August 29, 2002

Mr. Lawrence F. Womack
Vice President, Nuclear Services
Diablo Canyon Power Plant
P.O. Box 56
Avila Beach, CA 93424

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE DIABLO CANYON INDEPENDENT SPENT FUEL STORAGE INSTALLATION APPLICATION (TAC NO. L23399)

Dear Mr. Womack:

By letter dated December 21, 2001, the Pacific Gas and Electric Company (PG&E) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a 10 CFR Part 72 license to build and operate an independent spent fuel storage installation (ISFSI) at the Diablo Canyon Power Plant site. On March 25, 2002, NRC notified you that we had completed our acceptance review of the application and had found that the application contained sufficient information for the staff to initiate our technical review. On May 9, 2002, we provided you with our schedule to complete the technical review of the application. The NRC staff, with the assistance of the Center for Nuclear Waste Regulatory Analyses (CNWRA), has completed its initial review of your application and has determined that additional information is required to assess compliance with 10 CFR Part 72.

Enclosed is the staff's request for additional information (RAI). This information is needed for us to continue our review of your ISFSI application. We request that you respond to each item in the RAI. As identified in our May 9, 2002, schedule letter, your response to the enclosed RAI is expected by October 15, 2002. If you are unable to meet the October 15, 2002, milestone, you must notify us in writing, at least 2 weeks prior to that date, of your new response date and the reasons for the delay. The staff will then assess the impact of the new response date and will issue a revised schedule.

We are willing to meet with you to discuss and clarify the enclosed RAI. Based on preliminary discussions with your staff, we have tentatively agreed to a meeting on or about September 19, 2002, to be held at the CNWRA offices in San Antonio, Texas. A public meeting notice will be issued shortly, when the meeting arrangements are finalized.

Please reference Docket No. 72-26 and TAC No. L23399 in future correspondence related to this licensing action. If you have any questions, please contact me at (301) 415-1336.

Sincerely,

**/RA/**

James R. Hall, Senior Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-26 (50-275, -323)
TAC No. L23399

Enclosure: Request for Additional Information

cc: Mailing List

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Enclosure

**PACIFIC GAS AND ELECTRIC COMPANY**
**DOCKET NO. 72-26**
**TAC NO. L23399**

# REQUEST FOR ADDITIONAL INFORMATION

On December 21, 2001, the Pacific Gas and Electric Company (PG&E) submitted a license application to the U.S. Nuclear Regulatory Commission (NRC), to construct and operate an on-site independent spent fuel storage installation (ISFSI), in accordance with 10 CFR Part 72. The on-site ISFSI will store spent nuclear fuel and associated non-fuel hardware from Units 1 and 2 of the Diablo Canyon Power Plant. The proposed Diablo Canyon ISFSI will use the Holtec HI-STORM dry cask storage system, which employs multi-purpose canisters placed inside overpacks to store the spent nuclear fuel. Documents associated with this submittal include the License Application, Environmental Report, Safety Analysis Report, Emergency Plan, Technical Specifications, Quality Assurance Program, and a Preliminary Decommissioning Plan.

This document, entitled Request for Additional Information (RAI), contains additional information requirements identified by the NRC staff during its review of the PG&E application for a 10 CFR Part 72 license for the Diablo Canyon ISFSI. Each individual RAI describes information needed by the staff for it to complete its review of the application and determine whether PG&E has demonstrated compliance with the regulatory requirements. Applicable regulatory requirements are specified in the individual question or comment. The format of this RAI follows the chapters of NUREG–1567, “Standard Review Plan for Spent Fuel Dry Storage Facilities (NRC, 2000),” except for the addition of RAI Chapters 17, Environmental Review, Chapter 18, Materials, and Chapter 19, Editorial Comments.

The staff’s technical review was carried out in accordance with the applicable NRC regulations in 10 CFR Parts 20 and 72, and the NRC guidance contained in NUREG–1567, and in NUREG–1536, “Standard Review Plan for Dry Cask Storage Systems (NRC, 1997).” Note that RAI items may refer to the Spent Fuel Project Office's (SFPO) Interim Staff Guidance (ISG). The ISG was developed as a result of management decisions on several key issues related to the review and approval of spent fuel storage systems and represents positions discussed in meetings with the Nuclear Energy Institute. The current ISG will be incorporated into the next revisions of NUREG-1567 and NUREG-1536.

## Chapter 1. Introduction and General Description

The staff has no comments regarding the general description of the proposed Diablo Canyon ISFSI. The applicant has provided adequate information in the Safety Analysis Report such that the reviewer and other interested parties could become familiar with the pertinent, nonproprietary features of the ISFSI.

**Chapter 2. Site Characteristics**

2-1. Identify all sources of information used in the aircraft crash hazard analysis to support an evaluation of whether an aircraft crash is a credible hazard to the proposed facility.

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), §72.94(c), and §72.98(a).

2-2. Provide the calender year for the flight statistics (for each flight corridor) used to support the evaluation of the aircraft crash hazard analysis.

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), §72.94(c), and §72.98(a).

2-3. Provide technical bases for the estimated effective area of the facility for all aircraft types, as given in the Diablo Canyon ISFSI Safety Analysis Report. The technical bases should be consistent with the established methodologies for estimating the effective area of a given facility for a given aircraft, for example, Section 3.5.1.6 of NUREG–0800 (NRC, 1987), or any other standards.

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), §72.94(c), and §72.98(a).

2-4. Provide technical bases for the crash rate value (C), for each type of aircraft used in the Diablo Canyon ISFSI Safety Analysis Report. The technical bases should follow from an accepted methodology, such as the one documented in NUREG–0800 (NRC, 1987b).

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), §72.94(c), and §72.98(a).

2-5. Provide reasonable estimates for future aircraft activities in the vicinity of the proposed ISFSI facility and an estimate of the cumulative crash hazard of all types of aircraft that may fly in the vicinity of the proposed site. These analyses should follow an established methodology, such as the one documented in NUREG–0800 (NRC, 1987).

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), §72.94(c), and §72.98(a).

2-6. Provide information describing the (i) type of activities carried out by military aircraft in the vicinity of the proposed facility; (ii) possible ordnance carried by military aircraft, if any; and (iii) any potential hazard from the ordnance of these aircraft.

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), §72.94(c), and §72.98(a).

2-7. Provide additional information to determine whether missile tests at Vandenberg Air Force Base could be a credible hazard to the proposed facility. This information should

account for the number, type(s), and paths of missiles being tested in a year and describe the safety precautions to be implemented prior to and during tests.

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), and §72.94(c).

2-8. Provide information on potential accidents at nearby facilities and transportation routes, as described in NUREG–1567 (NRC, 2000). No information is given in the Safety Analysis Report as to why potential accidents at the Diablo Canyon Power Plant or on nearby transportation routes would not present a credible hazard to the proposed ISFSI.

- This information is necessary to determine compliance with 10 CFR §72.94(a), §72.94(b), §72.94(c), and §72.98(a).

2-9. Provide information and analysis to determine whether any sharing of utilities and services between the proposed ISFSI and the existing nuclear power plant increases the probability or consequences of an accident or possible malfunction of structures, systems, or components important to safety, or reduces the safety margin for any technical specification of either facility.

- This information is necessary to determine compliance with 10 CFR §72.122(k)(4).

2-10. Provide information and analysis to ensure that the cumulative effects of the combined operations of the proposed ISFSI facility and existing nuclear power plant will not constitute an unreasonable risk to the health and safety of the public.

- This information is necessary to determine compliance with10 CFR §72.122(e).

2-11. Provide information to show that any of the ISFSI structures, systems, and components important to safety that would be shared with the nuclear power plant will not impair the capability of either facility to perform its safety function, including the ability to return to a safe condition in the event of an accident.

- This information is necessary to determine compliance with10 CFR §72.122(d).

2-12. Provide clarification of the precipitation data presented in Subsections 2.3.1 and 2.3.2 of the Diablo Canyon ISFSI Safety Analysis Report.

Specifically address whether the maximum hourly amount of precipitation recorded in the Diablo Canyon area was 5.97 cm [2.35 in] or 8.33 cm [3.28 in]. Similarly, address whether the maximum amount of precipitation in a 24-hr period was 8.33 cm [3.28 in] or 15.19 cm [5.98 in]. Provide the average annual precipitation that is more appropriate for the ISFSI site, either the average annual precipitation of 40.64 cm [16 in] reported for the “area” or the 54.69 cm [21.53 in] reported for San Luis Obispo.

NUREG–1567 (Section 2.4.3.1) states that the applicant must provide precipitation extremes for the region.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.90(a), §72.90(b), §72.92(a), §72.92(b), §72.98(a), and §72.122(a).

