Attachment 2 to Holtec Letter 5021056

HI-STORM UMAX Amendment Request #3

RAI Responses – Non-Proprietary

RAI-1 Proprietary RAI

RAI-2 Proprietary RAI

RAI-3 Proprietary RAI

RAI-4 Proprietary RAI

RAI-5 Proprietary RAI

RAI-6 Proprietary RAI

RAI-7 Proprietary RAI

RAI-8 Proprietary RAI

RAI-9 Proprietary RAI

RAI-10 Proprietary RAI

RAI-15 Describe the structural performance of the 24PT1-DSC when subjected to a seismic analysis that utilizes three components rather than two.

In Section 2.4.3 of the application, the applicant states that it has chosen to comply with Section 3.7.1 of the NUREG 0800 to perform the seismic evaluation of the UMAX system with the 24PT1-DSC canister. Specifically, the applicant states that it has used five time histories that have two components only (one vertical and one horizontal). However, for nonlinear analyses, Section 3.7.1 of NUREG-0800 states that time histories should have one vertical component and two horizontal components. These three components should be statistically independent (further details can be found in Section 3.7.1 of NUREG-0800). Therefore, clarify how two lateral components can be replaced by one, and describe how results (safety margins) will be impacted by the use of one lateral component rather than two as stated in Section 3.7.1 of NUREG 0800. Update all seismic analyses and calculations using three components as necessary.

This information is needed to determine compliance with 10 CFR 72.236(l).

Holtec Response:

The method of analysis, as well as the seismic input motion, used to evaluate the structural performance of the 24PT1-DSC is the same approved method used in Amendment No. 1 (LAR 1040-1) to seismically qualify the HI-STORM UMAX Version MSE for storage of the MPC-37 and MPC-89. This is indicated in Subparagraph I.3.4.4.1.2 of the FSAR, which states:

> "The treatment of Load Case 03 (Design Basis Earthquake) for storage of the 24PT1-DSC inside the HI-STORM UMAX system, including the model and analysis methodology, is nearly identical

to that which is described in Subparagraph 3.4.4.1.2 of Chapter 3 for structural qualification of the HISTORM UMAX Version MSE."

The only difference between the two analyses is the physical modeling of the canisters; the methodology and the seismic input motion are the same.

The Design Basis Earthquake for the "Version MSE" is defined in Table 2.3.10 as a Reg. Guide 1.60 earthquake with a horizontal ZPA of 1.5g in two orthogonal directions and a vertical ZPA of 1.0g. Meanwhile, the Design Basis Seismic Model, which is described in Subparagraph I.3.4.4.1.2 and plotted in Figure I.3.4.2, is a half symmetric model (see also Subparagraph 3.4.4.1.2 and Figure 3.4.25 for UMAX Version MSE with MPC-37 canister). To insure that the half symmetric model yields conservative results, the applied motion in the horizontal direction (parallel to symmetry plane) is based on a Reg. Guide 1.60 earthquake with a minimum ZPA value of 2.12g, which is the resultant ZPA of the two 1.5g horizontal components. The 1.0g vertical motion is also applied to the model simultaneously. The 5 sets of acceleration time histories (w/ two components) used for the seismic analysis are summarized in Table 2.4.5.

In summary, while the five time history sets used for analysis have only two components, the applied horizontal motion represents the resultant motion of the two orthogonal components. Moreover, this analysis method, including the input time histories and the use of a half symmetric model, are consistent with the previously approved methodology from Amendment No. 1 (LAR 1040-1).

RAI-19 Proprietary RAI

RAI-20 Provide an analysis to demonstrate the dose rates for the HI-STORM-UMAX with the 24PT1-DSCs meets the regulatory requirements.

The applicant stated in the SAR that "[s]ince the determination of off-site doses is necessarily site-specific, more detailed dose assessment may be prepared by the licensee as part of implementing the HI-STORM UMAX System in accordance with 10 CFR 72.212."

In accordance with the requirements of 10 CFR 72.236(d), the applicant is required to demonstrate that the design is capable of meeting the regulatory requirements. The staff needs this information to determine if the request meets the regulatory requirements of 10 CFR 72.236(d), 10 CFR 72.104 and 72.106.

Holtec Response:

Table I.5.1.2 is added to SAR. This table shows annual dose at 100 meters from a HI-STORM UMAX module with 24PT1-DSC Canister. The shielding calculation package is included as an attachment to this letter.

