



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
1600 E. LAMAR BLVD  
ARLINGTON TX 76011-4511

November 23, 2016

Mr. Edward D. Halpin, Senior Vice President,  
Generation and Chief Nuclear Officer  
Pacific Gas and Electric Company  
Diablo Canyon Power Plant  
P.O. Box 56, Mail Code 104/6  
Avila Beach, CA 93424

SUBJECT: DIABLO CANYON POWER PLANT AND INDEPENDENT SPENT FUEL  
STORAGE INSTALLATION (ISFSI) – NRC INSPECTION REPORT  
05000275/2016011, 05000323/2016011, AND 07200026/2016001

Dear Mr. Halpin:

On September 19-24, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed a routine inspection of the dry cask storage activities associated with your Independent Spent Fuel Storage Installation (ISFSI). The preliminary inspection results were presented to Mr. Jan A. Nimick, Senior Director of Nuclear Services, and other members of your staff onsite on September 22, 2016. Following an in-office review of your heavy loads maintenance program, the final inspection results were presented to Mr. Tom Baldwin, Site Services Director, and other members of your staff by telephone on October 27, 2016.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspection reviewed compliance with the requirements specified in the Diablo Canyon's ISFSI License No. SNM-2511 and the associated Technical Specifications, Diablo Canyon's ISFSI Final Safety Analysis Report (FSAR), and Title 10 of the Code of Federal Regulations (CFR) Part 72, Part 50, and Part 20. Within these areas, the inspection included a review of radiation safety, cask thermal monitoring, quality assurance (QA), your corrective action program, safety evaluations, observations of dry fuel loading activities, and changes made to your ISFSI program since the last routine ISFSI inspection that was conducted by the NRC. No violations of NRC regulations were identified.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

E. Halpin

- 2 -

Should you have any questions concerning this inspection, please contact the undersigned at 817-200-1549, or Mr. Lee Brookhart at 817-200-1191.

Sincerely,

/RA by RLKellar Acting for/

Lee E Brookhart, Acting Chief  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

Dockets: 50-275, 50-323, 72-026  
Licenses: DPR-80, DPR-82, and SNM-2511

Enclosure:  
Inspection Report 05000275/2016011;  
05000323/2016011; 07200026/2016001

Attachments:  
1. Supplemental Information  
2. Loaded Casks at Diablo Canyon ISFSI

**U.S. NUCLEAR REGULATORY COMMISSION**

**REGION IV**

Dockets: 05000275; 05000323; 07200026

Licenses: DPR-80; DPR-82; SNM-2511

Report: 05000275/2016011; 0500323/2016011; 07200026/2016001

Licensee: Pacific Gas and Electric Company

Facility: Diablo Canyon Power Plant, Units 1 and 2

Location: 7 ½ miles NW of Avila Beach  
Avila Beach, CA

Dates: September 19 - 24, 2016

Inspectors: Lee Brookhart, RIV FCDB, Senior Inspector  
Eric Simpson, RIV FCDB, Inspector

Accompanying  
Personnel: Kenneth Womack, RII DFFI, Fuel Facility Inspector

Approved By: Lee Brookhart, Acting Chief  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

Enclosure

## SUMMARY OF FINDINGS

IR 05000275/2016011, 05000323/2016011, and 07200026/2016001; 09/19–24/2016; Diablo Canyon Power Plant and Independent Spent Fuel Storage Installation (ISFSI); Routine ISFSI Inspection Report

The report covers an announced inspection by two regional inspectors. The significance of any Part 50 findings are indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." The cross-cutting aspect is determined using IMC 0310, "Components Within the Cross-Cutting Areas." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after the NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process." In accordance with the NRC Enforcement Policy, all of the Part 72 ISFSI inspection findings follow the traditional enforcement process and are not dispositioned through the Reactor Oversight Process (ROP) or the Significance Determination Process.

A. NRC-Identified Findings and Self-Revealing Findings

No findings were identified.

B. Licensee-Identified Violations

None.

## PLANT AND ISFSI STATUS

Diablo Canyon Power Plant (DCPP) Independent Spent Fuel Storage Installation (ISFSI) stored forty-one Holtec HI-STORM 100SA (Short Anchored) casks at the beginning of the on-site routine inspection. DCPP was in the process of loading the 42<sup>nd</sup> canister during the routine inspection, which was the fifth canister in their current loading campaign. The licensee operated their ISFSI under a site specific Part 72 license, which utilized the Holtec HI-STORM 100 design. DCPP was loading the spent fuel in accordance with Amendment 5 to the Materials License No. SNM-2511 and the Diablo Canyon Spent Fuel Storage Installation Final Safety Analysis Report (FSAR), Revision 6. The license utilized the Multi-Purpose Canister (MPC) MPC-32 to store a maximum of thirty-two assemblies in each HI-STORM 100SA cask.

## REPORT DETAILS

### 4. OTHER ACTIVITIES

#### 40A5 Other Activities

##### .1 Operations of an Independent Spent Fuel Storage Installation at Operating Plants (60855.1)

##### a. Inspection Scope

##### (1) Quality Assurance (QA) Audits and Surveillances

The DCPP Quality Verification Department had performed one audit of activities associated with its ISFSI since the last routine NRC ISFSI inspection in June 2015. During that audit, the performance of the ISFSI program and its QA program implementation were assessed. The audit was documented in their *2015 ISFSI and Fuel Management Audit Report, August 17 – September 21, 2015*. The audit report concluded that all areas evaluated during the assessment were satisfactory. QA reviewers identified five deficiencies during the QA audit. Those deficiencies resulted in four ISFSI related Condition Reports (CRs). CRs at DCPP are referred to as SAP Notifications or SAPNs. SAP is a problem identification and resolution computer application used at DCPP to track identified site conditions. The QA audit related SAPNs reviewed by the NRC inspectors were of very low safety significance, largely administrative in nature, involving equipment storage, personnel training/qualification tracking, and records keeping. All notifications reviewed were evaluated by inspectors to have been adequately resolved. The conditions identified were processed in accordance with Procedure OM7.ID1, "Problem Identification and Resolution," Rev. 49.

