



September 15, 2011  
E-31507

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

Subject: Revision 6 to Transnuclear, Inc. (TN) Application for Revision 3 to Certificate of Compliance No. 9302 for the Model No. NUHOMS®-MP197 Packaging – Supplemental Information (Docket No. 71-9302, TAC No. L24336)

Based on recent discussions with the NRC staff, this submittal provides supplemental information regarding the NUHOMS®-MP197HB application. Enclosures 2 and 3 provide proprietary and non-proprietary versions of the supplemental information. Enclosure 4 provides a list of changed safety analysis report (SAR) pages with the reasons for changes indicated. It also includes the instructions for SAR page removal and insertion for the proprietary and non-proprietary versions.

Enclosures 5 and 6 provide changed SAR pages, for the proprietary and non-proprietary versions, respectively. In the SAR, changed pages are annotated as Revision 11, with changed areas indicated by italicized text and revision bars.

Enclosure 7 provides a list of computer input and output files used for shielding analysis. An electronic copy of the computer input and output files are provided in Enclosure 8. Since the information provided in Enclosure 8 is entirely proprietary, a non-proprietary version is not provided.

This submittal includes proprietary information which may not be used for any purpose other than to support your 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.

Should the NRC staff require additional information to support review of this application, please do not hesitate to contact Kamran Tavassoli at 410-910-6944 or me at 410-910-6881.

Sincerely,

Jayant Bondre, PhD  
Vice President - Engineering

cc: Kimberly Hardin (NRC SFST), six paper copies of this cover letter and Enclosures 1, 2, 4, 5, and 7 and one electronic copy of Enclosure 8, provided in a separate mailing

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Enclosures:

1. Affidavit Pursuant to 10 CFR 2.390
2. Supplemental Information (Proprietary Version)
3. Supplemental Information (Non-proprietary Version)
4. List of Changed SAR Pages and Page Change Instructions, with Indication of the Reasons for Changes
5. Replacement NUHOMS®-MP197 Safety Analysis Report Pages, Revision 11 (Proprietary version)
6. Replacement NUHOMS®-MP197 Safety Analysis Report Pages, Revision 11 (Non-proprietary version)
7. Listing of Computer Files Contained in Enclosure 8
8. One electronic copy of computer input and output files listed in Enclosure 7 (Proprietary)



### **RESULTS OF SHIELDING EVALUATION WITH PUNCTURE TEST**

The HAC dose rates shown in Table A.5-2 of the SAR do not explicitly consider the complete loss of neutron shielding around the location (approximately 6" diameter) of the damage due to puncture test. The design basis shielding evaluation documented in SAR inherently assumed that the modeling of a uniform loss of 75 % of the neutron shielding material sufficiently encompassed all the damaged configurations for HAC as indicated by the results of the fire tests where the maximum loss of the neutron shielding material did not exceed 20%.

The following justification is provided to ensure that the maximum HAC dose rate, 1m from the external surface of the package, does not exceed the applicable 71.51(a)(2) limit of 1000 mrem/hour.

The maximum total dose rate 1m from the external surface of the intact impact limiters with 100% loss of the neutron shield is calculated to be less than 950 mrem/hour (last row of Table 8-7 of calculation). This dose rate is calculated at a distance of 130 cm from the package surface. This calculation employs the design basis neutron source term of  $4.00 \times 10^8$  per fuel assembly, at a burnup of 70 GWD/MTU and a corresponding minimum enrichment of 4.3 wt. % U-235 and a minimum cooling time of 21.0 years as shown in Table A.5-12 of the SAR.

