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January 28, 2011

PG&E Letter HIL-11-002 10CFR 72.56

ATTN: Document Control Desk
Director, Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Materials License No. SNM-2514, Docket No. 72-27
Humboldt Bay Independent Spent Fuel Storage Installation
Supplemental Information for License Amendment Request 10-01
Revision to License Condition 7.B

Dear Commissioners and Staff:

On September 8, 2010, Pacific Gas and Electric Company (PG&E) submitted an application for amendment to Materials License No. SNM-2514, Docket No. 72-27, for the Humboldt Bay (HB) Independent Spent Fuel Storage Installation (ISFSI). PG&E proposed to change License Condition 7.B by adding process wastes to the Chemical and/or Physical Form description of Greater Than Class C Waste (GTCC), authorized to be received, possessed, transferred, and stored at the HB ISFSI.

On November 9, 2010, the NRC responded to the PG&E application for amendment by stating that, based on the NRC acceptance review, the application did not contain sufficient technical information to complete a detailed technical review. The NRC issued Requests for Supplemental Information (RSIs) for PG&E's response. On December 21, 2010, a member of PG&E's staff spoke with members of the NRC staff to obtain clarification of some of the issues contained in the RSIs.

The enclosure to this letter includes the NRC RSIs and PG&E's responses. The enclosure contains two attachments. Attachment 1 is a drawing depicting the configuration of the GTCC cask and its contents. Attachment 2 contains a proposed change to Table 3.1-3 in the HB ISFSI Final Safety Analysis Report to include a description of GTCC process waste.

ADD1
NRR

PG&E believes the enclosed responses adequately address the RSIs as clarified during the December 21, 2010, telecon. PG&E also understands that the NRC will respond with the results of the acceptance review within several weeks after receipt of this submittal. If you have any questions or require additional information, please contact Mr. David Sokolsky at (707) 444-0801.

I declare under penalty of perjury that the foregoing is true and correct.

This was executed on January 28, 2011.

Sincerely,

John T. Conway
*Senior Vice President – Energy Supply & Chief Nuclear Officer*

Enclosures
cc w/encl: Gary Butner, California Department of Public Health
Elmo E. Collins, NRC Region IV
John B. Hickman, NRC
Christopher M. Staab, NRC
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# PG&E RESPONSES TO NRC REQUESTS FOR SUPPLEMENTAL INFORMATION (RSIs) RELATED TO LICENSE AMENDMENT REQUEST 10-01 (ENCLOSURE CONTAINS TWO ATTACHMENTS)

## INTRODUCTION

The purpose of this Introduction is to provide a general description of the manner in which the Greater Than Class C (GTCC) process waste will be stored. Humboldt Bay (HB) Independent Spent Fuel Storage Installation (ISFSI) Drawing DSK-RXV-037, provided in Attachment 1 to this Enclosure, illustrates the configuration of the GTCC Overpack Assembly (referred to as the GTCC cask elsewhere in this Enclosure) and the stainless steel internal container, referred to as the Process Waste Container (PWC) that will contain GTCC process waste.

The GTCC process waste is currently stored wet in Interim Storage Container-18 (ISC-18) in the Humboldt Bay Power Plant (HBPP) spent fuel pool (SFP). The GTCC process waste will be transferred underwater from ISC-18 to a vendor-provided container. The vendor will ship the process waste to their offsite facility for drying and thermal destruction of all hydrogen generating materials. After thermal processing, the process waste will be in the form of a powder inside the PWC. The vendor will then inert the PWC and seal weld it shut prior to shipping it back to the HBPP SFP for eventual loading into the GTCC cask.

As shown in Attachment 1, the GTCC cask contains a container referred to as the GTCC Waste Container (GWC). The GWC is equivalent to the Multi-Purpose Canister (MPC) within a spent fuel cask. Also shown in Attachment 1 is the Outer Container that is welded onto the bottom of the GWC. The Outer Container is open on the top, and is designed to provide stabilization for the PWC.

The GTCC cask containing the GWC will be placed in the SFP in preparation for loading. The PWC will be placed within the Outer Container on the bottom of the GWC. Then the GTCC activated metals will be loaded into the GWC. Next, the GWC will be drained and filled with grout to prevent the movement of the activated metals and the PWC.

