UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

PRELIMINARY SAFETY EVALUATION REPORT

DOCKET NO. 72-1029

TN AMERICAS LLC

CERTIFICATE OF COMPLIANCE NO. 1029

STANDARDIZED ADVANCED NUHOMS® SYSTEM

AMENDMENT NO. 4

SUMMARY

This safety evaluation report (SER) documents the U.S. Nuclear Regulatory Commission (NRC) staff's review and evaluation of Amendment No. 4 to Certificate of Compliance (CoC) No. 1029 for the Standardized Advanced NUHOMS® System (Model No. Standardized Advanced NUHOMS® - 24PT1, 24PT4, and 32PTH2). By application dated November 15, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17326A125), as supplemented on February 22, May 16, June 26, and July 18, 2018 (ADAMS Accession Nos. ML18065A362, ML18138A289, ML18179A174, and ML18201A202, respectively), TN Americas LLC (hereinafter referred to as TN) (formerly known as AREVA, before that as Transnuclear Americas LLC) submitted a request to the NRC in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 72.244 to amend CoC No. 1029. TN requested the following changes to the Technical Specifications (TS), and the details can be found in Section 13 of this SER:

1. Remove any implied statements related to maintenance of a spent fuel pool after all spent fuel has been loaded into the Advanced Horizontal Storage Module (AHSM or AHSM-HS) at the independent spent fuel storage installation (ISFSI),
2. Credit the use of the installed temperature monitoring system specified in the existing TS 5.2.5(b) in lieu of performing daily visual vent inspections,
3. Provide peak dose rates on the front inlet bird screen and the door of the concrete storage module for the AHSM, and
4. Provide a new temperature rise value for the AHSM with a loaded 24PT4 dry shielded canister (DSC).

In support of the amendment, TN submitted proposed changes to the Updated Final Safety Analysis Report (UFSAR) for the TN Standardized Advanced NUHOMS® storage system. The NRC staff reviewed the amendment request using guidance in NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," Rev. 1, dated July 2010, Interim Staff Guidance (ISG) -11, "Cladding Considerations for the Transportation and Storage of Spent Fuel"; and ISG-21, "Use of Computational Modeling Software." The staff's evaluation focused only on modifications requested in the amendment as supported by the UFSAR change pages submitted and neither reassessed previous revisions of the UFSAR nor previous amendments to the CoC. For the

reasons stated below, and based on its review of the statements and representations in the application, as supplemented, and the conditions specified in the CoC and TS, the staff concludes that the requested changes meet the requirements of 10 CFR Part 72.

The NRC staff determined that the following areas of review are not affected by this amendment and therefore are not addressed in this SER: general description, principal design criteria, structural, confinement, criticality, materials, acceptance tests and maintenance program, radiation protection, accident analyses, and quality assurance.

4.0 THERMAL EVALUATION

The changes in the application that involve thermal considerations are described below.

4.1 Credit the Use of Installed Temperature Monitoring System for the 24PT1 Dry Shielded Canister

The applicant revised the UFSAR to credit the use of the installed temperature monitoring system specified in TS 5.2.5(b) in lieu of performing daily visual vent inspections for the 24PT1 DSC. The applicant previously provided a proprietary analysis supporting the use of the installed temperature monitoring system specified in TS 5.2.5(b) in UFSAR Section 4.4.2.5, "Monitoring of AHSM Temperature." The NRC staff approved the applicant taking credit for the installed temperature monitoring system specified in TS 5.2.5(b) for the 24PT4 DSC (ADAMS Accession No. ML051520016) and 32PTH2 DSC in Amendment No. 3 (ADAMS Accession No. ML15054A415). The applicant also previously provided an analysis supporting the 24PT1 80 °Fahrenheit (F) maximum temperature rise (in 24 hours) for a single thermocouple with a maximum temperature limit of 225 °F in UFSAR Table 4.4-12 (ADAMS Accession No. ML17167A234). The staff approved the maximum temperature rise and maximum temperature limit for the 24PT1 in Amendment No. 0 of CoC No. 1029 (ADAMS Accession No. ML030100419). Because the applicant will utilize the same maximum temperature rise and maximum temperature limit authorized in Amendment No. 0 of CoC No. 1029 with the installed temperature monitoring system, the staff finds taking credit for the installed temperature monitoring equipment specified in TS 5.2.5(b) acceptable.