The bounding neutron source term for a maximum burnup of 45 GWD/MTU with a corresponding minimum enrichment of 2.6 wt. % U-235 and a cooling time of 6.5 years is  $2.51 \times 10^8$  per fuel assembly. Using a conservative (1/D) approximation for the dose rate variation to account for the required tally location of 100 cm from the package surface and a direct scaling of the neutron source terms to account for the burnup variation, the bounding HAC dose rate is calculated as shown below:

$$950 \text{ mrem/hour} * (130 \text{ cm} / 100 \text{ cm}) * (2.51 \times 10^8 / 4.00 \times 10^8) = 775 \text{ mrem/hour}$$


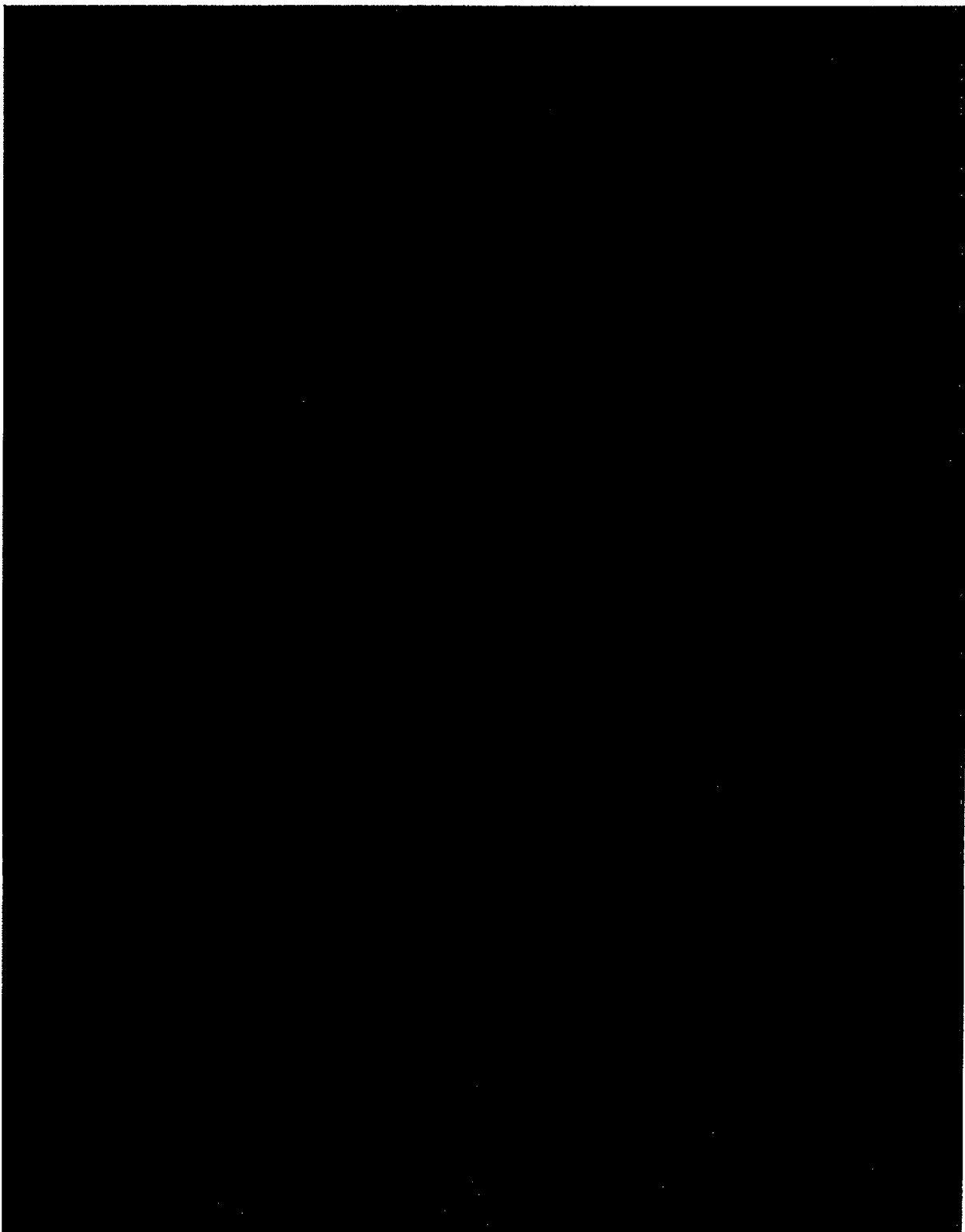
This ensures that that the maximum dose rate under HAC will be less than the limit of 1000 mrem/hour.

The relevant pages including the portion of the MCNP input/output file from the Transnuclear calculation package are attached herein. Further, the entire MCNP and SAS2H input/output files are also included with this submittal.

The SAR Table A.5-26 is revised to include these results.


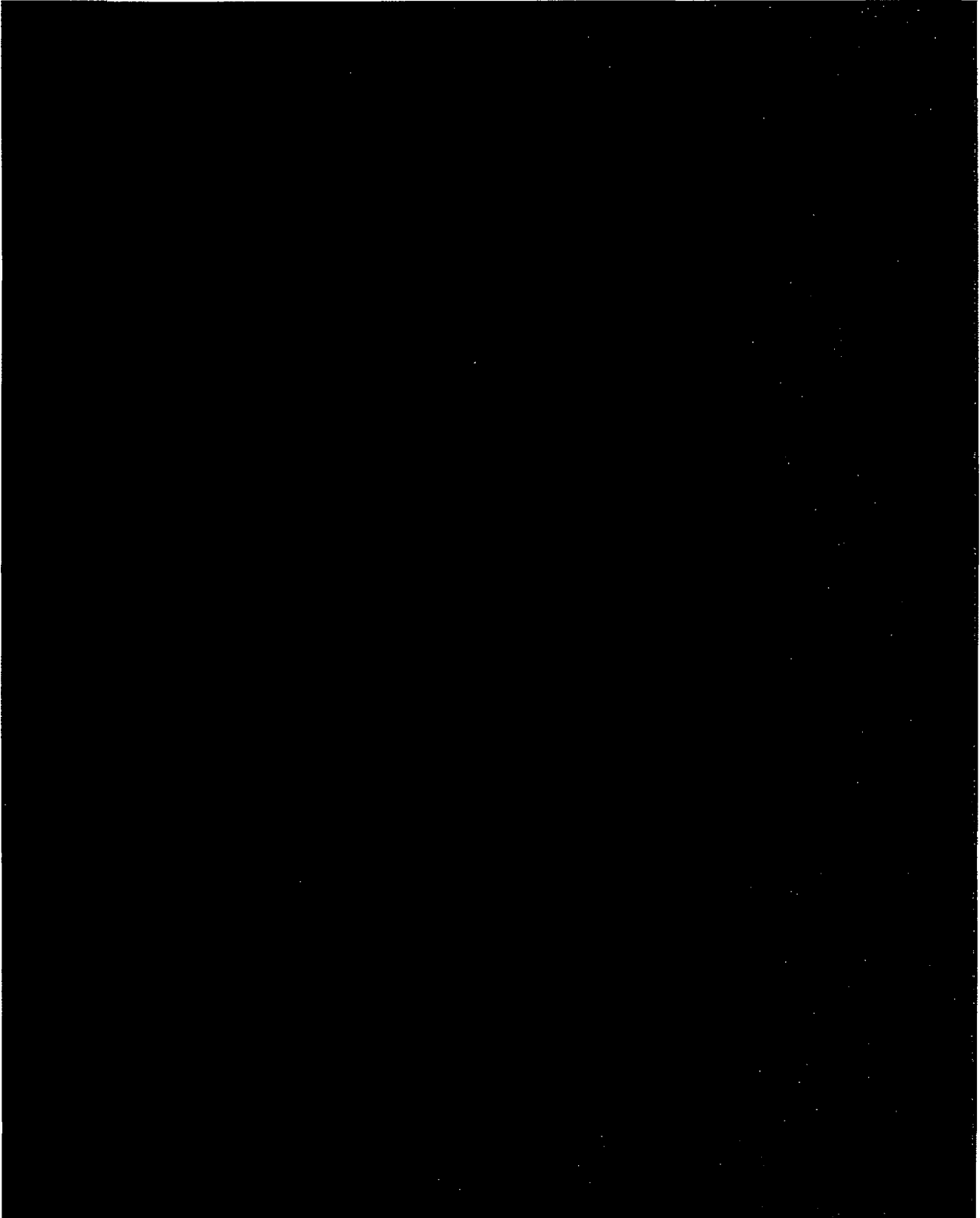
**Proprietary-Trade Secret**

**Proprietary Information Withheld Pursuant to 10 CFR 2.390**

 <b>AREVA</b> TRANSNUCLEAR INC.	<b>Calculation</b>	Calculation No.: MP197HB-0502 Revision No.: 0 Page: 53 of 82
		


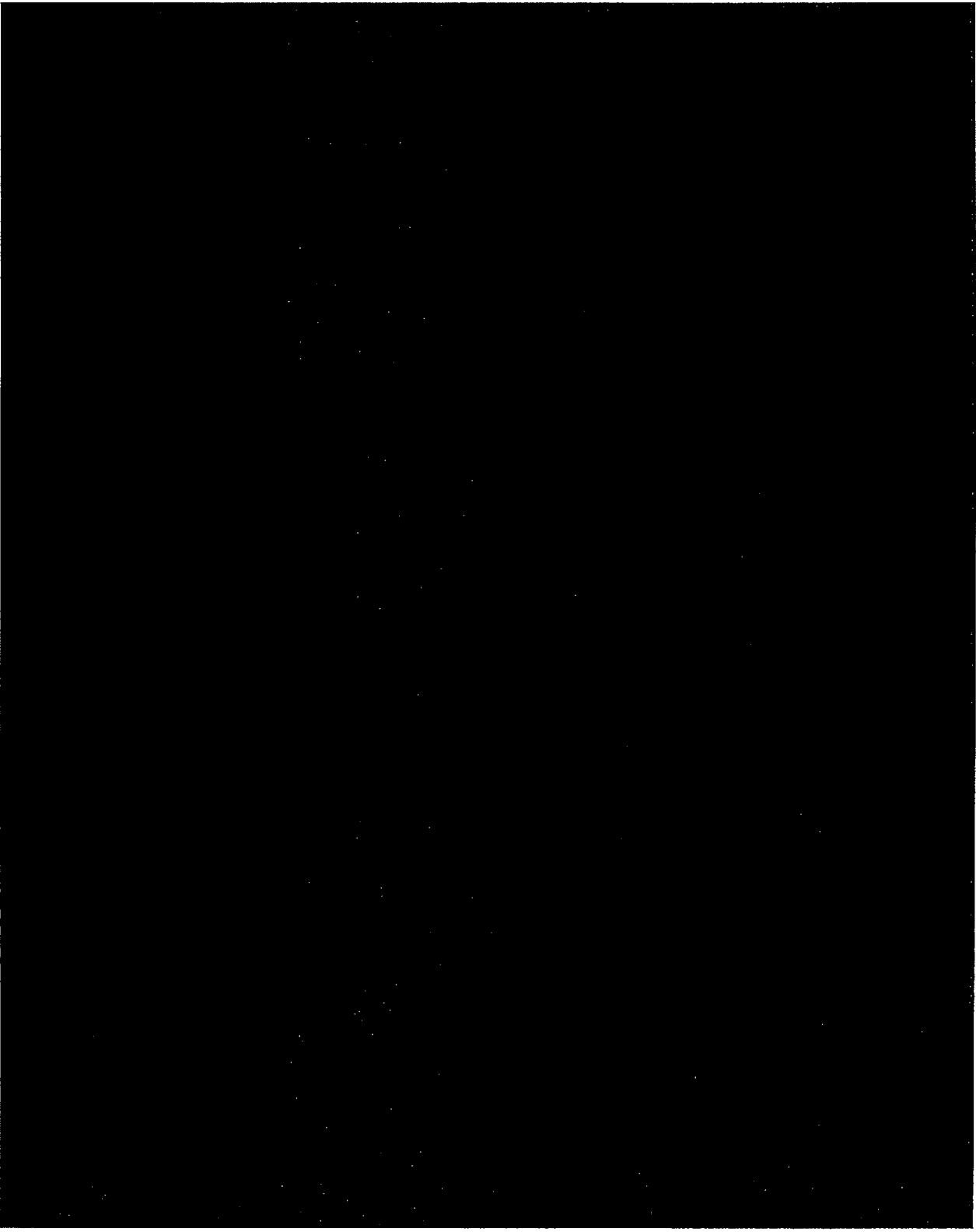
**Proprietary-Trade Secret**

**Proprietary Information Withheld Pursuant to 10 CFR 2.390**

 <b>AREVA</b> TRANSNUCLEAR INC.	<b>Calculation</b>	Calculation No.: MP197HB-0502 Revision No.: 0 Page: 64 of 82
		

**Proprietary-Trade Secret**

**Proprietary Information Withheld Pursuant to 10 CFR 2.390**

 <b>AREVA</b> TRANSNUCLEAR INC.	<b>Calculation</b>	Calculation No.: MP197HB-0502 Revision No.: 0 Page: 80 of 82
		

Enclosure 4 to TN E-31507

List of Changed Pages to the MP197HB Safety Analysis Report

Safety Analysis Report – Proprietary and Nonproprietary Versions		
Current Page No.	Replacement Page No.	Reason for change
Cover Page	Cover Page	Update
A.5-131	A.5-131	HAC dose rate evaluation

Enclosure 6 to TN E-31507

Replacement NUHOMS®-MP197 Safety Analysis Report Pages,  
Revision 11 (Non-proprietary Version)

Table A.5-26  
HAC Maximum Dose Rate at Various Radial Distances from Side of Cask

Radial Distance from <sup>(1)</sup> Impact Limiters, m	Primary Gamma Radiation		Secondary Gamma Radiation		Total Gamma Radiation		Neutron Radiation		Total	
	Dose Rate, mrem/hr	Relative Error	Dose Rate, mrem/hr	Relative Error	Dose Rate, mrem/hr	Relative Error	Dose Rate, mrem/hr	Relative Error	Dose Rate, mrem/hr	Relative Error
