Request for Additional Information
Diablo Canyon Independent Spent Fuel Storage Installation
Docket No. 72-26
Specific-License Renewal

By letter dated March 9, 2022, as supplemented on September 21, 2023, Pacific Gas & Electric Company (PG&E) submitted an application for renewal of License No. SNM-2511 for the Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI) (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML22068A189 and ML23264A859, respectively). By letter dated September 8, 2022, the Nuclear Regulatory Commission (NRC) staff acknowledged acceptance of your application for a detailed technical review and provided a proposed schedule for its review (ML22238A239). The staff used NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel" and NUREG-2214, "Managing Aging Processes In Storage (MAPS) Report" in its review of the renewal application.

Each individual request for additional information (RAI) describes information needed by the staff for it to complete its review of the renewal application and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

<u>RAI A.4-3a</u>: Detection of Aging Effects, 1.25 Times the Specified Inspection Frequency

Information Needed:
State the aging management programs (AMP's) criteria/actions that are in place to demonstrate that the intended function of the structures, systems, and components (SSC) important to safety will be maintain when the scheduled inspection is extended up to the proposed inspection frequency allowance (i.e., any ongoing degradation will not result in a loss of function per the licensing basis during the extended period of inspection +/- 1.25 times the inspection interval specified for the AMP). Update the application as needed.

Issue:
In the license renewal application (LRA), the applicant seeks to allow AMP inspections to be performed within 1.25 times the inspection frequency specified for the AMP, "as measured from the previous performance inspection or as measured from the time a specified condition of the frequency is met." This allows for potentially unanalyzed conditions of deficiencies or degradation(s) in SSC important to safety if not properly managed by the AMP and/or properly assessed within corrective action program. Furthermore, this language makes the applicability to AMPs unclear as it was intended for technical specifications surveillance requirements and not for inspections performed under an AMP.

The staff notes that the acceptance criteria and corrective actions program for the AMPs allows for SSCs with deficiencies or degradations to be considered as acceptable if they can still perform its design basis function until the next inspection (or until its repair in some cases). Such assessment depends on the time specified for the next scheduled inspection to demonstrate that there is reasonable assurance that the intended function can be maintained over the period leading up to the next inspection. This time is typically defined as the inspection interval specified for the AMP (e.g., 5-years inspection interval). This approach is acceptable for facilities without an inspection frequency allowance and is found to be consistent with the MAPS Report. Since the LRA is proposing to use an inspection frequency allowance (i.e., +/- 1.25-year), this deviation from the MAPS report needs to be properly addressed in the LRA to help demonstrate, in this case, how the AMP will adequately manage deficiencies or degradations identified for SSCs important to safety, even when the inspection interval is extended beyond the specified inspection frequency for the AMP.

It is further noted that a staff review of the AMPs program elements did not identify license-specific criteria addressing this issue. AMPs need to demonstrate that inspection frequencies used for evaluating deficiencies or degradations accounts for any inspection interval allowance specified to be found acceptable (i.e., 1.25 times the specified AMP inspection interval). This is necessary to provide reasonable assurance that the intended function of SSC important to safety will be maintain even when the inspection interval allowance is exercised by the licensee.

Regulatory Basis:
This information is necessary to demonstrate compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 72.240(c).

RAI A.6-1a: Preventive Actions, Storage in Sheltered Environment

Information Needed:
State the AMP's preventive action/criteria that is in place to demonstrate that the aging effects proposed not to be managed by the AMP per LRA Table 3-6 (e.g., changes in material properties) will be prevented from occurring. Update the preventive actions program element of the Cask Transportation System Aging Management Program, as necessary.

Issue:
In is response to RAI A.6-1, it is stated that the cask transportation system is shared between the Diablo Canyon ISFSI and Humboldt Bay ISFSI, and that the Diablo Canyon ISFSI Cask Transportation System AMP is consistent with the Humboldt Bay ISFSI Cask Transportation AMP and the associated aging management review (AMR) line items. However, the response does not provide sufficient technical basis to demonstrate that the aging effects/mechanisms considered not to require aging management per LRA Table 3-6 and is acceptable without crediting proper storage of the SSCs as a preventive action. The AMP needs to include this preventive action to demonstrate that proper actions are in place to prevent these aging effects from occurring.