2-13. Provide the data source for the precipitation data presented in Sections 2.3.1 and 2.3.2 of the Diablo Canyon ISFSI Safety Analysis Report.

NUREG–1567 (Section 2.4.3.1) states that the applicant should discuss data sources and reliability.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.90(a), §72.90(b), §72.92(a), §72.92(b), §72.98(a), and §72.122(a).

2-14. Provide the data and analyses used to support the statement that a maximum tsunami would not cause any flooding at the ISFSI site.

NUREG–1567 (Section 2.4.4.6) states that the applicant should analyze the history of tsunami in the region. The analysis should include all potential tsunami generators, such as specific faults, fault zones, volcanoes, and potential landslide areas.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.90(a), §72.90(b), §72.92(a), §72.92(b), §72.98(a), and §72.122(a).

2-15. Provide analysis to demonstrate the potential effects of a tsunami (either from an offshore earthquake or an earthquake-induced submarine landslide) on the stability of the Patton Cove landslide area. Resulting wave erosion could exacerbate slide potential at Patton Cove.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.90(a), §72.90(b), §72.92(a), §72.92(b), §72.98(a), and §72.122(a).

2-16. Provide analysis to demonstrate that the subsurface materials at the proposed storage-pad site are sufficiently competent to withstand the storage-pad foundation loading during a design-basis earthquake.

The analysis provided in Section 2.6.4 of the Diablo Canyon ISFSI Safety Analysis Report is not adequate because (i) the effects of preexisting structural features (such as joints, bedding planes, and clay beds) on potential failure modes of the subsurface materials were not adequately considered in the analysis; and (ii) the potential stress distributions that may control the behavior of the subsurface materials during an earthquake were not adequately considered in the analysis. The stress distributions arise from (i) initial stresses in the subsurface materials, (ii) gravitational loads from the pads and casks, (iii) seismic loading of the subsurface materials from the free-field ground motion, and (iv) seismic loading associated with the inertia of the pads and casks.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(d), §72.90, §72.92, §72.102(d), and 10 CFR §72.122(b)(2).

2-17. Provide data to show that the proposed transport route roadway is sufficiently far from the Patton Cove landslide such that an encroachment of the slide into the transport route can be considered unlikely.

The information provided in Section 2.6.5 of the Diablo Canyon ISFSI Safety Analysis Report does not include an adequate description of the subsurface materials and interfaces in the area between the transport route and the existing slide.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(d), §72.90, §72.92, and §72.122(b)(2).

2-18. Provide an assessment of the stability of the natural slope above and below the proposed storage-pad site during a design-basis earthquake.

The analysis provided in the Diablo Canyon ISFSI Safety Analysis Report is not adequate because (i) an assessment of the potential effects of a design-basis earthquake on the stability of the slope is not provided; and (ii) estimates of seismically induced displacements of potentially unstable masses were calculated using the Newmark sliding block analysis method, but the uncertainties of using the Newmark method for the ground-motion magnitudes associated with the design-basis earthquake were not evaluated.

- This information is necessary to determine compliance with 10 CFR §72.24, §72.90, §72.92, and §72.122(b)(2).

2-19. Provide site-response assessment of the vibratory ground motions for the proposed transport route roadway between the nuclear power plant and the Diablo Canyon ISFSI pad; or provide sufficient justification of why a seismic event that may cause cask drop, overturn of the transporter, or sliding of the transporter off the transport route is not credible (as described in Section 8.2.1.2.1 of the Diablo Canyon ISFSI Safety Analysis Report).

Unlike the power plant and the storage-pad locations, which are founded on bedrock, the proposed transport route is underlain by soils and manmade fill. The site response of these soils and manmade fill could change the amplitude and spectral frequency content of the input vibratory ground motions used in seismic design analyses of the transporter and casks. The conclusion provided by the Applicant in Section 8.2.1.2.1 of the Diablo Canyon ISFSI Safety Analysis Report is that the limited exposure time of the radioactive material during transportation from the power plant to the Cask Transfer Facility (12 hr per year, which is equal to a yearly probability of $1.37 \times 10^{-3}$), makes this a noncredible accident scenario. This conclusion requires further justification.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(d), §72.90, §72.92, §72.102(b), §72.122, §100.20, and §100.23.

**Chapter 3. Operational Systems**

3-1. Provide a complete operational description of the cask transporter during the following operations:

(a) Loading of the cask transport frame onto the cask transporter

(b) Transport to the Cask Transfer Facility (for example, what allowances are made for transverse slope of the road outside the Fuel Handling Building and operational controls of the transporter)

(c) Upending and downending of cask transport frame at the Cask Transfer Facility (for example, what defense-in-depth design features or operational controls prevent tipover during upending and prevent motion past vertical)

(d) Transfer of multi-purpose canisters to the storage cask (for example, what are the steps to attach the restraints for the transporter and controls to ensure that the multi-purpose canister does not bind during transfer)

(e) Transport of loaded storage cask to the storage-pad

(f) Placement of storage cask on the storage-pad (e.g., alignment process and torque sequence for bolts)

This information is necessary to allow the reviewers to assess the ability of the transporter to perform its tasks. This should include discussion of the design features, operator controls, and administrative controls. Section 5.1.1.3 of the Diablo Canyon ISFSI Safety Analysis Report contains only a brief narrative description that is supported in part by Figure 5.1.1 of the Diablo Canyon ISFSI Safety Analysis Report.

- This information is necessary to determine compliance with 10 CFR §72.24(b) and §72.128(a).

3-2. Provide details of the Cask Transfer Facility jack screw controls that are used to ensure a uniform lift of the storage cask.

Section 4.2.1.2 and 4.4.5 of the Diablo Canyon ISFSI Safety Analysis Report and supporting design calculations contain only a limited discussion of the operational characteristics of the cask transporter facility. The information should include a detailed discussion of the devices relied on to automatically shutdown the jack screw in a safe condition in the event of a failure. Moreover, the rationale for not classifying the jack screw controls and related safety features as important-to-safety must be provided. The Cask Transfer Facility jacks are classified as Category B, Important to Safety in Table 4.5.1 of the Diablo Canyon ISFSI Safety Analysis Report, but the table is unclear and does not include the jack screw controls. NUREG–1567 (Section 3.4.3) states that the applicant must provide a clear narrative description or flowcharts of the systems and system equipment and controls used to assure safety.

- This information is necessary to determine compliance with10 CFR §72.24(b) and §72.128(a).

3-3. Provide a description of the structural details and function of the seismic restraint of the cask transporter and storage cask in the Cask Transfer Facility, including associated diagrams. This should include the restraints themselves as well as their attachment points to both the transporter and the foundation.

The description given in Section 5.1.1.3 of the Diablo Canyon ISFSI Safety Analysis Report is insufficient. NUREG–1567 (Section 3.4.3) states that the applicant must provide a clear narrative description or flowcharts of the systems and system equipment and controls used to assure safety.

- This information is necessary to determine compliance with 10 CFR §72.24(b) and §72.128(a).

**Chapter 4. Structures, Systems, and Components and Design Criteria Evaluation**

4-1. Provide a classification for the cask transport frame and any other components present but not listed in Table 4.5-1 of the Diablo Canyon ISFSI Safety Analysis Report.

The Diablo Canyon ISFSI Safety Analysis Report does not include the cask transport frame in Table 4.5-1 and does not classify it as a Category A, B, C, or not-important-to-safety item. As identified within the text of the Diablo Canyon ISFSI Safety Analysis Report, the main function of the cask transporter frame is to facilitate rotation of the loaded transfer cask from vertical to horizontal position, or vice versa, at the Fuel Handling Building/Auxiliary Building and Cask Transfer Facility. NUREG–1567 (Section 4.4.2) states that the applicant must identify all structures, systems, and components, and provide a rationale for the identification.

- This information is necessary to determine compliance with 10 CFR §72.24(n).

4-2. Provide the structural design criteria and bases (e.g., enhanced safety factors, redundant systems, or both) for exclusion of cask drop events during handling and transport.

The Diablo Canyon ISFSI Safety Analysis Report (Section 4.3.2.1.2) states that mechanical design features and administrative controls provide a defense-in-depth approach to preventing load drops during lifting and handling without specifying the structural design criteria and bases. A simple statement that design is according to the applicable guidelines of NUREG–0612 is not adequate. Justification for exclusion of cask drops should be provided. Otherwise, there is a need to establish a cask lifting height limit. Specific design analysis and calculation for the components of lifting and handling system should be provided. NUREG–1567 (Section 4.5.3) states that the principal design criteria and bases for structures, systems, and components important to safety must be provided.

- This information is necessary to determine compliance with 10 CFR §72.24(c)(1) and (2), and §72.120(a).

