Enclosure (10)

CA06358 Source Terms Calculation

Calvert Cliffs Nuclear Power, Inc.
November 3, 2005

ESP No.:	ES200100401	Supp No.	000	Rev. No.	000	Page 1 of 181

FORM 19, CALCULATION COVER SHEET

A. INITIATION (Control Doc Type - DCALC) Page 1 of 181

DCALC No.: CA06358 Revision No.: 000

Vendor Calculation (Check one): ☐ Yes ☒ No

Responsible Group: FOSU

Responsible Engineer: Gerard E. Gryczkowski

B. CALCULATION

ENGINEERING DISCIPLINE: ☐ Civil ☐ Instr & Controls ☒ Nuc Engrg ☐ Electrical ☐ Mechanical ☐ Nuc Fuel Mngmt ☐ Other: ☐ Reliability Engrg

Title: CONTROL ROOM HABITABILITY SOURCE TERM CALCULATIONS

Unit ☐ 1 ☐ 2 ☒ COMMON

Proprietary or Safeguards Calculation ☐ YES ☒ NO

Comments: NA

Vendor Calc No.: NA REVISION NO.: NA

Vendor Name: NA

Safety Class (Check one): ☒ SR ☐ AQ ☐ NSR

There are assumptions that require Verification during walkdown: AIT #: NA

This calculation SUPERSEDES: NA

C. REVIEW AND APPROVAL:

Responsible Engineer: Gerard E. Gryczkowski 3/19/2004
Printed Name and Signature Date

Independent Reviewer: John. R. Massari 10/4/2004
Printed Name and Signature Date

Approval: Phillip Wengloski 10/6/04
Printed Name and Signature Date

IF the results or conclusions of this calculation or revision might affect a procedure or the basis of a procedure, a Change Notification Form (Form 14) shall be forwarded to the Procedure Development Unit with a summary of the calculation's purpose and results.

2. LIST OF EFFECTIVE PAGES

Page	Latest Rev	Page	Latest Rev	Page	Latest Rev	Page	Latest Rev	Page	Latest Rev
001	0	002	0	003	0	004	0	005	0
006	0	007	0	008	0	009	0	010	0
011	0	012	0	013	0	014	0	015	0
016	0	017	0	018	0	019	0	020	0
021	0	022	0	023	0	024	0	025	0
026	0	027	0	028	0	029	0	030	0
031	0	032	0	033	0	034	0	035	0
036	0	037	0	038	0	039	0	040	0
041	0	042	0	043	0	044	0	045	0
046	0	047	0	048	0	049	0	050	0
051	0	052	0	053	0	054	0	055	0
056	0	057	0	058	0	059	0	060	0
061	0	062	0	063	0	064	0	065	0
066	0	067	0	068	0	069	0	070	0
071	0	072	0	073	0	074	0	075	0
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091	0	092	0	093	0	094	0	095	0
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131	0	132	0	133	0	134	0	135	0
136	0	137	0	138	0	139	0	140	0
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151	0	152	0	153	0	154	0	155	0
156	0	157	0	158	0	159	0	160	0
161	0	162	0	163	0	164	0	165	0
166	0	167	0	168	0	169	0	170	0
171	0	172	0	173	0	174	0	175	0
176	0	177	0	178	0	179	0	180	0
181	0								

3. REVIEWER COMMENTS

(01) The title of the document could be somewhat limiting. Shouldn't you call it something like "Source Terms for Chapter 14 Accident Calculations Using AST".
Response: Valid point but not implemented.

(02) The coversheet says there are 280 pages, but there are only 184 pages in the calc.
Response: Corrected.

(03) General Comment. Regulatory Guide 1.183, Table 5 indicates the elements that should be included in the design basis source term used for AST calculations. The elements Br, Se, Pd, Eu, and Sm are in that list but are not included in the list of 65 isotopes extracted by the SAS2HED postprocessor, evaluated in Att. I, or even discussed anywhere in the calculation. Br has been included in previous CCNPP accident source terms (Ref. 15). While Section 6.5 mentions the 63 isotope limit of RADTRAD, it seems that there should be basis for picking those included in the final source term from the larger inventory of actinide and fission product isotopes available from SAS2H (i.e., dominant contributors to dose for a given group).
Response: Main 60 isotopes included in calculation were extracted from RADTRAD default deck, which included only the significant isotopes from a dose perspective. See Section 6.5.

(04) General Comment. There is no discussion of IFBA, or axial blankets, which may be included in an upcoming cycle (possibly as soon as next year). This could make the source term obsolete before it's approved.
Response: At time of analysis, no data on IFBA or blanket characteristics existed. Current work is expected to be bounding, since with IFBA and axial blankets, there is less high enriched fuel and less burnup on low enriched fuel.

(05) Section 5. In the second paragraph, the power fractions indicated for case CRCB should be 1.4/1.0/0.6 per Section 9.0 rather than 1.4/1.0/0.96. The latter yields a core power of 3082 MWt for the batch sizes given. This error also appears in the first paragraph of Section 10.
Response: Corrected

(06) Section 6.1. The title to this section says "MCNP4C Methodology," when it should say "SAS2H Methodology." MCNP4C was not used for this calculation.
Response: Corrected

(07) Section 6.3. The 12 cases run from CA06188 (Ref. 15) appear to have been run without adjusting the assembly powers to yield a total core power of 2754 MWt. Thus, they are still at the core power of 2738 MWt used for the Appendix K uprate EQ source term. This probably explains why the PFs in the Section 9 table for these cases do not quite match those calculated from Table 6-4 of CA06188. Furthermore, these 2738 MWt core inventories were divided by a core power of 2754 MWt when generating the Ci/MWt inventories using the SAS2HED code.
Response: Resultant inventory files corrected via use of 2738 MWt value.

(08) Section 6.3. Ref. 15 found that cycles which included an end-of-cycle RCS temperature coastdown (reduction in T_{ave} within program to stay at 100% power after most of sol. B has been letdown) produced the most bounding source term for EQ dose calculations. This is a more common occurrence than a 108 assembly reload, but was not considered in this study.
Response: The author is not aware of any utility that assumes an EOC RCS coastdown in calculating DBA source terms. However, to test this assertion, two additional cases were run: CRX1 (CRCB with inlet moderator temperature and density) and CRX2 (CRCB with outlet moderator temperature and density). Loading pattern comparisons with total and weighted activities and infinite and 30 day integrations were generated. The inlet moderator cases resulted in lower TEDE doses, while the outlet moderator cases resulted in higher TEDE doses. Thus, use of a coastdown moderator temperature would be nonconservative.

(09) Section 6.4(11). May need to say something about INTERPIN3 vs. FATES correlation. The former seems to yield higher fuel temps, which is why it was conservatively used for CA06421. However, the core inventories of the

dominant contributors to dose are not significantly affected by the difference in fuel temperatures that might occur from using one method over the other, as is demonstrated in the Table R1 below.
Response: FATES is CCNPP's design-basis fuel temperature correlation. As shown in Table R1, use of a much higher fuel temperature has a very small effect on isotopics. However, to test the effect of fuel temperature on integrated dose, an additional case was run: CRX3 (CRCB with fuel temperature increased by 300°F). Loading pattern comparisons with total and weighted activities and infinite and 30 day integrations were generated. The loading pattern comparisons with total activities resulted in a slight increase in integrated dose, while the loading pattern comparisons with weighted activities resuilted in a slight decrease in integrated dose. Thus, integrated dose is fairly insensitive to fuel temperature.

(10) Section 6.5, p. 12. The max core Ci/MWt is over predicted by as much as 26% for several isotopes due to the fact that the total Ci used is the sum of the cycle peak for each batch. This is based on a comparison of case 40A2 results from this calculation and Ref. 15. This occurs mainly for isotopes that peak in the fresh batch at some time other than the beginning or end of a cycle. Since this is in the conservative direction, it is not a significant concern.
Response: OK

(11) Section 9. In the table at the beginning of the section, the total core power for Core B and Core C is 2751 MWt and 2749 MWt. Thus, the Ci/MWt for these cases are also slightly non-conservative because the isotopic inventories were divided by 2754 MWt.
Response: Cores B and C adjusted to be slightly over-conservative rather than under-conservative, by changing the core composition from 72/72/73 to 73/72/72.

(12) Attachment D. In SAS2H cases CRAA through CRDB, The Bfrac values were set consistent with those calculated in Attachment C, however, the initial boron concentration in the moderator material was not set in accordance with the value listed in Attachment C. Instead, it seems to have been fixed at 950 ppm (cycle average), which means that the RCS boron concentration starts at the beginning of each cycle at half the value it should be. The moderator boron concentration should be set to the value you want it to be at for a Bfrac of 1.0.(i.e., 1900 ppm).
Response: Corrected

Table R1. Impact of T_{fuel} on Important Nuclide Concentrations

Isotope	Att. I Weighted CRCB Cloudshine Dose % Contribution	Att. I Weighted CRCB Inhalation Dose % Contribution	CA05780 eq4tsc6h Tfuel=1070K initial Ci/assy	CA05780 eq4tsc6ha2 Tfuel=700K initial Ci/assy	% Change With a 370K □ Fuel Temp
sr 90	0.00%	9.08%	4.06E+04	4.08E+04	-0.49%
i131	1.38%	39.49%	2.39E+05	2.38E+05	0.42%
i135	12.10%	2.83%	4.55E+05	4.54E+05	0.22%
kr87	4.61%	0.00%	8.60E+04	8.57E+04	0.35%
i133	4.51%	14.18%	4.72E+05	4.72E+05	0.00%
i134	22.49%	0.36%	5.13E+05	5.13E+05	0.00%
xe138	19.62%	0.00%	3.85E+05	3.84E+05	0.26%
cs134	1.13%	10.88%	1.01E+05	1.02E+05	-0.99%
xe135	1.39%	0.00%	1.40E+05	1.34E+05	4.29%
kr 88	15.93%	0.00%	1.17E+05	1.16E+05	0.85%
pu238	0.00%	2.64%	2.58E+03	2.57E+03	0.39%
pu241	0.00%	1.29%	6.78E+04	6.49E+04	4.28%
cm242	0.00%	0.74%	3.69E+04	3.60E+04	2.44%
cm244	0.00%	1.69%	5.87E+03	5.89E+03	-0.34%

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5. INTRODUCTION

Regulatory Guide 1.183 (Ref.1) and Regulatory Guide 1.195 (Ref. 10) both state that: "The core inventory should be determined using an appropriate isotope generation and depletion computer code such as ORIGEN2 or ORIGEN-ARP." ORIGEN-ARP is essentially a faster method for performing SAS2H/ORIGEN-S calculations. Core inventory factors (Ci/MWt) provided in TID 14844 (Ref.14) were derived for low burnup, low enrichment fuel and should not be used with higher burnup and higher enrichment fuels. Therefore, SAS2H/ORIGEN-S was utilized in this work to generate the isotopic activities for UFSAR Chapter 14 design basis accident scenarios.

For all comparison methodologies (dose rates with unit release fractions, dose rates with Regulatory Guide 1.183 release fractions, doses with unit release fractions, doses with Regulatory Guide 1.183 release fractions), Case CRCB is the most conservative. Case CRCB assumes a three cycle reload with 4.0 w/o enriched U-235, with power fractions of 1.4/1.0/0.6, with batch sizes of 73/72/72, and with a peak burnup of 62004 MWD/MTU. The maximum isotopic activity during a cycle was conservatively utilized to represent that isotopes activity for that cycle. Thus the isotopics from this model will be utilized for all radiological design basis accidents with failed fuel.

The following isotopes will be included in the control room and offsite dose radiological computations:

co 58	co 60	kr 85	kr 85m	kr 87	kr 88	rb 86	sr 89	sr 90	sr 91
sr 92	y 90	y 91	y 92	y 93	zr 95	zr 97	nb 95	mo 99	tc 99m
ru103	ru105	ru106	rh105	sb127	sb129	te127	te127m	te129	te129m
te131m	te132	i131	i132	i133	i134	i135	xe133	xe135	cs134
cs136	cs137	ba139	ba140	la140	la141	la142	ce141	ce143	ce144
pr143	nd147	np239	pu238	pu239	pu240	pu241	am241	cm242	cm244
xe133m	xe135m	xe138							

These nuclides comprise the 60 nuclides included in the RADTRAD default Nuclear Inventory File PWR_DEF.NIF plus the three additional noble gases formerly included in the TID-14844 nuclear inventory (Ref.14) that were determined to be most limiting.

6. INPUT DATA, TECHNICAL ASSUMPTIONS, AND METHODS OF ANALYSIS

(6.1) SAS2H Methodology

Using a prescribed reactor history, the SAS2H depletion analysis can be used to obtain radiation sources, decay heat, and spent fuel isotopics, and then subsequently compute the neutron and gamma dose rates at various distances from a specified shipping cask. Ref.2 documents the SCALE 4.4 modular code system SAS2H. The SAS2H control module performs the depletion/decay analysis using the well-established codes and data libraries provided in the SCALE system. Problem-dependent resonance processing of neutron cross sections is performed using the Bondarenko resonance self-shielding module BONAMI-S and the Nordheim Integral Treatment resonance self-shielding module NITAWL-II. The XSDRNPM-S module is used to produce spectral weighted and collapsed cross sections for the fuel depletion calculations. COUPLE updates the cross section constants included on an ORIGEN-S nuclear data library with data from the cell-weighted cross section library produced by XSDRNPM-S. The weighting spectrum computed by XSDRNPM is applied to update all nuclides in the ORIGEN-S library that were not specified in the XSDRNPM analysis. The point-depletion ORIGEN-S module is used to compute time-dependent concentrations and source terms for isotopes simultaneously generated and depleted through neutronic transmutation, fission, and radioactive decay. XSDOSE applies the angular flux at the surface of a shipping cask to compute dose rates at specified detector positions outside the shipping cask. Ref.5 states that "cross sections of actinide isotopes processed from ENDF/B-V were superior to those taken from ENDF/B-IV." Thus the cross section library 44GROUPNDF5 will be utilized in all SAS2H calculations. 44GROUPNDF5 is a 44-energy group library derived from the latest ENDF/B-V files with the exception of O-16, Eu-154, and Eu-155, which were taken from the more improved ENDF/B-VI files. Note that the SAS2H/ORIGEN-S libraries include 689 light elements, such as clad and structural materials, 129 actinides, including fuel nuclides and their decay and activation products, and 879 fission product nuclides.