DCPP provided NRC with records for six ISFSI related QA surveillances (observations) performed by the Quality Verification Department. All of the observation records were of the Radiation Protection Office at DCPP. Five of the six documented observations were related to DCPP ISFSI activities. The sixth observation was made of activities related to PG&E's Humboldt Bay ISFSI. The Humboldt Bay ISFSI is located at a PG&E decommissioning nuclear power plant several hundreds of miles north in Eureka, CA. The QA surveillances performed at the DCPP ISFSI did not result in any condition reports.

## (2) Radiological Conditions Related to Stored Casks

The DCPD ISFSI is located approximately ¼ mile from the Unit-1 reactor building in the east-northeast sector of the site. The ISFSI sits at an elevation of 310 feet above sea level, 225 feet above the elevation of the reactor site (85 feet above sea level). The ISFSI was constructed into the side of a hill, which provided shielding along its south side. The DCPD ISFSI was comprised of seven rectangular 68 by 105 foot concrete pads that were designed to hold 20 HI-STORM 100SA storage casks each. The total storage capacity for the DCPD ISFSI is limited to 140 casks. The pads were aligned along their longer side and run east to west. The HI-STORM casks were anchored to the pad with studs that were threaded into embedments constructed into the 7½ foot deep reinforced concrete pads for seismic stability.

A walk-down of the ISFSI pad was performed during the NRC inspection. The inspectors found the 41 loaded HI-STORM casks to be in good condition. No flammable or combustible materials were observed stored near or inside the ISFSI protected area. A recent radiological survey of the ISFSI pad was provided to the NRC inspectors prior to their arrival on-site. An ISFSI manager and a radiation protection (RP) technician accompanied the NRC inspectors during the pad tour. A radiological survey was performed by the RP technician with a Ludlum Model 12-4 meter with a neutron sensitive probe inside a Bonner sphere and a RadEye G Geiger-Mueller detector for gamma radiation measurements. The NRC inspector performed confirmatory gamma exposure rate measurements using a Ludlum Model 19 sodium-iodide survey meter (NRC #033906, calibration due July 13, 2017). The Ludlum Model 19 and RadEye G measured gamma exposure rates in microRoentgens per hour ( $\mu\text{R}^1/\text{h}$ ). The RP technicians Ludlum Model 12-4 measured neutron dose rates in millirem per hour (mrem/h).

Survey measurements were taken around the ISFSI pad, at selected cask lower vent locations, and at environmental TLD monitoring locations inside the ISFSI protected area fence. General area background readings before reaching the ISFSI were 5  $\mu\text{R}/\text{hr}$ , gamma and zero ( $< 0.2$ ) mrem/hr, neutron. The observed general exposure rates increased from the edge of (empty) DCPD ISFSI Pad #7 at 7  $\mu\text{R}/\text{hr}$ , gamma to ~330  $\mu\text{R}/\text{hr}$ , gamma around the edges of (fully loaded) Pads #1 and #2. Contact measurements were made at lower vent locations for the most recently loaded casks. Those measurements were 2.5 mR/hr, gamma and 4.7 mrem/hr, neutron for a total radiation dose rate of approximately 7.2 mrem/hr. The survey measurements taken by NRC and the RP technician confirmed survey records that were provided by the licensee.

## (3) Environmental Radiological Monitoring Program

There were four thermo luminescent dosimeter (TLD) monitoring sites located around the ISFSI pad that were responsible for measuring the direct radiological

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<sup>1</sup> For the purposes of making comparisons between NRC regulations based on dose-equivalent (rem) and measurements made in Roentgens, it may be assumed that one Roentgen equals one rem.

(<http://www.nrc.gov/about-nrc/radiation/protects-you/hppos/qa96.html>)

impact from the loaded casks located near the ISFSI pad. The TLD monitoring locations were identified by the DCPD Area Monitoring Program as: IS-11, a monitoring location along the centerline between pad 1 and pad 2, a distance of 51 feet north of the pad; IS-12, a monitoring location located directly centerline and west of pad 2, a distance of 74 feet; IS-13, a monitoring location directly centerline between pad 1 and pad 2, a distance of 41 feet to the south of the pad; and IS-14, a monitoring location centerline and directly east, a distance of 40 feet from the pad. In this inspection report, these TLD monitoring locations will be referred to as the **direct** ISFSI monitoring locations (see Figure 1, below).

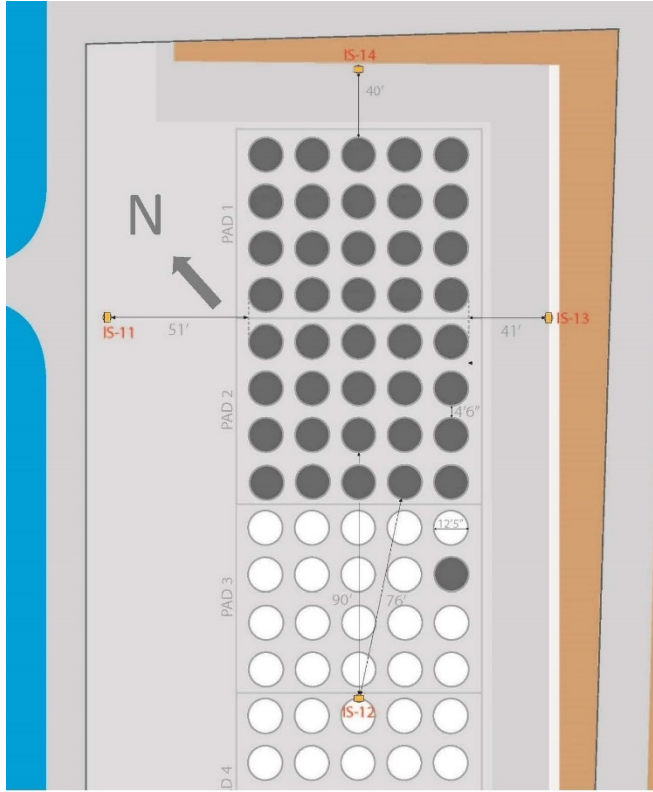


Figure 1, DCPD ISFSI

The TLDs used at the four direct ISFSI monitoring locations were the Mirion Type-36 dosimeters that monitored both gamma and neutron doses at each location. Each of the four monitoring locations around the ISFSI pad included a block of human tissue equivalent material. These “phantoms” improve the neutron dose response of the TLD to that of one worn by a human standing at the each monitoring location.