As stated in LRA Table 3-6 notes, some components had aging effects (e.g., changes in material properties due to exposure to elevate temperatures or chemicals) that were not listed in the AMR tables for aging management because the cask transporter and its components is expected to be stored in a sheltered environment. In the LRA, the storage as a sheltered environment is credited to prevent these SSCs from being exposed to the aging mechanism conducive to the aging effects, but without proper control for storage location movable equipment may be allowed to be stored in other locations where the aging effects may need to be considered as required for aging management. It is noted that previous staff evaluations considered wear as the only aging effect requiring management for these components because they are expected to be stored in an indoor environment with only brief outdoor exposure. Therefore, proper storage in a sheltered environment is a condition necessary to sustain this safety determination. The AMP considers this type of condition a preventive action. However, no such action for proper storage has been credited in the Diablo Canyon ISFSI AMP to provide reasonable assurance that this preventive action will be maintained for the period of extended operation.

Regulatory Basis:
This information is necessary to demonstrate compliance with 10 CFR 72.240(c).

RAI-E3: Please revise the environmental report (ER) to discuss the potential impacts to the California red-legged frog from incidental take.

Discussion:
On September 21, 2023, PG&E submitted their response (ML23264A859) to the NRC's request for additional information (RAI) (ML23159A238). Figure 3.8-1 "Sensitive Wildlife Resources at Diablo Canyon Power Plant," in Appendix F, Environmental Report Supplement, of the ISFSI license renewal RAI response indicates that the California red-legged frog occurs at the Diablo Canyon Creek in close proximity to the ISFSI site. Section F3.8 in Appendix F, Environmental Report Supplement, references the Permit Application Package for the Diablo Canyon Power Plant Decommissioning Project with the County of San Luis Obispo (PG&E 2021). The permit application package cites the biological survey performed by Terra Verde, which indicates the presence of the California red-legged frog at the Diablo Canyon Creek. The biological survey concludes that impacts from the decommissioning project on the California red-legged frog would be low due to the low population observed.

Section 9 of the Endangered Species Act of 1973, as amended (ESA) prohibits any action that causes the "taking" of any listed species of endangered or threatened fish or wildlife. ESA Section 7(a)(2) requires that Federal agencies consult with the U.S. Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS) for any action the agency carries out, funds, or authorizes that may affect species listed as threatened or endangered under the ESA or any critical habitat designated for listed species.

Request:
Please provide an analysis of the potential impacts of the proposed ISFSI license renewal on the California red-legged frog and its habitat, including the potential for vehicles traveling to and from the ISFSI site to collide with frogs that may occur on roadways. Please also describe any other effects from the proposed action that the California red-legged frogs may experience during the ISFSI license renewal period. Describe any actions that PG&E has taken to ensure that either (a) take of this species does not occur, or (b) that take of this species is appropriately addressed through ESA Section 7(a)(2) consultation or through an ESA Section 10 Habitat Conservation Plan. Please also evaluate effects on any additional Federally listed species that PG&E has identified as potentially being affected by the proposed ISFSI renewal.