The loading sequence of the GTCC cask is summarized as follows:

- The GTCC cask (including the GWC) will be placed inside the SFP.
- The PWC will be placed in the Outer Container inside the GWC within the GTCC cask. (NOTE – The PWC will be loaded into the cask in a wet environment; however, the interior of the stainless steel PWC, which contains the process waste, was inerted and the container welded closed at the vendor's site prior to being returned to HBPP; therefore the process waste will be loaded dry)
- The GTCC activated metals will be placed inside the GWC.
- The GTCC cask will be lifted out of the SFP and placed within the refueling building.

- The GWC and the GTCC cask will be drained.
- Grout will be added to the GWC.
- A lid will be placed on top of the GWC and welded shut.
- A lid will be placed on top of the GTCC cask and bolted shut.

**RESPONSES TO RSIs**

**Structural and Materials**

***RSI-1**: Clarify whether the discrete process waste containers, including cavity filler materials, are part of the weight consideration in meeting the maximum GTCC weight limit of less than 11 metric tons (MT), per License Condition 8.B of SNM-2514 for the HI-STAR-HB storage system.*

**PG&E RESPONSE**

PG&E will use one discrete process waste container. This discrete PWC, including PWC filler materials, is part of the weight consideration in meeting the maximum GTCC weight limit of less than 11 MT. The volume of the process waste material is slightly greater than 0.5 cubic feet, corresponding to an approximate weight of 150 lbs. The assumed weight of the GTCC activated metals waste is less than 5 MT. The weight of all GTCC wastes is well below the license condition limit of 11 MT.

**Structural and Materials**

***RSI-1 (continued):** Section 4.0, "Technical Analysis," Enclosure 1 of the application notes that, "[t]he material will be dry..., and will be encapsulated in discrete containers..." There is, however, insufficient description of encapsulating the GTCC waste in discrete containers for its loading along with the activated metal components. The staff is unclear how the proposed MPC-HB internal/content weights configuration is evaluated to demonstrate the effects of weight total and its distribution on structural performance are bounded by those approved previously for the HI-STAR HB storage system.*

**PG&E RESPONSE**

The GTCC process waste will be thermally processed offsite at a vendor's facility to destroy all hydrogen generating materials. The process waste, in the form of a powder, will be returned to the HBPP SFP inside a single, dry, inerted, stainless steel, welded container, referred to as the PWC. The PWC will be placed within an "Outer Container" that is welded onto the bottom of the GWC within the GTCC cask. The "Outer Container" restricts movement of the PWC, although the process waste, which is in the form of a powder, may move within the PWC. After the GTCC activated metals are loaded into the GWC, the GWC will be drained and filled with grout. The addition of grout will prevent movement of the activated metals and the PWC within the GWC.

The GTCC cask is structurally identical to the HB ISFSI spent fuel casks. The structural performance of the GTCC cask is enveloped by the structural analysis performed for the spent fuel casks. The weight of an MPC loaded with spent fuel is approximately 59,000 lbs. The

weight of the GWC loaded with GTCC waste is approximately 50,000 lbs. The GWC contains approximately 8,000 lbs of GTCC waste and approximately 5,000 lbs of grout. The grout will be evenly distributed within the GWC. The GTCC activated metals will be cut and placed within the GWC in an evenly distributed manner. As a result, the weight of the loaded GWC will be evenly distributed and will be less than the weight of an MPC. Thus, the overall weight of the GTCC cask will be less than the weight of a spent fuel cask.

Humboldt Bay ISFSI Drawing DSK-RXV-037, provided in Attachment 1 to this Enclosure, illustrates the configuration of the GTCC cask (overpack assembly), the GWC and the PWC. The proposed design of the PWC is that it will be an inerted, stainless steel, seal welded cylindrical container, approximately 12 inches in diameter and 18 inches high. A lid will be welded on top. PG&E will provide the NRC with a drawing of the PWC final design under a separate letter as soon as the vendor provides the drawing to PG&E.

The PWC lid will incorporate features for closure lid welding, vacuum drying and helium inerting. The PWC lid will have a perimeter seal weld, Swagelok fittings for vacuum drying and inerting, and caps that will be welded over the Swagelok fittings.

The perimeter seal weld will be examined for acceptance using the liquid dye penetrant (PT) method. Using the PWC lid's Swagelok fittings and a suitable vacuum pump, the PWC will be evacuated to 3 torr and held for 30 minutes. The PWC will then be backfilled with helium, and the PWC will be leak tested by "sniffing" helium. The caps will be welded over the PWC lid Swagelok fittings and the cap welds examined using PT. The PWC delivered to HBPP will be fully sealed and suitable for placement into the SFP for temporary storage prior to placement inside the GWC.

