

November 16, 2006

Mr. Evan Rosenbaum  
Project Manager  
Holtec International  
555 Lincoln Drive West  
Marlton, NJ 08053

SUBJECT: REVIEW STATUS OF HOLTEC INTERNATIONAL HI-STORM 100 LICENSE  
AMENDMENT REQUEST (TAC NO. L23850)

Dear Mr. Rosenbaum:

On May 16, 2005, Holtec International (Holtec) submitted Revision 1 to an application to amend Certificate of Compliance (CoC) No. 1014 for the HI-STORM 100 Cask System (License Amendment Request 1014-3, Revision 1) in accordance with 10 CFR Part 72. This amendment proposed to: (a) add a new underground storage design denoted as the HI-STORM 100U and (b) increase the maximum thermal decay heat load to 35.5kW and 38kW for boiling water reactor and pressurized water reactor spent nuclear fuel, respectively. The Nuclear Regulatory Commission (NRC) staff performed a technical review of the application and issued Request for Additional Information (RAI) No. 1 on November 30, 2005, and RAI No. 2 on June 6, 2006. Holtec's response to the RAIs were submitted on February 18, 2006, and July 10, 2006, respectively.

The purpose of this letter is to provide you with information regarding the staff's review, to share with you the staff's decision to discontinue its review of your application, and to outline options regarding the disposition of License Amendment Request 1014-3, Revision 1 (LAR 1014-3). Over the course of our review of the complex methodologies associated with your approach to the structural analysis for the underground storage design concept, the staff has been unable to draw any conclusive findings based on the information and materials Holtec has provided. It should be noted that the staff has not necessarily found the design as a whole unacceptable but that we are unable to approve the amendment application based on outstanding issues in the structural discipline. Enclosed with this letter is a summary of the outstanding issues regarding the structural analyses Holtec has provided to date.

The staff has determined the most prudent action would be to discontinue review of your application. The staff considers two possible paths forward available to you should you wish to pursue an approval of an amended CoC. The first being that you withdraw LAR 1014-3 in its entirety. You may, after further evaluation, resubmit a new amendment request incorporating any new analyses in response to the outstanding structural issues and which capture any pertinent information from the current amendment request. The second option is, noting that you have also requested an increase in the maximum thermal decay heat load, that you withdraw those changes requested in the amendment specific to the underground storage design, such that the staff may complete its technical review of the thermal aspects for the above ground storage design. It is expected this course of action would result in you submitting appropriate and acceptable revisions to the application before the staff would proceed with further review. Taking this action might allow the NRC to move forward with an approval of those portions of the application that remain.

E. Rosenbaum

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We request that you inform us in writing within two weeks of the date of this letter of what actions you intend to take in light of the NRC's decision to discontinue our review of the current application. If you decide to amend your application to remove the underground storage provisions, upon receipt of your written decision we will inform you as soon as possible of a proposed schedule for completion of the licensing action relating to those aspects not associated with the underground design concept.

Please refer to Docket Number 72-1014 and TAC No. L23850 in future correspondence related to this action. If you have any questions regarding our review, you may contact me or Christopher M. Regan of my staff at (301) 415-8500.

Sincerely,

**/RA/**

Robert Nelson, Chief

Licensing Branch

Division of Spent Fuel Storage and Transportation

Office of Nuclear Material Safety

and Safeguards

Docket No. 72-1014

TAC No. L23850

Enclosure: Summary of Structural Issues

E. Rosenbaum

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Robert Nelson, Chief  
Licensing Branch  
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Enclosure: Summary of Structural Issues