Basis:
This information is needed to determine compliance with the following requirements:

- 10 CFR 51.45(b), "Environmental considerations," requires, in part that "[t]he environmental report shall contain a description of the proposed action, …" and
- 10 CFR 51.45(b)(1) requires that the environmental report should also discuss "[t]he impact of the proposed action on the environment."
- 10 CFR 51.60(b)(1)(iii) requires an environmental report for "[s]torage of spent fuel in an independent spent fuel storage installation …"

References:
PG&E Letter DIL-23-008, Responses to NRC Request for Additional Information on the Diablo Canyon Independent Spent Fuel Storage Installation License Renewal Application (CAC/EPID NOS. 001028/L-2022-RNW-0007), dated September 21, 2023 (ML23264A859)

Letter from NRC Project Manager, Christopher T. Markley, Request for Additional Information for the Technical Review of the Application for Renewal of the Diablo Canyon Independent Spent Fuel Storage Installation (CAC/EPID NOS. 001028/L-2022-RNW-0007), dated July 25, 2023 (ML23159A236)

PG&E Letter DCL-21-045, "DRC2021-00092 – Diablo Canyon Power Plant Decommissioning: Revised Development Plan/Coastal Development Permit and Conditional Use Permit Application," Pacific Gas and Electric Company, June 30, 2021, Available online at: https://energov.sloplanning.org/EnerGov_Prod/SelfService#/plan/b9aba58d-62aa-4ed6-a139-30c8ed2ef82c?tab=attachments

Section 2.0, Scoping Evaluations

RAI M1: Table 2-1, Scoping Results.

Information Needed:
Provide or cite Diablo Canyon ISFSI UFSAR information that explains why certain ISFSI SSCs listed in LRA Table 2-1, including security systems, fencing, lighting, electrical power, communications systems, automated welding system, MPC helium backfill system, and MPC forced helium dehydration system, do not meet either of the two scoping criteria for inclusion of the SSCs within the scope of license renewal. This information is needed so that staff can review the justification for not including applicable ISFSI SSCs in the scope of renewal based on the two scoping criteria.

Discussion:
Section 2.4.3 of NUREG-1927, Revision 1 states that "the following SSCs may be excluded from the scope of renewal, *provided that they do not meet either of the [[scoping]] criteria*:" (emphasis added)

- "equipment associated with cask loading and unloading, such as (1) welding and sealing equipment, (2) lifting rigs and slings, (3) vacuum-drying equipment, (4) portable radiation survey equipment, and (5) other tools, fittings, hoses, and gauges associated with cask loading and unloading"

- "instrumentation and other active components/systems (i.e., not passive or long-lived) but subject to a change in configuration or replacement based on a qualified life or service time period."

- "miscellaneous hardware that does not support of perform any function that is important to safety"

The staff recognizes that the above-cited SSCs may not meet the scoping criteria in NUREG-1927, Rev. 1. However, the staff generally needs to review specific information in the renewal application or the FSAR concerning the functions of these SSCs to verify that they do not meet either of the two scoping criteria.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

RAI M2: Table 2-7, Intended Functions of ISFSI Storage Pads Subcomponents.

Information Needed:
Provide or cite Diablo Canyon UFSAR information that explains why the embedment support structure bolts (Part Number 8) do not have an ITS function and why their failure would not affect an important to safety (ITS) function, as identified in Note b of Table 2-7.

Discussion:
Justification is needed to support the determination in LRA Table 2-7 that the embedment support structure bolts have no ITS function, and their failure would not affect an ITS function, as specified in Note b. Based on the subcomponent identifications in LRA Table 2-7, the staff considers that the structural integrity of the embedment support structure bolts could potentially be relevant to ensuring the ITS-B structural function of other embedment support structure components, such as embedment support structure nuts (Parts 6 and 7), since such ITS-B structural components may potentially interface with and/or rely on the structural integrity of the embedment support structure bolts.

This information is needed for the NRC staff to determine that the embedment support structure bolts can be screened out of the scope of license renewal, consistent with the guidance in Sections 2.4.2 and 2.4.3 of NUREG-1927, Revision 1.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

Section 3.0, Aging Management Reviews

RAI M3: Table 3.1-1, Use of Terms for Materials.

