11 RADIATION PROTECTION EVALUATION

11.1 Conduct of Review

The objective of this section is to evaluate the capability of the organizational, design, and operational elements of the Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI) radiation protection plan to meet regulatory requirements. The requirements for providing adequate radiation protection to personnel and members of the public are specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and selected portions of 10 CFR Part 72. These requirements include the following:

- 10 CFR §20.1101(a) requires that a licensee develop, document, and implement a radiation protection program;
- 10 CFR §20.1101(b) requires that a licensee use sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable;
- 10 CFR §20.1101(c) requires that a licensee periodically (at least annually) review the radiation protection program content and implementation;
- 10 CFR §20.1101(d) requires that a licensee, as part of the radiation protection program, establish a constraint for air emissions of radioactive materials to the environment such that a member of the public is not expected to receive a total effective dose equivalent in excess of 0.1 mSv [10 mrem] per year from these emissions;
- 10 CFR §20.1201(a) requires that a licensee control occupational dose to the following annual dose limits: a total effective dose equivalent of 0.05 Sv [5 rem] or the sum of the deep-dose equivalent and committed dose equivalent to any individual organ or tissue other than the lens of the eye of 0.5 Sv [50 rem], whichever is most limiting, a dose equivalent of 0.15 Sv [15 rem] to the lens of the eye, and a shallow-dose equivalent of 0.50 Sv [50 rem] to the skin or an extremity;
- 10 CFR §20.1301(a) establishes dose limits for a member of the public, including a total effective dose equivalent of 1 mSv [0.1 rem] in a year, and a maximum dose in any unrestricted areas of 0.02 mSv [0.002 rem] in an hour;
- 10 CFR §20.1301(b) requires that if a licensee permits members of the public to have access to controlled areas, the limits for members of the public continue to apply to those individuals;
- 10 CFR §20.1301(d) requires that the licensee comply with the environmental radiation standards in 40 CFR Part 190;
- 10 CFR §20.1302(a) requires a licensee to perform radiation surveys and monitor radioactive materials in effluents in unrestricted and controlled areas

to demonstrate compliance with the dose limits for members of the public in 10 CFR §20.1301;

- 10 CFR §20.1302(b) requires that the licensee show compliance with the limits in 10 CFR §20.1301, by either demonstrating compliance with the dose limit to an individual by calculation or measurement, or by demonstrating that radioactivity in gaseous and liquid effluents does not exceed the values in table 2 of Appendix B to Part 20, and the dose from external sources would not exceed 0.02 mSv [0.002 rem] in an hour and 0.5 mSv [0.05 rem] in a year;

- 10 CFR §20.1406 requires that an applicant describe how facility design and procedures for operation will minimize contamination and generation of radioactive waste, and facilitate decommissioning;

- 10 CFR §20.1501(a)(1) requires that a licensee make surveys necessary to comply with 10 CFR Part 20;

- 10 CFR §20.1501(c) requires that dosimeters that are used by a licensee are processed and evaluated by a processor holding accreditation from the National Voluntary Laboratory Accreditation Program;

- 10 CFR §20.1701 requires that a licensee use process or other engineering controls to control the concentrations of radioactive material in the air;

- 10 CFR §20.1702 requires that when it is not practicable to apply process or other engineering controls, that the licensee shall increase monitoring and limit intakes by use of other controls, including access control, limitation of exposure times, use of respiratory protection, etc;

- 10 CFR §72.24(e) requires that the SAR include the means for controlling and limiting occupational radiation exposure within the limits given in 10 CFR Part 20, and for meeting the objective of maintaining exposures as low as is reasonably achievable;

- 10 CFR §72.104(a) requires that, during normal operations and anticipated occurrences, the annual dose equivalent to any real individual beyond the controlled area must not exceed 0.25 mSv [25 mrem] to the whole body, 0.75 mSv [75 mrem] to the thyroid and 0.25 mSv [25 mrem] to any other organ, from various sources, including planned discharges of radioactive materials to the environment;

- 10 CFR §72.104(b) requires that operational restrictions are established to meet objectives for maintaining doses as low as is reasonably achievable from radioactive materials in effluents;

- 10 CFR §72.104(c) requires that operational limits for radioactive materials in effluents are established to ensure that the dose limits in 72.104(a) are met;