4-3. Provide justification for the proposed Diablo Canyon Licensing Basis Velocities for Tornado-Generated Missiles in the form of (i)15.24-cm [6 in] diameter Schedule 40 pipe, (ii) 2.54-cm [1 in] diameter steel rod, (iii) utility pole, and (iv) 30.48-cm [12 in] diameter Schedule 40 pipe, listed at the bottom of Table 3.2-2 of the Diablo Canyon ISFSI Safety Analysis Report.

According to Section 3.2.1.1 of the Diablo Canyon ISFSI Safety Analysis Report, the tornado-generated missiles evaluated for the Diablo Canyon ISFSI are a compilation of those from the 1996 Diablo Canyon Power Plant Final Safety Analysis Report Update; NUREG–0800 (NRC, 1987), Section 3.5.1.4 Spectrum II missiles; and three 500-kV tower missiles specific to the Diablo Canyon ISFSI site. A review of the table indicated that the descriptions and masses for four missiles identified in the first sentence of this comment are consistent with Missiles B, C, D, and E of the Spectrum II missiles listed in NUREG–0800 (NRC, 1987); however, the associated velocity values are substantially smaller than those provided in NUREG–0800 (NRC, 1987).

- This information is necessary to determine compliance with 10 CFR §72.92(a) and §72.122(b).

4-4. Provide information to verify that the forces imposed on the transporter roadway, from the fully loaded transporter, are within design criteria of the as-built pavements and subgrade.

Section 4.3.2.1.1 of the Diablo Canyon ISFSI Safety Analysis Report only states that, “It is designed with two steel tracks to spread out the load on the transport route surface as a distributed pressure load.”

- This information is necessary to determine compliance with 10 CFR §72.24(b) and §72.24(c).

**Chapter 5. Installation and Structural Evaluation**

5-1. Provide an evaluation to support the conclusion that the concrete will not break out of the storage pads prior to failure of the ductile metal members.

The Diablo Canyon ISFSI Safety Analysis Report (Section 3.3.2.3, ISFSI Concrete Storage Pad: Design Criteria) states that the design strength capacity of the embedded base plate, concrete bearing, and diagonal tension shear capacity are in accordance with the design provisions of American Concrete Institute 349-97 and the embedded anchorage will meet the ductile anchorage provisions of the Proposed Draft New Appendix B to American Concrete Institute 349-97 (dated October 1, 2000). Supporting evidence that the concrete will not break out prior to failure of the ductile metal members is not provided in the Diablo Canyon ISFSI Safety Analysis Report. An evaluation of concrete breakout strength in tension of a group of anchor rods considering spacing and edge distance should be provided.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

5-2. Specify how Pacific Gas and Electric will identify changes to the final construction design and analysis of the Diablo Canyon ISFSI storage pad and the Cask Transfer Facility.

Section 4.2 of the Diablo Canyon ISFSI Safety Analysis Report states that final construction design and analysis of the Diablo Canyon ISFSI storage pad and the Cask Transfer Facility will be completed during the detailed design phase of the project and that no significant changes are anticipated from the information presented. Section 5.4.3 of NUREG–1567 (NRC, 2000) indicates that design descriptions should include sufficient detail to support a detailed review and evaluation, and that design analyses should be prepared such that they may be readily audited to permit determination of the sources of expressions used, values of material properties, data from other supporting calculations, and assumptions. In addition, this information is needed to assess compliance with the applicable codes, standards, and other functional design requirements (i.e., structural design requirements for off-normal and accident loading conditions).

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

5-3. Provide details on the heat from hydration during placement of the concrete in the storage pads.

This is a massive structure based on the 1.9-m [7.5-ft] thickness and the overall size of the individual pads. Heat generated during hydration may result in unacceptable cracking of the pad structure. Cracking of the pad may adversely affect the ability of the anchor system for the storage casks to perform its intended safety functions.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

5-4. Identify what stresses are imposed in the surrounding foundation rocks as a result of the static and dynamic loading of the Cask Transfer Facility and assess the potential consequences. This assessment should include the technical basis for the failure criteria used and a quantification of the factors of safety.

Section 4.4.5 of the Diablo Canyon ISFSI Safety Analysis Report contains only a brief discussion of the main shell. Sufficient detail and supporting analysis must be provided to identify the load paths, demand, and capacity of the various components.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

5-5. Provide the material specifications and mechanical properties for the seismic anchor system including the embedment plate, compression coupling blocks, anchor rods, and anchor plates.

NUREG–1567 (Section 5.4.1.3) states that the Safety Analysis Report must (i) establish compatibility of materials and coatings to be used with the environments to be

experienced; (ii) provide tables with material properties and allowable stresses and strains associated with temperature, as appropriate; and (iii) establish appropriate corrosion allowances and demonstrate these allowances are acceptable in the applicable structural analyses. Section 4.4.5.3 of the Diablo Canyon ISFSI Safety Analysis Report contains a statement that the main shell at the Cask Transfer Facility and its foundation are sufficient, but no supporting information is provided.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d); §72.24(i), and §72.122(b).

5-6. Provide additional information on the structural design and analyses of the Cask Transfer Facility given in Holtec Report No. HI–2012626, including (i) the main shell and the method used to anchor it to the surrounding concrete; (ii) the jack support platform; (iii) the lifting platform; and (iv) the Cask Transfer Facility concrete structure and the method used to anchor it to the surrounding rock foundation.

NUREG–1567 (Section 5.4.4.4) states that design analyses should be prepared such that they may be readily audited to permit determination of the sources of expressions used, values of material properties, data from other supporting calculations, and assumptions. Furthermore, NUREG–1567 (Section 5.5.4.) states that the following must be identified: (i) all dimensions, including locations, sizes, configurations, and weld specifications; (ii) structural materials with defining standards or specifications, including test requirements such as brittle fracture testing; (iii) fabrication, assembly, and test procedures for assemblies and subassemblies; and (iv) weld materials and weld codes, including pre- and post-heat requirements.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d); §72.24(i), §72.82, and §72.122(b).

5-7. Provide an assessment of potential impact loads between the storage cask and the Cask Transfer Facility during an earthquake, or justify why they do not need to be considered as part of the analysis identified in Section 4.4.5 of the Diablo Canyon ISFSI Safety Analysis Report.

NUREG–1567 (Section 5.5.1.4) states that normal, off-normal, and accident load conditions should be defined and evaluated.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

5-8. The analysis of the Cask Transfer Facility under seismic loading, given in Holtec Report No. HI–2012626, is performed using a quasi-static method. Provide the engineering basis for the assumption that the various components can be considered rigid. For example, identify what the axial mode of the screw jacks is when loaded by the HI-STORM 100 storage cask and multi-purpose canister. Identify what the buckling load for the screw jacks is when the system is at the top of its travel.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

5-9. Provide operational and design details of the proposed fail-safe features identified in Section 3.3.3.2 of the Diablo Canyon ISFSI Safety Analysis Report that are intended to automatically shut-down the cask transporter into a safe, stopped, and braked condition if the operator is injured for any reason while handling a loaded cask.

NUREG–1567 (Section 5.5.4.) states that text descriptions along with drawings, figures, tables, and specifications included in the application should fully describe structures, systems, and components important to safety.

- This information is necessary to determine compliance with 10 CFR §72.24 and §72.82.

5-10. Provide design analyses and calculation packages for the cask transporter, including (i) slings and special lifting devices; (ii) cask transporter lift points, overhead beam, vehicle body, and seismic restraints; and (iii) lifting towers.

NUREG–1567 (Section 5.4.4.4) states that design analyses should be prepared such that they may be readily audited to permit determination of the sources of expressions used, values of material properties, data from other supporting calculations, and assumptions. Furthermore, NUREG–1567 (Section 5.5.4.) states that the design analyses must identify: (i) all dimensions, including locations, sizes, configurations, and weld specifications; (ii) structural materials with defining standards or specifications, including test requirements such as brittle fracture testing; (iii) fabrication, assembly, and test procedures for assemblies and subassemblies; and (iv) weld materials and weld codes, including pre- and post-heat requirements.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), §72.82, and §72.122(b).

5-11. Provide design analyses and calculation packages that justify the assumption that the components of the cask transporter including (i) overhead beam, (ii) vehicle body, and (iii) lifting towers are rigid to 33 Hz.

Use of static design assumes that the elements are rigid within the frequency range of the loading. Structural beam properties needed to ensure a rigid structure are more stringent than those required to resist other loadings. NUREG–1567 (Section 5.5.4.4) states that all load combinations for structures, systems, and components important to safety must be appropriately evaluated.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

5-12. Provide or reference design analyses and calculation packages on the seismic restraints of the cask transporter at the Cask Transfer Facility. This should include the restraints themselves as well as their attachment points.

- This information is necessary to determine compliance with 10 CFR §72.24(a),

§72.24(b), §72.24(c), §72.24(d); §72.24(i), and §72.122(b).