Information Needed:
Identify the specific Diablo Canyon ISFSI storage cask subcomponents that are fabricated from Type 17-4 precipitation-hardened (PH) martensitic stainless steel, and revise the LRA AMR results to identity the subcomponents that are fabricated from Type 17-4 PH martensitic stainless steel. For any MPC-internal structural components fabricated from Type 17-4 PH martensitic stainless steel, supplement the LRA to include a bounding evaluation of the effects of thermal embrittlement on the fracture toughness and structural integrity of the MPC-internal structural components for normal operating and design basis accident conditions considering normal operating temperature, exposure time, stress levels, material composition, and the initial heat treatment of the material. This bounding evaluation should demonstrate, consistent with the guidance in NUREG-2214, Section 3.2.2.8, “Precipitation-Hardened Martensitic Stainless

Steel Subcomponents Exposed to Helium," that the reduction in fracture toughness due to thermal aging embrittlement would not be expected to compromise the intended function of the MPC-internal structural components.

Discussion:
LRA Table 3.1-1 identifies several material specifications for Type 17-4 precipitation-hardened (PH) martensitic stainless steels, including ASME BPVC II SA-564 Type 630 H925, ASTM A564 Type 630 H1150, and 17-4 PH H1150. However, the application does not identify the subcomponents that are fabricated from Type 17-4 PH martensitic stainless steel. NUREG-2214, Section 3.2.2.8, "Precipitation-Hardened Martensitic Stainless Steel Subcomponents Exposed to Helium," states that a review of thermal aging effects should be performed on a case-by-case basis for all subcomponents constructed from Type 17-4 PH martensitic stainless steel. For normal operating temperatures above 243 degrees C (470 degrees F), this section of NUREG-2214 states that the application should provide a bounding analysis to show that reduction in fracture toughness due to thermal aging embrittlement is not expected to compromise the SSC's intended function during the period of extended operation. This section of NUREG-2214 cites the recommendations of Olender, et al (referenced below) to perform an evaluation of thermal aging on a per-component basis considering operating temperature, exposure time, operating environment, stress levels, and material condition for operating temperatures between 243 and 316 degrees C (470 to 600 degrees F); above 316 degrees C (600 degrees F), the use of 17-4 PH martensitic stainless steel in any condition is not recommended. Subcomponents located inside the canister and near the fuel could be above the 243 degrees C (470 degrees F) minimum temperature threshold for thermal aging.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

Reference:
Olender, A., J. Gorman, C. Marks, and G. Ilevbare. "Recent Operating Experience Issues with 17-4 PH in LWRs." Fontevraud 8: Conference on Contribution of Materials Investigations and Operating Experience to LWRs' Safety, Performance and Reliability. France. 2015.

RAI M4: Table 3-3, AMR of MPC.

Information Needed:
Identify whether the intended function of the MPC aluminum vent plugs in the MPC helium environment is "SR" (structural, as identified in LRA Tables 2-3 and 3-3), "CO" (confinement, as identified in NUREG-2214, Table 4-7), or both of these functions. If the aluminum vent plugs do, in fact, perform a structural function, please revise the LRA Table 3-3 to identify loss of strength due to thermal aging and changes in dimensions due to creep as applicable aging effects and mechanisms, and supplement the LRA to include an evaluation of the effects thermal aging and creep on the structural function of the vent plugs for the period of extended operation.

Discussion:
LRA Tables 2-3 and 3-3 identify the intended function of the vent plugs as "SR" (structural), whereas NUREG-2214, Table 4-7, identifies the intended function of the vent plugs as "CO" (confinement). Since NUREG-2214, Table 4-7, does not evaluate the vent plugs as structural components, thermal aging and creep are not considered to be credible aging mechanisms for the vent plugs since there is no structural function that could be degraded by loss of strength

due to thermal aging and no significant operating stress that could lead to change in dimensions due to creep. However, it should be noted that NUREG-2214, Section 3.2.3.7, indicates that loss of strength due to thermal aging of aluminum in the high temperature internal helium environment is credible if the component performs a structural function, and Section 3.2.3.5 indicates that change in dimensions due to creep of aluminum in the high temperature internal helium environment is credible if the component performs a structural function. In contrast to NUREG-2214, Table 4-7, the screening results and AMR line item for the aluminum MPC vent plugs in LRA Tables 2-3 and 3-3 identify that the vent plugs have a structural function; however, the AMR line item still does not identify thermal aging and creep as credible aging mechanisms. Therefore, the applicant is requested to confirm whether this item actually has a structural function, and if so, the applicant is requested to evaluate whether thermal aging and creep could lead to unacceptable loss of strength or change in dimensions that could degrade vent plug structural performance during the period of extended operation.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

RAI M5: Sections 3.5.4.1 and 3.7.4.1, General Corrosion Evaluation.

