UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

September 13, 2018

Ms. Kim Manzione, Licensing Manager
Holtec International
Holtec Technology Campus
One Holtec Boulevard
Camden, NJ 08104

SUBJECT: HOLTEC INTERNATIONAL'S APPLICATION FOR SPECIFIC INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE FOR THE HI-STORE CONSOLIDATED INTERIM STORAGE FACILITY FOR SPENT NUCLEAR FUEL – FIRST REQUEST FOR ADDITIONAL INFORMATION, PART 2

Dear Ms. Manzione:

By letter dated March 30, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17115A431), as supplemented on April 13, October 6, December 21 and 22, 2017; and February 23, 2018 (ADAMS Accession Nos. ML17109A386, ML17310A218, ML17362A097, ML18011A158, and ML18058A617, respectively), Holtec International submitted to the U.S. Nuclear Regulatory Commission (NRC) an application for a specific independent spent fuel storage installation license to construct and operate the HI-STORE Consolidated Interim Storage Facility, in Lea County, New Mexico, in accordance with the requirements of Part 72 of Title 10 of the *Code of Federal Regulations*, "*Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste and Reactor-Related Greater than Class C Waste.*" The license application seeks NRC approval to store up to 8,680 metric tons of commercial spent nuclear fuel in the HI-STORM UMAX Canister Storage System for a 40-year license term.

The NRC staff is conducting a detailed technical review of your application and has determined that additional information is necessary in connection with its review. The information needed by the staff is discussed in the enclosed requests for additional information (RAI). For RAIs 6-1 through 6-5, we request that you provide responses within 30 days from the date of this letter. For the remaining RAIs, we request that you provide responses within 60 days from the date of this letter. If you are unable to meet these deadlines, please notify NRC staff in writing, within two weeks of receipt of this letter, of your new submittal date and the reasons for the delay.

As discussed in our February 28, 2018, letter notifying you of our decision to docket the application and begin a detailed technical review, the NRC staff expects to issue its first round of RAIs in several parts. The enclosed RAIs only address selected portions of the NRC staff review completed to date, and additional RAIs will be issued in the future as the staff's detailed review progresses. The NRC staff expects to complete its first round of RAIs by September 2018.

Upon removal of Enclosure 2, this document is uncontrolled

Please reference Docket No. 72-1051 and CAC/EPID No. 001028/L-2018-NEW-0001 in future correspondence related to the technical review for this licensing action. If you have any questions, please contact me at (301) 415-0606.

Sincerely,

/RA/

Jose R. Cuadrado, Project Manager
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No.: 72-1051
CAC/EPID Nos.: 001028/L-2018-NEW-0001

Enclosures:
1. 1st RAI - Part 2 (Non-Proprietary)
2. 1st RAI - Part 2 (Proprietary)

SUBJECT: HOLTEC INTERNATIONAL'S APPLICATION FOR SPECIFIC INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE FOR THE HI-STORE CONSOLIDATED INTERIM STORAGE FACILITY FOR SPENT NUCLEAR FUEL – FIRST REQUEST FOR ADDITIONAL INFORMATION, PART 2, DOCUMENT DATE: September 13, 2018

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First Request for Additional Information, Part 2 (Non-Proprietary)

Docket No. 72-1051
Application for specific independent spent fuel storage installation license for the HI-STORE Consolidated Interim Storage (CIS) Facility in Lea County, New Mexico

By letter dated March 30, 2017 (ADAMS Accession No. ML17115A431), as supplemented on April 13, October 6, December 21 and 22, 2017; and February 23, 2018 (ADAMS Accession Nos. ML17109A386, ML17310A218, ML17362A097, ML18011A158, and ML18058A617, respectively), Holtec International submitted to the U.S. Nuclear Regulatory Commission (NRC) an application for a specific independent spent fuel storage installation license to construct and operate the HI-STORE Consolidated Interim Storage (CIS) Facility, in Lea County, New Mexico, in accordance with the requirements of Part 72 of Title 10 of the *Code of Federal Regulations* (10 CFR 72), "*Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste and Reactor-Related Greater than Class C Waste.*" The license application seeks NRC approval to store up to 8,680 metric tons of commercial spent nuclear fuel in the HI-STORM UMAX Canister Storage System for a 40-year license term.

This request for additional information (RAI) identifies additional information needed by the NRC staff in connection with its safety and environmental review of the HI-STORE CIS facility license application. The requested information is sorted by the specific part of the license application, or the specific chapter or section number in the safety analysis report, environmental report, or their respective supporting analyses. The staff used the guidance in NUREG-1567, "Standard Review Plan for Spent Fuel Dry Storage Facilities," and NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," for its review of the application.

License Application (LA):

RAI LA-1: Justify the absence of a time limit for a canister to be returned to the nuclear plant of origin, or other facility licensed to perform fuel loading procedures, in Appendix A to the proposed Materials License, "Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility."

Sections 5.5.5.b.1 and 5.5.5.b.2 (Page 5-5) of Appendix A to the proposed Materials License do not provide a time limit for the return of a canister to the nuclear plant of origin, or other facility licensed to perform fuel loading procedures, if the canister does not pass the Krypton-85 test or helium leak test acceptance criterion and cannot be stored at the HI-STORE CIS Facility. If a time limit for the return of a non-compliant canister is not specified, the application should discuss how storage of this canister for an indefinite period is considered and accounted for in the site's safety analyses (e.g. normal and accident doses due to confinement and shielding, thermal time limits) and operating procedures.

This information is needed to determine compliance with 10 CFR 72.24(g) and 72.44(c)(1).

RAI LA-2: Justify why Section 5.5.1, "Radioactive Effluent Control Program," of Appendix A to the proposed Materials License, "Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility," does not contain references or similar language to that provided

in Section 5.5.5, “Canister Acceptance Program,” of Appendix A to the proposed Materials License.

Section 5.5.5 of Appendix A to the proposed Materials License should also be referenced or included in Section 5.5.1 of Appendix A because the canister acceptance program testing in Section 5.5.5, supports the radioactive effluent control program.

This information is needed to determine compliance with 10 CFR 72.24(g) 72.44(c)(3)(ii), and 72.128(a)(1).

RAI LA-3: Provide a description of the Technical Specification bases control program for the HI-STORE Consolidated Interim Storage (CIS) Facility.

The Technical Specification bases control program provides a means for processing changes to the bases of the Technical Specifications, and ensures the bases are maintained consistent with the HI-STORE SAR. This information was not included in Appendix A to the proposed Materials License for the HI-STORE CIS facility.

This information is needed to determine compliance with 10 CFR 72.26.

Safety Analysis Report (SAR), Chapter 6, “Thermal Evaluation”

RAI 6-1: Demonstrate how the effects of the site’s cask array size and the site’s meteorological conditions (e.g., wind) on the inlet air temperature were addressed in the thermal analysis.

The array analysis in the HI-STORM UMAX FSAR (Certificate of Compliance (CoC) No. 72-1040) was based on a 1-row array of UMAX modules. As discussed in the HI-STORM UMAX FSAR, the effects of a 1-row simulated cask array were to decrease inlet air mass flows and increase inlet air temperatures (by up to 13 deg F), such that peak cladding temperature (PCT) could increase by 34 deg F. However, the HI-STORE CIS site would have a multi-row array (500+ UMAX systems). In addition, HI-STORE SAR Section 2.3.1 indicates that moderate winds occur regularly at the site and that high seasonal period ambient temperatures are approximately 93 deg F. Therefore, a sensitivity analysis should be provided that quantifies the effects (e.g., temperatures, canister pressure) from neighboring rows of UMAX systems (i.e., a multi-row array) and takes site conditions into consideration (e.g., high seasonal period ambient temperatures, wind, UMAX module geometry). The thermal analysis should reflect any design differences (e.g., air flow from inlet to outlet, including geometry, flow areas, perforated plate open area, etc.) between the HI-STORM UMAX System approved in CoC No. 72-1040 and the site-specific UMAX system for the HI-STORE CIS Facility (i.e., drawing 10875 Rev. 0). [**Note**: HI-STORE SAR Section 6.4.3.5 that discusses wind conditions references Subsection 4.4.9 of the HI-STORM UMAX FSAR. However, wind conditions are not discussed in Subsection 4.4.9.]

The response should provide a detailed description of the FLUENT model and boundary conditions and resulting acceptance criteria (e.g., residuals, energy and mass balances, grid independence studies, and demonstration of model convergence) that justifies the appropriateness of the boundary conditions and methodology for analyzing the site conditions. This includes the extent of the pressure boundary (e.g., size and distance from array), the number of rows analyzed, turbulence models and their parameters, model inlet boundary conditions (e.g., temperatures), wind conditions, inlet/outlet vent design, etc.

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

RAI 6-2: Provide thermal analyses that include the bounding ambient temperatures that accurately represent the site's average maximum temperature for the high temperature seasonal period (e.g., June, July, and August), and that reflect the effect of high air temperatures due to surrounding air outlet vents. In addition, include the resulting component temperatures, internal multi-purpose canister (MPC) gas temperatures and densities, and cavity gas pressures for normal, off-normal, and accident conditions.

According to the FLUENT model provided in the HI-STORE SAR, the inlet boundary temperature for the normal conditions model was 16.67 deg C (62 deg F), which was reported as the annual average temperature. However, this temperature does not consider that during three months of the year at the proposed site, the average monthly maximum temperature ranges from 92.57 deg F to 93.62 deg F, as reported in Table 2.3.1 of the HI-STORE SAR. In addition, the normal conditions model's inlet temperature of 62 deg F did not include the effects of hot air (higher than ambient) entering the UMAX system from the array of neighboring UMAX storage modules proposed for the HI-STORE facility (see RAI 6-1). These effects would impact site performance, as discussed in the HI-STORM UMAX FSAR, which demonstrated that for a 1-row simulated cask array, decreased inlet air mass flows and increased inlet air temperatures (by up to 13 deg F) would increase peak cladding temperature by 34 deg F. The thermal analyses should reflect any design changes (e.g., air flow from inlet to outlet, including geometry, flow areas, perforated plate open area, etc.) between the HI-STORM UMAX System approved in CoC No. 72-1040 and the site-specific UMAX system for the HI-STORE CIS Facility (e.g., drawing 10875 Rev. 0). A detailed description of the FLUENT model and boundary conditions should be provided, as described in RAI 6-1.

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

RAI 6-3: Provide the MPC cavity gas pressure, gas temperature, and gas density associated with the normal, off-normal, and accident conditions, including off-normal environmental temperature, off-normal pressure, partial blockage of air inlet and outlet ducts, 100% blockage of air inlets and outlet ducts, 100% fuel rod rupture, extreme environmental temperature, and the conditions described in HI-STORE CIS SAR Tables 6.4.3, 6.4.4, 6.4.5, 6.4.6, 6.5.2. 6.5.3, 6.5.4. The bounding MPC (e.g., MPC-37, MPC-89) should be specified for each condition.

Although the MPC cavity pressure was provided for some (not all) of the conditions described above, the corresponding MPC cavity gas temperature and density were not provided, and therefore, an evaluation of the canister pressure to the various conditions could not be performed. The evaluation is necessary to understand the impact of site conditions on canister pressure, which is a component of structural loads and canister integrity.

It is noted that SAR Section 6.4.3.2 indicates that thermal performance would tend to increase due to rod ruptures. This should be confirmed, recognizing that cavity gas thermal conductivity, which impacts heat transfer, would tend to decrease due to rod ruptures.

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

RAI 6-4: Justify the assumption of 10% restriction of the exiting airflow (and ignoring inlet airflow) for the accident condition of the collapse of the canister transfer building (CTB) for the situations described in SAR Section 6.5.2.3. In addition, describe how the airflow restriction

boundary condition was applied and describe the changes to the canister transfer facility (CTF) and HI-TRAC CS external boundary conditions from the collapsed building.

The extent of inlet and outlet vent blockages caused by a collapsing building would affect cask thermal performance and, therefore, important-to-safety SSC temperatures. SAR Section 6.5.2.3 states that only the exiting airflow is assumed to be affected by the collapse of the CTB and that restriction would be limited to 10%. However, no discussion was provided that justified blockage would not occur for inlet air flow (recognizing that inlet and outlet vents are at the same elevation) or that a collapsing corrugated aluminum Butler building would limit the airflow restriction to 10%.