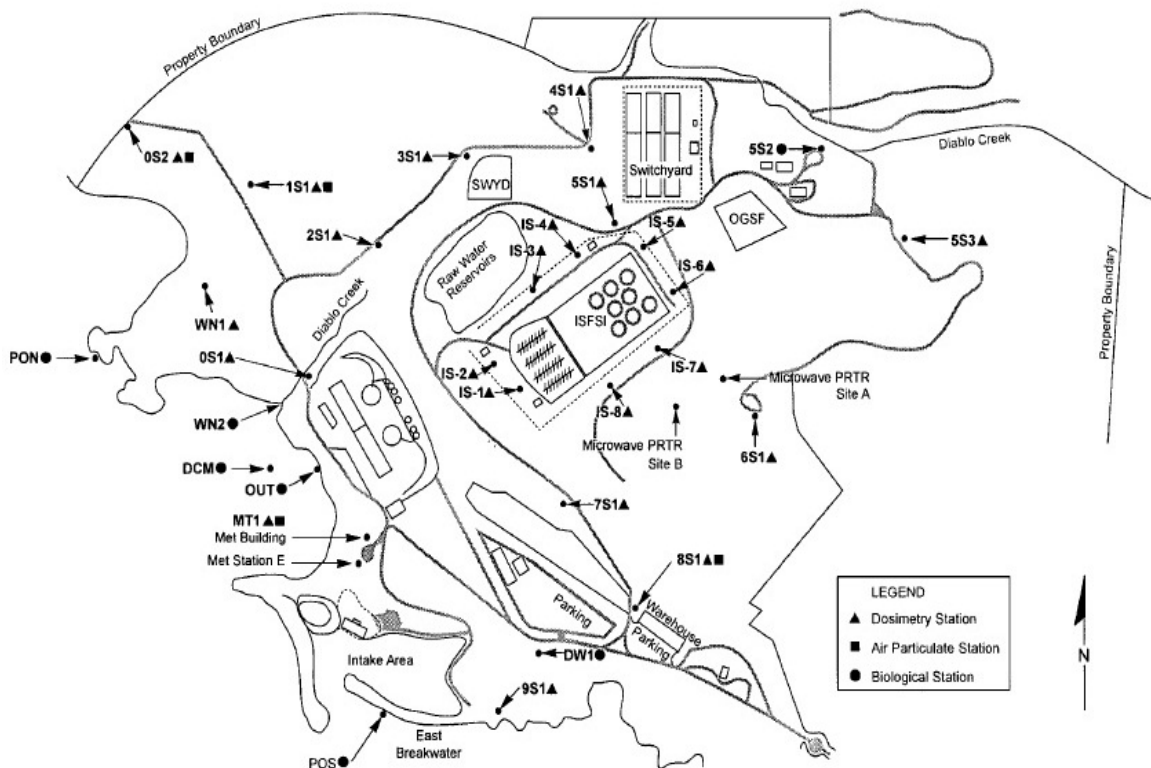
The gamma exposure rates at these four direct ISFSI TLD monitoring locations ranged from 70 to 150  $\mu\text{R}/\text{h}$  at the time of the inspection. It was not possible to correlate the direct TLD measurements with the annual TLD monitoring data because of the recent cask

loading activities and subsequent relocation of the monitoring locations. Site radiological conditions change with the addition of each newly placed spent fuel storage cask. The data showed monitoring locations IS-12 and IS-13 as posting higher yearly dose readings, on average, than locations IS-11 and IS-14 (see Table 1, below). All recently loaded spent fuel were being placed directly in the line-of-sight of monitoring location IS-12. The dose rates are generally trending upwards as more spent fuel casks are being stored in the ISFSI.

**Table 1, Annual Doses in mrem for Direct ISFSI Monitoring Locations**

Location	2014	2015
IS-11	905	1,110
IS-12	1,645	2,214
IS-13	1,336	1,870
IS-14	1,277	1,201

Offsite and onsite monitoring data from the 2013, 2014, and 2015 Diablo Canyon Annual Radiological Environmental Operating Reports (AREORs) were reviewed (ML14127A203, ML15117A657, and ML16118A159, respectively). Those reports were generated by the DCPD Radiological Environmental Monitoring Program (REMP). The REMP included eight environmental TLD monitoring locations installed just outside of the ISFSI fence to monitor the direct radiological impacts of the ISFSI at accessible areas. The monitoring locations were identified as IS-1 through IS-8. The TLDs used for those locations were the Panasonic UD-814 model which measure only gamma dose, unlike the four direct ISFSI TLDs which measured both gamma and neutron dose. We will refer to those eight TLDs as the **fixed** ISFSI monitoring locations. See figure 2, below, for the locations of all onsite environmental monitoring stations with respect to the ISFSI (near center of the figure).



**Figure 2, DCPD Onsite Environmental Radiation Monitoring Stations<sup>2</sup>**

Five of the fixed ISFSI TLD monitoring locations showed relatively elevated readings. IS-3 through IS-7 have historically been sensitive to fuel loading and storage activities at DCPD. This latest monitoring data is consistent with previous data in that regard.

