March 6, 2007

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

SUBJECT: REVISED 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 (LAR) 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 36.9kW (regionalized loading) for both boiling water reactor and pressurized water reactor spent nuclear fuel. The staff notified Holtec by letter dated November 16, 2006, that the review had been discontinued due to issues associated with the proposed HI-STORM 100U design identified during the course of the technical review and the inability of the staff to reach any conclusions and findings based on the information provided by Holtec. Subsequently in a letter dated November 29, 2006, Holtec requested that the HI-STORM 100U design be withdrawn from consideration for approval. Holtec submitted LAR 1014-3, Revision 2, on December 22, 2006, removing reference to the HI-STORM 100U design such that the staff could move forward with review of the request for an increase in the maximum thermal decay heat load and other changes to the CoC.

The purpose of this letter is to inform you of several inconsistencies and concerns identified by the staff in the December 22, 2006, Revision 2 to the LAR. In several areas of the revised application the HI-STORM 100U design is still mentioned, and these references will need to be removed. Further, and consistent with our letter of November 16, 2006, our review of the thermal aspects of the above ground storage design has identified several potential inconsistencies with shielding analyses and referenced material temperature limits. These items are delineated in further detail in the Enclosure to this letter. In order to complete the review of the application these items must be addressed. The staff does not anticipate that any significant delay in the schedule will result from rectifying these inconsistencies and concerns pending prompt response to this correspondence. We request that you inform us in writing within two weeks of the date of this letter of when and how you propose to disposition the enclosed items. We will inform you as soon as possible of any changes to the proposed schedule for completion of the licensing action if additional staff review time is necessary related to your response.

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 at (301) 415-8500.

Sincerely,

/RA/

Christopher M. Regan, Senior Project Manager
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 License Amendment Request Revision 2 Concerns

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 at (301) 415-8500.

Sincerely,

Christopher M. Regan, Senior Project Manager
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 License Amendment Request Revision 2 Concerns

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Enclosure

Holtec International
Amendment to Certificate of Compliance No. 1014
Summary of HI-STORM 100 License Amendment Request Revision Concerns

Holtec International (Holtec) submitted an application to amend Certificate of Compliance (CoC) No. 1014 for the HI-STORM 100 Cask System (License Amendment Request (LAR) 1014-3). Revision 2 to LAR 1014-3 was submitted December 22, 2006. Provided below is a list of outstanding items of concern for the Holtec HI-STORM 100 LAR 1014-3 that may require additional revision.

Item 1) The HI-STORM 100U design concept supporting references described in the original May 15, 2005, amendment request have not been fully removed from the current revision of the proposed appendices to the CoC and the Safety Analysis Report (SAR). These references and descriptions include, but may not be limited to:

A. References to the Vertical Ventilated Module (VVM). These references are, at a minimum, in Table 1.0.1 of the SAR, the definitions section of Appendix A and the definition of overpack in Appendix B to the CoC. The VVM term was added specifically to incorporate the HI-STORM 100U concept into the HI-STORM 100 system. With the removal of the HI-STORM 100U concept from this amendment, references to and definitions of the VVM should also be removed from the SAR and the CoC, to include the CoC appendices.

B. Material properties for soil in SAR Table 5.3.2. These properties were added specifically for the HI-STORM 100U shielding models. With the removal of the HI-STORM 100U from the amendment, this information should also be removed, since it is not a part of the shielding analyses for the above ground HI-STORM 100 overpacks remaining in the amendment.

C. Alternate Cask Transfer Facility (CTF) descriptions identified in proposed FSAR Section 2.3.3.1. It is noted that the CTF may include the following types of configurations to carry out cask manipulation and MPC transfers:

a. Underground, combined with a mobile lifting device.
b. Underground, combined with a cask transporter (i.e. crawler).

With the removal of the HI-STORM 100U from the amendment, these references do not appear to apply to the current HI-STORM 100 Cask System and should be removed.