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

RAI 6-5: Describe the evaluation method, including the model and boundary conditions, for determining the thermal time limit for all operations performed without helium in the transportation cask annulus, provide an upper temperature limit to base the thermal time limit, and describe the basis for that temperature limit. In addition, the results for a bounding canister within the HI-STAR 190 transport cask should be provided.

The Operational Limit before Step 11 of Section 10.3.3.1 of the HI-STORE SAR requires a thermal time limit be established based on specific transportation cask and canister conditions for the duration of all operations performed without helium in the transportation cask annulus. However, no evaluation methodology is discussed in the application, no temperature limit is described on which to base the thermal time limit, no acceptance criteria (e.g., time limits) are provided in the proposed Technical Specifications, and no bounding analysis model is provided nor results presented.

This information is needed to determine compliance with 10 CFR 72.122(h) and 72.128(a)(4).

Safety Analysis Report (SAR), Chapter 9, "Confinement Evaluation"

RAI 9-1: Include the references from Table 9.0.1, "Material Incorporated by Reference in this Chapter," of the HI-STORE SAR in Chapter 19, "Consolidated References," of the HI-STORE SAR.

Although references 1.0.7, 7.1.1, 7.1.2, 7.1.3, and 7.1.4 were included in Table 9.0.1 of the HI-STORE SAR, the references were not included in Chapter 19 of the HI-STORE SAR. When using incorporation by reference, the references should be included as part of the consolidated references in the HI-STORE SAR.

This information is needed to determine compliance with 72.24(c)(3), and relevant to 10 CFR 72.18.

RAI 9-2: Clarify the content in Table 9.0.1, "Material Incorporated by Reference in this Chapter," of the HI-STORE SAR.

Table 9.0.1 states, "SAR HI-STORM FW amendment 0 References [7.1.1, 7.1.2, 7.1.3, 7.1.4]," under the heading, "NRC approval of material incorporated by reference." This heading description does not match the specific documents referenced in the table. When using

incorporation by reference, the application should provide accurate and specific references to the NRC documents cited, including the correct amendment numbers.

This information is needed to determine compliance with 72.24(c)(3), and relevant to 10 CFR 72.18.

RAI 9-3: Clarify the content in Section 9.2.2, "Operational Activities," (Page 9-7) of the HI-STORE SAR.

Section 9.2.2 of the HI-STORE SAR should consistently address off-normal conditions, in addition to the normal, off-normal and accident conditions while on-site prior to, or during receipt inspection. This was not clearly addressed in the following sentence from Section 9.2.2 of the HI-STORE SAR and the text below is underlined for added emphasis.

> *"Hence once the canisters have passed the receipt inspection, also discussed in Subsection 9.2.1, there is <u>no credible normal or accident situation</u> that could challenge the integrity of the canister confinement integrity and result in a release of any radioactivity."*

A normal, off-normal, or accident condition(s) that could challenge the integrity of the canister confinement while on-site prior to, or during, receipt inspection, should also be described in the HI-STORE SAR. Note that the statement in Section 9.2.2 is contradictory to Section 9.2.1, "Storage Systems," (Page 9-4) which states:

> *"All normal, off-normal and accident conditions relevant to confinement integrity for which the canister is certified in the HI-STORM UMAX docket are equal to or less severe at the HI-STORE facility. Therefore, there are no new conditions for the HI-STORE CIS facility that would require additional confinement analyses."*

This information is needed to determine compliance with 10 CFR 72.11(a).

RAI 9-4: Clarify the statements made in HI-STORE SAR Sections 9.2.1, "Storage Systems," 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," and Table 10.3.2, "Canister Leakage Test Performance Specifications," with respect to describing the leak testing.

Section 9.2.1 (Page 9-5) of the HI-STORE SAR should accurately describe the leakage rate testing that is described in Section 10.3.3.1 and Table 10.3.2 of the HI-STORE SAR. The leakage rate testing described in Section 9.2.1 of the HI-STORE SAR describes leakage rate testing only on the redundant closure ring.

> *"Although the HI-STORM UMAX confinement boundary includes the MPC lid to shell weld, this weld is covered with a redundant closure ring. Therefore, the leak testing described is performed only on that redundant closure ring of the confinement boundary."*

The leak testing described in Section 10.3.3.1 and Table 10.3.2 of the HI-STORE SAR is performed on the assembled lid to shell weld and the redundant closure ring together.

This information is needed to determine compliance with 10 CFR 72.11(a).

RAI 9-5: Provide justification that the confinement boundary integrity is maintained after transport operations.

Section 9.2.1, "Storage Systems," of the HI-STORE SAR (Page 9-5), states:

> *"During transportation to the HI-STORE, canister transportation operations are bounded by the HI-STAR 190 SAR. Adherence to these criteria demonstrates confinement safety prior to receipt at the HI-STORE."*

It is not clear what specific analysis of the canister in the HI-STAR 190 demonstrates confinement safety and therefore provides assurance that the confinement boundary integrity is maintained during transport to the HI-STORE CIS Facility. Specific sections of the HI-STAR 190 SAR and/or HI-STAR 190 SER could be referenced, if appropriate, or additional analysis could be provided. The justification provided should demonstrate the analysis is bounding for all contents (e.g. both high and low burnup fuel).

This information is needed to determine compliance with 10 CFR 72.128(a)(3).

RAI 9-6: Justify why the following statements from Section 9.2.1, "Storage Systems," of the HI-STORE SAR are not discussed or identified in Sections 5.4.e, "Design control and facility change or modification," and 5.4.l, "Records management," of Appendix A, "Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility," to the proposed Materials License.

a. *"The canister records must be provided to the HI-STORE facility personnel prior to shipment of a canister."* (Page 9-5)

b. *"These records must be reviewed and any applicable 10 CFR 72.48 screenings or evaluations written against the canister's original licensing basis evaluated against the HI-STORE site specific license to determine if a change requiring NRC approval is necessary."* (Page 9-5)

Because these statements identify actions that support design control, facility change or modification, and records management activities, similar provisions should also be identified in Appendix A to the proposed Materials License for the HI-STORE CIS facility,

This information is needed to determine compliance with 10 CFR 72.24(g), and 72.44(c)(5).

Safety Analysis Report (SAR), Chapter 10, "Conduct of Operations Evaluation"

RAI 10-1: Clarify the reference air leakage rate acceptance criterion and leakage rate test sensitivity in Table 10.3.2, "Canister Leakage Test Performance Specifications," of the HI-STORE SAR to be consistent with ANSI N14.5-2014, "American National Standard for Radioactive Materials – Leakage Tests on Packages for Shipment."

Table 10.3.2 of the HI-STORE SAR describes the, "Reference air leakage rate (L_R) acceptance criterion," as "$2x10^{-7}$ ref-cm^3/s air (leaktight as defined by ANSI N14.5-2014 [10.3.3], using helium as tracer gas)." The numerical value of leaktight ($2x10^{-7}$ ref-cm^3/s air) in Table 10.3.2 is not correct.

The definition of leaktight in ANSI N14.5-2014 is, “The degree of package containment that, in a practical sense, precludes any significant release of radioactive materials. This degree of containment is achieved by demonstration of a leakage rate less than or equal to $1x10^{-7}$ ref-cm^3/s of air at an upstream pressure of 1 atmosphere (atm) absolute (abs), and a downstream pressure of 0.01 atm abs or less.”

Table 10.3.2 of the HI-STORE SAR describes the, “Leakage rate test sensitivity,” as, “$1x10^{-7}$ ref-cm^3/s air (1/2 of the leakage rate acceptance criterion per ANSI N14.5-2014 [10.3.3], using helium as tracer gas.” As described in ANSI N14.5-2014, the leakage rate test procedure shall have a sensitivity less than or equal to one-half the reference air leakage rate; therefore the leakage rate test sensitivity should be corrected based on the definition of leaktight in ANSI N14.5-2014.

This information is needed to determine compliance with 10 CFR 72.24(g) 72.4(c)(3)(ii), and 72.128(a)(1).

RAI 10-2: Clarify Step 12 of Section 10.3.3.1, “Receipt and Inspection of Transportation Cask and Canister,” of the HI-STORE SAR. In addition, clarify Section 5.5.5.b.2 of Appendix A to the proposed Materials License, “Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility,” and clarify the use of, “N14.5-2014.”

Step 12 describes that leakage rate testing procedures shall be approved by an ASNT Level III specialist. Step 12 of Section 10.3.3.1 of the HI-STORE SAR does not specify that the written leakage rate testing procedures shall be developed and approved by personnel certified by the ASNT as a Level III examiner for leakage testing, as indicated by industry standards.

The ANSI/ASNT CP-189-2006, “Standard for Qualification and Certification of Nondestructive Testing Personnel,” provides the minimum training, education, and experience requirements for nondestructive testing personnel. This Standard states that a nondestructive testing personnel Level III examiner has the qualifications to develop and approve written instructions for conducting the leak testing.

Step 12 of Section 10.3.3.1 of the HI-STORE SAR does not specify that the personnel performing leakage rate testing shall be qualified and certified in accordance with the Holtec QA program and Recommended Practice No. SNT-TC-1A.

This Recommended Practice recognizes that the effectiveness of NDT applications depends on the capabilities of the personnel who are responsible for, and perform, NDT. This Recommended Practice also establishes guidelines for the qualification and certification of NDT personnel whose specific jobs require appropriate knowledge of the technical principles underlying the nondestructive tests they perform, witness, monitor, or evaluate.

Table 10.3.2 of the HI-STORE SAR should be captured in Section 5.5.5.b.2 of Appendix A to proposed Materials License to completely describe the leakage rate testing performed on each canister during the receipt inspection. In addition, “N14.5-2014,” does not accurately refer to, “ANSI N14.5-2014.”

RAI 10-3: Ensure accuracy and consistency when using, “HI-STAR,” in Chapter 10, “Conduct of Operations Evaluation,” of the HI-STORE SAR, and in Sections 4.2.6.4 and 5.5.5.b.1 of Appendix A to the proposed Materials License, “Technical Specifications for the HI-STORE Consolidated Interim Storage (CIS) Facility.”

The HI-STAR 190 is the transportation package, as described in Chapter 1, "General Description," (Page 1-22) of the HI-STORE SAR, therefore, Chapter 10 of the HI-STORE SAR should clearly describe the use of the, "HI-STAR 190," rather than, "[…] HI-STAR […]." Section 4.2.1, "Storage Systems," of Appendix A to the proposed Materials License (Page 4-1) should clearly describe the use of the, "HI-STAR 190," rather than, "[…] a 10 CFR 71 certified shipping package." Sections 4.2.6.4 and 5.5.5.b.1 of Appendix A to Materials License No. SNM-1051 (Pages 4-3 and 5-5) should also clearly describe the use of the, "HI-STAR 190," rather than, "[…] loaded Transport Cask […]."

This information is needed to determine compliance with 10 CFR 72.11(a).

RAI 10-4: Specify the types of canister integrity testing in Section 10.2.2.1, "Pre-operational Testing of Equipment," of the HI-STORE SAR.

It is not clear if the canister integrity testing in Section 10.2.2.1 of the HI-STORE SAR includes the HI-STAR 190 cavity gas sampling for Krypton-85, HI-STAR 190 cavity evacuation, flushing, and potential backfill, and MPC leakage rate testing while in the HI-STAR 190.

This information is needed to determine compliance with 10 CFR 72.24(p).

RAI 10-5: Provide additional description for the leakage rate test equipment validation described in Section 10.2.2.3, "Other Testing," of the HI-STORE SAR.

Section 10.2.2.3 of the HI-STORE SAR describes that leak test equipment used for sampling the HI-STAR transportation annulus will be calibrated using a suitable reference concentration of Krypton-85 gas. It is not clear how a suitable reference concentration compares to the Krypton-85 acceptance criterion provided in Table 10.3.3, "Acceptance Criteria for Testing of Shipping Cask Gas Sample," or if the suitable reference concentration is determined by qualified personnel. In addition, calibration of the leak test equipment for helium should also be described in Section 10.2.2.3 of the HI-STORE SAR.