4.2 Updated Limit for Temperature Increase Associated with Blocked Vent Accident Condition for 24PT4 DSC in the Advanced Horizontal Storage Module

The applicant updated the temperature increase limit associated with a blocked vent accident condition based on dual thermocouple locations for the 24PT4 DSC stored in the AHSM. The applicant provided a proprietary description of the blocked vent accident condition thermal analysis for the NUHOMS® AHSM in UFSAR Section A.4.11.2. The applicant used the ANSYS FLUENT computational fluid dynamics code to predict the temperature rise of the thermocouple at the as-built location in the AHSM loaded with the 24PT4 DSC. The applicant described, and the staff reviewed, the proprietary thermal model design input provided in UFSAR Section A.4.11.2. The thermal model design input included the maximum off-normal ambient temperature of 107 °F, solar insolation from 10 CFR Part 71, and design load cases. Load case No. 1, the off-normal hot storage condition, provided the initial conditions for the transient blocked vent accident condition that the applicant evaluated for a duration of 25 hours.

The staff reviewed UFSAR Section A.4.11.2.3 that describes the proprietary computer aided design model, meshing, and computational fluid dynamics modeling geometry, sub-models,

material properties, boundary conditions, and solver controls. The staff reviewed UFSAR Section A.4.11.2.4 that describes the results of the steady-state and transient blocked vent accident condition models. The applicant provided the maximum component temperatures for off-normal conditions in UFSAR Table A.4.11.2-4. The 24PT4 DSC shell temperature in UFSAR Table A.4.11.2-4 is lower than, and therefore, bounded by the design basis analysis results from UFSAR Table A.4.4-3, "AHSM Peak Component Temperatures at Normal/Off-Normal Conditions." The applicant also provided the maximum component temperatures for blocked vent accident conditions in UFSAR Table A.4.11.2-5. The 24PT4 DSC shell temperature in UFSAR Table A.4.11.2-5 is lower than, and therefore, bounded by, the design basis analysis results from UFSAR Table A.4.1-3, "Component minimum and maximum temperatures in the Advanced NUHOMS® System (Storage and Transfer) for Accident Conditions." The applicant previously provided analysis results in UFSAR Section A.4.11.2.4.3 (ADAMS Accession No. ML063200165), which showed that the as-built thermocouple temperature rise for the first 12 hours of the blocked vent accident condition is 8.5 °F. The staff confirmed that TS 5.2.5(b) was updated to include this temperature rise. The staff also confirmed that the 24PT1 and 24PT4 DSCs temperature limits, which are 225 °F and 200 °F respectively, at the AHSM monitored locations were added to TS 5.2.5(b) because these temperatures could possibly indicate an inlet or outlet vent blockage. The staff also confirmed that TS 5.2.5(b) clearly identified which temperature limits were associated with the 24PT1 and the 24PT4 DSC. Based on the staff's review of the information presented in the application, the staff finds the temperature rise for the 24PT4 DSC, as well as the temperature limits for the 24PT1 and 24PT4 DSCs in TS 5.2.5(b), acceptable.

4.3 Evaluation Findings

F4.1 The staff has reasonable assurance that the structures, systems, and components (SSCs) important to safety are described in sufficient detail in Appendix A of the safety analysis report (SAR) to enable an evaluation of their thermal effectiveness. Cask SSCs important to safety remain within their operating temperature ranges.

F4.2 The staff has reasonable assurance that the Standardized Advanced NUHOMS® 24PT1 and 24PT4 DSCs within the AHSM system is designed with a heat-removal capability having verifiability and reliability consistent with its importance to safety. The casks are designed to provide adequate heat removal capacity without active cooling systems.

F4.3 The staff has reasonable assurance that the spent fuel cladding is protected against degradation leading to gross ruptures by maintaining the cladding temperature below maximum allowable limits in a helium gas environment in the cask cavity under normal, off-normal, and accidental storage conditions for the DSCs reviewed for this application. Protection of the cladding against degradation is expected to allow ready retrieval of spent fuel for further processing or disposal.

