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March 9, 2012

PG&E Letter DIL-12-001

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

Materials License No. SNM-2511, Docket No. 72-26
Diablo Canyon Independent Spent Fuel Storage Installation
Licensee Event Report 1-2012-001: Loose Anchor Stud Nuts on Independent Spent Fuel Storage Installation Casks

Dear Commissioners and Staff;

Pacific Gas and Electric Company (PG&E) is submitting the enclosed voluntary Licensee Event Report concerning the discovery of loose anchor stud nuts on the Independent Spent Fuel Storage Installation HI-STORM 100SA storage casks at Diablo Canyon Power Plant (DCPP). The design, construction and installation of the DCPP fuel storage casks are unique in the industry, and this bolting configuration is only used at DCPP.

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,

James R. Becker

mlpy/50451401
Enclosure
cc/enc: Elmo E. Collins, NRC Region IV
Michael S. Peck, NRC Senior Resident Inspector
Joseph Sebrosky, NRR Project Manager
Alan B. Wang, 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

Loose Anchor Stud Nuts on Independent Spent Fuel Storage Installation Casks

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
01	09	2012	2012	- 1 -	0	03	09	2012	FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE

10. POWER LEVEL

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)*
L. Mark Padovan, Regulatory Services Supervisor	(805) 545-4540

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)*

This is a voluntary report. On January 9, 2012, at 1405 PST, plant personnel notified the Diablo Canyon Power Plant (DCPP) shift manager (SM) that 1 of 16 anchor stud nuts of HI-STORM 100SA storage cask number 229-317 was not secured in accordance with the Independent Spent Fuel Storage Installation (ISFSI) Final Safety Analysis Report Section 4.2.1.1.6, "Storage Pad Design" specification. On January 9, 2012, at 2044 PST, Pacific Gas and Electric Company made an 8-hour, non-emergency report (NRC Event Notification 47580) under 10 CFR 72.75(c)(1), "A defect in any spent fuel...storage structure..." Plant personnel retensioned the loose nut and verified the tension of the 15 remaining anchor nuts of cask 229-317. On January 11, 2012, at 1325 PST, DCPP SM was notified that two additional loose nuts were found. Plant personnel have documented these additional occurrences in the corrective action system. This was reported on January 11, 2012, at 1707 PST as an update to Event Notification 47580. These anchor stud nuts were retensioned, and the tension was verified correct on the remaining 238 anchor stud nuts. On February 29, 2012, at 1610 PST, DCPP updated Event Notification 47580 to change the reporting criteria from "72.75(c)(1) Non-emergency condition" to "Voluntary Report."

The apparent cause was inadequate cleanliness prior to final tensioning. A bolt elongation of 0.023 inches results in the correct stud tension. A medium-grade grain of sand has a dimension between 0.010 and 0.020 inches. Dimensional degradation of grains of sand under the cask due to the weight of the cask could cause a relaxation in the tension of the anchor stud. The design, construction, and installation of the DCPP fuel storage casks are unique within the industry. This configuration is only used at DCPP.

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NARRATIVE

I. Event Description

A. Independent Spent Fuel Storage Installation Operating Conditions Before the Event

Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI) Final Safety Analysis Report (FSAR), Section 4.2.1.1.6, "Storage Pad Design," specifies that each spent fuel storage cask is compressed against an embedment plate using 16 anchor [ANC] studs. Each of the studs is preloaded to approximately 157,000 pounds force. The preload is achieved by threading the SA193-B7 studs into a coupling steel block located on the underside of the embedment plate, buried in the concrete. The seismic tensile/bending loads imposed on the pad are resisted by long A-36 steel rods [ROD] connected to the bottom base plate. The base plates are designed to provide sufficient bearing area onto the concrete so as to be able to transfer loads by bearing. Shear loads from each cask are carried through the embedment plate/coupling blocks into the concrete. The design, construction and installation of the Diablo Canyon Power Plant (DCPP) fuel storage casks are unique within the industry. This configuration is only used at DCPP.