This information is needed to determine compliance with 10 CFR 72.24(e) and 72.128(a)(1).

RAI 10-6: Clarify Section 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," steps 4 and 5 of the HI-STORE SAR.

Section 10.3.3.1, step 3 of the HI-STORE SAR states:

> *"The HI-STAR transportation package is moved into the CTB." Section 10.3.3.1, step 4 of the HI-STORE SAR describes, "The personnel barrier, if used is removed […]"*

In addition, Section 10.3.3.1, step 5 of the HI-STORE SAR describes:

> *"The HI-STAR shipment personnel barrier and tie-downs are removed."*

It is not clear if the removal of the personnel barriers in steps 4 and 5 is redundant, or if there are two different personnel barriers.

This information is needed to determine compliance with 10 CFR 72.11(a).

RAI 10-7: Clarify the following statements related to fission gas sampling, specifically Krypton-85, in Section 9.2.2, "Operational Activities," and Section 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," step 10 of the HI-STORE SAR. The HI-STORE SAR text is underlined below for emphasis.

Section 9.2.2 (Page 9-6) of the HI-STORE SAR describes:

> *"One of the vent/drain ports of the transportation cask is opened to allow access to the small free volume between the canister and the cask."*

Section 10.3.3.1, step 10 of the HI-STORE SAR describes:

> *"As a safety precaution, the HI-STAR closure lid access port cover is removed and sampling equipment is attached to test for the presence of Krypton-85."*

Neither statement specifies if the vent port or drain port of the HI-STAR 190 is used. It is not clear whether both the vent and drain port of the HI-STAR 190 could provide an adequate sample of Krypton-85 considering that attached to the drain port is a drain tube that extends to the bottom of the package, therefore the sample is coming from the bottom of the HI-STAR 190. Sampling from the vent port, where the sample is coming from the top of the HI-STAR 190, may not allow for circulation of the higher density Krypton-85 gas (i.e. heavier gas).

This information is needed to determine compliance with 10 CFR 72.24(e), 72.44(c)(ii), and 72.128(a)(1).

RAI 10-8: Clarify the following statements related to testing for fission products in Section 9.2.2, "Operational Activities," and Section 10.3.3.1, "Receipt and Inspection of Transportation Cask and Canister," steps 11 and 12 of the HI-STORE SAR.

Section 9.2.2 (Pages 9-6 and 9-7) of the HI-STORE SAR describes:

> *"The gas extracted from the volume during the evacuation and helium testing is also collected and tested for any fission products before being released."*

Section 10.3.3.1, steps 11 and 12 of the HI-STORE SAR do not describe testing the gas extracted from the volume between the HI-STAR 190 and the MPC for fission products. The specific fission products tested should be provided in Section 10.3.3.1, steps 11 and 12 of the HI-STORE SAR.

This information is needed to determine compliance with 10 CFR 72.24(e), 72.44(c)(ii), and 72.128(a)(1).

RAI 10-9: Revise Section 15.3.4 of the HI-STORE SAR to include methods to restore the UMAX system to a normal configuration after floodwater and debris are deposited in the system.

SAR Section 15.3.4 states that HI-STORM UMAX FSAR flood accident Subsection 12.2.4 is incorporated by reference. Subsection 12.2.4.3 of the HI-STORM UMAX FSAR states that specific methods to restore a UMAX from deposited floodwater and debris "[…] shall be addressed in the site emergency action plan" and gives example methods to achieve restoration. However, these methods to restore the UMAX system were not provided in the HI-STORE SAR.

This information is needed to determine compliance with 10 CFR 72.32(a) and 72.122(b).

Safety Analysis Report (SAR), Chapter 17, "Material Considerations"

RAI 17-1: Clarify the specific important to safety (ITS) components that are included under the description of "Special Lifting Devices" in Table 4.2.1 of the HI-STORE CIS SAR, and provide the materials of construction and their mechanical properties.

SAR Section 4.5.1 defines "special lifting devices" as those components constructed in accordance with ANSI N14.6, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4,500 kg) or More." SAR Section 5.4 states that special lifting devices include the transport cask lift yoke, multi-purpose canister (MPC) lift attachment, HI-TRAC CS lift yoke, HI-TRAC CS lift link, transport cask horizontal lift beam, and MPC lifting device extension. The staff notes that all of these components, except the HI-TRAC CS lift link, are included as separate line items in SAR Table 4.2.1, "ITS Classification of SSCs that Comprise the HI-STORE CIS Facility."

It is unclear to the staff whether the "Special Lifting Devices" line item in SAR Table 4.2.1 is meant to refer to the transfer cask lift link or additional lifting devices not already included in the table and described in the SAR. The materials and mechanical properties are needed to allow the staff to evaluate the design and performance of ITS structures, systems, and components (SCCs) used at the HI-STORE CIS Facility.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3) and (d).

RAI 17-2: State whether the ferritic steels that are used to construct the special lifting devices and the cask transfer building crane require drop weight or Charpy impact testing. If not, provide the technical justification for the adequacy of the fracture toughness for these materials.

Section 4.2.6 of ANSI N14.6-1993, "Special Lifting Devices for Shipping Containers Weighing 10 000 Pounds (4 500 Kg) or More" requires, with some exceptions, that ferritic steels for load-bearing members be tested with the ASTM drop weight or Charpy impact standard to establish adequate fracture toughness.

Section 4212 of ASME NOG-1-2015, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)," also requires, with some exceptions, that materials for structural components be tested with the ASTM drop weight or Charpy impact standard to establish adequate fracture toughness.

The staff notes that the HI-STORE special lifting devices and cranes are designed in accordance with ANSI N14.6 and ASME NOG-1, respectively; however, fracture toughness testing requirements do not appear in the SAR or drawings for the HI-TRAC CS lift yoke, transport cask lift yoke, transport cask horizontal lift beam, MPC lift attachment, MPC lifting device extension, HI-TRAC CS lift link, vertical cask transporter, and cask transfer building crane.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-3: Clarify the acceptable materials of construction for the cask transfer building (CTB) crane and vertical cask transporter (VCT).

SAR Sections 4.5.3.3 and 4.5.3.9 state that the VCT beam and lifting tower materials "shall be consistent with the ITS category of the part." The staff is unable to find in the SAR a description of how the ITS category of a part determines the material of construction.

SAR Table 4.5.2, "Design Parameters for the CTB Crane," states that the material of construction includes a carbon steel frame. However, Section 4200 of the crane design standard, ASME NOG-1-2015, provides specific steel grades that are considered acceptable. SAR Table 4.5.2 should reference these acceptable grades or a justification should be provided for not following the design standard.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3).

RAI 17-4: Provide justification for performing only visual examinations for the transfer cask and canister transfer facility welds that are fabricated in accordance with American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section III, Subsection NF.

SAR Section 1.5, Drawing No. 10868, "HI-TRAC CS," and Drawing No. 10895, "Canister Transfer Facility," indicate that the welds performed in accordance with ASME Code Section III Subsection NF are only visually examined. However, the ASME Code requires additional nondestructive examinations for welding of several types of components, such as primary members of Class 1, 2, and metal containment supports. The staff requires additional information regarding the specific Code criteria used in the design of the transfer cask in order to evaluate the adequacy of the welding inspections. If the welding inspections are not performed in accordance with the Code, provide a justification for performing only visual examinations.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3).

RAI 17-5: Provide the technical justification for the structural performance of the Metamic-HT fuel basket for MPCs with an indefinitely long service life.

SAR Table 17.0.2 states that the materials and mechanical properties for the Metamic-HT fuel basket are incorporated by reference from the HI-STORM UMAX FSAR, which, in turn, references the HI-STORM FW FSAR. Section 1.2.1.4.1 of the HI-STORM FW FSAR refers to the Metamic-HT Sourcebook for the technical basis for the properties of this material.

The staff notes that the Metamic-HT Sourcebook does not discuss mechanical properties beyond 40 years of service, and MPCs stored at the HI-STORE site may have a service life significantly longer that that time period. Additional technical justification is needed to demonstrate that the long-term effects at elevated temperatures will not prevent the fuel basket from fulfilling its structural function.

This information is required to demonstrate compliance with 10 CFR 72.24(d).

RAI 17-6: In SAR Section 5.4, provide a description, design criteria, material properties, and a summary of the structural analyses of the metallic components of the canister transfer facility.

SAR Chapter 5, “Installation and Structural Evaluation,” provides design information and structural analyses for all ITS components at the HI-STORE CIS Facility; however, the canister transfer facility is missing from this discussion. The staff notes that SAR Section 5.3.3 discusses the canister transfer facility concrete foundation, but there is no discussion of the structural steel components of the facility. This information is needed to allow the staff to evaluate the design and performance of the canister transfer facility and the maintenance requirements in SAR Section 10.3 that are frequently specific to the design-code of the SSC.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3) and (d).

RAI 17-7: For the components unique to the HI-STORE CIS Facility, provide the mechanical properties used to support the structural evaluation.

SAR Chapter 5, “Installation and Structural Evaluation,” frequently states that mechanical properties are obtained from applicable specifications, without providing the property data (e.g., SAR Sections 5.4.4.3, 5.4.5.3, 5.4.6.3, 5.5.1.3). In addition, in some cases, the SAR states that only the strength properties are obtained from applicable specifications, without reference to other properties included in those specifications (e.g., elongation).

The staff’s materials review includes the verification that property data from materials codes and standards are being used correctly, including the appropriate consideration of temperature and time-dependent properties. This information is needed to allow the staff to evaluate the design and performance of ITS SCCs used at the HI-STORE CIS Facility.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3) and (d).

RAI 17-8: Provide the fracture toughness testing requirements for ferritic steels used at the HI-STORE CIS Facility and clarify the value of the applicable lowest service temperature.

SAR Section 17.4.1 incorporates by reference information from HI-STORM UMAX FSAR, Section 3.3, to define the mechanical properties of materials used at the HI-STORE CIS Facility. However, the cited reference does not include the HI-STORM UMAX FSAR information on ferritic steel fracture toughness testing requirements (e.g., Table 3.1.9, “Fracture Toughness Test Requirements,” in the HI-STORM UMAX FSAR).

A description of the tests that are to be performed on ferritic steels that will demonstrate adequate resistance to brittle fracture is needed to allow staff to evaluate the performance of ITS SCCs used at the HI-STORE CIS Facility. Specific information needed includes:

- The specific value of the lowest service temperature that will be used to define testing requirements for all SSCs at the HI-STORE site and a justification for that temperature. SAR Section 17.4.3 states that the lowest service temperature will be 10 degrees F below the 24-average at the site for any day within the last year. Additional information is needed on the historical daily minimum temperatures to understand the degree to which the selected threshold is expected to bound the temperatures during the 40-year license.

- Fracture testing methodology, test temperature, and acceptance criteria for components and welds designed to ASME Code Section III, Subsection NF (transfer cask, tilt frame, canister transfer facility, vertical ventilated module (VVM), and applicable portions of the vertical cask transporter).

- Clarification of whether ASTM materials used in components designed to the ASME Code (e.g., transfer cask, tilt frame, and canister transfer facility) are subject to the ASME fracture testing requirements – and a technical justification if this is not the case.

- Fracture testing requirements for the bolts that secure the transfer cask to the VVM and canister transfer facility.

- Note: testing of special lifting devices and the crane is addressed separately in RAI 17-2.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3) and (d).

RAI 17-9: Clarify the required density of the concrete and soil used in the shielding evaluation.

The SAR contains inconsistencies and unclear terminology regarding the referenced values of concrete and soil density, as follows:

- The drawing for the VVM states that the plenum shield concrete shall have a minimum dry density as specified for the closure lid in Table 2.3.2 of the HI-STORM UMAX FSAR. However, the minimum density of the closure lid in that table differs from the specified density of the plenum shield concrete in Table 7.3.1 of the HI-STORE SAR.

