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January 16, 2004

PG&E Letter DIL-04-002

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Docket No. 72-26
Diablo Canyon Independent Spent Fuel Storage Installation
Response to NRC Request for Additional Information Regarding Implementation of Guidance Provided in ISG-11 (Cladding Considerations for the Transportation and Storage of Spent Fuel) (TAC No. L23399)

Dear Commissioners and Staff:

On December 21, 2001, Pacific Gas and Electric Company (PG&E) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for a 10 CFR 72 site-specific license to build and operate an independent spent fuel storage installation (ISFSI) at the Diablo Canyon Power Plant site (PG&E Letter DIL-01-002). The application included a Safety Analysis Report (SAR), Environmental Report, and other required documents in accordance with 10 CFR 72.

As a part of their review of PG&E's application, the NRC staff requested PG&E, in telephone call on December 19, 2003, to revise the application to implement the guidance of Revision 3 of Interim Staff Guidance Document – 11 (ISG-11). In order to meet the guidance in ISG-11, Revision 3, dated November 17, 2003, PG&E has proposed changes to the ISFSI SAR and the proposed ISFSI technical specifications (TS) to limit the maximum average burnup of fuel assemblies to be stored at the Diablo Canyon ISFSI to less than or equal to 45,000 megawatt days per metric ton of uranium (now defined in ISG-11 as low burnup fuel).

As described in the Diablo Canyon ISFSI SAR and the proposed ISFSI TS, the Diablo Canyon low burnup fuel will be transported and stored in previously certified casks approved for maximum cladding temperature limits of 570 °C for short-term operation and 400 °C for long-term operation. The HI-TRAC transfer cask will be used for fuel transport and the HI-STORM 100 System will be used for fuel storage (the HI-TRAC transfer cask and the HI-STORM 100 System were previously certified in Certificate of Compliance (CoC) 1014, Revision 0, effective on May 31, 2000, as amended by License Amendment Request 1014-1,

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Revision 2, dated July 3, 2001, including Supplements 1 through 4 and described and evaluated in Revision 0 of the Holtec Final Safety Analysis Report (FSAR) for the HI-STORM 100 System, issued on July 19, 2000).

Based on additional clarifications of ISG-11, Revision 3, provided by the NRC staff in the telephone call on December 19, 2003, PG&E believes its use of a previously certified cask system to transport and store the Diablo Canyon low burnup fuel complies with the NRC staff guidance promulgated in ISG-11, Revision 3.

Enclosure 1 shows proposed changes to the ISFSI SAR. All proposed SAR changes are related to implementation of the guidance in ISG-11, Revision 3, with the exception of the following:

- A Section 4.2.3.3.3 change that corrects a typographical error (1000 °F changed to 1040 °F) and clarifies maximum fuel cladding temperatures for the multi-purpose canisters (MPCs) MPC-24, MPC-32, and MPC-24E.
- A Section 10.2.2.1 change that requires water in the annulus between the MPC and the HI-TRAC transfer cask to be continuously flushed during vacuum drying operations for heat loads in the MPC-24 or MPC-24E/EF greater than 20.8 kW or any heat load in the MPC-32. This requirement, described in Section 5.1.1.2, was inadvertently left out of Section 10.2.2.1 of the Diablo Canyon ISFSI SAR.

These changes will be incorporated into the Diablo Canyon ISFSI FSAR in all appropriate locations following issuance of the ISFSI license.

Enclosure 2 shows proposed changes to the proposed ISFSI TS.

If you have any questions regarding this response, please contact Mr. Terence Grebel at (805) 545-4160.

Sincerely,

Lawrence F. Womack
Vice President Nuclear Services

Enclosures

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of PACIFIC GAS AND ELECTRIC COMPANY Diablo Canyon Independent Spent Fuel Storage Installation	Docket No. 72-26

AFFIDAVIT

Lawrence F. Womack, of lawful age, first being duly sworn upon oath states that he is Vice President, Nuclear Services of Pacific Gas and Electric company; that he is familiar with the content thereof; that he has executed this response to an NRC request for additional information regarding implementation of guidance provided in Interim Staff Guidance Document-11 for the Diablo Canyon Independent Spent Fuel Storage Installation on behalf of said company with full power and authority to do so; and that the facts stated therein are true and correct to the best of his knowledge, information, and belief.

Lawrence F. Womack
Vice President Nuclear Services

Subscribed and sworn to before me this 16th day of January 2004.

Notary Public
State of California
County of San Luis Obispo

CHUCK MACKEY
Commission # 1397547
Notary Public - California
San Luis Obispo County
My Comm. Expires Feb 1, 2007

ENCLOSURE 1

Proposed ISFSI Safety Analysis Report Changes

GLOSSARY

LTSP means long-term seismic program.

Maximum Reactivity means the highest possible k-effective including bias, uncertainties, and calculational statistics evaluated for the worst-case combination of fuel basket manufacturing tolerances.

MCNP means Monte Carlo N-Particle transport computer code.

Low or Moderate Burnup Fuel is a spent fuel assembly with an average burnup less than or equal to 45,000 MWD/MTU.

MPC-24 means the Holtec MPC designed to store up to 24 intact PWR fuel assemblies and associated nonfuel hardware.

MPC-24E means the Holtec MPC designed to store up to 24 PWR fuel assemblies and associated nonfuel hardware, 4 of which can be DFCs containing damaged fuel assemblies in designated fuel basket locations, and the balance being intact fuel assemblies.

MPC-24EF means the Holtec MPC designed to store up to 24 PWR fuel assemblies and associated nonfuel hardware, 4 of which can be DFCs containing damaged fuel assemblies or fuel debris in designated fuel basket locations, and the balance being intact fuel assemblies.

MPC-32 means the Holtec MPC designed to store up to 32 intact PWR fuel assemblies and associated nonfuel hardware.

MSL means mean sea level.

MTU means metric tons of uranium.

Multi-Purpose Canister (MPC) means the sealed canister that consists of a honeycombed fuel basket contained in a cylindrical canister shell that is welded to a baseplate, lid with welded port cover plates, and closure ring. The MPC is the confinement boundary for storage conditions.

MWD/MTU means megawatt–days per metric ton of uranium.

Neutron Shielding means a material used to thermalize and capture neutrons emanating from the radioactive spent nuclear fuel.

NFPA means National Fire Protection Association.

wastes under a 10 CFR 72 site-specific license. In accordance with the guidance of ISG 17, PG&E plans to request a modification to its proposed site-specific license at a future date to allow interim storage of GTCC wastes at the Diablo Canyon ISFSI.

(4) Exemption requests pertaining to the Diablo Canyon ISFSI license application are identified in Table 1.1-1.

(5) To be consistent with the guidance contained in Interim Staff Guidance Document 11 (ISG-11), Revision 3, issued on November 17, 2003, fuel assemblies to be stored initially at the Diablo Canyon ISFSI will be limited to a maximum average burnup of ≤45,000 MWD/MTU (defined in ISG-11 as low burnup fuel) (see PG&E Letter DIL-04-002, dated January 15, 2004). This burnup limit is more restrictive than that contained in Revision 0 of the HI-STORM 100 System Certificate of Compliance (CoC) 1014, as amended by License Amendment Request 1014-1, Revision 2, including Supplements 1 through 4, which is otherwise used as the basis for this application.

