January 18, 2002

Mr. Robert M. Grenier
President and Chief Operating Officer
Transnuclear West Inc.
39300 Civic Center Drive
Suite 280
Fremont, CA 94538

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING APPROVAL TO ADD NUHOMS®-32PT DRY STORAGE CANISTER TO THE STANDARDIZED NUHOMS® SYSTEM (TAC NO. L23343)

Dear Mr. Grenier:

On December 19, 2001, I transmitted to you a letter to which I attached the Nuclear Regulatory Commission (NRC) staff's "Request for Additional Information" for the NUHOMS®-32PT dry storage canister (DSC). The NRC was in the process of reconsidering the type of information it makes publicly available, and on December 19, 2001 you were also transmitted a letter discussing the impacts of that on the review schedule. The staff has determined that the Request for Additional Information for the NUHOMS®-32PT dry storage canister (DSC) can be released to the public without redaction. Therefore, I am enclosing a copy of the document for use by you and your staff. Responses to this RAI is expected by February 22, 2002.

If you have questions regarding this letter or the attachment, please contact me at 301-415-3781.

Sincerely,
/RA/

Mary Jane Ross-Lee, Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-1004

Enclosure: Request for Additional Information

January 18, 2002

Mr. Robert M. Grenier
President and Chief Operating Officer
Transnuclear West Inc.
39300 Civic Center Drive
Suite 280
Fremont, CA 94538

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING APPROVAL TO ADD NUHOMS®-32PT DRY STORAGE CANISTER TO THE STANDARDIZED NUHOMS® SYSTEM (TAC NO. L23343)

Dear Mr. Grenier:

On December 19, 2001, I transmitted to you a letter to which I attached the Nuclear Regulatory Commission (NRC) staff's "Request for Additional Information" for the NUHOMS®-32PT dry storage canister (DSC). The NRC was in the process of reconsidering the type of information it makes publicly available, and on December 19, 2001 you were also transmitted a letter discussing the impacts of that on the review schedule. The staff has determined that the Request for Additional Information for the NUHOMS®-32PT dry storage canister (DSC) can be released to the public without redaction. Therefore, I am enclosing a copy of the document for use by you and your staff. Responses to this RAI is expected by February 22, 2002.

If you have questions regarding this letter or the attachment, please contact me at 301-415-3781.

Sincerely,
/S/ /RA/
Mary Jane Ross-Lee, Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No. 72-1004

Enclosure: Request for Additional Information

Distribution:
Docket NRC File Center PUBLIC NMSS r/f SFPO r/f BWetzel, NRR
CMiller WHodges EWBrach BJorgenson, RIII
RLandsman, RIII
C:\Program Files\Adobe\Acrobat 4.0\PDF Output\32PT amendment RAI-1rev2.wpd

OFC	SFPO	e	SFPO	e	SFPO	e				
NAME	MJRoss-Lee		EZiegler		JMonninger					
DATE	01/16/02		01/16/02		01/18/02					

C = Cover E = Cover & Enclosure N = No copy
OFFICIAL RECORD COPY

TRANSNUCLEAR WEST INC.
DOCKET NO. 72-1004
TAC NO. L23343

REQUEST FOR ADDITIONAL INFORMATION

This document, titled Request for Additional Information (RAI), contains additional information requirements identified by the U.S. Nuclear Regulatory Commission (NRC) staff during its review of Transnuclear West Inc. (TN West) application to add the NUHOMS®-32PT dry storage canister (DSC) to the Standardized NUHOMS® System.

Each individual RAI describes information needed by the staff for it to complete its review of the application and determine whether TN West has demonstrated compliance with the regulatory requirements. Where an individual RAI relates to TN West's apparent failure to meet one or more regulatory requirements or where an RAI specifically focuses on compliance issues associated with one or more specific regulatory requirements (e.g., specific design criteria or accident conditions), such requirements will be specified in the individual RAI.