F4.4 The staff concludes that the thermal design of the Standardized Advanced NUHOMS® 24PT1 and 24PT4 DSCs within the AHSM system is in compliance with 10 CFR Part 72, and that the applicable design and acceptance criteria have been satisfied. The evaluation of the thermal design provides reasonable assurance that the Standardized Advanced NUHOMS® 24PT1 and 24PT4 DSCs within the AHSM system will allow safe storage of spent fuel for a licensed life of 20 years. This finding is reached on the basis of a review that considered the regulation itself, appropriate regulatory guides, applicable codes and standards, and accepted engineering practices.

6.0 SHIELDING EVALUATION

The purpose of this review is to verify that the proposed changes in Amendment No. 4 to the CoC No. 1029 (Docket No. 72-1029) meets the radiation dose requirements of 10 CFR 72.104 and 72.106 in accordance with 72.236(d).

The applicant proposed to establish dose rate limits for the 24PT1 DSC and 24PT4 DSC in TS 5.4 for the NUHOMS® AHSM system licensed for storage under CoC No. 1029. Currently, TS 5.4 does not contain dose rate limits and refers to the NUHOMS® AHSM-HS dose rate evaluation programs. For this amendment, there are no proposed changes to the authorized contents nor the source terms. Therefore, the applicant did not propose changes to the design of the major components of the NUHOMS® AHSM system.

The applicant proposed dose rate limits for the front inlet bird screen and the outside surface door as follows: (1) For 24PT1 DSC: 50 millirems (mrem)/hour (hr) at front inlet bird screen, and 10 mrem/hr outside surface door; (2) For 24PT4 DSC: 50 mrem/hr at front inlet bird screen, and 10 mrem/hr outside surface door. The proposed dose rate limit of 50 mrem/hr at the AHSM front inlet bird screen is based on a calculated maximum dose rate of 45.81 mrem/hr for the 24PT1 DSC, and the calculated maximum dose rate of 45.156 mrem/hr for 24PT4 DSC. The proposed dose rate limit of 10 mrem/hr at the AHSM front door is based on a calculated maximum dose rate of 4.04 mrem/hr for the 24PT1 DSC, and the calculated maximum dose rate of 4.453 mrem/hr for 24PT4 DSC.

The applicant states that the proposed dose rate limits are based on calculations presented in UFSAR, Revision 2, Table 5.1-2 for the 24PT1 DSC obtained from Table 8.3 of Calculation SCE-01.0502 Revision 2, and UFSAR, Revision 2, Table A.5 .1-2 for the 24PT4 DSC obtained from Table 8-4 of Calculation SCE-23.0502 Revision 0. The staff has reviewed these calculations previously as part of the approval of Amendment No. 0 and Amendment No. 1 to CoC No. 1029 and found that the radiation shielding features are sufficient to meet the radiation protection requirements of 10 CFR Part 20, 10 CFR 72.104, and 10 CFR 72.106.

6.1 Staff Evaluation

The staff reviewed the proposed TS dose rate limits and found them acceptable because they are based upon previously reviewed calculations for the storage system with the authorized contents that demonstrated the dose rates meets the regulatory requirements. The staff determined that the dose rate limits which are set higher than the calculated dose rates are appropriate because they are consistent with established practices to account for uncertainties in detector measurements. Therefore, the staff has reasonable assurance that compliance with 10 CFR 72.104(a) and 72.106(b) can be achieved with the DSCs in use. In addition, the licensee must also perform a site-specific evaluation, as required by 10 CFR 72.212(b), to demonstrate compliance with requirements for use of the DSCs at a specific site. General licensees have an established radiation protection program as required by 10 CFR Part 20, Subpart B, and will demonstrate compliance with dose limits.

9.0 OPERATING PROCEDURES EVALUATION

The applicant revised various UFSAR pages to clarify that unloading procedures are only applicable during the time period when the spent fuel pool is available (i.e., prior to decommissioning of the spent fuel pool). The applicant added text to the TS 5.1, "Procedures" stating that procedures for unloading operations no longer need to be maintained after all spent fuel has been transferred from the spent fuel pool and loaded into the AHSM or AHSM-HS. In addition, the applicant added clarifying text that the option of removing fuel from the DSC into the spent fuel pool is performed only if the pool is available. The applicant also clarified in TS 5.2.2, "Training Program" that training modules associated with unloading operations only need to address reflooding, if applicable.