D. Appendix B of the proposed CoC, the CASK TRANSFER FACILITY definition has been expanded to include an “underground system.” With the removal of the 100U from the amendment, this expansion to the definition does not appear to apply to the current HI-STORM 100 Cask System and should be removed.

E. Appendix B of the proposed CoC, in Section 3.5.1, under the description of the TRANSFER CASK and MPC Lifters, the following ststement is made: “The CTF Structure requirements below do not apply to heavy loads bounded by the regulations of 10 CFR 50, to the loading of an OVERPACK in a belowground restraint system which permits MPC transfers near grade level and does not require an aboveground CTF.” With the removal of the 100U from the amendment, this reference does not appear to apply to the current HI-STORM 100 Cask System and should be removed.

Item 2) The applicant proposed a change to permit control rod assemblies (CRAs) to be loaded with assemblies in all basket cell locations for all Pressurized Water Reactor (PWR) Multi-Purpose Canisters (MPCs). The cask system, as currently approved by the staff, limits CRAs to the innermost four basket cells in these MPCs. The applicant requested this limited allowance due to the variance in activation of CRAs from plant to plant. The staff Safety Evaluation Report (SER) for Amendment 1, the amendment under which CRAs were added to the approved non-fuel hardware contents, indicates the variance was viewed as significant. The justification for increasing the number of CRAs states that the limitation is unnecessary, but does not address the question of variance in activation and why the limit is now considered unnecessary.

Also, a more important issue is the non-fuel hardware that is used in the bounding dose estimates. The applicant continues to use Burnable Poison Rod Assemblies (BPRAs) to give the bounding dose rates. SAR Section 5.4.6 states that the radial surface doses from other non-fuel hardware is less than that of BPRAs, except for at the base of the cask. However, these dose rates occur at an area the applicant states is not normally occupied, underneath the cask base. The SAR indicates that these dose rates are localized. For the proposal to permit the loading of CRAs in all basket locations, it is no longer clear that the BPRAs bound the CRAs. While surface dose rates at the axial mid-plane of the cask are higher for BPRAs, the CRAs are significantly higher near the base of the cask (but still on the radial surface), near the inlet vents. Also, at a distance of 1 meter, the dose rates at the cask mid-plane are equivalent for BPRAs and CRAs, whereas the dose rates for CRAs remain significantly higher at the lower radial dose location. Dose rates due to BPRAs still exceed those of CRAs at the cask top surface and at one meter from the top; however, the difference at one meter from the top surface is not as significant as the differences in doses around the lower part of the cask where the CRAs produce the greatest dose. The staff also notes that the dose rates from CRAs are no longer truly localized; so personnel near the cask base would receive a greater dose than is estimated for a cask loaded with BPRAs and spent fuel. This would also be of concern since the Technical Specifications (TS) still allow for horizontal transport of the transfer cask. It would appear that use of CRAs as proposed would impact the normal and accident conditions dose rates (accounting for the horizontal orientation of the transfer cask and storage overpack) as well as estimated occupational dose rates determined in the SAR.

Item 3) The applicant has proposed changes to TS 5.7, “Radiation Protection Program.” The primary changes are to TS 5.7.3.a and 5.7.8.b to remove the requirement for the licensee to establish a dose rate limit for the top of the transfer cask (5.7.3.a) and to perform the associated measurements (5.7.8.b). The proposed changes to TS 5.7.6.b and 5.7.7 are associated with the proposed changes to 5.7.3.a and 5.7.8.b. It is staff’s position that these proposed changes, with the exception of the change of ‘OVERPACK’ to ‘MPC’ in TS 5.7.7, should not be implemented but the previous language should be restored to the TS.