5-13. Provide an evaluation of the effects of torque on the embedded anchor rods.

The torque is the result of applying the preload (698 kN/anchor [157 kips/anchor]) to the cask anchor studs. The cask anchor studs are threaded into compression/coupling blocks that enable the anchor studs to be preloaded to approximately 698 kN [157 kips]. However, the embedded anchor rods are threaded into the coupling blocks and the torque applied to the anchor studs will be transmitted to the anchor rods. The anchor system must perform its safety function and is of a unique design. The uniqueness is associated with the high preload of the anchor studs, the use of coupling blocks, the depth of embedment, and the interaction between the anchor studs and the embedded anchor rods. NUREG–1567 (Section 5.4.1.4) states that design analyses should be prepared such that they may be readily audited to permit determination of the sources of expressions used, values of material properties, data from other supporting calculations, and assumptions.

- This information is necessary to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(i), and §72.122(b).

**Chapter 6. Thermal Evaluation**

6-1. Provide the insolation source data collected by the California Irrigation Management Information System during the period May 1, 1986, to December 31, 1999, at the site 12 mi [19.31 km] from the proposed ISFSI location.

NUREG–1567 (Sections 2.4.3.1 and 6.5.3) states that this information should be provided by the applicant. This information is necessary to confirm that the Diablo Canyon site parameters are within the parameters analyzed for the HI-Storm 100 system.

- This information is necessary to determine compliance with 10 CFR §72.92(b) and §72.122(b)(3).

6-2. Provide clarification of the units used to quantify the Diablo Canyon Power Plant spent nuclear fuel rod burnup limits in Footnote (a) of Table 3.1-2 in the Diablo Canyon ISFSI Safety Analysis Report.

NUREG–1567 (Section 6.5.2.2) states that this information is needed to establish acceptable storage fuel cladding temperatures under normal, off-normal, and accident conditions.

- This information is necessary to determine compliance with 10 CFR §72.24, §72.26, and §72.44.

6-3. Provide the monthly average temperatures for the Diablo Canyon site.

This information is required to ensure the long-term environmental temperatures of the site are bounded by the cask limiting condition of operation. NUREG–1567 (Section 6.5.3) state that this information should be provided by the applicant.

- This information is necessary to determine compliance with 10 CFR §72.92(b) and §72.122(b)(3).

6-4. Provide thermal analyses of the ISFSI storage pad and Cask Transfer Facility concrete structure.

NUREG–1567 (Section 6.5.2.3) states the maximum calculated concrete temperatures should be assessed and must not exceed the material temperature criteria for normal, off-normal, and accident conditions.

- This information is necessary to determine compliance with 10 CFR §72.92(a), §72.92(b), §72.92(c), §72.122(b), and §72.128(a).

6-5. Provide clarification and rationale explaining the difference between the highest recorded hourly temperature of 36.1 °C [97 °F] and the extreme hot ambient temperature of 40 °C [104 °F] for the Diablo Canyon site.

NUREG–1567 (Sections 2.4.3.1 and 6.5.3) states that this information should be provided by the applicant.

- This information is necessary to determine compliance with 10 CFR §72.92(a), §72.92(b), §72.92(c), §72.122(b), and §72.128(a).

6-6. Provide clarification as to the maximum net allowable decay heat load and concomitant uncertainty for each applicable multipurpose canister and verify that these values are bounded by the assumed values used to analyze the normal, off-normal, and accident conditions in the cask Diablo Canyon ISFSI Safety Analysis Report.

NUREG–1567 (Section 6.5.3) states that this information should be provided by the applicant.

- This information is necessary to determine compliance with 10 CFR §72.92(a), §72.92(b), §72.92(c), §72.122(b), and §72.128(a).

6-7. Provide a revision of the proposed Technical Specifications for the ISFSI that includes an administrative procedure to prohibit transfer cask handling operations at environmental temperatures below -18 °C [0 °F].

Section 8.1.2.3 of the Diablo Canyon ISFSI Safety Analysis Report states that administrative procedures based on DC ISFSI TS 5.1.3 prohibit cask handling operations at environmental temperatures below -18 °C [0 °F]. Technical Specification 5.1.3 does not appear to contain this limitation, however. NUREG–1567 (Section 6.5.2.1) states that this information should be provided by the applicant.

- This information is needed to determine compliance with 10 CFR §72.24(h).

6-8. Revise Section 10.2.2.3 of the Diablo Canyon ISFSI Safety Analysis Report, Multi-Purpose Canister Drying Characteristics, to adopt the appropriate sections of Appendix 2.B, The Forced Helium Dehydration System, from the Holtec HI-STORM 100 Final

Safety Analysis Report, Amendment 1.

The Forced Helium Dehydration System is a new drying method. As a result, the Diablo Canyon ISFSI Safety Analysis Report should be revised to include the recommended analyses and a description of the acceptance testing procedures that will be implemented for the Forced Helium Dehydration System. NUREG-1567 (Section 6.5.1.2) states that the Safety Analysis Report should provide evidence that (i) the liquid in the cask does not boil during fuel assembly transfer operations to avoid uncontrolled pressures on the cask and the connected dewatering, purging, and recharging system(s); (ii) an adequate subcooling margin has been identified and a corresponding operating procedure to prevent boiling that may result in an inadvertent criticality due to optimum moderator conditions has been provided; and (iii) the ISFSI maximum temperature (under normal conditions) of the pool water and other water that may be used in the cask cavity during loading and unloading operations is below the temperature assumed in the cask criticality safety analysis if a time restriction exists in the corresponding technical specifications.

- This information is needed to determine compliance with 10 CFR §72.24(i).

6-9. Provide clarification as to whether a Vacuum Drying System will be used at the Diablo Nuclear Power Plant for drying canisters containing moderate and high burnup spent fuel as an alternative method to the Forced Helium Dehydration System.

If the Vacuum Drying System is used, the temperature of the fuel could be high enough to cause hydrides to reorient in a radial direction in highly oxidized high burnup fuel cladding. NUREG–1567 (Section 6.5.2.2) states that the Safety Analysis Report should address burnup dependent effects that could potentially lead to a failure of the cladding and dispersal of the fuel during transfer and handling operations.

- This information is needed to determine compliance with 10 CFR §72.24(i).

## Chapter 7. Shielding Evaluation

The staff has not identified any additional information regarding the applicant's shielding evaluation.

## Chapter 8. Criticality Evaluation

8-1. Provide a description of the differences between the multi-purpose canister-24E and multi-purpose canister-24EF and discuss how these differences allow fuel debris to be loaded into the multi-purpose canister-24EF compared to the multi-purpose canister-24E.

A review of the drawings has found some differences between the multi-purpose canister-24E and multi-purpose canister-24EF, but it is not clear how these differences affect the criticality performance of the canister and how the calculation models have accounted for these differences. Such differences are not addressed in Table 6.3.3 or

Figure 6.3.1A of the HI-STORM 100 Safety Analysis Report.

- This information is necessary to determine compliance with 10 CFR §72.124(a), §72.124(b), §72.126(a), and §72.236(a).

8-2. Provide the configurations for the various missing fuel rod and collapsed fuel cases referenced in Section 6.4.4.2.2 of the HI-STORM 100 Safety Analysis Report that were used to model the "realistic" assembly configurations. This information may be supplied by illustrations or a more detailed description in the text. Provide enough detail so that independent calculations can be performed.

- This information is necessary to determine compliance with 10 CFR §72.124(a), §72.124(b), §72.126(a), and §72.236(a).

8-3. Provide a table of the results for all the criticality cases analyzed, as summarized in Table 6.4.9 of the HI-STORM 100 Safety Analysis Report. Clarify the fuel configurations assumed in the pressurized water reactor damaged fuel analysis, and explain how to compare these results to the data plotted in Figure 6.4.14 of the HI-STORM 100 Safety Analysis Report.

Table 6.4.9 only gives the maximum calculated value for a series of cases. The table should give the calculated value for each case along with a short description of the different configurations assumed in each case. For example, Section 6.4.4.2.2 of the HI-STORM 100 Safety Analysis Report states that lattice spacings from 8x8 to 27x27 (20 different lattices?) were analyzed but does not describe how half rods of the lattice were treated and how the lattice was centered or modeled off-center in the damaged fuel container. A maximum, typical, and minimum pellet diameter was analyzed for each lattice spacing, but individual results are not tabulated. In addition, figure 6.4.14 of the HI-STORM 100 Safety Analysis Report uses the parameter, fuel mass per unit length, but does not tie this to the lattice configuration for each data point.

- This information is necessary to determine compliance with 10 CFR §72.124(a), §72.124(b), §72.126(a), and §72.236(a).