The method applied by SAS2H starts with the data describing a fuel assembly as it is initially loaded into a particular reactor. The composition, temperatures, geometry, and time-dependent specific power of the fuel assembly are required. For each time-dependent fuel composition, the SAS2H sequence performs 1-D neutron transport analysis (via XSDRNPM) of the reactor fuel assembly using a two-part procedure with two separate unit-cell-lattice models. The first model is a unit fuel-pin cell from which cell-weighted cross sections are obtained. The second model represents a larger unit cell (e.g., an assembly) within an infinite lattice. The larger unit-cell zones can be structured for different types of BWR or PWR assemblies containing water holes, burnable poison rods, gadolinium fuel rods, etc.

(6.2) Fuel and Assembly Parameters

The fuel assemblies contain uranium dioxide (UO_2) over the entire length of the active fuel region in each fuel rod and a uniform distribution of enrichments both radially and axially. The fuel and 14x14 assembly parameters for standard and VAP fuel designs are detailed in Attachment A. Note that this work models VAP assemblies, since their increased mass makes them more limiting.

(6.3) Cycle Loading Patterns

The cycle loading patterns modeled in this work are listed in Attachment B. The first three patterns (A, B, C) correspond to three cycle depletions of 668.3 EFPD per cycle with a maximum burnup of 62 GWD/MTU and a 72 assembly reload. The power fractions and corresponding specific power in MW/assembly were varied from uniform over the three cycles (PF=1) to a 40% skewed power distribution (cycle 1 PF=1.4, cycle 2 PF=1.0, cycle 3 PF=0.6). These core loading patterns maximized the number of assemblies achieving the maximum burnup of 62 GWD/MTU over three cycles. Pattern D corresponds to a two cycle depletion of 730 EFPD per cycle with a maximum burnup of 45152 MWD/MTU and a 108 assembly reload. Note that 730 EFPD is the maximum attainable under a two year cycle. These patterns (A, B, C, D) were modeled at 4.0 w/o and 5.0 w/o U-235, the minimum and maximum non-blanket enrichments expected to be utilized at CCNPP.

The cycle loading patterns 50A2, 50B2, 50C2, 50D2, 50E2, and 50F2 correspond to three cycle depletions ranging from an 84 to a 100 assembly reload of 5.0 w/o U-235 typical of CCNPP operation and are documented in detail in

Ref.15. Corresponding patterns were modeled at 4.0 w/o U-235 (40A2, ..., 40F2), the minimum and maximum non-blanket enrichments expected to be utilized at CCNPP.

Per UFSAR Tables 3.3-1 and 3.3-2, the maximum stack height density is 10.31 gm/cc (<94.5% theoretical density). Thus a nominal stack height density of 94.5% of theoretical density (10.3572 gm/cc) will be assumed. This corresponds to a assembly mass of 0.410372 MTU and a core mass of 89.05065 MTU.

(6.4) SAS2H Inputs
The SAS2H input decks for this work are listed in Attachment D. The various components of the input decks were determined as follows:

(01) The SAS2H module is executed by typing =SAS2H in the first six columns of the first card. To skip the cask dose rate calculations, type PARM=SKIPSHIPDATA on the first card.

(02) An 80-character title on the second card.

(03) On card 3, the SAS2H executions should utilize the 44GROUPNDF5 cross section library as recommended and validated in Refs.2 and 4. 44GROUPNDF5 is a 44-energy group library derived from the latest ENDF/B-V files with the exception of O-16, Eu-154, and Eu-155, which were taken from the more improved ENDF/B-VI files. Per Ref.2, SAS2H always requires LATTICECELL on card 3.

(04) Material Specifications
(a) The UO_2 weight percentages for 5.0, 4.5, 4.0, 3.5, 3.0, 2.5, and 2.0 w/o enriched fuel are derived in Attachment B. The methodology for calculating the weight percentages is as follows:

U5w = U235 w/o enrichment of total U (given)
U8w = (100-U5w) = U238 w/o enrichment of total U
Ow = 32*(U5w/235+U8w/238)
U5x = U5w/(U5w+U8w+Ow)=U235 w/o of UO_2
U8x = U8w/(U5w+U8w+Ow) =U238 w/o of UO_2
Ox = Ow/(U5w+U8w+Ow) =O16 w/o of UO_2

(b) Per UFSAR Tables 3.3-1 and 3.3-2, the maximum stack height density is 10.31 gm/cc (<94.5% theoretical density). Thus a nominal stack height density of 94.5% of theoretical density (10.3572 gm/cc) will be assumed.

(c) Per Refs.2 and 5, trace elements of selected nuclides are automatically included by SAS2H to assure appropriate cross sections are available for important nuclides that accumulate in the fuel during depletion. These include

Xe-135	Cs-133	U-234	U-235	U-236
U-238	Np-237	Pu-238	Pu-239	Pu-240
Pu-241	Pu-242	Am-241	Am-242m	Am-243
Cm-242	Cm-243	Cm-244	1/v-absorber	

(d) Per Ref.2, trace elements of additional nuclides (trace density $1x10^{-20}$ atoms/b-cm) may be added by the user to assure appropriate cross sections are available for important nuclides that accumulate in the fuel during depletion. The additional nuclides used in this work corresponds to a set generated by ORNL in Ref.5. These isotopes represent the highest worth fission products or the precursors for the highest worth fission products and include the following:

Moderator region: Co-59

Fuel region:	Zr-94	Mo-94	Nb-95	Mo-95
Tc-99	Rh-103	Rh-105	Ru-106	Sn-126
Xe-131	Cs-134	Cs-135	Cs-137	Pr-143
Nd-143	Ce-144	Nd-144	Nd-145	Nd-146
Nd-147	Pm-147	Sm-147	Nd-148	Pm-148

Sm-148	Pm-149	Sm-149	Nd-150	Sm-150
Sm-151	Eu-151	Sm-152	Eu-153	Eu-154
Gd-154	Eu-155	Gd-155	Gd-157	Gd-158
Gd-160				

(e) Light elements are used in the calculation of the average energy per fission. Since most of the energy released per fission is in the kinetic energy of the fission products, the correction for capture energy with light element absorption is small. ORNL in Ref.5 has been in the practice of estimating the light element content of PWRs by use of a constant content. Assembly light element masses were taken from Reference 5 and are summarized below.

Assembly Light Element Masses

Element	Kg/assm
O	119
Fe	11
Zr	195
Cr	5.2
Co	0.066
Nb	0.63
Mn	0.29
Ni	8.7
Sn	3.2

(5) Core Moderator Temperature:
Per UFSAR Figure 4-9, an average core moderator temperature of 574.5°F or 574.54°K will be employed in all SAS2H calculations. The corresponding water density of 0.7241 gm/cc is derived from data extracted from Ref.2.

(6) Clad Composition and Temperature:
The clad was assumed to be composed of zircaloy-4 (ZIRC4) as defined in the Standard Composition Library of Ref. 2. Current fuel pin clad composition includes zirlo, optin, low tin zirlo, alloy A, and M5; however, ~98% of these materials are composed of zirconium, thus the use of zirc4 should be representative of the clad. Also note that fission products and actinides will be extracted from the SAS2H executions for use in the dose calculations. A clad temperature of 584.5°K was utilized in this work consistent with Refs.4 and 5 (~10° above the moderator temperature).

(7) Path A Geometry:
The model used in Path A represents the fuel as an infinite lattice of fuel pins. Cell-weighted cross sections are produced by this model and are then applied to the fuel zone of the Path B model. The VAP fuel rod pitch (1.4732 cm), pellet outer diameter (0.96774 cm), clad outer diameter (1.1176 cm), and clad inner diameter (0.98552 cm) are extracted from Attachment A.

(8) Path B Geometry:
The model applied to Path B is a larger unit cell model used to represent part of an assembly within an infinite lattice. The concept of using cell-weighted data in the 1-D XSDRNPM-S analysis of Path B is an appropriate method for evaluating heterogeneity effects found in fuel pin lattices. The Path B model is used by SAS2H to generate few-group, cell-weighted cross sections for ORIGEN-S and to calculate the neutron flux for an assembly-averaged fuel region that is used to update the ORIGEN-S spectral parameters for isotopes not explicitly included in the cell model. The essential rule in deriving the zone radii is to maintain the relative volumes in the actual assembly. The effective radii for the SAS2H Path B model for 176 pin VAP CE 14x14 assemblies were taken from Attachment A.

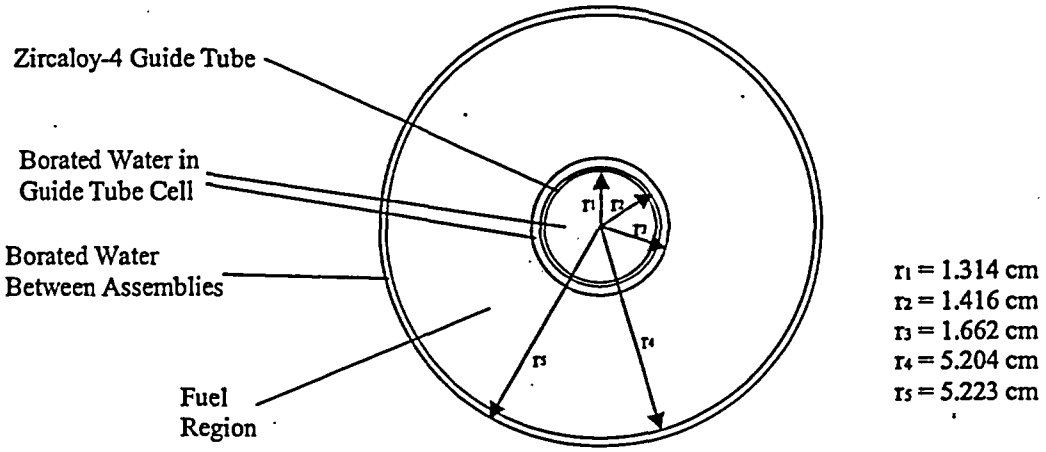

Figure 1: Path B Model for SAS2H

(9) Additional Inputs:

		Definition	Reference
NPIN/ASSM	176	Number of fuel rods/assembly	Attachment A
FUELNGTH	347.218	Fuel rod active length in cm	Attachment A
NCYCLES	Variable	Number of cycles	
NLIB/CYC	1	Number of libraries made per cycle	
PRINTLEVEL	10	Print level	Ref.2 S2.5.19
LIGHTEL	9	Number of light elements	Section 4e
INPLEVEL	2	Input level	Ref.2 S2.5.14
NUMHOLES	5	Number of guide tubes per assembly	Attachment D
NUMINSTR	0	Number of instrument tubes per assembly	Attachment D
MXTUBE	2	Mixture number of guide tubes	
ORTUBE	1.41605	Outside radius of guide tubes in cm	Attachment A
SRTUBE	1.31445	Inside radius of guide tubes in cm	Attachment A
ASMPITCH	20.7772	Assembly pitch in cm	Attachment A
NUMZTOTAL	5	Number of zones in Path B cell	Attachment A
MXREPEATS	1	Mixes and radius required only once	Ref.2 S2.5.5
MIXMOD	3	Mixture number of moderator	
FACMESH	1.0	Mesh size factor	

(10) Soluble Boron Concentration:

The concentration of soluble boron is adjusted to maintain core criticality. The soluble boron concentration is gradually decreased as the burnup increases and reaches a minimum value at the end of cycle. The limit on moderator temperature coefficient (MTC) restricts the level of soluble boron concentration in a given reactor cycle, which is the reason that many plants with long cycle lengths resort to the use of burnable absorbers in fuel assemblies. The average soluble boron concentration can be calculated from the critical boron letdown curve generated as a result of fuel reload analysis. Per Refs.16-18, the maximum BOC soluble boron concentration is less than 1820 ppm, where Ref.18 models a cycle at the MTC Technical Specification limit. The boron letdown curves in these cycles are approximately linear with exposure. Thus a bounding BOC soluble boron concentration of 1900 ppm will be assumed with a linear letdown curve, resulting in a maximum average soluble boron concentration of 950 ppm.

Attachment C details the calculation of the soluble boron concentration and the corresponding boron fraction (bfrac) as a function of burnup for loading patterns A-D. The soluble boron concentration and the corresponding boron fraction (bfrac) as a function of burnup for loading patterns 50A2, ...are detailed in Ref.15.

(11) Fuel Temperature:
A significant spatial variation exists in the fuel temperature because of the low thermal conductivity of UO_2. The fuel temperature is highest at the pellet centerline and lowest at the pellet outside diameter. In addition, the fuel temperature varies axially due to different linear heat generation rates at different axial positions. Fuel temperature used in the SAS2H cases was calculated using the fuel temperature correlation from the CORD model for Unit 1 Cycle 16, as documented in file gbnszsoq.cdf of Refs.19-20. The correlation is:

$$T_{fuel} = T_{mod} + (-2.34607E\text{-}7*B^2 + 1.10995E\text{-}3*B + 130.08)*L + (-9.505119E\text{-}13*B^3 + 5.13836E\text{-}8*B^2 - 5.11639E\text{-}4*B - 1.67177)*L^2$$

where,
T_{fuel} = fuel temperature in °F
T_{mod} = moderator temperature in °F
B = burnup in MWd/MTU
L = linear power density in kW/ft.

As in the CORD model, the actual burnup is used up to 20,000 MWd/MTU, above which it is fixed at 20,000 MWd/MTU.

Attachment C details the calculation of the fuel temperature as a function of burnup for a T_{mod} value of 574.5°F per UFSAR Figure 4-9 and a core thermal power of 2754 MWt for loading patterns A-D. The fuel temperature as a function of burnup for loading patterns 50A2, ...are detailed in Ref.15.

(12) TMPFUEL, TMPCLAD, TMPMOD
Note that the fuel, moderator, and clad temperatures are defined on the material cards; however, they may also be specified on the power cards via the TMPFUEL, TMPCLAD, and TMPMOD inputs. If the temperatures are specified on the power cards, all must be specified or none must be specified. If none are specified, the temperatures on the material cards will be utilized. If all are specified, the temperatures on the power cards will be utilized. If only some are specified on the power cards, the remaining will be set to zero.

