

REQUEST FOR SUPPLEMENTAL INFORMATION
TN Americas LLC
Certificate of Compliance (CoC) No. 1029 Renewal Application
Docket No. 72-1029

This request for supplemental information (RSI) identifies information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the renewal application. NUREG-1927, Revision 1, "Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel" was used by the staff in its review of the application. Each RSI describes information needed by the staff for it to begin its technical review of the application to determine whether the applicant has demonstrated compliance with the regulatory requirements.

In responding to the following RSIs, the staff notes that activities a licensee is performing during the current licensing period may be credited towards aging management in the renewed period, provided that the applicant demonstrates that the activities can effectively manage the effects of aging.

RSIs for CoC No. 1029 Renewal

RSI 2-1: Provide supplemental information to complete the scoping evaluation for the optional lightning plates included in CoC No. 1029 renewal application Table 2-6 for the Advanced Horizontal Storage Module (AHSM)-HS. The renewal application does not indicate the assessment for Criterion 1 or Criterion 2.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

RSI 2-2 (Refers to Proprietary): Provide supplemental information to complete the scoping evaluation for the Control Components included in CoC No. 1029 renewal application Table 2-7 for the spent fuel assemblies. The renewal application does not indicate the assessment for Criterion 2.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

RSI 3-1: Provide supplemental information on the assessment of thermal aging of steel material to justify that this aging mechanism is not credible. The CoC No. 1029 renewal application Section 3.5.3.1.8 states that the effects of elevated storage temperatures on material properties were evaluated during the initial license application. The analysis in CoC renewal application Section 3.5.3.1.8 relies on the analysis in the MAPS report (NUREG-2214) Section 3.2.1.8 and concludes that thermal aging of the steel is a credible aging mechanism for the steel materials. The staff notes that while the MAPS report indicates that

thermal aging of generally is not expected to produce degradation of the mechanical properties of steels in the period of extended operation, the MAPS report also states that this conclusion should be verified on a case-by-case basis. The staff reviewed the steel materials used in the DSCs used in the CoC No. 1029 and verified that all of the materials have a maximum continuous operating temperature of 700 °F [371 °C] (ASME code Section II Part D). Provide supplemental information on the maximum steel component temperatures to support the assessment that thermal aging is not credible for the steel components.

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RSI 4-1: Provide supplemental information to describe the inspection ring tool that is under development (CoC No. 1029 renewal application Section 4.3.4.2) including the following information:

- methods of inspection that will be included on the inspection ring tool
- types of aging mechanisms and other flaws and/or defects that may be detected
- ability of the inspection ring tool to characterize and size aging effects and other flaws and/or defects
- status of development and testing
- expected availability

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

RSI A-1: Provide supplemental information to support the results of the 2017 inspection at the Calvert Cliffs ISFSI including the actual inspection report for the 2017 inspection and supporting analyses. The document referenced in the CoC No. 1029 renewal application Section 3C.5.2 (2017 Calvert Cliffs Inspection) is a presentation that has limited information with respect to the inspection results.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

RSI A-2: Provide supplemental information to support the UFSAR changes associated with the CoC No. 1029 renewal listed in Table A-1 including the following calculations:

- Time-Limited Aging Analysis for Boron Depletion and Radiation Fluence for CoC No. 1029 License Renewal, Calculation Number 503821-TLAA03, Revision 0.
- Fatigue Evaluation of Dry Shielded Canisters for CoC No. 1029, Calculation Number 503821-TLAA02, Revision 0.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of

10 CFR 72.240(c) and (d).

RSI A-3: Provide supplemental information pertinent to the time-limited aging analyses (TLAAs) for irradiation effects on 24PT1 DSC, 24PT4 DSC, and AHSM:

- The spectrum for the neutron source used in the TLAAs with justification that the spectrum used in the TLAAs are appropriate for capturing the radiation damage; or
- The TLAAs with the design basis neutron spectrum.

The applicant provides neutron and gamma sources that are used in TLAAs for irradiation effects on 24PT1 DSC, 24PT4 DSC, and AHSM. However, the applicant provided only the magnitude of the neutron source in Table 3A-2 of the License Renewal Application (LRA). It is not clear what neutron spectrum was used in the TLAAs. Because the energy of the incident neutrons is critical for calculating the neutron irradiation effects on materials, it is imperative to use the right neutron energy to evaluate the irradiation damages on different materials.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.124(a) and 10 CFR 72.240(c).