Package Side Perimeter	15.5	0.11	44.5	0.005	55.2	0.02	847.8	0.01	903.0	0.01
0	7.9	0.16	27.8	0.005	33.6	0.02	557.8	0.005	591.4	0.005
1	4.3	0.09	13.7	0.004	17.9	0.02	293.7	0.004	311.7 <sup>(2)</sup>	0.004
2	2.6	0.12	6.5	0.006	9.1	0.03	147.4	0.005	156.5	0.005
2.7	1.7	0.12	3.7	0.007	5.3	0.04	87.7	0.01	93.0	0.01
4.3	1.1	0.17	1.9	0.01	3.0	0.06	46.5	0.01	49.2	0.01

(1) HAC dose rates for distances equal to 1 and 2 meters correspond to radial distances measured from the cask body (Shield Shell), not from side of Impact Limiters.

(2) The maximum total dose rate assuming a complete loss of neutron shielding using the source terms corresponding to a burnup of 45 GWD/MTU is calculated to be less than 775 mrem/hour.

**Note:** Location of Maximum of Total in dose rate spatial distribution may not coincide with positions of neutron, primary and secondary gamma radiation dose rates maximums. Because of that, the maximum of Total is less than or equal to the sum of maximums from neutron, primary and secondary gamma radiation dose rates.

Listing of Computer Files Contained in Enclosure 8  
(All files are Proprietary)

Disk ID No. (size)	Discipline	System/Component	File Series (topics)	Number of files
(Enclosure 8)  CD (1 of 1)  (4.30 MB)	Shielding	MP197HB	001-SAS2H – Folder	2
			002-MCNP – Folder	5