Note that RAI items may refer to the Spent Fuel Project Office's (SFPO) Interim Staff Guidance (ISG). The ISG was developed as a result of management decisions on several key issues related to the review and approval of spent fuel storage systems and represents positions discussed in meetings with the Nuclear Energy Institute. The ISG will be incorporated into the next revision of NUREG-1536, "Standard Review Plan for Dry Cask Storage Systems (SRP)."

Chapter 1 General Information

In accordance with 10 CFR 72.24(c)(3), the following information is required for the staff to evaluate whether all structures, systems, and components important to safety will satisfy the design bases with an adequate margin of safety.

1-1. Revise Drawing NUH-32PT-1001-SAR, Note 4 to include the "equivalent" to the electroless nickel coating proposed for use on all exposed carbon steel surfaces. Available standards and/or specifications for the proposed coatings should be cited.

In accordance with 10 CFR 72.122(b), structures, systems and components important to safety must be designed to accommodate the effects of, and to be compatible and durable with, site characteristics and environmental conditions associated with normal operations and hypothetical accident conditions.

1-2 Revise Drawing NUH-32PT-1001-SAR, Note 4, to indicate the locations and justify the use of a minimum of only two weld layers.

For designs employing austenitic lid materials and welds, multi-pass dye penetrant testing (PT) inspection methods are acceptable to ensure against potential development of larger flaws and thereby mitigate against fracture. See Interim Staff Guidance Memorandum No. 15, Revision 0, “Materials Evaluation,” Section X.5.2.3 Weld Design and Specifications for detailed technical basis.

1-3 Revise all figure numbers to match the figures referenced in the text of the SAR.

For example, Chapter 9, Section M.9.1.7.4, “B_4C Linear Density” makes reference to Figure M.1-2, however the figure for poison rod assemblies given in the SAR is Figure M.1.6-2. This inconsistency has been noted to occur throughout the SAR. This comment refers to 10 CFR 72.11.

1-4 Clarify the drawing locations for, and the differences between the OS197 and OS197H transfer casks as described in Section M.1.

Relate the shielding model and results to the OS197 and OS197H cask drawings, and to the drawings in FSAR 72-1004, dwg. no. NUH-03-8002-SAR titled: “General License NUHOMS® ISFSI Onsite Transfer Cask.” Describe differences between the model, licensing drawings, and the two different transfer casks and any assumptions made.

Update the SAR as applicable. This information is required to show compliance with 72.236(d).

1-5 On page M.1-3, Section M.1.1.1, second sentence - Reference is made to Figure M.1-1, but it appears that the intended figure is labeled, “Figure M.1.6-1.” Please clarify/correct as necessary.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

1-6 On page M.1-5, Section M.1.2.2.3.1, second sentence and page M.3.7-16, Section M.3.7.11, second sentence - Reference is made to Figure M.1-2, but it appears that the intended figure is labeled, “Figure M.1.6-2.” Please clarify/correct as necessary.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

Chapter 2 Principle Design Criteria

2-1 On page M.2-6, Section M.2.2.5.1.2, Reference 2.4 is cited in several places. It is assumed that the references should be to Reference 2.3. Please clarify/correct as necessary.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

2-2 On page M.2-8, Section M.2.3.2 there is reference to ANSI N14.5 [2.5]. This appears to be in error and should be Reference 2.4. Please clarify/correct as necessary.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

2-3 Correct inconsistencies regarding documented pressure values in the SAR.

Tables M.2-15 and M.2-20 list “normal” conditions with internal pressure of 15 psi yet maximum design basis “normal” internal pressure is denoted in Chapter 2 as 10 psi (page M.2-2)

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

Chapter 3 Structural

3-1 Revise Page M.3.1-5, Table M.3.1-1, ASME Code Exceptions to justify that the structural integrity closure welds will not be compromised when penetrant testing (PT) is the only inspection method employed.