The applicant justifies the proposed change, stating that it views the measurements on the transfer cask to be merely precautionary and that measurements on the storage overpack are sufficient to achieve the goal of TS 5.7. The applicant also argues that the measurement does not add value from an as low as reasonably achievable (ALARA) perspective and merely results in dose to personnel. The staff does not believe this argument has merit. The requirement for the licensee to establish a cask-specific dose rate limit for the top of the transfer cask, based upon the analysis in TS 5.7.2, and to perform measurements to verify compliance with the limit serves a couple of purposes. First, it provides an important and early way to detect whether a

mis-load or other problem has occurred, which would be indicated by an exceeded dose rate limit. Detection at this stage of operations provides the chance for the appropriate corrective actions to be taken prior to the MPC being placed in the storage overpack and at the ISFSI pad.

With regard to ALARA, 10 CFR 72.104(b), requires the establishment of operational restrictions to meet as low as reasonably achievable objectives for direct radiation levels associated with ISFSI operations. Development of appropriate controls, surveillances and programs in a cask system's TS is an integral and necessary part of these operational restrictions. Additionally, ALARA requirements are met when a necessary surveillance is performed in a manner that minimizes dose to personnel, not by simply removing the surveillance. Requiring the licensee to develop a dose rate limit for the top of the transfer cask assists the licensee to fulfill ALARA objectives. Having a TS limit for the cask top will provide the licensee with the information necessary to perform a thorough ALARA evaluation for anticipated cask work to minimize personnel exposure. Also, if radiation protection personnel perform numerous measurements around the HI-TRAC, as the applicant indicates occurs in its response to staff RAI1 (November 30, 2005) question 12-2, the requirement of four measurements on the top of the transfer cask does not constitute an undue burden; it would seem that these measurements would be a part of the other measurements being performed.

Item 4) The staff notes that, for consistency, it appears the applicant should propose removing the words 'ZR-clad' from Section 2.4.3.6 of CoC Appendix B. At the same time, however, the purpose of removing 'ZR-clad' from the various places in the SAR and CoC appendices where the applicant has proposed this change is not clear to the staff. This seems to be an unnecessary change given that Section 2.1.3 of CoC Appendix B states, "Regionalized loading is limited to those fuel assemblies with ZR cladding." Furthermore, Table 2.1-1 of CoC Appendix B still specifies set maximum burnup, minimum cooling time and maximum decay heat limits for stainless steel-clad assemblies that do not allow for regionalized loading and are not determined with the burnup equation method in Section 2.4 of CoC Appendix B. Also, the coefficients that are provided for use with the burnup equation method are only given for 'ZR-clad' fuel assembly arrays/classes. The staff further notes that the shielding analysis does not support use of the burnup equation method or regionalized loading for stainless steel-clad assemblies. In the SAR (particularly Section 2.9), this proposed change appears to introduce unneeded ambiguity with respect to what is permissable.

Item 5) The discussion presented in the SAR, pages 5.4-3 though 5.4-4, should be modified with respect to the MPC-24 and MPC-24E/EF (most notably the bullets). The dose contribution for both neutrons and gammas will now be (significantly) larger than is stated in these SAR pages due to the expanded size of the inner region. The discussion still relies on the currently approved configuration which allows the inner region of basket cells to only be the innermost four basket cells. This amendment proposes that the innermost twelve cells be called the inner region. Thus, there is much less shielding of the inner region by the outer region assemblies, with some inner region assemblies now having a corner area with a direct line of sight to the MPC shell. In modifying the discussion, variations in dose rates should be noted for areas where this direct line of sight from the inner region exists (versus where the outer region shields the inner region assemblies). While the staff understands that the applicant's shielding analysis bounds the configurations that would be possible under a regional loading pattern, it is important that a potential user be made aware that, for regional loadings in these MPCs with the higher heat load fuel in the expanded inner region, there will be locations around the MPC (and thus the transfer cask and storage overpack) where dose will peak because the outer region

assemblies do not provide shielding in those locations. This information is important for minimizing personnel dose and implementing necessary ALARA precautions.