8-4. Clarify the configuration assumed for the fuel debris analysis and how it differs from the damaged fuel model. Specify the number of fuel pellets that are assumed to change to powder. Indicate whether broken clumps or chunks of fuel (including shapes, sizes and spacing) were considered.

- This information is necessary to determine compliance with 10 CFR §72.124(a), §72.124(b), §72.126(a), and §72.236(a).

**Chapter 9. Confinement Evaluation**

The staff has not identified any additional information regarding the applicant's confinement evaluation.

**Chapter 10. Conduct of Operations Evaluation**

10-1. Provide a statement as to whether the Diablo Canyon ISFSI would contain any structures, systems, or components important to safety, for which functional adequacy or reliability have not been demonstrated. Provide a schedule showing how any safety questions for these items would be resolved prior to initial receipt of spent nuclear fuel or high-level waste.

- This information is needed to determine compliance with 10 CFR §72.24(i).

10-2. Provide a more complete description of the delegations of authority, required skills, and experience levels for the Diablo Canyon ISFSI management organization.

In particular, (i) define any responsibilities of the Director of Site Services relative to the Station Director; (ii) identify the responsibilities and reporting relationships of subordinates to the Director of Site Services; (iii) specify the qualifications and responsibilities for the ISFSI Specialists, Security Staff, the Director of Maintenance Services, the Manager of Radiation Protection, the Manager of Operations, the Manager of Chemistry and Environmental Operations, and any of their subordinates who may have responsibilities important to safety; (iv) identify whether persons other than the Station Director require designation of personnel to act in their absence; and (v) identify any positions having stop-work authority other than the Station Director. This information is required to allow the staff to determine that reporting relationships and assignments of responsibility are adequate to support safe operations at the Diablo Canyon ISFSI as specified in Section 10.4.1 of NUREG–1567.

- This information is needed to determine compliance with 10 CFR §72.28(c).

10-3. Provide an assessment that demonstrates that the proposed additional 11 staff members are sufficient to safely conduct the range of operations that might be required simultaneously at both the power plant and the ISFSI.

An assessment is needed as to whether the additional 11 staff members required for ISFSI operations (as discussed in Sections 9.1.2, 9.1.5, and 9.1.6.1 of the Diablo Canyon ISFSI Safety Analysis Report) will require that overall Diablo Canyon Power Plant staffing levels be increased. The Diablo Canyon ISFSI Safety Analysis Report should confirm that this additional staffing is sufficient for operating circumstances that could arise simultaneously at the power plant and the ISFSI.

- This information is needed to determine compliance with 10 CFR §72.40(a).

10-4. Provide supporting information for the determination that accidents and emergencies at the Diablo Canyon ISFSI can be adequately managed by personnel trained for power plant emergencies. A rationale is required for the fact that the minimum on-shift staffing requirements shown in Table 5.1 of the Emergency Plan do not require any additional personnel, nor personnel trained in ISFSI operations.

- This information is needed to determine compliance with 10 CFR §72.32(b) and §72.40(a).

10-5. Provide supporting information for the determination that no emergency equipment in addition to that provided for the Diablo Canyon Power Plant is required to support potential emergencies at the Diablo Canyon ISFSI.

Clarification is required for the allocation and location of any emergency equipment specifically for the Diablo Canyon ISFSI. The description of emergency facilities and equipment in Chapter 7 of the Diablo Canyon Power Plant Emergency Plan does not identify any such equipment that would be located within the ISFSI or that would be provided specifically for use by the ISFSI.

- This information is needed to determine compliance with 10 CFR §72.32(b) and §72.40(a).

10-6. Describe the mechanism in place for the case where accident conditions at the ISFSI continue to degrade to the point where the accident level should be escalated to a more severe emergency class.

The ISFSI emergency actions levels are at the Notification of Unusual Event (NOUE), with no apparent means for progression to the Alert level.

- This information is needed to ensure compliance with 10 CFR §72.32.

10-7. Describe the communication equipment available for staff to report emergencies from the ISFSI to the Control Room.

- This information is needed to ensure compliance with 10 CFR §72.32.

10-8. Describe how information about the ISFSI will be incorporated into the emergency plan training for staff and off-site responders, such as fire and police.

- This information is needed to ensure compliance with 10 CFR §72.32.

**Chapter 11. Radiation Protection Evaluation**

11-1. Provide a description of all nonfuel hardware at the plant which could be inserted into a fuel assembly prior to the assembly being loaded into a canister.

The SAR indicates that burnable poison rod assemblies and thimble plug devices are no longer in use in the core and therefore the inventory of these types of nonfuel hardware will not increase. Rod cluster control assemblies are still used. Other types of nonfuel hardware which are currently in inventory at the plant and could be placed in the canister need to be identified. (SAR Section 7.2.1.4, Nonfuel Hardware Source)

- This information is needed to determine compliance with 10 CFR §72.104.

11-2. Provide a summary of the sky-shine analyses prepared for the dose calculations. (SAR Section 7.3.2, Shielding)

- This information is needed to determine compliance with 10 CFR §72.104.

11-3. Provide a figure which identifies the location of the nearest resident.

The SAR indicates nearest resident is located 2,414 meters from the ISFSI but does not indicate which sector. (SAR Section 7.5, Offsite Collective Dose)

- This information is needed to determine compliance with 10 CFR §72.104 and 10 CFR Part 20.

11-4. Provide a summary description of the analyses performed to determine the dose to an individual at the DCPP site boundary.

- This information is needed to determine compliance with 10 CFR §72.104.

11-5. Provide an analysis which demonstrates compliance with the 40 CFR Part 190 dose rate limit of 25 mrem/year from all site sources.

- This information is needed to determine compliance with 10 CFR Part 20.

**Chapter 12. Quality Assurance Evaluation**

The staff has not identified any additional information regarding the applicant's Quality Assurance evaluation.

**Chapter 13. Decommissioning Evaluation**

The staff has not identified any additional information regarding the applicant's decommissioning evaluation.

**Chapter 14. Waste Confinement**

The staff has not identified any additional information needs regarding the applicant's waste confinement evaluation.

**Chapter 15. Accident Analysis**

15-1. Provide detailed information for the selection process and analysis used to eliminate a particular hazard from further consideration.

It is not clear how the potential off-normal and accident events have been selected for further consideration. This information is necessary to demonstrate that all appropriate potential hazards have been considered in the Diablo Canyon ISFSI Safety Analysis Report.

- The information is needed to determine compliance with 10 CFR §72.92(a), §72.92(b), §72.94(a), and §72.94(b).

15-2. Provide information on what safety features and/or administrative procedures would be used to avoid a potential collision between the cask transporter or other on-site vehicle and a storage cask, a transportation cask, the transfer facility, or the storage pad. In addition, describe any measures, such as safety features or administrative procedures relied on to mitigate the consequences from such hazards.

This information is necessary to determine whether collision of vehicles with important-to-safety structures is a credible hazard at the proposed facility.

- This information is needed to determine compliance with 10 CFR §72.122(b)(1), §72.122(e) and §72.122(g).

15-3. Provide an assessment of a cask drop of less than design-allowable height.

NUREG–1567, Subsection 15.5.1.1, Cask Drop Less than Design Allowable Height, indicates that drops of the casks at less than their allowable design heights during handling operations are hypothetical off-normal scenarios that the applicant must evaluate. An acceptable alternative to evaluating drops of the various fuel confinement components at less than design allowable heights is to demonstrate that their integrity and fuel spacing geometry will not be compromised when subjected to postulated drop and tipover accident scenarios. NRC considers the consequences of drops less than the allowable design heights to be bounded by these accident scenarios.

15-4. Provide an assessment of storage and transfer cask drops.

NUREG–1567, Subsection 15.5.2.2, Cask Drop, indicates that drops of the casks are hypothetical accident scenarios that must be evaluated by the applicant. Alternatively, provide justification for why such events are non-credible (see RAI # 4-2)

- This information is needed to determine compliance with 10 CFR §72.128(a).

15-5. Provide the technical bases for the proposed setback distances of transient sources of combustibles.

Site topography and potential thermal load must be considered in the development of these bases. Specifically address the 7,300 l [2,000 gal] tanker truck that will routinely pass near the ISFSI site on its way to the maintenance shop.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-6. Provide an analysis to justify the assertion that a potential fire in any existing stationary fuel tanks would not pose a hazard to the ISFSI facility. Provide additional information on the type(s) of fuel, capacity of the fuel tanks, construction of the tanks, and the safety features.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-7. Provide additional information to justify assumptions used in calculating the effects of wild fires in calculation HI–2012615, “Evaluation of Site-Specific Wild Fires for the Diablo

Canyon ISFSI," regarding the characteristics of the site-specific wild fires (e.g., flame height, flame front velocity, fireline intensity).

