Request for Additional Information
Docket No. 72-1040
HI-STORM UMAX Canister Storage System
Certificate of Compliance No. 1040
Amendment No. 3

The U.S. Nuclear Regulatory Commission (NRC) staff issued requests for additional information (RAI) on January 17, 2018 (Agencywide Document Access and Management System [ADAMS] Accession No. ML18018A017), September 30, 2019 (ML19259A155), and November 20, 2020 (ML20325A257). Holtec International (Holtec, the applicant) responded to the RAIs in letters dated December 15, 2019 (ML20002A299), March 31, 2020 (ML20104C047), August 11, 2021 (proprietary, non-public), March 3, 2023 (ML23062A662) and March 16, 2023 (ML23075A067). The questions below describe information that was not included in the responses and is needed by the staff to complete its review of the application and to determine whether the applicant has demonstrated compliance with regulatory requirements in 10 CFR Part 72.

Structural Evaluation

RAI-6 Clarify how shell appurtenance assembly is welded to the divider shell and submit information to support the statement that appurtenance assembly components do not transmit any seismic loads. (The staff issued the original RAI on September 30, 2019 (ML19259A156) and received the RAI response on December 15, 2019 (ML20002A316). Both RAI and the response are proprietary.)

The applicant stated that some of the appurtenance assembly components do not transmit any seismic loads and thus do not need to be detailed. However, the applicant has not provided information explaining why certain parts of the UMAX system, including the appurtenance assembly components, are not subject to seismic loads which are lateral and vertical in nature given that the UMAX is an underground system. Applicant should provide support for the proposition that not all components of the appurtenance assembly including connections/welds are subjected to 3-dimensional loads and may lose their configuration/stability without appropriate weld sizing.

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

RAI-15 Clarify how seismic analyses that utilize two components rather than three can replicate non-linear demands and effects on the 24PT1-DSC which can be observed in the nonlinear contact between components in LS-DYNA simulations. (The staff issued the original RAI on September 30, 2019 (ML19259A155) and received the RAI response on December 15, 2019 (ML20002A300).)

The applicant states that the original analysis for the UMAX only utilized two components, and it appears that the vertical component was not used. As stated in the final safety analysis report (FSAR) for Certificate of Compliance (CoC) No. 1029 (ML050410252, section 3.1.2.1.3.6), the 24PT1-DSC was evaluated with three seismic loads from vertical, transverse, and longitudinal. The applicant has not provided information to clarify why all three components are not needed in LS-DYNA simulations, and why the frequency content of the seismic analysis would not

otherwise be lost during a nonlinear analysis when only two components are considered.

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

RAI-16 Clarify how the top seismic restraint assembly and divider shell appurtenance assembly will restrain the 24PT1-DSC canister in the UMAX VVM when subjected to seismic loads. (The staff issued the original RAI on September 30, 2019 (ML19259A155), received the RAI response on March 31, 2020 (ML20104C050), discussed during a clarification call (ML21015A279), and received supplemental information on March 16, 2023 (ML23075A067, proprietary).)

[Proprietary Information – See Enclosure 2]

Although the applicant states in its March 2023 response that the existing licensing basis solution is conservative using Newmark's 100-40-40 rule, which assumes that when the maximum response from one earthquake component occurs, the responses from the other components are 40% of their corresponding maximum, the applicant fails to explain the basis for this assertion. The staff notes that the 100-40-40 rule assumes a linear system while the actual analysis in this case indicates nonlinear contact. In addition, the staff approved the use of 24PT1-DSC in the Standardized Advanced NUHOMS® Horizontal Modular Storage System which used three seismic components rather than two components for seismic evaluation (ML050410252, section 3.1.2.1.3.6).

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

Criticality Evaluation

RAI-21 Provide adequate justification that the 24PT1 canister will remain dry in the UMAX system in the proposed configuration. (The staff issued the original RAI on November 20, 2020 (ML20325A257) and received the response on March 16, 2023 (ML23075A067).)