Item 6) The applicant proposes to allow regional loading patterns with higher heat load assemblies in the outer region. Staff understands that the applicant's shielding analysis uses assemblies in a uniform pattern with burnup and cooling time combinations that bound the configurations possible under regional loading. However, the staff has a concern that the discussion on SAR page 5.1-7 with regard to the dose profiles across the top and base of the transfer cask are not necessarily applicable for MPCs with such a regional loading pattern. The profiles currently given in the SAR indicate a significant reduction in dose rate as one moves away from the center of the cask top/base. However, in the pattern where fuel with higher heat loads is placed in the outer basket region the degree of reduction in dose rate may be substantially diminished, depending upon the ratio of heat loads allowed in the inner and outer basket regions. Thus, the dose will continue to remain high across a greater portion of the cask top/base than is indicated in the current SAR discussion. This information is important for a site user to understand so that proper consideration may be given to the development of procedures that minimize personnel dose and implement necessary ALARA precautions.

Item 7) The applicant proposes to reduce the minimum concrete density in the overpack body, lid, and pedestal (for those overpacks with concrete in the pedestal) and make all three have the same density. The applicant's justification is merely to provide greater flexibility in implementing the cask system at various sites. This justification doesn't seem to really explain the need for the reduction, nor does it touch on why cask users would want concrete of different densities, particularly lower densities. From an ALARA perspective, this does not seem to be acceptable. ALARA would require that as much shielding as practical should be provided on the cask, which, in this case, would mean an overpack constructed with the highest density concrete practical should be used by a licensee. The SAR should include justification of the need to reduce the concrete density and should include any extenuating circumstances precluding use of higher density concrete-bearing overpacks at sites that cannot reasonably be altered to allow their use.

Item 8) FSAR, Table 2.2.3, indicates Off-Normal and Accident Condition temperatures for the MPC shell and internals have design temperature limits for the stainless steel and the neutron absorber set at 1200 degrees F, yet the tables, such as Table 3.1.6, provide stress intensity for Level D to only 800 degrees F. Also, page 3.3-1 of the FSAR states that, "However, no maximum temperature for Alloy X used at or within the confinement boundary exceeds 1000 degrees F." A clarification is needed.

Item 9) FSAR Table 2.2.3 contains extensive changes to the maximum design temperatures for all of the MPC components. Several of the new maximum design temperatures are now set at 1200°F. For instance, the MPC shell maximum design temperature is raised from 775°F to 1200°F. This appears to be far in excess of any present requirement, based upon examination of the accident analyses. Additionally, the proposed American Society of Mechanical Engineers (ASME) Code alternative, which attempts to justify the acceptability of the 1200°F limit, does not provide sufficient detail to assess the viability of the proposed limit. Given the wide disparity between the analyzed accident condition temperatures and the design maximum temperatures, the staff suggests revising the design temperatures downward and reinstating ASME Code Case N-47 or ASME Code Subsection NH (Note: ASME Code Case N-47 was incorporated into the ASME Code as Subsection NH in December 1995 and N-47 was annulled July 1, 1996).

Item 10) Identified editorial concerns. The following comments are editorial in nature.

A. The second 'and' in the 6th line of CoC condition #12 should be changed to 'any.'

B. It seems that Table 3-1 of the CoC, Appendix A is missing references to the MPC-32F, 68F, and 68FF.

C. TS 5.7.e should have the words 'of the' added before 'OVERPACK'.

D. The last sentence immediately preceding SAR Section 5.2.5 on page 5.2-10 should be modified to be consistent with the proposed changes to the allowed numbers and locations of Axial Power Shaping Rods (APSRs) and CRAs in the MPC-24 and MPC-32 and their variants.

E. In the proposed CoC, Appendix B, Section 3.5.2.1, Items 1. and 2., Table 3-3, should apparently be changed to Table 3-2.

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MEMORANDUM/LETTER TO: Evan Rosenbaum, Holtec International

FROM: Robert Nelson, SFST, NMSS

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

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