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-8. Provide analyses on explosion-generated missiles for Explosion Event Scenarios 1 through 3 to show that these missiles would not affect the ability of structures, systems, and components important to safety to perform their intended safety functions.

In the Diablo Canyon ISFSI Safety Analysis Report, the applicant cites existing information and analyses provided in Regulatory Guide 1.91 (NRC, 1978). The information and analyses in Regulatory Guide 1.91 are intended, however, for an overpressure that does not exceed 6.9 kPa [1.0 psi]. Regulatory Guide 1.91 clearly states that "If the overpressure criteria of this guide are exceeded, the effects of missiles must be considered." For Explosion Event Scenarios 1 through 3, as listed in Table 8.2-11 of the Diablo Canyon ISFSI Safety Analysis Report, the associated incident over-pressures are more than 6.9 kPa [1 psi]. Consequently, the effects of explosion-generated missiles due to Explosion Event Scenarios 1 through 3 must be analyzed.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-9. Provide the analysis that concluded that the risk of an explosion of the gasoline tanker truck, having a capacity of 7,300 l [2,000 gal] of fuel, will not affect the safety functions of the ISFSI and Cask Transfer Facility.

The applicant states in Section 8.2.6 of the Diablo Canyon ISFSI Safety Analysis Report that a probabilistic risk analysis, based on Regulatory Guide 1.91, was performed to show that the risk of this accident scenario is insignificant, but this analysis was not submitted for staff review.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-10. Provide an analysis to demonstrate that the probability and risk of an explosion in the transformers due to an electrical fault while the transfer cask is in the proximity will not impair the essential safety functions of the ISFSI or Cask Transfer Facility.

Section 8.2.6, Explosion, of the Diablo Canyon ISFSI Safety Analysis Report cites the risk acceptance criteria of Regulatory Guide 1.91 (NRC, 1978). This analysis was not submitted to the staff for review.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-11. Provide information and analysis to demonstrate that any explosion of the hydrogen bottles, shown in Figure 2.2-1 to be located close to the path of the transporter and the ISFSI pads, will not pose an undue hazard to structures, systems, and components important to safety at the proposed facility.

The Diablo Canyon ISFSI Safety Analysis Report did not provide the capacity of the hydrogen bottles or the maximum number of such bottles that can be stored at a given time. Additionally, no analysis has been provided.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-12. Provide the maximum amount of acetylene to be stored in one bottle. Describe the physical or administrative controls that would prevent more than one acetylene or propane bottle from being transferred in a single trip.

NUREG–1567 (Section 15.5.2.4) states that this information should be provided in the Safety Analysis Report.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-13. Provide an analysis to demonstrate that any explosion of the vapor cloud resulting from rupture of the propane and gasoline storage tanks, considering atmospheric dispersion, will not generate an air overpressure that may pose undue hazard to structures important to safety at the proposed facility.

Any atmospheric dispersion of the vapor cloud can bring the flammable mixture closer to the structures, systems, and components important to safety than the distances used in the analyses given in the Diablo Canyon ISFSI Safety Analysis Report and calculation HI–2002512. A delayed ignition of the vapor cloud may produce an unacceptable level of air overpressure near the structures important to safety.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-14. Provide information on how gasoline, diesel, propane, acetylene, and other combustible materials would be supplied to the facility.

If gasoline, diesel, and propane are replenished using tanker trucks, the size and number of the trucks that may be present at any time, and the location of the trucks with respect to structures, systems, and components important to safety should be provided. Analysis should also be presented to demonstrate that the tanker trucks would not pose any undue hazard to the facility. Similar information and analysis should be submitted for combustible and explosive materials supplied in bottles (e.g., acetylene, hydrogen).

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-15. Provide justification for the electrical resistivity values used to assess the consequences of lightning strike and 500-kV transmission line drop on the HI-STORM 100 storage cask and HI-TRAC transfer cask.

According to the American Society for Metals (1985), electrical resistivity for American Iron and Steel Institute-Society of Automotive Engineers (AISI–SAE) Grade 1042 carbon steel is 17.1 μΩ-cm at 20 °C (68 °F). AISI–SAE Grade 1042 carbon steel is relevant because it has a chemical composition that is similar to the outer shell material, SA 516 Grade 70. NUREG–1567 (Section 15.5.2.5) states that a discussion of the structural materials or components that might be damaged by heat or mechanical forces generated by passing electrical current to ground should be provided by the applicant.

- This information is needed to determine compliance with 10 CFR §72.122(b)(1) and §72.122(b)(2).

15-16. Provide an assessment of the potential consequences of a lightning strike or 500-kV transmission line drop on the site transporter while a cask is being transferred.

NUREG–1567 (Section 15.5.2.5) states that a discussion of the structural materials or components that might be damaged by heat or mechanical forces generated by passing electrical current to ground should be provided by the applicant.

- This information is needed to determine compliance with 10 CFR §72.122(b)(1) and §72.122(b)(2).

15-17. Provide an analysis of the potential lateral and axial sliding distances that the transporter may slide on the roadway during an earthquake.

In Section 8.2.1.2.1 of the Diablo Canyon ISFSI Safety Analysis Report, analysis is provided to demonstrate limited sliding of the transporter on those portions of the roadway underlain by bedrock. No such analysis is provided for vibratory ground motions on portions of the roadway underlain by soil and manmade fill (see RAI 2-19). The applicant should provide analyses demonstrating that the transporter will remain on the roadway, within a safe margin from the edge of the roadway, during the design basis ground motions.

- This information is needed to determine compliance with 10 CFR §72.92(a) and §72.122(b).

15-18. Provide a detailed basis for the bounding values of large, intermediate, and small tornado missiles (see RAI 4-3).

- This information is needed to determine compliance with 10 CFR §72.24 (c)(1), §72.24(c)(2), §72.92(a) §72.92(b), §72.92(c), and §72.122(b).

15-19. Provide analyses or technical bases to demonstrate that the bounding large missile,1,800 kg [4,000 lb], would not cause damage to the cask transfer facility that results in a drop of transfer cask from the top of overpack or damage to the overpack.

- This information is needed to determine compliance with 10 CFR §72.92(a) and §72.122(b).

15-20. Provide calculations to demonstrate that the transporter would not overturn while moving a loaded transfer cask to the Cask Transfer Facility and a loaded storage cask to the storage pads due to an impact by a design-basis tornado missile.

It is stated in Section 4.3.2.1.2, Design, that “the cask transporter is designed to withstand Diablo Canyon Power Plant design-basis tornado winds and tornado-generated missiles without overturning, dropping the load, or leaving the transporter route,” but the design analysis was not presented. Alternatively, the applicant may present an analysis demonstrating that there are no radiological consequences even if the transporter overturns.

- This information is needed to determine compliance with 10 CFR §72.122(c).

15-21. Provide a technical basis to support the statement in Section 8.2.2.2.2, Transfer Operations at the CTF, of the Diablo Canyon ISFSI Safety Analysis Report that "cask transport and transfer operations will not be conducted during severe weather. The top of the multiple-purpose canister will only be exposed for a short duration (nominally less than 4 hours). Therefore, in the configuration with the lid removed, a tornado missile impact is not credible."

This conclusion lacks a sufficient technical basis because an acceptable definition of credible was not provided. Alternatively, the applicant can provide information to demonstrate that the exposed multipurpose canister would be able to withstand impact of any tornado-generated missiles without loss of its safety functions. In addition, the applicant should define "severe weather."

- This information is needed to determine compliance with 10 CFR §72.92(a), §72.92(b), §72.92(b), and §72.122(b).

15-22. Provide the analyses that demonstrate collapse of the electrical transmission towers will not adversely affect the multipurpose canister while at the Cask Transfer Facility or the loaded overpacks stored on the pads.

NUREG–1567 (Section 15.4.3) states that the applicant must list and evaluate accidents that are specific to the design.

- This information is needed to determine compliance with 10 CFR §72.122.

15-23. Provide a fire analysis of a loaded overpack inside the Cask Transfer Facility.

This scenario may arise as the result of a fuel spill from the 7,300 l [2,000 gal] gasoline tanker truck that passes near the facility on a regular basis. NUREG–1567 (Section 15.4.3) states that the applicant must list and evaluate accidents that are specific to the design.

- This information is needed to determine compliance with 10 CFR §72.122.

**Chapter 16. Technical Specifications**

16-1 Provide Technical Specifications (TS) that follow the format and content of the HI-STORM 100 storage system.