**Structural and Materials**

***RSI-2**: Provide a detailed description of the various items that will constitute the GTCC waste. Include a description of the material composition (e.g. type 6061 aluminum alloy) for each type of waste. Also provide an analysis, for each material type, of any potential adverse chemical or galvanic reaction(s) that might occur between the waste and the storage canister materials or between the different waste types, should they be co-mingled.*

**PG&E RESPONSE**

The GTCC process waste is currently stored in ISC-18 located in the SFP. The contents of ISC-18 consist of the vacuumed residue from cleanup of the SFP, including Special Nuclear Material (SNM) waste and the remains of filters and resin. The material consists of distributed and particulate SNM waste mixed with resins, metallic oxides, and small Stellite particles. The total activity is 4.87E+4 mCi, of which there are 18.3 grams of SNM waste.

The following table identifies the nuclides contained in the process waste.

Waste Classification Table

| Isotope | Concentration | Class A Limit | Class A Fraction | Class B Limit | Class B Fraction | Class C Limit | Class C Fraction |
|---|---|---|---|---|---|---|---|
| C-14 | 3.24E-04 | 0.8 | 0.0004 | ---- | ---- | 8 | 0 |
| Tc-99 | 1.49E-03 | 0.3 | 0.005 | ---- | ---- | 3 | 0.0005 |
| I-129 | 1.16E-05 | 0.008 | 0.0015 | ---- | ---- | 0.08 | 0.001 |
| Pu-241 | 1.06E+05 | 350 | 302.2 | ---- | ---- | 3500 | 30.2 |
| Cm-242 | 0.00E+00 | 2000 | 0 | ---- | ---- | 20000 | 0 |
| Other TRU | 1.72E+04 | 10 | 1721.9 | ---- | ---- | 100 | 172.2 |
| **Sum of Fractions** | | | **2024.1** | **----** | | | **202.4** |
| H-3 | 3.95E-04 | 40 | 0 | ---- | ---- | ---- | ---- |
| Co-60 | 1.90E+03 | 700 | 2.7165 | ---- | ---- | ---- | ---- |
| Ni-63 | 9.78E+00 | 3.5 | 2.7941 | 70 | 0.1397 | 700 | 0.014 |
| Sr-90 | 2.29E+01 | 0.04 | 572.17 | 150 | 0.1526 | 7000 | 0.0033 |
| Cs-137 | 9.44E+02 | 1 | 943.99 | 44 | 21.24 | 4600 | 0.21 |
| T1/2<5 yrs | 0.00E+00 | 700 | 0 | ---- | ---- | ---- | ---- |
| **Sum of Fractions** | | | **1521.7** | | **21.75** | | **0.22** |

The process waste will be stored in a dry, inerted, welded shut, stainless steel container, with all organics destroyed. Therefore, the process waste is prevented from co-mingling with the GTCC activated metals. Also, no galvanic or chemical reaction will occur between the process waste and the PWC.

**Structural and Materials**

***RSI-2 (ctd):*** *The application indicates that the waste will be dry in storage, suggesting that no adverse chemical or galvanic reactions could occur due to the presence of water, but does not address other possible environmental aspects such as radiation field (e.g. radiolysis). Additionally, discuss whether the waste will be loaded wet, and, if so, what potential adverse chemical or galvanic reactions might occur during the loading and drying process, and their significance.*

**PG&E RESPONSE**

The GTCC process waste will be thermally processed offsite at a vendor's facility to destroy all hydrogen generating materials. A dry heating process will be employed to destroy the organics as well as remove moisture from the waste. Upon completion of the processing, the final product of the waste will be dry, in solid form (a powder), and free of hydrogen producing materials. The process waste will be returned to the HBPP SFP inside a single, dry, inerted, stainless steel, welded container, referred to as the PWC. The PWC will be loaded into the GWC in the SFP, a wet environment; however, the process waste contained within the PWC will remain dry during the loading. As a result, the process waste contained within the PWC will be totally isolated from the loading pool, and therefore, no chemical, galvanic, or radiation induced adverse reactions will occur.

After the process waste has been loaded into the GWC, the activated metals will be loaded into the GWC. The GWC will be moved out of the SFP, drained, and filled with grout.

During the loading sequence and ultimate storage in the ISFSI, radiolytic decomposition or other breakdown of the process waste will not be an issue because the waste will remain in a solid form incapable of producing hydrogen, and will be free of moisture. Additionally, the process waste inside the PWC will be physically isolated from reactor-produced activated metals stored in the GWC. Therefore, no chemical, galvanic or radiation induced adverse reactions will occur.

