

**PRELIMINARY SAFETY EVALUATION REPORT**

**TRANSNUCLEAR, INC.**

**STANDARDIZED NUHOMS<sup>®</sup> HORIZONTAL MODULAR STORAGE**

**SYSTEM FOR IRRADIATED NUCLEAR FUEL**

**DOCKET No. 72-1004**

**NUHOMS<sup>®</sup>-61BT SYSTEM**

**AMENDMENT NO. 9**

## PRELIMINARY SAFETY EVALUATION REPORT

Docket No. 72-1004  
Standardized NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel  
Certificate of Compliance No. 1004  
NUHOMS®-61BT System  
Amendment No. 9

### 1.0 SUMMARY

By application dated April 18, 2006, as supplemented on June 21, 2006, Transnuclear, Inc. (TN) submitted a request for amendment to Certificate of Compliance (CoC) No. 1004 for the Standardized NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel, under the provisions of 10 CFR Part 72, Subparts K and L. The application proposes to amend the authorized contents of the Standardized NUHOMS® System to include the Framatome-ANP Version 9x9-2 fuel assemblies (FANP9 9x9-2) in the NUHOMS®-61BT dry shielded canister (DSC).

TN requested changes to the Technical Specifications (TS) attached to CoC No. 1004, with supporting revisions to the Standardized NUHOMS® Updated Final Safety Analysis Report (UFSAR), in order to reflect the addition of the FANP9 9x9-2 fuel. The amendment application included the necessary engineering analyses and proposed page changes to be incorporated into the UFSAR. The technical bases supporting the requested changes to CoC No. 1004 are similar to those included as part of an exemption request submitted by PPL Susquehanna, LLC (PPL) on January 31, 2006. The Nuclear Regulatory Commission (NRC) staff granted that requested exemption on April 11, 2006, subject to additional conditions and limitations. In granting that exemption, the NRC staff authorized the limited loading of up to 5 casks at the Susquehanna Independent Spent Fuel Storage Installation (ISFSI), with the expectation that TN would submit a request to amend CoC No. 1004 in a timely manner to allow for future loadings of FANP9 9x9-2 fuel in the NUHOMS®-61BT at the Susquehanna ISFSI or other ISFSIs at reactor sites, in accordance with the general license provisions of 10 CFR Part 72.

The NRC staff has reviewed TN's amendment application using the guidance provided in NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems," (SRP), dated January 1997, and "Interim Staff Guidance No. 11, Cladding Considerations for the Transportation and Storage of Spent Fuel, Revision 3," (ISG-11, R3) dated November 17, 2003. The staff's evaluation of the proposed changes is documented in this safety evaluation report (SER). This SER only addresses those sections of the SRP relating to the specific changes requested.

Based on the statements and representations in the application, as supplemented, the staff concludes that the TN Standardized NUHOMS® System, as amended, meets the requirements of 10 CFR Part 72. The Amendment No. 9 changes to the CoC Technical Specifications are indicated by vertical change bars in the margins on the following affected pages: A-7, A-11, A-12, A-93, and A-108. The changes to pages A-7, A-93 and A-108 add a reference to the application of ISG-11, R3 for this fuel type. The changes to pages A-11 and A-12 incorporate the FANP9 9x9-2 fuel assembly characteristics into the appropriate Tables. In addition, the applicant has made several revisions to Appendix K of the UFSAR, as specified in the application and its supplement, and the staff finds these revisions acceptable.

## 2.0 DISCUSSION

### TN NUHOMS®-61BT System

TN requested an amendment to CoC No. 1004 for the Standardized NUHOMS® dry cask storage system to include the Framatome-ANP Version 9x9-2 fuel assemblies as authorized contents in the NUHOMS-61BT dry shielded canister (DSC). The NUHOMS®-61BT DSC design was added to the Standardized NUHOMS® system in Amendment No. 3 to CoC No. 1004, dated September 12, 2001. The NUHOMS®-61BT DSC is described in Appendix K of the Updated Final Safety Analysis Report (UFSAR) for the Standardized NUHOMS® system.

