March 30, 2007

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

SUBJECT: HI-STORM 100, LICENSE AMENDMENT REQUEST 1014-5, REQUEST FOR ADDITIONAL INFORMATION 2 (TAC NO. L23996)

Dear Dr. Anton:

On June 23, 2006, 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.

The amendment proposed to add site specific options to the CoC to permit use of a modified HI-STORM 100 Cask System at the Indian Point Unit 1 (IP1) Independent Spent Fuel Storage Installation (ISFSI). These options include the shortening of the HI-STORM 100S Version B overpack, the Multi-Purpose Canister (MPC) -32 and MPC-32F and the HI-TRAC 100D to accommodate site specific restrictions. Additional changes proposed address: the Technical Specifications (TS) definition of "TRANSPORT OPERATIONS," and associated language in the Safety Analysis Report; the soluble boron requirements for Array/Class 14x14E IP1 fuel; the helium gas backfill requirements for Array/Class 14x14E IP1 fuel; the addition of a fifth damaged fuel container design under the TS definition for Damaged Fuel Container; addition of separate burnup, cooling time, and decay heat limits for Array/Class 14x14E IP1 fuel for loading in an MPC-32 and MPC-32F; addition of antimony-beryllium secondary sources as approved contents; the loading of all IP1 fuel assemblies in damaged fuel containers; the preclusion of loading of IP1 fuel debris in the MPC-32 or MPC-32F; the reduction of the maximum enrichment for Array/Class 14x14E IP1 fuel from 5.0 to 4.5 wt% ^{235}U; changes to licensing drawings to differentiate the IP1 MPC-32 and MPC-32F from the previously approved MPC-32 and MPC-32F; and other editorial changes including replacing all references to US Tool and Die (UST&D) with Holtec Manufacturing Division (HMD).

By letter dated August 11, 2006, the staff acknowledged receipt of your application and informed you that the application appeared to contain the necessary information to begin a technical review. Based on a review of your application the staff provided you with a Request for Additional Information (RAI) dated November 28, 2006. You responded to the RAI by letter dated January 19, 2007. The staff has reviewed your response to the RAI and has additional concerns that should be addressed. These concerns are described in the enclosed second RAI. Information in response to this second RAI should be provided by May 31, 2007. 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 provide 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 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. L23996 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 Branch
Division of Spent Fuel Storage and Transportation
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-1014
TAC No. L23996

Enclosure: Request for Additional Information

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Request For Additional Information 2
Holtec International HI-STORM 100 Cask System
License Amendment Request 1014-5, Docket 72-1014

By application dated June 23, 2006, Holtec International (Holtec) requested an Amendment to Certificate of Compliance (CoC) No. 1014 for the HI-STORM 100 Cask System in accordance with 10 CFR Part 72. This second 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. 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.

General:

G-1 Propose language in the Certificate of Compliance (CoC) that specifically describes the HI-TRAC model for Indian Point Unit 1 (IP1) as the 75 ton HI-TRAC Version IP1, providing nominal shielding dimensions (thickness of shielding materials), and clarifies that this HI-TRAC model is only for use at IP1 while restoring the currently approved CoC language regarding the 100 ton and 125 ton HI-TRAC models.

The proposed wording, in response to the previous RAI (G-1) suggests that the IP1 HI-TRAC would have a maximum weight limit of 100 tons. This is not accurate, since the cask is designed for a maximum limit of 75 tons. This transfer cask is being designed for one specific site that can only handle a 75 ton maximum load. In addition to the large difference in maximum weight, the IP1 transfer cask has reduced radial shielding due to reduction in radial thickness of the lead and the steel outer shell. A comparison of the 100 ton HI-TRAC 100 and HI-TRAC 100D shows that, while there are some differences between the two, both are truly for a maximum weight limit of 100 tons and have the same radial shielding material thicknesses; the only difference between the 100 and 100D transfer casks is the number of radial ribs in the water (neutron shield) jacket.

This information is necessary to determine compliance with 10 CFR 72.236.

G-2 Remove the proposed explicit reference to the HI-STORM 100S Version B overpack from the CoC language.

In response to the previous RAI (G-2) the applicant proposed adding explicit reference to the Version B overpack in the CoC language. However, this overpack was added to the HI-STORM system as allowed by 10 CFR 72.48 and was not reviewed and approved by the NRC. Only those proposed changes that have been reviewed and approved by the NRC may be included in the CoC. The previous RAI sought clarification that some variants of the HI-STORM overpacks cannot be used in the anchored configuration. This clarification can be achieved without explicit reference to the Version B (and any other) overpack or other design changes incorporated as allowed by 10 CFR 72.48. The proposed language should read similar to the following:

"The HI-STORM 100A applies to both the 100 and 100S, *with the exception of some overpack variants,* that are classified as ..."