For the 24PT1, 24PT4 and 32PTH canisters for use in CoC No. 1029, the applicant evaluated each canister for a 75g load, and in each instance, the applicant demonstrated that the canister was able to accommodate the off-normal and accident loads, which are associated with the postulated drop scenarios (ADAMS Accession Numbers ML030100459, ML051520145 and ML15054A499, respectively). Therefore, based upon previous determinations that the 24PT1, 24PT4 and 32PTH canisters are capable of handling the off-normal and accident loads, the staff finds that the proposed changes to the operating procedures will not affect the cask system's ability to meet the regulatory requirements of 10 CFR Part 72.

13.0 TECHNICAL SPECIFICATIONS

The staff reviewed the proposed amendment to determine that applicable changes made to the conditions in the CoC and to the TS for CoC No. 1029, Amendment 4 would be in accordance with the requirements of 10 CFR Part 72. The staff reviewed the proposed changes to the TS to confirm the changes were properly evaluated and supported in the applicant's revised SAR. The applicant's proposed TS changes are as follows, and these changes are evaluated under Sections 4, 6, and 9 of this SER:

Table 13-1 - Conforming Changes to the Technical Specifications

Cover page	Amendment number changed to 4
TS 5.1 (Page 5-1)	Directed that unloading operations procedures be maintained until all spent fuel has been transferred from the spent fuel pool to dry storage, and clarified fuel removal can occur in the pool if it is available.
TS 5.2.2 (Page 5-3)	Added text for the training modules which clarified that reflooding may not apply to unloading operations.
TS 5.2.5(b) (Page 5-7)	Added new temperature limits for the 24PT4 DSC, identified how AHSM temperature rise limits for 24PT1 and 24PT4 DSCs are obtained, and minor editorial changes.
TS 5.2.5(c) (Page 5-8)	Clarified the bird screen to which the TS applied, removed requirement to visually inspect AHSM air vents daily, took credit for the temperature monitoring system in 5.2.5(b) for the 24PT1 DSC, specified the criteria for performing AHSM air vent visual inspections and identified the blocked vent time limitations for both the 24PT1 and 24PT4 DSCs.

TS 5.4, 5.4.1, 5.4.2, 5.4.3(a), 5.4.3(d) (Pages 5-9, 5-10, 5-11)	Added “AHSM or” to clarify the storage modules to which the TS applied.
TS 5.4.1, 5.4.2, 5.4.3(b), 5.4.3(c), 5.4.3(d) (Pages 5-9, 5-10, 5-11)	Removed “32PTH2” to clarify the DSCs to which the TS applied.
TS 5.4.2 (Page 5-10)	Added dose rate limits 3 and 4 and specified the locations at which these new dose rates should be measured.
TS 5.4.3(b) (Page 5-11)	Revised the text which identifies the spent fuel assembly limits.

The staff finds that the proposed changes to the TS for the Standardized Advanced NUHOMS® System conform to the changes requested in the amendment application, and do not affect the ability of the cask system to meet the requirements of 10 CFR Part 72. The proposed changes provide reasonable assurance that the Standardized Advanced NUHOMS® System will continue to allow safe storage of spent nuclear fuel.

15.0 CONCLUSIONS

The staff has performed a comprehensive review of the amendment application, during which the following requested changes to the Standardized Advanced NUHOMS® System were considered:

1. Any implied statements related to maintenance of a spent fuel pool were removed after all spent fuel has been loaded into the AHSM or AHSM-HS at the ISFSI,
2. The use of the installed temperature monitoring system specified in lieu of performing daily visual vent inspections was credited,
3. Peak dose rates on the front inlet bird screen and the door of the concrete storage module for the AHSM were provided, and
4. A new temperature rise value for the AHSM with a loaded 24PT4 DSC was provided.

The staff performed a detailed safety evaluation of the application for Amendment No. 4 to CoC No. 1029 for the Standardized Advanced NUHOMS® storage system. The staff performed the review in accordance with the guidance in NUREG-1536. Based on the statements and representations provided by the applicant in its amendment application, as supplemented, the staff concludes that the changes described above to the Standardized Advanced NUHOMS® System do not affect the ability of the cask system to meet the requirements of 10 CFR Part 72. Amendment No. 4 for the Standardized Advanced NUHOMS® System should be approved.

Issued with Certificate of Compliance No. 1029, Amendment No. 4
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