(13) Assembly Power
The specific power (SP) and assembly power (AP) are calculated from the VAP fuel data detailed in Attachment A.

$$M = \pi*(0.96774/2cm)^2*(347.218cm)*(10.96gm/cc)*(0.945)*(176)*(238/270)/(10^6 gm/MTU)$$
$$= 0.410372 \text{ MTU}$$

$$SP = (2700 \text{ MWt})*(1.02)*PF/217/M$$
$$= 30.93*PF \text{ MW/MTU}$$

$$AP = (2700 \text{ MWt})*(1.02)*PF/217$$
$$= 12.6912*PF \text{ MW/assm}$$

$$EFPD = \text{Burnup(MWD/MTU)} * M(\text{MTU}) / AP(\text{MW/assm})$$

which assumes a 2% power uncertainty and a peaking factor of PF. The correspondence between burnup and EFPD for the above powers are listed in Attachment C.

(6.5) Base Isotopics
Per Ref.26, Radtrad has the capability of using various core inventories that are specific to a plants needs, based on its licensed values. Currently, Radtrad v3.03 has MACCS (Ref.27) PWR and BWR default 60 nuclide inventory files. The default RADTRAD data have been taken from sample calculations used by MACCS (NUREG/CR-4691) that are based upon ORIGEN calculations. The isotopes chosen are those selected in WASH-1400 with the additional 6 isotopes added by NUREG/CR-4467 and used in the MACCS code (NUREG/CR-4691).

The relative importance to offsite health and economic consequences of the radioactive elements in a nuclear reactor core was examined in Ref.29, assuming equal release fractions. Radionuclide inventories for a PWR and BWR were calculated with the SANDIA-ORIGEN code (Ref.28) as a function of fuel burnup, reactor power level, reactor type, and time from shutdown. The relative radiological importance of the fission product, activation product, and actinide nuclides was determined with the severe accident risk-assessment code MELCOR and with the health and economic consequence model MACCS. Of the 89 elements and 500 nuclides considered by ORIGEN, only about 25 elements and 60 nuclides could be important contributors to offsite consequences. This conclusion was based on the inventory, half-life, and potential biological hazard of the radionuclides of each element. The 60 important nuclides determined in this work are identical to those employed in the RADTRAD default file.

The reference source term ST21 for severe accidents in French reactors (Ref.30) is a subset of that included in MACCS and the RADTRAD default file.

(6.6) SAS2H Edit Code:
The SAS2H/ORIGEN-S libraries include 689 light elements, such as clad and structural materials, 129 actinides, including fuel nuclides and their decay and activation products, and 879 fission product nuclides. It was necessary to generate SAS2H isotopics as a function of loading pattern, burnup, and enrichment; to edit each output for the specified number of actinide and fission product values; to convert the isotopic content from moles to curies/mwth; to create an EXCEL spreadsheet of the results, to create a summary punch file of the results, and to generate a Nuclear Inventory File suitable for input into the RADTRAD code (Ref.21). This laborious task was simplified by writing the FORTRAN programs SAS2HED2, which accomplished all of the above.

The FORTRAN code listing for SAS2HED2.FOR is included in Attachment E. The program can be compiled and linked via the FORT51 and LINK51 batch files. A copy of FORT51.BAT and LINK51.BAT are included on the accompanying CDROM. The program executable file SAS2HED2.EXE is executed on DOS. The program queries the user for the 8 character SAS2HED2 input file name (e.g. xxxx.SED).

The SAS2HED2 program reads the following data from the input SED file (e.g. See Attachment F):
(1) The 8 character name of the summary punch file generated by SAS2HED2 (e.g. xxxx.PUN - Attachment G) in Format A8.

(2) The 8 character name of the isotopic inventory per megawatt thermal power EXCEL file generated by SAS2HED2 (e.g. xxxx.XLS) in Format A8.

(3) The 8 character name of the nuclear inventory file generated by SAS2HED2 (e.g. xxxx.NIF - Attachment H) for direct use in RADTRAD in Format A8.

(4) The 8 character name of the SAS2H output file (e.g. xxxx.OUT) in Format A8.

(5) The reactor power POWER in MWth.

(6) The number of burnup steps in each of the three cycles of the SAS2H output (N1, N2, N3). The total number of burnup steps NT should correspond to the total number of burnup steps in the SAS2H execution.

(7) The number of assemblies in each of the three batches, each corresponding to a cycle (NA1, NA2, NA3). The total NAT should equal 217.

(8) 592 lines of a sample Nuclear Inventory File ANIF(K). Note that it is into this sample Nuclear Inventory File that the updated isotopic activities per unit power will be inserted.

The SAS2HED2 program performs the following functions:

(1) SAS2HED2 edits the number of moles for the following 65 actinides and fission products at each burnup step in SAS2H {B1C(I,J), where I=1,NT; J=1,65}.

co 58	co 60	kr 85	kr 85m	kr 87	kr 88	rb 86	sr 89	sr 90	sr 91
sr 92	y 90	y 91	y 92	y 93	zr 95	zr 97	nb 95	mo 99	tc 99m
ru103	ru105	ru106	rh105	sb127	sb129	te127	te127m	te129	te129m
te131m	te132	i131	i132	i133	i134	i135	xe133	xe135	cs134
cs136	cs137	ba139	ba140	la140	la141	la142	ce141	ce143	ce144
pr143	nd147	np239	pu238	pu239	pu240	pu241	am241	cm242	cm244
kr 83m	xe131m	xe133m	xe135m	xe138					

These nuclides comprise the 60 nuclides included in the RADTRAD default Nuclear Inventory File PWR_DEF.NIF plus five additional noble gases formerly included in the TID-14844 nuclear inventory (Ref.14). Note that RADTRAD has a 63 nuclide limit, and thus two of the additional nuclides must be manually deleted.

(2) The edited molar quantities are converted to curies/mwth via the following procedure:
(a) The edited molar quantities B1B(I,J) are converted to curies B1C(I,J) for each burnup step I=1,NT and for each isotope J=1,65 via the following algorithm:

B1C(I,J) = B1B(I,J) * (6.023E+23 atoms/mole) * CL(J) / (3.7E+10 dis/sec/Ci)

The relevant half-lives CT(I) in seconds extracted from Ref.22 are as follows:

6.1240E+06	1.6623E+08	3.3838E+08	1.6128E+04	4.5720E+03
1.0224E+04	1.6114E+06	4.3649E+06	9.1770E+08	3.4200E+04
9.7560E+03	2.3069E+05	5.0544E+06	1.2744E+04	3.6720E+04
5.5313E+06	6.0480E+04	3.0214E+06	2.3739E+05	2.1636E+04
3.3929E+06	1.5984E+04	3.2167E+07	1.2744E+05	3.3178E+05
1.5840E+04	3.3840E+04	9.4176E+06	4.1760E+03	2.9030E+06
1.1664E+05	2.8166E+05	6.9466E+05	8.2080E+03	7.4880E+04
3.1560E+03	2.3652E+04	4.5300E+05	3.2760E+04	6.5122E+07
1.1370E+06	9.5144E+08	5.0256E+03	1.1016E+06	1.4498E+05
1.4040E+04	5.5440E+03	2.8080E+06	1.1923E+05	2.4589E+07
1.1724E+06	9.4867E+05	2.0347E+05	2.7657E+09	7.6002E+11
2.0688E+11	4.5412E+08	1.3646E+10	1.4066E+07	5.7080E+08
6.6960E+03	1.0282E+06	1.8922E+05	9.1800E+02	8.4600E+02/

The isotopic decay constant is defined by

CL(I) = 0.6931472/CT(I)

(b) The maximum activity in curies for each isotope J for cycle 1 (N=1,N1) is determined and designated B1D(1,J). Similarly, the maximum activity in curies for each isotope J for cycle 2 (N=N1+1,N1+N2) is determined and designated B1D(2,J). Finally, the maximum activity in curies for each isotope J for cycle 3 (N=N1+N2+1,NT) is determined and designated B1D(3,J).

(c) The activity per unit power in curies per mwth for each isotope J is then calculated via

B1E(1,J) = B1D(1,J) * NA1 / POWER for once burned fuel
B1E(2,J) = B1D(2,J) * NA2 / POWER for twice burned fuel
B1E(3,J) = B1D(3,J) * NA3 / POWER for thrice burned fuel
B1E(4,J) = B1D(1,J) + B1D(2,J) + B1D(3,J) for total core

(3) End of execution isotopics in grams was also editted from SAS2H and stored as DG(1,J) for J=1,65. The end of execution isotopics in grams was also calculated from the previously editted quantity B1B(NT,J) via the algorithm

DG(2,J) = B1B(NT,J) * CW(J) for J=1,65

where the atomic weight CW(J) is defined as

058.	060.	085.	085.	087.	088.	086.	089.	090.	091.
092.	090.	091.	092.	093.	095.	097.	095.	099.	099.
103.	105.	106.	105.	127.	129.	127.	127.	129.	129.
131.	132.	131.	132.	133.	134.	135.	133.	135.	134.

136.	137.	139.	140.	140.	141.	142.	141.	143.	144.
143.	147.	239.	238.	239.	240.	241.	241.	242.	244.
083.	131.	133.	135.	138.					

(4) End of execution isotopics in curies was also editted from SAS2H and stored as DC(1,J) for J=1,65. The end of execution isotopics in curies was also calculated from the previously editted quantity B1B(NT,J) via the algorithm
DC(2,J) = B1B(NT,J) * (6.023E+23 atoms/mole) * CL(J) / (3.7E+10 dis/sec/Ci)

(5) The SAS2HED2 code then prints a summary output file (xxx.pun) to unit 6 with the following contents:
(a) The power, the number of burnup steps per cycle, the total number of burnup steps, the number of assemblies per cycle, and the total number of assemblies.

(b) A listing of the isotopic elements.

(c) For each burnup step, the EFPD and the isotopic activity in moles.

(d) For each burnup step, the EFPD and the isotopic activity in curies.

(e) For each isotope, the isotope name, CW(J), CT(J), CL(J), DG(1,J), DG(2,J), DC(1,J), and DC(2,J).

(f) For each isotope, the isotope name, B1D(1,J), B1D(2,J), B1D(3,J), B1E(1,J), B1E(2,J), B1E(3,J), B1E(4,J)

(6) The SAS2HED2 code then prints an EXCEL file (xxx.xls) to unit 7 with the isotopic activity in curies/mwth for each isotope.

(7) The SAS2HED2 code then prints a Nuclear Inventory file (xxx.nif) to unit 8 employing the sample NIF file from the input file with the isotopic activities replaced by the newly calculated isotopic activities in curies/mwth.

Verification that the program performs its intended function properly was checked as follows:

(1) The edited molar values were verified to be identical to those in the SAS2H output file.

(2) The conversion from moles to curies/mwth was verified.

(3) The RADTRAD Nuclear Inventory Files were verified.

7. REFERENCES

(01) "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors", Regulatory Guide 1.183:

(02) "SAS2H: A Coupled One-Dimensional Depletion and Shielding Analysis Module", NUREG/CR-0200 Rev.6.

(03) "SCALE 4.4 Verification and Validation for BGE's CCNPP", CA04910.

(04) "SAS2H Validation", CA05780.

(05) "Validation of the SCALE System for PWR Spent Fuel Isotopic Composition Analyses", ORNL/TM-12667.

(06) "Calvert Cliffs Unit 2 Cycle 14 EQ Source Term Verification", CA05653.

(07) NRC Generic Letter 83-11: Supplement 1: Licensee Qualification for Performing Safety Analyses

(08) "Standard Review Plan for Dry Cask Storage Systems, Final Report," NUREG-1536, January 1997

(09) "Standard Review Plan for Spent Fuel Dry Storage Facilities," NUREG-1567, March 2000.

(10) "Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light Water Nuclear Power reactors", Regulatory Guide 1.195

(11) "Safety Evaluation By the Office of Nuclear Reactor Regulation for Topical Report for the Insertion of Lead Test Assemblies Containing U-236 into the Sequoyah Unit 2 Core," Docket 50-328, February 1999.

(12) "Brunswick Steam Electric Plant, Units 1 and 2 – Issuance of Amendment Re: Alternate Source Term (TAC Nos. MB2570 and MB2571)", SER, May 30, 2002

(13) "Guide Tube Assembly Details", BGE Drawing E-STD-701-303 Rev.5.

(14) TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites"

(15) CA06188: EQ(50.49) Source Term for 24-Month Full Core VAP with Power Uprate

(16) "Unit 1 Technical Data Book", NEOP-13, Rev.18

(17) "Unit 2 Technical Data Book", NEOP-23, Rev.14

(18) "Calvert Cliffs Unit 1 Cycle 15 CORD and ROCS Design Models and Depletions", ABB/CE Calculation A-CC1-FE-0090 Rev.01

(19) "Calvert Cliffs Unit 1 Cycle 16 CORD/ROCS Design Models and Depletions," CCNPP Calculation CA05735, Westinghouse Calculation A-CC1-FE-0128, Rev. 0.

(20) "RC Waste Processing System Incident and Waste Gas Incident - Dose Analysis", CA05994

(21) NUREG/CR-6604 Supplement 2, 10/2002: RADTRAD A Simplified Model for Radionuclide Transport and Removal and Dose Estimation

(22) "Chart of the Nuclides", Nuclides and Isotopes Fifteenth Edition, GE Nuclear Energy.

(23) Federal Guidance Report No.11: Limiting Values of Radionuclide Intake and Air Concentration and DCFs for Inhalation, Submersion, and Ingestion

(24) Federal Guidance Report No.12: External Exposure to Radionuclides in Air, Water, and Soil

(25) CA06012: Control Room Habitability Atmospheric Dispersion Coefficient Calculations

(26) ITSC RADTRAD Version 3.03, Verification and Validation Report, 11/28/2001

(27) Melcor Accident Consequences Code System (MACCS): Model Description, NUREG/CR-4691, SAND86-1562, Vol.2

(28) Sandia ORIGEN User's Manual, NUREG/CR-0987, SAND 79-0299

(29) Relative Importance of Individual Elements to Reactor Accident Consequences Assuming Equal Release Fractions, NUREG/CR-4467, SAND85-2575

(30) Nuclear Fuel Cycle Implementation in France, M.Dreicer, etal, 8/95.