Note that the standard practices require volumetric examinations (ultrasonic testing and/or radiographic testing) coupled with PT examinations to ensure that flaw size will be less than that required to cause fracture under adverse conditions. Additionally, parts of the SAR acknowledge this by reference to the Code requirement. However, for closure weldments mention is sometimes made to the use of PT only for closure weldments, e.g., the Table of ASME Code Exceptions indicates the use of PT inspection of the closure weldments, but this exception is not acknowledged in Sections M.3.1.2.1, M.7.3.1 and M.7.1.4. Likewise, the third Paragraph of Section 3.1.2.1 indicates that the inner top cover plate is welded to Code Case N-595-2. Differentiations of inspection methodologies for the various weldments should be made throughout the text (perhaps by reference to a particular SAR section) wherever mention of containment weldments is made.

3-2 Remove all references to “ASME Code Exceptions” and replace the reference with, “Alternatives to the ASME Code.” Further, revise the table on Page M.3.1-5 in accordance with the guidance in Interim Staff Guidance 10, Revision 1, “Alternatives to the ASME Code.”

3-3 Figure M.3-1 illustrates the confinement/pressure boundary of the 32PT-DSC with Drawing NUH-32PT-1001-SAR, Sheets 1 thru 3 showing design details of the main assembly of the DSC. Note 1 on Sheet 1 of the drawing states that, "Alternate welds of equivalent strength may be used with TN West approval." On page M.2-11, Section M.2.5, the second paragraph states, "The NUHOMS®-32PT DSC (shell and closure) is designed and fabricated to the maximum practicable extent as a Class I component in accordance with the rules of the ASME Boiler and Pressure Vessel Code, Section III, Subsection NB, Article NB-3200." Table M.3.1-1 lists the ASME Code exceptions for the confinement boundary Category C joints between the outer and inner cover plates and the containment shell as those that are designed and fabricated under ASME Code Case N-595-2.

a. Does the statement referring to alternate welds mean all welds shown on the drawing including ASME Code welds as well as other welds?

b. Table M.3.1-1 does not address the welds between the inner top cover plate, the containment shell and the siphon and vent block as exceptions to the ASME Code. Please address these welds with regard to the ASME Code.

c. Explain why only NB-3200 of the ASME Code is cited as being used to the maximum practicable extent and whether or not NB-3100 and NB-3300 are excluded.

d. The words "to the maximum practicable extent" should be deleted since it is expected that all exceptions to the ASME Code have been listed in Table M.3.1-1 (and Table M.3.1-2 for the basket assembly).

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

3-4 In Section M.3.1.1 on page M.3.1-2 there is a discussion on the two materials/fabrications options available for the transition rails yet in Section M.3.3 on page M.3.3-1 only the solid transition rail option seems to be addressed.

If the two options are to be afforded, then Section M.3.3 on material properties should address both options. Please clarify and/or supplement this section.

10 CFR 72.236(b) requires that the design bases and design criteria must be provided for structures, systems, and components important to safety.

3-5 Justify the statement in Section M.3.7.8 (page M.3.7-14) that "there are no structural or thermal consequences of a DSC leakage accident." Quantify the amount of temperature increase should the Helium cover gas be lost. Alternatively, replace the statement in Section M.3.7.8 with a statement that shows there would be no leakage from the DSC during normal, off-normal, and accident conditions.

Chapter 4 Thermal

The information in items 4.1 through 4.17 is requested pursuant to 10 CFR 72.11, 72.24, and 72.236(f).

4-1 Verify that temperature values used in the thermal analyses do not exceed the temperature range denoted in the tables of Section M.4-2. Additionally, justify the use of linear interpolation when determining intermediate temperature values.

Section M.4-2 assumes intermediate temperature values can be determined by a linear interpolation. If values fall outside the bounds of the tables, provide the basis why linear interpolation is acceptable and provide the values above those which have been stated in the material tables.

4-2 What size cask was used in the ANSYS model of the DSC to determine the temperatures of the Horizontal Storage Model (HSM) and justify why this is a conservative assessment.

Section M.4.4 indicates that the shortest cask length was used in the thermal analysis of the DSC, since this gives the highest power density for a given total power. However, for the thermal analysis of the storage structure (the HSM), the largest cask might impose the greatest restriction to cooling via natural circulation. The text does not indicate what size cask was used in the ANSYS model of the DSC to determine the temperatures of the HSM.