Observations

OBS 2-1: Clarify the design basis of the 1029 system with respect to retrievability. Section 2.2 of the CoC No. 1029 renewal application references ISG-2 Revision 2 approved in 2016 which was after this CoC was approved.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c)(1).

OBS 2-2: Justify why the spent fuel assemblies are not screened in category 2 for the shielding analysis for the system.

Table 2-1, “Scoping Evaluation of Standardized Advanced NUHOMS® System SSCs” identified the spent fuel assemblies as not providing a shielding function. However, a review of the USFAR Section 5.4.1.1 reveals that the materials and geometric shape of the fuel assemblies (except failed fuel) are considered in the shielding analyses. As such, the geometry of the fuel assemblies in the cask is important in the shielding analysis. Although the fuel assemblies are not credited for providing a shielding function, degradation of the fuel assemblies and rearrangement of the source term could prevent fulfillment of the shielding function for the 1029 system. If the fuel assembly fails during storage, the shielding analyses for the system will become invalid because of source relocation and changes in material density of the fuel. Therefore, it appears that the geometry of the fuel assemblies should be screened in the shielding analysis under category 2 as described in NUREG-1927 Revision 1 Section 2.4.2 (ML16179A148). The staff notes that the spent assemblies are scoped in in the AMR for other reasons, but it is not clear why the effect of fuel assembly geometry on the shielding function is not identified in the AMR.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.236(d) and 10 CFR 72.240(c).

OBS 2-3: Provide additional information on the transfer casks (TC) included in the 1004 system and used in the 1029 storage system to address the period of extended operation (PEO) applied for in the 1029 renewal which, if approved, would extend past the PEO for the 1004 system. Provide a scoping evaluation, aging management review, and any necessary TLAAAs and aging management programs (AMPs) for the transfer casks approved for use in the 1029 system. The CoC No. 1029 renewal application Section 2.3.3 states that the TCs approved for use with the Standardized Advanced NUHOMS® System are the OS197, OS197H, and the OS200FC (Section 1.1 of CoC No. 1029 Technical Specifications). The TCs are certified under CoC No. 1004, renewed until 2055, and are not considered part of the Standardized Advanced NUHOMS® System subject to renewal. However, the TC is identified as an important to safety component in the CoC No. 1029 renewal application, which is requesting renewal through 2063. Therefore, the TCs authorized for use for the CoC No. 1029 should be considered in scope and included in the renewal application.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c).

OBS 3-1 (Refers to Proprietary): Provide additional information to support the determination that an assessment of fatigue of aluminum basket transition rails and basket assembly shims used in the 32PTH2 dry shielded canister (DSC) is not necessary for the period of extended operation. The CoC No. 1029 renewal application Section 3.5.3.3.6 Fatigue of Aluminum Material provides a general description of cyclic loading of aluminum components in the DSC. Section 3.5.3.3.6 of the renewal application states that the only cyclic loading experienced by the DSC aluminum material is associated with thermal cycling, but the DSC does not experience the full amplitude of ambient temperature cycles and the seasonal and daily variations in ambient conditions are ameliorated by the thermal mass of the HSM. In addition, Section 3.5.3.3.6 of the renewal application cites Section 3.2.3.6 of NUREG-2214 which calls for a review of all fatigue analyses contained in the design basis documents but also states that if no fatigue analysis was performed in support of the component design, no action is required.

The staff notes that renewal application Table 2-4 for the 32PTH2 DSC Drawing ANUH-01-4005 lists basket transition rails (items 1A, 1B and 2) and DSC Drawing ANUH-01-4004 lists the basket assembly shims (item 27) as having structural functions. It is not clear whether the design basis used to determine that a fatigue analysis was not necessary in the CoC amendment for the 32PTH2 DSC is applicable for the period of extended operation. Provide additional information on the cyclic loading of the basket transition rails which considers DSC loading and fuel drying operations, diurnal and seasonal temperature variations, and anticipated operational occurrences that may result in cyclic loading of the basket transition rails to support the determination that a fatigue analysis is not needed.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of

10 CFR 72.240(c) and (d).

OBS 3-2: Clarify the text in CoC No. 1029 Renewal Application Section 3.5.3.6.6 Corrosion of Reinforcing Steel of Concrete Material which states:

Although no cases of corrosion-induced damage have been reported, the results of a durability model show that corrosion of the reinforcing steel in concrete can potentially initiate and propagate within the 60-year timeframe for concretes of moderate to low quality. Therefore, corrosion of reinforcing steel in concrete exposed to outdoor and groundwater or soil (below-grade) environments is considered credible.