8. DOCUMENTATION OF COMPUTER CODES

The SCALE 4.4 code package was obtained from the Radiation Safety Information Computational Center (RSICC) at Oak Ridge National Laboratory (ORNL). The SCALE 4.4 code package can be used to perform nuclear criticality safety, radiation shielding, source term, and heat transfer computer analyses. The software package is comprised of control modules and functional modules that utilize appropriate cross section and data libraries.

The SCALE 4.4 verification package is documented in Ref.3. The combined test suite of 60 cases verified that the criticality, source term, shielding, and heat transfer modules were correctly installed on the subject PC, by comparing the computer outputs of Ref.3 with those provided from RSICC.

The SAS2H benchmark calculations are documented in Reference 4. SAS2H is benchmarked to the Calvert Cliffs Unit 2 Cycle 14 EQ radioactive source terms of Ref.6 and to the measured data in ORNL/TM-12667 (Ref.5). Ref.6 constitutes a safety-related source term calculation performed by Westinghouse/Combustion Engineering (W/CE), thus agreement between the Ref.6 and the Ref.4 results constitute a valid benchmark. Ref.5 documents radiological assays of PWR spent fuel conducted by the Material Characteristics Center (MCC) at Pacific Northwest Laboratory (PNL) using discharged PWR fuel from Calvert Cliffs Unit 1 and H. B. Robinson Unit 2. Additional spent fuel radiological assays were conducted by four research laboratories in Europe using fuel from the Obrigheim (KWO) PWR. Even though not exhaustive in scope, the validation included comparison of predicted and measured concentrations for 14 actinides and 37 fission and activation products.

Per GL 83-11 (Ref.7), the applicability of a methodology is that specified in NRC safety evaluation reports (SERs) or those that the NRC has reviewed and approved generically as determined by reference to applicable regulatory guides or NUREGs.

The use of SAS2H is supported in numerous NRC guidance documents that specifically discuss methods to generate isotopic and thermal source terms for irradiated fuel. In NUREG-1536 (Ref. 8, p. 5-3) and NUREG-1567 (Ref. 9, p. 7-9) the NRC states that: "Generally, the applicant will determine the source terms using ORIGEN-S (e.g., as a SAS2H sequence of SCALE), ORIGEN2, or the U.S. Department of Energy (DOE) Characteristics Data Base. Although the latter two are easy to use, both have energy group structure limitations. If the applicant has used ORIGEN2, verify that the chosen cross-section library is appropriate for the fuel being considered. Many libraries are not appropriate for burnup that exceeds 33,000 MWd/MTU."

With regards to determining the inventory of fission products in an operating reactor core for use in accident dose calculations, Regulatory Guide 1.183 (Ref. 1) and Regulatory Guide 1.195 (Ref. 10) both state that: "The core inventory should be determined using an appropriate isotope generation and depletion computer code such as ORIGEN2 or ORIGEN-ARP." ORIGEN-ARP is essentially a faster method for performing SAS2H/ORIGEN-S calculations. Therefore, while SAS2H is not specifically mentioned in RG 1.183 and RG 1.195, its endorsement is implicit in that of ORIGEN-ARP.

In addition to the numerous regulatory guides and review plans mentioned above, the NRC has also issued an SER (Ref. 11) for the Framatome topical report BAW-2328, which utilized SAS2H as part of its methodology. BAW-2328 was prepared to demonstrate that the use of four LTAs containing downblended uranium, with higher than standard amounts of U-234 and U-236, would be bounded by the original safety analysis parameters. As part of this demonstration, SAS2H was utilized to generate the isotopic source terms that were compared against standard assemblies to demonstrate no adverse radiological consequences. In addition, SAS2H generated isotopics were also used as input in criticality models to demonstrate that the higher amounts of U-234 and U-236 would not introduce a significant reactivity difference in the Sequoyah Unit 2 core during the depletion. Brunswick Steam Electric Plant, Units 1 and 2 implemented SAS2H in their SER (Ref.12) for control room habitability.

9. CALCULATIONS AND RESULTS

Twenty SAS2H executions were performed for this effort.

Case	Enr	EFPD	PF1	PF2	PF3	NA1	NA2	NA3	BU1	BU2	BU3
	w/o	/cycle							mwd/t	mwd/t	mwd/t
50A2	5.0	720	1.2013	1.0297	0.4736	88	88	41	26908	49972	60580
50B2	5.0	720	1.1959	1.0318	0.3269	92	92	33	26789	49901	57223
50C2	5.0	720	1.1911	1.0083	0.2976	96	92	29	26679	49266	55932
50D2	5.0	720	1.2993	1.0542	0.2105	88	88	41	29105	52718	57433
50E2	5.0	720	1.2353	1.0216	0.5451	84	84	49	27670	50553	62762
50F2	5.0	720	1.1687	0.9332	0.3265	100	100	17	26179	47081	54396
40A2	4.0	720	1.2013	1.0297	0.4736	88	88	41	26908	49972	60580
40B2	4.0	720	1.1959	1.0318	0.3269	92	92	33	26789	49901	57223
40C2	4.0	720	1.1911	1.0083	0.2976	96	92	29	26679	49266	55932
40D2	4.0	720	1.2993	1.0542	0.2105	88	88	41	29105	52718	57433
40E2	4.0	720	1.2353	1.0216	0.5451	84	84	49	27670	50553	62762
40F2	4.0	720	1.1687	0.9332	0.3265	100	100	17	26179	47081	54396
CRAA	5.0	668.3	1.0	1.0	1.0	73	72	72	20668	41336	62004
CRAB	4.0	668.3	1.0	1.0	1.0	73	72	72	20668	41336	62004
CRBA	5.0	668.3	1.2	1.0	0.8	73	72	72	24802	45470	62004
CRBB	4.0	668.3	1.2	1.0	0.8	73	72	72	24802	45470	62004
CRCA	5.0	668.3	1.4	1.0	0.6	73	72	72	28935	49603	62004
CRCB	4.0	668.3	1.4	1.0	0.6	73	72	72	28935	49603	62004
CRDA	5.0	730	1.0	1.0		108	109		22576	45152	
CRDD	4.0	730	1.0	1.0		108	109		22576	45152	

Attachment I displays the activity per unit power (S_i) results of the above SAS2H cases, which were extracted directly from the xxx.xls output files. To determine the most conservative case for the design basis accidents, effective TEDE doses and dose rates were calculated via several methodologies. Using the cloud-shine dose conversion factor (DCF_{CSi}) and inhaled chronic dose conversion factors (DCF_{ICi}) from Refs.23-24, decay constants (λ_i) calculated from Ref.22, and release fractions (RF_i) from Ref.1 as well as unit release fractions, the cloud-shine dose rates (DR_{CS}) and doses (D_{CS}), inhaled-chronic dose rates (DR_{IC}) and doses (D_{IC}), and TEDE dose rates (DR_T) and doses (D_T) were calculated via the following algorithms:

$$DR_{CS} = \Sigma\{DCF_{CSi} * S_i * RF_i\} * f * P * (3.70E{+}12 \text{ Rem/Ci / Sv/Bq}) / V_{CR} \text{ in Rem/sec}$$

$$D_{CS} = \Sigma\{DCF_{CSi} * S_i * RF_i / \lambda_i * (1. - \exp(-\lambda_i * t)\} * f * P * (3.70E{+}12 \text{ Rem/Ci / Sv/Bq}) / V_{CR} \text{ in Rem}$$

$$DR_{IC} = \Sigma\{DCF_{ICi} * S_i * RF_i\} * BR * P * (3.70E{+}12 \text{ Rem/Ci / Sv/Bq}) / V_{CR} \text{ in Rem/sec}$$

$$D_{IC} = \Sigma\{DCF_{ICi} * S_i * RF_i / \lambda_i * (1. - \exp(-\lambda_i * t)\} \; BR * P * (3.70E{+}12 \text{ Rem/Ci / Sv/Bq}) / V_{CR} \text{ in Rem/sec}$$

$$DR_T = DR_{CS} + DR_{IC}$$

$$D_T = D_{CS} + D_{IC}$$

where

f = geometry correction factor (Ref.1) = $V_{CR}^{0.338}/1173 = 0.059784$
V_{CR} = 189194 cf (Ref.25)
P = 1 MWt (assumed for comparitive purposes only)
t = 30 days (assumed for comparitive purposes only)
BR = breathing rate (Ref.1) = 3.5E-04 m^3/sec

Note that the results of the current cases are compared to the default RADTRAD case pwr_def.nif from Ref.21. For all four comparison methodologies (dose rates with unit release fractions, dose rates with Ref.1 release fractions, doses with unit release fractions, doses with Ref.1 release fractions), Case CRCB is the most conservative. Thus the isotopics from this model will be utilized for all radiological design basis accidents with failed fuel.

Since RADTRAD (Ref.21) can only utilize 63 isotopes, the 65 isotopes in the CRCB.NIF nuclear inventory file must be pared down to 63. Attachment J shows the xenon and krypton isotopes used in a TID-14844 analysis (Ref.14). Assuming TID-14844 source terms S_i (Ref.14), decay constants λ_i and half-lives from Ref.22, and dose conversion factors DCF_i from Ref.24, the isotopic doses D_i can be readily calculated:

$$D_i = S_i * P * DCF_i * (1. - \exp(-\lambda_i * t)) / \lambda_i$$

Since Xe-133, Xe-135, Kr-85m, Kr-85, Kr-87, and Kr-88 were included in the base RADTRAD files, Xe-131m, Xe133m, Xe-135m, Xe-138, and Kr-83m were analyzed for effect. The least consequential isotopes as determined in Attachment J are Xe-131m (contributing 0.083% of noble gas 30 day dose) and Kr-83m (contributing 0.00004% of noble gas 30 day dose). Thus Xe-131m and Kr-83m will be manually deleted from the CRCB nuclear inventory file prior to RADTRAD executions.

Finally, Attachment K calculates the CRCB dose rate with Ref.1 release fractions assuming that the isotopics per cycle result from the worst-case burnup step not the worst case isotope: a more realistic case. Comparison with the Attachment I result shows that the worst-case burnup step yields isotopics only 97.16% as conservative as the worst-case isotope. The worst-case isotopics per cycle will be utilized as indicated above.

10. CONCLUSIONS

For all comparison methodologies (dose rates with unit release fractions, dose rates with Regulatory Guide 1.183 release fractions, doses with unit release fractions, doses with Regulatory Guide 1.183 release fractions), Case CRCB is the most conservative. Case CRCB assumes a three cycle reload with 4.0 w/o enriched U-235, with power fractions of 1.4/1.0/0.6, with batch sizes of 73/72/72, and with a peak burnup of 62004 MWD/MTU. The maximum isotopic activity during a cycle was conservatively utilized to represent that isotopes activity for that cycle. Thus the isotopics from this model will be utilized for all radiological design basis accidents with failed fuel.

The following isotopes will be included in the control room and offsite dose radiological computations:

co 58	co 60	kr 85	kr 85m	kr 87	kr 88	rb 86	sr 89	sr 90	sr 91
sr 92	y 90	y 91	y 92	y 93	zr 95	zr 97	nb 95	mo 99	tc 99m
ru103	ru105	ru106	rh105	sb127	sb129	te127	te127m	te129	te129m
te131m	te132	i131	i132	i133	i134	i135	xe133	xe135	cs134
cs136	cs137	ba139	ba140	la140	la141	la142	ce141	ce143	ce144
pr143	nd147	np239	pu238	pu239	pu240	pu241	am241	cm242	cm244
xe133m	xe135m	xe138							

These nuclides comprise the 60 nuclides included in the RADTRAD default Nuclear Inventory File PWR_DEF.NIF plus the three additional noble gases formerly included in the TID-14844 nuclear inventory (Ref.14) that were determined to be most limiting.

11. ATTACHMENTS
ATTACHMENT A
FUEL DATA

217			Assemblies per core	UFSAR 3.1
77			CEAs per core	UFSAR 3.1
176			Rods per assembly	UFSAR 3.1
5			Guide tubes per assembly	UFSAR 3.1
136.7	347.218	in-cm	Active core height	UFSAR 3.1
1.035	2.6289	in-cm	Guide tube ID	BGE Drwg E-550-701-303 - Ref.13
1.115	2.8321	in-cm	Guide tube oD	BGE Drwg E-550-701-303 - Ref.13
0.580	1.4732	in-cm	Fuel rod pitch	UFSAR Figure 3.3-1
0.20	0.508	in-cm	Assembly spacing, fuel ros surface-surface	UFSAR Table 3.3-5
8.12	20.6248	in-cm	Assembly pitch (14*0.58")	UFSAR Figure 3.3-1
0.06	0.1524	in-cm	Assembly gap (8.18"-8.12")	UFSAR Figure 3.3-1
548		deg F	Tcold	UFSAR Figure 4-9
572.5		deg F	Tave	UFSAR Figure 4-9
599.4		deg F	Thot	UFSAR Figure 4-9
532		deg F	Thzp	UFSAR Figure 4-9
Standard Fuel Design				
0.3795	0.96393	in-cm	Pellet diameter (A-C U1)	UFSAR Table 3.3-1
15.4626	253.386	in3-cm3	Pin fuel volume	
0.3805	0.96647	in-cm	Pellet diameter (A-C U2)	UFSAR Table 3.3-2
15.5442	254.723	in3-cm3	Pin fuel volume	
0.3765	0.95631	in-cm	Pellet diameter (D-S U1, D-R U2)	UFSAR Table 3.3-1/2
15.2191	249.396	in3-cm3	Pin fuel volume	
0.388	0.98552	in-cm	Clad ID (A-C U1-U2)	UFSAR Table 3.3-1/2
0.384	0.97536	in-cm	Clad ID	UFSAR Table 3.3-1/2
0.440	1.1176	in-cm	Clad OD	UFSAR Table 3.3-1/2
10.170		gm/cc	Stack height density (max)	UFSAR Table 3.3-1/2
0.9279			Stack height density (% TD)	
VAP Fuel Design				
0.381	0.96774	in-cm	Pellet diameter	UFSAR Table 3.3-1/2
15.585	255.393	in3-cm3	Pin fuel volume	
0.388	0.98552	in-cm	Clad ID	UFSAR Table 3.3-1/2
0.440	1.1176	in-cm	Clad OD	UFSAR Table 3.3-1/2
10.310		gm/cc	Stack height density	UFSAR Table 3.3-1/2
0.9407			Stack height density (% TD)	
SAS2H Larger Unit Cell Effective Radii for 176 pin assembly (Standard and VAP Fuel Design)				
1.31445		cm	Clad ID/2 = 1.035"/2 = 0.5175" (H2O)	
1.41605		cm	Clad OD/2 = 1.115"/2 = 0.5575" (Zirc)	
1.66233		cm	SQRT[4*(0.58)^2/pi] = 0.65446" (H2O)	
5.20391		cm	SQRT[196*(0.58)^2/5/pi] = 2.04878" (Fuel)	
5.22314		cm	SQRT[(8.15)^2/5/pi] = 2.05635" (H2O)	In ORNL/TM-12667, uses 8.18".