<sup>2</sup> Figure 2 is from the 2010 Annual Radiological Environmental Operating Report DCPD



**Table 2, Annual Doses in mrem for Fixed ISFSI Monitoring Locations**

TLD Identifier	2013 Total	2014 Total	2015 Total
IS-1	95.1	89.4	93.6
IS-2	98.0	87.6	98.0
IS-3	136.0	126.1	168.2
IS-4	345.2	357.7	408.6
IS-5	232.8	212.7	207.5
IS-6	214.0	189.0	190.3
IS-7	150.4	133.2	154.5
IS-8	88.0	84.5	91.7

A cursory look at other TLD locations in relatively close proximity to the ISFSI pad did not show any elevated readings (see IS-1, IS-2, and IS-8, above). A selection of three TLD monitoring locations that were a bit further out from the ISFSI pad than the fixed monitoring locations were selected to see whether influences from the ISFSI extended outward to an appreciable degree. Those three monitoring locations will be referred to as the **boundary** ISFSI monitoring locations (see Table 3, below).

**Table, 3, Annual Doses in mrem for Boundary Monitoring Locations**

TLD #	Sector/Distance	Pre-ISFSI Average <sup>3</sup>	2013 Total	2014 Total	2015 Total
4S1	NE/0.5	75.6	79.5	74.4	73.7
5S1	ENE/0.4	92.0	92.2	86.6	87.0
5S3	ENE/0.7	74.4	75.3	73.0	72.4

It can be seen that all of the monitoring locations remained stable over the past several years. Overall, for the monitoring periods of 2013, 2014, and 2015, it appears that any ISFSI related elevations in dose at boundary locations were minimal based on current and pre-ISFSI average values. All monitoring results fluctuated minimally around the average historical values.

Annual radiological environmental monitoring program (REMP) data documented the dose equivalent to any real individual located beyond the site controlled area was well below the 10 CFR 72.104(a)(2) requirement of less than 25 mrem per year above background. Annual monitoring data near the ISFSI boundary locations show that all accessible areas of the ISFSI fall below the 10 CFR 20.1502(a)(1) dose limit for unmonitored workers, which is 500 mrem per year. Direct radiation impacts from the DCPD ISFSI met all regulatory requirements.

#### (4) Records Related to Fuel Stored in the Casks

NRC inspectors reviewed the records for one randomly selected previously loaded dry fuel storage cask at DCPD to determine if the licensee could readily retrieve the documents and to access whether the documents were being maintained as required by 10 CFR 72.212(b)(12). In addition, NRC performed a review of the dry fuel storage records for 12 casks loaded at the ISFSI, since the last NRC ISFSI inspection, to determine if the selected fuel for loading into the canisters met the requirements of the license and Technical Specifications (TS). The spent fuel

<sup>3</sup> Average monitoring location yearly value in mrem based on historical pre-ISFSI monitoring time frame from 1987 to 2008.

contents of the 12 most recently loaded HI-STORM 100SA casks (including four from the current loading campaign) were recorded in three documents, Engineering Calculation RE-20150415, "ISFSI Campaign Unit 1 Portion and Insert Selection," Rev. 1; Engineering Calculation RE-20150515, "ISFSI Campaign Unit 2 Portion and Insert Selection," Rev. 2; and Engineering Calculation RE-20160725, "ISFSI Campaign Unit 1 Portion and Insert Selection," Rev. 0, respectively. These documents contained MPC loading maps and fuel assembly specific information such as qualification data, identification, decay heat (kW), cooling time (years), average U-235 enrichment (%), burn-up values (MWd/MTU), and other information. A complete set of forms was reviewed for the last 12 canisters that were loaded and two more canisters designated to be loaded during the current campaign.

The licensee was in compliance with all applicable Technical Specifications and FSAR requirements for spent fuel stored at their ISFSI and all regulatory requirements for retrievability of cask records.

(5) Cask Temperature Monitoring

Diablo Canyon's ISFSI Material License No. SNM-2511, Technical Specification (TS) 3.1.2 included surveillance requirement SR 3.1.2.1, which called for the verification that all casks' inlet and outlet air duct screens were free from blockage. This surveillance was required to be performed daily for all Holtec HI-STORM 100SA casks loaded at Diablo Canyon. The licensee performed the vent inspections daily, in step 18.2.1 of Surveillance Test Procedure STP I-1A, "Routine Shift Checks Required by Licenses," Rev. 134 required the operator to record the surveillance data on Attachment OPT-102A-1, Rev. 37. NRC inspectors reviewed documentation for (randomly selected) weeks in August and December of 2015 and in April 2016. The licensee met the technical specification requirement for the daily verification of all four vents being clear for each cask. No issues were identified with DCP's compliance to the TS 3.1.2 vent surveillance requirement for unblocked vents.

(6) Corrective Action Program

A review of the Corrective Action Program associated with the ISFSI operations and the cask handling crane. A list of Notifications issued since the last NRC inspection conducted in June 2015, was provided by the licensee. Of this list, 57 Notifications were selected by the NRC inspectors for further review. The conditions identified covered a broad range of issues. Based on the range of issues identified, the licensee demonstrated a suitably low threshold for placing issues into the corrective actions program. Corrective actions and final resolution of the issues were appropriate to the safety significance of the identified issues. No significant trends were identified during the review of the Corrective Action Program. The Notifications were processed in accordance with DCP Procedure OM7.ID1, "Problem Identification and Resolution," Rev. 49. No NRC safety concerns were identified related to the Notifications reviewed.

## (7) Preparation for Loading Activities

The inspectors requested documentation related to maintenance of the spent fuel building cask handling crane, the annual maintenance of the licensee's special lifting devices, the annual maintenance of the licensee's Vertical Cask Transporter (VCT) and the calibration of various gauges/instruments associated with the licensee's current loading activities.

