

December 20, 2002

Mr. U. B. Chopra  
Licensing Manager  
Transnuclear, Inc.  
39300 Civic Center Drive, Suite 280  
Fremont, CA 94538-2324

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE TRANSNUCLEAR,  
INC. NUHOMS AMENDMENT NO. 7 APPLICATION (TAC NO. L23436)

Dear Mr. Chopra:

By letter dated March 29, 2002, (NUH03-02-30), Transnuclear, Inc. (TN), submitted an application to the United States Nuclear Regulatory Commission (NRC) in accordance with 10 CFR Part 72 for approval of Amendment No. 7 to Certificate of Compliance No. 1004 for the Standardized NUHOMS® System.

This request for additional information (RAI) identifies additional information needed by the NRC staff in connection with our review of the aforementioned amendment application. The specific information needed is identified in the enclosure to this letter.

Your response to this RAI should be provided by February 14, 2003. If you are unable to meet this deadline, you must notify us in writing, at least 2 weeks in advance of your new submittal date, and the reasons for the delay. The staff will then assess the impact of the new submittal date and notify you of a revised schedule. Additional information requested by this letter should be submitted in the form of a discussion of each of the RAI responses and, if necessary, justification of any changes made to the Safety Analysis Report (SAR). Changes to the SAR should be indicated using a redline strikeout convention.

If you have any questions regarding our review, you may contact me at (301) 415-1179. Please refer to Docket Number 72-1004 and TAC No. L23436 in future correspondence related to this review.

Sincerely,  
**/RAI/**  
Christopher Regan, Project Manager  
Licensing Section  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

Docket No.: 72-1004

TAC No.: L23436

Enclosure: Request for Additional  
Information

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## Request For Additional Information

### NUHOMS Amendment 7 to Certificate of Compliance 1004 Docket 72-1004

By letter dated March 29, 2002, (NUH03-02-30), Transnuclear, Inc. (TN), submitted an application to the United States Nuclear Regulatory Commission (NRC) in accordance with 10 CFR Part 72 for approval of Amendment No. 7 to Certificate of Compliance No. 1004 for the Standardized NUHOMS® System. This request for additional information (RAI) identifies additional information needed by the NRC staff in connection with its review of the amendment. The requested information is listed by chapter number and title following the convention used in NUREG-1536, "Standard Review Plan For Dry Cask Storage Systems."

Each individual RAI describes information needed by the staff for it to complete its review of the application and/or the Safety Analysis Report (SAR) and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

#### Chapter 1: General

- 1-1 Clarify the baseline Final Safety Analysis Report (FSAR) document that the proposed changes should be referenced against.

It is unclear if the proposed changes refer to the proposed FSAR approved in Amendment No. 3 or FSAR - Revision 6, recently submitted to the NRC. This information is required to verify compliance with 10 CFR 72.230.

- 1-2 Identify and discuss physical design changes (if any) in the proposed FSAR revision for the NUHOMS 61BT cask system design, which are different than that approved by NRC in Amendment No. 3 for the original 61BT design.

Attachment A in the application states that "all other aspects of the supporting analyses, including criticality and shielding analyses for damaged fuel were reviewed by the staff and determined acceptable in the Safety Evaluation Report [Amendment No. 3 approval]." However, by letter dated September 16, 2002, Transnuclear indicates several design changes have been made to the general NUHOMS design under Condition 9 of Certificate of Compliance (CoC) 1004, Amendment No. 2 and under 10 CFR 72.48(d)(2).

This information is required to verify compliance with 10 CFR 72.230.

- 1-3 Justify the reason for removing channel internal width and Co-59 content from the technical specification of proposed contents in Table 1-1d.

This information is required to verify compliance with 10 CFR 72.230.

- 1-4 Clarify and specifically identify the damaged fuel types and additional fuel types listed in Table 1-1d.

This amendment proposes to add damaged Boiling Water Reactor fuel assemblies and additional fuel types. It is not clear what specifically is being added. This information is required for the staff to assess compliance with 10 CFR 72.230.

- 1-5 Provide a maximum decay heat specification for the "alternate radiological parameters" listed in proposed Tables 1-1c and 1-1j for intact and damaged fuel.

This information is required to verify compliance with 10 CFR 72.236(a).

- 1-6 Revise Table 1-2g to incorporate the enrichments, burnup, and cooling times for the fuel Groups 1-4 listed in Tables 1-1c and 1-1j.

The proposed technical specification format requires the cask user to interpret the correct radiological parameters for the same fuel from either Table 1-2g or Table 1-1c (intact fuel). This information is required to verify compliance with 10 CFR 72.236(a).

## **Chapter 2: Principle Design Criteria**

The staff had no Requests for Additional Information specific to this section. However, note that responses to other RAIs may require discussion in this area.