In the March 16, 2023 response, Holtec did not provide sufficient information to credit a no water intrusion argument. The staff notes that the 24PT1 canister was previously approved for use in a horizontal above-ground storage system and analyses supporting that approval was based, in part, upon a determination that the likelihood of the canister being submerged in water is very low. However, Holtec has not provided sufficient information that supports reasonable assurance that the same "no water intrusion" assumption is valid for the storage of the 24PT1 canister in the UMAX system, which is a vertical underground storage configuration. Thus, without additional supporting information, the staff cannot accept the applicant's "always dry assumption" for the 24PT1 canister when stored in the UMAX system as a viable path forward to meeting the double contingency principle. Holtec should consider an alternate way to demonstrate that the UMAX system loaded with the 24PT1 canister meets the regulatory requirements of 10 CFR 72.124(a), which specifies that spent fuel storage systems must be designed to be maintained subcritical and to ensure that, before a nuclear criticality accident is possible, at least two unlikely, independent, and concurrent or sequential changes have occurred in the conditions essential to nuclear criticality safety. As noted in the RAI-21 dated November 20,

2020, the applicant should provide the same engineering features as described in the criticality analysis for UMAX Amendment No. 0.

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

RAI-23 Justify the modeling of accident conditions used in Supplement I.6 of the FSAR to evaluate the reactivity of the 24PT1-DSC. (The staff issued the original RAI on November 20, 2020 (ML20325A257) and received the response on March 16, 2023 (ML23075A067).)

Since the accident analyses presented in the March 16, 2023 response to this RAI are predicated on a dry configuration assumption, the analyses cannot be used to demonstrate that they are bounding for accidents for the 24PT1 canister in the UMAX configuration as discussed in Holtec's response to RAI-21. As discussed above in RAI-21, Holtec should justify the dry configuration assumption used in its modeling of the cask under accident conditions that is consistent with the configuration of the UMAX storage configuration.

This information is needed by the staff to determine compliance with 10 CFR 72.236(a), 72.236(b), 72.236(c), and 72.124(a).

Operations Evaluation

RAI-28 Provide the fabrication, inspection, test, and maintenance and repair program for the NUHOMS® transfer cask, including the routine and annual inspection requirements. (The staff issued the original RAI on September 30, 2019 (ML19259A155) and received the RAI response on December 15, 2019 (ML20002A300).)

The applicant's response to RAI-28 (ML20002A300) pertains to the proposed CoC No. 1040 applicability or scope of CoC No. 1040 (see Public Meeting Question Issue #1 below) and states that NUHOMS® transfer equipment is not part of the HI-STORM UMAX certificate. Although the NUHOMS® transfer equipment is described and approved to be used in CoC No. 1029, the use of the NUHOMS® transfer equipment with Holtec's HI-TRAC and other features, such as mating collar, canister handling apparatus (CHA), and tilting fixture, is not described in CoC No. 1029.

This information is needed by the staff to determine compliance with 10 CFR 72.236(g) and 72.236(l).

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. (The staff issued the original RAI on September 30, 2019 (ML19259A155) and received the RAI response on December 15, 2019, (ML20002A300).)

The applicant's response to RAI-29 (ML20002A300) pertains to the proposed CoC No. 1040 applicability or scope of CoC No. 1040 (see Public Meeting Question Issue #1 below) and states that NUHOMS® systems (NUHOMS® transfer cask, NUHOMS® transfer trailer/skid, NUHOMS® ram assembly) are outside the boundary of CoC No. 1040. In addition, the applicant did not provide the important to safety classification or justification for not providing a classification for the mating collar or tilting frame,

which are Holtec transfer equipment as a part of CoC No. 1040. While some NUHOMS® transfer equipment is described and approved for use in CoC No. 1029, the use of the equipment with Holtec's HI-TRAC and other features is not described in CoC No. 1029. If the equipment is not provided with a classification within CoC No. 1040, applicant has failed to explain how the equipment could be relied upon by a general licensee using CoC No. 1040.

