TRANSNUCLEAR
AN AREVA COMPANY

April 16, 2010
E-29215

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

Subject: TN-32 Updated Final Safety Analysis Report (UFSAR), Revision 4, and 10 CFR 72.48 Summary Report for the Period 04/18/08 to 04/16/10, Docket 72-1021

Reference: Letter from Robert Grubb (TN) to NRC Document Control Desk, "TN-32 Final Safety Analysis Report (FSAR) Update per 10 CFR 72.248 and TN-32 Summary Report for the Period 12/30/06 to 04/17/08, Docket 72-1021," April 17, 2008 (E-26268)

Pursuant to 10 CFR 72.248, Transnuclear, Inc., (TN) has updated the TN-32 UFSAR to Revision 4. This update incorporates changes implemented by TN pursuant to 10 CFR 72.48, through the date of this letter. Changes are identified with revision bars and italicized text. The changed UFSAR pages are provided as Enclosure 1 and are as follows:

- Page 4A.3-1, directly replacing the Rev. 1, 5/00 page of the same number
- Page 4A.9-1, directly replacing the Rev. 0, 1/00 page of the same number

I certify that this submittal accurately presents changes made since the date of the submittal referenced above.

Also, pursuant to 10 CFR 72.48(d)(2), TN hereby submits the 72.48 summary report for the TN-32 System for the period 04/18/08 to 04/16/10, as Enclosure 2.

Should you have any questions regarding this submittal, please do not hesitate to contact Mr. Donis Shaw at 410-910-6878 or me at 410-910-6881.

Sincerely,

Jayant Bondre

Jayant Bondre, PhD
Vice President - Engineering

cc: Eric Benner (NRC SFST) (5 copies, provided in a separate mailing)

Enclosures:

1. Replacement Pages for the TN-32 UFSAR, Revision 4
2. 72.48 Summary Report for the TN-32 System for the Period 04/18/08 to 04/16/10

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Enclosure 1 to TN E-29215

Replacement Pages for the TN-32 UFSAR, Revision 4

List of Pages:

- Page 4A.3-1, directly replacing the Rev. 1, 5/00 page of the same number
- Page 4A.9-1, directly replacing the Rev. 0, 1/00 page of the same number

4A.3 Summary of Thermal Properties of Materials

The thermal properties of materials used in the thermal analyses are reported below. The values listed are based on the corresponding references.

a. Thermal Conductivity of UO_2 Pellets

Temperature, °F	*80*	*260*	*440*	*620*	*800*	*980*	*1160*	*1340*
Thermal Conductivity Btu/hr-in-°F [Ref. 10] and [Ref. 11]	*0.191*	*0.177*	*0.163*	*0.149*	*0.137*	*0.127*	*0.118*	*0.111*

The computed effective transverse conductivity of the fuel assembly in Appendix 4A.6 is based on un-irradiated UO_2 conductivity of 5 W/m-K (2.9 Btu/hr-ft-°F) taken from Ref. 5, Appendix A - Fuel Material Properties, Chapter 2.

The effect of using irradiated UO_2 conductivity on the maximum fuel cladding temperature is less than 1°F and considered as insignificant.

b. Thermal Conductivity of Zircaloy
Ref. 5, Appendix B - Cladding Material Properties, Chapter 2

Temperature, °F	200	300	400	500	600	800
Thermal Conductivity, Btu/hr-ft-°F	7.86	8.28	8.68	9.06	9.44	10.20

c. Surface Emissivity of Zircaloy
Ref. 5, Appendix B - Cladding Material Properties, Chapter 2

$\varepsilon = 0.8$

d. Thermal Conductivity of Helium
Ref. 5, Appendix C - Gas Material Properties, Chapter 1

Temperature, °F	200	300	400	500	600	800
Thermal Conductivity, Btu/hr-ft-°F	0.1000	0.1104	0.1206	0.1303	0.1398	0.1580

e. Surface Emissivity of Fuel Compartment

Unpolished Stainless Steel, Ref. 6

$\varepsilon = 0.3$

The analyses use interpolated values when appropriate for intermediate temperatures where the temperature dependency of a specific parameter is deemed significant. The interpolation assumes a linear relationship between the reported values.