Information Needed:
For the overpack carbon steel shim plate and base bottom plate in the outdoor air environment, and the ISFSI storage pad carbon steel embedment support top structure plate in the outdoor air environment, supplement the evaluations in LRA Sections 3.5.4.1 and 3.7.4.1 to include an analysis of the structural performance of these subcomponents for all applicable normal and off-normal operating conditions and design basis accident conditions considering the projected loss of material and associated decrease in section thickness (as determined in these LRA sections) that could occur due to general corrosion of the carbon steel surfaces exposed to the outdoor air environment.

Discussion:
For the above subcomponents, LRA Sections 3.5.4.1 and 3.7.4.1 include a calculation of the projected decrease in section thickness over a 60-year period due to the specified general corrosion rate for carbon steel surfaces exposed to outdoor air. Since all of the above subcomponents have an intended function of maintaining their structural integrity under all applicable normal, off-normal, and design basis accident conditions, a structural evaluation is needed to ensure that these components will maintain their required structural integrity considering the projected loss of material and associated decrease in section thickness due to general corrosion, as determined in these LRA sections. This information is needed to support the determination that no specific aging management activity (e.g., visual inspections and evaluation of component degradation) is needed to address loss of material due to general corrosion of these subcomponents.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

RAI M6: Sections 3.5.4.1 and 3.7.4.1, Pitting and Crevice Corrosion.

Information Needed:
For the overpack carbon steel shim plate and base bottom plate in the outdoor air environment, and the ISFSI storage pad carbon steel embedment support top structure plate in the outdoor air environment, supplement the evaluations in LRA Sections 3.5.4.1 and 3.7.4.1 to address the potential for pitting and crevice corrosion to cause localized loss of material and formation of flaws (i.e., pits and degraded creviced regions) in these subcomponents. Supplement LRA Sections 3.5.4.1 and 3.7.4.1 to include an evaluation of how potential surface flaws that may be formed due to pitting and crevice corrosion could affect the structural performance of these subcomponents for all applicable normal and off-normal operating conditions and design basis accident conditions.

Discussion:
For the above subcomponents, LRA Table 3-5 and 3-7 identify loss of material due to general corrosion and pitting and crevice corrosion as credible aging mechanisms and effects. Galvanic corrosion is also identified for the overpack carbon steel base bottom plate and is already addressed in LRA Section 3.5.4.1. The corrosion rates cited in LRA Section 3.5.4.1 and 3.7.4.1 are generally associated with uniform general corrosion of uncoated carbon steel surfaces directly exposed to aqueous outdoor air environments. These corrosion rates do not accurately represent localized corrosion effects for carbon steel material, such as loss of material due to pitting and crevice corrosion. NUREG-2214, Section 3.2.1.2, states that carbon steel is known to be susceptible to pitting and crevice corrosion in an oxidizing environment in the presence of chlorides. This section of NUREG-2214 also states that depending on the quality and chemical composition of the carbon steel coating, water and corrosive agents can permeate coating defects, initiating pitting. Further, after initiation of a coating defect, the coating could function as a crevice and initiate crevice corrosion. The formation of flaws in carbon steel components due to pitting and crevice corrosion could degrade component structural integrity. If these flaws grow to a critical size, the components may be susceptible to fracture or ductile failure, depending on the applied loads and material temperature, since the flaws may create a significant stress concentration in the carbon steel component. Since all of the above subcomponents have an intended function of maintaining structural integrity under all applicable normal, off-normal, and design basis accident conditions, an evaluation is needed to ensure that these components will maintain their required degree of structural integrity considering the potential for formation of flaws due to localized loss of material caused by pitting and crevice corrosion. This information is needed to support the determination that no specific aging management activity (e.g., visual inspections and evaluation of component degradation) is needed to address localized loss of material due to pitting and crevice corrosion of these subcomponents.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

