3 OPERATION SYSTEMS

3.1 Conduct of Review

The objective of the operation systems review was to evaluate the description presented in the Diablo Canyon ISFSI Safety Analysis Report (SAR) (Pacific Gas and Electric Company, 2002) of all operations, including systems, equipment, and instrumentation and to determine if they fulfill the U.S. Nuclear Regulatory Commission (NRC) regulatory requirements for clarity and completeness. Particular emphasis was placed on how operation systems relate to handling and storage of spent nuclear fuel, confinement of nuclear material, and management of expected and potential radiological dose. The review of the operation systems included selected sections of Chapter 3, "Principal Design Criteria," Chapter 4, "ISFSI Design," Chapter 5, "ISFSI Operations," and Chapter 8, "Accident Analysis" of the SAR, and documents cited in the SAR. This review did not include spent fuel cask lifting and movement within the DCPP Fuel Handling Building and Auxiliary Building (FHB/AB); those operations were addressed in license amendments issued on September 26, 2003, for DCPP Units 1 and 2.

3.1.1 Operation Description

The description of the operation systems was reviewed for conformance with the following regulations:

- 10 CFR §72.24(b) requires a description and discussion of the ISFSI structures with special attention to design and operating characteristics, and principal safety considerations.
- 10 CFR §72.40(a)(5) requires that the proposed operating procedures are adequate to protect health and to minimize danger to life or property.
- 10 CFR §72.40(a)(13) require that the proposed activities can be conducted without endangering the health and safety of the public.
- 10 CFR §72.104(b) and (c) require operational restrictions and limits to be established to meet as low as reasonably achievable objectives for radioactive materials in effluent and direct radiation levels associated with ISFSI operations.
- 10 CFR §72.122(f) requires that systems and components must be designed to permit inspection, maintenance and testing.
- 10 CFR §72.122(i) requires that instrumentation systems for dry storage casks be provided in accordance with cask design requirements to monitor conditions that are classified as important to safety over anticipated ranges for normal conditions and off-normal conditions.
- 10 CFR §72.126(b) requires that radiological alarm systems be provided in accessible work area as appropriate to warn operating personnel of radiation and airborne radioactive material concentrations above a given set point.

- 10 CFR §72.126(c) requires means for measuring the amount of radionuclides in effluents during normal operations and under accident conditions and means to measure direct radiation levels in and around the area.

- 10 CFR §72.128(a)(1) requires that the spent fuel waste storage systems be designed with capability to test and monitor components important to safety.

In SAR Section 3.1.2, the applicant describes the general operating functions to be performed in preparing and storing spent nuclear fuel in the HI-STORM 100 System to be used at the Diablo Canyon ISFSI. Additional details are provided in SAR Chapters 3, 4, 5, and 8.

The operations to be performed at the ISFSI in accordance with 10 CFR Part 72 include the receipt and inspection of incoming empty storage casks. The HI-STORM 100 System storage casks and multipurpose canisters (MPCs) will arrive at the DCPP site and will be visually inspected. Personnel will then transfer each empty storage cask to the Cask Transfer Facility (CTF). An empty MPC will be transferred to the DCPP fuel handling building (FHB/AB) for spent fuel loading operations. The empty MPC will be inserted into the HI-TRAC 125 Transfer Cask, and the entire assembly will be lowered into the spent fuel pool, where the MPC will be loaded with spent nuclear fuel. The underwater MPC loading activities will use a combination of fixtures and equipment designed by the cask system vendor and equipment specifically designed for the DCPP. After the spent fuel is loaded, the MPC and transfer cask assembly will be placed in the cask wash-down area in the FHB/AB, where the MPC closure welding and draining, drying, and helium backfilling operations will be performed. The MPC and transfer cask will then be placed inside the cask transport frame, rotated to a horizontal position, removed from the FHB/AB, then picked up by the cask transporter. Subsequent operations include the transport of the MPC in the HI-TRAC 125 Transfer Cask to the CTF, transfer of the MPC containing the spent nuclear fuel from the transfer cask to the storage cask, placement of the loaded storage casks on the storage pads, surveillance and maintenance of the storage casks and pads, performance of the health physics activities consistent with as low as reasonably achievable (ALARA) requirements, and inventory documentation management. Ultimately, the spent fuel will be removed from the ISFSI, and the facility will be decommissioned.

The SAR describes in detail the activities that will be performed to ensure that the stored casks do not endanger public health and safety. In summary, these activities include the following actions. After the storage casks are placed on the storage pad, the ISFSI Technical Specifications require that the casks be inspected periodically to ensure that the air vents are not blocked. Security personnel control access to the storage area and identify and assess off-normal and emergency events. Health physics personnel perform dose rate and contamination surveys to ensure that the appropriate regulatory limits are maintained. Maintenance personnel maintain the facilities including the storage casks, emergency equipment, and transport systems.