RAI-21 Provide justification to support the assumption that the 24PTH1-DSC will remain dry in the proposed storage configuration or provide an evaluation to show the proposed system will remain subcritical under flooding conditions.

The applicant needs to provide justification that the 24PTH1-DSC canister system meets the criticality safety requirements for underground storage in the HI-STORM UMAX system. The applicant provided no analysis to address the likelihood of water entering into the 24PTH1-DSC during underground storage. The proposed HI-STORM UMAX amendment has no discussion or analysis that addresses water intrusion into the 24PTH1-DSC. The safety basis submitted by the applicant, and stated throughout Supplement I.6, is that the 24PTH1-DSC is only analyzed for dry conditions, which they believe leads to a sufficient margin of safety to address uncertainties in their approach.

This information is needed to evaluate compliance with 10 CFR 72.124(a) and 72.236(c).

Holtec Response:

The HI-STORM UMAX System has a number of barriers against the possibility of water entering the 24PT1-DSC canister. The HI-STORM UMAX VVM lid has been tested for storm water control to demonstrate that significant amounts of rain water do not come in contact with the canister. Per HI-STORM UMAX FSAR, Section 10.3, item iv, this test simulates exposure to rainfall of at least 2 inches per hour for an hour. This test was performed on the initial constructed HI-STORM UMAX VVMs and showed acceptable results, that water did not accumulate beyond the FSAR allowed criteria.

Although the system is designed to prevent flooding of the VVM cavity, the canister also has features to ensure it remains dry. The Advanced NUHOMS FSAR (Reference [21-1]), Section 6.1, states the following, "A *leaktight* high integrity confinement boundary is provided to exclude the possibility of flooding the 24PT1-DSC cavity during the transfer operations and storage period." This statement is echoed in the NRC SER related to the approval of the canister (Reference [21-2]), which states that, "The confinement boundary is welded and tested to meet the leak tight criteria of "American National Standard for Radioactive Materials," ANSI N14.5-1997 and is shown to maintain confinement during all normal, off-normal, and hypothetical accident conditions." This leaktight criteria is based on a helium leak rate, which is more stringent than criteria would be for just water tight.

As outlined in the 24PT1-DSC confinement supplement to the HI-STORM UMAX FSAR (Supplement I.7), there are no scenarios that change the confinement boundary of the canister in storage in the HI-STORM UMAX. Additionally, the manufacturing and Code requirements from the Advanced NUHOMS CoC are included in the HI-STORM UMAX CoC, to ensure that the canisters continue to meet all the requirements that allowed the NRC to make the finding quoted above. Based on this evaluation of the canister design basis, there is no credible leakage of water into the canister.

As additional defense in depth, the HI-STORM UMAX system is designed for the ability to remove water that comes in contact with the canister. This is described in the corrective actions for flooding of the cooling passages in Paragraph 12.2.4.3 of the HI-STORM UMAX FSAR, which states, "Appropriate vacuuming equipment is inserted through the inlet plenum and down to the transverse shells." Using this equipment, any water that enters the HI-STORM UMAX cavity can be removed, well before it would challenge the canister integrity.

In summary, there are multiple layers of defense against the intrusion of water into the canister area, including:

- HI-STORM UMAX designed to keep water out of the VVM cavity
- HI-STORM UMAX designed for easy detection and removal of any water that enters the VVM cavity
- Canister is designed and manufactured to be leaktight, which is a more stringent criteria than watertight. This design is not changed when stored in the HI-STORM UMAX System.

Based on these features, there is reasonable assurance that flooding of the canister can be excluded as a non-credible condition.

References

[21-1] "Final Safety Analysis Report for the Standardized Advanced NUHOMS Horizontal Modular Storage System for Irradiated Nuclear Fuel", Non-Proprietary Version. AREVA Report No. ANUH-01.0150, Revision 6, issued August 2014

[21-2] Standardized Advanced NUHOMS SER, Amendment 0, issued February 5, 2003

RAI-26 Clarify (provide) the basis and evaluation as to why the technical specification (TS) requirement for and of a fuel removal procedure are not provided in the HI-STORM UMAX TS.

Page 5-1 of the Standardized Advanced NUHOMS® TS states the requirement for a fuel removal procedure and then lists, at a minimum, what it shall include. However, the HI-STORM UMAX TS provided in this application do not contain similar requirements to ensure the same level of rigor and protection of personnel that is provided in the fuel removal procedure. Holtec stated in its response to NRC's Request for Supplemental Information Observation (O-6) that HI-STORM UMAX certificate of compliance (CoC) Condition 8 of proposed Amendment No. 3 had been revised to require a procedure for fuel unloading from the welded TN NUHOMS® 24PT1-DSCs (canisters) following storage in a HI-STORM UMAX System. Upon NRC review of the proposed Condition 8, no requirement for a fuel unloading procedure had been added.

