

Responses to Request for Supplemental Information
Certificate of Compliance No. 1032
Docket No. 72-1032
HI-STORM FW Storage System
Amendment No. 6

Shielding Evaluation

RSI-Sh-1

Provide the following:

- a. the analyses for the transfer cask and overpack that demonstrates that the cask meets the criteria in Title 10 of the *Code of Federal Regulations* (10 CFR) Sections 72.236(b) through (f) in the event of a cask drop due to failure of the handling equipment. This information should ensure that this equipment maintains its safety function during credible accidents when the single failure proof criterion is not satisfied.
- b. a revised application including a demonstration that the regulations in 10 CFR 72.236 are met considering the drop analysis when the handling equipment does not meet the single failure proof criterion.
 - i. a demonstration that the spent fuel storage cask is still subcritical considering any reconfiguration resulting from the drop analysis;
 - ii. a demonstration that radiation and confinement features are sufficient to meet the accident dose limits in 10 CFR 72.106; and
 - iii. a demonstration that the storage cask is still capable of providing adequate heat removal capacity.

The applicant proposes to modify technical specification 5.2(c) in Appendix A to the certificate of compliance (CoC) to allow the use of handling equipment that does not meet the single failure proof criterion during loading operations of the HISTORM FW Storage System, as long as a site-specific drop analysis is performed as part of the 10 CFR 72.212 report. Section 3.5.1.2, "Structural Design Criteria and Design Features," of NUREG-1536, "Standard Review Plan for Spent Fuel Dry Storage Systems at a General License Facility," Revision 1, states the following about the design of a cask system and handling operations:

The cask's radiation shield "must not degrade under normal or off-normal conditions or events....Any permissible degradation in shielding must be shown to result in dose rates sufficiently low to permit recovery of the damaged cask including unloading, if necessary..."

Moreover, the regulations in 10 CFR 72.236 require the certificate holder and applicant for a CoC to demonstrate compliance. Therefore, the staff does not find that requiring the general licensee to perform the site-specific drop analysis meets the regulations in 10 CFR 72.236(b) through (f), as these requirements need to be met by the CoC holder (i.e., the applicant).

This information is needed to determine compliance with the regulatory requirements in 10 CFR 72.236 (b) through (f).

Holtec Response:

As discussed in Holtec's response to RSI-St-1, design evaluations of a free vertical fall from a carry height of 11 in. onto a representative target, have been performed for both the transfer cask and the storage overpack. These evaluations, provided in Attachment 7 to Holtec Letter 5018078, demonstrate that neither the transfer cask nor the overpack experience plastic deformation in excess of their material failure strain, and thus their shielding capacities will not be compromised by the drop event. Likewise, the design evaluations demonstrate that both the MPC enclosure vessel and fuel basket do not sustain significant deformation such that the confinement or criticality control design functions of the MPC are affected. Because the evaluations demonstrate there is no degradation to the functions of the components, there is no change to the subcritical performance, dose rates, or heat rejection capability of the cask.

Structural Evaluation

RSI-St-1

Provide a design evaluation to demonstrate that the HI-STORM FW storage system meets the criteria in 10 CFR 72.236(l) for a design basis cask drop evaluation due to failure of lifting equipment that does not meet the criteria listed in technical specification 5.2(c)(1) through (3) in Appendix A to the CoC.

The applicant proposed to modify technical specification 5.2(c) in Appendix A of the CoC by adding technical specification 5.2(c)(4). to allow the use of existing lifting equipment that does not meet criteria (1) through (3) of technical specification 5.2(c). Technical specification 5.2(c)(3) includes the single failure proof criteria. Proposed technical specification 5.2(c)(4) specifies that the general licensee must perform a site-specific drop analysis as part of the 10 CFR 72.212 report. The staff notes that 10 CFR 72.236 requires the certificate holder to provide a design basis evaluation for structures, systems, and components (SSCs) important to safety to demonstrate structural adequacy under the design basis accident conditions, including a cask drop scenario.