Because the HI-STORM 100 System licensing and design basis incorporated by reference in this application is taken from Revision 0 of the HI-STORM 100 System FSAR, many of the design and safety evaluations discussed in this SAR are for bounding burnups exceeding those authorized for loading at the Diablo Canyon ISFSI (see, for example, the ISFSI thermal design discussed in Section 4.2, the radiological analyses in Chapter 7, and selected accident analyses in Chapter 8). Based on the fuel burnup limit of ≤45,000 MWD/MTU, these generic design and safety evaluations are conservative and bound the allowed cask contents in this application.

The fuel burnup limit is specified in Section 10.2 and in the proposed Diablo Canyon technical specifications. Holtec International is currently undergoing licensing review of an amendment request for the generic HI-STORM System design (LAR 1014-2), whereby higher fuel burnups will be authorized for loading, consistent with the guidance of ISG-11, Revision 3. PG&E anticipates requesting authorization to store fuel with higher burnups consistent with future HI-STORM CoC amendments.

Licensing of the Diablo Canyon ISFSI also involves NRC review of a number of site-specific issues. They include the site-specific environmental review, geotechnical issues related to the site and natural phenomena, and other site-specific matters. Although the Holtec LAR 1041-1 includes a high-seismic capability for the storage overpack (the HI-STORM 100SA), it does not incorporate some Diablo Canyon specific information (for example, the pad design, the overpack seismic anchorage design, the cask transporter seismic design, and the CTF design). PG&E is submitting information

(2) Physical Configuration/Condition

Only fuel and associated nonfuel hardware irradiated at DCPP Units 1 and 2 with the physical configuration described in this section and SAR Section 10.2 will be stored in the Diablo Canyon ISFSI.

Fuel records will be maintained that identify the configuration and initial enrichment of each fuel assembly. Each fuel assembly and associated nonfuel hardware are engraved with a unique identification number. A verification of these numbers will be made to ensure that only approved fuel and associated nonfuel hardware is loaded in MPCs in accordance with the Diablo Canyon ISFSI TS and SAR Section 10.2.

3.1.1.2 Thermal and Radiological Characteristics

Details of the thermal and radiological characteristics of the DCPP fuel to be stored are provided in Table 3.1-2. The following fuel assembly thermal and radiological characteristics constitute the most significant limiting parameters for storage of fuel assemblies at the Diablo Canyon ISFSI.

(1) Heat Generation

The maximum heat generation rate for an assembly that is stored at the Diablo Canyon ISFSI will be less than that specified in SAR Section 10.2.

The heat generation rate of an individual fuel assembly is dependent on four factors: the initial fuel enrichment, the uranium mass, the fuel burnup, and the amount of cooling time. Fuel records will be used to ensure that the heat generation per assembly is less than that specified in SAR Section 10.2.

(2) Fuel Burnup

The maximum average fuel burnup per assembly of any fuel that is stored at the ISFSI will be limited to that specified in SAR Section 10.2. The maximum allowed burnup is a function of the fuel cooling time. To be consistent with the guidance contained in Interim Staff Guidance Document 11 (ISG-11), Revision 3, issued on November 17, 2003, fuel assemblies to be stored initially at the Diablo Canyon ISFSI will be limited to a maximum average burnup of ≤45,000 MWD/MTU (defined in ISG-11 as low burnup fuel) (see PG&E Letter DIL-04-002, dated January 15, 2004). This burnup limit is more restrictive than that contained in Revision 0 of the HI-STORM 100 System Certificate of Compliance 1014, as amended by License Amendment Request 1014-1, Revision 2, including Supplements 1 through 4, which is otherwise used as the basis for this application.

Because the HI-STORM 100 System licensing and design basis incorporated by reference in this application is taken from Revision 0 of the HI-STORM 100 System FSAR, many of the design and safety evaluations discussed in this SAR are for bounding burnups exceeding those authorized for loading at Diablo Canyon ISFSI (see, for example, the ISFSI thermal design discussed in Section 4.2, the radiological analyses in Chapter 7, and selected accident analyses in Chapter 8). Based on the fuel burnup limit of ≤45,000 MWD/MTU, these generic design and safety evaluations are conservative and bound the allowed cask contents in this application.

The fuel burnup limit is specified in Section 10.2 and in the proposed Diablo Canyon technical specifications. Holtec International is currently undergoing licensing review of an amendment request for the generic HI-STORM System design (LAR 1014-2), whereby higher fuel burnups will be authorized for loading, consistent with the guidance of ISG-11, Revision 3. PG&E anticipates requesting authorization to store fuel with higher burnups consistent with future HI-STORM CoC amendments.

(3) Cooling Time

The cooling time of any fuel that is stored at the ISFSI will be greater than or equal to 5 years as specified in SAR Section 10.2. The minimum required cooling time is a function of the fuel burnup and decay heat.

air duct inlet and outlet screens at the ISFSI pad to verify that the air duct screens are not blocked and are intact as required by the Diablo Canyon ISFSI TS.

3.1.3 REFERENCES

1. Diablo Canyon Power Plant Units 1 & 2 Final Safety Analysis Report Update, Revision 14, November 2001.

2. 10 CFR 72 Certificate of Compliance No. 1014 for the HI-STORM 100 System Dry Cask Storage System, Holtec International, Revision 0, May 2000.

3. License Amendment Request No. 1014-1, Holtec International, Revision 2, July 2001 including Supplements 1 through 4 dated August 17, 2001; October 5, 2001; October 12, 2001; and October 19, 2001; respectively.

4. Final Safety Analysis Report for the HI-STORM 100 System, Holtec International Report No. HI-2002444, Revision 0, July 2000.

5. Cladding Considerations for the Transportation and Storage of Spent Fuel, Interim Staff Guidance Document (ISG) 11, Revision 3, November 17, 2003.

The thermal performance of the MPC to limit fuel cladding temperature inside the transfer cask during welding, draining, drying, and helium backfill operations, and during transportation of the loaded transfer cask to the CTF is bounded by the thermal evaluation performed with the MPC under a hypothetical, complete-vacuum condition. The vacuum condition is bounding for the other transient operational conditions mentioned above, because there is no fluid medium to transfer heat from the fuel to the MPC shell. In the other conditions, there is some amount of either helium or water in the MPC cavity to enhance heat transfer. All internal MPC heat transfer in the vacuum condition is through conduction and radiation.

Sections 4.5.1.1.4 and 4.5.2.2 of the HI-STORM 100 System FSAR, as amended by LAR 1014-1, discuss the thermal evaluation of the MPC under vacuum conditions and the resultant MPC and fuel cladding temperatures with design-basis heat load. Maximum fuel cladding temperatures for the MPC-24, MPC-32, and MPC-24E are shown to be 960 °F, 1040 °F, and 942 °F, respectively, in Table 4.5.9 of the HI-STORM 100 System FSAR. All of these temperatures are less than the short-term temperature limit of 1058 °F. ~~Fuel cladding temperatures are shown in HI-STORM 100 System FSAR Table 4.5.9, and are all less than 1,000°F, which is less than the short-term temperature limit of 1,058°F.~~ The design-basis heat load used for this evaluation bounds the heat load for all combinations of DCPP fuel to be loaded into the HI-STORM 100 System. The characteristics of the operations to be performed at Diablo Canyon are the same as those described in the HI-STORM 100 System FSAR. Therefore, the evaluations described in Section 4.5 of the HI-STORM 100 System FSAR, as amended by Holtec LAR 1014-1, bound operations at DCPP.