Documents were provided that demonstrated the fuel building cask handling crane was inspected on an annual basis in accordance with the requirements of the American Society of Mechanical Engineers (ASME) B30.2, "Overhead and Gantry Cranes," prior to the 2016 loading campaign. DCPD utilized Work Order (WO) 64130793 for the crane inspection. The annual crane inspection was completed in February 2016.

Diablo Canyon's ISFSI FSAR Section 4.4.1.3.1 stated: The transfer-cask-lifting trunnions and the lift yoke are designed, fabricated, inspected, maintained, and tested in accordance with NUREG-0612, "Control of Heavy Loads," to ensure that structural failures of these items are not credible. NUREG-0612 Section 5.1(4) states: Special lifting devices should satisfy the guidelines of American National Standards Institute (ANSI) N14.6.

ANSI N.14.6 Section 6.3.1 stated that each special lifting device shall be subjected annually to either load testing and a visual inspection; or if the load testing is omitted, to dimensional testing, visual inspection, and nondestructive examination (NDE) of major load-carrying welds and critical areas.

DCPD had been performing dimensional and visual inspections on its lift yoke in accordance with the ANSI standard, but had not been performing the NDE on critical areas. The inspectors found that DCPD had been following Holtec (the cask vendor) guidance that the lift yoke did not have any critical areas and that NDE of the lift yoke was not required. Holtec provided DCPD with Response to Request for Technical Information (RRTI) 2655-2 which documented the vendor's position of why no critical areas existed and as such the NDE was not required. This position to not perform NDE on the lift yoke as part of the annual maintenance was identified by NRC Region IV inspectors as differing from other Region IV sites that utilize the Holtec systems. Other sites in Region IV do perform NDE inspections on their lift yokes in accordance with the ANSI standard on an annual basis. Since this appeared to be a non-conservative approach to the NRC regional inspectors and it did not match the maintenance activities associated with other Region IV Holtec users, the Region forwarded the information regarding the applicability of NDE inspections on the lift yoke to NRC Headquarters' Division of Spent Fuel Management (DSFM) for their assistance in this review. Until DSFM completes their review of this item, it is being tracked as an Unresolved Item (URI 72-26/1601-01). Following the identification by NRC inspectors, DCPD did perform a magnetic particle NDE examination on areas of the lift yoke and found no indications or defects.

The annual maintenance as required by American National Standards Institute (ANSI) N14.6 for special lifting devices was completed for the following special

lifting devices (SLDs): the HI-TRAC lifting trunnions, HI-STORM lift brackets, and the MPC lift cleats. Documentation reviewed included WO 64132844 for the trunnions, WO 64135530 for the brackets, WO 64115096 for the cleats. All tested equipment passed the visual inspection, the dimensional testing, and either the magnetic particle or liquid dye penetrant inspection (NDE inspections).

Diablo Canyon License SNM-2511 TS 4.3.1.c. states, the VCT shall be designed, fabricated, inspected, maintained, operated and tested in accordance with applicable guidelines of NUREG-0612. NUREG-0612 Section 5.1.1.(6) requires cranes to be inspected in accordance with ASME B30.2 and Section 5.1.1.(4) requires special lifting devices to be inspected in accordance with ANSI N14.6. Both requirements were applicable to DCP's VCT. The licensee completed annual and frequent crane inspections in accordance with the ASME standard on its VCT. Prior to the 2016 loading campaign the annual maintenance was completed utilizing WO 68041872 and the daily inspections were performed under Procedure PEP DF-4, Attachment 1. Special lifting device inspections were completed on the VCT's canister downloading system in accordance with the ANSI standard prior to the 2016 loading campaign. The licensee performed a proof load test followed by visual inspections on the critical welds associated with the downloading system. The work was completed under WO 68041872.

(8) HI-STORM 100 Cask Yearly Maintenance

The Diablo Canyon ISFSI Final Safety Analysis Report (FSAR) Section 4.4.3, "Storage Cask Repair and Maintenance," references to Section 9.2, Maintenance Program," of the HI-STORM 100 System. The HI-STORM 100 FSAR specified the HI-STORM maintenance schedule in Table 9.2.1. Among other tasks, the schedule required an annual visual inspection of the storage cask's external surfaces and identification markings for signs of damage or degradation. NRC inspectors reviewed the documentation related to the annual visual examination of DCP's HI-STORM 100SA casks for 2016. Those documents included WO #64132253 and included filled out copies Procedure PEP DF-12, "HI-STORM Annual Inspection," and its Attachment 9.1, "HI-STORM Annual Inspection Data Sheet." In 2016, 13 out of 37 HI-STORM over packs required some level of vent screen maintenance and several of the older overpacks experienced fading painted surfaces, including dose survey targets, lid to body alignment markings, and pad to body alignment markings. Work orders were written to address all of the noted maintenance issues. The NRC inspectors determined that the licensee's yearly maintenance activities and records met the requirements of the FSAR. The casks were also visually inspected as part of the NRC ISFSI pad tour. All casks appeared to be in good physical condition.

(9) Changes to the SNM-2511 License and FSAR

At the time of the previous ISFSI inspection in June 2015, DCP was utilizing ISFSI License SNM-2511, Amendment 3 and FSAR Revision 5. At the time of the current inspection, the site was operating under License SNM-2511, Amendment 5 (ML16104A373) and FSAR Revision 6.

License SNM-2511, Amendment 4 (ML105041A057), issued on January 5, 2016, provided a security related update to the license. License Amendment 5, issued April 7, 2016, removed the term *preferential loading* from the Technical Specifications and improved clarity and human factors usage of the Technical Specifications.

Changes to the Diablo Canyon ISFSI FSAR to move from Revision 5 to 6 were largely to reflect changes made for the implementation of ISFSI License Amendment 3 and other updates. Since FSAR, Revision 6 was submitted to NRC in March 2016, it does not include the implementation of the current License Amendment 5, which was issued in April 2016.