- 10 CFR §72.106(b) requires that any individual located on or beyond the nearest controlled area boundary shall not receive a dose greater than 0.05 Sv [5 rem] to the whole body or any organ from any design basis accident, and that the minimum distance from the spent fuel waste handling and storage facilities to the nearest boundary shall be at least 100 meters;

- 10 CFR §72.126(a) requires that radiation protection systems must be provided for areas and operations where onsite personnel may be exposed to radiation or airborne radioactive materials. Structures, systems, and components for which operation, maintenance, and inspections may involve occupational exposure, must be designed, fabricated, located, shielded, controlled and tested to control external and internal radiation exposures. The design must include means to, among other things, control access to areas of potential contamination or high radiation, measure and control contamination, minimize worker time, and shield personnel;

- 10 CFR §72.126(c)(1) requires that, as appropriate for the handling and storage system, effluent systems must be provided, as well as methods for measuring the amount of radionuclides in the effluents;

- 10 CFR §72.126(c)(2) requires that areas containing radioactive materials must be provided with systems for measuring the direct radiation levels in and around these areas; and

- 10 CFR §72.126(d) requires that the ISFSI be designed to limit effluents to levels that maintain doses as low as is reasonably achievable, and analyses must show that releases to the environment during normal operations and anticipated occurrences will be within the exposure limit given in 10 CFR §72.104.

PG&E will use the HI-STORM 100 System for the Diablo Canyon ISFSI. This cask system consists of (1) interchangeable multi-purpose canisters (MPC) that contain the fuel; (2) a storage overpack that contains the MPC during storage; and (3) a transfer cask that contains the MPC during loading, unloading, and transfer operations. The system has been reviewed and approved by the NRC for use in accordance with the general license provisions of 10 CFR Part 72. Amendment 1 to the HI-STORM 100 System Certificate of Compliance (CoC) became effective on July 15, 2002 (U.S. Nuclear Regulatory Commission, 2002a).

The staff's review included Chapter 7, "Radiation Protection" of the Diablo Canyon ISFSI SAR (Pacific Gas and Electric Company, 2002). Chapter 7 of the SAR describes the radiation protection features of the proposed Diablo Canyon ISFSI that ensure that radiation exposures to personnel and members of the public meet the regulatory requirements. Information included in the HI-STORM 100 System Final Safety Analysis Report (FSAR), Revision 1 (Holtec International, 2002) that pertains to ISFSI radiation protection was also considered in the review.

11.1.1 As Low As Reasonably Achievable Considerations

The objective of this section is to evaluate whether PG&E has appropriately considered the goal of maintaining occupational doses and doses to the members of the public as low as reasonably achievable (ALARA) during the operation of the ISFSI. Considerations related to maintaining doses ALARA are described in Section 7.1 of the SAR.

11.1.1.1 As Low As Reasonably Achievable Policy and Program

The primary objective of the Health Physics Program is to maintain radiation exposure to workers, visitors, and members of the public below regulatory limits and otherwise ALARA. The DCPP Health Physics program objectives are described in Section 12.3.2 of the DCPP FSAR update (Pacific Gas and Electric Company, 2001). The policy and program for maintaining doses ALARA are described in Section 7.1.1, "Policy Considerations and Organization" of the SAR. PG&E will apply the existing Diablo Canyon Power Plant (DCPP) program for maintaining doses ALARA, which complies with the regulatory requirements of 10 CFR Parts 20 and 50, to the proposed ISFSI-related activities under 10 CFR Part 72. The program for maintaining doses ALARA follows the guidance in Regulatory Guides 8.8 (U.S. Nuclear Regulatory Commission, 1978) and 8.10 (U.S. Nuclear Regulatory Commission, 1975). The program and procedures will be revised and supplemented, as appropriate, to address ISFSI-related activities.

11.1.1.2 Design Considerations

The description of the design considerations to maintain doses ALARA is provided in Section 7.1.2 of the SAR, "Design Considerations," which delineates the following specific features of the Diablo Canyon ISFSI:

- Centralized location of the ISFSI within the DCPP site boundary to reduce offsite doses;
- Placement of the storage pads at a sufficient distance from buildings and occupied places, so doses to workers are maintained ALARA;
- Adequate spacing between storage casks on the pads to allow personnel to function efficiently during placement, surveillance, maintenance, and repair activities;
- Use of a restricted area fence and a security perimeter fence that protect individuals against undue risks from radiation exposure and prevent unauthorized access to the ISFSI;
- Use of thick biological shielding in overpacks that provides gamma and neutron shielding;
- Use of a dry environment inside the seal-welded MPCs to preclude the possibility for release of radioactive liquids and other radioactive effluents from inside the canister; and

- Use of inflatable seals in the MPC-transfer cask annulus to preclude spent fuel pool water from contacting the exterior of the MPC, to minimize surface contamination.