This information is necessary to determine compliance with 10 CFR 72.236.

G-3 Explain the need to have the 14x14E assembly class/array listed as allowable contents for the Multi-Purpose Canister (MPC) 24, 24E, and 24EF.

Since the 14x14E assembly class/array is only comprised of IP1 fuel assemblies and these assemblies are all to be loaded into MPC-32(F)s, it appears there is no longer a practical need for listing this assembly class/array as part of the allowed contents for other MPCs containing pressurized water reactor (PWR) fuel. The applicant should consider the necessity of maintaining the assembly class/array as allowed contents for the other PWR MPCs and/or the removal of it from the MPCs' allowed contents.

This information is necessary to determine compliance with 10 CFR 72.236(a).

Shielding

SH-1 Provide language in the Technical Specifications (TS) that clarifies the definition of non-fuel hardware (NFH) and the limitations regarding the types and locations of non-fuel hardware that may be stored with the different assembly classes/arrays in the different MPCs.

In response to the previous RAI (SH-1) the applicant proposed language to indicate that NFH is not permitted to be stored with the IP1 assembly class/array (i.e., 14x14E). The proposed language states that, besides Antimony-Beryllium neutron sources, "Other NON-FUEL HARDWARE" is not permitted, which indicates that the neutron sources are classified as NFH. However, the current definition of NFH does not include neutron sources. Thus, the definition of NFH should be modified to include neutron sources. Additionally, the TS should be modified to preclude the loading of neutron sources with assemblies and/or in MPCs and MPC basket locations for which loading of neutron sources is not supported by the applicant's shielding evaluation.

This information is necessary to determine compliance with 10 CFR 72.236(a).

SH-2 Provide either a shielding analysis of the IP1 fuel as damaged fuel or provide greater justification for why this analysis is not necessary.

In response to the previous RAI (SH-2) the applicant states that an analysis is not needed. To support this position, the applicant relies on assembly design, results of assembly inspections, and shielding analyses done for the other MPCs that allow limited loading of damaged fuel assemblies. The staff does not consider this justification sufficient.

Although the assembly design includes a shroud and the cladding is stainless steel, the applicant does not make it clear as to how these assembly characteristics make damage to IP1 assemblies and, under any accident condition, geometric reconfiguration

of damaged IP1 assemblies much less likely than for standard PWR assemblies. Also, while inspections of the assemblies have not identified any damage, the inspections were limited in their ability to determine the condition of the entire assembly; they appear to have been visual inspections, which enable inspection of only a small fraction of an assembly. Thus, there are large portions of each assembly that have not been inspected. The applicant notes that it is the inability to fully inspect the assemblies and a lack of sufficient records that, in accordance with the damaged fuel assembly and intact fuel assembly TS definitions, requires classifying the assemblies as damaged.

The shielding analyses for damaged fuel in the other MPCs (Final Safety Analysis Report (FSAR) Section 5.4.2.2) is based upon the limitation of damaged fuel to certain locations. The analysis for the MPC-68 appears to be the most relevant; however, damaged fuel is limited to 16 of the outermost basket storage locations. Thus, not all the outermost locations are analyzed for damaged fuel. Also, while other shielding analysis show that assemblies in the basket's periphery locations dominate the dose rates, the contributions from the remaining assemblies are not insignificant, particularly for the neutron dose rate, which is a significant fraction of the overall dose rate in the analyzed accident condition. Thus, the dose rate decrease at the cask midplane may not be as significant for the IP1 MPC-32 as it is for the MPC-68 while the dose rate increase may be more significant in areas such as around the lower parts of the cask, where personnel are likely to be.

Therefore, the applicant should either provide a shielding analysis for damaged fuel loaded in the MPC-32 in the configuration proposed in the amendment (providing dose rates for all three radial locations - locations 1, 2, and 3) or provide greater justification, quantitative as well as qualitative, to support the argument that the analysis is not needed. This justification should include information that details how the design (the presence of the shroud and the stainless steel cladding and shroud) results in a much lower likelihood of assembly damage and geometric reconfiguration, including information regarding the mechanisms for damage to stainless steel versus the cladding material of standard PWR assemblies, the operating environment to which the assemblies were exposed and whether or not the conditions of that environment were conducive to mechanisms for damaging stainless steel, whether any failures occurred during in-core operations, and so forth. Staff recognizes that stainless steels are not susceptible to the hydride concerns that affect zirconium-based alloys; however, staff notes that stainless steels that have been exposed to a sufficient neutron fluence do experience embrittlement.