#### (10) Cask Loading Observations

Various loading activities were observed by the NRC inspectors during the course of the routine ISFSI inspection. DCPD was in the process of loading canister #42 at the time of the inspection. The NRC inspectors observed the fuel movement activities to place spent fuel assemblies into canister #42. The licensee's staff was experienced in moving the spent fuel assemblies and was proficient in locating the correct assembly, verifying the assembly, moving the assembly from the rack to the canister, and inserting the assembly into the assigned canister slot.

Selected welding and non-destructive examination activities were observed during the loading activities associated with canister #42. An automatic welding process was used to weld the canister lid, which utilized one weld head to weld the lid-to-shell weld. The welders operated the equipment remotely in a low dose rate area. Hydrogen monitoring was performed during the welding of the root weld through the final pass. Additionally, the NRC inspectors observed the non-destructive dye penetrant exams conducted on the lid-to-shell weld and the welds on the vent and drain port covers. Any welding defects that were found were repaired by the welders and subsequent NDE examinations of the area passed with clear results.

Other activities that were observed by NRC inspectors during the loading of canister #42 included the hydrostatic testing of the MPC, draining of the MPC, and drying of the MPC. Inspectors observed the heavy loads operations associated with moving the HI-TRAC transfer cask/MPC from the fuel building to a low profile transporter, movement of the HI-TRAC transfer cask/MPC with the VCT to the Cask Transfer Facility (CFT), downloading operations of the MPC from the transfer cask to the HI-STORM overpack, and movement of the overpack to the ISFSI pad. The licensee's cask handling crane and VCT were able to handle the heavy loads without any observed problems.

#### b. Findings

None.

.2 Review of 10 CFR 72.48 Evaluations (60857)

a. Inspection Scope

DCPP's 10 CFR 72.48 screenings and evaluations for ISFSI program changes since the last NRC routine ISFSI inspection were reviewed to determine regulatory compliance. DCPP evaluated their 10 CFR 72.48 screenings and evaluations using DCPP Procedure TS3.ID2, "Licensing Basis Impact Evaluations," Revision 42. DCPP had performed a number of procedure revisions under the 72.48 process since the last ISFSI inspection. NRC inspectors reviewed the 72.48 screens for seven of those procedure changes. Additionally, inspectors reviewed the 72.48 screens associated with four design change packages made within the ISFSI program. None of the screens led to a full 10 CFR 72.48 safety evaluation. All screenings were determined to be adequately evaluated.

As part of the safety review inspection scope, the NRC inspectors documented that the licensee had made no 10 CFR 50.59 screenings or evaluations associated with the fuel building cask handling crane since the last ISFSI inspection.

b. Findings

No findings were identified.

**40A6 Meetings, Including Exit**

Exit Meeting Summary

On September 22, 2016 while on-site, the inspectors presented the preliminary inspection results to Mr. Jan A. Nimick, Senior Director of Nuclear Services, and other members of the licensee staff. Following an in-office review of your heavy loads maintenance program, the final inspection results were presented to Mr. Tom Baldwin, Site Services Director, and other members of your staff by telephone on October 27, 2016. The licensee acknowledged the inspection details presented. The inspector asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

## **SUPPLEMENTAL INSPECTION INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee Personnel

K. Brasco, Engineer, Dry Fuel Management  
S. Flickinger, Project Manager, Dry Fuel Management  
R. Hagler, Supervisor, Technical Services  
M. McCoy, NRC Interface, Regulatory Services  
J. Morris, Supervisor, Regulatory Services  
L. Pulley, Manager, Dry Fuel Management  
J. Strickland, Leader, Technical Services

### **INSPECTION PROCEDURES USED**

IP 60855.1	Operations of an ISFSI at Operating Plants
IP 60857	Review of 10 CFR 72.48 Evaluations

### **LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

#### Opened

URI 07200026/201601-01, "Applicability of required NDE inspections on the Lift Yoke in accordance with ANSI N14.6"

#### Discussed

None

#### Closed

None

## LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather, that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

### 40A5.1 Other Activities

#### **Drawings**

<u>NUMBER</u>	<u>TITLE</u>	<u>DATE</u>
Survey 50765	MPC-389 Post Bolt Down and ISFSI Pad Annual	09/03/16
Survey 50879	MPC-388 Bolt Down and CTF RCA Release	09/10/16
DC 6021754-38-1	MPC Cleat	Rev. 2
DC 6021754-39-1	Diablo Canyon HI-TRAC Lift Yoke Ancillary #702	Rev. 0
DC 6021754-32-1	Holtec Purchase Specification for HI-TRAC Lift Yoke	Rev. 5

#### **Procedures**

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
MP M-42-DFS.1	FHB Dry Fuel Storage Rigging and Load Handling	Rev. 8
OP B-8H	Spent Fuel Pool Work Instructions	Rev. 45A
PEP DF-1	MPC and HI-STORM Preparation	Rev. 2
PEP DF-2	Multi-purpose Canister (MPC) Loading	Rev. 2
PEP DF-3	Drying, Backfilling, and Sealing the MPC	Rev. 4
PEP DF-4	Multi-purpose Canister Transport	Rev. 3
PEP DF-6	Responding to Abnormal Conditions	Rev. 1
PEP DF-9	PG&E Liaison Guidance	Rev. 5
IDAP DF1.ID3	Cask Transport Evaluation Program	Rev. 3
PCI GQP 9.2	Liquid Penetrant Examination/Acceptance Standards	Rev. 9
PCI GQP 9.6	Visual Examination of Welds	Rev. 15
PI-CNSTR-T-OP-230	Closure Welding of MPCs at Diablo Canyon	Rev. 7
MSLT-DSC-HOLTEC	Helium Mass Spectrometer Leak Test Procedure	Rev. DC-00
OM.7ID1	Problem Identification and Resolution	Rev. 49
TS3.ID2	Licensing Basis Impact Evaluations	Rev. 42
STP I-1A	Routine Shift Checks Required by License	04/23/2014

