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August 22, 2013

PG&E Letter DCL-13-085

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

10 CFR 50.73

Docket No. 50-275, OL-DPR-80
Diablo Canyon Unit 1
Licensee Event Report 1-2013-005-00, Both Trains of Residual Heat Removal Inoperable Due to Circumferential Crack on a Socket Weld

Dear Commissioners and Staff;

Pacific Gas and Electric Company (PG&E) submits the enclosed Licensee Event Report (LER) regarding completion of a shutdown of Diablo Canyon Power Plant, Unit 1, as required by the technical specifications when both trains of the residual heat removal system were declared inoperable due to a circumferential crack on a socket weld. PG&E is submitting this LER in accordance with 10 CFR 50.73(a)(2)(i)(A), 50.73(a)(2)(ii)(B), and 50.73(a)(2)(v)(D). All systems operated as designed with no problems observed.

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

Barry S. Allen

dngd/4955/50570623
Enclosure
cc: Thomas R. Hipschman, NRC Senior Resident Inspector
Jennivine K. Rankin, NRR Project Manager
Steven A. Reynolds, Acting NRC Region IV
Diablo Distribution
INPO

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

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4. TITLE

Both Trains of Residual Heat Removal Inoperable Due to Circumferential Crack on a Socket Weld

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
									FACILITY NAME	DOCKET NUMBER
06	25	2013	2013	- 005 -	00	08	22	2013		

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)*
Dan Gibbons, Engineer, Regulatory Services	805-545-4955

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
B	BP	N/A	N/A	Y					

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

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

On June 25, 2013, during a walkdown of the Diablo Canyon Power Plant (DCPP) Unit 1 containment, maintenance personnel noted an accumulation of boric acid on the inlet pipe to residual heat removal system relief valve RHR-1-RV-8708. Subsequent cleanup of the boric acid accumulation revealed an active leak of 3 drops per minute. A visual inspection identified that the source of the leak was a circumferential crack on the socket weld.

DCPP determined that system vibration induced a low-stress, high-cycle fatigue which caused the socket weld to fail. DCPP replaced the socket weld. The new weld has improved fatigue resistance over the original, equal-leg socket weld. Additionally, DCPP will install a new support to reduce the chances of piping vibration amplification by increasing its natural frequencies to significantly higher than the current resonant frequencies.

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

NARRATIVE

I. Plant Conditions

At the time of the event, Diablo Canyon Power Plant (DCPP) Unit 1 was 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

The function of the emergency core cooling system (ECCS) is to provide core cooling and negative reactivity to ensure that the reactor core is protected after any of the following accidents:

a. loss-of-coolant accident, non-isolable coolant leakage greater than the capability of the normal charging system [CB];
b. rod ejection accident;
c. loss-of-secondary-coolant accident, including uncontrolled steam release or loss of feedwater; and
d. steam generator tube rupture.

The addition of negative reactivity is designed primarily for the loss-of-secondary-coolant accident where primary cooldown could add enough positive reactivity to achieve criticality and return to significant reactor power. The ECCS consists of three separate subsystems: centrifugal charging (high head) [BQ], safety injection (intermediate head), and residual heat removal (RHR) (low head) [BP]. Each subsystem consists of 2 redundant, 100 percent capacity trains.

The design function of relief valve [RV] RHR-1-RV-8708 is to protect the RHR discharge piping from exceeding its design pressure rating. The inlet pipe to the valve is connected to a 12-inch RHR header line, which provides a flow path for injection to Reactor Coolant System (RCS) [AB] Hot Legs 1 and 2. This line is occasionally used to fill the reactor cavity during refueling outages. The normal flow path for shutdown cooling (Modes 4 and 5) does not use this line.

B. Event Description

On June 25, 2013, during a walkdown of the Unit 1 containment, maintenance personnel noted an accumulation of boric acid on the inlet pipe to relief valve RHR-1-RV-8708. The problem was entered into the corrective action program. Subsequent cleanup of the boric acid accumulation revealed an active leak of 3 drops per minute (dpm). A visual inspection identified a circumferential crack on the socket weld.

The active boric acid leak was located on the common header from the RHR pump [P] discharge to RCS Hot Legs 1 and 2. The active boric acid leak could not be isolated. Both trains of the RHR system were declared inoperable and Technical Specification (TS) 3.0.3 was entered on June 25, 2013 at 2158 PDT. DCPP made a 4-hour report to the NRC about the TS-required shutdown of Unit 1 (NRC Event Notification Number 49148).

NARRATIVE

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 a walkdown of the Unit 1 containment, maintenance personnel noted an accumulation of boric acid on the inlet pipe to relief valve RHR-1-RV-8708. Subsequent cleanup of the boric acid accumulation revealed an active leak of 3 dpm. A visual inspection identified that the source of the leak was a circumferential crack on the socket weld.

F. Operator Actions

Operators declared both RHR trains inoperable.

G. Safety System Responses

None.

III. Cause of the Problem

DCPP determined that the socket weld on the inlet piping to relief valve RHR-1-RV-8708 failed due to low-stress, high-cycle fatigue (from operation-induced system vibration) and a lack of fusion in the weld root. The crack initiated at a stress riser and propagated due to cyclical loading.

IV. Assessment of Safety Consequences

DCPP assessed the Unit 1 risk significance of a leak in the vent line of the RHR supply line to the Hot Leg 1 and 2 supply lines. This assessment concluded that the incremental conditional core damage probability was less than 1.0E-06/year. 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 Actions

DCPP replaced the socket weld on June 27, 2013. The new weld uses a 2:1-leg ratio fillet weld, which has improved fatigue resistance over the original equal-leg socket weld. This weld configuration has been

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NARRATIVE

recommended by the Electric Power Research Institute and is used by the industry and DCPP where enhanced fatigue resistance is required.

B. Other Corrective Actions

DCPP will install new, rigid-lateral support(s) on the discharge line from relief valve RHR-1-RV-8708. The new support(s) will reduce the chances of piping vibration amplification by increasing its natural frequencies to significantly higher than the current resonant frequencies. DCPP will also assess extent of cause for additional socket welds in susceptible locations.

VI. Additional Information

A. Failed Components

DCPP discovered a circumferential crack on the socket weld on the inlet to relief valve RHR-1-RV-8708.

B. Previous Similar Events

DCPP – On February 8, 1999, an operator observed a leak on the weld for chemical and volume control system valve CVCS-2-839 while on routine rounds. The cause of the leak was determined to be high-cycle fatigue of the socket-welded connection due to degraded positive displacement pump operation causing excessive vibration of the piping near the pumps, which led to the growth of through-wall cracks. The corrective action was to remove the valve/pipe assembly and install a plug in the fitting.