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Mr. John Goshen
Project Manager – Licensing Branch
Division of Spent Fuel Management
U.S. Nuclear Regulatory Commission

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 2055-0001

Subject: HI-STORM 100 CoC 72-1014 Condition 9 and HI-STORM FW 72-1032
Condition 8 Airflow Tests

Dear Mr. Goshen:

Condition 9 (Special Requirements for First Systems in Place) of the Certificate of Compliance (CoC) for the Holtec HI-STORM 100 cask storage system states the following:

The air mass flow rate through the cask system will be determined by direct measurements of air velocity in the overpack cooling passages for the first HI-STORM Cask Systems placed into service by any user with a heat load equal to or greater than 20 kW. In the aboveground HI-STORM Models (HI-STORM 100, 100S, etc.), the velocity will be measured in the annulus formed between the MPC shell and the overpack inner shell. In the underground HI-STORM Model (HI-STORM 100U), the velocity will be measured in the vertical downcomer air passage. An analysis shall be performed that demonstrates the measurements, and validates the analytic methods and thermal performance predicted by the licensing-basis thermal models in Chapter 4 of the FSAR.

Note that the HI-STORM FW CoC contains essentially the same requirement as the HI-STORM 100 CoC Condition 9. Therefore the discussion below applies equally to both the HI-STORM 100 and HI-STORM FW CoCs.

Important aspects of the condition are as follows:

- Testing Device: Holtec has determined that the specific test requirements (physical barriers, high temperatures, low air flow) can only be met through the use of a hot-wire anemometer system, since this can accurately measure velocity in discrete locations in the annulus.
- Calibration: Generally, the calibration of such devices is not a difficult problem. However, in this case, the velocity needs to be measured at a temperature around 120 C or more. Calibration at lower temperatures is not recommended as it would increase the



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uncertainty in test measurements. There are no independent labs that perform air flow velocity calibrations at the required temperature.

- Flow field: Measurements in the annulus can only be performed close to the outlet. However, the flow field in this area is complex, with vertical, horizontal, as well as azimuthal components of velocity as the air transitions from the annulus all around the MPC into the 4 discrete outlets. It is not considered possible to determine, by measurement, a flow field to the extent that an accurate determination of the total mass flow rate can be calculated. Either a large number of measurement locations would be necessary, which is not possible due to the complex geometry and access restrictions, or only a limited number of measurements would be taken, which would result in a large uncertainty of the measurement.
- Uncertainties: Large uncertainties would render the measurements unusable. It is common practice that measurement uncertainties are considered in the conservative direction. When the uncertainties are too large, this could result in a “false negative”, i.e. that the measurement does not confirm the calculation when it in fact does. On the other hand, not making such a consideration could result in a “false positive”, i.e. the conclusion that the measurement confirms the calculation, when in fact it does not. This has to be avoided, i.e. the measurement uncertainties have to be small enough to be negligible. Given the calibration and flow field aspects discussed above, that does not appear possible.

Based on these aspects, Holtec has determined that the current requirement specified by NRC in the CoC cannot be met as written. Holtec therefore request a meeting with NRC, as a follow-up to the meeting held on May 19, 2015, to discuss a) how the requirement in the CoC can be modified; and b) agree on a revised approach.

With respect to the modification of the requirement in the CoCs, we note that for both the HI-STORM 100 (72-1014) and the HI-STORM FW (72-1032) amendments are currently under review at the NRC. Since the modification to the CoC conditions does not require any FSAR changes or technical evaluations on Holtec’s side, we would hope that the revised wording can be implemented with the approval of those amendments, which would allow a timely performance of those tests. The modification should then also include clarifications to allow users of previous amendments to reference the test performed under the revised condition. However, there is a concern amongst our users that this may not be possible unless the wording in each CoC is updated accordingly. If that is considered necessary by NRC, then a revision to each active Amendment may be required. The requested meeting should provide a clear licensing path.

With respect to a revised approach, Holtec is proposing a test to be performed that measures the total air mass flow through the four (HI-STORM 100) or eight (HI-STORM FW) inlet ducts. As an example, this test can be performed by adding ductwork to the HI-STORM inlets, using a hot-wire anemometer to measure the air velocity inside those ducts. The purpose of adding ducts is



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to generate a well –developed velocity profile. The advantages of this revised approach include the fact that the anemometer can be calibrated at ambient temperature as well as assurance that the velocity profile is fully developed. Additionally, personnel dose is reduced as the Duct Photon Attenuators do not need to be removed from the outlets. Also, the test can be completed more safely and efficiently due to the elimination of work at the elevation of the outlets.

For this testing approach, Holtec would suggest that the revised test wording reads as follows:

The air mass flow rate through the cask system will be determined by direct measurement of air velocity in the overpack cooling passages. This measurement is to be performed once for a HI-STORM Cask Systems with a heat load equal to or greater than 20 kW. In the aboveground HI-STORM, the measurement will be performed at the inlets. In the underground HI-STORM Model (HI-STORM 100U), the velocity will be measured at the inlets or in the vertical downcomer air passage. An analysis shall be performed that validates the analytic methods and thermal performance, based on the licensing-basis thermal models in Chapter 4 of the FSAR.

Holtec anticipates that the requested meeting will identify a path forward with respect to the licensing process to be used to modify the CoC condition described above. To provide sufficient preparation time we propose to a meeting date in September 2015.

If you have any questions, please contact me at (856)-797-0900 ext. 3659.

Sincerely,

A handwritten signature in blue ink that reads "Stefan Anton".

Stefan Anton
Vice President of Engineering,
Holtec International

cc: (via email)
Mark Lombard, USNRC
Michelle Sampson, USNRC
HUG Licensing Committee
Holtec Condition 9 Subcommittee