- Section 7.3.1 of the HI-STORE SAR states that the shielding material properties (other than that for the transfer cask) are provided in Table 5.3.2 of the HI-STORM UMAX SAR. However, Table 5.3.2, "Composition of the Materials in the HI-STORM FW System," does not address the subgrade requirements unique to the underground system. The staff notes that the HI-STORM UMAX FSAR, Table 2.3.2 has density requirements for the subgrade that are used in the shielding analysis.

- In Table 7.3.1 of the HI-STORE SAR, it is unclear what the word "Ground" refers to in the "HI-TRAC CS Concrete" line item.

- In Table 7.3.1 of the HI-STORE SAR, it is unclear if the word "Ground" under the "Soil" line item is intended to refer to all subgrades, or just that between the ISFSI pad and support foundation pad. The staff notes that the HI-STORM UMAX FSAR has different density requirements for the subgrade at the pad and the subgrade adjacent to the pad (referred to as Space A and Space B, respectively, in Figure 2.4.4 of the HI-STORM UMAX FSAR and 4.3.1 of the HI-STORE SAR).

This information is required to demonstrate compliance with 10 CFR 72.24(d) and (e).

RAI 17-10: Reconcile the difference between the permissible temperature limit for shielding concrete provided in HI-STORE SAR Table 4.4.1 and Holtec Position Paper DS-289.

HI-STORE SAR Table 4.4.1, "Permissible Temperature Limits for HI-TRAC CS and CTF Materials," includes a 650 °F temperature limit for shielding concrete under accident conditions. This table references the analysis on concrete requirements in the HI-STORM 100 FSAR, Revision 14. However, the staff notes that Revision 15 of the HI-STORM 100 FSAR has a 572 °F allowable temperature limit, based on the latest revision of Holtec Position Paper DS-

289, “Maximum Permissible Temperature in Plain Concrete in HI-STORM System Components Under Off-Normal and Accident Conditions.”

This information is required to demonstrate compliance with 10 CFR 72.24(d) and (e).

RAI 17-11: Justify the elevated-temperature performance of the cask transfer building slab and canister transfer facility foundation.

HI-STORE SAR Table 6.4.5 states that, while positioned inside the canister transfer facility, the enclosure shell of the transportation cask may reach 336 °F (160 °C). The SAR does not provide information on the temperature of the adjacent concrete structures.

SAR Sections 4.6.2 and 5.3.3 state that the cask transfer building slab and canister transfer facility foundation are designed to meet the strength requirements of ACI 318-05, “Building Code Requirements for Structural Concrete.” The staff notes that ACI 318 does not include provisions for high temperature exposure; however, ACI 349, “Code Requirements for Nuclear Safety Related Concrete Structures,” has a 150 °F (66 °C) limit for normal operation.

Data on the effect of temperature on the strength of concrete indicates that compressive strength drops by more than 20 percent after a few days of exposure to temperatures near 150 °C (Carette and Malhotra, 1985). It is unclear to the staff whether the cask transfer building slab and canister transfer facility may reach temperatures that could degrade the concrete strength and, if so, if the loss of strength may affect the concrete structural performance.

This information is required to demonstrate compliance with 10 CFR 72.24(d) and 72.120(d).

Reference:

Carette, G.G. and Malhotra, V.M.,” Performance of Dolostone and Limestone Concretes at Sustained High Temperatures,” Temperature Effects on Concrete, ASTM STP 959, T.R. Naik, Ed., American Society for Testing and Materials, Philadelphia, 1985, pp. 38-67.

RAI 17-12: Provide additional information to justify the statements in HI-STORE SAR Chapter 18 that the halide content in the air at the HI-STORE site is negligible with respect to the potential to cause stress corrosion cracking of stainless steel.

HI-STORE SAR Section 18.3 states that “the halide content in the air is negligible.” SAR Section 18.4 states that the air contains a “minuscule concentration of halides” and that the relative humidity in the high desert of southeastern New Mexico is low, making the delivery of salts to the canister surface less effective.

The staff notes that it does not appear that the above conclusions in HI-STORE SAR Chapter 18 are supported by local the area information provided in SAR Chapter 2 and the Environmental Report, as follows:

- SAR Chapter 2 describes the area around the site as containing several playas, or transitory shallow lakes, that contain accumulations of halite (sodium chloride) and gypsum. The SAR also states that the surrounding area historically has been mined for potash. The staff notes that sylvinite, a mixture of sylvite (potassium chloride) and halite, is the typical potash ore mined in the Carlsbad Potash District in southeastern New

Mexico (Barker and Austin, 1993). Magnesium-containing minerals, such as langbeinite (potassium magnesium sulfate) and carnallite (potassium magnesium chloride) are also common to the area.

- Section 3.5.1 of the Environmental Report notes the high salinity conditions in the local playas, which includes Laguna Gatuna and Laguna Plata within two miles of the site.

- In contrast to the statement in SAR Section 18.4, low levels of relative humidity are typically associated with a greater degree of dust transport in semi-arid climates (Csavina et al., 2014).

- SAR Section 2.1.2 states that soil samples at the HI-STORE site had chloride concentrations of 26-43,000 mg/kg, although the SAR concludes that the high chloride measurements were due to sampling in areas previously used for oilfield disposal.

The staff requires additional justification for why the salts that are known to be present in the surrounding area would not be expected to be transported to the canisters, and why elevated salt concentrations in the soil were necessarily attributed to the oil field rather than the naturally occurring salt deposits in the region and high salinity of the local playas.

This information is required to demonstrate compliance with 10 CFR 72.122(b)(1).

References:

J.M. Barker and G.S. Austin, "Economic Geology of the Carlsbad Potash District, New Mexico," Carlsbad Region (New Mexico and West Texas), Love, D. W.; Hawley, J. W.; Kues, B. S.; Austin, G. S.; Lucas, S. G.; [eds.], New Mexico Geological Society 44th Annual Fall Field Conference Guidebook, 1993, pp. 283-291 [available at http://nmgs.nmt.edu/publications/guidebooks/44].

Csavina, J., J. Field, O. Felix, A Corral-Avitia, A. Saez, and E. Betterton, "Effect of Wind Speed and Relative Humidity on Atmospheric Dust Concentrations in Semi-Arid Climates," Science of the Total Environment, Vol. 487, pp. 82-90, 2014 [available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4072227/]

RAI 17-13: Clarify the coating requirements in the drawings and provide additional information in the SAR on the functions and materials for the coatings used at the HI-STORE CIS Facility.

HI-STORE SAR Section 17.2 states that acceptance criteria for materials subject to long-term storage include ensuring that coatings remain intact and adherent. In addition, SAR Sections 17.7 and 17.11 describe the role of coatings to prevent corrosion of all exposed carbon steel surfaces. However, the staff notes that most of the drawings for carbon steel components do not specify the use of coatings and the maintenance activities described in SAR Table 10.3.1 refer to coating inspections for only a portion of the carbon steel components. As a result, it is unclear to the staff whether coatings are considered necessary to prevent the degradation of ITS SCCs.

Clarify the functions, materials, and maintenance activities for all coatings used at the HI-STORE CIS Facility, addressing (but not necessarily limited to):

- Clarify coating requirements in all drawings.

- Provide specific information on coating materials (i.e., chemistry and proprietary coating names). SAR Section 17.7 states that steel surfaces, except the exterior of the canister enclosure container, are coated with the same or equivalent preservative as used in the HI-STORM FW and HI-STORM 100 overpacks. However, that information is not incorporated by reference into the HI-STORE SAR. The SAR also does not define which specific Keeler and Long coating is acceptable for the canister enclosure container. The HI-STORE SAR should provide details on coatings to be used at the HI-STORE CIS Facility or incorporate by reference such information.

- Revise SAR Table 10.3.1 to describe coating maintenance activities for all carbon steel surfaces where coatings are credited for preventing the degradation of ITS SCCs.

- Clarify SAR Section 17.6, which states that coatings will be used for bolts if the ambient environment is aggressive. For the ITS bolts at the HI-STORE CIS Facility, clarify whether the environment is considered aggressive, and if so, provide coating requirements.

- Describe the VVM divider shell coating material referenced in VVM drawing 10875, which is stated to be necessary to meet emissivity requirements.

- Describe the coating used on the ISFSI concrete surrounding the VVMs. SAR Section 18.3 states that this coating will prevent spalling of the concrete.

This information is required to demonstrate compliance with 10 CFR 72.24(c)(3) and 72.122(b)(1).

RAI 17-14: Clarify the details of the VVM maintenance activities. The staff notes that some portions of the HI-STORE SAR descriptions of the VVM maintenance activities are unclear with respect to inspection details:

- For the annual VVM in-service inspection for long-term degradation, neither SAR Section 10.3.4 nor Table 10.3.1 explicitly state how many VVMs will be inspected. SAR Section 10.3.4 (though not Table 10.3.1) states the 5-year inspection will be performed on one VVM, but the sampling for the annual inspection is not described.

- SAR Section 10.3.4 states that inspection activities include those for cavity enclosure container (CEC) wall thinning. It is not clear how the proposed borescope inspection will measure wall thinning, especially for thinning occurring from the outside surface of the CEC shell in contact with the subgrade.

- It is not clear what is considered an accessible area for the annual visual inspections. SAR Section 10.3.4 states that the “more thorough” 5-year inspection will use remote devices, such as a borescope; however, no similar description is provided for the annual visual inspection. As a result, it is unclear to the staff whether the annual inspections are simply “walk-downs” of the VVMs or a more-focused remote inspection capable of identifying degradation of the interior of the cavity enclosure container.

In order to allow the staff to evaluate the adequacy of the VVM inspections, provide clarifying details to address the above issues related to maintenance.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-15: [Contains Proprietary Information, see Enclosure 2]

RAI 17-16: State the qualification requirements of personnel performing inspections of the ISFSI pad, and clarify the method used to confirm that ISFSI pad settlement will be within the design basis.

HI-STORE SAR Table 10.3.1 states that, as part of the maintenance program, the ISFSI pad will be inspected annually for cracks and, every five years, settlement will be confirmed to be within the design basis. SAR Section 18.8 also states that the Reinforced Concrete AMP will include annual inspection for concrete degradation, and the acceptance criteria for those inspection will be in accordance with American Concrete Institute (ACI) 349.3R-02, "Evaluation of Existing Nuclear Safety-Related Concrete Structures."

Chapter 7 of ACI 349.3R-02 includes minimum personnel qualification requirements for the responsible engineer and the inspectors to ensure that concrete inspections are property implemented. In addition, ACI 349.3R-02 references specific methods by which settlement can be measured (e.g., surveying techniques).

The SAR descriptions of the maintenance and AMP do not reference the ACI Code for personnel qualification, and it is unclear to the staff how personnel will be trained to ensure that concrete degradation will be appropriately identified and evaluated. Also, the SAR does not state the method by which pad settlement will be confirmed to be within the design basis every five years.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-17: Include the groundwater chemistry monitoring activities in Holtec Report No. HI-2167378, "Aging Assessment and Management Program for HI-STORE CIS."

SAR Section 18.8 provides a summary of the Reinforced Concrete AMP, which includes a description of groundwater chemistry monitoring. However, the detailed description of the program in the Holtec Report No. HI-2167378 does not mention this activity.

In order to allow the staff to evaluate the efficacy of the program to address potential degradation of the concrete, the staff requires additional information on the groundwater monitoring activity (e.g., parameters monitored, monitoring frequency, acceptance criteria).

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-18: Provide a technical justification for the MPC inspection sample size and inspection frequency in the Canister AMP.

SAR Section 18.5, "Canister Aging Management Program," states that one MPC will be inspected every five years. The SAR does not provide a technical basis for the adequacy of this

inspection approach to identify stress corrosion cracking of the potential population of 500 MPCs at the HI-STORE CIS Facility.

The staff requires additional information to justify the inspection sample size and inspection frequency, considering:

- The history of the canisters prior to arriving at the HI-STORE CIS Facility. SAR Section 18.5 states that the ranking of canisters at the site will consider the prior site; however, it is not clear how information on the potential storage conditions at prior sites (e.g., proximity to chloride sources, humidity) was considered in developing the inspection sample size of one MPC and frequency of every five years.