The ISFSI will be located within the owner-controlled boundary of the DCPP; therefore, the transfer of the spent nuclear fuel from the spent fuel pool to the ISFSI will not take place on any public roads. The ISFSI storage pads will be located in a cut into a hill that provides natural shielding on one side and partial shielding on two other sides and will be at a sufficient distance from the controlled-area boundary such that offsite exposures will be further minimized.

The staff finds that the design of the Diablo Canyon ISFSI provides reasonable assurance that doses to personnel and members of the public will be maintained ALARA and meets the requirements of 10 CFR §72.126(a). The staff finds that the requirements for minimization of contamination and amount of generated radioactive waste outlined in 10 CFR §20.1406 are satisfied. The staff finds that the design of the seal-welded MPCs, which are not opened at the ISFSI and allow no effluents, meets the requirements of 10 CFR §72.126(d).

11.1.1.3 Operational Considerations

The operational considerations to maintain doses ALARA are described in Section 7.1.3 of the SAR, "Operational Considerations." The operating procedures for the Diablo Canyon ISFSI, such as cask loading and unloading, transfer to the Cask Transfer Facility (CTF), MPC transfer, and transfer to the storage pad were developed in accordance with Regulatory Guides 8.8 (U.S. Nuclear Regulatory Commission, 1978) and 8.10 (U.S. Nuclear Regulatory Commission, 1975). Specifically, the program to maintain doses ALARA includes the following operational elements:

- Use of classroom training, mockups, and dry-run training to train personnel about canister transfer procedures, to verify equipment operability and procedure efficiency to minimize radiation exposure;

- Fuel loading procedures will follow accepted work practices that reflect lessons learned about maintaining doses ALARA from other facilities that use dry cask storage;

- Use of a regionalized MPC loading strategy of placing less radioactive assemblies on the periphery of the MPC basket and more radioactive assemblies in the center to take advantage of the spent nuclear fuel self shielding and minimize onsite and offsite dose rates from direct radiation;

- Use of power-operated tools in bolting operations to minimize personnel exposure time; and

- Use of temporary portable shielding during fuel transfer to minimize personnel exposure to direct radiation.

The staff finds that PG&E's description of the operational considerations for maintaining doses ALARA satisfies the requirements of 10 CFR §72.24(e) and that use of Regulatory Guides 8.8

(U.S. Nuclear Regulatory Commission, 1978) and 8.10 (U.S. Nuclear Regulatory Commission, 1975) in planning operations is appropriate and provides reasonable assurance that doses to personnel and members of the public will be maintained ALARA.

11.1.2 Radiation Protection Design Features

Information relevant to the proposed radiation design features of the ISFSI is contained in Section 7.3, “Radiation Protection Design Features,” of the SAR.

11.1.2.1 Installation Design Features

The ISFSI radiation protection design features are described in Section 7.3.1 of the SAR, “Installation Design Features.” The ISFSI will be located within the DCPP owner-controlled area with the nearest site boundary point 427 m [1,400 ft] away and the nearest residence 2.4 km [1.5 mi] from the nearest row of the stored casks on the pad. The ISFSI will be surrounded by a protected area fence. Periodic inspections, placement of loaded storage casks, and routine security checks are the planned operations to be conducted at the ISFSI.

The HI-STORM 100 System will be used at the ISFSI. The major components of the system include a stainless steel cylindrical MPC confinement vessel, a steel-lined concrete storage cask, and a transfer cask that is a steel-lead-steel layered cylinder with a water jacket attached to the exterior.

The fuel is stored dry inside the MPC, so no leakage of radioactive liquid is possible. Airborne radioactive materials will be prevented from leaking from the MPCs by the welded seals, and once sealed, fuel is not removed from the MPCs at either the ISFSI storage pads or the CTF. The storage system is passive and requires little maintenance. The system is not expected to leak during normal, off-normal, or accident conditions, and therefore, the staff concludes that airborne radioactive monitors specified in 10 CFR §72.126 are not required at the ISFSI. Spacing of the storage casks on the storage pads provides self shielding for interior casks. The air inlets and outlets for the storage overpacks are designed to minimize radiation streaming.