In addition, while staff understands the purpose of the amendment shielding analysis is to show that the dose rates from the HI-STORM 100 system designed for IP1 are bounded by the dose rates from the standard HI-STORM 100 system and that the applicant's current analysis indicates the presence of a large margin, a true demonstration of the bounding nature of the standard system versus the IP1 system will compare the bounding condition of the standard system with the bounding condition of the IP1 system. It is not clear that the currently proposed supplemental shielding analysis is making such a comparison. Also, with regard to analyses for damaged fuel, as stated in Section 5.4.2.2 of the FSAR, while under normal conditions damaged fuel resembles intact fuel, damaged fuel assemblies cannot be guaranteed to stay intact under accident conditions and may begin to resemble fuel debris in its post-accident

configuration. If the applicant selects to justify not analyzing IP1 fuel as damaged fuel by providing a shielding analysis, the staff notes that the review and potential finding of acceptability will be limited to only IP1 fuel loaded in the design configuration presented in the amendment application; in other words, this justification, which then forms a part of the analysis method for this amendment, cannot be extended to other fuel contents or other design configurations.

This information is necessary to determine compliance with 10 CFR 72.236(a) and 72.236 (d).

SH-3 Provide either an analysis that includes the contribution of the Antimony-Beryllium (Sb-Be) sources in the IP1 assemblies or further justification for why this analysis is not necessary.

In response to the previous RAI (SH-3) the applicant references the license amendment request (LAR) 1014-4 that is currently in rulemaking, wherein a few neutron source types were requested for inclusion as allowable contents. The NRC's approval of that change in the contents is based on a restriction of the number of sources (one) and the allowable location (the interior basket region). The more active neutron sources (Plutonium-Beryllium (Pu-Be) and Americium-Beryllium (Am-Be) sources) are described as the reason for imposing these restrictions. Since different limitations were not proposed for the other neutron sources requested in LAR 1014-4, these other neutron sources (including the Sb-Be sources) were only reviewed to ensure they were bounded by the Pu-Be and Am-Be sources. The applicant also states that the source term calculation done for the Dresden Antimony-Beryllium sources is "extremely conservative." However, the basis for this statement is not provided nor does this statement justify why it is acceptable to omit the Antimony-Beryllium sources' contribution.

The applicant should justify (quantitatively as well as qualitatively) why the inclusion of the Antimony-Beryllium sources in the analysis is not necessary. This justification should include: 1) a more realistic calculation of the contribution from the IP1 neutron sources with adequate justification of how the calculated source term is realistic and still bounding, and 2) a comparison of the source strength versus an assembly and an individual fuel rod (since the neutron source takes the place of a fuel rod in the assembly). The comparison should show that replacing a fuel rod does not (noticeably) alter the source term. Or, the applicant should include the contribution from the IP1 neutron sources in the IP1 analysis. Again, as stated in the preceding RAI question, while it is recognized that there is large margin in this case, use of an appropriate comparison of bounding conditions is important.

This information is necessary to determine compliance with 10 CFR 72.236(a) and 72.236(d).

SH-4 Provide further justification for the cobalt impurity level used in the steel in the IP1 analysis.

In response to the previous RAI (SH-8 and SH-9) the applicant references ORNL/TM-6501, which uses a Cobalt impurity in steel of 0.8g/kg. Given that the document is from 1978, the impurity level seems appropriate for use with IP1 fuels. The authors of that document assume this impurity level based on a personal communication with a fuel vendor representative, who explained that to achieve this level of cobalt contamination required a judicious selection of the heats from which the nickel-containing metals are taken. Such a statement implies that 0.8g/kg is not a bounding impurity level, but rather a minimum level for steels at the time. The applicant's FSAR also references PNL-6906, Vol. 1, which indicates that fuels with steel manufactured during the same time frame could have as much as 2.2g/kg impurity in the steel. Thus, it would seem that the steel of the IP1 assemblies may have a higher impurity level and therefore a larger contribution to the dose rates. The shielding analysis should include an appropriate level of Cobalt impurity in the assembly's steel components with an appropriate justification (quantitative as well as qualitative) for the assumed impurity level. Such justification should include, if available, any information regarding the steels, such as established impurity limits or composition measurements, used by the IP1 fuel assembly manufacturer(s). As stated in the preceding RAI questions, it is important that an appropriate comparison of the bounding conditions be provided in the shielding analysis.

This information is necessary to determine compliance with 10 CFR 72.236(d).

SH-5 Modify Section 11.II.1.5 of the proposed FSAR to be consistent with the restriction on the transport orientation of the IP1 version of the HI-TRAC.

In response to the previous RAI (SH-13) the applicant stated that the HI-TRAC version for IP1 is precluded from horizontal transport. There still remains text in the proposed FSAR that appears to be inconsistent with the restriction. The staff notes, for example, that Section 11.II.1.5 describes upending and downending operations for the IP1 HI-TRAC. The information in the FSAR should be consistent regarding the restriction on the transfer cask's transport orientation.

This information is necessary to determine compliance with 10 CFR 72.126(a) and 72.236(d).