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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Reference:
1. USNRC Docket No. 72-1014 (HI-STORM 100)
2. Holtec Project 5014
3. Holtec Letter 5014649, dated April 15, 2008
4. NRC SFST Staff and Holtec Teleconference on July 25, 2008

Subject: License Amendment Request #7 (LAR 1014-7) to HI-STORM 100 Certificate of Compliance – Updated Summary of Proposed Changes

Holtec International submitted a request to amend the Certificate of Compliance (CoC) 1014 for the HI-STORM 100 Dry Cask Storage System on April 15, 2008 [3]. This license amendment request (LAR) seeks to add instrument tube tie rods (ITTRs) to the approved contents of the MPC-24 and MPC-32 models presently included in the HI-STORM 100 CoC.

In a teleconference [4], NRC Staff indicated that a more detailed discussion and justification of the effects on criticality was needed.

This letter transmits an updated summary of proposed changes in Attachment 1. Holtec requests that this Attachment 1 replace the previously submitted Attachment 1 in its entirety. No further changes are made to the application.

Attachment 1: Summary of Proposed Changes (Updated) (4 pages)

Please feel free to contact me if you have any questions.

Sincerely,

Tammy S. Morin
Acting Licensing Manager, Holtec International

cc: Mr. Chris Bajwa, USNRC (letter w/Attachment by email only)
Mr. Eric Benner, USNRC (letter w/Attachment by email only)
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Attachment 1 to Holtec Letter 5014659
LAR 1014-7, REVISION 0

SUMMARY OF PROPOSED CHANGES – Updated August 1, 2008

Proposed Change No. 1

Instrument tube tie rods (ITTRs) are added to the approved contents as non-fuel hardware. All modifications are a result of this proposed change. Editorial and minor text changes are made to the HI-STORM 100 Cask System Certificate of Compliance (CoC) wording as follows:

- Change Amendment Number, Effective Date and Licensing Chief to "TBD".
- Appendix B, Section 1.0; added the words "instrument tube tie rods (ITTRs)," to the definition of NON-FUEL HARDWARE.
- Appendix B, Table 2.1-1, Section I, Note 1; added the words "with or without ITTRs," to the note. This change is also made to Note 1 of Section IV and V of Table 2.1-1.
- Appendix B, Table 2.1-1; Page numbers were modified as necessary.
- Appendix B, Table 2.1-8
  - Note 8 was added to the table stating "Non-fuel hardware burnup and cooling times are not applicable to ITTRs since they are installed post-irradiation."
  - Reference to Note 8 was added in the title of the table.

Additionally, the following changes are made to the HI-STORM FSAR:

- FSAR Section 1.0; added the words "instrument tube tie rods (ITTRs)," to the definition of Non-fuel hardware.
- FSAR Section 2.1, Table 2.1.17, Table 2.1.20 and Table 2.1.24; In the column labeled "Value" in the row labeled "Other Limitations" the text "with or without ITTRs," is added to the bullet beginning "BPRAs…"
- FSAR Section 2.1, Table 2.1.25
  - Note 8 was added to the table stating "Non-fuel hardware burnup and cooling times are not applicable to ITTRs since they are installed post-irradiation."
  - Reference to Note 8 was added in the title of the table.
- FSAR Section 5.0, page 5.0-2
  - Deletion of the text "yet removable"
  - Addition of the text ", with the exception of instrument tube tie rods (ITTRs), which may be stored in the assembly along with other types of non-fuel hardware"
- FSAR Section 5.0; add "n" to "patters" to create the correct word "patterns"

Attachment 1 to Holtec Letter 5014659
LAR 1014-7, REVISION 0

SUMMARY OF PROPOSED CHANGES – Updated August 1, 2008

- FSAR Section 5.4, page 5.4-11; change the 2nd , 3rd, and 4th sentences of 1st paragraph of subsection 5.4.6 to read:

  "Since each of these devices occupy the same location within an assembly (i.e., the guide tubes), only one of these devices will be present in a given assembly. ITTRs, which are installed after core discharge and do not contain radioactive material, may also be stored in the assembly. BPRAs, TPDs and ITTRs are authorized for unrestricted storage in an MPC."

- FSAR Section 6.4, page 6.4-16; add:

  "An Instrument Tube Tie Rod (ITTR) is inserted into the instrument tube and is permitted for storage with all PWR assemblies. Studies for representative PWR assemblies, including the assembly with the lowest margin (15x15F in the MPC-32), with voided instrument tubes confirm that this condition is equivalent to or bounded by the condition with flooded instrument tubes. An ITTR in the assembly instrument tube is therefore acceptable in all PWR assembly types, and all results and conclusions for PWR fuel assemblies without an ITTR are directly applicable to PWR assemblies with an ITTR."