The staff finds that the use of Regulatory Position 2 of NRC Regulatory Guide 8.8 (U.S. Nuclear Regulatory Commission, 1978), which provides guidance regarding facility and equipment features, is appropriate. The staff finds that given the proposed design features described in the SAR, PG&E has satisfied the requirements of 10 CFR §72.126(a) and §72.128(a)(2). The distance between the spent nuclear fuel handling and storage areas and the nearest boundary of the controlled area of the proposed ISFSI {427 m [1,400 ft]} exceeds the minimum distance specified in 10 CFR §72.106(b), which is 100 m [330 ft]. Sections 3.3.1.5, 3.3.1.5.2, 4.2.3.2, 4.2.3.3, 7.1.2, 7.3.1, 7.3.2, 7.3.3, and 7.3.4 of the SAR discuss design features that address radiation monitoring, control of airborne contaminants, instrumentation and controls, and other considerations related to maintaining doses ALARA.

The staff finds that the SAR provides reasonable assurance that the use of the HI-STORM 100 System for the Diablo Canyon ISFSI will meet the regulatory requirements in 10 CFR Part 20, §72.104(a), §72.104(b), §72.104(c), and §72.106(b). Chapters 7, 9, and 15 of this SER discuss the staff’s evaluations of the radiation shielding features and the confinement features during

off-normal and accident conditions. Based on these evaluations, the staff finds that the radiation protection features for the proposed Diablo Canyon ISFSI are acceptable.

11.1.2.2 Access Control

The access control to the ISFSI is described in Sections 2.2.2, "Site Description;" 3.3.1.5.1, "Access Control;" 4.1, "Location and Layout;" 7.6.2, "Equipment, Instrumentation, and Facilities;" and 9.6, "Physical Security Plan" of the SAR. Access control to the restricted area provides for both personnel radiation protection and stored fuel physical protection. There are two fences that will surround the Diablo Canyon ISFSI. A security fence, with a locked gate, will circumscribe the ISFSI storage pads and will serve as the protected-area boundary in compliance with the requirements of 10 CFR §73.55. There is a minimum 12-m [40-ft] distance between the storage casks and the security fence. A second fence will be built outside the protected area fence, approximately 30 m [100 ft] from the storage casks. The second fence will further restrict access and will ensure that the dose rate at this boundary will not exceed 20 µSv/hr [2 mrem/hr], as specified in 10 CFR Part 20.

Once the Diablo Canyon ISFSI is operational, entrance to and work within the ISFSI protected area will be controlled by radiation protection and security personnel who will maintain a list of individuals authorized for access. During normal storage operations, personnel will conduct infrequent, short-duration checks on the material condition of the casks to ensure the overpack air ducts are free of blockage. Higher occupancy activities will occur during construction of new pads and placement of loaded overpacks. Radiation work permits will be required for authorized work. The ISFSI protected area will have an intrusion detection system to detect unauthorized entry. The controlled area within the owner-controlled area is surrounded by a farm-type fence with the nearest boundary to the ISFSI site 427 m [1,400 ft] away. The dose rate outside the controlled area will not exceed 250 µSv/yr [25 mrem/yr], as specified in 10 CFR §72.104(a).

The staff finds that the description of access control at the Diablo Canyon ISFSI is acceptable and meets the radiation protection requirements of 10 CFR §72.126(a)(3). The physical security plan prevents the entry of unauthorized personnel into radiologically controlled areas. The ISFSI security program contains information that is to be withheld from the public in accordance with 10 CFR §2.790(d) and §73.21. A summary of the staff's review of the security program for the ISFSI is provided in Section 10.1.6 of this SER.