The above discussion demonstrates that the HI-STORM 100 System as deployed at the Diablo Canyon ISFSI meets the requirements of 10 CFR 72.122(h), 72.128(a)(4), and 72.236(f) and (g) for thermal design.

4.2.3.3.3.1 HI-STORM Overpack at the CTF

The site-specific design of the Diablo Canyon CTF involves transferring a loaded MPC into the overpack with the overpack located below grade in a vault. The thermal implications of the difference between a loaded overpack located in a vault and one located at grade level have been evaluated.

Under normal conditions, the loaded overpack will remain in the vault only for the time it takes to remove the transfer cask from atop the overpack, retrieve and install the overpack lid, and raise the overpack out of the vault with the CTF lift system. This is expected to take less than 4 hours and has an insignificant effect on heat removal and fuel cladding temperatures.

Under off-normal conditions, such as a power failure affecting the CTF lift system, the condition could last several hours, depending upon the time it takes to complete corrective actions to restore power, or to provide an alternate power source. The effect of a loss of electrical power on the ability of the overpack to transfer the heat from the saturation temperature for the water is reduced, causing evaporation of residual water) or through the use of a forced helium dehydration (FHD) system ~~(required for high burnup fuel)~~. The design criteria for the FHD system are provided in Section 10.2. The Diablo Canyon ISFSI TS program controls and SAR Section 10.2 specify the dryness acceptance criteria for both methods of drying. After meeting the drying acceptance criteria, the MPC is backfilled with 99.995 percent pure helium to within a pressure range defined by SAR Section 10.2.

When the MPC has been satisfactorily drained, dried, backfilled with helium, and the lid-to-shell weld has been leak tested, the MPC vent and drain port cover plates are welded on, inspected, and leak tested in accordance with the commitments in the HI-STORM 100 System FSAR, including ANSI N14.5-97. Then, the MPC closure ring is welded in place and inspected in accordance with the commitments in the HI-STORM 100 System FSAR. The inner diameter of the closure ring is welded to the MPC lid and the outer diameter is welded to the top of the MPC shell. The MPC-to-transfer cask annulus may be drained at any time after the MPC has been successfully backfilled with helium.

The MPC lift cleats are attached to the MPC lid, and the MPC is now ready for transfer to storage. The transfer cask top lid is installed. The impact limiter is unbolted from the bottom of the transfer cask and the lift yoke is re-engaged with the transfer-cask-lifting trunnions. The bolts attaching the impact limiter are removed. The FHB crane is used to lift the loaded transfer cask to a height sufficient to detach the impact limiter from the transfer cask, and the crane tension links are installed (the transfer cask remains directly above the impact limiter until the tension links are operable). The seismic restraint system in the cask washdown area is then opened. The height to which the transfer cask is lifted is carefully controlled to be equal to the thickness of the cask transport frame plus a minimal clearance needed to move the cask onto the cask transport frame.

The transfer cask is then moved laterally to the cask transport frame, staged nearby in the upright position. The transfer cask is attached to the cask transport frame and the cask transport frame stabilizer is removed. After the crane tension links are removed, an impact limiter is positioned to protect the loaded transfer cask, and to protect the FHB/AB in case of a crane load-handling equipment failure (see Figure 4.4-2). As the loaded transfer cask and cask transport frame are lowered to just above the impact limiter, the impact limiter is removed from the downending path to allow completion of the downending operation onto the rail dolly for movement outside the FHB/AB. The cask transport frame is moved out of the FHB/AB on rails to a position just outside the FHB/AB door.

4.4.1.2.4 MPC Transfer and Overpack Storage at the ISFSI

Outside the FHB/AB, the loaded transfer cask and cask transport frame are rigged to the cask transporter and moved to the CTF in the horizontal position. These evolutions and the cask transport system design, including associated lifting components, are

10.2 DEVELOPMENT OF OPERATING CONTROLS AND LIMITS

This section provides an overview of, and the general bases for, operating controls and limits specified for the Diablo Canyon ISFSI.

10.2.1 FUNCTIONAL AND OPERATING LIMITS, MONITORING INSTRUMENTS, AND LIMITING CONTROL SETTINGS

To be consistent with the guidance contained in Interim Staff Guidance Document 11 (ISG-11), Revision 3, issued on November 17, 2003, fuel assemblies to be stored initially at the Diablo Canyon ISFSI will be limited to a maximum average burnup of ≤45,000 MWD/MTU (defined in ISG-11 as low burnup fuel) (see PG&E Letter DIL-04-002, dated January 16, 2004). This burnup limit is more restrictive than that contained in Revision 0 of the HI-STORM 100 System Certificate of Compliance (CoC) 1014, as amended by License Amendment Request 1014-1, Revision 2, including Supplements 1 through 4, which is otherwise used as the basis for this application.

Because the HI-STORM 100 System licensing and design basis incorporated by reference in this application is taken from Revision 0 of the HI-STORM 100 System FSAR, many of the design and safety evaluations discussed in this SAR are for bounding burnups exceeding those authorized for loading at the Diablo Canyon ISFSI (see, for example, the ISFSI thermal design discussed in Section 4.2, the radiological analyses in Chapter 7, and selected accident analyses in Chapter 8). Based on the fuel burnup limit of ≤45,000 MWD/MTU, these generic design and safety evaluations are conservative and bound the allowed cask contents in this application.

The fuel burnup limit is specified in the proposed Diablo Canyon technical specifications and discussed below. Holtec International is currently undergoing licensing review of an amendment request for the generic HI-STORM System design (LAR 1014-2), whereby higher fuel burnups will be authorized for loading, consistent with the guidance of ISG-11, Revision 3,. PG&E anticipates requesting authorization to store fuel with higher burnups consistent with future HI-STORM CoC amendments.

This section provides requirements for the controls or limits that apply to operating variables classified as important to safety and are observable and measurable. The operating variables required for the safe operation of the Diablo Canyon ISFSI are:

- Spent fuel characteristics
- Spent fuel storage cask (SFSC) heat removal capability
- Multi-purpose canister (MPC) dissolved boron concentration level
- Annulus gap water requirement during moisture removal for loading and reflooding for unloading

- Water temperature of a flooded MPC
- MPC vacuum pressures
- MPC recirculation gas exit temperature
- Helium purity
- MPC helium backfill pressures
- Gas exit temperature of a MPC prior to reflooding
- SFSC time limitation while seated in the cask transfer facility (CTF)
- ~~Fuel cladding oxide thickness~~

Each of the specifications for these characteristics is provided below with the exception of the MPC dissolved boron concentration, SFSC time limitation in the CTF, and heat removal parameters, which are provided in the Diablo Canyon ISFSI Technical Specifications (TS) and their bases. Although provided in the SAR sections below, the TS and bases also provide Limiting Conditions for Operation and bases for maintaining the integrity of the MPC during loading and unloading. These include vacuum pressure, recirculation gas temperature, backfill pressure, and leak rate during loading, and exit gas temperature during unloading.