The staff reviewed the operating functions described in SAR Chapters 3, 4, 5, and 8 to ensure that the applicant adequately described the appropriate procedures, equipment, and personnel requirements. The SAR identifies the specific equipment and the personnel to accomplish the transfer, storage, and retrieval of the casks in compliance with 10 CFR §72.24(b). The staff determined that the detailed procedure descriptions for operating, inspecting, and testing are consistent with the operation systems in compliance with 10 CFR §72.122(f).

The staff found the general description of the proposed ISFSI operations to be acceptable. Diablo Canyon ISFSI operations can be conducted without endangering the health and safety of the public and are, therefore, in compliance with 10 CFR §72.40(a)(5) and 10 CFR §72.40(a)(13). Additionally, the SAR provides acceptable descriptions and discussions of the projected operating characteristics and safety considerations as required by 10 CFR §72.24(b). The staff found that the design and procedures provide acceptable capability to test and monitor components important to safety, in compliance with 10 CFR §72.128(a)(1).

The applicant's ALARA considerations are reviewed in Chapter 11 of this SER. Based on this review, staff found that the design and operations consider ALARA, as required by 10 CFR §72.104(b) and §72.104(c). Direct radiation monitoring is also considered in the design, in compliance with the requirements of 10 CFR §72.126(b) and §72.126(c).

3.1.2 Spent Nuclear Fuel Handling Systems

The description of the spent nuclear fuel handling systems was reviewed for conformance with the following regulations:

- 10 CFR §72.24(b) requires a description and discussion of the ISFSI structures with special attention to design and operating characteristics, and principal safety considerations.

- 10 CFR §72.104(b) and (c) require operational restrictions and limits to be established to meet as low as reasonably achievable objectives for radioactive materials in effluent and direct radiation levels associated with ISFSI operations.

- 10 CFR §72.128(a) requires that the spent fuel waste storage and handling systems must be designed with: a capability to test and monitor components important to safety, suitable shielding under normal and accident conditions, confinement structures and systems, and heat removal capability.

Handling of the HI-STORM 100 System, including the MPC, is described in detail in the HI-STORM 100 System Final Safety Analysis Report (FSAR) (Holtec International, 2000), which the staff has previously reviewed and found acceptable (U.S. Nuclear Regulatory Commission, 2002a,b). Handling operations at the Diablo Canyon ISFSI will be consistent with the handling operations described in the HI-STORM 100 System FSAR.

3.1.3 Other Operating Systems

The description of the other operating systems was reviewed for conformance with the following regulations:

- 10 CFR §72.104(b) and (c) require operational restrictions and limits to be established to meet as low as reasonably achievable objectives for radioactive materials in effluent and direct radiation levels associated with ISFSI operations.

- 10 CFR §72.122(k)(2) requires that emergency utility services be designed to permit testing of each system for the transfer between the normal and emergency power supply and to permit the operation of associated safety systems.

- 10 CFR §72.122(k)(3) requires that proposed design of the ISFSI include provisions so that emergency power is provided to maintain safe storage condition and permit continued functioning of all systems essential to safe storage.

- 10 CFR §72.126(b) requires that radiological alarm systems be provided in accessible work area as appropriate to warn operating personnel of radiation and airborne radioactive material concentrations above a given set point.

- 10 CFR §72.126(c) requires means for measuring the amount of radionuclides in effluents during normal operations and under accident conditions and means to measure direct radiation levels in and around the area.

In the SAR, the applicant discusses the structures, systems, and components (SSCs) (i.e., security systems, cask transporter, fire protection systems, and radiation monitoring systems) classified as not important to safety, but having security or operational importance. The SAR states that the designs of the SSCs classified as not important to safety comply with applicable codes and standards. Further, the SAR states that the SSCs classified as not important to safety will be compatible with SSCs classified as important to safety and be designed to a level of quality to ensure that they will mitigate the effects of off-normal or accident-level events, as required.

The staff reviewed the description of the other operating systems described in the SAR. The applicant's ALARA considerations are reviewed in Chapter 11 of this SER. Based on this review, the staff found that the design and operations consider ALARA as required by 10 CFR §72.104(b). Radiological alarm systems and direct radiation monitoring are considered in the design, in compliance with the requirements of 10 CFR §72.126(b) and §72.126(c).

The proposed design of the ISFSI does not require utility systems during spent nuclear fuel storage. Therefore, the emergency utility services addressed by 10 CFR §72.122(k)(2) are not needed and the requirement is not applicable. The proposed design of the ISFSI does not include systems and subsystems that require continuous electric power to permit continued functioning. Because the design of the ISFSI does not require emergency power, 10 CFR §72.122(k)(3) is also not applicable.

3.1.4 Operation Support Systems

The descriptions of the operation support systems were reviewed for conformance with the following regulations:

- 10 CFR §72.122(i) requires that instrumentation systems for dry storage casks must be provided in accordance with cask design requirements to monitor

conditions that are classified as important to safety over anticipated ranges for normal conditions and off-normal conditions.

- 10 CFR §72.122(k)(1) requires that each utility service system be designed to meet emergency conditions and include redundant systems to maintain the ability to perform safety functions assuming a single failure.

