August 15, 2002

Mr. Brian Gutherman
Licensing Manager
Holtec International
555 Lincoln Drive West
Marlton, NJ 08053

SUBJECT: HI-STORM 100, AMENDMENT 2, ACCEPTANCE REVIEW
(TAC NO. L23424)

Dear Mr. Gutherman:

On March 4, 2002, Holtec International (Holtec) submitted a revised application in accordance with 10 CFR Part 72 for an amendment to Certificate of Compliance (CoC) No. 72-1014 for the HI-STORM 100 Cask System to: (a) revise the contents in accordance with various new thermal, confinement, criticality, and shielding review methodologies; (b) permit the inclusion of damaged fuel contents to the MPC-32; and (c) permit the inclusion of intact, damaged fuel, and fuel debris contents to a new MPC-32F.

This letter is to inform you that the U.S. Nuclear Regulatory Commission (NRC) staff has determined that, in some areas of the application, information necessary to begin our review is still needed. The attached document contains information needed to complete initiation of our review under the section entitled, *Information Needed to Review HI-STORM 100, Amendment 2*. Please review the enclosure and determine when Holtec will be able to provide the information. The NRC will develop a schedule for the review of this amendment request after Holtec commits to a date to provide the information.

The NRC acceptance review has determined that the remaining areas of the amendment request appear complete, and the NRC review can begin. While performing the acceptance review, the staff has also identified several technical areas which will likely be addressed in our initial request for additional information (RAI). Some of these areas are briefly described in the enclosure for your consideration under the section entitled, *Technical Issues for Further Evaluation*. Please note that no response to these issues is required at this time.

We would like to note that making additional changes to the amendment request in the future, beyond providing the information requested, could result in significant delays in scheduling and completing the review.

Your application also included an affidavit, dated February 28, 2002, requesting that certain proposed changes be withheld from public disclosure pursuant to 10 CFR 2.790. The staff is still reviewing your request and has not yet determined whether all or part of the identified information should be withheld. We will inform you of our determination in separate correspondence.

Please reference docket number 72-1014 and TAC No. L23424 in future correspondence related to this action. You may contact me at 301/415-8512, if you have any questions regarding our review of the amendment request.

Sincerely,

/RA/
Julia M. Barto, Project Scientist
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-1014
TAC No. L23424

Enclosures: (1) Information Needed to Review HI-STORM 100, Amendment 2
(2) Technical Issues for Further Evaluation

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Enclosure 1

INFORMATION NEEDED TO REVIEW HI-STORM 100, AMENDMENT 2

Technical Specifications

1. Provide the methodology used to determine allowable surface dose rate limits in conjunction with Technical Specification 5.7, *Radiation Protection Program*.

   Page 31 of NUREG-1745, *Standard Format and Content for Technical Specifications for 10 CFR Part 72 Cask Certificates of Compliance*, states that the process for establishing a limit may be moved to an administrative program if a method of evaluation acceptable to the NRC is presented in the Safety Analysis Report (SAR). Surface dose rate limits assure proper loading and consistency with the site-specific off-site dose analysis, which in turn ensure compliance with radiological requirements in 10 CFR Part 20, and 10 CFR Part 72.

   A user that determines allowable surface dose limits under proposed Technical Specification 5.7, in lieu of numeric dose limits specified in the Technical Specifications, should use an NRC-approved methodology for determining allowable dose rates. The methodology should specify appropriate shielding design considerations, acceptable analytical methods, baseline inputs and assumptions, and qualifications of personnel. A methodology is required in the SAR, with a discussion of an administrative program to measure and control dose limits in order to satisfy the requirements of 10 CFR 72.104, and 72.106.

2. Provide additional information to clarify the statement in Technical Specification 5.7, that a user may "establish a separate radiation protection program" from its 10 CFR Part 50 radiation protection program. Provide information in the SAR concerning the programmatic structure and necessary elements of an alternate radiation protection program, including establishment of contamination limits, for an ISFSI using the HI-STORM 100.

3. Provide the methodology used to determine if contents can satisfy the criteria listed in Technical Specification 2.3 of Appendix B, *Deviations from Cask Content Requirements*.

   A user that requests a deviation in allowable cask contents should use an appropriate/approved methodology for determining whether the proposed contents satisfy criteria number one and two of the proposed technical specification. The methodology should establish acceptance criteria that define "an equivalent level of safety" for new or different contents. The methodology should also discuss limitations on important content parameters when proposing a change in cask contents (e.g., what changes trigger the need for an amendment request). The methodology should also specify appropriate design considerations and baseline inputs and assumptions that are required to determine whether proposed new contents provide "an equivalent level of safety" and satisfy applicable NRC requirements.