The NUHOMS®-61BT DSC provides confinement and criticality control for the storage and transfer of irradiated fuel. The two digits refer to the number of fuel assemblies stored in the DSC. The character B for boiling water reactor (BWR) is to designate the type of fuel stored, and T is to designate that the DSC is intended for transportation in a 10 CFR Part 71 approved package. The principal component subassemblies of the DSC are the shell with integral bottom cover plate, bottom shield plug or shield plug assemblies, ram/grapple ring, top shield plug or shield plug assemblies, top cover plate, and basket assembly. The shell length is fuel-specific. The internal basket assembly for the NUHOMS®-61BT DSC consists of assemblies of stainless steel fuel compartments held in place by basket rails and a holddown ring, and is designed to hold 61 BWR assemblies. The basket assembly aids in the insertion of the fuel assemblies, enhances subcriticality during loading operations, and provides structural support during a hypothetical drop accident.

The staff has determined that the Framatome-ANP 9x9-2 fuel assembly is bounded by other fuel types currently authorized for loading in the NUHOMS®-61BT DSC. The staff's technical evaluations are documented below.

### Thermal Evaluation

The staff evaluated the applicant's thermal analyses for normal conditions of storage and transfer following the requirements stated in 10 CFR Part 72.

The applicant compared the key parameters of the different fuel assembly (FANP9 9x9-2) with the NUHOMS®-61BT design basis fuel parameters, including maximum decay heat load, total decay heat load, and maximum assembly average burnup. In addition, comparisons of density, heat capacity and thermal conductivity were summarized.

The applicant concluded that the design parameters for the design basis fuel assembly used in Chapter K.4 of the Updated Final Safety Analysis Report for the Standardized NUHOMS® System bound the FANP9 9x9-2 fuel assembly. The applicant also committed to further limit the loading of FANP9 9x9-2 fuel assemblies to a maximum decay heat load per assembly of 210 watts, as specified in a footnote to Table 1-1c of CoC No. 1004, Attachment A, Technical Specifications. This is less than the maximum decay heat limit of 300 watts per assembly specified for the other approved fuel types.

The staff reviewed the comparisons and found that there is reasonable assurance that the FANP9 9x9-2 fuel, when loaded and stored in the NUHOMS®-61BT DSC in accordance with CoC No. 1004, meets the thermal requirements of 10 CFR Part 72.

## Criticality Evaluation

The staff evaluated the applicant's criticality analyses for normal conditions of storage and transfer following the requirements stated in 10 CFR Part 72.

The applicant performed the criticality evaluation using the KENO V.a module from the SCALE4.4 package and the 44 group ENDF/B-V cross section library. The staff finds that the code and the selected cross sections were sufficiently documented and validated, and agrees that they are appropriate for this application.

The applicant's evaluation concluded that the FANP9 9x9-2 fuel assembly is bounded by the most reactive fuel assembly identified in Table K.6-6 of the UFSAR for the Standardized NUHOMS® System. The parameters used to define the Framatome ANP 9x9-2 fuel assembly are listed below in Table 1.

The NRC staff performed independent confirmatory criticality calculations for normal conditions of storage and transfer. The staff's model assumptions were similar to the applicant's. Staff's  $k_{eff}$  values have acceptable agreement with the applicant's results and are within the acceptable limits.