ATTACHMENT B
CYCLE LOADING PATTERNS

Cycle Loadiing Patterns						
P(MWt)	2754	12.691244				
M(MTU)	89.05065	0.410372				
UO2(gm/cc)	10.3572	347.218	0.96774			
Core A						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	73	1	1	668.3	20668	12.6912
B	72	1	2	668.3	41336	12.6912
C	72	1	3	668.3	62004	12.6912
	217					
Core B						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	73	1.2	1	668.3	24802	15.2295
B	72	1	2	668.3	45470	12.6912
C	72	0.8	3	668.3	62004	10.1530
	217					
Core C						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	73	1.4	1	668.3	28935	17.7677
B	72	1	2	668.3	49603	12.6912
C	72	0.6	3	668.3	62004	7.6147
	217					
Core D						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	108	1	1	730	22576	12.6912
B	109	1	2	730	45152	12.6912
	217					
Fuel Isotopic Fractions						
U235	U238	U235	U238	O16		
2.000000	98.0000	1.7629	86.3826	11.8545		
2.500000	97.5000	2.2036	85.9412	11.8552		
3.000000	97.0000	2.6443	85.4998	11.8559		
3.500000	96.5000	3.085	85.0585	11.8565		
4.000000	96.0000	3.5257	84.6171	11.8572		
4.500000	95.5000	3.9664	84.1758	11.8579		
5.000000	95.0000	4.4071	83.7344	11.8585		

Reload Strategies						
P(MWt)	2754	12.691244				
M(MTU)	88.5227	0.407939				
UO2(gm/cc)	10.2958	347.218	0.96774			
Core 50A2						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	88	1.2013	1	720	26908	15.2457
B	88	1.0297	2	720	49972	13.0677
C	41	0.4736	3	720	60580	6.0102
	217					
Core 50B2						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	92	1.1959	1	720	26789	15.1780
B	92	1.0318	2	720	49901	13.0948
C	33	0.3269	3	720	57223	4.1485
	217					
Core 50C2						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	96	1.1911	1	720	26679	15.1160
B	92	1.0083	2	720	49266	12.7972
C	29	0.2976	3	720	55932	3.7766
	217					
Core 50D2						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	88	1.2993	1	720	29105	16.4902
B	88	1.0542	2	720	52718	13.3789
C	41	0.2105	3	720	57433	2.6712
	217					
Core 50E2						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	84	1.2353	1	720	27670	15.6772
B	84	1.0216	2	720	50553	12.9650
C	49	0.5451	3	720	62762	6.9177
	217					
Core 50F2						
Batch	Assms	PF	Cycles	Days	BU	MW/Assy
A	100	1.1687	1	720	26179	14.8323
B	100	0.9332	2	720	47081	11.8432
C	17	0.3265	3	720	54396	4.1443
	217					

ATTACHMENT C
SAS2H DEPLETION STEPS

SAS2H Tfuel Calculations							
Tfuel = Tmod + (A1*B^2 + A2*B + A3)*L + (B1*B^3 + B2*B^2 + B3*B + B4)*L^2							
A1=	-2.34607E-07			B1=	-9.50512E-13		
A2=	1.10995E-03			B2=	5.13836E-08		
A3=	1.30080E+02			B3=	-5.11639E-04		
				B4=	-1.6718E+00		
L=(2754000kw)/(11.39167')/(217)/(176)=					6.3300	kw/ft	
Tmod=	574.5	F			574.5389	K	
Assembly Power = (2700 * 1.02 / 217) =					12.6912	MW/asm	
Specific Power = ((2754 / 217) / (Mfuel)) =					30.9262	MW/MTU	
Vfuel=176*PI*(0.96774/2)^2*(347.218)=					44949.18	Cc	
Mfuel=(10.96)*(0.945)*Vfuel*(238/270)=					410371.653	Gm	

Core A							
Burnup	Tfuel	Tfuel	Power	EFPD	Delta	Boron	bfrac
Mwd/mtu	deg-F	deg-K	MW/assm		EFPD	ppm	
0	1330.92	994.77	12.6912	0.00	0.00	1900.00	1.0000
2000	1305.96	980.91	12.6912	64.67	64.67	1716.14	0.9032
4000	1283.77	968.58	12.6912	129.34	64.67	1532.28	0.8065
6000	1262.50	956.76	12.6912	194.01	64.67	1348.42	0.7097
8000	1240.35	944.45	12.6912	258.68	64.67	1164.56	0.6129
10000	1215.47	930.63	12.6912	323.35	64.67	980.70	0.5162
12000	1186.04	914.28	12.6912	388.02	64.67	796.85	0.4194
14000	1150.23	894.39	12.6912	452.69	64.67	612.99	0.3226
16000	1106.22	869.94	12.6912	517.36	64.67	429.13	0.2259
18000	1052.17	839.91	12.6912	582.03	64.67	245.27	0.1291
20000	986.27	803.30	12.6912	646.70	64.67	61.41	0.0323
20668	986.27	803.30	12.6912	668.30	21.60	0.00	0.0000
22000	986.27	803.30	12.6912	711.37	43.07	1777.55	0.9356
24000	986.27	803.30	12.6912	776.04	64.67	1593.69	0.8388
26000	986.27	803.30	12.6912	840.71	64.67	1409.83	0.7420
28000	986.27	803.30	12.6912	905.38	64.67	1225.97	0.6452
30000	986.27	803.30	12.6912	970.05	64.67	1042.11	0.5485
32000	986.27	803.30	12.6912	1034.72	64.67	858.25	0.4517
34000	986.27	803.30	12.6912	1099.39	64.67	674.40	0.3549
36000	986.27	803.30	12.6912	1164.06	64.67	490.54	0.2582
38000	986.27	803.30	12.6912	1228.73	64.67	306.68	0.1614
40000	986.27	803.30	12.6912	1293.40	64.67	122.82	0.0646
41336	986.27	803.30	12.6912	1336.60	43.20	0.00	0.0000
42000	986.27	803.30	12.6912	1358.07	21.47	1838.96	0.9679
44000	986.27	803.30	12.6912	1422.74	64.67	1655.10	0.8711
46000	986.27	803.30	12.6912	1487.41	64.67	1471.24	0.7743
48000	986.27	803.30	12.6912	1552.08	64.67	1287.38	0.6776
50000	986.27	803.30	12.6912	1616.75	64.67	1103.52	0.5808
52000	986.27	803.30	12.6912	1681.42	64.67	919.66	0.4840
54000	986.27	803.30	12.6912	1746.09	64.67	735.80	0.3873
56000	986.27	803.30	12.6912	1810.76	64.67	551.95	0.2905
58000	986.27	803.30	12.6912	1875.43	64.67	368.09	0.1937
60000	986.27	803.30	12.6912	1940.10	64.67	184.23	0.0970
62004	986.27	803.30	12.6912	2004.90	64.80	0.00	0.0000

Core B							
Burnup	Tfuel	Tfuel	Power	EFPD	Delta	Boron	bfrac
Mwd/mtu	deg-F	deg-K	MW/assm		EFPD	ppm	
0	1330.92	994.77	15.2295	0.00	0.00	1900.00	1.0000
2000	1305.96	980.91	15.2295	53.89	53.89	1746.79	0.9194
4000	1283.77	968.58	15.2295	107.78	53.89	1593.57	0.8387
6000	1262.50	956.76	15.2295	161.68	53.89	1440.36	0.7581
8000	1240.35	944.45	15.2295	215.57	53.89	1287.15	0.6774
10000	1215.47	930.63	15.2295	269.46	53.89	1133.93	0.5968
12000	1186.04	914.28	15.2295	323.35	53.89	980.72	0.5162
14000	1150.23	894.39	15.2295	377.24	53.89	827.51	0.4355
16000	1106.22	869.94	15.2295	431.13	53.89	674.29	0.3549
18000	1052.17	839.91	15.2295	485.03	53.89	521.08	0.2743
20000	986.27	803.30	15.2295	538.92	53.89	367.87	0.1936
22000	986.27	803.30	15.2295	592.81	53.89	214.65	0.1130
24000	986.27	803.30	15.2295	646.70	53.89	61.44	0.0323
24802	986.27	803.30	15.2295	668.31	21.61	0.00	0.0000
26000	986.27	803.30	12.6912	707.05	38.74	1789.87	0.9420
28000	986.27	803.30	12.6912	771.72	64.67	1606.01	0.8453
30000	986.27	803.30	12.6912	836.39	64.67	1422.15	0.7485
32000	986.27	803.30	12.6912	901.06	64.67	1238.29	0.6517
34000	986.27	803.30	12.6912	965.73	64.67	1054.43	0.5550
36000	986.27	803.30	12.6912	1030.40	64.67	870.57	0.4582
38000	986.27	803.30	12.6912	1095.07	64.67	686.71	0.3614
40000	986.27	803.30	12.6912	1159.74	64.67	502.85	0.2647
42000	986.27	803.30	12.6912	1224.41	64.67	319.00	0.1679
44000	986.27	803.30	12.6912	1289.08	64.67	135.14	0.0711
45470	986.27	803.30	12.6912	1336.61	47.53	0.00	0.0000
46000	986.27	803.30	10.1530	1358.03	21.42	1839.10	0.9679
48000	986.27	803.30	10.1530	1438.87	80.84	1609.27	0.8470
50000	986.27	803.30	10.1530	1519.71	80.84	1379.44	0.7260
52000	986.27	803.30	10.1530	1600.55	80.84	1149.61	0.6051
54000	986.27	803.30	10.1530	1681.38	80.84	919.78	0.4841
56000	986.27	803.30	10.1530	1762.22	80.84	689.95	0.3631
58000	986.27	803.30	10.1530	1843.06	80.84	460.12	0.2422
60000	986.27	803.30	10.1530	1923.90	80.84	230.29	0.1212
62004	986.27	803.30	10.1530	2004.90	81.00	0.00	0.0000

Core C							
Burnup	Tfuel	Tfuel	Power	EFPD	Delta	Boron	bfrac
Mwd/mtu	deg-F	deg-K	MW/assm		EFPD	ppm	
0	1330.92	994.77	17.7677	0.00	0.00	1900.00	1.0000
2000	1305.96	980.91	17.7677	46.19	46.19	1768.67	0.9309
4000	1283.77	968.58	17.7677	92.39	46.19	1637.34	0.8618
6000	1262.50	956.76	17.7677	138.58	46.19	1506.01	0.7926
8000	1240.35	944.45	17.7677	184.77	46.19	1374.68	0.7235
10000	1215.47	930.63	17.7677	230.96	46.19	1243.36	0.6544
12000	1186.04	914.28	17.7677	277.16	46.19	1112.03	0.5853
14000	1150.23	894.39	17.7677	323.35	46.19	980.70	0.5162
16000	1106.22	869.94	17.7677	369.54	46.19	849.37	0.4470
18000	1052.17	839.91	17.7677	415.74	46.19	718.04	0.3779
20000	986.27	803.30	17.7677	461.93	46.19	586.71	0.3088
22000	986.27	803.30	17.7677	508.12	46.19	455.38	0.2397
24000	986.27	803.30	17.7677	554.31	46.19	324.05	0.1706
26000	986.27	803.30	17.7677	600.51	46.19	192.73	0.1014
28000	986.27	803.30	17.7677	646.70	46.19	61.40	0.0323
28935	986.27	803.30	17.7677	668.30	21.60	0.00	0.0000
30000	986.27	803.30	12.6912	702.73	34.44	1802.10	0.9485
32000	986.27	803.30	12.6912	767.40	64.67	1618.24	0.8517
34000	986.27	803.30	12.6912	832.07	64.67	1434.38	0.7549
36000	986.27	803.30	12.6912	896.74	64.67	1250.52	0.6582
38000	986.27	803.30	12.6912	961.41	64.67	1066.66	0.5614
40000	986.27	803.30	12.6912	1026.08	64.67	882.80	0.4646
42000	986.27	803.30	12.6912	1090.75	64.67	698.94	0.3679
44000	986.27	803.30	12.6912	1155.42	64.67	515.08	0.2711
46000	986.27	803.30	12.6912	1220.09	64.67	331.22	0.1743
48000	986.27	803.30	12.6912	1284.76	64.67	147.36	0.0776
49603	986.27	803.30	12.6912	1336.60	51.83	0.00	0.0000
50000	986.27	803.30	7.6147	1357.99	21.40	1839.17	0.9680
52000	986.27	803.30	7.6147	1465.77	107.78	1532.75	0.8067
54000	986.27	803.30	7.6147	1573.56	107.78	1226.32	0.6454
56000	986.27	803.30	7.6147	1681.34	107.78	919.89	0.4842
58000	986.27	803.30	7.6147	1789.12	107.78	613.47	0.3229
60000	986.27	803.30	7.6147	1896.91	107.78	307.04	0.1616
62004	986.27	803.30	7.6147	2004.91	108.00	0.00	0.0000

