1 GENERAL DESCRIPTION

1.1 Conduct of Review

By letter dated December 15, 2003, 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 Humboldt Bay Power Plant (HBPP) site. The Safety Analysis Report (SAR) is included in the license application (Pacific Gas and Electric Company, 2004). Chapter 1 of the SAR explains the need for the Humboldt Bay ISFSI and provides a general description of the site, the major components and operations of the ISFSI, and the co-located HBPP. The objective of this chapter of the Safety Evaluation Report (SER) is to familiarize the reader with the pertinent features of the ISFSI. The NRC staff's review of the SAR was conducted in accordance with the guidance in NUREG-1567 (U.S. Nuclear Regulatory Commission, 2000).

1.1.1 Introduction to the Humboldt Bay Independent Spent Fuel Storage Installation

The proposed Humboldt Bay ISFSI will use spent nuclear fuel (SNF) dry cask storage technology. In accordance with 10 CFR §72.42, the initial term for an ISFSI license is 20 years. Before the end of this license term, an applicant may submit an application to renew the license. Prior to expiration of the 10 CFR Part 72 license, all SNF will be transferred from the ISFSI, and the ISFSI will be ready for decommissioning.

The Humboldt Bay ISFSI will be co-located with the HBPP on PG&E-owned property, which is located on the northern California coast approximately 5 km [3 mi] south of Eureka, California. The HBPP consists of five generating units. Unit 3, a boiling water reactor, operated for approximately 13 years before being shut down in July 1976. The reactor has remained inactive since that time. The fuel is currently stored in the spent fuel pool (SFP) in Unit 3. Units 1 and 2 are co-located, conventional 53 megawatt-electric (MWe) units capable of operating on fuel oil or natural gas. Two 15 MWe gas turbines in the vicinity of Units 1, 2 and 3 provide additional generating capacity.

HBPP Unit 3 received a construction permit on October 17, 1960. Provisional Operating License DPR-7 was issued in August 1962, and commercial operation began in August 1963. On May 17, 1976, NRC issued an order that required the satisfactory completion of a specified seismic design upgrade program and resolution of specified geologic and seismic concerns prior to power operation following the 1976 shutdown. In 1983, PG&E concluded that the seismic modifications and other modifications required (in response to the Three Mile Island accident in 1979) were not economical and opted to decommission the plant. In 1988, NRC approved the SAFSTOR decommissioning plan for Unit 3 and revised the operating license to a possession-only license that expires on November 9, 2015.

The SNF currently stored at HBPP will need to remain at the HBPP site until a U.S. Department of Energy or other facility is available for further interim storage or permanent disposal. The Humboldt Bay ISFSI will facilitate dismantling the existing Unit 3 structures by allowing the SNF to be transferred out of the SFP, thereby providing for earlier termination of the 10 CFR Part 50 license.

The Humboldt Bay ISFSI is designed to store up to 400 SNF assemblies in five casks, with a sixth cask to store Greater than Class C (GTCC) waste. The maximum average fuel burn-up per assembly of any fuel that will be stored at the ISFSI is less than 23,000 MWd/MTU. The maximum average initial fuel assembly enrichment is equal to or less than 2.51 percent.

The Humboldt Bay ISFSI consists of a storage vault, onsite cask transporter, and the dry cask storage system. PG&E will use the Holtec International HI-STAR 100 dry cask system, as modified for the HBPP SNF. The physical characteristics of the SNF assemblies and GTCC waste to be stored are described in Section 3.1 of the SAR. The Humboldt Bay-specific design is referred to as the HI-STAR HB dry cask storage system. The HI-STAR HB system incorporates a cask design that is suitable for both storage and transportation; however, the scope of this licensing action is limited to onsite SNF storage under 10 CFR Part 72. The HI-STAR HB cask provides structural protection and radiation shielding for the multi-purpose canister (MPC-HB) containing the SNF. The onsite handling of the HI-STAR HB cask will be accomplished using a tracked transporter. PG&E will use the transporter developed for the Diablo Canyon ISFSI.

The modified HI-STAR HB system design and associated analyses were performed in accordance with the analyses methodologies previously licensed by NRC for the HI-STAR 100 system (U.S. Nuclear Regulatory Commission, 2001), as appropriate. The Holtec HI-STAR 100 Final Safety Analysis Report (FSAR) (Holtec International, 2002) provides descriptions of the generic HI-STAR analyses and supplemental analyses for certain site-specific issues that are applicable to the Humboldt Bay ISFSI site and the HI-STAR HB system.

As discussed in Section 9.4.2 of the SAR, the applicant is requesting an exemption from 10 CFR §72.72(d), which requires that SNF and high-level waste records in storage be kept in duplicate at a separate, sufficiently remote location from the original records to ensure that a single event will not destroy both sets of records. Pursuant to 10 CFR §72.140(d), the applicant will use an NRC-approved Quality Assurance (QA) program that satisfies the criteria of 10 CFR Part 50, Appendix B, to implement the QA requirements for the ISFSI. An exemption from the record storage requirements of 10 CFR §72.72(d) will allow records of SNF storage to be maintained in the same manner as the HBPP QA records. The staff reviewed this exemption request and considered it acceptable (SER Section 10.1).