Reason for Change

The changes detailed are necessary to provide adequate description and justification that the addition of ITTRs to the approved contents of the HI-STORM CoC are within the bounds of the safety analysis presented in the HI-STORM FSAR.

Justification for Change

Structural

The maximum weight requirement for PWR fuel assemblies, which includes the weight of any non-fuel hardware or damaged fuel container, remains unchanged. All structural calculations are performed with the maximum weight; therefore no further structural calculations are necessary.

Thermal

An ITTR is a long stainless steel rod inserted in the PWR instrument tube located in or near the center of the fuel assembly. The principal effect of the ITTR on the thermal design of the HI-STORM cask is the blockage of the instrument tube flow area for thermosiphon cooling and reduction in the free volume of the MPCs.

The flow blockage is bounded by the HI-STORM thermal analysis because solid (i.e. blocked) guide tubes and instrument tubes are assumed in the flow resistance calculations. The ITTRs under a bounding fuel loading scenario (MPC-32 canister and ITTRs inserted in all storage

locations) displace a miniscule volume (0.4 ft^3) relative to the free volume of the MPC-32 (226.5 ft^3).

Shielding

ITTRs are installed into spent fuel assemblies post-irradiation. Since these devices do not add to the source term, it is conservative to neglect the steel associated with the ITTR for the shielding analysis

Criticality

The current criticality analysis assumes that the instrument tube of the PWR assembly remains flooded with spent fuel pool water. This water includes credit for soluble boron as necessary for demonstration that the appropriate regulatory requirements for reactivity are met. Studies for representative assemblies with voided instrument tubes confirm that this condition is equivalent to or bounded by the condition with flooded instrument tubes.

Section 6.4.8 of the HI-STORM FSAR analyzes the condition of voiding the guide tubes in PWR fuel assemblies to address the presence of non-fuel hardware (NFH). In these calculations, the instrument tube that is present in most assembly types is still assumed to be flooded with water (pure or borated, as applicable).

The instrument tube tie rods (ITTRs) are inserted into the instrument tubes in addition to the NFH in the guide tubes. The reactivity effect of the ITTR is evaluated by performing selected calculations with voided instrument tubes in addition to the already voided guide tubes. The results of the analysis presented below shows that voiding the instrument tubes results in a lower or statistically equivalent reactivity.

The presence of the ITTR is only of concern for conditions with a high soluble boron concentration (i.e., the MPC-32), since the insert will displace both moderator (water) and neutron absorber (soluble boron). For conditions with pure water or low soluble boron concentration (i.e., the MPC-24), the insertion of device into the guide and/or instrument tubes will always results in a reduction in reactivity, since the assemblies are already under-moderated with the rods filled with water. This is supported by the calculations in Table 6.2.4, which shows a significant reduction in reactivity as a result of voiding the guide tubes, i.e., the removal of water from the guide tubes.

The concern regarding any increase in reactivity due to voided instrument tubes is only applicable to cases with high soluble boron concentrations. The bounding case is therefore the MPC-32 with assemblies of 5.0 wt% enrichment (see Table 6.1.6 of the HI-STORM FSAR). Starting with the calculations to support the reactivity values presented in Table 6.1.6, the instrument tubes are voided in addition to the guide tubes. Calculations are performed for representative 15x15 and 17x17 PWR assembly classes. For these assembly types, the bounding

fuel assembly classes were analyzed, namely the 15x15B, 15x15F and 17x17C. The 16x16 assemblies are not analyzed since these assembly types do not have instrument tubes. The 14x14 assemblies were not analyzed since the bounding assembly in this group, the 14x14C, has no instrument tubes, and since the other assemblies in this group have a much lower reactivity. The results of the calculations are presented in Table 1 below:

Table 1: Reactivity Effect of Voided Instrument Tubes

Assembly Class	Reference Max k_{eff}[1]	Voided Instr. Tubes Max k_{eff}[2]	Delta k
15x15B	**0.9429**	0.9443	0.0014
15x15F	**0.9483**	0.9470	-0.0013
17x17C	**0.9437**	0.9412	-0.0025

In all cases, the condition of voiding the instrument tubes results in a reactivity that is less than or statistically equivalent to that with a water filled tube. Further, in the assembly class with the highest overall reactivity (15x15F), the voided instrument tube results in a slight reduction in reactivity. NFH hardware in instrument tubes is therefore acceptable in all PWR assembly types.

Confinement

The MPC meets the appropriate guidance defined in ISG-18 and therefore there is no radioactive leakage from the MPC. The presence of an ITTR in the instrument tubes does not change the justification that there is no credible leakage from the MPC.

Operations

The ITTRs do not change the operation or loading of the MPC.

[1] Bolded values are reproduced from Table 6.1.6 of the HI-STORM FSAR.
[2] All calculations have a calculational uncertainty of 0.0006 or 0.0007.