a)(2)(v)(A)
- ☐ 50.73(a)(2)(v)(B)
- ☐ 50.73(a)(2)(v)(C)
- ☐ 50.73(a)(2)(v)(D)
- ☐ 50.73(a)(2)(vii)
- ☐ 50.73(a)(2)(viii)(A)
- ☐ 50.73(a)(2)(viii)(B)
- ☐ 50.73(a)(2)(ix)(A)
- ☐ 50.73(a)(2)(x)
- ☐ 73.71(a)(4)
- ☐ 73.71(a)(5)
- ☐ OTHER

Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Redacted, Sr. Engineer, Regulatory Services	Redacted

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

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☑ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On July 10, 2013, at 09:50 PDT, while performing the periodic hot-washing of the 500 kV insulators, a flashover of the Phase A 500 kV to ground across the Phase A lightning arrestor occurred and actuated the 500 kV differential relay. The actuation of the 500 kV differential relay opened the Unit 2 generator output breakers to isolate the generator, which then actuated a turbine trip. Since Unit 2 was operating above the 50 percent power permissive, the reactor protection system initiated a Unit 2 reactor trip. All plant equipment responded as designed.

Diablo Canyon Power Plant (DCPP) staff determined the root cause of this event to be the hot-washing of the Phase A transmission line string insulators (500 kV dead-end insulators) with inadequate controls for oversight of supplemental PG&E transmission line personnel and on-line maintenance risk analysis that resulted in a conductive overspray, which induced an external arc around the lightning arrester insulation resulting in flashover. The corrective action to prevent reoccurrence involves the development and implementation of a maintenance strategy for 500 kV dead-end insulators to ensure they remain adequately contamination free, structurally sound, and minimize risk to DCPP.

There were no personnel injuries, no offsite radiological releases, and no damage to safety-related equipment associated with this condition. This condition did not have an adverse effect on the health and safety of the public.

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NARRATIVE

I. Plant Conditions

At the time of the event, Diablo Canyon Power Plant (DCPP) Units 1 and 2 were in Mode 1 (Power Operation) at approximately 100 percent reactor [RCT] power with normal operating reactor coolant temperature and pressure.

II. Problem Description

A. Background

DCPP is equipped with a Class 1E alternating current (AC) electrical power distribution system [EB] that is divided into three load groups. The power sources for this system consist of two physically-independent offsite sources and multiple onsite standby power sources (three diesel generators (DGs)[DG] for each unit). These systems have independent controls, independent protection, and separate switchyards, transmission lines, and tie-lines to the plant. In the normal alignment, the power produced at DCPP is transmitted offsite via the 500 kV system [EL] and also feeds normal onsite loads via the auxiliary transformer [XFMR]. Backup power is available immediately via the 230 kV system [EK] and startup transformer. In the event of a loss of 230 kV power, backup power is available from onsite DGs. The AC electrical power sources provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to engineered safety systems so that the fuel, reactor coolant system [AB], and containment [NH] design limits are not exceeded.

Each phase of the main bank transformers has an associated lightning arrester (LA) connected to the 500 kV line between the transformer high voltage bushing and the first transmission line tower out from the transformer yard. The LAs are designed to protect the high voltage winding of its associated transformer against impulse and switching surges on the transmission line.

A hot-washing of the 500 kV dead-end insulators has been conducted every 6 weeks since about 1996. The purpose of hot-washing is to remove contaminants and prevent the long term accumulation of nitric acid.

B. Event Description

On July 10, 2013, while performing the periodic hot-washing of the 500 kV dead-end insulators, a flashover of Phase A 500 kV to ground across the Phase A LA occurred and actuated the 500 kV differential relay. The actuation of the 500 kV differential relay opened the Unit 2 generator output breakers to isolate the generator which then actuated a turbine trip. Since Unit 2 was operating above the 50 percent power permissive, the reactor protection system initiated a Unit 2 reactor trip. All plant equipment responded as designed. All three Unit 2 auxiliary feedwater (AFW) pumps [P] started, the containment fan [FAN] cooling units started and ran in slow speed, and the standby auxiliary saltwater train started, all as expected.

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C. Status of Inoperable Structure, Systems, or Components That Contributed to the Event

None.

D. Other Systems or Secondary Functions Affected

None.

E. Method of Discovery

Annunciators in the control room alerted licensed control room operators of the 500 kV system problem.

F. Operator Actions

Plant operators verified appropriate plant trip response using Emergency Operating Procedure (EOP) E-0, "Reactor Trip or Safety Injection," and EOP E-0.1, "Reactor Trip Response."

G. Safety System Responses

Vital buses transferred from auxiliary power to startup power as designed.

III. Root Cause

DCPP staff determined the root cause of this event to be the hot washing of the Phase A transmission line string insulators (500 kV dead-end insulators) with inadequate controls for oversight of supplemental PG&E transmission line personnel and on-line maintenance risk analysis that resulted in a conductive overspray, which induced an external arc around the lightning arrester insulation resulting in flashover.

IV. Assessment of Safety Consequences

There were no safety consequences as a result of this event. The transfer of plant loads to startup occurred as designed. Equipment necessary for Unit 2 decay heat removal was available and operated as required by plant design. Unit 1 remained at full power and all of its vital buses remained powered by auxiliary power. Therefore, the event is not considered risk significant and did not adversely affect the health and safety of the public.

V. Corrective Actions

A. Immediate Corrective Action

Suspended hot-wash activities pending results of the root cause evaluation and establishment of controls determined as necessary as a result of this event.

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B. Other Corrective Actions

DCPP staff will develop and implement a maintenance strategy for 500 kV dead-end insulators to ensure they remain adequately contamination free, structurally sound, and minimize risk to DCPP.

VI. Additional Information

A. Failed Components

None.

B. Previous Similar Events

On October 11, 2012, at 12:08 PDT, the DCPP Unit 2 500 kV line differential relay actuated, resulting in a unit trip. The 500 kV coupling capacitor voltage transformer (CCVT) bushing experienced a flashover to ground, resulting in a unit trip and turbine trip. With the turbine tripped and Unit 2 operating above the 50 percent power permissive, the reactor protection system initiated a reactor trip as designed. All plant equipment, including the auto-start of the AFW system, responded as designed.

At the time of the event, the environmental conditions consisted of light rain. PG&E determined that the causes of the bushing failure were inadequate insulator material performance and inadequate engineering design practices.

Additionally, an unintended AFW pump restart occurred following this event as a result of a procedure deficiency that was created when the procedure was not revised following a plant modification. PG&E revised the procedure and supporting documents and performed tailboards with the procedure writing staff on use of the supporting documents to identify all changes required by a plant modification. CCVTs have now all been relocated to the switchyard and are no longer at the transformer location.