As stated, this may be interpreted to imply that the HSM concrete is of moderate to low quality. A clarification that the HSM concrete is designed and constructed in accordance with ACI standards and that this is included to be conservative may be appropriate.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

OBS 3-3: Clarify the information provided in CoC No. 1029 renewal application Section 3.5.3.8.1, Creep of Spent Fuel Assembly Hardware Materials. The text at the end of Section 3.5.3.8.1 appears to be out of place. The text states:

Section 3.5.3.2.6 evaluated the creep aging mechanism for stainless steel with the DSC and concluded it was not credible.

Therefore, creep is not credible for the SFA hardware materials.

It is unclear how the evaluation in Section 3.5.3.2.6 is related to the evaluation in Section 3.5.3.8.1.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

OBS 3-4: Table 3-6 page 4 (CoC No. 1029 renewal application page 3-72) appears to be in need of a format correction. The first 7 entries in Table 3-6 on page 3-72 appear to be in the “Spent Fuel Cladding” Material Grouping although the format of the table on this page suggests that only Mechanical Overload is included in that material grouping and the following 6 entries are associated with an unnamed material grouping.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

OBS 3-5: Clarify the applicable ISFSI Basemat AMP for the credible aging mechanism Leaching of Calcium Hydroxide for Concrete in an Air-Outdoor environment. Table 3-9 of the CoC No. 1029 renewal application indicates the aging management activity is the HSM AMP.

However, Table 3-16 (pages 3-136 and 3-137) indicates the aging management activity for this aging mechanism is covered by the Basemat AMP.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

OBS 3-6: Provide information on how to detect loss of the shielding function of the concrete components.

Table 3-6 of the LRA provides a summary of potential aging mechanisms for the structures and components of the NUHOMS® dry storage system. The data in the table indicate that several aging mechanisms could result in cracking and loss of materials of concrete components. Because one of the important safety functions of the concrete components is shielding the radiation from the contents, it important to detect aging effects in a timely matter. However, it was not clear how the cracks, particularly cracks not visible from the surfaces, will be managed to ensure the impairment of the shielding function of these components are detected in a timely manner before unexpected radiation streaming may occur.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.236(d) and 10 CFR 72.240(c).

OBS 4-1: Provide additional information to clarify the potential use of surrogate inspections. The CoC No. 1029 renewal application Section 4.3.1 identifies the potential for utilizing surrogate inspection results in lieu of an inspection of the DSC. It is not clear what information is considered in the "operational history" as described in Section 4.3.1. The NRC response to Nuclear Energy Institute (NEI) 14-03 Revision 2 (<https://www.nrc.gov/docs/ML1832/ML18325A207.pdf>) states that the NRC does not believe there is substantial operating experience for canister examinations for the various susceptibility rankings to understand how the susceptibility assessments may be applied, and surrogates used, across the independent spent fuel storage installation fleet. In addition, the NRC response to NEI 14-03 Revision 2 indicates that an approach of using surrogates would need to be justified on a case-by-case basis by an applicant, considering canister examination results for the susceptibility rankings.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.240(c) and (d).

OBS A-1 (Proprietary): Justify why the conservatism can be reduced or revise the TLAAAs for the irradiation effects on 24PT1 DSC, 24PT4 DSC, and AHSM.

On page 3A-16 of the LRA, the applicant states: [

The staff does not understand why it is acceptable to reduce the conservatism in the design basis analyses.]

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.236(d) and 10 CFR 72.240(c).

OBS A-2: (Proprietary): Address apparent inconsistency between Section 4.3.4.3 and Section 3B.6 regarding DSC thickness needed to ensure confinement boundary.

Section 3B.6 states "... that a DSC shell thickness of [] was adequate to maintain confinement ...". Furthermore, Section 4.3.4.3 states that "Subsequent inspections are to be conducted every 5 years \pm 1 year or when an engineering evaluation **predicts an identified crack will reach [] through-wall, whichever is less** [emphasis added], following the baseline inspection." Based on the first statement, a thickness of [] represents approximately a [] reduction of the DSC overall shell thickness. This is less than the [] through-wall crack depth inspection requirement in the second statement. It is not clear to the staff how confinement is maintained when both these statements seem to provide conflicting requirements. Address or justify this apparent inconsistency.

The staff needs this information to proceed with its review to determine if the Standardized Advanced NUHOMS® System CoC renewal application meets the regulatory requirements of 10 CFR 72.236(d) and 10 CFR 72.240(c).