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Enclosure

**Holtec International**  
**Amendment to Certificate of Compliance 1014**  
**HI-STORM 100 Structural Issues Summary**

Holtec International (Holtec) submitted an application to amend Certificate of Compliance (CoC) No. 1014 for the HI-STORM 100 Cask System (License Amendment Request 1014-3, Revision 1) proposing to add a new underground storage design denoted as the HI-STORM 100U. The proposed HI-STORM 100U Storage System consists of a site-specific array of underground Vertical Ventilation Modules (VVMs) anchored to a subsurface flexible concrete pad embedded in soil, (e.g., a 2 x 5 array is shown in Figure 1.1.3 of the Final Safety Analysis Report (FSAR) Supplement 1.1). To determine the seismic adequacy of the design, Holtec submitted a soil-structure interaction (SSI) analysis of a single VVM anchored to bedrock and surrounded laterally by soft soil. This model was subjected to an acceleration time history defined by Regulatory Guide 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," with a peak ground acceleration (PGA) of 0.5g. Based on the results of this analysis, Holtec performed a stress evaluation of VVM components important to safety (ITS) including the Multi-Purpose Canister (MPC) confinement boundary.

The NRC staff's second RAI, issued June 6, 2006, specifically requested justification that; (1) a single VVM bounds the results for multiple VVMs, (2) a rigid concrete pad (i.e., bedrock) results in a conservative structural response when compared to a flexible concrete pad, and (3) a VVM model founded directly on bedrock provides reasonably accurate results when compared to a more realistic SSI model where soil exists on all sides and beneath the flexible concrete pad. In response to the staff's RAI, Holtec submitted a SSI analysis of a single VVM anchored directly to bedrock and surrounded laterally by soft soil as an analysis representative of a methodology that would be applied on a site-specific basis by licensees. The staff determined this response to be unacceptable, as it does not respond to the RAI by demonstrating that such an analysis methodology could reasonably represent the critical response characteristics of an actual independent spent fuel storage installation (ISFSI) site. The staff also determined that in the Holtec report HI-2053389, "Calculation Package for the HI-STORM 100U," Holtec Calculation 004, "Comparison of Shell and Brick Elements in Seismic Analysis Representation Case," does not support the Concrete Enclosure Cavity (CEC) being modeled as a single layer of solid (constant stress) elements as asserted in Holtec Calculation 007, "Seismic Analysis." In addition, the staff determined that the stress evaluation of the MPC confinement boundary in Calculation 007 to be inconclusive with respect to the calculation of the American Society of Mechanical Engineers (ASME) Code stress intensities.

Additionally, the NRC staff's second RAI requested the Bill of Materials or equivalent information be included in the FSAR. Holtec responded that licensing Drawing 4501, included in Section 1.5 of the proposed revised FSAR, contains the material type and critical dimensions of the HI-STORM 100U components and Table 2.1.7 in the FSAR lists the material and ITS Category of the components. The staff did not identify all dimensions that are considered critical for ITS items for the analyses and design in the submitted response. For example, the thickness of the CEC bottom plate, the thicknesses of the upper and lower MPC guides and the thickness of the divider shell restraint do not appear to be identified on Sheets 1 through 6 of Drawing 4501 submitted in response to the staff's second RAI. Also, the NRC staff requested

that Drawing 4501, Sheet 4, be revised to reflect the information for ITS items contained in Revision 0 of the drawing using Detail K as an example of necessary information. Holtec's response indicated the information had been restored to Sheet 4 as requested. With regard to Detail K, Holtec provided Detail M, however, the staff considers the necessary critical information to be missing. The pipe weight has not been identified, plate size and thickness has not been identified, and the plate hole size not identified. Also noted on Revision 2 of Sheet 4 is a note for additional "optional gusset plates" in the anchorage zone of the CEC outer shell with no explanation regarding need for use of the option.

Furthermore additional expansion and/or clarification is necessary regarding the use of alternative or equivalent materials for ITS components. Although the approach for defining alternative or equivalent materials is acceptable in principle additional details must be provided. Holtec employs a new term "critical characteristic" (along with a definition for "equivalent") that mentions "attributes....in the associated material specification, as necessary to render the material's intended function." However, the specific attributes, such as chemical composition or mechanical properties (i.e. TS, YS, elongation) have not been specifically delineated in sufficient detail for each of the various materials for which an alternative material is desired.