

March 23, 2006

Dr. Stephan Anton  
Licensing Manager  
Holtec International  
555 Lincoln Drive West  
Marlton, NJ 08053

SUBJECT: HI-STORM 100, AMENDMENT 4, REQUEST FOR ADDITIONAL  
INFORMATION (TAC NO. L23923)

Dear Dr. Anton:

On November 7, 2005, Holtec International (Holtec) submitted a License Amendment Request (LAR) application in accordance with 10 CFR Part 72 for an amendment to Certificate of Compliance (CoC) No. 1014 for the HI-STORM 100 Cask System. This amendment proposed to: (a) add additional fuel debris and non-fuel hardware to the approved contents and (b) streamline several loading operations thereby reducing occupational exposures. By letter dated November 23, 2005, the staff acknowledged receipt of your application and informed you that the application appeared to contain the necessary information to begin a technical review. Subsequently, you were informed of the staff's proposed schedule by letter dated December 21, 2005. The staff began the technical review of LAR 1014-4 on January 9, 2006, and has prepared the enclosed Request for Additional Information (RAI).

It was noted in the November 23, 2005, letter that the staff did not consider LAR 1014-4 Proposed Change No. 2, "elimination of the helium leak test requirement for the vent and drain port cover plates," as constituting an acceptable approach for ensuring the integrity of a storage cask confinement boundary. You informed the Nuclear Regulatory Commission (NRC) at a public meeting between the NRC staff and Holtec on December 15, 2005, that it was the intent of Holtec, as part of the LAR 1014-3 to the HI-STORM 100 Cask System CoC, to continue to implement leakage testing of the vent and drain port cover plates. You stated you would provide clarifying language in the Final Safety Analysis Report and Technical Specifications associated with this proposed action. As such the staff considers that LAR 1014-4 Proposed Change No. 2 will no longer be necessary, as it will be addressed in LAR 1014-3, and therefore will not be part of the staff review of LAR 1014-4. However, it is suggested that the clarifying language be incorporated at this time as part of your response to the staff RAI.

In connection with the staff's review, information identified in the enclosure to this letter is needed. The RAI requests information specific to the seven proposed changes and information necessary to address several key developing technical issues (some to confirm consistency with respect to LAR 1014-3), but which have not been fully captured in the LAR 1014-4 submittal. Information in response to the RAI should be provided by April 30, 2006. If you are unable to meet this deadline, you must notify us in writing, at least 2 weeks in advance of your new submittal date, and the reasons for the delay. The staff will then assess the impact of the new submittal date and notify you of a revised schedule. If additional information requested by

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this letter results in you making changes to the Final Safety Analysis Report (FSAR), revised FSAR pages should be submitted. Justification for any FSAR changes should also be included in your response.

Reference Docket No. 72-1014 and TAC No. L23923 in future correspondence related to this licensing action. If you have any questions regarding this matter, you may contact me at (301) 415-8500.

Sincerely,

**/RA/**

Christopher M. Regan, Senior Project Manager  
Licensing Section  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 72-1014  
TAC No. L23923

Enclosure: Request for Additional Information

S. Anton

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Enclosure: Request for Additional Information

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**Request For Additional Information  
Holtec International HI-STORM 100 Cask System  
License Amendment Request 1014-4, Docket 72-1014**

By application dated November 7, 2005, Holtec International (Holtec) requested Amendment 4 to Certificate of Compliance (CoC) No. 1014 for the HI-STORM 100 Cask System in accordance with 10 CFR Part 72. This Request for Additional Information (RAI) identifies additional information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the application. The requested information is listed by proposed change number indicated in the Amendment application and, where possible, section number, in the applicant's safety analysis report. The General RAIs request information necessary to address several developing key technical issues (some to ensure consistency with Holtec License Amendment Request (LAR) 1014-3) but which have not been fully captured in the LAR 1014-4 submittal. NUREG-1536, "Standard Review Plan For Dry Cask Storage Systems," was used by the staff in its review of the application.