Section 4.0, Time-Limited Aging Analyses

RAI M7: Section 4.4, Neutron Absorber and Shielding Depletion TLAA.

Information Needed:
Clarify whether the calculation of the 60-year Boron-10 depletion fraction for the Boral fixed neutron absorber, as reported in the second paragraph of LRA Section 4.4, is applicable to both the Boral and the Metamic fixed neutron absorber, and revise the LRA as needed to make this clear. If not applicable to both neutron absorber materials, provide a calculation of projected 60-

year Boron-10 depletion fraction in the Metamic fixed neutron absorber, and revise the LRA as needed to make the projected boron depletion values clear for all materials that rely on Boron-10 to absorb neutrons for performing applicable criticality control and neutron shielding safety functions.

Discussion:
The second paragraph LRA Section 4.4 states that the following:

"To support the 60-year storage duration for license renewal, the Boron-10 depletion from the original analyses were scaled up by a factor of 6/5 (60 years/50years). The analysis concludes that the total depletion of Boron-10 in Boral over a 60-year period remains negligible (less than 3E-09 of total Boron-10 atoms depleted for the fixed neutron absorber and less than 5E-08 of total Boron-10 atoms depleted for the neutron shielding). The TLAA for neutron absorber and shielding depletion has been projected to 60 years and is therefore valid to the end of the PEO in accordance with TLAA disposition (ii)."

Since the first paragraph of LRA Section 4.4 and the AMR results for the MPC in LRA Table 3-3 identify Boral and Metamic fixed neutron absorbers, it appears that the TLAA information in the second paragraph of LRA Section 4.4 needs to be revised to clarify the applicability of the projected 60-year Boron-10 depletion fraction to the Boral and Metamic neutron absorbers.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

RAI M8: Section 4.4, Neutron Absorber and Shielding Depletion TLAA.

Information Needed:
Please address whether the scaled up Boron-10 depletion fraction of "less than 3E-09 of total Boron-10 atoms depleted" (emphasis added) for the fixed neutron absorber over a 60-year period, as specified in the second paragraph of LRA Section 4.4, needs to be revised in the LRA, and revise the LRA as needed.

Discussion:
The first paragraph of LRA Section 4.4 states that the original analysis for the fixed neutron absorber demonstrated that the boron depletion fractions of the neutron absorbing materials, "2.6E-09", is negligible over a 50-year duration. The staff confirmed that this 50-year boron depletion fraction is included in Section 6.3.2 of the HI-STORM 100 FSAR. However, the second paragraph of LRA Section 4.4 states that, to support the 60-year storage duration for license renewal, the Boron-10 depletion fractions from the original analyses were scaled up by a factor of 6/5 (60 years/50 years), and the total depletion fraction of Boron-10 atoms in Boral over a 60-year period is "less than 3E-09" (emphasis added) of total Boron-10 atoms depleted for the fixed neutron absorber. The staff checked this calculation and noted that (6/5) multiplied by 2.6E-09 is equal to 3.12E-09, which is greater than 3E-09, not "less than" 3E-09. Therefore, the staff determined that the second paragraph of LRA Section 4.4 likely needs to be revised to ensure accurate information is reported in the application.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

RAI M9: Section 4.4, Neutron Absorber and Shielding Depletion TLAA.