11.1.2.3 Radiation Shielding

The radiation shielding evaluation is contained in Chapter 7 of this SER. As stated in Chapter 7 of this SER, the staff evaluated the Diablo Canyon ISFSI SAR shielding calculations and found them to be acceptable. The dose rates at the onsite and offsite locations were found to be below the limits specified in 10 CFR §20.1201, §20.1301, §20.1302, and §72.104(a). The applicant's description, combined with a sample input file in the HI-STORM 100 System FSAR Revision 1 (Holtec International, 2002), provides reasonable assurance that the ISFSI shielding was adequately evaluated. The applicant's analysis demonstrates that no credible accident will cause a significant increase in public or personnel dose rates from direct radiation. This provides reasonable assurance that during accident conditions, dose rates from direct radiation will be below the limits specified in 10 CFR §72.106(b).

11.1.2.4 Confinement and Ventilation

The evaluation of the MPC confinement system is provided in Chapter 9 of this SER. The MPC is a welded cylindrical enclosure with no mechanical joints or seals in the confinement boundary and is not vented.

11.1.2.5 Area Radiation and Airborne Radioactivity Monitoring Instrumentation

Area radiation and airborne radioactivity monitoring instrumentation is described in Sections 3.3.1.3.2, "Instrumentation;" 3.3.1.5.3, "Radiological Alarm Systems;" 6.2, "Radioactive Wastes;" and 7.3.4, "Area Radiation and Airborne Radioactivity Monitoring Instrumentation." All spent nuclear fuel at the Diablo Canyon ISFSI will be stored in seal-welded MPCs. There are no credible events that could result in the release of radioactive materials from within MPCs, and there are no credible events that might increase dose rates from direct radiation from the casks. Therefore, area radiation and airborne radioactivity monitors are not needed at the Diablo Canyon ISFSI storage pads. Continuous monitoring and audible high-radiation level alarms will be available in the Fuel Handling Building/Auxiliary Building. Thermoluminescent dosimeters will be used to monitor and record area doses at appropriate intervals in all four directions around the ISFSI restricted-area fence. Hand-held radiation protection instruments and dosimeters will be provided during fuel transfer operations at the CTF and routine maintenance at the ISFSI storage pads. Before discharge, all water collected in the CTF sump will be sampled and, if contamination is found, it will be disposed of in accordance with the DCPP Radioactive Waste Management program.

The staff finds that the radiation monitoring instrumentation described in the SAR meets the requirements of 10 CFR §72.126(c) and provides reasonable assurance that actual dose rates around the ISFSI will be adequately monitored to verify compliance with the radiological limits specified in 10 CFR Parts 20 and 72 for members of the public, and any unexpected increases in dose rates will be properly detected in a timely manner.

11.1.3 Dose Assessment

The dose assessments are presented in Sections 7.3.2, "Shielding;" 7.4, "Estimated Collective Dose Assessments;" 7.5, "Offsite Collective Dose;" 8.1.3.5, "Radiological Impact of Confinement Boundary Leakage;" 8.1.4.5, "Radiological Impact of Partial Blockage of Air Inlets;" 8.1.6.5, "Radiological Impact of Loss of Electric Power;" 8.1.7.5, "Radiological Impact of Cask Transporter Off-Normal Operation;" 8.2.6.3, "Accident Dose Calculations;" 8.2.7.3, "Dose Calculations for Hypothetical Accident Conditions;" and 8.2.15.3, "Dose Calculations for 100 Percent Blockage of Air Inlet Ducts."

PG&E proposes to use the HI-STORM 100 System for the Diablo Canyon ISFSI. This system has been reviewed and approved by NRC for use under the general license provisions of 10 CFR Part 72. Amendment 1 of the HI-STORM 100 System CoC became effective on July 15, 2002 (U.S. Nuclear Regulatory Commission, 2002a). The staff evaluations of the shielding, confinement, radiation protection evaluation, and dose assessments for the cask system are documented in the HI-STORM 100 System SER (U.S. Nuclear Regulatory Commission,

2002b). The staff concluded that the design of radiation protection features in the HI-STORM 100 System is sufficient to meet the radiation protection requirements of 10 CFR Part 20, §72.104, and §72.106.

PG&E calculated offsite dose rates for 140 casks located on the storage pads. The bounding dose analyses are conducted by assuming that overpacks loaded with identical MPC-32s are completely loaded with fuel assemblies having burnups of 32,500 MWd/MTU [2.42×10^{12} Btu/ton uranium] and cooling times varying from 5 to 20 years. A Babcock and Wilcox 15 × 15 fuel assembly, a design-basis assembly for the HI-STORM 100 System, was used in the Diablo Canyon ISFSI shielding analyses. Additional credit was taken in the dose analyses for longer cooling times as the casks are placed at the ISFSI at the rate of eight casks per year. The transfer cask dose analysis was performed for the MPC-24 using burnup and cooling time of 55,000 MWd/MTU [4.09×10^{12} Btu/ton uranium] and 12 years. These dose rates bound those for other MPC designs, and fuel burnup and cooling time combinations.