Each individual RAI describes information needed by the staff in order to complete the review of the application and to determine whether the applicant has demonstrated compliance with regulatory requirements.

**Proposed Change No. 1**

**Certificate of Compliance**

P1-1. Clarify the intent of the language of proposed CoC Section 1.b, Paragraph 2, Sentence 2 - Replace "carbon steel/lead/carbon steel" with "carbon steel and/or lead."

The change infers that it is possible to construct the transfer cask entirely of lead.

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

**Proposed Change No. 2**

As stated in the acknowledgment review letter dated November 23, 2005, the staff, at this time, does not consider the elimination of the helium leak test requirement for the vent and drain port cover plates as constituting an acceptable approach for ensuring the integrity of a storage cask confinement boundary. The technical review of this matter will be addressed in LAR 1014-3. To clarify LAR 1014-4, Holtec should provide revised Final Safety Analysis Report (FSAR) pages, consistent with changes made to LAR 1014-3, to reflect the helium leak test requirements for the vent and drain port cover plates.

Enclosure

### **Proposed Change No. 3**

#### **Technical Specifications**

- P3-1. Explain why verification that the Multi Purpose Canister (MPC) cavity pressure is within limits can be achieved either via analysis or direct measurement.

Unless quantified uncertainties related to the analysis are provided, direct measurement would constitute the preferred method of verifying cavity pressure.

This information is needed to assure compliance with 10 CFR 72.11, 72.24(d), and 72.236.

#### **Chapter 4 Thermal Evaluation**

- P3-2. Clarify whether or not pre-cooling of the MPC prior to reflooding has been eliminated during fuel unloading operations.

Proposed Change No. 3 modifies LCO 3.1.3 in Appendix A to the CoC to eliminate cooling of the MPC cavity prior to reflood with water (as part of cask unloading operations). However, Page 4.5-14 of the FSAR states that for this operation, a helium cool-down system is engaged to the MPC via lid access ports and a forced helium cooling of the fuel and MPC is initiated. See also Scenario 5 of Table 4.5.8 of the FSAR.

This information is needed to assure compliance with 10 CFR 72.11, 72.24(d), and 72.236.

#### **Chapter 12 Operating Controls and Limits**

- P3-3 Provide specific cases where cool-down by directly reflooding the cask with water has occurred. Also, provide some studies and/or experiments that concluded direct cool-down by water did not result in fuel cladding failures. Explain why this also would apply for high burnup fuel.

The FSAR states that industry standard practice for the dry cask storage has historically been to directly reflood the cask with water. This standard practice is known not to induce fuel cladding failures. However, the applicant has not provided specific examples where direct reflooding of the cask has occurred or documented existing justification for this practice.

NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," January 1997, states that for unloading operations, the applicant should evaluate temperature and pressure calculations supporting procedural steps presented in FSAR, Section 8, for cask cooldown and reflooding of the cask internals. To ensure that the cask does not overpressurize and that the fuel assemblies are not subjected to excess thermal stresses, the applicant's analysis should specify and justify the appropriate temperature and flow rate of the quench fluid, assuming maximum fuel cladding temperatures in the unloading configuration.

This information is needed to assure compliance with 10 CFR 72.11, 72.24(d), and 72.236.

## **Proposed Change No. 4**

### **Chapter 6      Criticality Evaluation**

- P4-1    Provide the studies cited in Sections 6.2.2.4 and 6.2.4.3.2 and supporting sample calculations that demonstrate that linear interpolation of the soluble boron concentration is conservative when compared to the calculated multiplication factors listed in Tables 6.1.5, 6.1.6, and 6.1.12.

LAR 1014-4, Revision 0, proposed this change and cites supporting studies that were conducted by the licensee that demonstrate a saturation effect that overestimates the minimum soluble boron concentration providing conservatism but these studies were not included in the amendment request. Also, additional tables may need to be added in conjunction with Tables 6.1.5, 6.1.6, and 6.1.12 that clearly show the proposed interpolated soluble boron concentrations for varying enrichments.

This information is needed to determine compliance with 10 CFR 72.236(b).

