

SAFETY EVALUATION REPORT
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
MATERIALS LICENSE NO. SNM-2514
AMENDMENT NO. 3

1.0 SUMMARY

This safety evaluation report (SER) documents the review and evaluation of a license amendment request (LAR 10-01) to Special Nuclear Materials (SNM) License No. 2514 for the Humboldt Bay (HB) independent spent fuel storage installation (ISFSI). By letter dated September 8, 2010, as supplemented January 28, April 1, and September 9, 2011; June 19, June 25, and October 4, 2012; as well as January 16, March 7, and March 21, 2013, Pacific Gas and Electric Company (PG&E) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 72.56, to amend the chemical and/or physical form definition of greater than Class C (GTCC) waste in Condition 7.B of Materials License No. SNM-2514 to include process wastes. The licensee stated that this amendment was requested to make the license both technically accurate and consistent with the definition of GTCC in Interim Staff Guidance – 17, “Interim Storage of Greater Than Class C Waste.”

NRC staff (staff) reviewed the application including the justifications for the requested changes. As discussed in further detail below, based on its review of the application, as supplemented, the staff found that the requested amendment to Materials License No. SNM-2514 for the HB ISFSI meets the regulatory requirements of 10 CFR Part 72.

2.0 REVIEW CRITERIA

Staff's evaluation of the requested changes was based on ensuring HB ISFSI continues to meet the applicable requirements of 10 CFR Part 72 for independent storage of spent fuel and of 10 CFR Part 20 for radiation protection. The staff followed the guidelines provided in NUREG-1567, “Standard Review Plan for Spent Fuel Dry Storage Facilities” in conducting its evaluation. Staff's evaluation focused only on changes to SNM-2514 requested in the application and did not reassess previously approved portions of the license, technical specifications (TS), the updated final safety analysis report (FSAR) or those areas of the FSAR modified by HB ISFSI as allowed by 10 CFR 72.48.

3.0 SYSTEM, STRUCTURE, AND COMPONENT (SSC) AND DESIGN CRITERIA EVALUATION

Staff reviewed the proposed change and determined that the structures, systems and components findings in the original SER, dated November 11, 2005, were not impacted by this proposed change. The SERs issued with Amendments 1 and 2, dated August 6, 2008 and

August 28, 2009 respectively, did not address structures, systems and components. Therefore, the staff has determined that a new evaluation is not needed.

4.0 STRUCTURAL EVALUATION

4.1 Review of Requested Changes

The licensee proposes to change License Condition 7.B by adding process wastes to the Chemical or Physical Form description of GTCC Waste authorized to be stored at the HB ISFSI. Section 4.0, "Technical Analysis," in Enclosure 1 of the application, specified the organic free, dry process waste material will be encapsulated to prevent co-mingling of the process waste with the activated metal. Later, in its January 28 supplement PG&E provided clarification that approximately 150 lbs (0.068 metric tonnes) of process waste, having a volume slightly greater than 0.5 cubic feet, would be loaded into a discrete process waste container (PWC) along with approximately 2 metric tonnes of activated metal.

PG&E also provided proposed revised FSAR pages to assist staff in their review of the application. Figure 3.3-5 of the SAR presents design features of the stainless steel, seal welded cylindrical PWC, which measures approximately 12 inches in diameter and 24 inches high. Figure 3.3-4 showed the PWC located within an outer container, which will be welded to the bottom of the Humboldt Bay GTCC waste container (GWC). SAR Section 3.1.1.4 stated that after loading the GTCC waste into the GWC, the GWC and the GTCC cask will be drained.

Based on its review of the application, staff determined that the amount of process waste the licensee proposes to store would cause a very small increase in the weight of the GTCC cask resulting in a minimal impact on the structural integrity of the GTCC cask. Specifically, the licensee's placement of the process waste at the cask bottom would hardly alter the center-of-gravity location of the GTCC cask. Therefore, all previous tip-over analysis results and analyzed configurations for the normal, off-normal, and natural phenomenon as well as accident conditions remain applicable and the staff determined that the GTCC cask is structurally acceptable for loading.

4.2 Conclusions

On the basis of the above, staff has reasonable assurance that the GTCC waste, including the process waste, would continue to maintain its analyzed configurations for the normal, off-normal, and natural phenomenon as well as accident conditions. This ensures that the requested change will not adversely affect the structural performance of the GTCC waste storage system in meeting the 10 CFR Part 72.122(b) and 10 CFR Part 72.122(c) requirements.

4.3 Evaluation Findings

F4.1 The staff finds that the structural design of the system remains in compliance with 10 CFR Part 72, and that the applicable design and acceptance criteria have been satisfied.