The staff notes that Section 2.5.2.2, "External Conditions," of NUREG-1536 states that the staff has generally considered that the cask drop should be evaluated as one of the accident conditions in the safety analysis report (SAR), which is part of the application. The staff notes that Section 3.5.1.4, "Structural Analysis," of NUREG-1536 states that a cask drop is a high priority item for the staff's structural review and that the applicant should analyze the accident condition or demonstrate that the scenario is not credible. The staff expects that the applicant provide an evaluation in the final SAR (FSAR) for a drop due to failure of lifting equipment that does not meet the criteria listed in technical specification 5.2(c)(1), (2), and (3) of Appendix A to the CoC.

This information is needed to determine compliance with the regulatory requirements in 10 CFR 72.236(l).

Holtec Response:

It is correctly noted that if the lifting device fails to meet the single failure proof criteria as per requirements of ANSI N14.6, a postulated free drop (free fall) shall be evaluated.

In order to address this, a design evaluation is performed for the postulated drops (free fall) of the HI-STORM FW Version E and the HI-TRAC VW. The drop analyses documented in the FSAR consider a free vertical fall of 11 in. onto a representative target. The target stiffness properties evidently bound the majority of the ISFSI sites.

If the site parameters differ in so much to amplify (increase) the cask response in terms of stresses, strains and g-loads, site specific analysis will be conducted using the finite element models and methodology elaboratively discussed in the FSAR. For example, the cask carry height more than 11 in. will warrant a site-specific analysis. Likewise, site specific analysis will be conducted if the target at the site is stiffer than that discussed in this FSAR.

RSI-St-2

Provide a design evaluation to demonstrate that the anchored variant of the HI-STORM FW Storage System, including the anchorage and attachment points, meets the requirements of 10 CFR 72.236(l) in the case of a tornado missile impact and tornado wind event.

The applicant notes in proposed Revision 7 of the FSAR for the HI-STORM FW Storage System that a site-specific tornado missile analysis shall be performed to demonstrate that the HI-STORM FW Storage System, Version E, cask's anchors and its attachment points comply with the Level D stress limits in the American Society of Mechanical Engineers (ASME) Section III, Subsection NF. Regulation 10 CFR 72.236 requires the certificate holder and applicant for a CoC to provide a design evaluation for SSCs important to safety to demonstrate that the SSCs are structurally adequate.

NUREG-1536, Sections 2.4.2.2, "External Conditions," and 2.5.2, "Design Bases for SSCs Important to Safety," mentions that the safety analysis report should evaluate natural phenomena events, including tornadoes, as part of design-basis accidents. Specifically, NUREG-1536, Revision 1, Section 2.5.2, states the following:

"The NRC staff accepts design-basis tornado wind loading as defined by RG 1.76, "Design Basis Tornado and Tornado Missiles for Nuclear Power Plants" (Region 1) and RG 1.117, "Tornado Design Classification." Design criteria should be established for the cask on the basis of these wind-loading and missile-impact definitions. The cask should not tip over, and the capability to perform the confinement safety function should not be impaired. The NRC staff considers that tornadoes and tornado missiles may occur without warning...."

The staff also notes that Section 3.5.1.4 of NUREG-1536 states that both tornado missiles and tornado winds are low priority review items for the staff's structural review and that the applicant must address these accident conditions in the SAR (application). Similar to the structural evaluation performed for the seismic event, the staff expects that an evaluation be presented in the FSAR for a design basis tornado missile impact and tornado wind event.

This information is needed to determine compliance with the regulatory requirements in 10 CFR 72.236(l).

Holtec Response:

A design analysis is performed for tornado missile impacts and is discussed in the FSAR.

The Design Basis Missiles (DBM) for the HI-STORM FW overpack, including HI-STORM FW Version E, are listed in Table 2.2.5. Since the intermediate and small (penetrant) missile don't challenge the physical stability of the anchored overpacks (HI-STORM FW Version E), their analysis and conclusion are identical to those of the free-standing casks. The large missile impact on the HI-STORM FW Version E is evaluated and documented in the FSAR.