## **Proposed Change No. 5**

The staff has no RAI specific to this proposed change.

## **Proposed Change No. 6**

### **Chapter 1      General Description**

- P6-1    Describe the materials of construction for the non-fuel hardware items listed in Proposed Change No. 6 and discuss whether these additions introduce any new material types into the cask. Provide a discussion of any potential chemical or galvanic reactions that the additional non-fuel hardware materials may create.

The amendment proposes to add certain non-fuel hardware to the approved list of items to be stored. If the materials of construction of these items are the same as for previously approved cask contents, no additional discussion is needed and the applicant may state that no new material types would be introduced into the cask by this addition.

This information is required for completeness per 10 CFR 72.24 and to comply with 10 CFR 72.120(d).

## **Proposed Change No. 7**

### **Chapter 6      Criticality Evaluation**

- P7-1    Provide the studies cited in Section 6.4.12 and supporting sample calculations that demonstrate the addition of annular fuel pellets in the top and bottom 12 inches of

Pressurized Water Reactor (PWR) fuel assemblies do not result in significant reactivity effects.

LAR 1014-4, Revision 0 proposed this change and cites supporting studies that were conducted by the licensee to justify this addition of annular fuel pellets but these studies were not included in the amendment request.

This information is needed to determine compliance with 10 CFR 72.236(b).

### **General (Not Associated with a Specific Change):**

#### **Chapter 1      General Description and Technical Specifications**

- G-1      Revise the FSAR and Technical Specifications (TS) definition of damaged fuel to correspond with the definition in HI-STAR 100, Amendment 2, CoC No. 9261. Alternatively, revise the definition to be consistent with that proposed in LAR 1014-3.

This information is required for completeness per 10 CFR 72.24 and to provide consistency between amendments currently under review by the staff.

#### **Chapter 1      General Description**

- G-2      Review and clarify the definition of the term “Thermosiphon”. Rev. 3B of the SAR states the following:

**Thermosiphon** is the term used to describe the buoyancy-driven natural convection circulation of helium within the MPC fuel basket maximum heat load during short-term operating conditions up to which no time limit or other restriction is imposed on the operating condition.

However, Rev. 1 of the FSAR states the following:

**Thermosiphon** is the term used to describe the buoyancy-driven natural convection circulation of helium within the MPC fuel basket

This information is needed to assure compliance with 10 CFR 72.11, 72.24(d), and 72.236.

#### **Chapter 8      Operating Procedures**

- G-3      Explain why the Supplemental Cooling System (SCS) procedure was deleted from the FSAR.

The SCS procedures should describe in, general, what type of equipment is used and how it is connected to the HI-TRAC transfer cask. As stated in NUREG-1536, “Standard Review Plan for Dry Cask Storage Systems,” January 1997, the operating sequences described in the FSAR should provide an effective basis for the development of the more detailed operating and test procedures required by the cask user. The user will

then use the applicant supplied procedures as guidance when preparing and implementing detailed site-specific procedures, as required by the licensee's quality assurance (QA) and procedure writing programs. The NRC normally inspects selected site-specific procedures.

This information is needed to assure compliance with 10 CFR 72.11, 72.24(d), and 72.236.

- G-4 Verify that, during loading, when the water level in the loaded cask is lowered in preparation for lid welding, that either of these conditions occur; 1) the water level reduction is restricted so as to avoid uncovering any portion of the fuel cladding, or, 2) an inert gas is used to displace the water. Also verify that similar controls exist during cask unloading. In addition, provide draft wording for incorporating this restriction into the TS.

The intent of this provision is to ensure that no fuel is in contact with air when it is at an elevated temperature (above the boiling point of water). This ensures that no deleterious oxidation of the fuel pellets can occur. Note that the fuel cladding need not be classified as damaged for this situation to occur. The definition of undamaged fuel still permits pinhole leaks and hairline cracks, which may allow oxidation of the fuel pellets and consequent splitting of the cladding.

This information is required for completeness per 10 CFR 72.24 and to provide consistency between amendments currently under review by the staff.