5.0 THERMAL EVALUATION

5.1 Review of Requested Changes

The licensee proposes to add process wastes to License Condition 7.B of the Chemical or Physical Form description of GTCC waste for storage in a GTCC cask at the HB ISFSI. The licensee proposes to have the GTCC process waste thermally processed by an off-site vendor. The off-site vendor will return the processed waste sealed in a small process waste container (PWC) which would then be secured in a larger GWC, that PG&E evaluated to be "equivalent" to the multi-purpose canister (MPC) used to store fuel at the HB ISFSI. After securing the PWC within the GWC, the licensee intends to place activated metal GTCC waste in the GWC. The GWC will then be welded shut and secured in a bolted HI-STAR cask for emplacement on the ISFSI pad. The licensee stated that no decay heat issues are associated with storage of the process waste in a Holtec HI-STAR cask for the HB ISFSI.

Based upon a review of the amendment request, staff identified the primary source of heat from the process waste is approximately 18.3 grams of particulate special nuclear material (SNM). Staff noted that SNM is also the primary source of heat in an irradiated fuel assembly and that 18.3 grams of SNM is significantly less than that in an irradiated fuel assembly. Consequently, staff determined that there would be a negligible increase in heat load of the GTCC cask due to storage of the process waste. Therefore, the staff determined that storing the process waste will not impact the ability of the GTCC cask to dissipate heat.

5.2 Conclusions

The NRC staff reviewed PG&E's application, and based upon the findings stated above, determined the proposed changes are acceptable because the thermal design of the system will remain in compliance with applicable regulations.

5.3 Evaluation Findings

F5.1 The staff finds that the thermal design of the system remains in compliance with 10 CFR Part 72.128(a)(4), and that the applicable design and acceptance criteria have been satisfied. The evaluation of the thermal design provides reasonable assurance that the system will continue to allow safe storage of spent fuel for a certified life of 20 years.

6.0 SHIELDING EVALUATION

6.1 Review of Requested Changes

The licensee proposes to revise Materials License No. SNM-2514, Condition 7.B, to change the chemical and physical Form definition of GTCC waste to be stored at the HB ISFSI. Specifically, the licensee proposes to revise Table 3.1-3 of the FSAR to add a description of process waste within a sealed stainless steel container to be stored within the GTCC canister. This waste will consist of a mixture of SNM waste and resins, metal oxides, and stellite particles, and will be less than 1.0 ft³ in volume.

The process waste will be placed inside of a single dried, inerted, and sealed stainless steel canister referred to as the PWC. The PWC will be placed inside an outer container which is welded to the bottom center of the GTCC canister. A lid will be placed on top of the outer container to prevent any significant source redistribution under normal conditions and anticipated occurrences.

The licensee indicated that the total radioactivity contained in the process waste is 48.5 Curies. Staff noted this level of radioactivity is significantly less than that associated with a single spent fuel assembly. Staff also noted the bulk of the 48.5 Curies is alpha-emitting transuranic nuclides; e.g., plutonium. Consequently, staff determined storage of the process waste will result in a negligible contribution to the external dose rate of the cask system; therefore, the licensee will continue to meet the applicable offsite does requirements.

6.2 Conclusions

Based on staff's review of PG&E's application, the staff determined there is reasonable assurance that the HB ISFSI will continue to meet the offsite dose requirements of 10 CFR 72.104 and 10 CFR 72.106 with the addition of process wastes to the chemical and physical form definition of SNM-2514, Condition 7.B.

6.3 Evaluation Findings

F6.1 The staff finds that the shielding design of the system remains in compliance with 10 CFR Part 72, and that the applicable design and acceptance criteria have been satisfied.

7.0 CRITICALITY EVALUATION

The licensee stated in its application that the amount of SNM in the process waste will be no more than 18.3 grams. Staff reviewed the proposed change and determined that this amount of fissile material is significantly below the minimum critical masses for all fissile nuclides of interest. Therefore, the staff determined that a criticality evaluation is not needed.

8.0 CONFINEMENT EVALUATION

8.1 Review of Requested Changes

The HB ISFSI cask system as described will provide two barriers to any release of radioactivity from the process wastes proposed for storage in this system. The inner PWC will be mechanically sealed and leak-tested prior to placement in the GWC. In addition, the GWC will be seal welded and placed within a bolted cask.

The GWC will continue to be subject to a helium leak test at the time of fabrication. After the GWC is loaded, water will be removed from the container and the void space backfilled with helium. After the GWC lid is installed, the vent and drain port cover plates for the GWC lid will be seal welded and helium leak tested.

The licensee stated the process waste will undergo a heating process to ensure it is organic free and is not a source for hydrogen generation. Because the process waste will undergo this heating process, staff determined the hydrogen content within the GWC by volume should be less than 5% at the Humboldt Bay ISFSI when it is loaded with the process waste. Therefore, the staff determined that the process waste will be organic free and will not be a source of hydrogen generation.