As discussed in Section 7.1.4.2 of this SER, the contact surface dose rate for the HI-TRAC transfer cask was estimated to be approximately 3,893 µSv/hr [389.3 mrem/hr] outside the lid in its center, and the average contact surface dose rate for the HI-STORM 100 System storage cask (side-dose value) was estimated to be approximately 348 µSv/hr [34.8 mrem/hr] at the midplane of the overpack. Based on these values, PG&E estimated the controlled-area boundary dose rate to be 0.027 µSv/hr [0.0027 mrem/hr], which corresponds to 56.2 µSv/yr [5.62 mrem/yr] for 2,080-hour annual occupancy with 140 casks from direct and scattered radiation exposure. As discussed in Chapter 9 of this SER, no release of radioactive materials in effluent is expected during normal operations, therefore, the doses caused by effluents are not considered. PG&E estimated an annual direct and scattered radiation dose to the nearest resident located 2.4 km [1.5 mi] away from the ISFSI as 0.0035 µSv [0.00035 mrem], assuming the resident is continually present at the residence for 8,760 hours per year. These dose values are less than the 250 µSv/yr [25 mrem/year] whole-body dose limit specified in 10 CFR §72.104(a).

The estimated dose from loading, transport, and emplacement of a single MPC in a storage overpack on the storage pad was estimated at 21 person-mSv [2.1 person-rem].

The annual occupational exposures from routine maintenance activities, such as cask inlet or outlet duct surveillance, concrete inspections, and radiation protection surveys, were estimated to result in a dose of 18 person-mSv [1.8 person-rem]. The estimated annual exposure for overpack repair activities was estimated as 16 person-mSv [1.6 person-rem] and for construction of the last storage pad as 432 person-mSv [43.2 person-rem]. Based on these estimates, there is reasonable assurance that personnel exposures will be below the annual occupational dose limit of 50 mSv [5 rem] specified in 10 CFR §20.1201.

The staff's evaluation of the controlled-area boundary and nearest resident dose assessments, and of the shielding evaluation of direct and scattered radiation doses is contained in Chapter 7 of this SER. As discussed in Chapter 9 of this SER, the doses caused by effluents were not considered. The use of dosimeters and periodic radiological surveillance at the ISFSI will detect any unexpected significant releases of radioactive materials and, therefore, these measures will meet the requirements outlined in 10 CFR §72.126(c)(2) and §20.1301.

Contributions to the dose rates from other nuclear fuel-cycle facilities located within a 5-km [3-mi] radius of the proposed ISFSI, which are the two units of the DCPP, were taken into account in the total off-site collective dose assessment. As listed in Table 7.5-4 of the ISFSI SAR, the annual dose from the other uranium fuel cycle operations was estimated as 0.44 µSv/yr [0.044 mrem/yr] at the controlled-site boundary, and this same dose was conservatively applied to the nearest resident. The combined annual dose from the proposed ISFSI (including off-normal effluent release from a single cask) and other nuclear fuel-cycle facilities was estimated as 58.4 µSv [5.84 mrem] at the controlled-site boundary and 4.5 µSv [0.45 mrem] to the nearest resident. The total off-site collective dose assessment presented in the SAR provides reasonable assurance that the cumulative effects of the combined operations of the ISFSI and DCPP will not constitute an unreasonable risk to the health and safety of the public, in compliance with 10 CFR §72.104(a) and §72.122(e).

The staff finds the applicant's occupational and off-site dose assessments for the Diablo Canyon ISFSI acceptable. The results of these site-specific assessments and the staff's evaluations of the previously approved HI-STORM 100 System (U.S. Nuclear Regulatory Commission, 2002b) provide reasonable assurance that doses to personnel and members of the public will be maintained ALARA and will meet the requirements of 10 CFR Part 20, §72.24(m), and §72.104(a).

11.1.4 Health Physics Program

The health physics program is described in Section 7.6, "Health Physics Program" of the SAR.