Core D							
Burnup	Tfuel	Tfuel	Power	EFPD	Delta	Boron	bfrac
mwd/mtu	deg-F	deg-K	MW/assm		EFPD	ppm	
0	1330.92	994.77	12.6912	0.00	0.00	1900.00	1.0000
2000	1305.96	980.91	12.6912	64.67	64.67	1731.68	0.9114
4000	1283.77	968.58	12.6912	129.34	64.67	1563.36	0.8228
6000	1262.50	956.76	12.6912	194.01	64.67	1395.04	0.7342
8000	1240.35	944.45	12.6912	258.68	64.67	1226.72	0.6456
10000	1215.47	930.63	12.6912	323.35	64.67	1058.40	0.5571
12000	1186.04	914.28	12.6912	388.02	64.67	890.08	0.4685
14000	1150.23	894.39	12.6912	452.69	64.67	721.76	0.3799
16000	1106.22	869.94	12.6912	517.36	64.67	553.44	0.2913
18000	1052.17	839.91	12.6912	582.03	64.67	385.12	0.2027
20000	986.27	803.30	12.6912	646.70	64.67	216.80	0.1141
22000	986.27	803.30	12.6912	711.37	64.67	48.48	0.0255
22576	986.27	803.30	12.6912	730.00	18.62	0.00	0.0000
24000	986.27	803.30	12.6912	776.04	46.05	1780.16	0.9369
26000	986.27	803.30	12.6912	840.71	64.67	1611.84	0.8483
28000	986.27	803.30	12.6912	905.38	64.67	1443.52	0.7597
30000	986.27	803.30	12.6912	970.05	64.67	1275.19	0.6712
32000	986.27	803.30	12.6912	1034.72	64.67	1106.87	0.5826
34000	986.27	803.30	12.6912	1099.39	64.67	938.55	0.4940
36000	986.27	803.30	12.6912	1164.06	64.67	770.23	0.4054
38000	986.27	803.30	12.6912	1228.73	64.67	601.91	0.3168
40000	986.27	803.30	12.6912	1293.40	64.67	433.59	0.2282
42000	986.27	803.30	12.6912	1358.07	64.67	265.27	0.1396
44000	986.27	803.30	12.6912	1422.74	64.67	96.95	0.0510
45152	986.27	803.30	12.6912	1459.99	37.25	0.00	0.0000