- 10 CFR §72.122(k)(3) requires that the proposed design of the ISFSI include provisions so that emergency power is provided to maintain safe storage conditions and permit continued functioning of all systems essential to safe storage.

The operation of the ISFSI is passive and self-contained. The storage casks do not require any instrumentation or control systems to ensure safe operation when they are placed into storage.

During operation of the ISFSI, however, the storage casks will be inspected periodically. These inspections will provide a means to assess the performance of the storage casks. The proposed design of the ISFSI does not require utility systems during spent nuclear fuel storage. As stated previously, the proposed design of the ISFSI does not include systems and subsystems that require continuous electric power to permit continued functioning, and the design of the ISFSI does not require emergency power.

The staff reviewed the proposed operation support systems described in the SAR. In addition, the staff evaluated the appropriate sections in the SAR that identify the SSCs important to safety. The staff agrees that instrumentation systems to be used to periodically monitor the Diablo Canyon ISFSI are appropriately classified as not important to safety; therefore, 10 CFR §72.122(i) is not applicable. The staff found that the proposed self-contained, passive storage facility requires no permanently installed auxiliary systems. All auxiliary systems required to support loading and off-loading of the system, periodic monitoring, and maintenance are designed to be portable systems. The systems are not important to safety, and therefore 10 CFR §72.122(k)(1) is not applicable. Additionally, as stated previously, the requirements of 10 CFR §72.122(k)(3) are not applicable because the design of the Diablo Canyon ISFSI does not require electrical power for systems essential to safe storage.

3.1.5 Control Room and Control Area

The descriptions of the control room and control area were reviewed for conformance with the following regulation:

- 10 CFR §72.122(j) requires that, if appropriate, a control room or control area must be designed to permit occupancy and actions to be taken to monitor the ISFSI under normal conditions and provide safe control under off-normal and accident conditions.

The storage casks are passive storage systems. A control room and control area are not necessary to maintain the conditions required for safe operation of the ISFSI, store spent nuclear fuel safely, prevent damage to the spent nuclear fuel during handling and storage, or

provide reasonable assurance that the spent nuclear fuel can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public.

The staff reviewed the applicant's discussion in the SAR regarding control room and control areas. In addition, the staff has evaluated the sections pertaining to monitoring instruments, limits, and controls of the proposed cask systems in the SAR. The staff found that a control room and control area are not necessary. The ISFSI is a self-contained, passive storage facility that requires no permanent control room or control area to ensure safe operation; therefore, the requirements of 10 CFR §72.122(j) are not applicable.

3.1.6 Analytical Sampling

The description of the operating system was reviewed for conformance with the following regulations:

- 10 CFR §72.24(b) requires a description and discussion of the ISFSI structures with special attention to design and operating characteristics, and principal safety considerations.

As discussed in the SAR, no analytical sampling is required. The HI-STORM 100 System design will preclude release of effluents for normal, off-normal, and accident conditions during storage.

3.1.7 Pool and Pool Facility Systems

The pool and pool facility systems were reviewed for conformance with the following regulations:

- 10 CFR §72.24(b) requires a description and discussion of the ISFSI structures with special attention to design and operating characteristics, and principal safety considerations.

The Diablo Canyon ISFSI utilizes dry cask storage technology, which houses spent nuclear fuel inside sealed, inerted canisters rather than in a spent nuclear fuel pool. Therefore, neither the use of a pool nor any system supporting a pool is incorporated into the Diablo Canyon ISFSI as covered by the 10 CFR Part 72 SAR. Note that the spent nuclear fuel is transferred from the DCPP spent fuel pools into the storage canisters within the confines of the DCPP. Certain activities associated with this operation are controlled under the 10 CFR Part 50 license, while other specific cask loading and preparation activities will be governed by the requirements of the 10 CFR Part 72 license.

3.2 Evaluation Findings

The staff found that the descriptions of the proposed operating procedures and systems for the Diablo Canyon ISFSI are acceptable. Diablo Canyon ISFSI operations meet the regulatory requirements and can be conducted without endangering the health and safety of the public.

3.3 References

Holtec International. *Final Safety Analysis Report for the Holtec International Storage and Transfer Operation Reinforced Module Cask System (HI-STORM 100 Cask System)*. Vols I and II. HI–2002444. Docket No. 72-1014. Marlton, NJ: Holtec International. 2000.

Pacific Gas and Electric Company. *Diablo Canyon ISFSI Safety Analysis Report*. Amendment 1. Docket No. 72-26. Avila Beach, CA: Pacific Gas and Electric Company. October 2002.

U.S. Nuclear Regulatory Commission. *10 CFR Part 72 Certificate of Compliance No. 1014, Amendment 1, for the HI-STORM 100 Cask System*. Docket No. 72-1014. Washington, DC: U.S. Nuclear Regulatory Commission. July 15, 2002a.

U.S. Nuclear Regulatory Commission. *Holtec International HI-STORM 100 Cask System Safety Evaluation Report*. Amendment 1. Docket No. 72-1014. Washington, DC: U.S. Nuclear Regulatory Commission. 2002b.