10.2.1.1 Fuel Characteristics

The Diablo Canyon ISFSI is designed to provide interim storage for up to 4,400 fuel assemblies, which accommodates the number of assemblies predicted to be used during the licensed operating life of the plant. The Diablo Canyon ISFSI storage system will use four MPC types for the storage of fuel assemblies, fuel debris and associated nonfuel hardware. The DCPP fuel will normally be stored as nonconsolidated fuel assemblies both with and without control components. The intact fuel assemblies will be stored in either the MPC-24, MPC-24E, MPC-24EF, or MPC-32 canisters. The damaged fuel assemblies can only be stored in MPC-24E or MPC-24EF canisters, and the fuel debris can only be stored in MPC-24EF canisters. Damaged fuel or fuel debris will be placed in a damaged fuel container before loading into an MPC. The fuel debris can be consolidated, however, the amount of debris is limited to the equivalent of a single intact fuel assembly.

Fuel qualification is based on the requirements for criticality safety, decay heat removal, radiological protection, and structural integrity. The analysis presented in Chapters 4, 7 and 8 of this SAR documents the qualification of DCPP inventory of spent fuel assemblies and associated nonfuel hardware for storage in the Diablo Canyon ISFSI storage system design.

10.2-4 and other referenced tables may be stored in the SFSC system. These SAR tables and specifications are duplicated in Tables 2.2-1 through 2.2-10 of the Diablo Canyon ISFSI TS.

- For MPCs partially loaded with damaged fuel assemblies or fuel debris, all remaining intact fuel assemblies in the MPC shall meet the decay heat generation limits for the damaged fuel assemblies. This requirement applies only to uniform fuel loading.

Fuel proposed for storage at the Diablo Canyon ISFSI is bounded by the thermal analyses described in References 1 and 2. The thermal design is also summarized in Section 4.2.3.3.3 of the Diablo Canyon ISFSI SAR. Off-normal and accident conditions for the HI-STORM 100 System are addressed in Sections 11.1 and 11.2, respectively, of Reference 1.

10.2.1.3 Uniform and Preferential Fuel Loading

Fuel assemblies used in uniform or preferential fuel loading shall meet all applicable limits specified in Tables 10.2-1, 10.2-2, 10.2-3, 10.2-4, and 10.2-5. Fuel assembly burnup, decay heat, and cooling time limits for uniform loading are specified in Tables 10.2-6 and 10.2-7. Preferential fuel loading shall be used during uniform loading (that is, any authorized fuel assembly in any fuel storage location) whenever fuel assemblies with significantly different post-irradiation cooling times (≥ 1 year) are to be loaded in the same MPC. Fuel assemblies with the longest post-irradiation cooling times shall be loaded into fuel storage locations at the periphery of the basket. Fuel assemblies with shorter post-irradiation cooling times shall be placed toward the center of the basket. Regionalized fuel loading as described in 10.2.1.4 below meets the intent of preferential fuel loading.

10.2.1.4 Regionalized Fuel Loading

Fuel may be stored using regionalized loading in lieu of uniform loading to allow higher heat emitting fuel assemblies to be stored than would otherwise be able to be stored using uniform loading. Figures 10.2-1 through 10.2-3 (these figures are duplicated in the Diablo Canyon ISFSI TS as Figures 2.1-1 through 2.1-3), define the regions for the MPC-24; MPC-24E/MPC-24EF; and MPC-32 models, respectively. Fuel assembly burnup, decay heat, and cooling time limits for regionalized loading are specified in Tables 10.2-8 and 10.2-9. In addition, fuel assemblies used in regionalized loading shall meet all other applicable limits specified in Tables 10.2-1, 10.2-2, 10.2-3, 10.2-4, and 10.2-5. Limitations on nonfuel hardware to be stored with their associated fuel assemblies are provided in Table 10.2-10.

10.2.1.5 For Allowable Content - Functional and Operating Limits Violations

If any fuel specifications or loading conditions above are violated, the following Diablo Canyon ISFSI TS actions shall be completed:

10.2.2.1 Annulus Gap Water Requirement

For loading the MPC-24 or MPC-24E/EF with heat loads up to 20.8 kW, maintaining water in the annulus between the MPC and the HI-TRAC transfer cask is sufficient to ensure the thermal analysis for the vacuum condition is preserved. For heat loads in the MPC-24 or MPC-24E/EF greater than 20.8 kW or any heat load in the MPC-32, the water in the annulus needs to be continuously flushed with water during vacuum drying operations (References 1 and 2, Section 4.5.1.1.4.1).

~~During the loading and unloading processes there are time periods when there is no water in the MPC, or it is being removed, or the inert environment in the MPC cavity has not been completely established or maintained at levels that will continue to provide adequate cooling and maintain fuel cladding integrity. During these time periods maintaining the water level in the annular gap and continuous recirculation for high heat fuel (> 22 kw) between the loaded MPC and the transfer cask ensures that the cooling capability is adequate to maintain the fuel cladding integrity.~~ As long as the annular gap water level is maintained with borated water and the temperature of the water in the gap is maintained below boiling through continuous flushing~~recirculation~~, there is no time limitation for refilling the MPC with borated water or establishing an acceptable inert environment in the MPC.~~-for moderate burnup fuel (≤45,000 MWD/MTU).~~ However, without ~~recirculation~~ continuous flushing of the annulus water gap, there is a limit of 2 hours to establish this process or establish an inert environment. ~~For higher burnup fuel (>45,000 MWD/MTU), which requires the use of a forced helium dehydration (FHD) system for drying, once the drying process is completed and if residual helium is not removed from the MPC, there is a limit of 2 hours to re-establish an inert environment in the MPC. This is discussed further in Section 10.2.2.3.~~

During the loading process, prior to start of the removal of water from the MPC through the vacuum drying process, the annular gap shall be filled and ~~maintained full~~continuously flushed throughout the drying and backfill process. For heat loads in the MPC-24 or MPC-24E/EF greater than 20.8 kW or any heat load in the MPC-32, the water in the annulus needs to be continuously flushed with water during vacuum drying operations (References 1 and 2, Section 4.5.1.1.4.1). This water level shall be maintained until the MPC inert environment is established at an acceptable level to support long-term storage or the MPC is refilled with water. In addition, during an unloading process the annular gap shall be filled with water prior to removal of the inert environment in the MPC cavity. There are no annulus gap water requirements if the forced helium dehydration (FHD) system is used for MPC moisture removal.

10.2.2.2 MPC Water Temperature

During the loading and unloading processes, maintaining the integrity of the fuel in the MPC is the critical activity. As a result of decay heat produced by the spent fuel assemblies, providing a coolant source is imperative to maintaining control of cladding temperature and the fuel integrity. During these processes when there is water in the MPC, the water is considered the coolant source. As long as there is water in the MPC it will continue to perform the coolant function. This water should continue to perform its function as long as it does not reach the boiling temperature. As a result, the parameter that will best indicate the potential reduction of water would be the temperature of the water in the MPC. However, since monitoring the water temperature in the MPC directly may not always be possible, an analysis of the potential for the water to reach the boil-off temperature is performed to ensure that the boil-off temperature cannot be reached. This analysis will be based on the decay heat levels of the contents and the various volumes of water in the MPC as it is loaded. The results of this analysis will provide any time limitation or any requirement for compensatory measures.