#### **Design Basis Documents**

<u>NUMBER</u>	<u>TITLE</u>	<u>REVISION</u>
SNM-2511	Materials License for Diablo Canyon ISFSI	Amendment 5
ISFSI FSAR	DC ISFSI Final Safety Analysis Report Updated	Revision 6



**Miscellaneous Documents**

<u>NUMBER</u>		<u>TITLE</u>
NUPIC 24235	Holtec International NUPIC Audit	09/30/2016
FileNet #152150011	PG&E DCP 2015 ISFSI and Fuels Audit Report	10/01/2015
Obs. Report 15197	DC Engineering Practices	09/19/2016
Obs. Report 6558	DC Radiation Protection	05/06/2015
2014 TLD	2014 Annual ISFSI TLD Report	2014
2015 TLD	2015 Annual ISFSI TLD Report	2015
2016 TLD	2016 Annual ISFSI TLD Report	2016
HOI-068880	Calibration Record	08/11/2016
Calc 9000040833	Fuel Assembly/Cask Loading for Unit 1 Campaign 1	06/19/2012
Calc RE-20160725	Fuel Assembly/Cask Loading for Unit 1 Campaign 6	07/25/2016
Calc RE-20150515	Fuel Assembly/Cask Loading for Unit 2 Campaign 5	06/25/2015
CMTR D65-65033	Certified Material Test Reports for Embed Coupler	04/28//2006
NDE UT-2	Ultrasonic Thickness Measurement Datasheet	08/16/2016
Holtec PP DS-258	Position Paper Fracture Toughness Considerations	05/29/2014
Holtec RRTI-2665	Request for Technical Information on Lift Yoke	10/10/2016
NDE MT-1	Magnetic Particle Examination Sheet for Lift Yoke	11/16/2016

**72.48 Screenings and Evaluations (PADs/ Procedure Updates)**

<u>NUMBER</u>	<u>PROCEDURE TITLE</u>	<u>REVISION/DATE</u>
DCP 1000025285	Design Change Package Anchor Stud Length	08/17/2016
DCN 2000001651	Design Change Notice Dry Cask Storage System	08/03/2016
DCP 1000025269	Design Change Package Dry Cask Storage System	08/14/2016
DCN 2000001673	Design Change Notice Storage Pad Embedded Struc.	08/18/2016
LBIE 50872463	Gouged Shim Plate	10/01/2016

**Work Orders**

WO 64132253	WO 64132844	WO 64125530	WO 64114004
WO 64130793	WO 68042682	WO 68041872	WO 64115096

**Condition Reports**

50806538	50806718	50806741	50872735	50872461	50872464
50872463	50806538	50806718	50806741	50869610	50869197
50867370	50867369	50866772	50862393	50862392	50862391
50862187	50862186	50862185	50858137	50846786	50846298
50843797	50843007	50842893	50840383	50840382	50840229
50832257	50832136	50824413	50814558	50806719	50806714
50806559	50802610	50798798	50798124	50795763	50793370
50806558	50773261	50711216	50711075	50710898	50710229
50709971	50709708	50708491	50708482	50708370	50707391
50706835	50706355	50706314	50705943	50705752	50705608

## LIST OF ACRONYMS

ADAMS	Agency-wide Documents Access and Management System
ANSI	American National Standards Institute
AREOR	Annual Radiological Environmental Operating Report
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CR	Condition Report
CTF	Cask Transfer Facility
DCPP	Diablo Canyon Power Plant
DNMS	Division of Nuclear Material Safety
F	Fahrenheit
FSAR	Final Safety Analysis Report
IMC	Inspection Manual Chapter
IP	inspection procedure
ISFSI	Independent Spent Fuel Storage Installation
kW	kilowatt
mR	milliRoentgen
micro( $\mu$ )R/h	microRoentgen per hour
MPC	multipurpose canister
mrem	milliRoentgen equivalent man
MWD/MTU	megawatt days/metric ton uranium
NDE	Non-destructive examination
NRC	U.S. Nuclear Regulatory Commission
PAR	Publicly Available Records
QA	quality assurance
REMP	Radiological Environmental Monitoring Program
ROP	Reactor Oversight Program
RP	radiation protection
SA	Short Anchored
SNM	Special Nuclear Material
TLD	thermoluminescent dosimeter
TS	Technical Specification
VCT	Vertical Cask Transporter
WO	work order

**LOADED HI-STORMs AT THE DIABLO CANYON ISFSI**

<b>LOADING ORDER</b>	<b>HI-STORM ID No.</b>	<b>MPC ID No.</b>	<b>Unit</b>	<b>DATE ON PAD</b>	<b>HEAT LOAD (kW)</b>	<b>BURNUP MWd/MTU (max)</b>	<b>MAXIMUM FUEL ENRICHMENT %</b>	<b>PERSON-REM DOSE</b>
1	103	20	1	6/23/09	18.847	44887.85	4.597	0.370
2	91	12	1	6/30/09	18.915	44351.86	4.611	0.274
3	80	10	1	7/8/09	20.121	44966.91	4.406	0.313
4	102	14	1	7/18/09	20.193	44028.93	4.403	0.245
5	93	17	1	7/26/09	20.211	44717.52	4.405	0.253
6	95	21	1	8/2/09	20.256	44999.07	4.405	0.239
7	78	65	1	8/10/09	20.293	44768.81	4.403	0.196
8	100	8	1	8/17/09	19.066	44966.11	4.398	0.169
9	322	127	2	5/13/10	19.599	44863.65	4.411	0.399
10	318	123	2	5/29/10	20.101	44785.9	4.405	0.319
11	320	126	2	6/6/10	20.155	44640.73	4.414	0.199
12	317	121	2	6/12/10	20.206	44921.61	4.422	0.161
13	319	124	2	6/19/10	19.579	44841.1	4.424	0.139
14	323	120	2	6/26/10	19.632	44962.69	4.426	0.153
15	321	125	2	7/3/10	19.647	44797.98	4.427	0.122
16	316	122	2	7/10/10	19.687	44710.2	4.427	0.140
17	513	168	1	1/30/12	12.54	47682.5	4.405	0.167
18	510	167	1	2/12/12	12.71	47845.3	4.397	0.111