After draining water from the annulus between the GWC and the cask, the cask lid will be installed and bolted. Neither drying nor backfilling operations will be performed for the cask. Also, the cask is not tested for leakage. The licensee stated that, because the cask is used only for shielding and structural protection during storage, it does not require sealing or backfilling with helium. The staff reviewed the licensee's assessment regarding cask sealing and backfilling and found it acceptable because the cask does not perform a confinement function during storage.

8.2 Conclusions

The process of sealing and leak testing both the PWC and the GWC will provide multiple, independent barriers to prevent a release of radioactive material from the GTCC cask. As a result, the staff finds there is reasonable assurance that the proposed system for confinement of the GTCC process wastes meets the requirements in 10 CFR 72.104 for confinement of radionuclides.

8.3 Evaluation Findings

F8.1 The staff finds the changes acceptable and that the storage system employed at the Humboldt Bay Nuclear Power Plant ISFSI will continue to meet the requirements of 10 CFR Part 72 for the confinement of radionuclides.

9.0 CONDUCT OF OPERATIONS

Staff reviewed the proposed change and determined that the conduct of operations findings in the original SER, dated November 11, 2005, were not impacted by this change. The SERs issued with Amendments 1 and 2, dated August 6, 2008 and August 28, 2009 respectively, did not address conduct of operations. Therefore, the staff has determined that a new evaluation is not needed.

10.0 RADIATION PROTECTION EVALUATION

Staff reviewed the proposed change and determined that the radiation protection findings in the original SER, dated November 11, 2005, were not impacted by this change. The SERs issued with Amendments 1 and 2, dated August 6, 2008 and August 28, 2009 respectively, did not address radiation protection. Therefore, the staff has determined that a new evaluation is not needed.

11.0 QUALITY ASSURANCE EVALUATION

Staff reviewed the proposed change and determined that the quality assurance findings in the original SER, dated November 11, 2005, and the Amendment 2 SER, dated August 28, 2009, were not impacted by this change. The SER issued with Amendment 1, dated August 6, 2008, did not address quality assurance. Therefore, the staff has determined that a new evaluation is not needed.

12.0 DECOMMISSIONING EVALUATION

Staff reviewed the proposed change and determined that the decommissioning findings in the original SER, dated November 11, 2005, were not impacted by this change. The SERs issued with Amendments 1 and 2, dated August 6, 2008 and August 28, 2009 respectively, did not address decommissioning. Therefore, the staff has determined that a new evaluation is not needed.

13.0 WASTE CONFINEMENT AND MANAGEMENT EVALUATION

Staff reviewed the proposed change and determined that the waste confinement and management findings in the original SER, dated November 11, 2005, were not impacted by this change. The SERs issued with Amendments 1 and 2, dated August 6, 2008 and August 28, 2009 respectively, did not address waste confinement and management. Therefore, the staff has determined that a new evaluation is not needed.

14.0 ACCIDENT ANALYSIS

Staff reviewed the proposed change and determined that the accident analysis findings in the original SER, dated November 11, 2005, were not impacted by this change. The SERs issued with Amendments 1 and 2, dated August 6, 2008 and August 28, 2009 respectively, did not address accident analysis. Therefore, the staff has determined that a new evaluation is not needed.

15.0 TECHNICAL SPECIFICATIONS

15.1 Review of Requested Change

The licensee proposes a modification to the license condition 7.B to include process waste. As part of the license modification, the licensee will also revise Section 3.1 of the SAR that was incorporated by reference into step 5.1.6 of Section 5.0, "Administrative Controls" in the license technical specifications. Specifically, the licensee will revise Section 3.1.1.4 of the FSAR to provide a brief description of the process waste; i.e., its composition, radiological characteristics, etc. as well as outline the method by which the process waste will be loaded into a storage cask and transferred to the storage pad. In addition, the licensee will also revise Table 3.1-3 to identify the process waste as GTCC waste.

The licensee stated that storing process waste at the ISFSI will not increase the dose to the public and will not generate any additional effluents. The staff reviewed the licensee's proposed changes, and based upon the staff findings in Sections 6, 7 and 8 of this SER, determined there is reasonable assurance that storing process waste at the HB ISFSI will neither increase the dose to the public nor generate additional effluents. Also, based on the staff findings in Sections 6, 7 and 8 of this SER, there is reasonable assurance that the licensee will still be able to verify, through monitoring, that both the GTCC cask surface dose rates are consistent with the offsite dose analysis and that GTCC cask effluents comply with 10 CFR 20.1201 requirements as stated in the Technical Specifications (TS).