- The proximity to chloride sources at the HI-STORE CIS Facility (see RAI 17-11).

- The potential for deliquescence of deposited salts, based on weather station data, canister temperatures, and potential deposited salt compositions. SAR Chapter 2 describes the site has having low humidity; however, the SAR does not provide a quantitative evaluation of when atmospheric moisture may deliquesce. The staff notes that the combination of the minerals in the surrounding area could lead to salt mixtures that undergo deliquescence at levels of relative humidity significantly lower than that for a single salt alone. For example, adding potassium chloride to sodium chloride can depress deliquescence relative humidity from about 74% to 68%, while additions of magnesium chloride can depress the deliquescence relative humidity much further (24% for pure magnesium chloride). (Yang et al., 2011)

- An estimate of the stress corrosion crack growth rates, considering laboratory data, field experience, and time of canister wetness (deliquescence).

This information is required to demonstrate compliance with 10 CFR 72.120(a).

Reference:

Yang, L., R. Pabalan, P. Shukla, M. Juckett, X. He, K.T. Chiang, H. Gonzalez, and T. Ahn, “Corrosion of Alloy 22 Induced by Dust Deliquescence Brines,” Report Prepared for the Nuclear Regulatory Commission, March 2011, ADAMS ML110730489.

RAI 17-19: Include the MPC eddy current activities in the Canister AMP in Holtec Report No. HI-2167378, “Aging Assessment and Management Program for HI-STORE CIS,” and clarify the criteria that prompts the performance of this testing.

SAR Section 18.5 provides a summary of the Canister AMP, which includes a brief description of eddy current testing. However, the detailed description of the program in Holtec Report No. HI-2167378 does not mention this activity. In order to allow the staff to evaluate the efficacy of the program described in HI-2167378 to address potential degradation of the MPC, the staff requires additional information on the eddy current testing activity, including:

- A description of the method;

- Qualification requirements of personnel performing the testing;

- How the method will be demonstrated to be capable of identifying and sizing anomalies;

- The extent of test coverage that will be performed on an MPC(s) if a U-bend specimen exhibits defects or anomalies, and;

- The acceptance criteria for allowable flaw size.

In addition, the staff notes that SAR Section 18.5.3 states that eddy current testing may be performed if U-bend coupons indicate a defect or anomaly. The SAR does not indicate whether indications found on the MPC could also prompt eddy current testing.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-20: Provide additional details of the U-bend coupon testing in the Canister AMP in Holtec Report No. HI-2167378, "Aging Assessment and Management Program for HI-STORE CIS," its technical basis, and how it will be used to inform inspections in the AMP.

The staff notes that the summary of the Canister AMP in SAR Section 18.5 contains significantly more information on the U-bend testing than the full description of the program in Holtec Report No. HI-2167378. In order to allow the staff to evaluate the efficacy of the program described in HI-2167378 to address potential degradation of the MPC, the staff requires additional information on the coupon testing activity, including:

- The standard to which the coupons will be prepared;

- Details of pre-exposure examination methodology;

- Details of the post-exposure examination methodology;

- Whether coupons are placed back into service after post-exposure examinations (versus having multiple coupons that are each exposed just once), and, if so, how artifacts from the examination (e.g. dye penetrant, cleaning) that could affect the subsequent results will be avoided;

- Frequency of coupon examinations, and;

- Canister sample size. SAR Section 18.5.2 states that coupons will be installed in VVMs that contain oldest and coldest canisters where inspections are expected. The staff notes that the program proposes to inspect only one MPC, and thus it is not clear if coupons are planned to be installed in one VVM or some larger sample of VVMs.

In addition, it is not clear to the staff why U-bend coupons installed in the VVMs with the oldest and coldest canister would best serve as an early warning to predict the onset of cracking. The staff notes that this VVM would be expected to have the lowest airflow of any VVM on the site and thus the lowest potential for pulling in atmospheric contaminants. Also, the coupons will not have had the exposure history of the oldest and coldest canister (i.e., exposure at original storage site). SAR Section 18.5.2 states that the coupon testing will help provide insight into the long term aging behavior; however, it does not appear that the AMP provides adequate consideration of possible false negative coupon results (i.e., assuming that no corrosion of the coupon means no corrosion of the canister) and the potential to inappropriately relax MPC

inspections in the future based on coupon results. As a result, the staff requires additional information regarding:

- The technical basis for choosing the VVM with the oldest and coldest canister for the coupon testing;

- Whether a VVM's position on the pad may influence the degree to which is it exposed to contaminants from the surrounding area (and thus whether VVM position should be considered in coupon placement), and;

- Given the coupon limitations discussed above, how the AMP will prevent the results of coupon testing from inappropriately relaxing the AMP activities in the future.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-21: Provide the technical justification that establishes that the MPCs arriving at the HI-STORE CIS Facility will have adequate structural integrity under normal, off-normal, and accident conditions of storage.

The staff notes that the MPCs arriving at the HI-STORE CIS Facility have an undefined length of prior storage, and they may have been subject to aging mechanisms during that storage term that have the potential to challenge the integrity of the canisters. The staff also notes that, while the proposed canister leak testing described in SAR Section 10.3.3.1 provides information on the state of confinement at the time of receipt, this testing does not provide information on the structural integrity of the MPCs (i.e., presence or absence of indications, their number and size).

The staff recognizes that a license or CoC under which an MPC was previously stored or transported may include some inspections capable of verifying structural integrity; however, that is not necessarily the case. The HI-STORE SAR does not incorporate by reference any such criteria from other licenses/CoCs nor does it establish minimum inspection criteria for MPCs that are received on the HI-STORE site.

As a result, the staff requires additional information that demonstrates that MPCs with an undefined length of prior service will have adequate structural integrity when received at the HI-STORE CIS Facility.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-22: Provide additional details on the areas that will be visually inspected as part of the HI-TRAC CS transfer cask maintenance program prior to each handling campaign.

Table 10.3.1 of the HI-STORE SAR states that, prior to each handling campaign, surface coatings will be verified to be intact, shield gates will be confirmed to be operational, and trunnions will be inspected for indications of overstress, such as cracking.

In order to allow the staff to evaluate the efficacy of the transfer cask maintenance program, provide additional information in Table 10.3.1 regarding:

- The specific subcomponents or areas that are included in the visual inspection for coating integrity, including whether the transfer cask cavity (inside surface) is inspected;

- Clarification of whether the bottom lid bolts and bolt holes are inspected (as stated in SAR Section 10.3.4.1), and;

- The technical basis for using visual inspections to identifying trunnion cracking. ASME Code Section V, "Nondestructive Examination," Table A-110, "Imperfection vs Type of NDE Method," states that fatigue cracks can be detected by most liquid penetrant and magnetic particle techniques. However, for visual examinations, the Code states that "special techniques, conditions, and/or personnel qualifications are required to detect this imperfection."

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-23: Provide additional details on areas that will be visually inspected on the HI-TRAC CS transfer cask as part of the HI-TRAC CS AMP in Holtec Report No. HI-2167378 and justify the use of visual inspections to identify trunnion cracks.

Holtec Report No. HI-2167378 states that all accessible painted surfaces will be inspected for corrosion and paint degradation and the water jacket will be inspected for leaks. SAR Section 18.6 and Report No. HI-2167378 also state that visual inspections will be used to identify trunnion cracks.

In order to allow the staff to evaluate the efficacy of the HI-TRAC CS AMP, clarify the following:

- If the transfer cask cavity (inside surface) is considered an "accessible" painted surface. If not, state how the degradation of these surfaces will be monitored.

- Clarify the reference to a water jacket; transfer cask drawing no. 10868 does not include a water jacket.

- (Similar to RAI 17-21 for transfer cask maintenance) The technical basis for using visual inspections to identifying trunnion cracking.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-24: In SAR Table 10.3.1, provide additional information regarding the maintenance requirements, if applicable, for the special lifting devices, CTB crane, canister transfer facility (CTF), CTF floor slab, and transport cask tilt frame.

SAR Table 10.3.1 provides the maintenance activities at the HI-STORE CIS Facility; however, it is missing information found elsewhere in the SAR for maintenance of the special lifting devices, CTB crane, CTF, CTF floor slab, and transport cask tilt frame. Update the table to provide the scope, inspection method, frequency (or applicable standard) for the maintenance activities.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-25: Clarify details in SAR Section 18.10 regarding the aging management activities for lifting devices.

SAR Section 18.10 summarizes the Lifting Device AMP. There are several details in this

section that are unclear to the staff:

- The list of examples of “special lifting devices” includes canister lift cleats and cask lift brackets. The staff notes that these two subcomponents do not appear in any drawings and are not discussed in the list of special lifting devices in SAR Section 5.4.6.1. Revise SAR Section 5.4.6.1, Table 4.2.1, and Section 18.1, as needed, to clarify whether the canister lift cleats and cask lift brackets are ITS components.

- The list of items addressed by the AMP does not include the HI-TRAC CS Lift Link, which is described in SAR Section 5.4.6.1 as a special lifting device used at the HI-STORE CIS Facility. Clarify whether the program manages the aging of this component.

- SAR Section 18.10 states that the program performs visual inspections of all “internal surfaces for corrosion and integrity.” Clarify what is meant by an “internal surface” of the lifting devices. Clarify what is meant by “integrity” (i.e., coating integrity vs. structural integrity). Note that SAR Section 18.11 also uses the term “integrity.”

- SAR Section 18.10 states that the Lifting Device AMP addresses ancillaries needed to carry out short term operations, but it also includes the canister transfer facility in the list of components inspected in the program. The staff notes that the canister transfer facility does not fall under the classification of “ancillaries,” as defined in SAR Section 4.5. Clarify Section 18.10 to expand the scope of the program beyond ancillaries.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-26: [Contains Proprietary Information, see Enclosure 2]

RAI 17-27: Clarify the maintenance activities for the cask transfer building crane.

HI-STORE SAR Section 10.3.7 states that crane systems designed to ASME NOG-1, “Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder),” shall be maintained per the requirements of that standard.

The staff notes that, as stated in ASME NOG-1 Nonmandatory Appendix C, this standard is a design standard and does not address operation and maintenance.

This information is required to demonstrate compliance with 10 CFR 72.120(a).

RAI 17-28: Clarify the details of the High Burnup Fuel AMP that will be used to demonstrate fuel performance beyond 20 years of storage.

HI-STORE SAR Section 18.9 states that the High Burnup Fuel AMP will be used to monitor and assess information on fuel performance to ensure that the fuel remains in an analyzed configuration. Holtec Report No. HI-2167378, “Aging Assessment and Management Program for HI-STORE CIS,” provides additional detail on the program, which relies on a surrogate demonstration program to provide fuel performance data.

The staff notes that the description of the High Burnup Fuel AMP in Holtec Report No. HI-2167378 is not clear regarding the specific requirements of a surrogate demonstration program

that are needed to verify the performance of fuel at the HI-STORE site, such as:

- The specific parameters that are to be monitored or inspected in the surrogate program (i.e., what specific parameters need to be monitored by the surrogate program to make it acceptable for demonstrating fuel performance at the HI-STORE site).

- Methods that are acceptable to detect those parameters and identify potential fuel aging effects.

- Additional details on acceptance criteria. The staff notes that the acceptance criteria are vague with respect to which portions of the demonstration cask they apply.

The staff notes that the AMP is written in a manner that assumes that whatever actions are taken in the referenced U.S. Department of Energy surrogate program will necessarily be acceptable for demonstrating high burnup fuel performance beyond 20 years.

This information is required to demonstrate compliance with 10 CFR 72.120(a) and 72.122(h)(1), (h)(5), and (l).

Emergency Response Plan (ERP) (Report No. HI-2177535, Revision 2)

RAI EP-1: Clarify the statements in Sections 4.3.3 and 4.3.12 of the proposed ERP, which refer to classification of accidents at the proposed HI-STORE CIS Facility.