4-3 Section M.4.4.1.3 states that “a two-dimensional ANSYS model of a cross-section of the HSM with loaded DSC” is used to determine the surface temperatures on the DSC. The axial location of this cross-section is not described, and there is no discussion of how it was selected. The natural circulation flow patterns around the DSC are unlikely to be uniform, due to the design of the venting inflow and outflow paths. What approach was used to determine that the selected cross-section will contain the hottest temperatures on the surface of the cask?

4-4 What gap distances were used in the model and what is the basis for determining these gap distances? Section M.4.4.1.1 delineates a bounding heat conductance uncertainty between adjacent components using conservative gaps.

4-5 Perform a mesh sensitivity study for all finite element analysis (FEA) models and report the results of the study.

It must be demonstrated that the FEA models presented in the results of the analyses have converged and are not mesh-dependent (i.e., that temperature distributions do not change when the element mesh is refined.)

4-6 Confirm and provide a basis why during a fire transient, only considering conduction, is still conservative, i.e., what effect will the consideration of radiation have on fuel cladding temperature increase during a hypothetical accident condition (HAC) fire.

Section M.4.4.1.1 asserts that all heat transfer across gaps is by gaseous conduction and that other modes of heat transfer are conservatively neglected. In this regard during normal and off normal operations heat transfer is primarily from the fuel to the environment however, during a fire transient heat transfer to the fuel from the environment becomes a greater consideration when determining fuel cladding temperature increase so consideration of other means of heat transfer to the fuel may be more conservative than only considering conduction.

4-7 Describe the procedure for determining where specific modeling of gaps have been retained or removed from the FEA models for normal, off-normal, and hypothetical accident conditions (HAC). Describe the effect of removing the gaps on peak cladding temperature.

4-8 Section M.4.4.1.1 discusses the elements representing the XM-19 grid structure and the associated adjustment to the conductivity to account for gaps between basket components.

Quantify this adjustment and describe the methodology used to arrive at these conductivity values.

4-9 Describe the procedure used in ANSYS for applying a distributed decay heat load as volumetric heat generation in the homogenized fuel assemblies.

4-10 Clarify if fuel assembly effective thermal conductivity values have been determined for the full range of temperatures up to 1000°F, and factor these values into the thermal analysis.

4-11 Justify that the error margin in your methodology bounds the 2 to 3 degree margin indicated by the results in Table M.4-1, which indicates fuel cladding long term storage temperatures.

For the assembly decay heat of 0.63kW the maximum calculated temperature of 613°F approaches the limit of 615°F. Similarly, for an assembly decay heat of 0.70kW the maximum calculated temperature of 618°F approaches the temperature limit of 621°F.

4-12 Provide the justification and bases that the models used to determine fuel assembly conductivity, peak fuel clad temperature, and total cask thermal behavior have been validated against actual fuel and cask component temperature data, or benchmarked against validated analysis codes.

Analytic results of safety related equipment must be performed using validated methods. These methods include the computer codes, qualification of the analyst to understand the equations/assumptions that comprise the computer program and establishment of methods for proper implementation of the computer programs (i.e., includes experimental validation, for example, analytic comparisons with data from the Idaho National Engineering and Environmental Laboratories (INEEL) spent fuel cask thermal data). Demonstration of these methods are necessary to provide assurances that the results presented in the SAR are accurate.

4-13 Provide the calculation for the quantity of gas released from control components (BPRAs) during normal, off normal, and accident conditions as summarily described in Section M.4.4.4.6.

4-14 Clarify the apparent disparity regarding shaded and unshaded thermal conditions.

The shaded versus unshaded bounding scenario determination is confusing and requires clarification. Section M.4.5.3 states that the thermal performance of the DSC without the sunshade at an ambient temperature of 100°F is limiting and bounds the maximum off-normal 117°F case. However, Table M.4-8 lists off-normal event fuel cladding maximum temperatures for storage and transfer as calculated for 117°F, the shaded analysis. Additionally, the temperature values for 117°F storage in Table M.4-8 are in excess of those in Table M.4-2 for fuel cladding short term normal condition maximum temperatures.

4-15 Provide a discussion of how solar absorptivity is applied in the thermal analysis considering the fact that ANSYS will only accept thermal emissivity values for material properties. An explanation of how the values presented in the SAR were actually applied to the thermal models is needed.

4-16 Clarify if the rate of reflood is dictated by overpressure considerations or by fuel cladding integrity issues. Section M.4.7.1.2 describes reflooding of the cask. Provide an evaluation that addresses thermal shock of the fuel during reflood and defines the time/rate of reflood requirements that must be maintained in order to ensure fuel cladding integrity is maintained for bounding fuel cladding temperatures.

4-17 File “BL_Vent_Conv_32PT.txt” provided in response to the staff’s acceptance review includes information and a calculation specific to the blocked vent accident scenario. Included in this file are “footnote” items that state the “T_amb” (ambient temperature) is 107°F. Justify and provide the basis for use of this temperature.

4-18 Provide a calculation for the bounding maximum accident internal pressure case that results in the 102.9 psi value. Also clarify the bounding scenario that results in maximum accident internal pressure and correct and clarify inconsistent language in the FSAR.

Section M.11.2.9.1 describes the bounding internal pressurization of the 32PT DSC as postulated to result from cladding failure of the spent nuclear fuel in combination with blocked inlet and outlet vents and the consequent release of spent nuclear fuel rod fill gas and free fission gas. However, Section M.4.6.4 states that the maximum accident pressure condition for the DSC occurs during the transfer accident case with the loss of sun shield and liquid neutron shielding in the transfer cask under extreme ambient conditions of 117°F and maximum insolation. This analysis also assumes 100% rupture of the fuel pins.

Chapter 5 Shielding

5-1 Clarify the figures which describe the shielding model used. The figures should show clear descriptions of materials and thicknesses including boundaries, and should contain dimensions and thickness that relate the model figures to the drawings shown in Section 1. The figures should include a legend describing what materials are in what locations. The legend and figure should also clearly relate to any input files provided, including Section M.5.5.2.

The staff cannot determine the adequacy of the model based on Figures M.5-1 through M.5-5 alone. Additionally, the staff is unable to determine how these figures match with Section M.5.5.2. This information is required to verify compliance with 10 CFR 72.24, 72.236(b) and 72.236(d).

5-2 Provide supportive three dimensional shielding analysis for the NUHOMS system. The code selected should be validated against actual data for the configuration analyzed and several shielding configurations should be modeled including but not limited to the following three:

a. an analysis of dose rates radially outward at the corners of the DSC due to location of two 1.2 kW fuel assemblies on outer corners of DSC area (as shown in Figure M.2-2, page M.2-38), which may drive dose rates up at this region.

b. an analysis of streaming at locations which may be susceptible.

c. accident conditions analysis in Chapter 11.

Additionally, code generated figures should be provided which clearly address the concerns raised in question 5-1 of this RAI.

The staff no longer accepts the 2D analysis alone as discussed in Section M.5.4. This information is required to verify compliance with 10 CFR 72.24 and 72.236(d).

5-3 Clarify how the “source regions are homogenized (smeared) to simplify shielding calculations,” as described on page M.5-11, first bullet.

Smearing source regions may be non-conservative in situations where spacer disks and guide tubes are smeared in with other material densities (fuel, cover gas). This information is required to show compliance with 10 CFR 72.24 and 72.236(d).

5-4 Clarify the following typographical or editorial errors.

Add units to Table M.5-17. The staff assumes that Table M.5-17 is in units of mrem/hr.

Chapter 6 Criticality

6-1 Revise Page M.6-1 to justify that Boralyn™ at the level of 0.0070 g/cm^2 has been qualified, i.e., demonstrated to have the required durability (under the thermal and radiological environments of concern) and uniformity of boron carbide material, for use as thermal absorber materials in dry storage application.

Note that this apparently enriched material, Note 3 on Drawings NUH-32PT-1003-SAR and NUH-32PT-1004-SAR (options 1 and 2, respectively, for the PWR Fuel Basket Assembly), has not been previously approved for use as thermal absorber materials in dry storage application.

6-2 Revise Tables M.6-1 and M.2-3 to be consistent. The tables show the required number of poison rod assemblies (PRA) based on enrichment. Table M.6-1 contains CE 16X16 fuel assemblies but Table M.2-3 does not. In addition, revise the application to specify the minimum length of the PRA for each fuel assembly type.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

6-3 Revise the Technical Specifications to specify the minimum amount of B-10 and the minimum number of PRA that are required in the storage cask for criticality safety purposes.

NUREG-1645, “Standard Format and Content for Technical Specifications for 10 CFR Part 72 Cask Certificates of Compliance” specifies that design features significant to safety if altered or modified, such as boron control, should be specified in the Technical Specifications. Note that this also includes the borated sheets used in the basket.

6-4 Show how the B_4C density was determined for the PRA shown in table M.6-4. It appears that the B_4C densities shown in Table M.6-4 are different from the B_4C density shown in Table M.6-5.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

6-5 Revise the application to justify increasing the boron concentration in the poison plates when the plate thickness is decreased to the minimum value shown on the drawings. In addition specify the enrichment of the boron in the poison plates.

It would appear that when fabricating the plates the boron concentration would be independent of the plate thickness.

6-6 Revise the application to show that 60% moderator density is most reactive when the poison plates are reduced to their minimum dimensions.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

6-7 Provide an analysis of the effect of misloading on the criticality safety of the cask.

Misloadings should be caught and corrected before the cask is closed. The proposed cask loading patterns are complex which increases the likelihood of misloading. The analysis should provide information on the impact if fuel misloadings are not detected and corrected. The NRC needs this information to evaluate the safety margin of the proposed design and assess the importance of detecting misloadings.

6-8 Revise the application to provide a sample input for a criticality calculation performed when PRA are required in the cask.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

6-9 Revise the criticality evaluation to show that the average energy group from the KENO evaluations of the NUHOMS storage cask is bounded by the average energy group for the criticality calculations for the benchmarking evaluation.

The cask is required to be subcritical during loading and storage in accordance with 10 CFR 72.124. The applicant is using the benchmarking evaluation to show that the Keno criticality code accurately calculates the k-eff of the NUHOMS cask loaded with fresh fuel. In order to ensure that the applicant has properly evaluated a heavily borated system such as this, the average energy group of the NUHOMS cask should be bounded by the average energy group for the k-eff of the critical experiments used in the benchmarking evaluation.

Chapter 7 Confinement

7-1 Revise Page M.7-3, Section M.7.1.3, “Seals and Welds,” and Section M.7.1.4, “Closure” to clarify that a code case is being used as an alternative to the code for specific (port and inner cover) closure welds of the containment boundary.

In accordance with 10 CFR 72.24(c)(3), sufficient information shall be included for materials of construction to satisfy the design bases with an adequate margin for safety.

7-2 Revise Page M.7-3, Section M.7.1.3 to specify that the cylindrical shell weldments described in the opening sentence of this section includes the bottom of the cylinder.

The concern is that all non-field welds of the shell should normally have been volumetrically inspected. This comment refers to 10 CFR 72.236(b).

Chapter 8 Operating Procedures

8-1 Revise Chapter 8, Section 8.1.3, “DSC Drying and Backfilling”, Item 12 to clearly describe the PT inspection methodologies to be employed in the operating procedures.

In accordance with 10 CFR 72.24(c)(3), sufficient information shall be included for materials of construction to satisfy the design bases with an adequate margin for safety.

8-2 Revise Section 8 to specify the verification process for fuel assemblies which require that PRA be present prior to loading the fuel assembly into the cask.

The applicant should have a sufficient number of inspections to prevent the misloading of a significant number of fuel assemblies in the cask.

8-3 Section M.1.2.2.3.1 appears to indicate that the PRA may be removed after the 32PT basket is drained. If they are removed after draining, revise Section 8 to add steps to ensure that the PRA are properly removed after draining and are properly replaced prior to reflooding if the cask needs to be unloaded, while keeping the dose to workers as low as reasonably achievable.

Completeness and accuracy of all information provided to the NRC is required per 10 CFR 72.11.

8-4 Submit the Helium leak test procedure described in Section M.8.1.4 “DSC Sealing Conditions,” Step 5 (page M.8-7) that will be used to verify Technical Specification (TS) 1.2.4a

Include step by step descriptions of the methodologies used, and applicable drawings which show how appropriate confinement welds will be tested, and when. Also include a description of the sensitivity obtainable of each qualified method and the required testing sensitivity level to demonstrate compliance with TS 1.2.4a. Additionally, address effects such as ambient helium, testing location, and any other applicable effects.

8-5 Clarify the standards and criteria that will be used to qualify the leak test personnel. Provide information which shows that personnel performing leak tests have the qualifications necessary (such as SNT-TC-1A) to perform such tests. This information is necessary to show compliance with 10 CFR 72.190 and 72.192.

8-6 Remove the statement on page M.8-1 regarding the operating procedures that states: "They are not intended to be limiting in that the licensee may judge that alternate acceptable means are available to accomplish the same operational objective." Update Sections M.8 and M.9 as applicable (M.9.1.3 for example).

Alternatively, update the SAR and develop an administrative program in the technical specifications that lays out the minimum necessary inclusions for operating procedures and procedures which may be changed. Include the minimum guidance listed in NRC document titled: "Standard Format and Content for Technical Specifications for 10 CFR Part 72 Certificates of Compliance" in both the updated SAR and TSs.

8-7 Provide a line in the applicable procedures in Section 8, which includes taking dose rate measurements to show compliance with applicable technical specifications. This information is required to show compliance with 10 CFR 72.104 and 72.106.

8-8 Page M.8-4 procedure step 19 (2 errors): "Fill the neutron shield with demineralized water it was drained in Step M..8.1.1.5.

Chapter 9 Acceptance Tests and Maintenance Program

9-1 Revise Chapter 9, Section M.9.1.7.4, " B_4C Linear Density" to justify that pellets of B_4C proposed for use in the poison rod assemblies have been shown to be durable under the conditions expected over the life of their service as neutron absorber materials.

The concern is that if these materials are not durable they may break apart and fall to the bottom of the tube, or in other ways localize, and thereby be less effective as neutron absorbers than that required for safety. Conditions that may promote the breakup of the particles would be thermal exposure or radiation effects. This comment refers to 10 CFR 72.11, 72.24 and 72.236 (c).

9-2 Revise the acceptance tests to include a visual examination for defects and dimensional checks for absorber plates and rods.

Visual examination of all finished plates and rods are done to ensure that they are free of cracks, porosity, blisters, or foreign inclusions. Dimensional checks of rods and plates are done to ensure the correct effective boron areal density is adequate. This comment refers to 10 CFR 72.11, 72.24 and 72.236 (c).

9-3 Revise Chapter 9 to specify the area of the beam used in a single measurement of areal density of ^{10}B. Further, indicate that the sample taken from the plate material is a coupon and the measurement is taken using a beam size of about one centimeter in diameter.

The text is not clear on this significant point and the concern is that the statistical requirements associated with the thermal neutron absorber materials approved (for 90 percent credit) to date have assumed that the area of the beam used in a single measurement is about one square centimeter. The use of beams that expose the sample to measurement areas different from this one square centimeter level would require a review of these statistical requirements so as to permit the establishment of a suitable set of requirements for a different beam area. The area of the beam is mentioned under various parts of Chapter 9, however the distinction between sample, coupon, and beam is not at all clear, and seems to be misleading as written. For clarity, indicate that the sample taken from the plate material is a coupon and the measurement is taken using a beam size of about one centimeter in diameter. This comment refers to 10 CFR 72.11, 72.24 and 72.236 (c).

9-4 Revise Chapter 9, Section M.9.1.7.3.1.3, "Borated Aluminum Acceptance Testing, Neutronic" to justify the acceptance criterion given as item "a) Individual plates may be accepted...criterion, and b) Selected plates may be re-examined...."

The concern is that statistical consideration, e.g., the assumption that every coupon is like every part of every plate (which leads to the conclusion that coupons having detected malformations can be rejected from statistical analyses), may eliminate later acceptance of any plate in the rejected lot. This comment refers to 10 CFR 72.11, 72.24 and 72.236 (c).

9-5 Revise Chapter 9, Section M.9.1.7.3.1.4, "Justification for Acceptance Test Requirements, Borated Aluminum" to justify or eliminate the justification subpart "c)" regarding the measured values being lower if the effects noted in NUREG/CR-5661 are present.

9-6 Revise Chapter 9, Section M.9.1.7.3.2.1, "Boralyn™ Material Description" to specify a maximum areal density that will be permitted for use in Boralyn™ whose composition, or ^{10}B content, has been adjusted as described herein and specify the types of testing that are required when key variables have been altered.

If either key processing variables (e.g., temperature and pressure) have been altered, or if the areal density is larger than that already qualified for this application, products fabricated under these conditions may not be adequately durable. The concern further is that where the term "testing" is used it sometimes should read "qualification testing with NRC approval on the adequacy of the data and the suitability of the material." This comment refers to 10 CFR 72.11, 72.24 and 72.236 (c).

Chapter 10 Radiation Protection

10-1 Provide the estimated uncertainty in the MCNP results shown in Table M.10-3, including the R-value.

Additionally, provide a discussion of the sources and magnitude of uncertainties in the MCNP calculation employed, including the variance reduction techniques employed and the selection of point detectors as next event estimators for tally results. This information is required to show compliance with 10 CFR 72.104 and 72.106.

10-2 Justify the selection of point detectors as the tally estimator for the MCNP model inlight of the discussions in the MCNP manual (CCC-701, MCNP4C2) pages 2-61, 2-62, and 2-90 through 2-95.

Point detectors are deterministic estimates of the potential contribution of a particle to the detector as opposed to tallies of particles over areas. In particular, the detector can provide an error similar to that described on page 2-91 of the MCNP manual. Clarify how this problem is addressed in the MCNP site boundary dose calculation. This information is required to show compliance with 10 CFR 72.24, 72.104, 72.106 and 72.236(d).

Chapter 11 Accident Analysis

11-1 Clarify the relation of Tables M.10-3 and M.11-1.

The dose rates presented in Table M.11-1 do not appear to be similar to the dose rates presented in Table M.10-3 when dividing this table by the number of HSMs in the array. This information is required to show compliance with 10 CFR 72.24.

11-2 Include an evaluation which analyzes the probability and effects of an inadvertently loaded assembly. Based on recent events, NRC staff no longer accepts that inadvertent loading of an assembly with a heat generation rate greater than design basis is not credible based on quality assurance programs, particularly when complicated loading schemes exist as in this application.

The staff does accept that analyses do not have to be performed for “misloadings,” if the probability and consequences of such an event can be shown to be not significant to safety from a thermal, containment, shielding, and criticality perspective.

Update Section M.11.2 as applicable. This information is required to verify compliance with 10 CFR 72.94 and 72.236(l).

11-3 Section M11.2.10, “Fire and Explosion” lists the bounding capacity of the fuel tank as 300 gallons. Provide a way to ensure that no greater than 300 gallons will be present, or provide justification why this is not necessary.

Chapter 12 Conditions for Cask Use

The following regulatory requirements are applicable in this chapter: 10 CFR 72.11, 72.24(g), 72.26, 72.44(c), 72.104, 72.106, 72.234(a), 72.236, and Subparts C, E, F, G, H, and I. It should be noted that other regulatory requirements may be applicable to this section.

12-1 Include a maximum assembly weight in Table 1-1f, “PWR Fuel Assembly Design Characteristics for the NUHOMS®-32PT DSC.”