While there is water in the MPC, there will be adequate assurance through analysis that the temperature of that water in the MPC will not reach the boil-off level and that the volume of water in the MPC is not allowed to decrease significantly. If the water temperature is shown to potentially reach the boiling level, action will be taken to limit the time of the activity to less than the time to boil off or, as a minimum, continue to replace the volume of water that is boiling off. If no action is possible to correct this condition, then the content loaded in the MPC shall be removed and placed back in the SFP.

10.2.2.3 MPC Drying Characteristics

~~Dependent on the allowable content of a specific MPC,~~The cavity moisture removal can be performed by using either vacuum drying or the ~~a Forced Helium Dehydration (~~FHD~~)~~ system after the MPC has been drained of water. See Figure 10.2-4 for a schematic diagram of the FHD system. The Standard Review Plan (SRP) acceptance criterion for dryness is ≤ 1 gram-mole per cask of oxidizing gases. This has been translated by the industry to be 3 torr for vacuum drying. For the recirculation drying process using the FHD system, measuring the temperature of the gas exiting the demoisturizer of the FHD system provides an indication of the amount of water vapor entrained in the helium gas in the MPC. Maintaining a demoisturizer exit temperature of less than or equal to 21°F for 30 minutes or more during the recirculation drying process ensures that the partial pressure of the entrained water vapor in the MPC is less than 3 torr.

~~If the MPC contains only moderate burnup fuel (≤ 45,000 MWD/MTU)~~ When vacuum drying is~~can be~~ used, ~~In this process~~ any water that has not drained from the MPC cavity evaporates from the MPC cavity due to the vacuum. This drying is aided by the temperature increase due to the decay heat of the fuel. To ensure adequate drying the vacuum drying pressure in the MPC must be verified to be at ≤ 3 torr for ≥ 30 minutes. This low vacuum pressure is an indication that the cavity is dry and the moisture level in the MPC is acceptable.

~~For any MPC that contains fuel assemblies of any authorized burnup, the~~ When the FHD system is~~can be~~ used, ~~to remove~~ the remaining moisture in the MPC cavity is removed after all of the water that can practically be removed through the drain line using a hydraulic pump has been expelled in the water blowdown operation. ~~The FHD system is required to be used for any MPCs containing at least one high burnup fuel~~

~~assembly (>45,000 MWD/MTU).~~The recirculation process using the FHD involves introducing dry gas into the MPC cavity that absorbs the residual moisture in the MPC. This humidified gas exits the MPC and the absorbed water is removed through condensation and/or mechanical drying. The dried gas is then forced back through the MPC until the gas exit temperature from the FHD demoisturizer is ≤ 21°F for at least 30 minutes. Meeting these temperature and time criteria ensures that the cavity is dry and the moisture level in the MPC is acceptable. The FHD system shall be designed to ensure that during normal operation (that is, excluding startup and shutdown ramps) the following criteria are met:

(1) The temperature of helium gas in the MPC shall be at least 15°F higher than the saturation temperature at coincident pressure.

(2) The pressure in the MPC cavity space shall be less than or equal to 60.3 psig (75 psia).

(3) The recirculation rate of helium shall be sufficiently high (minimum hourly throughput equal to ten times the nominal helium mass backfilled into the MPC for fuel storage operations) so as to produce a turbulated flow regime in the MPC cavity.

(4) The partial pressure of the water vapor in the MPC cavity will not exceed 3 torr if the helium temperature at the demoisturizer outlet is ≤ 21°F for a period of 30 minutes.

In addition to the above system design criteria, the individual modules shall be designed in accordance with the following criteria:

(1) The condensing module shall be designed to devaporize the recirculating helium gas to a dew point of 120°F or less.

(2) The demoisturizer module shall be configured to be introduced into its helium conditioning function after the condensing module has been operated for the required length of time to ensure that the bulk moisture vaporization in the MPC has been completed.

(3) The helium circulator shall be sized to effect the minimum flow rate of circulation required by the system design criteria described above.

(4) The preheater module shall be engineered to ensure that the temperature of the helium gas in the MPC meets the system design criteria described above.

The design of the FHD system is subject to the confirmatory analyses listed below to ensure that the system will accomplish the performance objectives set forth in this SAR.

(1) System thermal analysis in Phase 1: Characterize the rate of condensation in the condensing module and helium temperature variation under Phase 1 operation (i.e., the scenario where there is some unevaporated water in the MPC) using a classical thermal-hydraulic model wherein the incoming helium is assumed to fully mix with the moist helium inside the MPC.

(2) System thermal analysis in Phase 2: Characterize the thermal performance of the closed loop system in Phase 2 (no unvaporized moisture in the MPC) to predict the rate of condensation and temperature of the helium gas exiting the condensing and the demoisturizer modules. Establish that the system design is capable to ensure that partial pressure of water vapor in the MPC will reach less than or equal to 3 torr if the temperature of the helium gas exiting the demoisturizer is predicted to be at a maximum of 21°F for 30 minutes.

(3) Fuel Cladding Temperature Analysis: A steady-state thermal analysis of the MPC under the forced helium flow scenario shall be performed using the methodology described in HI-STORM 100 FSAR Subsections 4.4.1.1.1 through 4.4.1.1.4 with due recognition of the forced convection process during FHD system operation. This analysis shall demonstrate that the peak temperature of the fuel cladding under the most adverse condition of FHD system operation (design maximum heat load, no moisture, and maximum helium inlet temperature), is below the fuel peak cladding temperature limit for normal conditions of 400 °C.storage for the applicable fuel types (PWR or BWR) and cooling times at the start of dry storage.

If Diablo Canyon is the first user of the FHD system designed and built for the MPC drying function, the system will be subject to confirmatory testing as follows:

(1) A representative quantity of water will be placed in a manufactured MPC (or equivalent mock-up) and the closure lid and RVOAs installed and secured to create a hermetically sealed container.

(2) The MPC cavity drying test will be conducted for the worst case scenario (no heat generation within the MPC available to vaporize water).

(3) The drain and vent line RVOAs on the MPC lid will be connected to the terminals located in the preheater and condensing modules of the FHD system, respectively.

During the fuel cool-down process, if the MPC helium gas exit temperature limit is not met, proceeding with reflooding shall be prohibited and actions must be taken to restore the parameters to within the limits before reflooding. In addition, while this parameter is being restored within limits, the proper conditions must be verified to exist for the transfer of heat from the MPC to the surrounding environs to ensure the fuel cladding remains below the short-term temperature limit. Maintaining the annular gap water level between the MPC and the transfer cask will ensure that adequate cooling capability exits.

10.2.4 OTHER OPERATING CONTROLS AND LIMITS

None

10.2.4.1 Fuel Cladding Oxide Thickness

In determining whether fuel assemblies are considered intact or damaged, several parameters are considered as is discussed in Section 10.2.1. Most of these parameters concern known or suspected cladding failures. However, for high burnup fuel (> 45,000 MWD/MTU), fuel cladding oxidation is also a concern and shall be evaluated prior to a specific fuel assembly being identified as an intact assembly. A very high oxidation level can mean that a fuel assemble is not structurally sound and may fail in storage causing a change in the conditions inside the affected MPC. The evaluation of fuel cladding oxidation can be performed by actual physical measurement or an appropriate predictive methodology. For a high burnup spent fuel assembly to be classified as an intact fuel assembly, the computed or measured average oxidation layer thickness shall not exceed the applicable maximum allowable average fuel cladding oxidation layer thickness provided in the Diablo Canyon ISFSI Technical Specifications.

For a high burnup fuel assembly, if the fuel cladding oxidation layer thickness that is computed or measured on any fuel rod exceeds the limit, that fuel assembly will be considered a damaged fuel assembly. As such it will require storage in a damaged fuel container and limited to what MPC type it may be stored in.

10.2.5 LIMITING CONDITIONS FOR OPERATION

10.2.5.1 Equipment

All Diablo Canyon ISFSI equipment important to safety is passive in nature, therefore, there are no limiting conditions regarding minimum available equipment or operating characteristics. The MPC, transfer cask, CTF, and overpack have been analyzed for all credible equipment failure modes and extreme environmental conditions. No credible postulated event results in damage to fuel, release of radioactivity above acceptable limits, or danger to the public health and safety. All operational equipment is to be maintained, tested, and operated according to the implementing procedures developed for the ISFSI. The failure or unavailability of any operational equipment can delay the transfer of an MPC to the transfer cask or to the SFSC, but would not result in an unsafe condition.

10.2.5.2 Technical Conditions and Characteristics

The following technical conditions and characteristics are required for the Diablo Canyon ISFSI:

- Spent fuel characteristics
- SFSC heat removal capability
- MPC dissolved boron concentration level
- Annulus gap water requirement during moisture removal for loading and reflooding for unloading
- Water temperature of a flooded MPC
- MPC vacuum pressures
- MPC recirculation gas exit temperature
- Helium purity
- MPC helium backfill pressures
- Gas exit temperature of an MPC prior to reflooding
- SFSC time limitation while seated in the CTF
- ~~Fuel cladding oxide thickness~~

The spent fuel specifications for allowable content for storage in the ISFSI and their bases are detailed in Section 10.2.1. In addition, the spent fuel specifications are also contained in Diablo Canyon ISFSI TS Section 2.0. A description of bases for selecting the above remaining conditions and characteristics are detailed in Sections 10.2.2 through 10.2.4, with the exception of the heat removal capability, SFSC time limitation in the CTF, and dissolved boron concentration. These are provided in the Diablo Canyon ISFSI TS bases. Although provided in the above SAR sections, the Diablo Canyon ISFSI TS and TS Bases also provide Limiting Conditions for Operations and bases for maintaining the integrity of the MPC during loading and unloading. These include vacuum pressure, recirculation gas temperature, backfill pressure, and leak rate during loading, and exit gas temperature during unloading.

The combination of the above controls and limits and those discussed previously in Section 10.2 define requirements for the Diablo Canyon ISFSI storage system components that provide radiological protection and structural integrity during normal storage and postulated accident conditions.

10.2.8 ADMINISTRATIVE CONTROLS

Use of the existing DCPP organizational and administrative systems and procedures, record keeping, review, audit, and reporting requirements coupled with the requirements of this SAR ensure that the operations involved in the storage of spent fuel at the ISFSI are performed in a safe manner. This includes both the selection of assemblies qualified for ISFSI storage and the verification of assembly identification numbers prior to and after placement into individual MPCs. The spent fuel qualification, identification, and control are discussed in Sections 10.2.1 through 10.2.4 above. Other administrative programs will control revisions to the Diablo Canyon ISFSI TS Bases; radioactive effluents; fuel-cladding-oxide thickness; MPC loading and unloading processes; ISFSI operations, and transportation route conditions. These other programs are defined in the Diablo Canyon ISFSI TS.

10.2.9 OPERATING CONTROL AND LIMIT SPECIFICATIONS

The operating controls and limits applicable to the Diablo Canyon ISFSI, as documented in this SAR, are delineated in the Diablo Canyon ISFSI TS and the TS Bases. These include:

- MPC dryness, backfill pressure and leak rate limitations
- SFSC heat removal capability
- Fuel Cool-Down exit gas temperature limitation
- SFSC time limitation in the CTF
- Dissolved boron concentration

10.2.10 REFERENCES

Detailed information describing the HI-STORM 100 System is provided in the following two references, which must be used together:

1. Final Safety Analysis Report for HI-STORM 100 System, Revision 0, July 2000.

2. License Amendment Request 1014-1, Holtec International, Revision 2, July 2001, including Supplements 1 through 4 dated August 17, 2001; October 5, 2001; October 12, 2001; and October 19, 2001; respectively.

3. Cladding Considerations for the Transportation and Storage of Spent Fuel, Interim Staff Guidance Document 11, Revision 3, NRC, November 17, 2003.

Reference 2 contains information related to MPC-32, MPC-24, MPC-24E, MPC-24EF, and the HI-STORM 100SA. General references to these documents are made in Chapter 10 as needed to supplement SAR information.

TABLE 10.2-6

FUEL ASSEMBLY COOLING AND MAXIMUM AVERAGE BURNUP (UNIFORM FUEL LOADING)

Post-Irradiation Cooling Time (years)	MPC-24 Assembly Burnup (Intact Fuel Assemblies) (MWD/MTU)	MPC-24E/24EF Assembly Burnup (Intact Fuel Assemblies) (MWD/MTU)	MPC-24E/24EF Assembly Burnup (Damaged Fuel Assemblies and Fuel Debris) (MWD/MTU)	MPC-32 Assembly Burnup (Intact Fuel Assemblies) (MWD/MTU)
≥ 5	40,600	41,100	39,200	32,200
≥ 6	45,000	45,000	43,700	36,500
≥ 7	45,000~~45,900~~	45,000~~46,300~~	44,500	37,500
≥ 8	45,000~~48,300~~	45,000~~48,900~~	45,000~~46,900~~	39,900
≥ 9	45,000~~50,300~~	45,000~~50,700~~	45,000~~43,700~~	41,500
≥ 10	45,000~~51,600~~	45,000~~52,100~~	45,000~~50,100~~	42,900
≥ 11	45,000~~53,100~~	45,000~~53,700~~	45,000~~51,500~~	44,100
≥ 12	45,000~~54,500~~	45,000~~55,100~~	45,000~~52,600~~	45,000
≥ 13	45,000~~55,600~~	45,000~~56,100~~	45,000~~53,800~~	45,000~~45,700~~
≥ 14	45,000~~56,500~~	45,000~~57,100~~	45,000~~54,900~~	45,000~~46,500~~
≥ 15	45,000~~57,400~~	45,000~~58,000~~	45,000~~55,800~~	45,000~~47,200~~

NOTE 1: Linear interpolation between points is permitted.
NOTE 2: Burnup for fuel assemblies with cladding made of ZIRLO is limited to 45,000 MWD/MTU or the value in this table, whichever is less.

TABLE 10.2-8

FUEL ASSEMBLY COOLING AND MAXIMUM AVERAGE BURNUP
(REGIONALIZED FUEL LOADING)

Post-Irradiation Cooling Time (years)	MPC-24 Assembly Burnup for Region 1 (MWD/MTU)	MPC-24 Assembly Burnup for Region 2 (MWD/MTU)	MPC-24E/24EF Assembly Burnup for Region 1 (MWD/MTU)	MPC-24E/24EF Assembly Burnup for Region 2 (MWD/MTU)	MPC-32 Assembly Burnup for Region 1 (MWD/MTU)	MPC-32 Assembly Burnup for Region 2 (MWD/MTU)
≥ 5	45,000~~49,800~~	32,200	45,000~~51,600~~	32,200	39,800	22,100
≥ 6	45,000~~56,100~~	37,400	45,000~~58,400~~	37,400	43,400	26,200
≥ 7	45,000~~56,400~~	41,100	45,000~~58,500~~	41,100	44,500	29,100
≥ 8	45,000~~58,800~~	43,800	45,000~~60,900~~	43,800	45,000~~46,700~~	31,200
≥ 9	45,000~~60,400~~	45,000~~45,800~~	45,000~~62,300~~	45,000~~45,800~~	45,000~~48,400~~	32,700
≥ 10	45,000~~61,200~~	45,000~~47,500~~	45,000~~63,300~~	45,000~~47,500~~	45,000~~49,600~~	34,100
≥ 11	45,000~~62,400~~	45,000~~49,000~~	45,000~~64,900~~	45,000~~49,000~~	45,000~~50,900~~	35,200
≥ 12	45,000~~63,700~~	45,000~~50,400~~	45,000~~65,900~~	45,000~~50,400~~	45,000~~51,900~~	36,200
≥ 13	45,000~~64,800~~	45,000~~51,500~~	45,000~~66,800~~	45,000~~51,500~~	45,000~~52,900~~	37,000
≥ 14	45,000~~65,500~~	45,000~~52,500~~	45,000~~67,500~~	45,000~~52,500~~	45,000~~53,800~~	37,800
≥ 15	45,000~~66,200~~	45,000~~53,700~~	45,000~~68,200~~	45,000~~53,700~~	45,000~~54,700~~	38,600
≥ 16	-	45,000~~55,000~~	-	45,000~~55,000~~	-	39,400
≥ 17	-	45,000~~55,900~~	-	45,000~~55,900~~	-	40,200
≥ 18	-	45,000~~56,800~~	-	45,000~~56,800~~	-	40,800
≥ 19	-	45,000~~57,800~~	-	45,000~~57,800~~	-	41,500
≥ 20	-	45,000~~58,800~~	-	45,000~~58,800~~	-	42,200

NOTE 1: Linear interpolation between points is permitted.

NOTE 2: These limits apply to intact fuel assemblies, damaged fuel assemblies, and fuel debris.

NOTE 3: Burnup for fuel assemblies with cladding made of ZIRLO is limited to 45,000 MWD/MTU or the value in this table, whichever is less.

ENCLOSURE 2

Proposed ISFSI Technical Specification Changes

TABLE 2.1-6

FUEL ASSEMBLY COOLING AND MAXIMUM AVERAGE BURNUP
(UNIFORM FUEL LOADING)

Post-Irradiation Cooling Time (years)	MPC-24 Assembly Burnup (INTACT FUEL ASSEMBLIES) (MWD/MTU)	MPC-24E/24EF Assembly Burnup (INTACT FUEL ASSEMBLIES) (MWD/MTU)	MPC-24E/24EF Assembly Burnup (DAMAGED FUEL ASSEMBLIES and FUEL DEBRIS) (MWD/MTU)	MPC-32 Assembly Burnup (INTACT FUEL ASSEMBLIES) (MWD/MTU)
≥ 5	40,600	41,100	39,200	32,200
≥ 6	45,000	45,000	43,700	36,500
≥ 7	45,000~~900~~	45,000~~46,300~~	44,500	37,500
≥ 8	~~48,300~~45,000	45,000~~48,900~~	45,000~~46,900~~	39,900
≥ 9	~~50,300~~45,000	45,000~~50,700~~	45,000~~48,700~~	41,500
≥ 10	~~51,600~~45,000	45,000~~52,100~~	45,000~~50,100~~	42,900
≥ 11	~~53,100~~45,000	45,000~~53,700~~	45,000~~51,500~~	44,100
≥ 12	45,000~~54,500~~	45,000~~55,100~~	45,000~~52,600~~	45,000
≥ 13	45,000~~55,600~~	45,000~~56,100~~	45,000~~53,800~~	45,000~~45,700~~
≥ 14	45,000~~56,500~~	45,000~~57,100~~	45,000~~54,900~~	45,000~~46,500~~
≥ 15	45,000~~57,400~~	45,000~~58,000~~	45,000~~55,800~~	45,000~~47,200~~

NOTE 1: Linear interpolation between points is permitted.
NOTE 2: Burnup for fuel assemblies with cladding made of ZIRLO is limited to 45,000 MWD/MTU or the value in this table, whichever is less.

TABLE 2.1-8

FUEL ASSEMBLY COOLING AND MAXIMUM AVERAGE BURNUP
(REGIONALIZED FUEL LOADING)

Post-Irradiation Cooling Time (years)	MPC-24 Assembly Burnup for Region 1 (MWD/MTU)	MPC-24 Assembly Burnup for Region 2 (MWD/MTU)	MPC-24E/24EF Assembly Burnup for Region 1 (MWD/MTU)	MPC-24E/24EF Assembly Burnup for Region 2 (MWD/MTU)	MPC-32 Assembly Burnup for Region 1 (MWD/MTU)	MPC-32 Assembly Burnup for Region 2 (MWD/MTU)
≥ 5	45,00049,800	32,200	45,00051,600	32,200	39,800	22,100
≥ 6	45,00056,100	37,400	45,00058,400	37,400	43,400	26,200
≥ 7	45,00056,400	41,100	45,00058,500	41,100	44,500	29,100
≥ 8	45,00058,800	43,800	45,00060,900	43,800	45,00046,700	31,200
≥ 9	45,00060,400	45,00045,800	45,00062,300	45,00045,800	45,00048,400	32,700
≥ 10	45,00061,200	45,00047,500	45,00063,300	45,00047,500	45,00049,600	34,100
≥ 11	45,00062,400	45,00049,000	45,00064,900	45,00049,000	45,00050,900	35,200
≥ 12	45,00063,700	45,00050,400	45,00065,900	45,00050,400	45,00051,900	36,200
≥ 13	45,00064,800	45,00051,500	45,00066,800	45,00051,500	45,00052,900	37,000
≥ 14	45,00065,500	45,00052,500	45,00067,500	45,00052,500	45,00053,800	37,800
≥ 15	45,00066,200	45,00053,700	45,00068,200	45,00053,700	45,00054,700	38,600
≥ 16	-	45,00055,000	-	45,00055,000	-	39,400
≥ 17	-	45,00055,900	-	45,00055,900	-	40,200
≥ 18	-	45,00056,800	-	45,00056,800	-	40,800
≥ 19	-	45,00057,800	-	45,00057,800	-	41,500
≥ 20	-	45,00058,800	-	45,00058,800	-	42,200

NOTE 1: Linear interpolation between points is permitted.

NOTE 2: These limits apply to INTACT FUEL ASSEMBLIES, DAMAGED FUEL ASSEMBLIES, and FUEL DEBRIS.

NOTE 3: Burnup for fuel assemblies with cladding made of ZIRLO is limited to 45,000 MWD/MTU or the value in this table, whichever is less.