ATTACHMENT D
SAS2H INPUT FILES

```
40A2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case A twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case A twice burn
arbm-uo2  10.2957 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
```

```
'CLAD material:
zirc2   2 1              599.82   end
'MODERATOR material:
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1      573.43 end
boron   3 den=0.7264  1671.3e-6  573.43 end
end comp
'   BASE REACTOR LATTICE SPECIFICATION   (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0      mxtube=2        ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1     mixmod=3        facmesh=1.0   end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.2457   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=13.0677   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
```

```
power=13.0677  burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=6.0102   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=70  down=0  bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119   cr 5.2   mn 0.29
 fe 11   co 0.066  ni 8.7
 zr 195  nb 0.63   sn 3.2
'   END OF SAS2H INPUT
end
```

```
40B2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case B twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case B twice burn
arbm-uo2  10.2957 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82    end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1     573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2         ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1       mixmod=3         facmesh=1.0    end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.1780    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=13.0948    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=13.0948   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=70 down=0 bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=4.1485   burn=50 down=0 bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.88 tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.80 tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.72 tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=70 down=0 bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'   END OF SAS2H INPUT
end
```

```
40C2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case C twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case C twice burn
arbm-uo2  10.2957 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82    end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1      573.43 end
boron    3 den=0.7264  1671:3e-6   573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'    BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2         ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1      mixmod=3         facmesh=1.0    end
'    Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.1160    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.1160    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=12.7972    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=12.7972    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=12.7972    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=12.7972    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=12.7972    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=12.7972   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=3.7766   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=70  down=0  bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119   cr 5.2   mn 0.29
 fe 11   co 0.066  ni 8.7
 zr 195  nb 0.63   sn 3.2
'   END OF SAS2H INPUT
end
```

```
40D2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case D twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case D twice burn
arbm-uo2  10.2957 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
         1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82   end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1       573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'    BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2        ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1      mixmod=3        facmesh=1.0    end
'    Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=16.4902    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=13.3789    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=13.3789   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=2.6712   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=70  down=0  bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119   cr 5.2   mn 0.29
 fe 11   co 0.066  ni 8.7
 zr 195  nb 0.63   sn 3.2
'   END OF SAS2H INPUT
end
```

```
40E2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case E twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case E twice burn
arbm-uo2  10.2957 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82    end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1     573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION   (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2        ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      mixmod=3        facmesh=1.0   end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.6772   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.6772   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=12.9650   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=12.9650   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=70 down=0 bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=6.9177   burn=50 down=0 bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.88 tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.80 tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.72 tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=70 down=0 bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119   cr 5.2   mn 0.29
 fe 11   co 0.066  ni 8.7
 zr 195  nb 0.63   sn 3.2
'   END OF SAS2H INPUT
end
```

```
40F2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case F twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 4.0% U235, no shim, Case F twice burn
arbm-uo2  10.2957 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82    end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1       573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'    BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2         ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1      mixmod=3         facmesh=1.0   end
'    Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=14.8323    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=11.8432    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=11.8432   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=4.1443   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=70  down=365.25 bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'   END OF SAS2H INPUT
end
```

```
50A2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case A twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case A twice burn
arbm-uo2  10.2958 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82   end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1     573.43 end
boron   3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION   (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0      mxtube=2        ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1     mixmod=3        facmesh=1.0   end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.2457   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.2457   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=13.0677   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=13.0677   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=13.0677   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=6.0102   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=6.0102   burn=70  down=365.25 bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'   END OF SAS2H INPUT
end
```

```
50B2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case B twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case B twice burn
arbm-uo2  10.2958 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82   end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1     573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'  BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0      mxtube=2        ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1      mixmod=3         facmesh=1.0    end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.1780    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.1780    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=13.0948    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=13.0948    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=13.0948   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=13.0948   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=4.1485   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=4.1485   burn=70  down=0 bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119   cr 5.2    mn 0.29
 fe 11   co 0.066  ni 8.7
 zr 195  nb 0.63   sn 3.2
'    END OF SAS2H INPUT
end
```

```
50C2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case C twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case C twice burn
arbm-uo2  10.2958 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82   end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1     573.43 end
boron   3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION   (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0    mxtube=2        ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1     mixmod=3        facmesh=1.0   end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.1160   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.1160   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=12.7972   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=12.7972   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=12.7972   burn=70 down=0 bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=3.7766   burn=50 down=0 bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.88 tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.80 tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.72 tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=3.7766   burn=70 down=0 bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63   sn 3.2
'   END OF SAS2H INPUT
end
```

```
50D2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case D twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case D twice burn
arbm-uo2  10.2958 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82   end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1      573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2         ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1       mixmod=3         facmesh=1.0    end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=16.4902    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=16.4902    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=13.3789    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=13.3789    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=13.3789   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=13.3789   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=2.6712   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=2.6712   burn=70  down=0  bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119   cr 5.2   mn 0.29
 fe 11   co 0.066  ni 8.7
 zr 195  nb 0.63   sn 3.2
'   END OF SAS2H INPUT
end
```

```
50E2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case E twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case E twice burn
arbm-uo2  10.2958 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82   end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1       573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2         ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1       mixmod=3         facmesh=1.0    end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=15.6772    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=15.6772    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=12.9650    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=12.9650    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=12.9650    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=12.9650    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=12.9650    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=12.9650   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=12.9650   burn=70 down=0 bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=6.9177   burn=50 down=0 bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.88 tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.80 tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.72 tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.64 tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.56 tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.48 tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.39 tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.31 tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.23 tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.15 tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=50 down=0 bfrac=0.07 tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=6.9177   burn=70 down=0 bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'   END OF SAS2H INPUT
end
```

```
50F2.INP
=sas2h   parm=skipshipdata
sas2 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case F twice burn
44groupndf5   latticecell
'   MATERIAL SPECIFICATION INPUT
' 24m Full Core VAP w/ 1.4% uprate, 5.0% U235, no shim, Case F twice burn
arbm-uo2  10.2958 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 892.36  end
co-59    3 0 1-20 573.43 end
zr-94    1 0 1-20 892.36 end
mo-94    1 0 1-20 892.36 end
nb-95    1 0 1-20 892.36 end
mo-95    1 0 1-20 892.36 end
tc-99    1 0 1-20 892.36 end
rh-103   1 0 1-20 892.36 end
rh-105   1 0 1-20 892.36 end
ru-106   1 0 1-20 892.36 end
sn-126   1 0 1-20 892.36 end
xe-131   1 0 1-20 892.36 end
cs-134   1 0 1-20 892.36 end
cs-135   1 0 1-20 892.36 end
cs-137   1 0 1-20 892.36 end
pr-143   1 0 1-20 892.36 end
nd-143   1 0 1-20 892.36 end
ce-144   1 0 1-20 892.36 end
nd-144   1 0 1-20 892.36 end
nd-145   1 0 1-20 892.36 end
nd-146   1 0 1-20 892.36 end
nd-147   1 0 1-20 892.36 end
pm-147   1 0 1-20 892.36 end
sm-147   1 0 1-20 892.36 end
nd-148   1 0 1-20 892.36 end
pm-148   1 0 1-20 892.36 end
sm-148   1 0 1-20 892.36 end
pm-149   1 0 1-20 892.36 end
sm-149   1 0 1-20 892.36 end
nd-150   1 0 1-20 892.36 end
sm-150   1 0 1-20 892.36 end
sm-151   1 0 1-20 892.36 end
eu-151   1 0 1-20 892.36 end
sm-152   1 0 1-20 892.36 end
eu-153   1 0 1-20 892.36 end
eu-154   1 0 1-20 892.36 end
gd-154   1 0 1-20 892.36 end
eu-155   1 0 1-20 892.36 end
gd-155   1 0 1-20 892.36 end
gd-157   1 0 1-20 892.36 end
gd-158   1 0 1-20 892.36 end
gd-160   1 0 1-20 892.36 end
'CLAD material:
zirc2    2 1              599.82   end
'MODERATOR material:
```

```
'1671.27 ppm boron at BOC 1C16 (avg for 1st 50 EFPD)
h2o     3 den=0.7264    1     573.43 end
boron    3 den=0.7264  1671.3e-6  573.43 end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176 fuelngth=347.218 ncycles=42 nlib/cyc=1
printlevel=10 lightel=9  inplevel=2 numholes=5
numinstr=0       mxtube=2         ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1       mixmod=3         facmesh=1.0    end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'POWER HISTORY
'1st cycle
power=14.8323    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=14.8323    burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'2nd cycle
power=11.8432    burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=11.8432    burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
```

```
power=11.8432   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=11.8432   burn=70  down=0  bfrac=0.001 tmpfuel=802.4
 tmpclad=599.82 tmpmod=573.43
'3rd cycle
power=4.1443   burn=50  down=0  bfrac=1.00 tmpfuel=892.4
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.94 tmpfuel=882.3
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.88  tmpfuel=874.5
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.80  tmpfuel=868.0
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.72  tmpfuel=861.9
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.64  tmpfuel=855.7
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.56  tmpfuel=848.6
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.48  tmpfuel=839.5
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.39  tmpfuel=828.1
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.31  tmpfuel=818.7
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.23  tmpfuel=813.9
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.15  tmpfuel=810.5
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=50  down=0  bfrac=0.07  tmpfuel=807.6
 tmpclad=599.82 tmpmod=573.43
power=4.1443   burn=70  down=0  bfrac=0.001
 tmpclad=599.82 tmpmod=573.43 tmpfuel=802.4 end
' Light Elements
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'   END OF SAS2H INPUT
end
```

```
CRAA.INP
=sas2h    parm=skipshipdata
sas2h - 5.0 w/o VAP fuel - No Erbia - 62 gwd/mtu
44groupndf5    latticecell
'    MATERIAL SPECIFICATION INPUT
' VAP (U235 enrichment = 5 wt%) w/o Er2O3
arbm-uo2       10.3572 3 0 0 0
          92235  4.4071
          92238 83.7344
           8016 11.8585
           1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'CLAD material:
zirc4    2 1              584.5    end
'MODERATOR material:
```

```
'950 ppm boron average
h2o     3 den=0.7241    1      574.5  end
boron    3 den=0.7241  1900.0-6  574.5  end
'END OF MATERIAL SPECIFICATIONS
end comp
'   BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
npin/assm=176     fuelngth=347.218  ncycles=33
nlib/cyc=1        printlevel=10     lightel=9
inplevel=2        numholes=5        numinstr=0
mxtube=2          mixmod=3          ortube=1.41605
srtube=1.31445    asmpitch=20.7772  numztotal=5
mxrepeats=1       facmesh=1.0       end
'   Path B Model
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
power=12.6912   burn=64.67  down=0.0000 bfrac=0.9032
   tmpfuel=980.91  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.8065
   tmpfuel=968.58  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.7097
   tmpfuel=956.76  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.6129
   tmpfuel=944.45  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.5162
   tmpfuel=930.63  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.4194
   tmpfuel=914.28  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.3226
   tmpfuel=894.39  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.2259
   tmpfuel=869.94  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.1291
   tmpfuel=839.91  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.0323
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=21.60  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.9356
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.8388
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.7420
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.6452
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.5485
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.4517
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.3549
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.2582
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
```

```
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1614
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0646
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=43.20  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.9679
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8711
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7743
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6776
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5808
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4840
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3873
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2905
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1937
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0970
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.80  down=00.000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
' Light Elements
 o 119  cr 5.2  mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'   END OF SAS2H INPUT
end
```

```
CRAB.INP
=sas2h   parm=skipshipdata
sas2h - 4.0 w/o VAP fuel - No Erbia - 62 gwd/mtu
44groupndf5   latticecell
'
'   MATERIAL SPECIFICATION INPUT
'
' VAP (U235 enrichment = 4 wt%) w/o Er2O3
arbm-uo2      10.3572 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'
```

```
'
'CLAD material:
zirc4    2 1              584.5    end
'
'MODERATOR material:
'950 ppm boron average
'
h2o      3 den=0.7241    1      574.5  end
boron    3 den=0.7241  1900.0-6  574.5  end
'
'END OF MATERIAL SPECIFICATIONS
end comp
'
'   BASE REACTOR LATTICE SPECIFICATION   (Path A Model)
'--------------------------------
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
'--------------------------------
npin/assm=176    fuelngth=347.218  ncycles=33
nlib/cyc=1       printlevel=10    lightel=9
inplevel=2       numholes=5       numinstr=0
mxtube=2         mixmod=3         ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      facmesh=1.0      end
'
'   Path B Model
'
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
'
power=12.6912  burn=64.67  down=0.0000 bfrac=0.9032
  tmpfuel=980.91  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8065
  tmpfuel=968.58  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7097
  tmpfuel=956.76  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6129
  tmpfuel=944.45  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5162
  tmpfuel=930.63  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4194
  tmpfuel=914.28  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3226
  tmpfuel=894.39  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2259
  tmpfuel=869.94  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1291
  tmpfuel=839.91  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0323
  tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=21.60  down=0.0000 bfrac=0.0000
  tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.9356
  tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
```

```
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8388
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7420
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6452
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5485
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4517
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3549
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2582
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1614
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0646
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=43.20  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.9679
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8711
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7743
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6776
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5808
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4840
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3873
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2905
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1937
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0970
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.80  down=00.000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
'
' Light Elements
'
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'
'   END OF SAS2H INPUT
'
end
```

```
CRBA.INP
=sas2h   parm=skipshipdata
sas2h - 5.0 w/o VAP fuel - No Erbia - 62 gwd/mtu
44groupndf5   latticecell
'
'   MATERIAL SPECIFICATION INPUT
'
' VAP (U235 enrichment = 5 wt%) w/o Er2O3
arbm-uo2      10.3572 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'
```

```
'
'CLAD material:
zirc4    2 1                584.5    end
'
'MODERATOR material:
'950 ppm boron average
'
h2o      3 den=0.7241    1      574.5  end
boron    3 den=0.7241   1900.0-6   574.5  end
'
'END OF MATERIAL SPECIFICATIONS
end comp
'
'    BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
'--------------------------------
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
'--------------------------------
npin/assm=176    fuelngth=347.218  ncycles=33
nlib/cyc=1       printlevel=10    lightel=9
inplevel=2       numholes=5       numinstr=0
mxtube=2         mixmod=3         ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      facmesh=1.0      end
'
'    Path B Model
'
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
'
power=15.2295   burn=53.89  down=0.0000 bfrac=0.9194
   tmpfuel=980.91  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.8387
   tmpfuel=968.58  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.7581
   tmpfuel=956.76  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.6774
   tmpfuel=944.45  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.5968
   tmpfuel=930.63  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.5162
   tmpfuel=914.28  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.4355
   tmpfuel=894.39  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.3549
   tmpfuel=869.94  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.2743
   tmpfuel=839.91  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.1936
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.1130
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=15.2295   burn=53.89  down=0.0000 bfrac=0.0323
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
```

```
power=15.2295  burn=21.61  down=0.0000 bfrac=0.0000
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=38.74  down=0.0000 bfrac=0.9420
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8453
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7485
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6517
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5550
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4582
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3614
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2647
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1679
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0711
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=47.53  down=0.0000 bfrac=0.0000
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=21.42  down=0.0000 bfrac=0.9679
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.8470
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.7260
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.6051
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.4841
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.3631
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.2422
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.1212
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=81.00  down=00.000 bfrac=0.0000
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
'
' Light Elements
'
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066 ni 8.7
 zr 195 nb 0.63  sn 3.2
'
'   END OF SAS2H INPUT
'
end
```

```
CRBB.INP
=sas2h   parm=skipshipdata
sas2h - 4.0 w/o VAP fuel - No Erbia - 62 gwd/mtu
44groupndf5   latticecell
'
'   MATERIAL SPECIFICATION INPUT
'
' VAP (U235 enrichment = 4 wt%) w/o Er2O3
arbm-uo2      10.3572 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'
```

```
'
'CLAD material:
zirc4    2 1              584.5    end
'
'MODERATOR material:
'950 ppm boron average
'
h2o      3 den=0.7241    1      574.5 end
boron    3 den=0.7241   1900.0-6  574.5 end
'
'END OF MATERIAL SPECIFICATIONS
end comp
'
'   BASE REACTOR LATTICE SPECIFICATION   (Path A Model)
'--------------------------------
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
'--------------------------------
npin/assm=176    fuelngth=347.218  ncycles=33
nlib/cyc=1       printlevel=10    lightel=9
inplevel=2       numholes=5       numinstr=0
mxtube=2         mixmod=3         ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      facmesh=1.0      end
'
'   Path B Model
'
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
'
power=15.2295  burn=53.89  down=0.0000 bfrac=0.9194
  tmpfuel=980.91  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.8387
  tmpfuel=968.58  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.7581
  tmpfuel=956.76  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.6774
  tmpfuel=944.45  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.5968
  tmpfuel=930.63  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.5162
  tmpfuel=914.28  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.4355
  tmpfuel=894.39  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.3549
  tmpfuel=869.94  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.2743
  tmpfuel=839.91  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.1936
  tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.1130
  tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=15.2295  burn=53.89  down=0.0000 bfrac=0.0323
  tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
```

```
power=15.2295  burn=21.61  down=0.0000 bfrac=0.0000
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=38.74  down=0.0000 bfrac=0.9420
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8453
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7485
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6517
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5550
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4582
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3614
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2647
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1679
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0711
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=47.53  down=0.0000 bfrac=0.0000
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=21.42  down=0.0000 bfrac=0.9679
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.8470
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.7260
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.6051
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.4841
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.3631
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.2422
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=80.84  down=0.0000 bfrac=0.1212
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=10.1530  burn=81.00  down=00.000 bfrac=0.0000
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
'
' Light Elements
'
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066 ni 8.7
 zr 195 nb 0.63  sn 3.2
'
'   END OF SAS2H INPUT
'
end
```

```
CRCA.INP
=sas2h   parm=skipshipdata
sas2h - 5.0 w/o VAP fuel - No Erbia - 62 gwd/mtu
44groupndf5   latticecell
'
'   MATERIAL SPECIFICATION INPUT
'
' VAP (U235 enrichment = 5 wt%) w/o Er2O3
arbm-uo2      10.3572 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'
```

```
'
'CLAD material:
zirc4    2  1                584.5    end
'
'MODERATOR material:
'950 ppm boron average
'
h2o      3 den=0.7241    1      574.5 end
boron    3 den=0.7241  1900.0-6  574.5  end
'
'END OF MATERIAL SPECIFICATIONS
end comp
'
'   BASE REACTOR LATTICE SPECIFICATION   (Path A Model)
'--------------------------------
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
'--------------------------------
npin/assm=176    fuelngth=347.218  ncycles=33
nlib/cyc=1       printlevel=10    lightel=9
inplevel=2       numholes=5       numinstr=0
mxtube=2         mixmod=3         ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      facmesh=1.0      end
'
'   Path B Model
'
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
'
power=17.7677   burn=46.19  down=0.0000 bfrac=0.9309
   tmpfuel=980.91  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.8618
   tmpfuel=968.58  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.7926
   tmpfuel=956.76  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.7235
   tmpfuel=944.45  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.6544
   tmpfuel=930.63  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.5853
   tmpfuel=914.28  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.5162
   tmpfuel=894.39  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.4470
   tmpfuel=869.94  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.3779
   tmpfuel=839.91  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.3088
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.2397
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=17.7677   burn=46.19  down=0.0000 bfrac=0.1706
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
```

```
power=17.7677  burn=46.19  down=0.0000 bfrac=0.1014
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.0323
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=21.60  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=34.44  down=0.0000 bfrac=0.9485
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8517
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7549
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6582
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5614
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4646
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3679
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2711
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1743
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0776
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=51.83  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=21.40  down=0.0000 bfrac=0.9680
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.8067
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.6454
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.4842
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.3229
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.1616
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=108.00  down=00.000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
'
' Light Elements
'
 o 119  cr 5.2  mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'
'   END OF SAS2H INPUT
'
end
```

```
CRCB.INP
=sas2h   parm=skipshipdata
sas2h - 4.0 w/o VAP fuel - No Erbia - 62 gwd/mtu
44groupndf5   latticecell
'
'   MATERIAL SPECIFICATION INPUT
'
' VAP (U235 enrichment = 4 wt%) w/o Er2O3
arbm-uo2      10.3572 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'
```

```
'
'CLAD material:
zirc4    2 1              584.5    end
'
'MODERATOR material:
'950 ppm boron average
'
h2o      3 den=0.7241    1      574.5  end
boron    3 den=0.7241   1900.0-6   574.5  end
'
'END OF MATERIAL SPECIFICATIONS
end comp
'
'   BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
'--------------------------------
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
'--------------------------------
npin/assm=176    fuelngth=347.218  ncycles=33
nlib/cyc=1       printlevel=10    lightel=9
inplevel=2       numholes=5       numinstr=0
mxtube=2         mixmod=3         ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      facmesh=1.0      end
'
'   Path B Model
'
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
'
power=17.7677  burn=46.19  down=0.0000 bfrac=0.9309
   tmpfuel=980.91  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.8618
   tmpfuel=968.58  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.7926
   tmpfuel=956.76  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.7235
   tmpfuel=944.45  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.6544
   tmpfuel=930.63  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.5853
   tmpfuel=914.28  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.5162
   tmpfuel=894.39  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.4470
   tmpfuel=869.94  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.3779
   tmpfuel=839.91  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.3088
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.2397
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.1706
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
```

```
power=17.7677  burn=46.19  down=0.0000 bfrac=0.1014
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=46.19  down=0.0000 bfrac=0.0323
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=17.7677  burn=21.60  down=0.0000 bfrac=0.0000
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=34.44  down=0.0000 bfrac=0.9485
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8517
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7549
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6582
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5614
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4646
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3679
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2711
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1743
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0776
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=51.83  down=0.0000 bfrac=0.0000
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=21.40  down=0.0000 bfrac=0.9680
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.8067
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.6454
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.4842
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.3229
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=107.78  down=0.0000 bfrac=0.1616
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=7.6147  burn=108.00  down=00.000 bfrac=0.0000
  tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
'
'Light Elements
'
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'
'   END OF SAS2H INPUT
'
end
```

```
CRDA.INP
=sas2h   parm=skipshipdata
sas2h - 5.0 w/o VAP fuel - No Erbia - 45 gwd/mtu
44groupndf5   latticecell
'
'   MATERIAL SPECIFICATION INPUT
'
' VAP (U235 enrichment = 5 wt%) w/o Er2O3
arbm-uo2      10.3572 3 0 0 0
        92235  4.4071
        92238 83.7344
         8016 11.8585
          1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'
```

```
'
'CLAD material:
zirc4    2 1              584.5    end
'
'MODERATOR material:
'950 ppm boron average
'
h2o      3 den=0.7241    1      574.5 end
boron    3 den=0.7241   1900.0-6  574.5  end
'
'END OF MATERIAL SPECIFICATIONS
end comp
'
'    BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
'--------------------------------
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
'--------------------------------
npin/assm=176     fuelngth=347.218  ncycles=24
nlib/cyc=1       printlevel=10    lightel=9
inplevel=2       numholes=5       numinstr=0
mxtube=2         mixmod=3         ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      facmesh=1.0      end
'
'    Path B Model
'
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
'
power=12.6912   burn=64.67  down=0.0000 bfrac=0.9114
   tmpfuel=980.91  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.8228
   tmpfuel=968.58  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.7342
   tmpfuel=956.76  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.6456
   tmpfuel=944.45  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.5571
   tmpfuel=930.63  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.4685
   tmpfuel=914.28  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.3799
   tmpfuel=894.39  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.2913
   tmpfuel=869.94  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.2027
   tmpfuel=839.91  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.1141
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=64.67  down=0.0000 bfrac=0.0255
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
power=12.6912   burn=18.62  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5   tmpmod=574.5   end
```

```
power=12.6912  burn=46.05  down=0.0000 bfrac=0.9369
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8483
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7597
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6712
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5826
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4940
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4054
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3168
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2282
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1396
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0510
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=37.25  down=0.0000 bfrac=0.0000
   tmpfuel=803.30 tmpclad=584.5  tmpmod=574.5  end
'
' Light Elements
'
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'
'   END OF SAS2H INPUT
'
end
```

```
CRDB.INP
=sas2h   parm=skipshipdata
sas2h - 4.0 w/o VAP fuel - No Erbia - 45 gwd/mtu
44groupndf5   latticecell
'
'   MATERIAL SPECIFICATION INPUT
'
' VAP (U235 enrichment = 4 wt%) w/o Er2O3
arbm-uo2      10.3572 3 0 0 0
        92235  3.5257
        92238 84.6171
         8016 11.8572
          1 1.0 994.77  end
co-59    3 0 1-20 574.5  end
zr-94    1 0 1-20 994.77 end
mo-94    1 0 1-20 994.77 end
nb-95    1 0 1-20 994.77 end
mo-95    1 0 1-20 994.77 end
tc-99    1 0 1-20 994.77 end
rh-103   1 0 1-20 994.77 end
rh-105   1 0 1-20 994.77 end
ru-106   1 0 1-20 994.77 end
sn-126   1 0 1-20 994.77 end
xe-131   1 0 1-20 994.77 end
cs-134   1 0 1-20 994.77 end
cs-135   1 0 1-20 994.77 end
cs-137   1 0 1-20 994.77 end
pr-143   1 0 1-20 994.77 end
nd-143   1 0 1-20 994.77 end
ce-144   1 0 1-20 994.77 end
nd-144   1 0 1-20 994.77 end
nd-145   1 0 1-20 994.77 end
nd-146   1 0 1-20 994.77 end
nd-147   1 0 1-20 994.77 end
pm-147   1 0 1-20 994.77 end
sm-147   1 0 1-20 994.77 end
nd-148   1 0 1-20 994.77 end
pm-148   1 0 1-20 994.77 end
sm-148   1 0 1-20 994.77 end
pm-149   1 0 1-20 994.77 end
sm-149   1 0 1-20 994.77 end
nd-150   1 0 1-20 994.77 end
sm-150   1 0 1-20 994.77 end
sm-151   1 0 1-20 994.77 end
eu-151   1 0 1-20 994.77 end
sm-152   1 0 1-20 994.77 end
eu-153   1 0 1-20 994.77 end
eu-154   1 0 1-20 994.77 end
gd-154   1 0 1-20 994.77 end
eu-155   1 0 1-20 994.77 end
gd-155   1 0 1-20 994.77 end
gd-157   1 0 1-20 994.77 end
gd-158   1 0 1-20 994.77 end
gd-160   1 0 1-20 994.77 end
'
```

```
'
'CLAD material:
zirc4    2 1              584.5    end
'
'MODERATOR material:
'950 ppm boron average
'
h2o      3 den=0.7241    1      574.5  end
boron    3 den=0.7241  1900.0-6  574.5  end
'
'END OF MATERIAL SPECIFICATIONS
end comp
'
'   BASE REACTOR LATTICE SPECIFICATION    (Path A Model)
'--------------------------------
squarepitch  1.4732 0.96774 1 3 1.1176 2 0.98552 0 end
'--------------------------------
npin/assm=176    fuelngth=347.218  ncycles=24
nlib/cyc=1       printlevel=10    lightel=9
inplevel=2       numholes=5       numinstr=0
mxtube=2         mixmod=3         ortube=1.41605
srtube=1.31445   asmpitch=20.7772  numztotal=5
mxrepeats=1      facmesh=1.0      end
'
'   Path B Model
'
3 1.314  2 1.416  3 1.662  500 5.204  3 5.223
'
'U1C16 POWER HISTORY
' fuel temp per FATES correlation
'
power=12.6912  burn=64.67  down=0.0000 bfrac=0.9114
   tmpfuel=980.91  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8228
   tmpfuel=968.58  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7342
   tmpfuel=956.76  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6456
   tmpfuel=944.45  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5571
   tmpfuel=930.63  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4685
   tmpfuel=914.28  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3799
   tmpfuel=894.39  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2913
   tmpfuel=869.94  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2027
   tmpfuel=839.91  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1141
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0255
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=18.62  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
```

```
power=12.6912  burn=46.05  down=0.0000 bfrac=0.9369
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.8483
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.7597
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.6712
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.5826
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4940
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.4054
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.3168
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.2282
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.1396
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=64.67  down=0.0000 bfrac=0.0510
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
power=12.6912  burn=37.25  down=0.0000 bfrac=0.0000
   tmpfuel=803.30  tmpclad=584.5  tmpmod=574.5  end
'
' Light Elements
'
 o 119  cr 5.2   mn 0.29
 fe 11  co 0.066  ni 8.7
 zr 195  nb 0.63  sn 3.2
'
'   END OF SAS2H INPUT
'
end
```