The provisions of 10 CFR 72.32(a)(3), *"Classification of accidents,"* only require an "Alert" classification for accidents at an independent spent fuel installation (ISFSI), while 10 CFR 72.32(b)(3) requires a classification for accidents at a monitored retrievable storage (MRS) facility as either an "alert" or "site area emergency."

Section 3.1, "Classification System," of the proposed ERP correctly states that emergencies for the proposed ISFSI are classified as an Unusual Event or Alert. However, Section 4.3.3, "Site Emergency Director (SED)," of the proposed ERP states, in part:

> "*The SED can be reached via telephone to assist and advise the on duty EC [Emergency Coordinator] of his recommendations. These duties include:*
>
> *[…]*
> - *Decision to escalate to a site area emergency, if appropriate."*

In addition, Section 4.3.12, "Activation of the ERP," of the proposed ERP further states, in part:

> "*When the EC determines that an emergency exists, he/she will immediately:*
>
> - *Determine if the emergency involves a loss of control or potential loss of control over hazardous or radioactive materials, thus requiring further classification as an Alert, or Site Area Emergency."*

As Section 3.1 of the proposed ERP limits the emergency classification levels to a Notice of Unusual Event and Alert, consistent with 10 CFR 72.32(a)(3), clarify why Sections 4.3.3 and 4.3.12 of the proposed ERP, refer to a Site Area Emergency classification level, which is only required for an MRS facility.

This information is necessary to determine compliance with 10 CFR 72.32(a)(3).

RAI EP-2: Justify why the most recent version of the NRC endorsed guidance for the development of EALs was not used in the development of the EALs for the HI-STORE CIS Facilty ERP.

The guidance used by Holtec for the development of the CIS Facility Emergency Action Levels (EALs) is Nuclear Energy Institute (NEI) document, NEI 99-01 "Methodology for Development of Emergency Action Levels," Revision 4, dated January 2003. However, the most recent version of NRC-endorsed guidance for the development of EALs is NEI 99-01, "Development of Emergency Action Levels for Non Passive Reactors," Revision 6, dated November 2012 (ADAMS Accession No. ML12326A805). In addition, the proposed EALs for the HI-STORE CIS facility, contained in Table 3.1B, "CIS Facility Malfunction Initiating Condition Matrix," are not consistent with guidance in NEI 99-01, Revision 4.

This information is necessary to determine compliance with 10 CFR 72.32(a)(3).

RAI EP-3: Revise Table 3.1B of the proposed ERP to include radiation level thresholds for specific event initiating conditions at the HI-STORE CIS Facility.

Table 3.1B of the proposed ERP provides the following two initiating conditions (ICs):

- Notice of Unusual Event – UNCONTROLLED increase in radiation level at the CIS Facility, and;

- Alert - UNCONTROLLED increase in radiation level that impedes operations at the CIS Facility.

Since there are no radiation level value thresholds with these two ICs, the declaration of these events would appear to the staff as subjective, which would result in potential inconsistent event declaration. Explain how the Emergency Coordinator or designee would perform an accurate and timely emergency classification for these ICs, or revise accordingly consistent with NRC-endorsed guidance, provided in Nuclear Energy Institute (NEI) document, NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors," dated November 21, 2013 (ADAMS Accession No. ML13091A209).

This information is necessary to determine compliance with 10 CFR 72.32(a)(3).

RAI EP-4: Clarify or revise Table 3.1B of the proposed ERP to state the specific safety systems that would be affected to meet the event initiating conditions at the HI-STORE CIS Facility.

Table 3.1B of the proposed ERP also provides the following two ICs:

- Notice of Unusual Event – Other severe incident that may compromise safety systems potentially resulting in a release of radioactivity at the CIS Facility, and;

- Alert - Other severe incident that compromises safety systems resulting in a release of radioactivity at the CIS Facility.

Since dry cask storage facilities are typically passive with no support systems, the staff cannot readily identify which safety systems would need to be affected to meet the initiating conditions for the events. Explain which safety systems are included or should be considered to ensure accurate and timely emergency classification for these ICs, or revise accordingly consistent with NRC-endorsed guidance.

This information is necessary to determine compliance with 10 CFR 72.32(a)(3).

RAI EP-5: Justify the criteria for Notification of Unusual Event in Section 3.1 of the proposed ERP.

Section 3.1 of the proposed ERP states, in part:

> *"Emergencies are classified as an Unusual Event or Alert."*

However, Section 4.2.1, "Direction and Coordination," of the proposed ERP states, in part:

> *"These duties include:*
> - *Decision to declare an Alert.*
> - *Activation of onsite emergency response organization.*
> - *Prompt notification of offsite response authorities to inform them that an Alert has been declared (normally within 15 minutes of declaring an Alert).*
> - *Notification to the NRC Operations Center at 301-816-5100 immediately after notification of offsite authorities, and in any case within 1 hour of the declaration of an Alert.*

Although the regulations only require the Alert classification, the proposed ERP proposes a classification for a Notification of Unusual Event (Unusual Event). Provide justification why the above duties do not include reference to an Unusual Event, or revise accordingly to address this inconsistency.

This information is necessary to determine compliance with 10 CFR 72.32(a)(3).

RAI EP-6: Identify the intended linkage between Table 3.1B and Appendix C to the proposed ERP, and provide the missing information for Unusual Event incidents in Appendix C.

Appendix C, "Facility Emergency Action Levels," to the proposed ERP includes a listing of incidents, which would appear to identify the applicable thresholds and natural or destructive phenomena for the generic criteria contained in Table 3.1B. However, the proposed ERP does not provide a direct linkage or reference from Table 3.1B to Appendix C. In addition, the column in Appendix C identifying incidents for "Unusual Events" lists "under development" for each row. The column should identify the specific incidents that trigger the Unusual Event and Alert classifications to allow verification of sufficient differentiation between these, and to ensure accurate and timely emergency classification.

This information is necessary to determine compliance with 10 CFR 72.32(a)(3).

RAI EP-7: Justify the Alert criteria and the dose thresholds used for the radiological plume incident in Appendix C of the proposed ERP.

Appendix C contains the following Alert criteria for a radiological plume incident:

> "*>100 mrem CEDE [committed effective dose equivalent] but <500 mrem CEDE from an accidental release of radioactive material to the general public.*
>
> *--------or------*
>
> *>1 rem CEDE in a Facility from an accidental release of radioactive"*

This criteria is not consistent with the analysis in NUREG-1140, "A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees," dated January 1988, (ADAMS Accession No. ML062020791), and is more representative of the thresholds for a Site Area Emergency classification. Please provide justification for the use of these radiation levels as thresholds for an Alert classification, or revise accordingly. In addition, the use of a CEDE dose threshold is inconsistent with NRC-endorsed EAL guidance. Provide a justification for using the CEDE dose, or revise accordingly consistent with the latest NRC-endorsed EAL guidance.

This information is necessary to determine compliance with 10 CFR 72.32(a)(3).

RAI EP-8: Provide the location where emergency response personnel will observe indications for fire and smoke alarms and for radiation monitoring instrumentation.

Section 2.2, "Detection of Accidents," of the proposed ERP states, in part:

> "*Detection of accidents is dependent on personnel observation, by fire and smoke alarms, and radiation monitoring instrumentation."*

The proposed ERP should state the specific location where personnel can observe indications of alarms and radiation monitoring instrumentation for the detection of an accident and to ensure accurate and timely emergency classification.

This information is necessary to determine compliance with the requirements of 10 CFR 72.32(a)(4), *"Detection of accidents."*

RAI EP-9: Provide further information on the types and methods of onsite and offsite sampling and monitoring in case of a release of radioactive or other hazardous material, as well as a description of the provisions for the projection of offsite radiation exposures at the HI-STORE CIS Facility.

Section 5.2, "Accident Assessment," of the proposed ERP states:

> *"In either case the attendant RPT [Radiation Protection Technician] would collect real time data at or near the incident site and relay that data to the RSO [Radiation Safety Officer] and/or EC."*

The guidance in SFST-ISG-16, Section 3.7, "Assessment of Releases," states that the ERP:

> *"This should include the types and methods of onsite and offsite sampling and monitoring in case of a release of radioactive or other hazardous material. The provisions for projection of offsite radiation exposures should be described."*

This information is necessary to determine compliance with 10 CFR 72.32(a)(6), *"Assessment of releases."*

RAI EP-10: Clarify what specific ERO position will perform the tasks described in the Section 3.3 of the ERP.

Section 3.3, "Information to be Communicated," of the proposed ERP states, in part:

> *"The **ERO** [emergency response organization] will provide clear, concise information to onsite personnel, the **ERO**, and offsite response organizations & agencies on the incident underway. To that end, the information from the ERO to the onsite and offsite staff and agencies will have the following attributes."*

The ERP should specify the individual and/or position that will perform these tasks.

This information is necessary to determine compliance with 10 CFR 72.32(a)(7), *"Responsibilities."*

RAI EP-11: Clarify the following information regarding Emergency Coordinator staffing requirements at the HI-STORE CIS Facility:

- Section 4.2.1, "Direction and Coordination," of the proposed ERP states, in part:

  > *"The SED or designee is the individual who is responsible for managing the activities outlined under this ERP. The SED delegates his duties to the on shift EC until the SED arrives on site to assume command and control of the event. The SED can be reached via telephone to assist and advise the duty EC of his recommendations."*

- Section 4.3.2, "ERO Members," states, in part,

  > *"The EC, RSO and other key ERO personnel are available by cell phone 24 hours a day."*

- Section 4.3.4, "Emergency Coordinator," states, in part,

  > *"The EC, or alternate, is on the facility premises or on call 24 hours a day (i.e., available to respond to an emergency by reaching the facility within less than one hour if after working hours).*

- Section 4.3.5, "Delegation and Assignment," states, in part,

  > *"The ERP identifies ECs who train to coordinate the response of the ERO to an emergency event. These personnel may not always be present at the facility when an event occurs. Depending upon the nature of the event, the on-call EC may designate certain duties to those present at the facility by phone or electronic communication."*

In addition, Table 4.1, “Emergency Declaration at the CIS Facility,” of the proposed ERP shows the Security Shift Supervisor listed as an Emergency Coordinator Backup and an on-shift position. However, Figure 4.2, “CIS Facility Emergency Response Organization,” of the proposed ERP lists an “Emergency Coordinator” as an on-shift position. It is not clear whether the individual with the authority and responsibility to classify an event and notify offsite agencies and NRC (ERO position), is on site at all times (24-hour per day, 7 day per week).

This information is necessary to determine compliance with 10 CFR 72.32(a)(7).

RAI EP-12: Describe the role and responsibilities of the ERO “Shift Radiation Coordinator,” as described in Figure 4.2 of the proposed ERP.

Figure 4.2 of the proposed ERP lists the “Shift Radiation Coordinator” as an on-shift position. However, this position is not described anywhere else in the proposed ERP.

This information is necessary to determine compliance with 10 CFR 72.32(a)(7).

RAI EP-13: Provide the following information from Figure 4.2 of the proposed ERP:

- The composition of minimum on-shift staffing at all times, and;
- What the augmenting positions are and any reporting requirements these positions would have in the event of a declared emergency.

Figure 4.2 of the proposed ERP lists the on-shift positions and call-in positions. However, the proposed ERP does not provide sufficient detail to allow NRC staff to evaluate the adequacy of the proposed on-shift and augmented staffing for a declared emergency.

This information is necessary to determine compliance with 10 CFR 72.32(a)(7).

RAI EP-14: Clarify whether the Security Supervision and/or Officers are trained and qualified to perform the duties of the EC, as listed in Section 4.3.4 of the proposed ERP.

Section 4.3.9, “Security Supervision and Officers,” of the proposed ERP states, in part:

> *“Security Supervision and/or Officers are responsible for:*
> *[…]*
> - *Acting as on shift EC for initial event response during nights, weekends and holidays.*

The ERP should specify whether these officers are trained and qualified to perform the duties of the EC.

This information is necessary to determine compliance with 10 CFR 72.32(a)(7).

RAI EP-15: Provide a description, by position or title, of the person responsible for developing, maintaining and updating the ERP.

