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January 24, 2013

PG&E Letter DCL-13-005

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

10 CFR 50.73

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Units 1 and 2
Licensee Event Report 1-2012-008-00, Loss of Control Room Ventilation System due to Inadequate Design Control

Dear Commissioners and Staff;

Pacific Gas and Electric Company (PG&E) submits the enclosed Licensee Event Report (LER) identifying that inadequate design controls resulted in loss of the control room ventilation system. Both Units 1 and 2 are affected by this issue. PG&E submits this LER in accordance with 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(v)(D), and 10 CFR 50.73(a)(2)(vii).

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

wrl8/50525605
Enclosure
cc/enc: Elmo E. Collins, NRC Region IV
Thomas R. Hipschman, NRC Senior Resident Inspector
Joseph M. Sebrosky, NRR Senior 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

Loss of Control Room Ventilation System due to Inadequate Design Control

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
									Diablo Canyon, Unit 2	05000-323
11	27	2012	2012	- 008 -	00	01	24	2013	FACILITY NAME	DOCKET NUMBER

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)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☑ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☑ 50.73(a)(2)(i)(B)	☑ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Wilbert R. Landreth, Regulatory Services Engineer	(805) 545-6980

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 November 27, 2012, at 2038 PST, while performing a functional test of the Control Room Ventilation System (CRVS) pressurization system using surveillance test procedure (STP) I-118A, "Functional Test of Control Room Pressurization Rad Monitors RM-51, 52, 53, and 54," Pacific Gas and Electric Company (PG&E) identified that none of the four CRVS pressurization fans would continuously operate if they started in response to a Phase A or control room radiation atmosphere intake actuation signal. Operators declared the Units 1 and 2 CRVS actuation instrumentation and CRVS inoperable and entered Technical Specifications (TS) 3.3.7, "Control Room Ventilation System (CRVS) Actuation Instrumentation," and TS 3.7.10, "Control Room Ventilation System (CRVS)," respectively. PG&E reports this condition in accordance with 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(v)(D), and 10 CFR 50.73(a)(2)(vii).

Following troubleshooting activities in response to this event, PG&E developed, issued, and implemented a design change to modify the logic scheme for the CRVS pressurization fans to bypass the opposite unit pressure switch interlocks for a running CRVS pressurization fan. Investigation following the initial failure determined that these interlocks were not necessary. PG&E performed an apparent cause evaluation and concluded that the loss of CRVS was due to inadequate design controls.

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NARRATIVE

I. Plant Conditions

At the time of discovery, Units 1 and 2 were in Mode 1 (Power Operation) at 100 percent power.

II. Problem Description

A. Background

The Unit 1 and 2 common control room ventilation system (CRVS) provides a protected environment from which operators can control the units from the common control room (CR) following an uncontrolled release of radioactivity, hazardous chemicals, or smoke. The CRVS consists of two trains (one CRVS train from each unit) that recirculate and filter the air in the common control room envelope (CRE), and a CRE boundary that limits the in-leakage of unfiltered air. A CRVS train is operable when the associated:

1. main supply fan [FAN] (one), filter booster fan (one) and pressurization fan (one) are operable;
2. high-efficiency particulate-air (HEPA) filters [FLT] and charcoal adsorbers [ADS] are not excessively restricting flow, and are capable of performing their filtration functions; and
3. ductwork [DUCT], valves [V], and dampers [DMP] are operable, and air circulation can be maintained.

Each train is comprised of two redundant, full-capacity, active components so that each train is composed of two subtrains. Technical Specification (TS) 3.7.10, "Control Room Ventilation System (CRVS)," for the CRVS pertains to the two CRVS trains rather than the four subtrains. Either of the two redundant subtrains is manually selected via a switch in the CR, with either subtrain in each unit capable of satisfying the CRVS train operability requirement.

The CRVS is an emergency system, parts of which may also operate during normal unit operations. Upon receipt of an actuating signal, the normal air supply to the CRE is isolated, and the stream of outside ventilation air from the pressurization system and recirculated CR air is passed through a system filter. The pressurization system draws outside air from either the north end or the south end of the turbine building [NM]. The prefilters remove any large particles in the air to prevent excessive loading of the HEPA filters and charcoal adsorbers.

The CRVS is designed to maintain a habitable environment in the Units 1 and 2 common CRE for the duration of the most severe design basis accident (DBA) without exceeding 5-rem whole body dose or its equivalent to any part of the body (calculated over 30 days).

On October 4 and 10, 2012, in response to a prompt operability assessment on the CRE, Pacific Gas and Electric Company (PG&E) completed modifications to the Units 1 and 2 CRVS, respectively, by adding a back-draft damper in each unit's CRVS recirculation line. These dampers minimize the amount of unfiltered air entering the control room when one train is not in operation.

On October 11, 2012, following the damper installation, plant staff performed routine surveillance test procedure (STP) I-18M1, "Control Room Air Intake Monitor Functional Test (RM-25 and 26)," with satisfactory results.

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On October 12, 2012, STP I-118A, "Functional Test of Control Room Pressurization Rad Monitors RM-51, 52, 53, and 54," was run with satisfactory results, which ensured the system functioned adequately to meet the design requirements.

On October 15, 2012, following the routine performance of STP I-118A, plant staff completed flow-balancing activities using Diablo Canyon Power Plant (DCPP) Temporary Procedure (TP) TB-12007, "CRVS Flow and Pressure Balancing Following Dampers VAC-1(2)-BD-67 Installation." The goal for the flow balancing was to minimize the pressurization fan flow as low as possible, while still maintaining the control room differential pressure above the TS 3.7.10 Bases requirement. This flow balancing maximized the recirculation flow through the operating booster fan and thus minimized the radiation dose to the CR operators. As part of the development of TP TB-12007, PG&E created engineering calculation HVAC-2012-03, "CRVS Damper Throttling Model." This calculation assessed flow rates and pressures throughout the CRVS in the various operating configurations. The flow model used in the calculation determined system performance.