Information Needed:
Identify a credible reference in the current NRC-approved licensing basis (e.g., Diablo Canyon ISFSI UFSAR, HI-STORM 100 FSAR, or a technical safety analysis that is incorporated by reference in the docketed SARs) for the current licensed Boron-10 depletion fraction of “4.0E-08” for the Holtite neutron shielding material. Revise the LRA as needed to accurately cite the reference that contains the current licensed Boron-10 depletion fraction for Holtite neutron shielding material.

Discussion:
A thorough search of the Diablo Canyon ISFSI UFSAR and the HI-STORM 100 FSAR did not identify any specific value of the current licensed Boron-10 depletion fraction for the Holtite neutron shielding material, or any numerical value that is equal to “4.0E-08.” Further, the staff noted that the application includes an invalid citation of the Diablo Canyon ISFSI UFSAR as the source document for the Boron-10 depletion fraction values; specifically, the first paragraph of LRA Section 4.4 cites “Reference 4.7.2, Section 5.3.2”. The staff searched for Section 5.3.2 in Reference 4.7.2, which is the Diablo Canyon ISFSI UFSAR, and noted that no such section exists in the Diablo Canyon ISFSI UFSAR. The staff noted that Section 5.3.2 does exist in the HI-STORM 100 FSAR, but this section does not include any specific value of the Boron-10 depletion fraction for the Holtite neutron shielding material. Therefore, the staff requests that revisions to this section of the LRA be made to ensure the reporting of factual information.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

RAI M10: Section 4.6.4, Cask Transfer Facility (CTF) Structural Members.

Information Needed:
Provide a fatigue evaluation for the critical structural members of the CTF that experience significant stress cycles during normal CTF operation to demonstrate that cracking due to fatigue is not a credible aging effect/mechanism for the CTF structural members. A fatigue evaluation is needed considering that the AMR results in LRA Table 3-8 and the applicable AMP (the cask transportation system AMP) for the carbon steel CTF structural members do not include any specific activity for managing potential fatigue cracking (e.g., inspections to detect cracking due to fatigue and associated flaw evaluations).

Alternatively, revise the AMR results in LRA Table 3-8 and LRA Appendix D Table 9.4-1 and the cask transportation system AMP described in LRA Appendix A Section A.6 and LRA Appendix D Section 9.4.3.3.6 to include aging management activities, such as inspections and flaw evaluations, that can be credited as a basis for managing fatigue cracking in the CTF structural members.

Discussion:
LRA Section 4.6.4 does not include a sufficient explanation for the lack of a specific fatigue analysis for the CTF structural members considering that the applicable AMP is not managing potential cracking due to fatigue in CTF structural members. As addressed in LRA Section

4.6.4, Section 4.4.5.3 of the Diablo Canyon ISFSI UFSAR states that the load path parts of the CTF are conservatively designed in accordance with the ASME Code, Section III, Subsection NF. Subsection NF includes rules for high cycle fatigue design for linear-type supports for Class 1 construction when members and their connections are subject to high cycle fatigue (> 20,000 loading cycles) as defined in NF-3331. However, it should be noted that design rules in NF-3000 were developed for supports for Class 1, 2, 3, and MC components in nuclear power plants and do not account for the types of load cycles experienced by the CTF. Thus, it appears an appropriate fatigue analysis may not have been performed for the design of CTF structural members. The staff notes that Section 2.3.3.1.E.iii of the HI-STORM 100 FSAR specifies that fatigue failure modes of primary structural members in the CTF structure whose failure may result in uncontrolled lowering of the HI-TRAC transfer cask or the MPC (critical members) shall be evaluated, with a minimum factor of safety of two on the number of permissible loading cycles on the critical structural members.

In response to RAI A.6-2 regarding this issue, the applicant stated that LRA Table 3-8 line items for cracking of carbon steel components associated with the CTF are consistent with NUREG-2214, Table 3-2, and its referenced sections for not including cracking due to fatigue if no fatigue analysis was performed for the component. The RAI response also states that there is no site-specific operating experience indicating cracking is a concern; therefore, there is no basis for including an aging effect that is not consistent with NUREG-2214.