In order to support the earlier termination of the SAFSTOR license and dismantlement of the SFP, the applicant requested that the Humboldt Bay ISFSI license be issued by December 2005. Assuming that there are no delays in the review process and NRC issues the Humboldt Bay ISFSI license in late 2005, the applicant would apply to the California Public Utilities Commission (CPUC) to use Humboldt Decommissioning Trust funds for procurement and construction of the ISFSI and, after CPUC approval, will proceed with ISFSI procurement and construction of long lead time items. The applicant does not plan to initiate extensive facility construction activities until the NRC environmental review is completed, permits are obtained, the necessary environmental findings are made, and the Humboldt Bay ISFSI license is issued. A 10 CFR Part 50 license amendment request to permit Holtec HI-STAR HB cask handling activities in the HBPP refueling building (RFB) has been submitted to NRC.

1.1.2 General Description of the Location

The Humboldt Bay ISFSI will be located within the PG&E owner-controlled area at the HBPP. The HBPP is located near the coastal community of King Salmon on the shore of Humboldt Bay in Humboldt County in northwestern California. Eureka, the largest city in Humboldt County, is located approximately 5 km [3 mi] north of the ISFSI site. There are several small residential communities within 8 km [5 mi] of the ISFSI site, including King Salmon, Humboldt Hill, Fields Landing, and the suburban communities surrounding the City of Eureka.

The applicant owns approximately 0.57 km^2 [143 acres] of land on the shore of Humboldt Bay opposite the bay entrance with water areas extending approximately 150 m [500 ft] into Humboldt Bay from the land area. The owner-controlled area does not have public highways or railroads. The only access to the ISFSI site is from the south via King Salmon Avenue, which also serves the community of King Salmon situated on the western part of the peninsula. A public trail to access a breakwater for fishing traverses the controlled area. However, 10 CFR §72.106(c) allows the controlled area to be traversed so long as appropriate and effective arrangements are made to control traffic and to protect public health and safety. The public trail crossing the PG&E property to the north of the ISFSI will be controlled by fencing and gates. The gates will be open to allow access to the public trail during normal ISFSI storage operation. During cask transfer and handling operations, the gates will be locked to prevent public access within the controlled area until the cask transfer activities and any corrective actions are completed. If an accident should occur within the controlled area during normal ISFSI operation, the applicant will assess radiological conditions. If radiation levels exceed the allowable levels for public health and safety, the gates will be closed and locked to prevent public access within the controlled area until radiological conditions return to allowable levels. The applicant has full authority to control all activities within the ISFSI site and owner-controlled area boundaries.

The ISFSI will be located near the top of a small hill surrounded by wetlands to the east and Humboldt Bay to the west. The terrain in the vicinity of the HBPP rises rapidly from the bay on the north side to an elevation of approximately 22.1 m [72.7 ft] above mean sea level (MSL) at Buhne Point. Terrain to the north and east of the site is generally flat. To the south and east, the terrain rises rapidly forming Humboldt Hill, which reaches an elevation of over 153.5 m [503.7 ft] above MSL within 3.2 km [2 mi] of the ISFSI.

The staff finds that the site and Humboldt Bay ISFSI descriptions have sufficient detail to allow familiarization with the site characteristics of the proposed ISFSI.

1.1.3 General Systems Description

The Humboldt Bay ISFSI includes the following major structures, systems, and components (SSCs): dry cask storage system, storage vault, and the onsite transporter.

Dry Cask Storage System

The dry cask storage system selected by the applicant is the Holtec International HI-STAR HB system. This is a variation of the HI-STAR 100 cask system, which has been certified by NRC (U.S. Nuclear Regulatory Commission, 2001) for use by 10 CFR Part 50 licensees under the

general license provisions of 10 CFR §72.210. The HI-STAR HB system is comprised of the MPC-HB, which is a seal-welded canister containing 80 SNF assemblies; Damaged Fuel Containers, which can be inserted into an MPC-HB and can hold an intact fuel assembly or damaged fuel; and the HI-STAR HB storage overpack (or cask). The design and operation of these components are generically described in detail in the HI-STAR 100 system FSAR (Holtec International, 2002). Holtec developed the modified (shorter) HI-STAR HB system and MPC-HB for use at Humboldt Bay because of the smaller HBPP fuel assembly dimensions (length and width).

The MPC-HB provides the confinement boundary for the SNF and associated nonfuel hardware (SAR Figure 4.2-2). An integrally-welded pressure vessel holds up to 80 HBPP SNF assemblies and meets the stress limits of the ASME Boiler and Pressure Vessel Code, Section III, Subsection NB (ASME International, 2001). The MPC-HBs are welded cylindrical structures consisting of a honeycomb fuel basket, a baseplate, canister shell, a lid, and a closure ring. The honeycomb fuel basket uses geometric spacing and fixed neutron absorbers for criticality control. The MPC-HB is made entirely of stainless steel, except for the neutron absorbers and an aluminum seal washer in the vent and drain ports.