Section 7.0, “Maintaining Emergency Preparedness Capability,” of the proposed ERP does not include the identification of the personnel responsible for developing, maintaining, and updating the plan, as required in 10 CFR 72.32(a)(7).

This information is necessary to determine compliance with 10 CFR 72.32(a)(7).

RAI EP-16: Provide a description of the contingency plans for the possible evacuation of the Emergency Operations Center for the HI-STORE CIS Facility.

Section 6.1, "Emergency Operations Center (EOC)," of the proposed ERP states, in part:

> *"Though unlikely, the RSO or designee will monitor for conditions that may require the evacuation of the EOC."*

However, the proposed ERP does not address the requirement in 10 CFR 72.32(a)(8), *"Notification and coordination,"* which states that, "[t]he notification and coordination must be planned so that unavailability of some personnel, parts of the facility, and some equipment will not prevent the notification and coordination."

The ERP should describe where notification and coordination will be performed if the EOC is evacuated, and whether the alternate location has the necessary communication equipment, procedures, etc., to perform these activities.

This information is necessary to determine compliance with 10 CFR 72.32(a)(8).

RAI EP-17: Clarify if the New Mexico Department of Homeland Security and Emergency Management will be the only State and local entity notified and if this has been agreed upon with State and local authorities.

Section 3.3, "Information to be Communicated," of the proposed ERP states, in part:

> "*The emergency plan implementing procedures will instruct the ERO to make any protective action recommendations directly to State or local officials responsible for implementing the specific protective actions, if appropriate."*

Section 4.3.12, "Activation of the ERP," of the proposed ERP states, in part:

> *"Activation of the ERP requires notification of the following:*
>
> - *Activation of the ERP for any reason is reported to the New Mexico Department of Homeland Security and Emergency Management*
> - *If an emergency is declared, notify the NRC within one hour as required by 10 CFR Part 72 of contacting off-site response agencies."*

However, the e-mail from Don Shainin, New Mexico Department of Homeland Security and Emergency Management (page 71 of the ERP) states:

> *"Just a mention of a few things and that is the state of New Mexico [NM] by statute puts NM State police as incident commander for all hazardous materials related incidents. This would require a notification to them if an incident were to occur at your site of this nature."*

This information is necessary to determine compliance with 10 CFR 72.32(a)(8).

RAI EP-18: Clarify the commitment for notification of the NRC operations center to align with the specific requirements of 10 CFR 72.32(a)(8) and 10 CFR 50.72(a)(3).

The provisions of 10 CFR 72.32(a)(8) require the licensee to, "commit to notify the NRC operations center immediately after notifications of the appropriate offsite response organizations and not later than one hour after the licensee declares an emergency."

However, Section 4.3.12 of the proposed ERP merely states, in part:

> *"If an emergency is declared, notify the NRC within one hour as required by 10 CFR Part 72 of contacting off-site response agencies."*

As stated above, this could be inferred as allowing for the notification of the NRC within one hour of notifying off-site response agencies and not within the 2nd criteria of "not later than one hour after the licensee declares an emergency."

This information is necessary to determine compliance with 10 CFR 72.32(a)(8).

RAI EP-19: Clarify if the location of the alternate assembly area described in Section 5.3.6 of the ERP is off-site, whether it is for augmenting personnel responding from off-site or on-site personnel and will it have the capability to perform notification and coordination activities.

The provisions of 10 CFR 72.32(a)(8) require the licensee to, "[t]he notification and coordination must be planned so that unavailability of some personnel, parts of the facility, and some equipment will not prevent the notification and coordination."

However, Section 5.3.6, "Hostile Action Response," of the proposed ERP states, in part:

> "*If necessary, Site Security and/or the SED will direct the ERO to an alternate assembly area if the location of the EOC is deemed to be unsafe."*

This information is necessary to determine compliance with 10 CFR 72.32(a)(8).

RAI EP-20: Revise the threshold limits in Section 5.5 of the ERP to ensure consistency with the latest version of the EPA Protective Action Guide (PAG) Manual for early phase PAGs.

Section 5.5, "Exposure Control in Radiological Emergencies," of the proposed ERP states, in part:

> "*The PAG [protective action guide] threshold of concern[2] for CIS Facility is based on the EPA [U.S. Environmental Protection Agency] limits of less than one Rem Committed Effective Dose Equivalent (CEDE), five Rem thyroid, or 50 Rem skin dose at the site boundary.*
>
> [2] *"Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," Office of Radiation Programs, USEPA, 1992*"

These limits are not consistent with those provided in either Table 2-1, "PAGs for the Early Phase of a Nuclear Incident," of the Manual of Protective Action Guides and Protective Actions for Nuclear Incidents (EPA-400-R-92-001, May 1992) or in Table 1-1, "Summary Table for PAGs, Guidelines, and Planning Guidance for Radiological Incidents," of the PAG Manual:

Protective Action Guides and Planning Guidance for Radiological Incidents (EPA-400/R-17/001, January 2017).

This information is necessary to determine compliance with 10 CFR 72.32(a)(9), *"Information to be communicated."*

RAI EP-21: Provide additional description, discussion, or clarification regarding the type of information to be provided during an emergency notification, as stated in Section 4.3.12 of the ERP.

Section 4.3.12 of the proposed ERP states, in part:

> *"Whenever an emergency notification is made, the following information will be provided if requested:*
>
> - *The possible hazards to human health and the environment outside the facility*
> - *Notify NRC as required by 10 CFR Part 72."*

The provisions of 10 CFR 72.32(a)(9) describe the information that must be communicated during an emergency, and specifically states that it should communicate facility status, radioactive releases, and recommended protective actions to be given, if any are necessary. It is not clear to staff whether the information identified in Section 3.3, "possible hazard to human health," is considered a protective action. Additionally, it is not clear why "notify NRC as required," should be part of the information provided regarding protective actions or status of the facility.

This information is necessary to determine compliance with 10 CFR 72.32(a)(9).

RAI EP-22: Describe the proposed size and shape of the Site Controlled Area boundary, and clarify the definitions for chief elected officials in Section 5.9 of the ERP.

Section 5.9, "Emergency Planning Zone (EPZ)," of the proposed ERP states, in part:

> *"Based on the potential consequences of postulated emergencies, the EPZ for the CIS Facility has been defined as the Site Controlled Area boundary."*

Section 5.9 further states:

> *"The size of the EPZ is sufficiently large that:*
>
> - *Detailed planning within the EPZ provides both an adequate basis for responding to all reasonably credible accidents and a substantial base for the expansion of response efforts in the event that this proves necessary by CIS Facility, State of New Mexico, local agencies and other organizations responsible for off-site emergency response.*
>
> - *Projected maximum doses resulting from credible accidents within the site will not require protective actions to be taken outside the EPZ.*
>
> *Chief elected officials responsible for various portions of the CIS Facility EPZ will provide the public information on operational emergencies at the CIS Facility and, based*

on inputs from the site and regulatory agencies, may recommend public protective actions, such as sheltering or evacuation."

The staff needs additional description of the proposed size and shape of the Site Controlled Area boundary. The staff also needs further clarification on the definition of "Chief elected officials," as referenced in Section 5.9.

This information is necessary to determine compliance with 10 CFR 72.32(a)(1), *"Facility description,"* 72.32(a)(9), and 72.106.

RAI EP-23: Clarify or revise the frequency and scope of the emergency planning drills and exercises, as provided in Section 7.3 of the ERP.

Section 7.3, "Drills and Exercises," of the proposed ERP states, in part:

"*Drills will be conducted semi-annually as required by regulation.*
[…]
Consistent with the requirements in 10 CFR 72.32 (a) and (b), documented quarterly communications checks with off-site response organizations will include the check and update of all necessary telephone numbers."

This is not consistent with 10 CFR 72.32(a)(12), *"Exercises,"* which requires that the Emergency Plan include, "[p]rovisions for conducting semiannual communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies. Radiological/Health Physics, Medical, and Fire drills shall be conducted annually […]."

Section 7.3 of the ERP does not contain provision identified for radiological/health physics, medical, and fire drills to be conducted annually, or a requirement to conduct a biennial exercise. Additionally, communication checks are required semiannually, rather than quarterly as identified in Section 7.3.

This information is necessary to determine compliance with 10 CFR 72.32(a)(12).

RAI EP-24: Provide documentation that demonstrates that agreements are in place with the offsite organizations that will respond during an emergency or the commitment to establish these prior to receiving spent fuel.

Section 4.3.11, "Local Off-site Assistance," of the proposed ERP provides a list of the local off-site organizations that may assist the facility and states, in part:

"[…] that in Appendix D (Later) is documentation of the agreements reached with these organizations."

The letters provided in Appendix D, "External Agency Agreements," are letters requesting review of the proposed REP, not agreements. Agreements, or a commitment to establish such agreements, should be in place for the following off-site organizations:

- medical treatment facilities,
- first aid personnel and/or ambulance service,
- fire-fighting assistance, and

- law enforcement assistance.

This information is necessary to determine compliance with 10 CFR 72.32(a)(15), *"Offsite assistance."*

RAI EP-25: Clarify or provide additional description of the following information from Section 4.3.11 of the ERP:

a. Please clarify whether the City of Hobbs N.M. ambulance service has the capability to transport a radiologically contaminated, injured person.

b. Please describe what services the Lea County Sheriff's department will provide related to law enforcement at the facility, if requested for a security event.

Section 4.3.11 of the proposed ERP further states, in part:

> *"The City of Hobbs N.M. has ambulance service available for the CIS Facility. Response time for medical assistance to the CIS Facility site is about 30 minutes.*
>
> *The Lea County Sheriff's department will provide traffic control and residential evacuation if required. The Sheriff's Department also provides 24-hour emergency dispatch service for all emergency response organizations."*

Additionally, Section 7.6, "Letters of Agreement," of the proposed ERP states, in part:

> "*Letters of agreement (Appendix D) for the CIS Facility from law enforcement and medical assistance providers describe their capabilities to evaluate and treat injuries from radiation, radioactive materials and other hazardous materials used in conjunction with a radioactive materials event."*

This information is necessary to determine compliance with 10 CFR 72.32(a)(15).

RAI EP-26: Clarify that the change process for the ERP under the Holtec QA Program will be evaluated in accordance with 10 CFR 72.44(f), and that maintenance and updating of the ERP will be consistent with the requirements of 10 CFR 72.32(a)(14).

Section 7.1, "Written Emergency Plan Procedures," of the proposed ERP states, in part:

> *"Changes to this ERP and all Site Emergency Procedures are made in accordance with the Holtec QA program. Written Emergency Procedures will be maintained and updated per 10 CFR Part 73 [Ref. 8]."*

10 CFR Part 73 are requirements for physical protection of plants and materials and is not applicable to emergency plan changes.

This information is necessary to determine compliance with 10 CFR 72.44(f) and 72.32(a)(14).

RAI EP-27: Clarify how the training of the staff at the Lea Regional Medical Center and Carlsbad Medical Center by the Waste Isolation Pilot Plant (WIPP) is verified and documented.

Section 7.2.3, "Off-Site Response Teams," of the proposed CERP states, in part:

"Currently, the staff at the Lea Regional Medical Center in Hobbs, New Mexico and Carlsbad Medical Center in Carlsbad, New Mexico train with WIPP."

This information is necessary to determine compliance with 10 CFR 72.32(a)(10).

HI-STORE CIS Environmental Report (ER)

Transportation (TR):

RAI ER-TR-1: Provide input and output files for the incident-free transportation dose and risk calculations in the ER that were conducted with both RADTRAN and TRAGIS codes.

This information is needed to conduct a detailed evaluation of the calculations. The provisions of 10 CFR 51.45(c) require that analyses in environmental reports be quantitative to the fullest extent practicable and contain sufficient data to aid the NRC in its development of an independent analysis.

This information is necessary to determine compliance with 10 CFR 51.45(c).

RAI ER-TR-2: Provide post-processing dose calculation spreadsheets for the incident-free transportation dose and risk calculations.

This information is necessary to determine compliance with 10 CFR 51.45(c).

RAI ER-TR-3: Provide a description of the measures, if any are known, that reactor licensees would take to mitigate the potential consequences of accidents along routes for shipping SNF to the CISF.