4A.9 References

1. L.E. Fisher, "Spent Fuel Heating Analysis Code for Consolidated and Unconsolidated Fuel," LLNL, PATRAM '89 CONF-890631-Vol III.

2. SFBTA: A Version of SFHA, Memorandum S90-143 from J. Hovingh to L.E. Fisher dated October 15, 1990.

3. Wooton et. al., Scoping Design Analysis for Optimizing Shipping Casks Containing 1, 2, 3, 5, 7, or 10 Year Old PWR Spent Fuel, ORNL/CSD/TM-149, 1983 (Appendix J only).

4. SAND90-2406, Sanders, T. L., et al., A Method for Determining the Spent-Fuel Contribution to Transport Cask Containment Requirements, 1992.

5. NUREG/CR-0497, A Handbook of Material Properties for Use the Analysis of Light Water Reactor Fuel Rod Behavior MATPRO - Version 11 (Revision 2), EG&G Idaho, Inc., 1981.

6. COBRA-SFS: A Thermal-Hydraulic Analysis Computer Code,Vol. III, Validation Assessments, PNL-6049, 1986.

7. Viebrock and Malin, Domestic Light Water Reactor Fuel Design Evolution, Volume III, prepared by Nuclear Assurance Corporation for U. S. Department of Energy, September 1981.

8. ANSYS Engineering Analysis System, User's Manual for ANSYS Revision 5.4, ANSYS, Inc., Houston, PA.

9. NUREG/CR-0200, SCALE Manuals, Volume 3, Miscellaneous (Revision 5)

10. *K. Minato, et. al., "Thermal Conductivities of Irradiated* UO_2 *and (U, Gd)*O_2 *Pellets", Journal of Nuclear Materials, 300 (2002) 57-64.*

11. *C. Ronchi, et. al., "Effect of Burn-up on the Thermal Conductivity of Uranium Dioxide up to 100,000 MWd/t", Journal of Nuclear Materials, 327 (2004) 58-76.*

72.48 Summary Report for the TN-32 System for the Period 04/18/08 to 04/16/10

LR 721021-008 Rev. 0

Change Description

Based on NRC Information Notice 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," this licensing review evaluated the impact of irradiated UO_2 pellet conductivity and thermal performance on the TN-32 storage cask.

Evaluation Summary

The TN-32 cask is designed for storage of PWR fuel assemblies. The effective fuel conductivities in the TN-32 cask design are calculated based on ANSYS models using un-irradiated UO_2 conductivity. A sensitivity study was performed to document the effect of calculating the effective fuel assembly conductivities with irradiated UO_2. The effective fuel assembly conductivity, with irradiated UO_2 conductivity considered, is approximately 3% lower than that with un-irradiated UO_2 conductivity at operating temperatures of 700 °F. This difference is smaller at lower operating temperatures. This sensitivity analysis demonstrated that the effect of fuel conductivity degradation due to irradiation of UO_2 on the maximum fuel cladding temperature is limited to 1 °F.

The internal pressure of the cask cavity is proportional to the average cavity gas temperature. An increase of 1 °F for the cavity gas temperature increases the internal pressure by only 0.1 % for operating temperatures from 300 °F to 800 °F. Therefore, the effect of considering irradiated UO_2 on the cask cavity pressure is insignificant.

The irradiated UO_2 conductivity does not affect the cask structure directly. The impact of the irradiated UO_2 on the thermal stresses of cask shells, and therefore on the structural function is insignificant.

There is no adverse impact on the confinement capabilities of the cask as there are no new leak paths introduced and the effect of irradiated UO_2 on the cavity internal pressures is insignificant, as discussed above.

There is no adverse impact on shielding, as the irradiated UO_2 conductivity does not change the source term limits of the fuel assemblies nor impact the shielding properties of the materials.

There is no adverse impact on criticality. There will be no dispersal or reconfiguration of pellet material. The structure, the geometry, and the neutron absorbing capability of the basket materials remain unaffected by the irradiated UO_2 conductivity.

There is no adverse impact on operations. The temperature limits for operations, such as vacuum drying, remain unaffected. The increase of the maximum fuel cladding temperature for these operations is insignificant. Therefore, there are no required changes to the procedures for loading, unloading, or any other cask handling operations.

These results demonstrated that considering the effects of irradiated UO_2 conductivity does not adversely affect the system design functions and all eight 72.48 evaluation criteria are met.