**Table 1**

### Parameters for Framatome ANP 9x9-2 Fuel Assembly

|   |                  |   |       |
|---|------------------|---|-------|
| <u>Manufacturer:</u>                          | Framatome ANP    | <u>Array:</u>                               | 9x9   |
| <u>Version:</u>                               | FANP9            | <u>Active Fuel Length (inches):</u>         | 150   |
| <u>Number of Fuel Rods per Assembly:</u>      | 79 (Full Length) | <u>Pitch (inches):</u>                      | 0.572 |
| <u>Fuel Pellet Outside Diameter (inches):</u> | 0.3565           | <u>Clad Thickness (inches):</u>             | 0.030 |
| <u>Clad Outside Diameter (inches):</u>        | 0.424            | <u>Water Rod Outside Diameter (inches):</u> | 0.425 |
| <u>Water Rod Inside Diameter (inches):</u>    | 0.364            |   |       |

Based on a review of the representations and information supplied by the applicant and the staff's confirmatory analyses, the staff concludes that the nuclear criticality safety design has been adequately described and evaluated by the applicant and finds reasonable assurance that the NUHOMS®-61BT DSC loaded with Framatome ANP 9x9-2 fuel meets the criticality safety requirements of 10 CFR Part 72.

## Other Evaluations

In its April 21, 2006, letter, TN also discusses the structural evaluation, shielding evaluation,

and radiation protection evaluation for the Framatome ANP 9x9-2 fuel assembly. TN concludes that the results for each of those evaluations are bounded by those for the existing evaluations for the NUHOMS®-61BT DSC contained in Sections K.3, K.5, and K.10, respectively, of the UFSAR for the Standardized NUHOMS® System.

Regarding the structural evaluation, the staff has reviewed the applicant's evaluation and concludes that there is reasonable assurance that the structural properties of the Framatome ANP 9x9-2 fuel assemblies are bounded by the properties of other fuel assemblies previously approved for the NUHOMS®-61BT DSC. Therefore, the staff finds that the Framatome ANP 9x9-2 fuel meets the structural requirements of 10 CFR Part 72.

Regarding the shielding and radiation protection evaluations, the applicant stated that the heavy metal loading (uranium) of the Framatome ANP 9x9-2 fuel assembly is lower than the GE 7x7 shielding design basis fuel assembly (0.180 MTU/assembly, versus 0.198); therefore, for the same burnup and cool time, the source term from the FANP9 9x9-2 fuel assembly will be lower than for the GE 7x7 fuel. Additionally, the applicant stated that the cobalt-59 content of each fuel assembly region (bottom, incore, gas plenum and top) is lower for the FANP9 9x9-2 fuel than that for the shielding design basis fuel assembly, yielding a lower cobalt source term, and consequently, lower dose rates than those calculated for the bounding assembly. Therefore, based on its review of the representations and information supplied by the applicant, the staff concludes that the loading of Framatome ANP 9x9-2 fuel assemblies in a NUHOMS®-61BT DSC meets the shielding and radiation protection requirements of 10 CFR Part 72.

Regarding the confinement analysis, the applicant states that this evaluation is not affected by the authorized contents and therefore remains applicable when the Framatome ANP 9x9-2 fuel assembly is added to the authorized contents. The staff agrees with this statement, therefore, the staff concludes that loading FANP9 9x9-2 fuel assemblies in a NUHOMS®-61BT DSC meets the confinement requirements of 10 CFR Part 72.

### **3.0 CONCLUSION**

The NRC staff has reviewed the proposed amendment to the Certificate of Compliance for the Transnuclear Standardized NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel (CoC No. 1004). The staff considered the regulations, appropriate regulatory guides, applicable codes and standards, and accepted engineering practices in reaching this conclusion. Only those sections of the Standard Review Plan (NUREG-1536) relevant to the specific request were considered by the staff. The Technical Specifications for CoC No. 1004 have been revised to include the FANP9 9x9-2 fuel assemblies as authorized contents in the NUHOMS®-61BT DSC, subject to the conditions specified. Based on the statements and representations contained in the application, as supplemented, the staff concludes that these changes do not adversely affect the ability of the TN Standardized NUHOMS® storage system to meet the requirements of 10 CFR Part 72, and that they are acceptable.

Issued with Certificate of Compliance No. 1004, Amendment No. 9 on **DRAFT** .