The HI-STAR HB storage cask (SAR Figure 3.3-3) provides an internal, cylindrical cavity of sufficient size to house an MPC-HB during loading, unloading, and transfer of the MPC-HB from the SFP to the storage vault. It is a rugged, heavy-walled cylindrical container constructed of carbon steel. The overpack provides gamma and neutron shielding and protects the MPC-HB from missiles and natural phenomena during onsite transfer and storage.

Storage Vault

The cask storage vault is comprised of six below-grade, cylindrical storage cells that are structural units constructed of steel-reinforced concrete with a carbon steel liner. The vault provides additional shielding and defense-in-depth of the casks from missiles and natural phenomena. The vault is sized to hold five SNF casks and one GTCC certified cask. The storage vault is about 183 m [600 ft] from the RFB. The vault will be located inside a security area that has applicable barrier, access, and surveillance controls that meet 10 CFR §73.51 requirements.

Onsite Transporter

A transporter is used to move the HI-STAR HB cask from outside the RFB to the vault. The transporter developed for the Diablo Canyon ISFSI will be used for the Humboldt Bay ISFSI. The transporter is a U-shaped tracked vehicle consisting of the vehicle main frame, hydraulic lifting towers, an overhead beam system that connects between the lifting towers, a cask restraint system, the drive and control systems, and a series of cask lifting attachments. The transporter design permits the HI-STAR HB cask to be handled vertically. The transporter also is used to lower the HI-STAR HB cask into the storage vault. Each loaded overpack is approximately 2.4 m [8 ft] in diameter, 3.2 m [10.5 ft] high, and weighs about 72,574.7 kg [160,000 lb].

The important-to-safety SSCs of the ISFSI are identified in Section 4.5 of the SAR. A general description of the major SSCs is provided in Section 1.3 of the SAR. More detailed descriptions

of the HI-STAR HB system are contained in Section 4.2 of the SAR, and more details on the storage vault and transporter are provided in Sections 4.2 through 4.4 of the SAR.

The staff finds that the description of the storage cask system to be used at the ISFSI is sufficiently detailed to allow familiarization with its design.

1.1.4 Identification of Agents and Contractors

Section 1.4 of the SAR identifies the organizations responsible for providing the engineering, design, licensing, and operation of the SNF storage and transfer systems for the Humboldt Bay ISFSI. Engineering, site preparation, and construction of the ISFSI storage vault will be performed by the applicant (PG&E), Holtec, Enercon, and additional specialty contractors, as necessary.

Holtec International will provide the SNF storage system, consisting of the HI-STAR HB overpacks, the MPC-HB canisters, the transporter, and design for the ISFSI storage vault. Enercon will provide design of ancillary facilities, including the transfer route and security system. The applicant will be responsible for the operation of the ISFSI and for providing quality assurance services.

The staff finds that the agents and contractors responsible for the design and operation of the installation have been adequately identified.

1.1.5 Material Incorporated by Reference

Many chapters of the ISFSI SAR include a reference section that identifies documents referred to in those chapters. The primary document referenced in the Humboldt Bay ISFSI SAR is the HI-STAR 100 FSAR (Holtec International, 2002).

The staff finds that material incorporated by reference, including topical reports and docketed material, has been appropriately identified in the SAR.

1.2 Evaluation Findings

The staff finds that the site and Humboldt Bay ISFSI descriptions presented in Chapter 1 of the SAR have sufficient detail to allow familiarization with the pertinent site-related features of the proposed Humboldt Bay ISFSI, and therefore meet the requirements for the general description under 10 CFR Part 72.

1.3 References

ASME International. *ASME Boiler and Pressure Vessel Code, Section III, Division 1.* New York City, NY: ASME International. 2001.

Holtec International. *Final Safety Analysis Report for the Holtec International Storage Transport, and Repository Cask System* (*HI-STAR 100 System*). Rev. 1. HI-2012610. Docket 72-1008. Marlton, NJ: Holtec International. 2002.

Pacific Gas and Electric Company. *Humboldt Bay ISFSI Safety Analysis Report*. Amendment 1. Docket No. 72-27. Avila Beach, CA: Pacific Gas and Electric Company. 2004.

U.S. Nuclear Regulatory Commission. NUREG-1567, *Standard Review Plan for Spent Fuel Dry Storage Facilities.* Washington, DC: U.S. Nuclear Regulatory Commission. 2000.

U.S. Nuclear Regulatory Commission. *10 CFR Part 72 Certificate of Compliance No. 1008, Amendment 2, for the HI-STAR 100 System Dry Cask Storage System.* Docket No. 72-1008. Washington, DC: U.S. Nuclear Regulatory Commission. 2001.