The criticality aspects of the Diablo Canyon ISFSI Safety Analysis Report rely on the approved HI-STORM 100 storage system. The Diablo Canyon ISFSI Safety Analysis Report shows that the fuel to be loaded at Diablo Canyon falls within the bounds of fuel already approved for the HI-STORM 100 system. The staff's approval of the HI-STORM 100 application, as amended, was based, in part, on the TS also approved for that system. The applicant should use the previously approved documents (HI-STORM 100

Safety Analysis Report and accompanying Technical Specifications) as a basis in developing the Diablo Canyon ISFSI TS, with appropriate changes to reflect any limitations or site specific features (such as the applicable multipurpose canister and fuel types). Alternatively, the applicant must sufficiently describe and justify differences between the proposed TS for the Diablo Canyon ISFSI and those approved by the staff for the HI-STORM 100 system.

- This information is needed to determine compliance with 10 CFR §72.44(c).

16-2. Develop a maintenance program for the purpose of monitoring and verifying the preload of the HI-STORM 100SA overpack anchor studs. Specify the coating to be used on the exposed surfaces of the anchor studs and the embedment plate for corrosion protection. The program should also specify the time interval for periodic inspection of the anchor studs. This program should be included in the Technical Specifications.

Section 4.2.1.1.6 of the Diablo Canyon ISFSI Safety Analysis Report states that: "Each cask is compressed against the embedment plate using 16 studs. Each stud is preloaded to approximately 157,000 lbf." In addition, Section 8.2.1.2.3.1 of the Diablo Canyon ISFSI Safety Analysis Report states that: "The preloaded cask anchor studs are threaded into compression/coupling blocks to ensure a continuous compressive state of stress at the interface between the lower surface of the HI-STORM 100SA overpack and the top surface of embedment plate. The continued contact ensures development of interface friction forces sufficient to resist lateral movement of overpack base relative to the embedment plate. It also ensures that the ISFSI storage pad embedment structure provides the resisting moment to stabilize the system under seismic loading." To be certain that the anchorage system will maintain its safety functions during an earthquake, it is important that the anchor stud preload will not be reduced over the design life of the anchorage system.

- This information is needed to determine compliance with 10 CFR §72.24(a), §72.24(b), §72.24(c), §72.24(d), §72.24(n), and §72.44(c).

**Chapter 17. Environmental Review**

The following information is needed in order to for the staff to complete its review of PG&E's Environmental Report (ER) for the proposed action of constructing and operating an ISFSI at the Diablo Canyon site. The ER was submitted in accordance with the requirements of 10 CFR §51.61and 10 CFR §72.34. (Chapters and sections identified in these comments refer to the applicant's ER.)

17-1 Provide a concise description identifying the purpose of the proposed action.

Chapter 1, Proposed Activities, provides the facility background, need for the proposed action, and schedule but does not include a written statement identifying the purpose of the proposed action.

10 CFR §51.45(b) states that the applicant's environmental report shall contain a description of the proposed action and a statement of its purposes.

- This information is needed to determine compliance with 10 CFR §51.45(b).

17-2 Provide wind roses which show the average meteorology for the site. Provide information to show any seasonal variation in wind speed and direction.

Section 2.4.2, Local Meteorology, does not provide this information. Wind speed and direction are necessary to determine the radiological impact from the proposed action.

- This information is needed to determine compliance with 10 CFR §51.45(b)(1).

17-3 Provide a description of the calculations or provide the calculation packages for determining atmospheric dispersion factors for normal and accident conditions. This information is necessary to determine the radiological impact from the proposed action. (Section 2.4.4 Diffusion Estimates)

- This information is needed to determine compliance with 10 CFR §51.45(b)(1).

17-4 Describe how this area is of great spiritual importance to a local Native American and assess how the ISFSI may impact that spiritual importance. (Section 2.9.6, Native American Consultation)

This information is needed to determine if the proposed action may cause indirect cultural or historical impacts to the area.

- This information is needed to determine compliance with 10 CFR §51.45(c).

17-5 Provide a summary of the response from the Tribal Elders of the Santa Ynez band of Chumash to the letter dated August 7, 2000, sent by PG&E. (Section 2.9.6, Native American Consultation)

This information is needed to determine if the proposed action may cause indirect cultural or historical impacts to the area.

- This information is needed to determine compliance with 10 CFR §51.45(c).

17-6 Provide a description of the environmental impacts expected from the alternative actions which were considered. (Chapter 8, Siting and Design Alternatives)

The regulations in 10 CFR Part 51 require the environmental impact from both the proposed action and the alternatives be described.

- This information is needed to determine compliance with 10 CFR §51.45(b)(3).

17-7 Identify all permits and approvals needed from the State of California, and also from local and county officials, and the dates they were, or will be, received. Provide the names and telephone numbers of the local, county, and State of California officials responsible for issuing the necessary permits for the ISFSI. (Chapter 9, Environmental Approvals and Consultation)

- This information is needed to determine compliance with 10 CFR §51.45(d).

**Chapter 18. Materials**

18-1. Describe the considerations and criteria that are or will be used at Diablo Canyon to classify fuel as either intact or damaged for storage in the proposed ISFSI. Provide information on any tests or inspections conducted to determine the fuel condition.

- The information is needed to determine compliance with 10 CFR §72.124(a), 10 CFR §72.124(b), and 10 CFR §72.236(m).

18-2. Provide the following information for the storage of damaged fuel:

(a) Whether any of the fuel assembly structure is mechanically damaged or has geometrical changes to the assembly structure such that the assembly cannot be handled using normal (i.e., crane and grapple) handling methods.

(b) Whether the fuel assemblies have missing or displaced structural components such as grid spacers, and

(c) Whether any of the fuel is no longer in the form of a fuel bundle and consists of debris, loose fuel pellets, or rod segments.

Subcriticality and adequate confinement of the spent fuel must be maintained under all conditions of storage and transportation. In addition, the spent fuel must be readily retrieved from the storage systems and the design of spent fuel storage casks should consider ultimate disposition by the Department of Energy.

- The information is needed to determine compliance with 10 CFR §72.124(a), 10 CFR §72.124(b), and 10 CFR §72.236(m).

18-3. Provide information for fuel retrievability under normal, off-normal and accident conditions.

- The information is needed to determine compliance with 10 CFR 72.122(l) and 10 CFR 72.236(m).

18-4. Provide an analysis of the potential for fuel reconfiguration during storage operations for ZIRLO and Zircaloy-4 (See ISG-11, Revision 2). This analysis should include low burnup fuel and high burnup fuel.

The analyses should discuss cladding temperatures for normal, off-normal, repeated thermal cycling, and accidents. Additionally, the applicant should indicate the oxide thickness and methodology used to determine the thickness. Proposed TS 5.1.3.i. should be revised, as appropriate.

- This information is needed to determine compliance with 10 CFR §72.122(h)(1).

18-5. Provide a table that clearly indicates the burnups, cooling times, exact quantity of different rods, and temperatures (normal, off-normal, and accident) for all fuel types (i.e., Zirlo, Zircaloy-4, etc.) to be stored at the Diablo Canyon ISFSI.

The application contains conflicting and confusing information concerning temperature limits and which fuel types are high burnup.

- The information is needed to determine compliance with 10 CFR §72.122(h)(1).

18-6. Provide the Diablo Canyon ISFSI Safety Analysis Report sections that identify the allowable cladding types and temperature limits and the helium backfill gas parameters.

Revise Table 3.4-2, to adopt Appendix 4A to incorporate the temperature limits for high burnup fuel. Appendix A of the Diablo Canyon ISFSI Safety Analysis Report indicates that Sections 4.2.6.1 and 4.2.6.2 of the Diablo Canyon ISFSI Safety Analysis Report contain the required information. However, the version of the Diablo Canyon ISFSI Safety Analysis Report submitted to NRC does not include these two sections. The concern is that cladding types, temperature limits, and helium backfill parameters could affect the integrity of the spent nuclear fuel cladding.

- The information is needed to determine compliance with 10 CFR §72.122(h)(1).

18-7. Revise Diablo Canyon ISFSI Safety Analysis Report Section 10.2.4.1, to adopt the corrosion allowance tables that provide an alternate criterion in lieu of the guidance in NRC ISG-15 for high burnup Zircaloy-4 fuel cladding. The values are given in Table 4.A.4 and 4.A.5 of Appendix 4.A of the Holtec Safety Analyses Report, amendment 1.

- The information is needed to determine compliance with 10 CFR §72.122(h)(1).

18-8. Provide information on any alternatives to American Society of Mechanical Engineers Boiler and Pressure Vessel Code and clearly specify which alternatives have not been approved by the NRC.

It is recognized by the staff that not all of the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code may be practical at the Diablo Canyon ISFSI. Alternatives to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code must, however, be evaluated and approved by staff.

- This information is needed to determine compliance with 10 CFR §72.122(a), §72.122(b), and §72.122(c).

18-9. Provide current manufacturer data sheet(s) for all of the coating(s) to be applied to all safety significant carbon steel components of the transfer and storage casks.