B. Event Description

On November 27, 2012, at 2038 PST, while performing a functional test of the CRVS pressurization system in accordance with STP I-118A, PG&E identified that none of the four CRVS pressurization fans would continuously operate if they started in response to a safety injection or CR atmosphere intake radiation actuation signal. Operators declared the Units 1 and 2 CRVS actuation instrumentation inoperable and entered TS 3.3.7, "Control Room Ventilation System (CRVS) Actuation Instrumentation." As directed by TS 3.3.7, Condition B, operators also declared one train of CRVS inoperable and entered TS 3.7.10, Condition A. PG&E reports this condition in accordance with 10 CFR 50.73(a)(2)(v)(D) as a condition that could have prevented fulfillment of a safety function to mitigate the consequences of an accident, 10 CFR 50.73(a)(2)(vii) as a common cause inoperability of independent trains needed to mitigate the consequences of an accident, and 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by TS.

Initial troubleshooting efforts determined that the recent installation of back-draft dampers and post-modification CRVS flow balancing resulted in a higher static head in CRVS common ducting during Mode 4 operation. This caused pressurization fan cycling due to actuation of the system pressure switch(es) [63][PS]. Original pressurization system design utilized pressure switches to provide interlocks which precluded running two fans simultaneously by causing the nonassociated fan to shut off. This was originally designed to protect against over pressurization of the system ducting. Soon after initial system construction, the pressurization fans were modified such that over-pressurization was no longer possible, but the pressure interlocks remained in the actuation circuitry. Per design basis document Design Criteria Memorandum (DCM) S-23F, "Control Room HVAC System," the pressure switches were only identified as providing a low pressure permissive to start a redundant fan. Therefore, engineers involved in the damper modification and flow rebalancing did not recognize that the same pressure switches also provided an over-pressurization interlock. Following these modifications, the pressurization fan that was selected to run increased static pressure in ducting downstream of the pressurization fans enough to exceed the setpoint of all the pressure switch(es) that indicate their associated fan is running. Thus, this condition caused the operating fan to shut down, which lowered the common-header static pressure below the setpoint of the pressure switch. This reduction of static pressure in the common header resulted in the restart of

the pressurization fan. Thus, with the on-and-off cycling of the pressurization fan, Mode 4 would not be sustained upon a Phase A containment isolation or radiation monitor actuation. However, Mode 4 CRVS operation could be sustained by control room operator manual action taken as directed by DCPP Emergency Operating Procedure E-0, "Reactor Trip or Safety Injection," Appendix E, "ESF Auto Actions, Secondary and Auxiliaries Status."

A review of the results of calculation HVAC-2012-03 indicated that the predicted pressures near the location of the pressure switches were higher than the pressure switches' high setpoint of 2 pounds per square inch (psig). The measured pressure at each pressure switch after this event was very close to the predicted pressures calculated in HVAC-2012-03. DCPP design calculation HVAC-96-01, "To Determine CRVS Operation Characteristics under Various Operating Conditions," issued in 2008, assessed the CRVS configuration prior to the flow balancing activities. This calculation indicated that the predicted pressures at the pressure switches were lower than the 2 psig high-pressure setpoint.

Since STP I-118A was successfully performed on October 12, 2012, following the installation of the back-draft dampers, PG&E concluded that the back-draft damper installation had not contributed to this event. PG&E reviewed the back-draft damper modification and flow balancing activities and found no additional unintended consequences. In addition, PG&E created a testing matrix of all tests that are performed on the CRVS so that testing following implementation of a design change to modify the logic scheme for the pressurization fans provided a very high level of certainty that all system functions are tested.

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

During the performance of plant procedure STP I-118A, CR operators noticed an unexpected change in CRVS modes.

F. Operator Actions

Operators declared the Units 1 and 2 CRE inoperable and entered TS 3.3.7 and 3.7.10.

G. Safety System Responses

None.

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III. Cause of the Problem

PG&E concluded that as a result of flow balancing activities, the throttling of some CRVS dampers caused the pressure in the common header to exceed the high-pressure setpoint of the system pressure switches. This configuration was not prevented because the functions of the pressure switches and CRVS interlocks had never been adequately described in DCM S-23F, resulting in inadequate design controls being established following system modification.

IV. Assessment of Safety Consequences

PG&E concluded that the failure of the CRVS pressurization function does not impact mitigation of any of the initiating events that affect core damage frequency modeled in the probabilistic risk assessment and thus a failure of the pressurization function does not directly contribute to an increase of the core damage frequency or large early release frequency. This event did not result in failure of any equipment or a radiological release to plant personnel or the public. Therefore, this event did not adversely affect the health and safety of the public.

V. Corrective Actions

A. Immediate Corrective Actions

Following verification that the high-pressure function of the pressure switches were no longer required, PG&E developed, issued, and implemented a design change to modify the logic scheme for the CRVS pressurization fans to bypass the opposite unit pressure switch interlocks for a running pressurization fan. This aligned the physical configuration of the pressure switch logic and the design basis descriptions of the pressure switches in DCM S-23F.

B. Other Corrective Actions

As part of the investigation into the PG&E design basis document DCM S-23F, PG&E discovered other legacy design functions issues that need to be corrected. These findings have been entered into PG&E's corrective action program.

VI. Additional Information

A. Failed Components

None.

B. Previous Similar Events

None.

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C. Industry Reports

None.