## **Chapter 3: Structural**

- 3-1 Discuss the assumed conservatism and its bases used in the linear-elastic stress analysis for evaluating fuel cladding integrity where, "a cladding thickness reduction of  $200\mu\text{m}$  has been conservatively assumed in the structural integrity evaluations to account for water side and inner surface oxidation." (Table K.3.6-5).

Since the linear-elastic stress analysis is based on this assumption, the information is required for the staff to assess compliance with 10 CFR 72.236.

- 3-2 What are the associated acceleration values (g) for cases 4 and 5, the hypothetical end and side drops respectively, noted in Table K.3.6-6?

Table K.3.6-6 summarizes the computed fuel cladding stresses for normal and off-normal load cases by linear -elastic stress analysis. Although the computed maximum fuel cladding stresses are low compared to the yield stress of the Zircaloy cladding, this information is required for the staff to assess compliance with 10 CFR 72.236.

- 3-3 The last sentence on page K.1-1 states "...In addition, additional fuel types have been added to the authorized contents listed in Section K.2 and supporting analyses provided." Please provide the supporting analyses or provide reference to their location.

This information is required for the staff to assess compliance with 10 CFR 72.230.

- 3-4 In view of NRC revision (Revision 1) to Interim Staff Guidance 1 (ISG-1), "Damaged Fuel," specify whether Amendment 7 should be reviewed against Revision 0 to ISG-1 or Revision 1.

ISG-1, Revision 1, incorporated substantial changes to the definition of damaged fuel. In light of extensive revision and expansion of the items addressed in Amendment 7, address the specific nature of these changes with respect to the guidance of ISG-1, Revision 1. This information is required to verify compliance with 10 CFR 72.236.

- 3-5 Clarify if the structural analysis provided (page K.3.6-19A) is applicable for storage applications.

The analyses provided considers normal and off-normal events of storage and normal conditions of transportation. Clarification is needed as to why 10 CFR Part 71 analyses are included in this application for a storage license under 10 CFR Part 72. If transportation loadings for certain conditions are considered bounding for storage then additional discussion should be provided explaining why such an approach is appropriate. This information is required to identify the regulatory scope of this application.

#### **Chapter 4: Thermal**

- 4-1 Provide a thermal analysis that demonstrates that fuel component and cask material temperature limits are not exceeded for failed fuel storage in the 61BT storage canister. Include analysis and discussion of the thermal implications of fuel rubble accumulation in the lower portion of the failed fuel can.

This information is required to verify compliance with 10 CFR 72.11(a) and 72.236(f).

- 4-2 Provide a brief description of the validation for the thermal methodology used to analyze the NUHOMS 61BT canister. Address the applicability of the validation with respect to the thermal conditions, material properties, and geometry described in the 61BT SAR evaluation.

This information is required to verify compliance with 10 CFR 72.11(a) and 72.236(f).

#### **Chapter 5: Shielding**

- 5-1 Revise bullet 4 in Tables 1-2g and K.2-11 to state that burnup greater than 40 GWd/MTU is unacceptable.

The FSAR has not evaluated burnups greater than 40 GWD/MTU. This information is required to verify compliance with 10 CFR 72.236(d).

- 5-2 Clarify the statement in bullet 1 in Tables 1-2g and K.2-11 that indicates licensees are responsible for considering uncertainties in enrichment and burnup. Specify the types of uncertainties that are implied by this statement.

This information is required to verify compliance with 10 CFR 72.236(d).

- 5-3 Provide a supportive three dimensional analysis and/or benchmark experiments to validate the I-D ANISN analysis used to determine shielding response functions for the gamma and neutron energy groups used in the analysis.

The use of a one-dimensional method used to calculate values for a complex, three-dimensional shielding system should be evaluated to determine the expected errors in shielding response functions. This information is required to verify compliance with 10 CFR 72.236(d).

- 5-4 Provide a sketch of the 61BT ANISN model and provide a sample input file for the response function calculations. Provide or reference the material densities used in the ANISN model.

This information is required to verify compliance with 10 CFR 72.236(d).

- 5-5 Provide the gamma and neutron dose response functions discussed in Section 5.2.4.

Section 5.2.4 refers to Table K.5-20, however it does not appear to be present in the proposed amendment. This information is required to verify compliance with 10 CFR 72.236(d).

- 5-6 Specify the ORIGEN-2 library used in the new cooling time calculations and justify its acceptability for the range of requested fuel types and associated BWR reactor operating conditions.

ORIGEN-2 libraries were generated on the basis of specific fuel types, and some libraries may not be appropriate for higher burnups. This information is required to verify compliance with 10 CFR 72.236(d).