An editorial error was also identified by staff in Section 5.1.1.d of the TS. The TS referenced criteria in 5.5.1.b. Staff corrected the reference to read 5.1.1.b in lieu of 5.5.1.b after discussing this issue with the licensee (Agency Document Access Management System Accession No. ML13128A024). In addition, the staff will update the license to add process waste to condition 7.B and revise license condition 9 to identify the revision to the final safety analysis report which resulted from this amendment request.

15.2 Evaluation Findings

F15.1 The staff finds that the conditions for use remain in compliance with 10 CFR 72.44(c), and that the applicable design and acceptance criteria have been satisfied. The revised TS provide reasonable assurance that the HB ISFSI will continue to allow safe storage of both spent fuel and GTCC waste.

16.0 MATERIALS EVALUATION

16.1 Review of Requested Change

This license amendment request proposes to add process wastes to License Condition 7.B, the chemical or physical form description of GTCC waste, to the approved contents of the HB ISFSI. The process waste is composed of SNM, resin beds, filters, and other residue removed from the spent fuel pool. All GTCC waste will be stored in a single storage canister, referred to as the GWC, which is similar to the multi-purpose canister used for the storage of spent fuel. GTCC waste will not be stored with spent fuel.

The process waste will be loaded into an off-site vendor supplied container under water in the spent fuel pool, and then shipped to the vendor's offsite facility. The process waste will undergo drying and thermal destruction of all organics or hydrogen generating materials before being converted to a dry powder. The process waste is then placed inside a stainless steel PWC. The PWC will be inerted and mechanically sealed shut prior to shipping it back to the HB ISFSI site for eventual loading into the GWC storage cask. The quantity of process waste will be less than 1 cubic foot in volume.

The PWC will be loaded into the GWC in the spent fuel pool; however, the process waste within the PWC will remain dry during the loading. After the process waste (in the PWC) has been loaded into the GWC cask, activated metal from the retired reactor vessel will be loaded into the GWC. The activated metal, which are composed of either type 304 Stainless Steel or Inconel, will be loaded wet. After loading is complete, the GWC storage cask will be drained, backfilled with helium and sealed.

Since the process waste will be isolated from the pool water during loading and will be transformed into inert metal oxides, staff determined this waste will not cause any adverse chemical or galvanic reaction. In addition, staff noted the stainless steel and Inconel activated metals are compatible with each other and the GWC storage canister material. Thus, staff concluded no adverse chemical or galvanic reactions will occur between the contents or the GWC storage canister, and therefore the licensee will continue to meet the requirements of 10 CFR 72.120(d).

Staff considered the possibility for radiolytic decomposition of either the process waste or activated metals during the loading sequence and storage in the ISFSI. The staff found that radiolytic decomposition will not be an issue for the process waste as it will be in a dry powder form, free of moisture after thermal processing and incapable of producing hydrogen. The activated metals (stainless steel and Inconel) are not susceptible to any form of radiolytic decomposition. Consequently, the staff determined that the confinement boundary will not be challenged either by corrosive chemicals, combustible gases or increased pressure from gas generation.

16.2 Evaluation Findings

F16.1 The staff finds that the materials design of the system remains in compliance with 10 CFR 72.120(d), and that the applicable design and acceptance criteria have been satisfied.

17.0 REQUIREMENTS FOR NOTICING PROPOSED ACTION

In accordance with 10 CFR 72.16 and 72.46, a notice of proposed action and opportunity for hearing was published in the *Federal Register* on May 27, 2011 (76 FR 30980). No requests for a hearing or leave to intervene were submitted. Accordingly, pursuant to 10 CFR 72.46(d), action can be taken on this license amendment request.

18.0 ENVIRONMENTAL REVIEW

The NRC staff also considered in the review of this license amendment request whether there would be any significant environmental impacts associated with the amendment. Pursuant to 10 CFR 51.30, the NRC staff prepared an environmental assessment (EA) of the proposed action, which is approval of the proposed amendment to NRC License No. SNM-2514 to allow storage of GTCC process waste at the Humboldt Bay ISFSI. On the basis of the EA, the staff concluded that the proposed action will not significantly affect the quality of the human environment. The EA is located at ADAMS Accession No. ML13241A289. The staff also prepared a Finding of No Significant Impact, which was published in the *Federal Register* (78 FR 56944, September 16, 2013).

19.0 CONCLUSION

Based on its review of LAR-12-003, as revised and supplemented, the staff determined there is reasonable assurance that: (i) the activities authorized by the amended license will be conducted without endangering the health and safety of the public and (ii) these activities will be conducted in compliance with the applicable regulations of 10 CFR Part 72. The staff further determined that the issuance of the amendment will not be inimical to the common defense and security. Therefore, the amendment should be approved.

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Issued with Materials License No. SNM-2514.

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