   At a minimum, an approved NRC methodology is one which contains: in depth descriptions of acceptable analytical and computer code methods, assumptions, and

validations at all burnup levels; calculational packages and complete models; qualifications demonstrating ability to utilize the NRC approved methodology; examples of the types of changes which could be made; and any limitations on methodology applicability.

4. Provide a clarification of whether or not the HI-STORM 100 design is compliant with the recently revised staff guidance regarding cladding temperature limits, burnup levels, etc., contained in ISG-11, Rev. 2, *Cladding Considerations for the Transportation and Storage of Spent Fuel*, dated July 30, 2002.

   If the design is not in compliance with this latest staff guidance, it will be necessary to change all references of "Zircalloy (or other alloy of zirconium)" throughout the Technical Specifications and the SAR, to clearly specify which alloy is being requested; i.e., zirc-2, zirc-4, ZIRLO, M5, OPTIN, etc. For those alloys other than zirc-2 and zirc-4, it will be necessary to provide all data regarding the mechanical, creep, and hydride properties of the specific cladding type for the design temperature/stress regimes.

Chapter One, General Description

Provide a drawing of the MPC-32F.

Chapter Three, Structural

1. Provide calculations similar to those found in Appendix 3.AS for the MPC-32F.

2. Provide the updated calculation package which contains the supporting analytical approaches and calculations which were previously included in Appendices 3.B through 3.AS.

Chapter Four, Thermal

1. Provide the following supporting documentation, calculations, etc.:

   a. ANSYS analysis models in .db or .inp format which were used to obtain the bounding PWR and BWR MPC regional effective thermal properties.

   b. Provide the new Figure 4.4.27.

   c. Provide the updated calculation package which contains the supporting analytical approaches and calculations for all the thermal analyses described in Chapter 4 and Chapter 11.

2. Revise Figures 4.4.16, 4.4.17, 4.4.19, 4.4.20, 4.4.26, 4.5.2, to clarify the units used to report analysis results.

3. Either change the "List of Effective Pages for Proposed FSAR Revision 2" to reflect that Figures 4.4.16, 4.4.17, 4.4.19, 4.4.20, 4.4.26, are of "Revision 1," or submit the updated figures. Currently, the list shows the above figures as "Revision 2."

Chapter Five, Shielding

Provide a full description of the “vibration suppressor inserts,” and clearly describe the differences and similarities between these components with burnable poison rod assemblies.

Chapter Six, Criticality

1. Provide the locations of the missing rods for the MPC-32 damaged fuel analysis as was done in Figures 6.4.2 to 8 for the MPC-24.

2. Provide sample input files for the MCNP runs of the MPC-32F, which describe how the fuel debris was modeled. Provide a sketch of the model with a vertical slice showing the key dimensions and the important features like the active fuel, hardware, poison plates, MPC and cask structure, etc.

3. Provide information to quantify and apply the reactivity effect for off-center fuel in the basket cells, per page 6-3 of NUREG-1536, *Dry Cask Storage Systems*. Consider off-center configurations beyond the gratis example given in NUREG-1536 (see NUREG-1567, *Spent Fuel Dry Storage Facilities*, Section 8.4.3.1, for other examples).

4. Provide information for the cases in Figure 6.4.14 to enable independent calculations. Include the variations in pitch of the fuel arrays, location of missing rods for damaged fuel, configuration of collapsed fuel, and configuration of fuel debris. Show that this figure applies to the 5% fuel case with borated water.

Chapter Seven, Confinement Boundary

1. Provide information to justify the gravitational settling values used in the confinement analysis.

   The confinement analysis uses gravitational settling values to reduce the amount of fines, volatiles and crud available for release from the canister. Use of gravitational settling values in the confinement analysis is a deviation from NUREG-1536, and Interim Staff Guidance (ISG) 5, *Confinement Evaluation*. Deviations from the NUREG-1536, and ISG-5 must be described and justified.

   Revise the SAR to provide the assumptions and calculations used to develop the gravitational settling values for the amended HI-STORM 100 design. The assumptions and calculations should be in sufficient detail such that the staff can independently confirm if the gravitational settling values used in the analysis are appropriate for the HI-STORM 100 design and its contents. In addition, the assumptions and calculations should be of sufficient detail such that the staff can re-create these gravitational settling values.

2. Provide information to explain how the gravitational settling values were incorporated into the confinement analyses.

The confinement analysis incorporates gravitational settling values which are not described in NUREG-1536 and ISG-5. Any deviations from NUREG-1536 and ISG-5, must be described and justified. Revise the SAR to describe how the gravitational settling values were incorporated with the methodology of ISG-5. The confinement evaluation should be in sufficient detail such that the staff can independently confirm that the deviation from ISG-5 is appropriate for the HI-STORM 100 design and its contents. In addition, the assumptions and calculations should be of sufficient detail such that the staff can re-create the HI-STORM 100 confinement analysis.