- 5-7 Provide an example, such as a table, preferably specific to damaged fuel or a new fuel type added, which demonstrates the calculation of total dose rate using the ANISN response functions and ORIGEN-2 source terms. Specify whether the multiplication and summation of dose rates are performed by a spreadsheet program, special computer code, or other method.

This information is required to verify compliance with 10 CFR 72.236(d).

- 5-8 Specify the limiting dose rates that were used to determine minimum cooling times in Section K.5.2.4. Clarify if maximum decay heat was a limiting parameter in determining minimum cooling times.

This information is required to verify compliance with 10 CFR 72.236(d).

- 5-9 Specify how gamma dose contributions from Cobalt-60 hardware activation are accounted for in the response functions specified in Section 5.2.4. Clarify if there is a separate neutron-gamma interaction response function, or whether it is incorporated into a single neutron response function.

This information is required to verify compliance with 10 CFR 72.236(d).

- 5-10 Specify the Co-59 concentration assumed for the various hardware regions of the design-basis fuel assembly, that was used in the source term calculations. Specify the amount of Co-60 (Ci) calculated for the four fuel combinations identified in Section K.5.

This information is required to verify compliance with 10 CFR 72.236(d).

- 5-11 Specify the active fuel length and fuel loading for the new Exxon fuel types listed in Table K.5-1.

This information is required to verify compliance with 10 CFR 72.236(d)

- 5-12 Justify the statement in Section K.5.2 that cobalt content of the fuel assembly has negligible impact on the site dose rates. Specify the contribution of gamma radiation from hardware activation to the total dose rates listed in Table K.5-2.

The grid spacers in the active fuel region may contain significant amounts of cobalt impurities and produce high-energy gamma radiation.

This information is required to verify compliance with 10 CFR 72.236(d).

- 5-13 Justify that the off-site dose calculations in Chapter K.10 bound the burnup and cooling time parameters listed in Table K.2-11. Specify the source terms a cask user should use when calculating off-site dose rates in accordance with 10 CFR 72.212, when using the alternate fuel loadings defined in Table K.2-11.

It appears the values in Table K.2-11 are based on a combination of gamma and neutron dose rates, with variation in the relative contributions of each type of radiation to the total dose rate. The radiation transport characteristics of gamma and neutron radiation is different at large distances. Therefore, the relative contribution can affect the calculated off-site dose rates. It appears the dose calculations in Chapter 10 are based on a specific source term with a fixed relative contribution from gamma and neutron radiation.

This information is required to verify compliance with 10 CFR 72.236(d).

## **Chapter 6: Criticality**

- 6-1 Clarify the reference to burnup credit in Section 3 of the FSAR and Technical Specification 1.2.1 (Figure 1.1) for the allowable contents.

The SAR provides extensive analyses in the body of the report, as well as in the Technical Specifications, yet mentions that burnup credit has not been approved by NRC.

This information is required to verify compliance with 10 CFR 72.230.

- 6-2 Clarify the page number of Table K.6-2 in the proposed SAR replacement pages in Amendment No. 7. Verify and confirm for the staff that pagination for all other affected changes are correct

The page number for the proposed revision is page 50, whereas the original is page 52. This implies other FSAR pages are deleted from the original Appendix K.

This information is required to verify compliance with 10 CFR 72.230.

- 6-3 Specify the assumed pellet diameters that are referenced in the footnotes in Table K.6-6 for the most reactive fuel types.

This information is required to verify compliance with 10 CFR 72.236.

### **Chapter 7: Confinement**

The staff had no Requests for Additional Information specific to this section. However, note that responses to other RAIs may require discussion in this area.

### **Chapter 8: Operating Procedures**

- 8-1 Describe and discuss any changes to operating procedures necessary for handling, loading, and storage, of damaged fuel and new fuel types to be added to the 61BT cask.

No information was provided regarding loading of the damaged fuel into the damaged fuel cans or any reference to procedural changes made as a result of this activity.

This information is required to verify compliance with 10 CFR 72.236.

### **Chapter 9: Tests and Maintenance**

- 9-1 Describe any additional testing activities, either during fabrication or during loading, needed for new equipment or hardware to be used for the storage of damaged fuel.

This information is required to verify compliance with 10 CFR 72.236.

### **Chapter 10: Radiation Protection**

The staff had no Requests for Additional Information specific to this section. However, note that responses to other RAIs may require discussion in this area.

### **Chapter 11: Accident Analysis**

The staff had no Requests for Additional Information specific to this section. However, note that responses to other RAIs may require discussion in this area.

### **Chapter 12: Conditions of Cask Use**

The staff had no Requests for Additional Information specific to this section. However, note that responses to other RAIs may require discussion in this area.



## **Chapter 13: Quality Assurance**

The staff had no Requests for Additional Information specific to this section. However, note that responses to other RAIs may require discussion in this area.