B. Status of Structures, Components, or Systems That Were Inoperable at the Start of the Event and That Contributed To the Event

On January 9, 2012, at 1405 PST, plant personnel notified the DCPP shift manager that 1 of 16 anchor stud nuts of HI-STORM 100SA storage cask number 229-317 was not secured in accordance with the FSAR specification. Staff retensioned the loose nut and verified the tension of the 15 remaining anchor stud nuts of cask 229-317. Additional inspections of the anchor stud nuts for each of the remaining HI-STORM casks identified two additional loose anchor stud nuts. Plant personnel documented these additional occurrences in the DCPP corrective action system. These anchor stud nuts were retensioned, and the tension on each of the remaining 238 anchor stud nuts was verified. This work was completed on January 19, 2012.

C. Cause of Each Component or System Failure or Personnel Error

The apparent cause was inadequate cleanliness prior to final tensioning. The Research Council on Structural Steel recommends that "surfaces adjacent to the bolt head and nut shall be free of dirt and other foreign material." This information is contained in "Specification for Structural Joints Using High-Strength Bolts," dated December 2009. Based on this insight, it appears that the installation procedure contained weaknesses which contributed to this occurrence. During the processing of the first cask in the third campaign, it was noted that a significant amount of dirt and debris had collected on the underside of the HI-STORM unit.

A medium-grade grain of sand in the bearing area could create a condition that would prevent long-term maintenance of the stud tension forces. Calculations indicate a bolt elongation of 0.023 inches provides a tension of 157,000 pounds force. A medium-grade grain of sand has a dimension between 0.010 and 0.020 inches. Dimensional degradation of a grain of sand due to the weight of the HI-STORM could cause a relaxation in the tension of the anchor stud and nut assembly. This installation is not subject to cyclic vibrations or significant environmental transients or other external forces.

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Review of the installation procedure concluded that Holtec Procedure HPP-1073-400, "Procedure for MPC Transport at Diablo Canyon Power Plant," provided inadequate instruction to consistently perform the tensioning process under real field conditions. Specifically:
- The procedure did not specify final cleanliness actions immediately prior to the positioning of the HI-STORM cask on the steel embedment ring.
- The procedure did not verify final stud tension after removal of the cask transporter.

D. List of Systems or Secondary Functions That Were Also Affected For Failures of Components with Multiple Functions

None.

E. Method of Discovery of Each Component or System Failure or Procedural Error

DCPP personnel identified the loose bolt during implementation of the HISTORM Monthly Inspection (Maintenance Procedure M-42-DFS.4). Discovery of this condition was coincidental to the monthly inspection activity.

F. Cause(s) and Circumstances for Each Human Performance Related Root Cause

Not Applicable.

G. Manufacturer and Model Number (or Other Identification) of Each Component That Failed During the Event

None (no component failure).

H. Quantities and Chemical and Physical Forms of the Spent Fuel Involved In the Event

Spent fuel was not involved in this occurrence; only supporting structures were affected.

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II. Assessment of Safety Consequences

DCPP personnel evaluated the effect of not pre-tensioning the anchor studs. The evaluation demonstrated that if preload is reduced or lost in any or all anchor studs, the DCPP HI-STORM 100SA storage casks on the ISFSI pads will maintain their stability in the event of a design-basis seismic event. With cask stability maintained, the casks remain capable of performing their safety function until such time as a detensioned anchor stud can be retensioned.

III. Corrective Actions

Immediate corrective actions included the following:

- Retensioned anchor stud nut 16 on Cask 229-317, nut 4 on Cask 229-321, and nut 13 on Cask 229-78.
- Verified tension on all anchor studs and nuts for Cask 229-317 and nuts for 15 remaining casks.
- Evaluated the condition of cask anchor studs and nuts for 15 additional fuel storage casks.

Corrective actions included the following:

Revised HPP-1073-400 to:
- Require a final cleaning swipe of the embedment ring and HI-STORM underside just prior to the final positioning of the HI-STORM cask.
- Include verification of stud tension after the cask transporter has been moved away from the HI-STORM.

IV. Previous Similar Events at DCPP

None.

V. Extent of exposure of individuals to radiation or to radioactive materials

Plant personnel retensioning the anchor stud nuts received a combined exposure of 28 millirems.