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

Public Meeting Questions

Issue #1 Provide clearly defined boundary or applicability of CoC No. 1040 so that implementation of the CoC is clear in the CoC, TS, and FSAR. (The question of the boundary or applicability of the CoC was introduced in the applicant's response to RAI-28 and RAI-29 (ML20002A300), which was discussed during the public meeting on December 15, 2020 (ML20366A042). The applicant provided additional information on March 16, 2023 (ML23075A067).)

From an implementation perspective, it is important for both the NRC and the general licensees to have a clear understanding on which requirements fall within the CoC. In response to Public Meeting Questions Issue #1, the applicant states that "(t)he HI-STORM UMAX CoC applies to the DSC from when the canister is transferred into the HI-TRAC through storage in the UMAX cavity, and applicability ends when the DSC is removed from the HI-TRAC transfer cask into another licensed component."

However, despite this response, the applicant has not provided information to clarify what is meant by "another licensed component." Without such clarification, it is unclear to a user of a CoC system that the component would have to be approved to accept the 24PT1-DSC as content.

Using UMAX FSAR (ML20104C052) figure I.9.2.1 to illustrate, it means the applicability of CoC No. 1040 begins from figure I.9.2.1E. However, in this amendment, the applicant proposed to use a new tilting fixture (shown in figures I.9.2.1C and D), a mating collar (shown in figures I.9.2.1 C, D, and E), and a CHA (shown in figure I.9.2.1 D), all unique to this amendment and thus, not part of CoC No. 1029. It would be difficult for the general licensees to follow CoC No. 1029 while using the three components not analyzed in CoC No. 1029, and also not provided with a safety classification regarding their use within the boundary of CoC No. 1040, as stated in the applicant's March 2023 response.

Therefore, the application, including the DSC applicability statement in the CoC description (page 2 of the proposed CoC), does not sufficiently explain how the boundary of this CoC allows for implementation of the CoC No. 1040.

This information is needed by the staff to determine compliance with 10 CFR 72.236(b) and (g).

Issue #2 Clarify the definition of the allowable 24PT1-DSC canister service life during storage in the HI-STORM UMAX system. (This question was introduced in the applicant's

response to RAI-27 (ML20002A300), and was discussed during the December 15, 2020 public meeting (ML20366A042). The applicant provided additional information on March 16, 2023 (ML23075A067).)

The proposed CoC appendix C, "Technical Specifications," section 5.4 includes requirements to verify, *prior to storage* [emphasis added], that the DSC is within its "initial 20-year license life." The proposed CoC appendix D, "Approved Contents and Design Features," section 2.1, "Fuel Specifications and Loading Conditions," also states that DSCs must meet the above verifications requirements in appendix C.

The statements in CoC appendices C and D may introduce uncertainty with respect to the allowable age of the DSC while in storage in the UMAX System.

1. The applicant has not sufficiently clarified in CoC appendices C and D that the age restriction on the DSC applies also to the entire UMAX storage term, not just the age at the time of loading.

2. The applicant's proposed DSC service life criterion ("initial 20-year license life") contains an inaccurate assumption that the initial approved storage term of all DCS will necessarily be 20 years. The staff notes that, if a DSC were to be initially loaded in the renewed period of extended operation of the original CoC (i.e., after the renewal of the Advanced NUHOMS CoC No. 1029), the canister may have an initial 40-year storage term (see NUREG-1927, Revision 1, appendix F, "Storage Terms"). To avoid this and potential other issues in referring to the initial CoC storage term, citing a DSC that "has been in service (i.e., stored fuel) for no longer than 20 years" or similar approach is considered a more clear, accurate criterion to capture the proposal to not allow the UMAX System to store DSCs older than 20 years.

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

AMENDMENT NO. 3 TO CoC NO. 1040 FOR THE HI-STORM UMAX CANISTER STORAGE SYSTEM – RAI DATE March 31, 2023

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