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June 7, 2018
E-51655

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Subject: Supplement to Application for Amendment 16 to Standardized NUHOMS® Certificate of Compliance No. 1004 for Spent Fuel Storage Casks (Docket No. 72-1004)

Reference: Revision 4 to Application for Amendment 16 to Standardized NUHOMS® Certificate of Compliance No. 1004 for Spent Fuel Storage Casks, E-49944 dated April 26, 2018 (Docket No. 72-1004)

As a result of the public meeting with NRC staff, held on May 14, 2018 to obtain additional feedback regarding the proposed changes to Certificate of Compliance (CoC) No. 1004 as part of the Pilot for Graded Approach for Certificate of Compliance Format, Content, and Selection Criteria review for Amendment 16, TN Americas LLC (TN) is providing this supplement to the application. Clarification calls with NRC staff to discuss the approach on Fuel Qualification Tables (FQTs) were held on 03/14/18 and 04/05/18. A follow-up public meeting concerning the treatment of the FQTs was held on 05/14/18, resulting in a plan to submit an example of the process for fuel selection and qualification for thermal and shielding purposes. Background information, a description of the process methodology, and two examples using this methodology are provided as Enclosure 1 of this submittal. Portions of Enclosure 1 include proprietary information. In accordance with 10 CFR 2.390, TN Americas LLC is providing an affidavit (Enclosure 2), specifically requesting that this proprietary information be withheld from public disclosure. Enclosure 3 provides a public version of this document.

Should the NRC staff require additional information to support review of this application, please do not hesitate to contact Dennis Williford at 704-805-2223, or me at 410-910-6881.

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Sincerely,

Jayant Bondre
Chief Technical Officer

cc: John Vera (NRC SFM), as follows:

- Six paper copies of this cover letter and Enclosures 1 and 2

Enclosures:

1. Fuel Qualification Methodology – Shielding and Thermal (Proprietary)
2. Affidavit Pursuant to 10 CFR 2.390
3. Fuel Qualification Methodology – Shielding and Thermal (Public)

AFFIDAVIT PURSUANT
TO 10 CFR 2.390

TN Americas LLC)
State of Maryland) SS.
County of Howard)

I, Jayant Bondre, depose and say that I am Chief Technology Officer of TN Americas LLC, duly authorized to execute this affidavit, and have reviewed or caused to have reviewed the information that is identified as proprietary and referenced in the paragraph immediately below. I am submitting this affidavit in conformance with the provisions of 10 CFR 2.390 of the Commission's regulations for withholding this information.

The information for which proprietary treatment is sought meets the provisions of paragraph (a) (4) of Section 2.390 of the Commission's regulations. The information is contained in Enclosure 1, as listed below:

- Enclosure 1 - Portions of the Fuel Qualification Methodology – Shielding and Thermal

I have personal knowledge of the criteria and procedures utilized by TN Americas LLC in designating information as a trade secret, privileged or as confidential commercial or financial information. This document has been appropriately designated as proprietary.

Pursuant to the provisions of paragraph (b) (4) of Section 2.390 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure, included in the above referenced document, should be withheld.

1) The information sought to be withheld from public disclosure involves portions of the fuel qualification methodology for the shielding and thermal disciplines related to the design of the Standardized NUHOMS® dry spent fuel storage system, which is owned and has been held in confidence by TN Americas LLC.

2) The information is of a type customarily held in confidence by TN Americas LLC, and not customarily disclosed to the public. TN Americas LLC has a rational basis for determining the types of information customarily held in confidence by it.

3) Public disclosure of the information is likely to cause substantial harm to the competitive position of TN Americas LLC, because the information consists of descriptions of the design methodology for dry spent fuel storage systems, the application of which provide a competitive economic advantage. The availability of such information to competitors would enable them to modify their product to better compete with TN Americas LLC, take marketing or other actions to improve their product's position or impair the position of TN Americas LLC's product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.

Further the deponent sayeth not.

Jayant Bondre
Chief Technology Officer, TN Americas LLC

Subscribed and sworn before me this 7th day of June, 2018.

Leslie LeFors
Notary Public

My Commission Expires 9/29/21

LESLIE LEFORS
Notary Public-Maryland
Frederick County
My Commission Expires
September 29, 2021

Fuel Qualification Methodology – Shielding and Thermal

The methodology used to qualify a fuel assembly loading for thermal and shielding purposes is provided in this document. Other aspects of fuel assembly qualification, such as criticality control, are outside the scope of this document.