LOADING ORDER	HI-STORM ID No.	MPC ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
19	506	169	1	2/19/12	13.07	47397.8	4.397	0.104
20	514	166	2	2/26/12	12.25	46111.5	4.008	0.075
21	516	170	2	3/5/12	15.38	47194.8	4.409	0.136
22	507	165	2	3/11/12	16.03	47017.7	4.407	0.134
23	508	173	2	3/17/12	16.48	46983.4	4.407	0.129
24	632	259	1	8/18/2013	17.446	46995	4.604	0.272
25	636	256	1	8/31/2013	19.448	48113	4.405	0.225
26	638	252	1	9/7/2013	19.594	48014	4.404	0.214
27	635	250	2	9/14/2013	15.095	46946	4.423	0.121
28	641	255	2	9/21/2013	16.431	47029	4.421	0.122
29	639	251	2	9/28/2013	16.137	47269	4.407	0.124
30	640	254	1	5/5/2015	18.240	52715	4.801	0.331
31	637	175	1	5/17/2015	18.666	52722	4.407	0.331
32	634	176	1	5/24/2015	19.580	52472	4.792	0.186
33	633	257	1	5/30/2015	26.900	55813	4.946	0.411
34	512	253	1	6/6/2015	25.870	55009	4.95	0.400
35	515	258	2	6/20/2015	26.954	55680	4.953	0.376
36	509	171	2	6/27/2015	26.777	54857	4.806	0.341
37	517	172	2	7/4/2015	26.775	54976	4.947	0.365

LOADING ORDER	HI-STORM ID No.	MPC ID No.	Unit	DATE ON PAD	HEAT LOAD (kW)	BURNUP MWd/MTU (max)	MAXIMUM FUEL ENRICHMENT %	PERSON-REM DOSE
38	511	174	1	8/18/2016	17.897	56570	4.800	0.266
39	884	381	1	8/27/2016	18.591	56096	4.947	0.217
40	886	389	1	9/03/2016	17.924	55197	4.947	0.169
41	878	388	1	9/10/2016	25.861	54911	4.951	0.382
42	885	387	1	9/25/2016	25.856	53934	4.811	0.333

- NOTES:
- Heat load (kW) is the sum of the heat load values for all spent fuel assemblies in the cask
  - Burn-up is the value for the spent fuel assembly with the highest individual discharge burn-up
  - Fuel enrichment is the spent fuel assembly with the highest individual "initial" enrichment percent of U-235
  - Casks 1-16 Decay Heat revision reference SAPN 50453662

Casks #1 through 8 were loaded to SNM-2511, License Amendment 0, and the Updated Final Safety Analysis Report, Revision 2.  
Casks #8 through 16 were loaded to SNM-2511, License Amendment 1, and the Updated Final Safety Analysis Report, Revision 3.  
Casks #16 through 23 were loaded to SNM-2511, License Amendment 2, and the Updated Final Safety Analysis Report, Revision 3.  
Casks #24 through 29 were loaded to SNM-2511, License Amendment 2, and the Updated Final Safety Analysis Report, Revision 3  
Casks #30 through 37 were loaded to SNM-2511, License Amendment 3 and the Updated Final Safety Analysis Report, Revision 5  
Casks #38 through 41 were loaded to SNM-2511, License Amendment 5 and the Updated Final Safety Analysis Report, Revision 6

All casks are maintained under SNM-2511, License Amendment 5, and the Updated Final Safety Analysis Report, Revision 6.

E. Halpin

- 2 -

Should you have any questions concerning this inspection, please contact the undersigned at 817-200-1191 or Mr. Lee Brookhart at 817-200-1549.

Sincerely,

/RA by RLKellar Acting for/

Lee E Brookhart, Acting Chief  
Fuel Cycle and Decommissioning Branch  
Division of Nuclear Materials Safety

Dockets: 50-275, 50-323, 72-026  
Licenses: DPR-80, DPR-82, and SNM-2511

Enclosure:  
Inspection Report 05000275/2016011;  
05000323/2016011; 07200026/2016001

- Attachments:
1. Supplemental Information
  2. Loaded Casks at Diablo Canyon ISFSI

DISTRIBUTION  
See next page

ADAMS ACCESSION NUMBER: ML16323A110

<input checked="" type="checkbox"/> SUNSI Review	ADAMS	<input checked="" type="checkbox"/> Publicly Available	<input checked="" type="checkbox"/> Non-Sensitive	Keyword:
By: L.Brookhart	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Non-Publicly Available	<input type="checkbox"/> Sensitive	NRC-002
OFFICE	RIV/DNMS/FCDB	RIV/DNMS/FCDB	RIV/DNMS/FCDB/BC /RA by RLKellar Acting for/	
NAME	LBrookhart	ESimpson	LBrookhart	
SIGN	/RA/	/RA/	/RA by RLKellar Acting for/	
DATE	11/22/16	11/21/2016	11/23/16	

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Letter to Edward D. Halpin from Lee E. Brookhart dated November 23, 2016

SUBJECT: DIABLO CANYON POWER PLANT AND INDEPENDENT SPENT FUEL  
STORAGE INSTALLATION (ISFSI) – NRC INSPECTION REPORT  
05000275/2016011, 05000323/2016011, AND 07200026/2016001

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