The staff determined that the response to RAI A.6-2 is not an accurate representation of the information in NUREG-2214 concerning fatigue, and it is not sufficient for addressing the issue raised in RAI A.6-2, as it pertains to management of fatigue for the CTF structural members. While it is true that Section 3.2.1.7 (last paragraph) states that “if no fatigue analysis was performed in support of the component design, no action is required of the applicant”, this statement is applicable to static structures and components, such as the MPC and overpack, that are subjected to very few mechanical load cycles.

Further, the fact that there is no site-specific OpE indicating that fatigue cracking is a concern for CTF structural members during the initial ISFSI license term is not a valid basis for determining that there is no potential for fatigue cracking in the period of extended operation since a susceptible component that does not show fatigue crack indications during the first 20 years of service can develop fatigue cracks during the next 40 years of service as additional stress cycles add to the cumulative usage of the material.

Therefore, given the requirements of Section 2.3.3.1.E.iii of the HI-STORM 100 FSAR regarding the need to evaluate fatigue failure modes of primary structural members in the CTF structure whose failure may result in uncontrolled lowering of the HI-TRAC transfer cask or the MPC, a fatigue evaluation is needed to demonstrate that fatigue failure of critical structural members of the CTF will not occur during the period of extended operation. The only alternative to such an evaluation is to include aging management activities, such as inspections and flaw evaluations, that can be credited as a basis for managing fatigue cracking in the CTF structural members.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).

Appendix A, Aging Management Programs

<u>RAI M11:</u> Section A.3, Transfer Cask AMP.

Information Needed:
Explain why the transfer cask AMP, as described in LRA Section A.3, does not include inspections of the lifting trunnions or lifting trunnion blocks to detect cracking due to fatigue, as provided in the example AMP for transfer casks in Section 6.9 and Table 6-6 of NUREG-2214, given the operating experience described in Element 10 of the LRA AMP and the fact that no fatigue analysis was performed for lifting trunnion components. Please revise the LRA as needed to address this potential aging effect and mechanism for the lifting trunnions.

Discussion:
LRA Section A.3 states that the Diablo Canyon ISFSI Transfer Cask AMP is based on the example AMP for transfer casks described in NUREG-2214, Section 6.9.

Element 1 of the example AMP for transfer casks in Section 6.9 and Table 6-6 of NUREG-2214 states that, “If not addressed with a fatigue analysis, this AMP also includes inspections of trunnions for cracking.”

Element 3 of the example AMP for transfer casks in Section 6.9 and Table 6-6 of NUREG-2214 states that, “If trunnions are not addressed with a fatigue analysis, trunnion surfaces are monitored for the presence of cracks.”

Element 4 of the example AMP for transfer casks in Section 6.9 and Table 6-6 of NUREG-2214 states that, “If the fatigue of trunnions is not addressed with an analysis, surface or volumetric inspection techniques are performed on 100 percent of trunnion surfaces to identify the presence of fatigue cracks.”

The staff noted that the fatigue-related information from the Diablo Canyon ISFSI UFSAR and the HI-STORM 100 FSAR, as cited in LRA Section 4.6.3, includes only qualitative statements regarding the fatigue resistance and endurance of the lifting trunnion materials and does not constitute an actual fatigue analysis that could be used as basis for not performing suitable inspections of lifting trunnions to detect fatigue cracks, consistent with example AMP for transfer casks described in NUREG-2214, Section 6.9.

Further, Element 10 of the transfer cask AMP described in LRA Section A.3 states that routine transfer cask inspections that are currently performed prior to use for loading campaigns include lifting trunnion inspections per NUREG-0612/ANSI N14.6. This LRA AMP element also states that review of precedent LRA operating experience identified aging related to transfer cask lifting trunnions. Therefore, the staff considers that this operating experience may provide additional evidence to support the need for inspections of the lifting trunnions to detect fatigue cracks during the period of extended operation.

Basis:
This information is requested to ensure that the application meets the requirements of 10 CFR 72.42(a).