**Shielding**

***RSI-1**: Revise the Safety Analysis Report (SAR) to include a description of the process wastes to be stored as reactor-related Greater Than Class C (GTCC) waste at the Humboldt Bay Independent Spent Fuel Storage Installation (ISFSI).*

*Pacific Gas and Electric Company License Amendment Request 10-01, dated September 8, 2010, requests that process wastes be added to the chemical and physical form definition of GTCC wastes in License Condition 7.B of Material License No. SNM-2514. The licensee did not, however, include an adequate description of the process wastes to be stored in GTCC canisters at the ISFSI. Consistent with Interim Staff Guidance 17 (ISG-17), Interim Storage of Greater Than Class C Waste, the licensee should appropriately characterize the reactor-related GTCC waste so that there is reasonable assurance that storage is in compliance with the regulations. For GTCC waste, the following information should be provided: waste form (e.g., activated metal, process waste); the maximum quantity of waste to be stored at the ISFSI; the radionuclide inventory; and the location and configuration of GTCC waste containers with respect to the spent fuel storage casks. The licensee provided a detailed description of the previously approved activated metal GTCC waste to be stored at the ISFSI, in Table 3.1-3 of the SAR. The SAR should be revised to include a similar characterization of the process wastes to be stored as GTCC at the ISFSI, per the recommendations of ISG-17.*

**PG&E RESPONSE**

PG&E proposes to revise Final Safety Analysis Report (FSAR) Table 3.1-3 by adding a single line entry at the bottom to provide the same level of detail for the process wastes that is currently provided for activated metals. Attachment 2 to this enclosure contains the proposed change to FSAR Table 3.1-3 shown with a revision bar in the margin.

Regarding the question of location and configuration of the GTCC waste container with respect to the spent fuel storage casks, FSAR Section 3.1.1.4 provides a physical description, and FSAR Figure 3.2-1, Sheet 4 of 5, depicts the location and configuration. Section 3.1.1.4 states "GTCC is stored in a separate cask from spent fuel in accordance with 10 CFR 72.120(b)(1). There are no criticality issues associated with the storage of GTCC waste."

# PROPOSED CHANGE TO HUMBOLDT BAY ISFSI

## FSAR TABLE 3.1-3, Sheet 3 of 3

PROPOSED HUMBOLDT BAY ISFSI FSAR UPDATE TABLE 3.1-3, Sheet 3 of 3

| GTCC Description | Location | Quantity | Approximate Individual Item Size | Estimated Total Volume | Material |
|---|---|---|---|---|---|
| Rod - Core Support | Reactor Vessel | 4 | 3/8" O.D. x 11" | 0.003 $ft^3$ | 304 Stainless Steel |
| Miscellaneous hardware for core support assembly (u-bolts, bolts, screws, nuts, dowel pins, groove pins and safety wire ) | Reactor Vessel | Various | small | < 0.1 $ft^3$ | 304 Stainless Steel |
| Rim | Reactor Vessel | 1 | 86" O.D. x 82-1/2" I.D. | 1.0 $ft^3$ | 304 Stainless Steel |
| Cylinder (part of core shroud - surrounds the reactor core) - includes miscellaneous associated hardware (blocks, locating pins, gussets, etc.) | Reactor Vessel | 1 | 96" O.D. x 95-3/8" h x 1/4" thick | Approximately 4.5 $ft^3$ | 304 Stainless Steel |
| Core hold down (includes all associated hardware and components) | Reactor Vessel | 8 | 5" x 11" x 1-1/2" | 0.40 $ft^3$ | 304 Stainless Steel, Inconel-X |
| Lower portion of fuel hold down at the top of the core | Reactor Vessel | 45 | Pipe: 1-1/2" O.D. x 3 ft. Latch: 1/2" x 1-1/2" x 4-1/4" | 1.8 $ft^3$ | 304 Stainless Steel |
| Portions of support ring (below the core in close proximity) and chimney (above the core in close proximity) | Reactor Vessel | Various | Cut to fit | Estimated to be 5.0 $ft^3$ | 304 Stainless Steel |
| A mixture of SNM waste, metal oxides, and stellite particles. | Spent Fuel Pool | 1 | Approx 12" dia x 18" high | <1.0 $ft^3$ | Process waste within a sealed 304 Stainless Steel container |