ER Section 4.9.3.1 provides a description of what DOE would do if they were the shipper (e.g., emergency response training to states and other local stakeholders) but does not provide comparable information for a licensee-shipper.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Public and Occupational Health (POH)

RAI ER-POH-1: Describe the methods used in ER Section 4.12.2.1 to calculate the dose (2.5 mrem/year) to the maximally exposed individual.

The ER references the SAR for dose calculations; however, in a review of the SAR, the NRC staff could not readily find any documentation of a maximally exposed individual public dose calculation resulting in a 2.5 mrem/yr dose.

Furthermore, the ER states that the maximally exposed public individual is based on "full-time occupancy" at a fence line distance of 100 meters [328 feet] from the storage pads. However, the (non-proprietary) SAR does not describe a maximally exposed individual dose calculation but reports maximum occupancy (8,760 hours/yr) dose rates with distance (SAR Table 7.4.3) from 500 loaded storage casks at 100 meters [328 feet] as 540 mrem/yr. SAR Table 7.4.3 reports a 2.86 mrem/yr dose at 500 meters [1,640 feet] from storage modules. At 2,000 hr/yr occupancy (typical full time worker) and 100 meter distance, SAR Table 7.4.3 still reports a

dose of 123 mrem/yr. Based on the cited information in the SAR, it is not clear how the ER maximally exposed individual dose of 2.5 mrem/yr at 328 feet was calculated.

This information is necessary to determine compliance with 10 CFR 51.45(c).

RAI ER-POH-2: Clarify the scope of the proposed radiological environmental monitoring program (REMP) summarized in ER Section 4.12.3, including whether it addresses determining the site-specific background radiation at the site prior to the start of operations.

The ER summary describes the REMP only in the context of operations and states that the REMP will sample "media and effluents, including gases and vapor, air particulates, soil, sediment, fauna, vegetation, surface water, waste waters, and groundwater." The applicant should confirm and clarify what "media and effluents" and "waste waters" will be sampled, how samples will be analyzed, and whether pre-operational measures would be taken to establish baseline or background measures in various media. The ER also refers to national average (not site-specific) information in describing background radiation, but provides no information about the natural background radiation at the proposed site. The applicant should also clarify whether any pre-construction rail spur soil sampling would be conducted to establish a baseline for eventual comparison with decommissioning measurements.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Waste Management (WM)

RAI ER-WM-1: Provide quantitative annual and total waste volume estimates by facility lifecycle phase for low-level radioactive waste and nonhazardous solid waste or explain why volumes are not needed to support impact analyses (i.e., why volumes would be negligible or small).

ER Section 4.11 does not provide volume estimates for any solid wastes that could be generated in larger than negligible quantities. For negligible quantities, the applicant should provide upper-bound estimates of waste volumes that are not expected to be exceeded, so staff can understand the qualitative terms "small" or "minimal" that are used in the ER. This includes, but is not limited to, annual and cumulative total volumes of low-level radioactive waste and nonhazardous solid waste that would be generated during decommissioning.

This information is necessary to determine compliance with 10 CFR 51.45(c).

RAI ER-WM-2: Provide additional information about the local municipal landfills and the anticipated destination for Low-Level Radioactive Waste (LLRW), including the currently projected operational life of these facilities.

There is no discussion in the license application regarding the destination of LLRW, which is necessary to determine impacts on the waste management resources available.

This information is necessary to determine compliance with 10 CFR 51.45(b).

Cost Benefit Analyses (CB)

RAI ER-CB-1: Clarify the source for the spent nuclear fuel (SNF) transportation cost estimate and describe the types of costs incorporated into this cost estimate.

In the environmental report (ER) Tables 9.2.1, 9.2.2, 9.2.3, and 9.2.6, the applicant cites a Government Accounting Office report (GAO, 2014) as the source for the $26,000 per MTU cost estimate for transporting SNF. The ER does not include a description of the types of costs incorporated into this cost estimate (e.g., capital equipment, such as rail cars). The applicant should clarify which sections of the referenced GAO report includes this information and provide that to staff, or provide a verifiable alternate information source.

This information is necessary to determine compliance with 10 CFR 51.45(c).

RAI ER-CB-2: Clarify or provide the following information regarding the cost benefit analyses:

a) The basis for using an annual consolidated interim storage facility (CISF) operating cost of $4.5 million for the proposed action considering the no-action alternative used a value of $6.25 million per plant for essentially the same activity.

   The Data Call for the CISF Environmental Report – January 2017 states that the $4.5 million estimate for operations for the proposed action was based on previous experience. However, details provided in the 2017 Data Call (Appendix G to the ER) concerning previous experience were limited, and no cost estimate range (i.e., variability) was provided. Section 9.2.1 of the ER notes that the $6.25 million (per plant) estimate for the no-action alternative is based on the average of the cost estimate range ($4.5 to $8 million) for storing SNF at shutdown reactor sites, as stated in the Blue Ribbon Commission on America's Nuclear Future - Report to the Secretary of Energy (BRC, 2012). However, the ER did not explain why the proposed action and no-action alternative used different cost estimates for essentially the same activity (i.e., storing SNF at a site without an active reactor). Provide information and/or justification for the projected lower annual cost of operating the CIS Facility, which would likely contain more fuel than an ISFSI at a shut-down reactor site, and may have ongoing activity [see RAI ER-CB-2 (b)].

b) The activities associated with the projected Holtec CISF annual operation costs, as well as the basis for using the $4.5 million estimate over the entire 40 year period. If appropriate, revise the analyses accordingly.

   ER Table 9.2.5 estimates that the CIS Facility operation would cost $4.5 million annually over the entire 40 year license period. The 2017 Data Call (Appendix G to the ER) indicates that SNF transportation to the CIS Facility site contributes to the operation costs and assumes that the CIS Facility receives 250 SNF casks per year (i.e., 40 years for 10,000 casks). In contrast, ER Section 1.0 states that receipt of the 10,000 casks occurs during the first twenty years (i.e., this activity does not occur during the second half of the license period). Provide clarification concerning what activities, including SNF transportation or receipt activities, are included in the operation costs over the 40 year license period, as well as the appropriateness of using the same $4.5 million cost estimate over the entire 40 year license period.

This information is necessary to determine compliance with 10 CFR 51.45(b) and (c).

RAI ER-CB-3: Clarify or provide additional details of the timing assumptions made for activities contained in the description of proposed action and no-action alternative including:

- Shipment from generation sites to the CIS Facility;
- SNF transportation from the CIS Facility to the repository;
- Construction of three new reactor site independent spent fuel storage installations (ISFSIs).

The cost estimates in ER Tables 9.2.1, 9.2.2, 9.2.3, and 9.2.6 are discounted, which requires specifying the timing (i.e., the specific years) in which various activities occur. However, that information is not included in the report. ER Chapter 9 identifies both 2048 and 2060 as possible dates for the opening of a repository but is unclear which year was used in the discounting calculations. It is also unclear whether the proposed action includes SNF transport from the CIS Facility to a repository within the initial 40-year license period. In addition, for the purpose of cost benefit analysis discounting, ER Chapter 9 did not specify the dates for the construction of the three new reactor site ISFSIs that are assumed to be needed under the no-action alternative. This information is needed regarding when activities are projected to occur in order to support the NRC staff's understanding of how the discounting calculations were performed and for evaluation of cost and benefits of the proposed action and no-action alternative.

This information is necessary to determine compliance with 10 CFR 51.45(b) and (c).

RAI ER-CB-4: Clarify how the annual and cumulative storage costs for Scenario 1 in ER Chapter 9 were calculated.

Table 9.2.1 of the ER specifies three different annual storage estimates ($77, $135, and $375 million) and ER Section 9.2.1 estimates cumulative storage cost for operating sites at $60 million. However, there is no supporting information for these estimates. Background information regarding the details of calculations is required to support its analysis of costs associated with the no-action alternative in the EIS. The applicant should ensure that assumptions made for these estimates are consistent with the information provided in response to RAIs ER-CB-2 and ER-CB-3.

This information is necessary to determine compliance with 10 CFR 51.45(c).

RAI ER-CB-5: Provide details of the calculations and assumptions made for the construction costs in ER Table 9.2.4 and the operation and maintenance costs in ER Table 9.2.5.

ER Section 9.2.2 does not provide details concerning the estimated construction costs or operation and maintenance costs for the CIS Facility. Instead, the ER cites the 2017 Data Call (Appendix G to the ER) as the source of the information in ER Table 9.2.4 and Table 9.2.5. The staff requests more detail concerning the calculation of these costs. The staff notes that the cost estimates provided in the "HI-STORE CIS Facility Financial Assurance & Project Life Cycle Cost Estimate" (Holtec, 2017a) and the "Holtec International & Eddy Lea Energy Alliance (ELEA) CIS Facility – Decommissioning Cost Estimate and Funding Plan" (Holtec, 2017b) provide an example of the appropriate level of detail that the applicant should provide to justify the construction, operation, and maintenance costs assumptions for the cost benefit analyses in the ER.

This information is necessary to determine compliance with 10 CFR 51.45(c).

References:

1. BRC. “Blue Ribbon Commission on America’s Nuclear Future - Report to the Secretary of Energy.” ML120970375. Washington, D.C. 2012

2. Government Accountability Office. “Spent Nuclear Fuel Management: Outreach Needed to Help Gain Public Acceptance for Federal Activities that Address Liability”. Report GAO-15-141. United States Government Accountability Office: Washington, D.C. October 2014.

3. Holtec International. “HI-STORE CIS Facility Financial Assurance & Project Life Cycle Cost Estimates.” ML18058A608. Marlton, N.J. 2017. (Holtec, 2017a)

4. Holtec International. “Holtec International & Eddy Lea Energy Alliance (ELEA) CIS Facility – Decommissioning Cost Estimate and Funding Plan” ML18058A607. Marlton, N.J. (Holtec, 2017b).

Air Quality (AQ)

RAI ER-AQ-1: Provide the detailed information (e.g., calculations, inputs, sources, activities, and parameters) used to generate each of the emission inventories in ER Tables 4.6.1 to 4.6.4.

ER Section 4.6 provides a limited description of how the emission inventories were calculated. Detailed information is needed for NRC to independently verify the emission inventories.

This information is necessary to determine compliance with 10 CFR 51.45(c).

Cultural Resources (CR)

RAI ER-CR-1: Provide the geographic information systems (GIS) data input files used to generate the cultural resources graphics.

The GIS files will be used to generate maps and delineate the direct and indirect area of potential effect (APE). Delineation of the APE is necessary as part of the National Historic Preservation Act of 1966 (NHPA) Section 106 review.

This information is necessary to determine compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

RAI ER-CR-2: Provide the following information regarding the information in the Cultural Resources Survey (Appendix C of the ER):

1. Provide brief descriptions and data on previous surveys within the project area;
2. Provide National Register of Historic Places (NRHP) eligibility recommendations for previously recorded sites and State Historic Preservation Officer concurrence for any site within or adjacent to the project area;

3. Include a brief description of the isolated finds in Appendix C- Chapter 5, and references to Table B.1;
4. Include references in site descriptions to maps, tables, and site forms showing site location, feature, and artifact data contained in appendices;
5. Include imagery of select artifacts from eligible sites;
6. Add the legal location description for each site;
7. Provide supporting imagery or reference for site integrity discussions;
8. Include length of HCPI 42195 within the Project Area;
9. Provide additional discussion on background for eligibility statements and criteria used to make eligibility recommendations;
10. Provide background for research potential, if identified;
11. Provide background for prehistoric sites with diagnostic artifacts, faunal, or floral remains containing potential to address questions of wild plant and animal resource use and seasonality;
12. Fix typos throughout report and provide an updated version.

This information is needed to identify and assess impacts to historic properties, and determine compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).

RAI ER-CR-3: Provide cultural survey information for the areas that will be disturbed by all future construction and operational phases of the project, including the railroad spur. Also, include cultural survey information for appropriate buffer areas adjacent to disturbed areas.

This information is needed to identify and assess impacts to historic properties, and determine compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA).