AREVA

February 24, 2012
E-32348

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

Subject: Revision 1 to Transnuclear, Inc. (TN) Application for Amendment 3 to Standardized Advanced NUHOMS® Certificate of Compliance No. 1029, Response to Request for Supplemental Information (Docket No. 72-1029; TAC No. L24607)

Reference: Letter from Steve Ruffin (NRC) to Don Shaw (TN), "Application for Amendment No. 3 to the Standardized Advanced NUHOMS® Certificate of Compliance No. 1029 - Supplemental Information Needed," February 9, 2012 (Docket No. 72-1029; TAC No. L24607)

The letter referenced above advised TN that NRC staff has completed an acceptance review of our December 15, 2011 application for Amendment 3 to the Standardized Advanced NUHOMS® Certificate of Compliance No. 1029 and that supplemental information is needed for the staff to continue their review. The information needed was enclosed in the letter as Request for Supplemental Information (RSI). The letter also included observations to allow TN to start earlier on items containing the potential to be asked at a later date. The letter indicated that responses to the observations are not required for the staff to begin a detailed technical review.

The purpose of this submittal is to respond to the RSI and the observations. The responses are provided as Enclosure 2. A changed UFSAR page is provided as Enclosure 3, annotated as Revision 1, February 2012. Certain portions of this submittal include proprietary information which may not be used for any purpose other than to support the NRC staff's review of the application. In accordance with 10 CFR 2.390, I am providing an affidavit (Enclosure 1) specifically requesting that you withhold this proprietary information from public disclosure. Public versions of portions containing proprietary information are provided in Enclosure 4.

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Should the NRC staff require additional information to support review of this application, please do not hesitate to contact Mr. Don Shaw at 410-910-6878 or me at 410-910-6881.

Sincerely,

Jayant Bondre, PhD
Vice President - Engineering

cc: Steve Ruffin (NRC SFST)

Enclosures:

1. Affidavit Pursuant to 10 CFR 2.390
2. RSI and Observations Items and Responses (Proprietary Version)
3. CoC 1029 Amendment 3, Revision 1, Changed UFSAR Page
4. RSI and Observations Items and Responses (Public Version)

AFFIDAVIT PURSUANT
TO 10 CFR 2.390

Transnuclear, Inc.)
State of Maryland) SS.
County of Howard)

I, Jayant Bondre, depose and say that I am a Vice President of Transnuclear, Inc., duly authorized to execute this affidavit, and have reviewed or caused to have reviewed the information which 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 is contained in Enclosure 2 and is listed below:

- Portions of RSI and Observations Items and Responses

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

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 a Transnuclear, Inc. response to an NRC request for supplemental information regarding the thermal analysis related to the design and analysis of dry spent fuel storage systems, which are owned and have been held in confidence by Transnuclear, Inc.

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

3) Public disclosure of the information is likely to cause substantial harm to the competitive position of Transnuclear, Inc. because the information consists of descriptions of the thermal analysis of 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 Transnuclear, Inc., take marketing or other actions to improve their product's position or impair the position of Transnuclear, Inc.'s product, and avoid developing similar data and analyses in support of their processes, methods or apparatus.

Further the deponent sayeth not.

Jayant Bondre
Vice President, Transnuclear, Inc.

Subscribed and sworn to me before this 24th day of February, 2012.

Zora M Dougherty
Notary Public

My Commission Expires 2 /24 / 2012

ZORA M. DOUGHERTY
My Commission Expires
NOTARY PUBLIC
10-17-2015
HOWARD COUNTY, MD

REQUEST FOR SUPPLEMENTAL INFORMATION

CONTAINMENT

RSI-1

Provide a general description of the fabrication helium leak rate test for the entire confinement boundary of the new and modified DSCs.

Consistent with the guidance in ANSI 14.5-1997, and as provided for in the recent amendment to 72-1004, leak testing of the confinement boundary should encompass welds, joints, and surfaces of the confinement boundary including the base material. The staff does not have sufficient data to generically grant an exception of helium leak testing of base material that may be procured, fabricated, and operated under various conditions for multiple types of canisters, although the likelihood of helium leakage through thick, forged base material for any given canister confinement boundary may be very low. In addition, there is not sufficient evidence to correlate the minimum flaw sizes that are detectable during other fabrication examinations (e.g. UT) with the minimum flaw sizes in any orientation that may cumulatively result in leak rates greater than 1.0 x 10^{-7} ref cm^3/sec. The applicant should list the operating procedures for helium leak testing of the confinement boundary in the SAR and TS, for helium leakage rate test to the entire confinement boundary of the Advanced NUHOMS® DSCs.

Alternatively, the applicant should provide a basis for demonstrating that the materials, forging, fabrication, and testing of the entire confinement boundary construction provides reasonable assurance that leakage through the canister during its entire service life is not credible, without confirmation by helium leak test. The basis should describe the physical properties of the confinement boundary after fabrication, potential types of flaws (e.g., stringers), and other mechanisms that could potentially result in leakage. In addition, the industry leak test data for canister bodies, or the applicable data for similar types of nuclear components, should be provided to validate the assumed integrity of the base metal and fabrication welds.

This information is needed to determine compliance with 10 CFR 72.236(j) and 72.236(l).

RESPONSE TO RSI-1

UFSAR Section B.9.1.3, page B.9.1-2, of the Amendment 3 application provides the general description and acceptance criteria for the helium leak testing for the 32PTH2 DSC confinement boundary. This testing is conducted in two phases. The first (titled Procedure 1) is performed at the completion of the fabrication process and is as follows:

Upon completion of all 32PTH2 DSC shell welding and attachment of the inner bottom cover plate to the DSC shell, a temporary seal plate is placed over the open end of the 32PTH2 DSC. A bag or other enclosure is placed around the outside of the entire 32PTH2 DSC and it is filled with helium. The 32PTH2 DSC cavity is evacuated and a helium leakage test is performed using a *port in the seal plate. This test is used to show that the entire 32PTH2 DSC confinement boundary tested is leak tight ($1x10^{-7}$ ref cm^3/s).*

Following completion of fuel loading, a second helium leak test (Procedure 2 of Section B.9.1.3) is performed which demonstrates that the inner top cover plate, plate to shell weld, and the vent and siphon ports are leak tight.

This commitment provides both a general description of the fabrication and the final closure helium leak tests and a firm commitment to meet the leak tightness criteria established by ANSI N 14.5 for the base metal and the welds comprising the confinement boundary of the DSC.

OBSERVATIONS

STRUCTURAL

Provide a benchmark for the use of LS-DYNA, or an ANSYS analysis for the 32PTH2 basket assembly during the 80-inch accidental side drop.

Amendment No. 3 SAR section B.3.6.1.2.6 evaluates the 32PTH2 basket assembly side drop (accident) by a LS-DYNA transient dynamic finite element analysis.

The 32PTH2 basket assembly analysis methodology using LS-DYNA to determine stress values (no direct stress intensities output) is inconsistent with that of the current ANSYS analysis technique for the 80-inch, 75g side drop. LS-DYNA capability for basket assembly analysis must be properly benchmarked for intended use. Specifically, the applicant must demonstrate that LS-DYNA analysis results can be properly post-processed for section-cut internal stress quantities (i.e. the ability to extract validated stress intensities consistent with ASME code criteria) relevant for a comprehensive structural integrity evaluation of the 32PTH2 fuel basket assembly.

This information is needed to demonstrate compliance with 10 CFR 72.236(c).

RESPONSE TO STRUCTURAL OBSERVATION

A similar question has been asked in RAI question 3-8 for Amendment 13 to the STANDARDIZED NUHOMS® SYSTEM (Docket No. 72-1004). TN is in the process of benchmarking LS-DYNA capabilities to demonstrate that the program correctly extracts stress intensities consistent with the ASME code criteria. TN is planning to submit this information to NRC staff in response to the 72-1004 Amendment 13 request for additional information. We can also provide the response for this application, if required.

THERMAL

Obtain the analysis discretization error for the bounding case by calculating the grid convergence index (GCI) following the procedure described in American Society of Mechanical Engineers Verification and Validation 20-2009 (ASME V&V 20-2009), "Standard for Verification and Validation in Computational Fluid Dynamics and Heat Transfer."

Per ASME V&V 20-2009, when using the GCI method to estimate the discretization error, the following criteria should be met:

- The solution from the different grids used display monotonic convergence.
- The solution from the different grids used should be in the asymptotic range.

To test for:

- A minimum of four grids is required to demonstrate that the observed order of accuracy p is constant for a simulation series. In fact, it may require more than four grids to convincingly demonstrate asymptotic response in difficult problems, possibly five or six grid resolutions in cases where the convergence is noisy (ASME V&V 20-2009).
- The observed order of accuracy p has to be comparable to the expected order of accuracy of the method.
- If order of accuracy p is not consistent, then the factor of safety (Fs) should be equal to 3.

Provide all analysis files generated as a result of the GCI calculation.

This information is necessary to verify the requirements of 10 CFR 72.11 and 72.236.

RESPONSE TO THERMAL OBSERVATION

As discussed in UFSAR Chapter B.4, Section B.4.6.7 mesh sensitivity analyses are performed for the 32PTH2 DSC model to demonstrate the independence of the maximum temperatures to the size of the mesh. The threshold considered for the mesh sensitivity analyses is ± 1°F variation in the maximum component temperatures. The threshold of ± 1°F is considered so that any uncertainties due to the mesh size are negligible.

The 32PTH2 DSC model "32PTH2_Sens_Medium" used in the thermal analyses uses a 16x16 mesh to represent the homogenized regions of the various fuel assemblies. This satisfies the recommendation in Section 7.1.1 of [2] which states that a minimum of 14x14 elements should be used to represent a PWR fuel assembly and that any mesh sizes greater than 14x14 are reasonably consistent.

Although the mesh sensitivity discussed in ASME V&V 20-2009, Section 2-4.2 of [1] is developed based on CFD models and is not directly applicable for conduction based finite element models, the numerical uncertainty in the 32PTH2 DSC model is discussed below using the Grid Convergence Index (GCI) methodology prescribed in ASME V&V 20-2009, Section 2-4 of [1].

Proprietary information withheld pursuant to 10 CFR 2.390

Proprietary information withheld pursuant to 10 CFR 2.390

References

1 Standard for Verification and Validation in Computational Fluid Dynamics and Heat Transfer, ASME V&V 20-2009.

2 "Spent Nuclear Fuel Effective Thermal Conductivity Report", US Department of Energy, Document Identifier: BBA000000-01717-5705-00010 Rev.00.

MATERIALS

Justify the 40-year strength of the HSM concrete that will operate above 350°F, as stated in Table B.4.1-3. The footnote to Table B.4.1-3 states:

"The maximum concrete temperature for accident conditions is above the 350°F limit given in ACI-349 [B4.28]. Testing will be performed to demonstrate that the concrete compressive strength is greater than that assumed in structural analyses of Chapter B.2." It is not clear how mechanical testing will accurately predict the strength of concrete operating outside the bound of the code specifications.

This information is required for compliance with 10 CFR 72.120(d).

RESPONSE TO MATERIALS OBSERVATION

ACI Code 349-06, Section E.4.2 states, in part:

> **E.4.2** The following temperature limitations are for accident or any other short-term period. The temperatures shall not exceed 350 °F for the surface.

ACI Code 349-06, Section E.4.3 states, in part:

> **E.4.3** Higher temperatures than those given in E.4.1 and E.4.2 above may be allowed for concrete if tests are provided to evaluate the reduction in strength and this reduction is applied to design allowables.

The postulated thermal accident condition, as described in UFSAR Chapter B.4, is the blocked vent accident storage condition (Load Case S7) which is considered for up to 40 hours (short-term accident condition). Based on the provisions of Section E.4.3 of ACI code 349-06, the AHSM-HS concrete will be qualified by testing to demonstrate concrete compressive strength at higher temperatures. The concrete will be held at uniform temperature of at least 408°F (Table B.4.4-3) for at least 40 hours and then *testing will be performed to demonstrate that the concrete compressive strength is greater than that assumed in the structural analysis of Chapter B.2.* (Requirements for concrete testing of AHSM-HS are provided in Section 5.5 of the proposed Amendment 3 technical specification.) In addition, the design basis strength of both the reinforcing steel and the concrete compressive strength are conservatively reduced from their nominal values by 10% for all accident evaluations.

UFSAR Table B.4.1-3 Note (3) is revised to include allowance of the test by ACI-349.