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. MPC helium leak rate limit not met.	C.1	Perform an engineering evaluation to determine the impact of increased helium leak rate on heat removal capability and offsite dose.	24 hours
	AND		
	C.2	Develop and initiate corrective actions necessary to return the MPC to an analyzed condition.	7 days
D. Required Actions and associated Completion Times not met.	D.1	Remove all fuel assemblies from the MPC.	30 days

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.1.1	~~For those MPCs containing all moderate burnup (≤ 45,000 MWD/MTU) fuel assemblies~~V~~, v~~erify MPC cavity vacuum drying pressure is ≤ 3 torr for ≥ 30 min. OR ~~For those MPCs containing fuel assemblies of any authorized burnup,~~ W~~w~~hile recirculating helium ~~or nitrogen~~ through the MPC cavity, verify that the ~~MPC~~ gas ~~exit~~ temperature exiting the demoisturizer is ≤ 21°F for ≥ 30 min.	Once, prior to TRANSPORT OPERATIONS.
SR 3.1.1.2	Verify MPC helium backfill pressure is ≥ 29.3 psig and ≤ 33.3 psig.	Once, prior to TRANSPORT OPERATIONS.
SR 3.1.1.3	Verify that the total helium leak rate through the MPC lid confinement weld and the drain and vent port confinement welds is ≤ 5.0E-6 atm-cc/sec (He).	Once, prior to TRANSPORT OPERATIONS.

5.0 ADMINISTRATIVE CONTROLS (continued)

5.1.3 *MPC and SFSC Loading, Unloading, and Preparation Program*

This program shall be established and maintained to implement Diablo Canyon ISFSI SAR Section 10.2 requirements for loading fuel and components into MPCs, unloading fuel and components from MPCs, and preparing the MPCs for storage in the SFSCs. The requirements of the program for loading and preparing the MPC shall be complete prior to removing the MPC from the fuel handling building/auxiliary building. The program provides for evaluation and control of the following requirements during the applicable operation:

a. Verify that no transfer cask handling operations are allowed at environmental temperatures below -18 °C [0 °F].

b. Verify the maintenance of water in the annular gap between the loaded MPC and TRANSFER CASK during MPC moisture removal operations (loading) or MPC reflooding operations (unloading).

c. The water temperature of a water-filled or partially filled loaded MPC shall be shown by analysis to be less than boiling at all times.

d. Verify that the drying times and pressures assure that ~~short-term~~ fuel cladding temperature limit~~s~~ is ~~are~~ not violated and the MPC is adequately dry.

e. Verify that the inerting backfill pressure and purity assure adequate heat transfer and corrosion control.

f. Verify that leak testing assure adequate MPC integrity and consistency with offsite dose analysis.

g. Verify surface dose rates on the TRANSFER CASK are adequate to assure proper loading and consistency with the offsite dose analysis.

h. Verify surface dose rates on the SFSCs are adequate to assure proper storage and consistency with the offsite dose analysis.

i. During MPC re-flooding, verify the helium exit temperature is such that water quenching or flashing does not occur.

~~j. Fuel cladding oxide thickness shall be evaluated to determine the average fuel cladding oxide thickness of high burnup (> 45,000 MWD/MTU) SPENT NUCLEAR FUEL assemblies proposed to be stored in the ISFSI facility. Direct physical measurements or an appropriate predictive methodology with due consideration of all significant variables (e.g., in-core flux, cycle length and number, power history, coolant temperature profile, coolant chemistry, and metallurgy of the fuel cladding material) to determine the average oxide thickness on the fuel cladding may be used. If a predictive methodology is used to determine average fuel cladding oxide thickness, a sufficient number of fuel cladding thickness measurements shall be made to adequately benchmark the methodology.~~

-(continued)

5.0 ADMINISTRATIVE CONTROLS (continued)

5.1.3 (cont'd) ~~In order to classify a high burnup spent fuel assembly as an INTACT FUEL ASSEMBLY, the maximum allowable average fuel cladding oxidation layer thickness (t_{ox}) shall be:~~

~~For DCPP LOPAR assemblies without IFBA fuel, t_{ox} = 173.5 micrometers.~~

~~For DCPP VANTAGE 5 assemblies without IFBA fuel, t_{ox} = 190.5 micrometers.~~

~~For DCPP LOPAR assemblies with IFBA fuel, t_{ox} = 67 micrometers.~~

~~For DCPP VANTAGE 5 assemblies with IFBA fuel, t_{ox} = 88 micrometers.~~

~~A high burnup spent fuel assembly shall be considered a DAMAGED FUEL ASSEMBLY if the computed or measured average oxidation layer thickness on any fuel rod exceeds the applicable limit above.~~

This program will control limits, surveillances, compensatory measures and appropriate completion times to assure the integrity of the fuel cladding at all times in preparation of and during LOADING, UNLOADING or TRANSPORT OPERATIONS, as applicable.

5.1.4 ISFSI Operations Program

This program will implement the Diablo Canyon ISFSI SAR requirements for ISFSI operations. It will included criteria to be verified and controlled:

a) SFSC cask storage location.

b) Design features listed in Section 4.0 and design basis ISFSI pad parameters consistent with the Diablo Canyon ISFSI SAR analysis.

c) Condition of the ISFSI Pad anchor bolt surface coatings exposed directly to the elements.

5.1.5 Cask Transportation Evaluation Program

This program will evaluate and control the transportation of loaded MPCs between the DCPP fuel handling building/auxiliary building, the CTF and the ISFSI storage pads. Included in this program will be pre-transport evaluation and control during transportation of the following:

- Transportation route road surface conditions.
- Onsite hazards along the transportation route.
- Security
- Transporter control functions and operability
- CTF equipment operability
- SFSC auxiliary cooling capability availability

SURVEILLANCE REQUIREMENTS

SR 3.1.1.1, SR 3.1.1.2, and SR 3.1.1.3

The long-term integrity of the stored fuel is dependent on storage in a dry, inert environment. For moderate burnup fuel cavity dryness may be demonstrated either by evacuating the cavity to a very low absolute pressure and verifying that the pressure is held over a specified period of time or by recirculating dry helium through the MPC cavity to absorb moisture until the demoisturizer exit temperature reaches and remains below the acceptance limit for the specified time period. A low vacuum pressure or a demoisturizer exit temperature meeting the acceptance limit is an indication that the cavity is dry.

~~For high burnup fuel, the forced helium recirculation method of moisture removal must be used to provide necessary cooling of the fuel during drying operations. Cooling provided by normal operation of the forced helium dehydration system ensures that the fuel cladding temperature remains below the applicable limits since forced recirculation of helium provides more effective heat transfer than that which occurs during normal storage operations.~~

Having the proper helium backfill pressure ensures adequate heat transfer from the fuel to the fuel basket and surrounding structure of the MPC. Meeting the helium leak rate limit ensures there is adequate helium in the MPC for long term storage and the leak rate assumed in the confinement analyses remains bounding for off-site dose.

The leakage rate acceptance limit is specified in units of atm-cc/ sec. This is a mass-like leakage rate as specified in ANSI N14.5 (1997). This is defined as the rate of change of the pressure-volume product of the leaking fluid at test conditions. This allows the leakage rate as measured by a mass spectrometer leak detector (MSLD) to be compared directly to the acceptance limit without the need for unit conversion from test conditions to standard, or reference conditions.

All three of these surveillances must be successfully performed once, prior to TRANSPORT OPERATIONS to ensure that the conditions are established for SFSC storage, which preserve the analysis basis supporting the cask design.

(continued)