Per Inspections, Tests, and Evaluations (ITE) 4.4, the air temperature rise at the outlet vents of a horizontal storage module (HSM) must be measured and verified to be less than the specified limits. [

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Older Certificate of Compliance (CoC) No. 1004 FQTs (e.g., 24P, 52B) were developed to maintain dose rates below a certain value. However, all of the recently developed FQTs in CoC No. 1004 (unified PWR, 61BTH, and 69BTH) were developed to match the decay heat limits specified in the various heat load zoning configurations rather than dose rates. Design basis sources are selected from the burnup/enrichment combinations considered in the heat-load-based FQTs. [

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Based on these considerations, only the three newer FQTs developed solely on heat load (unified PWR, 61BTH, and 69BTH) will be moved from the TS to the updated final safety analysis report (UFSAR). All other FQTs, which are used to maintain dose rates below a certain value, will remain in the TS. Therefore, this methodology document is applicable only to the FQTs that are being moved to the UFSAR.

Per Section 4.3.2 of the TS - Radiation Protection Program, the licensee shall perform an analysis to confirm that the limits of 10 CFR Part 20 and 10 CFR 72.104 will be satisfied under the actual site conditions considering the planned number of DSCs/HSMs to be used and the planned fuel loading conditions. As part of this evaluation, the transfer cask and HSM calculations provided in the UFSAR must be examined to establish dose rates appropriate for the occupational exposure estimation for loading and transfer operations. Established transfer cask and HSM dose rates must also be lower than the dose rate limits in ITE 3.2 and 3.3. Therefore, relocating heat-load-based FQTs to the UFSAR will not affect compliance with regulatory dose rates.

[1] Note that in the Amendment 16 Revision 4 submittal, when TS 3.1.4 was converted into ITE 4.4, the note requiring calculation of the maximum air temperature rise allowed was inadvertently omitted. This provision will be restored in the next Amendment 16 submittal.

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Dose rates for the transfer cask and HSM are limited by ITE 3.2 and 3.3, respectively. [

] In addition, as part of the Radiation Protection Program, dose rates for the transfer cask and HSM are measured per ITE 3.2 and 3.3. Therefore, the newer heat-load-based FQTs do not perform a safety function that merits inclusion in the TS, as there are sufficient requirements in the TS fuel specification tables, TS heat load zone configurations, TS Section 4.3.2, ITE 3.2, 3.3, and 4.4, to ensure thermal and dose rate compliance.

For these reasons, TN Americas proposes to move the unified PWR FQTs proposed in Amendment 15, the 61BTH FQTs, and the 69BTH FQTs from the TS to the UFSAR, while all other FQTs remain in the TS. The FQTs relocated to the UFSAR will be renamed "Fuel Loading Recommendations" to clearly indicate these tables represent guidance that a GL may use to help develop loading plans. However, these "Fuel Loading Recommendations" tables, and the associated minimum cooling times, do not represent hard limits if the GL can demonstrate that their fuel population results in lower transfer cask and HSM dose rates than the limits provided in ITE 3.2 and 3.3.

A step-by-step methodology with two examples follows.

Fuel Qualification Methodology – Shielding and Thermal

Step	Process	Regulatory Basis
1	Obtain known fuel information for each fuel assembly to be loaded: • Fuel assembly burnup • Fuel assembly initial enrichment (minimum enrichment for shielding, maximum enrichment for criticality; this methodology document is limited to the shielding and thermal aspects of fuel qualification) • Fuel assembly cooling time since reactor shutdown • Fuel assembly decay heat (it is the responsibility of the GL to determine the decay heat for all fuel assemblies to be loaded)	72.236(a) 72.236(d)
2	Verify the minimum enrichment, minimum cooling time, and maximum burnup for each fuel assembly meet the global limits provided in the fuel specification tables in the Technical Specifications (TS). If any fuel assembly does not meet any of these requirements, it cannot be loaded.	72.236(a) 72.236(d)
3	Select a heat load zone configuration (HLZC) appropriate for the fuel to be loaded. HLZCs are defined in the TS. Verify that each fuel assembly meets the decay heat limit for the zone in which it will be loaded. The decay heat is provided by the GL for each fuel assembly to be loaded. Also verify that zone and total decay heat limits are met. Following the HLZC ensures that temperature limits are met. If any fuel assembly does not meet the requirements for at least one zone, it cannot be loaded.	72.236(a) 72.236(d)
4	Per Section 4.3.2 of the TS, transfer cask and HSM dose rates must be established for input to the site-specific occupational exposure estimation. These dose rates must not exceed the limits provided in ITE 3.2 and 3.3. [ ]]	72.236(d)
5	Compliance with 10 CFR 72.104 dose rate limits must be demonstrated by analysis per Section 4.3.2 of the TS.	72.104 72.106