It is unclear if the approved Carboline 890 or Thermaline 450, as listed on Page 3-4 of the Holtec Safety Evaluation Report, will be used on the transfer cask. Provide documentation that the selected coating will perform as required considering expected neutron and gamma radiation and specific conditions expected during immersion in borated water. Provide temperatures for the inner and outer surfaces of the overpack

that are coated and verify that these temperatures do not exceed the maximum continuous or noncontinuous recommended temperature for the coating. Provide information that indicates the coatings used on the storage casks can be repaired. Section 4.4.3 of the Diablo Canyon ISFSI Safety Analysis Report indicates that storage cask repair and maintenance may require reapplication of corrosion inhibiting materials on accessible external surfaces. According to Carboline data (1996, 2002), the maximum surface temperature for application is 51.7 °C [125 °F]. Damage to the overpack coating may not be properly repaired if the surface temperature of the overpack exceeds the maximum temperature for the proper application of the coating.

- This information is needed to determine compliance with 10 CFR §72.122(a), §72.122(b), §72.122(c), and §72.236(g).

18-10. Provide documentation that the operating procedures for cask loading and unloading include provisions for detecting the presence of hydrogen and preventing the ignition of combustible gases. Buildup of hydrogen, which may evolve as a result of corrosion reactions in borated water, may create a fire hazard.

- This information is needed to determine compliance with 10 CFR §72.24(c)(3).

18-11. Provide the following information on the fabrication of the transfer and storage casks:

(a) Specifications for weld filler materials for the multiple-purpose canisters the HI-TRAC transfer casks, and the storage overpacks including associated American Welding Society classification.

(b) The preheat and post weld heat treatment temperatures for the storage overpacks and the HI-TRAC transfer casks.

(c) Holtec's position paper DS 213 cited in HI-STORM Final Safety Analysis Report Chapter 9 and any additional information used to assess the critical flaw size in accordance with the American Society of Mechanical Engineers Section XI methodology.

- This information is needed to determine compliance with 10 CFR §72.122(a).

18-12. Provide the penetrant testing requirements for the multi-purpose canister closure weld.

Different penetrant testing requirements are identified in Diablo Canyon ISFSI Safety Analysis Report Section 4.4.1.2.3 and the HI-STORM Final Safety Analysis Report Drawing 1393 Sheet 1. The Diablo Canyon ISFSI Safety Analysis Report Section 4.4.1.2.3 indicates penetrant testing of the multiple-purpose canister closure weld, if used instead of ultrasonic testing, will be performed on the root pass, at ½ the weld thickness and on the final pass. However, the HI-STORM Final Analysis Report Drawing 1393 sheet 1 indicates penetrant testing will be performed after the root pass, after the final pass and twice after intermediate passes.

- This information is needed to determine compliance with 10 CFR §72.24(c)(3) and §72.122(a).

18-13. Provide the coefficient of thermal expansion for bolting materials used on the HI-STORM storage overpacks and the HI-TRAC transfer casks as well as the thermal expansion coefficients for the storage overpack and transfer cask materials of construction over the entire range of temperatures expected during normal, off-normal, and accident conditions.

Differences between the thermal expansion coefficients of the bolting materials and the overpack and transfer cask materials may lead to either higher than anticipated bolt stresses or reduced mechanical integrity of the transfer cask and overpack closures.

- This information is needed to determine compliance with 10 CFR §72.122(a), §72.122(b), and §72.122(c).

18-14. Provide specifications of the materials to be used for the seismic anchor. In particular, the applicant should address the following:

(a) Compatibility of materials and coatings to be used with the Diablo Canyon ISFSI environment

(b) Tables with material properties and allowable stresses and strains associated with temperature, as appropriate

(c) Appropriate corrosion allowances used in the structural analyses.

- This information is needed to determine compliance with 10 CFR §72.122(a), and §72.122(b).

18-15. Provide a revised Materials evaluation, to evaluate the potential reaction between the aluminum heat conduction elements, Boral, stainless steel in the MPC and the spent fuel pool water with respect to its impact on the safe operation and performance of the cask under normal, off-normal, and accident conditions. Also, revise the operating procedures to include appropriate controls for detecting the presence of hydrogen and preventing the ignition of combustible gases during cask loading and unloading.

The evaluation should consider: (1) water temperature change during loading and unloading, (2) the generation of reactive gases due to irradiation, (3) the generation of gases due to the aluminum and the stainless steel basket, and (4) the welding of the MPC lid, including pre- and post- weld heat treatments. Reaction of the heat conduction elements with the spent fuel pool water and/or steel components may produce hydrogen in concentrations close to the lower explosive limit of hydrogen.

- This information is needed to determine compliance with 10 CFR §72.122(b).

18-16. Demonstrate that the coatings to be used on all carbon steel components of the transfer and storage casks are non-reactive with the spent fuel pool water and that they will remain adherent when exposed to the various environments of the Diablo Canyon ISFSI.

The most prevalent environments include: immersion in spent fuel pool water during

loading and unloading operations and the relatively high temperature (elevated temperatures cause degradation in normal coatings), high radiation (including neutrons), and dry inert gas environment encountered during storage, the potential for mechanical damage through abrasion or erosion, and environment exposure duration.

In accordance with 10 CFR §72.122 (c), non-combustible and heat resistant materials must be used whenever practical, and in accordance with §72.122 (h)(1), the spent fuel cladding must be protected from degradation that leads to gross ruptures. The concern is that any degradation of coating material, including gases or particulates that originate from a deteriorating coating, could affect the integrity of the cladding. Further, in accordance with §72.236 (h), the cask, and cask components, must be compatible with wet or dry spent fuel loading and unloading facilities. Thus, the coatings must remain intact and adherent to perform their intended functions during all loading and unloading operations.

- This information is needed to determine compliance with 10 CFR §72.122(b), §72.122(c), and §72.122(h)(1).

18-17. Revise the Diablo Canyon ISFSI SAR to include section 3.4.1 from the Holtec SAR on Chemical and Galvanic Reactions.

The reference tables evaluating each component (i.e., stainless steel, concrete, neutron absorber, coatings, shielding material, etc.) should also be included in the Diablo Canyon ISFSI SAR.

**Chapter 19. Editorial Comments**

The following revisions to the Diablo Canyon ISFSI SAR are requested to demonstrate compliance with 10 CFR §72.11.

19-1. Provide a complete PGE-009-CALC-001 package. Pages 4 and 12 are missing from the PGE-009-CALC-001 package.

19-2. Revise Drawing No. 3769, Figure 4.2-6, Section A-A. The current version of that figure shows an anchor system differing from the Diablo Canyon ISFSI Safety Analysis Report description and design (e.g., no compression coupling block).

19-3. Correct page 10.2-1 of the Diablo Canyon ISFSI Safety Analysis Report. The eleventh bullet states “SFSC time limitation while seated in the **cast** transfer facility (CTF).” Please change it to read “SFSC time limitation while seated in the **cask** transfer facility (CTF).”

19-4. Correct the title of the second column of Table 10.2-7 in the Diablo Canyon ISFSI Safety Analysis Report. The column title should read “Assembly Decay Heat” instead of “Assembly Burnup”.

19-5. Provide a reference in the Diablo Canyon ISFSI Safety Analysis Report to the design details and analysis of the storage-pads that are contained in Pacific Gas and Electric

Company Calculation Nos. 52.27.100.704 “Non-Linear Seismic Sliding Analysis of the ISFSI Pad,” 52.27.100.705 “Embedment Support Structure,” and 52.27.100.707 “ISFSI Cask Storage Pad Seismic Analysis.”

19-6. Provide a reference in the Diablo Canyon ISFSI Safety Analysis Report to the design and design analysis of the Cask Transfer Facility that is contained in Pacific Gas and Electric Company Calculation Nos. 52.27.100.708 “Cask Transfer Facility (Reinforced Concrete),” and OQE-10 “Structural Evaluation of Diablo Canyon Cask Transfer Facility.”

19-7. Provide a reference in the Diablo Canyon ISFSI Safety Analysis Report to the design and design analysis, showing that the cask transporter will not fail by tornado or tornado missile impact, that is contained in Pacific Gas and Electric Company Calculation Nos. 52.27.100.703 “Design Basis Wind and Tornado Evaluation for DCPP,” and OQE–9 “Transporter Stability on Diablo Canyon Dry Storage Travel Paths.”

**REFERENCES**

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NRC. *Standard Review Plan for Dry Cask Storage Systems*. Final Report. NUREG–1536. Washington, DC: NRC, 1997.

NRC. *Standard Review Plan for Spent Fuel Dry Storage Facilities*. Final Report. NUREG–1567. Washington, DC: NRC, 2000.