11.1.4.1 Organization

The health physics program organization is described in Section 7.6.1, of the SAR, "Organization" and references the health physics program described in the DCPP FSAR update (Pacific Gas and Electric Company, 2001), Section 12.3. The Radiation Protection Manager is responsible for health physics activities related to ISFSI operations for the life of the facility. The Radiation Protection Manager is independent of the Operations Manager. Once the storage site is operational, entrance to and work within the ISFSI protected area will be controlled by Radiation Protection and Security personnel. The staff finds that this element of the proposed radiation protection program satisfies 10 CFR §20.1101(a).

11.1.4.2 Equipment, Instrumentation, and Facilities

The equipment, instrumentation, and facilities pertinent to the ISFSI health physics program are described in Section 7.6.2, "Equipment, Instrumentation, and Facilities," of the SAR. The ISFSI is located within the Diablo Canyon owner-controlled area; PG&E has full authority to control all activities within the ISFSI and owner-controlled area boundaries. Equipment, instrumentation, and facilities described in the DCPP FSAR update (Pacific Gas and Electric Company, 2001) will also be used for ISFSI operations and radiation surveys.

Once the ISFSI is operational, entrance to and work within the Diablo Canyon ISFSI protected area will be controlled by Radiation Protection and Security personnel, and radiation work permits will be required for conducting activities within the ISFSI protected area. The available DCPP radiological instrumentation and other equipment proposed for use at the ISFSI include:

- Personal monitoring equipment;
- Portable radiation measuring instruments;
- Portable air sampling equipment;
- External dosimetry devices used for monitoring whole-body exposure, including thermoluminescent dosimeters and self-reading dosimeters;
- Facilities for internal radiation monitoring;
- Count room equipment; and
- Decontamination equipment and facilities.

The DCPP Radiological Environmental Monitoring Program will also be applied for the ISFSI. Additional thermoluminescent dosimeters will be used to determine dose rates at restricted-area and controlled-area boundaries. There will be no additional effluent monitoring because no radioactive effluents are expected during normal ISFSI operations. The ultimate compliance with the requirements specified in 10 CFR §72.104(a) will be demonstrated through the DCPP environmental monitoring program.

The staff finds that the requirements of 10 CFR §20.1101(a) are met because the health physics equipment, instrumentation, and facilities proposed for use at the Diablo Canyon ISFSI are adequate to perform surveys of direct radiation, airborne radioactivity, and potential intakes by inhalation, ingestion, or absorption through skin or wounds.

11.1.4.3 Policies and Procedures

The policies and procedures pertinent to the ISFSI Health Physics Program are described in Section 7.6.3, “Policies and Procedures,” of the SAR. The Health Physics Program at the Diablo Canyon ISFSI will be implemented in accordance with PG&E program directives, administrative procedures, and working-level procedures, which will be revised as needed to address ISFSI operations prior to operation of the ISFSI. The operation and use of radiation monitoring equipment will be described in written procedures.

The staff concludes that the description of the Health Physics Program satisfies the requirements of 10 CFR §20.1101(a), §20.1101(b), §20.1302(a), §20.1406, and §20.1501(a)(1).

11.2 Evaluation Findings

Based on the review of information in the Diablo Canyon SAR, the staff makes the following findings regarding the Radiation Protection Program for the proposed ISFSI:

- The design and operating procedures of the Diablo Canyon ISFSI provide acceptable means for controlling and limiting occupational radiation exposures

within the limits given in 10 CFR Part 20 and for meeting the objective of maintaining exposures ALARA, in compliance with 10 CFR §72.24(e).

- The SAR and other documentation submitted in support of the application are acceptable and provide reasonable assurance that the activities authorized by the license can be conducted without endangering the health and safety of the public, in compliance with 10 CFR §72.40(a)(13).

- The proposed Diablo Canyon ISFSI is to be on the same site as the DCPP. The cumulative effects of the combined operations of these facilities will not constitute an unreasonable risk to the health and safety of the public, in compliance with 10 CFR §72.122(e).

- The SAR provides analyses showing that releases to the general environment during normal operations and anticipated occurrences will be within the exposure limits given in 10 CFR §72.104.

- The design of the Diablo Canyon ISFSI provides suitable shielding for radiation protection under normal and accident conditions, in compliance with 10 CFR §72.128(a)(2).

11.3 References

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

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