Step	Process	Regulatory Basis
6	Load the DSC based upon the loading plan. Confirm via measurement that applicable dose rate limits for the TC are met per ITE 3.2.	72.236(d) 72.104 72.106
7	Load the DSC into the HSM. Confirm via measurement that applicable dose rate limits for the HSM are met per ITE 3.3.	72.236(d) 72.104 72.106
8	Confirm via measurement that applicable air temperature rise limits for the HSM are met per ITE 4.4.	72.236(d)
9	After all HSMs are loaded, confirm via measurement that 10 CFR 72.104 dose rate limits are met.	72.104 72.106

Example #1: Fuel Population Falls Within the Analyzed Region

Step	Process
1	Obtain known fuel information for 32 fuel assemblies to be loaded in the 32PTH1 DSC • Fuel assembly burnup • Fuel assembly initial enrichment • Fuel assembly cooling time since reactor shutdown • Fuel assembly decay heat
2	Verify the minimum enrichment, minimum cooling time, and maximum burnup for each fuel assembly meet the global limits provided in the fuel specification tables in the Technical Specifications (TS). • 32PTH1 DSC fuel specification is TS Table 1-1aa • Maximum burnup ≤ 62 GWd/MTU • Minimum enrichment ≥ 0.2 wt.% • Minimum cooling time ≥ 2 years For this example, assume all 32 fuel assemblies meet these requirements.
3	TS Figure 1-26, HLZC 1, Zone 1 is to be used. For the purposes of this example, the actual decay heat is a known quantity provided by the GL, and it is assumed the HLZC heat loading criteria is met.
4	[ ] Therefore, this DSC loading will result in acceptable transfer cask and HSM dose rates, and the transfer cask/HSM dose rates provided in the UFSAR may be used as inputs to a site-specific exposure analysis. The licensee documents this result in their loading plan records.
5	Compliance with 10 CFR 72.104 dose rate limits is demonstrated by analysis.
6	Load the DSC based upon the loading plan. All measured TC dose rates required per ITE 3.2 will be met.
7	Load the DSC into the HSM. All measured HSM dose rates required per ITE 3.3 will be met.
8	The measured HSM air temperature rise with a loaded DSC per ITE 4.4 will be met.
9	After all HSMs are loaded, all measured dose rates required per 10 CFR 72.104 will be met.

Example #2: Some of Fuel Population Falls Outside of the Analyzed Region

Step	Process
1	Obtain known fuel information for 32 fuel assemblies to be loaded in the 32PTH1 DSC • Fuel assembly burnup • Fuel assembly initial enrichment • Fuel assembly cooling time since reactor shutdown • Fuel assembly decay heat
2	Verify the minimum enrichment, minimum cooling time, and maximum burnup for each fuel assembly meet the global limits provided in the fuel specification tables in the Technical Specifications (TS). • 32PTH1 DSC fuel specification is TS Table 1-1aa • Maximum burnup ≤ 62 GWd/MTU • Minimum enrichment ≥ 0.2 wt.% • Minimum cooling time ≥ 2 years For this example, assume all 32 fuel assemblies meet these requirements.
3	TS Figure 1-26, HLZC 1, Zone 1 is to be used. For the purposes of this example, the actual decay heat is a known quantity provided by the GL, and it is assumed the HLZC heat loading criteria is met.
4	[ ] Therefore, this DSC loading will result in acceptable transfer cask and HSM dose rates, and the transfer cask/HSM dose rates provided in the UFSAR may be used as inputs to a site-specific exposure analysis. The licensee documents this result in their loading plan records. Note that ALL fuel assemblies to be loaded meet the decay heat restrictions in Step 3.
5	Compliance with 10 CFR 72.104 dose rate limits is demonstrated by analysis.
6	Load the DSC based upon the loading plan. All measured TC dose rates required per ITE 3.2 will be met.
7	Load the DSC into the HSM. All measured HSM dose rates required per ITE 3.3 will be met.
8	The measured HSM air temperature rise with a loaded DSC per ITE 4.4 will be met.
9	After all HSMs are loaded, all measured dose rates required per 10 CFR 72.104 will be met.

Table 1:
Analyzed and Unanalyzed Regions, Unified PWR

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