Chapter Nine, Acceptance Tests and Maintenance Program

Provide the qualification and acceptance tests for the neutron absorber (METAMIC^{TM}), including the statistical acceptance criteria. Provide engineering testing evidence that the material functions according to the design requirements; i.e, Boron content, temperature resistance over time, etc. Submit manufacturing procedures to verify the quality of the material; i.e., how to avoid voids, assuring the Boron content, etc.

Chapter Ten, Radiation Protection

Provide occupational dose assessments that are based on the bounding burnup and cooling times for the new proposed contents. Note, page 10-3 of NUREG-1536, states the following, “The applicant should use these data [SAR sections 5 and 8] to estimate the doses received by occupational personnel during cask loading and transportation to the ISFSI.”

Enclosure 2

TECHNICAL ISSUES FOR FURTHER EVALUATION

Technical Specifications

1. Provide an appropriate provision in Technical Specification 3.1, LCO 3.3.1.e., if the applicant's intent is to request damaged fuel or fuel debris with enrichments less than or equal to 4.0 wt%, as contents for the MPC-24E or MPC-24EF.

2. For Technical Specification, Appendix B, Table 2.1-1, Item VIII.C., "Neutron sources," either add this item to the section in the SAR entitled, "CoC Markup," or delete it from the section entitled, "Revised CoC." If the applicant's intent is to add Item VIII.C., "Neutron sources," then clearly describe what "neutron sources" are being requested for contents in the MPC-32F. Provide isotopic information, such as activity, decay time, etc. Perform a detailed shielding analysis in Chapter Five of the SAR.

Chapter Five, Shielding

1. Provide information in Section 5.2, which specifies the expected error in source term estimates for actinides and fission products important in shielding (e.g., Cs-134 and Cm-244), and source term estimates for total decay heat, as a function of requested burnup between 45 and 75 GWd/MTU.

2. Clarify how the burnup and cooling time combinations in Table 5.2.1 were determined to bound the burnup and cooling time combinations in Appendix B of the proposed CoC.

3. Justify in Section 5.4, why a burnup and cooling time combination of 43.5 GWd/MTU and 3 years is specified to produce the highest dose rates in the MPC-24 in the 100-ton HI-TRAC, whereas Table 5.2.1 specifies the bounding burnup as 47.5 GWd/MTU.

4. Justify in Section 5.4, why a burnup and cooling time combination of 70 GWd/MTU and 10 years was used to calculate dose rates from the MPC-24 in the 125-ton HI-TRAC, whereas Appendix B of the proposed CoC indicates fuel with a burnup and cooling time of 75 GWD/MTU and 6 years may be authorized contents.

5. Justify in Section 5.4, why a burnup and cooling time combination of 45.5 GWd/MTU and 4-years cooling was used to calculate dose rates from the MPC-32 in the 100-ton HI-TRAC, whereas Table 5.2.1 specifies the bounding burnup and cooling time as 33 GWd/MTU and 3 years.

Chapter Six, Criticality

1. Indicate which version of the HI-TRAC was modeled in the evaluations cited on page 6.1-4 (the 100 ton model with 2.875" thick lead or the 125 ton model with 4.5" thick lead). Provide sketches of this model.

2. Provide information to document the statement on page 6.2-1, which indicates that k_{eff} is maximum for maximum active fuel length.

3. Clarify the fuel debris model for case 3 on page 6.4-8. (e.g., describe the number of pellets which change to powder. Indicate if clumps or chunks were considered).

4. Provide statistical uncertainties to evaluate the significance of differences in summary of results, for comparison of the detailed results in Appendix 6C.

5. Clarify how the data were obtained for Figure 6.4.10. Explain how it differs from the data in Table 6.4.1.

6. Explain how the mass of fuel per unit length was varied as cited on page 6.4-12. Indicate if the density or diameter was changed, or if fuel rods were added to the lattice.

7. Explain if the hypothetical fuel debris configuration referenced in the last paragraph in Section 6.4.4.2.6, is the same as that described in item no. 4 of Enclosure 1, or how it is different.

8. Describe the studies referenced in the third sentence in the last paragraph on page 6.4-9.

Please reference docket number 72-1014 and TAC No. L23424 in future correspondence related to this action. You may contact me at 301/415-8512, if you have any questions regarding our review of the amendment request.

Sincerely,

/Sa/
Julia M. Barto, Project Scientist
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

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