This information is needed to determine compliance with 10 CFR 72.234(f).

Holtec Response:
Holtec apologizes for the previous confusion, the CoC Condition 8 has been updated and is attached to this letter. It should be noted that the boundary of the HI-STORM UMAX license is with removal of the DSC from the HI-STORM UMAX transfer cask. If a site chose to unload fuel from the canister, those actions would be performed in accordance with the 72-1029 CoC. This has been noted in the added CoC condition.

RAI-27 Explain the planned process and actions that will be taken when a TN NUHOMS® 24PT1-DSC reaches the original licensed life of 20 years and is being stored in a HI-STORM UMAX system VVM.

Section I.10.1.1.1 states, in part, that 24PT1-DSC canisters in use for longer than 20 years are not permitted to be stored in the HI-STORM UMAX per this FSAR. This restriction of not permitting storage over 20 years vs. just stating the licensed and design life of a system is a change from the current HI-STORM UMAX FSAR design bases and introduces a new requirement. However, no process, actions, or controls are explained in the application to describe what occurs to a 24PT1-DSC canister stored in a HI-STORM UMAX system when it reaches its original licensed life of 20 years to ensure continued safe storage. Therefore, the NRC requests additional information on what are the planned actions, process, and/or controls at 20 years if 24PT1 DSCs are being stored in the HI-STORM UMAX system. Given the fact that there are 24PT1-DSC canisters currently loaded under CoC No. 1029, there is the potential that this scenario could occur if they were transferred into the HI-STORM UMAX storage system before they reached their original licensed life of 20 years.

This information is needed to determine compliance with 10 CFR 72.236(g).

Holtec Response:
A DSC canister that has been in storage for 20 years would be handled the same as any other licensed canister that reaches the end of its licensed life. In such a situation, either a renewal application will be submitted in accordance with Part 72 or the canister will be removed from service, identical to any canister in any NRC approved license.

The restriction on not loading canisters greater than 20 years is specifically to exclude any user of the HI-STORM UMAX CoC from loading a canister that has been stored under a different CoC for a time exceeding the licensed life of the HI-STORM UMAX CoC.

RAI-28 Provide the fabrication, inspection, test, and maintenance and repair program for the NUHOMS® transfer cask, including the routine and annual inspection requirements.

Supplement I.10 describes the fabrication, inspection, test, and maintenance programs for the 24PT1-DSC canister, HI-STORM UMAX, and chain hoist assembly (CHA-90) but is silent on these programs for the NUHOMS® transfer cask. The NUHOMS® transfer cask is considered important to safety equipment as described in the Advanced NUHOMS® FSAR, Section 2.5.

This information is needed to determine compliance with 10 CFR 72.236(l).

Holtec Response:
The NUHOMS transfer equipment is identified as important to safety in that FSAR. However, the boundary of the HI-STORM UMAX license begins when the canister is already loaded and staged in the NUHOMS transfer cask and transfer begins to the HI-TRAC transfer cask. This is described in Subsection I.9.2.3, which states that the DSC is placed in the NUHOMS transfer cask under the NUHOMS FSAR. Therefore, the components listed in the RAI question are not considered part of the HI-STORM UMAX license and maintenance is performed under their existing license.

RAI-29 Provide the important to safety classifications for all transfer equipment used during the transfer of the 24PT1-DSC canister from the Advanced Horizontal Storage Module to the HI-STORM UMAX VVM.

Section I.2.5 describes the important to safety classifications for the CHA, top seismic restraint assembly (TSRA), VVM pedestal, and Divider Shell Appurtenance, but not for all the transfer equipment used. Specifically, important to safety classifications were not provided for the NUHOMS® transfer cask, NUHOMS® transfer trailer/skid, NUHOMS® ram assembly, mating collar, and tilting frame.

This information is needed to determine compliance with 10 CFR 72.236(b).

Holtec Response:
As stated in the response to RAI-28, the components of the NUHOMS system listed in the RAI are not considered to be part of the HI-STORM UMAX license, because they are outside the boundary of where the license begins. Therefore, safety classifications are not provided within the HI-STORM UMAX FSAR, because those components are classified in the FSAR under which they are licensed.