ATTACHMENT E
SAS2H EDIT CODE SOURCE FILE (SAS2HED2.FOR)

```
      PROGRAM SAS2HED2
C*********************************************************************
C*      D:\CRHVAC\SAS2HED\SAS2HED2.FOR
C*      COMPILE COMMAND IS   FORT51 SAS2HED2
C*                           LINK51 SAS2HED2
C*   EDIT SAS2H OUTPUT FOR MOLES OF ACTIVITY
C*   CONVERT MOLES TO CURIES/MWTH
C*   PRINT INPUT FOR RADTRAD
C*********************************************************************
      DIMENSION A1A(65),B1A(50),B1B(50,65),B2A(8),XX(8),B1C(50,65)
      DIMENSION CW(65),CL(65),CT(65),DG(2,65),DC(2,65),B1D(3,65)
      DIMENSION B1E(4,65),ANIF(592)
      CHARACTER A1A*8,A1B*8,A1C*14,A1D*9,A1E*16,A1F*34,A1G*31
      CHARACTER A2A*8,A2C*14,A2D*9,A2E*16,A2F*34,A2G*31
      CHARACTER A1I*29,A2I*29,A1J*29,A2J*29,A1K*30,A2K*30,A1L*8
      CHARACTER B1A*10,B2A*10,B3A*10,ANIF*80
      DATA A1A/' co 58 ',' co 60 ',' kr 85 ',' kr 85m',' kr 87 ',
     1     ' kr 88 ',' rb 86 ',' sr 89 ',' sr 90 ',' sr 91 ',
     2     ' sr 92 ',' y 90 ',' y 91 ',' y 92 ',' y 93 ',
     3     ' zr 95 ',' zr 97 ',' nb 95 ',' mo 99 ',' tc 99m',
     4     ' ru103 ',' ru105 ',' ru106 ',' rh105 ',' sb127 ',
     5     ' sb129 ',' te127 ',' te127m',' te129 ',' te129m',
     6     ' te131m',' te132 ',' i131 ',' i132 ',' i133 ',
     7     ' i134 ',' i135 ',' xe133 ',' xe135 ',' cs134 ',
     8     ' cs136 ',' cs137 ',' ba139 ',' ba140 ',' la140 ',
     9     ' la141 ',' la142 ',' ce141 ',' ce143 ',' ce144 ',
     a     ' pr143 ',' nd147 ',' np239 ',' pu238 ',' pu239 ',
     b     ' pu240 ',' pu241 ',' am241 ',' cm242 ',' cm244 ',
     c     ' kr 83m',' xe131m',' xe133m',' xe135m',' xe138 '/
      DATA CT/6.1240E+06,1.6623E+08,3.3838E+08,1.6128E+04,4.5720E+03
     1,    1.0224E+04,1.6114E+06,4.3649E+06,9.1770E+08,3.4200E+04
     2,    9.7560E+03,2.3069E+05,5.0544E+06,1.2744E+04,3.6720E+04
     3,    5.5313E+06,6.0480E+04,3.0214E+06,2.3739E+05,2.1636E+04
     4,    3.3929E+06,1.5984E+04,3.2167E+07,1.2744E+05,3.3178E+05
     5,    1.5840E+04,3.3840E+04,9.4176E+06,4.1760E+03,2.9030E+06
     6,    1.1664E+05,2.8166E+05,6.9466E+05,8.2080E+03,7.4880E+04
     7,    3.1560E+03,2.3652E+04,4.5300E+05,3.2760E+04,6.5122E+07
     8,    1.1370E+06,9.5144E+08,5.0256E+03,1.1016E+06,1.4498E+05
     9,    1.4040E+04,5.5440E+03,2.8080E+06,1.1923E+05,2.4589E+07
     a,    1.1724E+06,9.4867E+05,2.0347E+05,2.7657E+09,7.6002E+11
     b,    2.0688E+11,4.5412E+08,1.3646E+10,1.4066E+07,5.7080E+08
     c,    6.6960E+03,1.0282E+06,1.8922E+05,9.1800E+02,8.4600E+02/
      DATA CW/058.,060.,085.,085.,087.,088.,086.,089.,090.,091.
     1,    092.,090.,091.,092.,093.,095.,097.,095.,099.,099.
     2,    103.,105.,106.,105.,127.,129.,127.,127.,129.,129.
     3,    131.,132.,131.,132.,133.,134.,135.,133.,135.,134.
     4,    136.,137.,139.,140.,140.,141.,142.,141.,143.,144.
     5,    143.,147.,239.,238.,239.,240.,241.,241.,242.,244.
     6,    083.,131.,133.,135.,138./
      DATA A1B/'totals '/
      DATA A1C/'light elements'/
```

```
      DATA A1D/'actinides'/
      DATA A1E/'fission products'/
      DATA A1F/'nuclide concentrations, gram atoms'/
      DATA A1G/'basis = single reactor assembly'/
      DATA A1H/'      '/
      DATA A1I/'nuclide concentrations, grams'/
      DATA A1J/'nuclide radioactivity, curies'/
      DATA A1K/'basis =single reactor assembly'/
      DATA A1L/'total  '/
      DATA B3A/'       '/
      DATA CA/6.023E+23/,CC/3.7E+10/
      CALL START
C*********************************************************************
C* OPEN ALL FILES TO BE USED:                                        *
C*      6 = PRINTED OUTPUT        (OPENED IN SUBROUTINE START)      *
C*      7 = PUNCH OUTPUT FOR EXCEL (OPENED IN SUBROUTINE START)     *
C*      8 = PUNCH OUTPUT FOR NIF   (OPENED IN SUBROUTINE START)     *
C*      9 = SAS2H OUTPUT FILE      (OPENED IN SUBROUTINE START)     *
C*     10 = INPUT FILE             (OPENED IN SUBROUTINE START)     *
C*********************************************************************
C   READ INPUT DATA
      READ(10,*) POWER
      WRITE(6,500) POWER
      READ(10,*) N1,N2,N3
      NT=N1+N2+N3
      WRITE(6,501) N1,N2,N3,NT
      READ(10,*) NA1,NA2,NA3
      NAT=NA1+NA2+NA3
      WRITE(6,502) NA1,NA2,NA3,NAT
      READ(10,503) (ANIF(I),I=1,592)
  500 FORMAT(2X,'POWER = ',F8.3,' MWTH')
  501 FORMAT(2X,'N1   = ',I8,/,2X,'N2   = ',I8,/
     1,2X,'N3   = ',I8,/,2X,'NT   = ',I8)
  502 FORMAT(2X,'NA1  = ',I8,/,2X,'NA2  = ',I8,/
     1,2X,'NA3  = ',I8,/,2X,'NAT  = ',I8)
  503 FORMAT(A80)
C*********************************************************************
C   INITIALIZE VARIABLES
      DO 10 I=1,50
      DO 10 J=1,65
      B1B(I,J)=0.0
   10 B1C(I,J)=0.0
      DO 11 J=1,65
   11 CL(J)=0.6931472/CT(J)
      DO 12 I=1,2
      DO 12 J=1,65
      DG(I,J)=0.0
   12 DC(I,J)=0.0
      DO 13 I=1,3
      DO 13 J=1,65
   13 B1D(I,J)=0.0
      IN=0
C*********************************************************************
C   READ LIGHT ELEMENTS GRAM ATOM SAS2H DATA
   20 READ(9,520,END=990) A2C
```

```
      IF(A2C.NE.A1C) GO TO 20
  520 FORMAT(96X,A14)
      READ(9,521,END=990) A2F
      IF(A2F.NE.A1F) GO TO 20
  521 FORMAT(//,43X,A34)
      READ(9,522,END=990) A2G
      IF(A2G.NE.A1G) GO TO 20
  522 FORMAT(43X,A31)
      READ(9,530) (B2A(I),I=1,8)
      DO 30 I=1,8
      IF(B2A(I).NE.B3A) GO TO 30
      IX=I-1
      GO TO 31
   30 CONTINUE
      WRITE(6,531)
      CALL EXIT
   31 CONTINUE
  530 FORMAT(10X,8A10)
  531 FORMAT(2X,'ERROR CODE 524')
      IN=IN+1
      B1A(IN)=B2A(IX)
   38 CONTINUE
      DO 32 K=1,51
      READ(9,532) A2A,(XX(I),I=1,IX)
  532 FORMAT(2X,A8,8E10.2)
      IF(A2A.EQ.A1B) GO TO 39
      DO 33 JN=1,65
      IF(A2A.NE.A1A(JN)) GO TO 33
      B1B(IN,JN)=B1B(IN,JN)+XX(IX)
      GO TO 32
   33 CONTINUE
   32 CONTINUE
      READ(9,525)
  525 FORMAT(/////)
      GO TO 38
   39 CONTINUE
C***********************************************************************
C     READ ACTINIDE GRAM ATOM SAS2H DATA
   40 READ(9,540,END=990) A2D
      IF(A2D.NE.A1D) GO TO 40
  540 FORMAT(101X,A9)
      READ(9,541,END=990) A2F
      IF(A2F.NE.A1F) GO TO 40
  541 FORMAT(//,43X,A34)
      READ(9,542,END=990) A2G
      IF(A2G.NE.A1G) GO TO 40
  542 FORMAT(43X,A31)
      READ(9,543)
  543 FORMAT(1X)
   58 CONTINUE
      DO 52 K=1,51
      READ(9,552) A2A,(XX(I),I=1,IX)
  552 FORMAT(2X,A8,8E10.2)
      IF(A2A.EQ.A1B) GO TO 59
      DO 53 JN=1,65
```

```
      IF(A2A.NE.A1A(JN)) GO TO 53
      B1B(IN,JN)=B1B(IN,JN)+XX(IX)
      GO TO 52
   53 CONTINUE
   52 CONTINUE
      READ(9,555)
  555 FORMAT(/////)
      GO TO 58
   59 CONTINUE
C*********************************************************************
C     READ FISSION PRODUCT GRAM ATOM DATA
   60 READ(9,560,END=990) A2E
      IF(A2E.NE.A1E) GO TO 60
  560 FORMAT(94X,A16)
      READ(9,561,END=990) A2F
      IF(A2F.NE.A1F) GO TO 60
  561 FORMAT(//,43X,A34)
      READ(9,562,END=990) A2G
      IF(A2G.NE.A1G) GO TO 60
  562 FORMAT(43X,A31)
      READ(9,563)
  563 FORMAT(1X)
   78 CONTINUE
      DO 72 K=1,51
      READ(9,572) A2A,(XX(I),I=1,IX)
  572 FORMAT(2X,A8,8E10.2)
      IF(A2A.EQ.A1B) GO TO 79
      DO 73 JN=1,65
      IF(A2A.NE.A1A(JN)) GO TO 73
      B1B(IN,JN)=B1B(IN,JN)+XX(IX)
      GO TO 72
   73 CONTINUE
   72 CONTINUE
      READ(9,575)
  575 FORMAT(/////)
      GO TO 78
   79 CONTINUE
      IF(IN.LT.NT) GO TO 20
C*********************************************************************
C     READ LIGHT ELEMENTS GRAM SAS2H DATA
   80 READ(9,580,END=990) A2C
      IF(A2C.NE.A1C) GO TO 80
  580 FORMAT(96X,A14)
      READ(9,581,END=990) A2I
      IF(A2I.NE.A1I) GO TO 80
  581 FORMAT(//,44X,A29)
      READ(9,582,END=990) A2K
      IF(A2K.NE.A1K) GO TO 80
  582 FORMAT(44X,A30)
      READ(9,583)
  583 FORMAT(1X)
   85 CONTINUE
      DO 86 K=1,53
      READ(9,584) A2A,XX(1)
  584 FORMAT(2X,A8,E10.2)
```

```
      IF(A2A.EQ.A1L) GO TO 89
      DO 87 JN=1,65
      IF(A2A.NE.A1A(JN)) GO TO 87
      DG(1,JN)=DG(1,JN)+XX(1)
      GO TO 86
   87 CONTINUE
   86 CONTINUE
      READ(9,585)
  585 FORMAT(/////)
      GO TO 85
   89 CONTINUE
C***********************************************************************
C    READ LIGHT ELEMENTS CURIE SAS2H DATA
   90 READ(9,590,END=990) A2C
      IF(A2C.NE.A1C) GO TO 90
  590 FORMAT(96X,A14)
      READ(9,591,END=990) A2J
      IF(A2J.NE.A1J) GO TO 90
  591 FORMAT(//,46X,A29)
      READ(9,592,END=990) A2K
      IF(A2K.NE.A1K) GO TO 90
  592 FORMAT(46X,A30)
      READ(9,593)
  593 FORMAT(1X)
   95 CONTINUE
      DO 96 K=1,53
      READ(9,594) A2A,XX(1)
  594 FORMAT(2X,A8,E10.2)
      IF(A2A.EQ.A1L) GO TO 99
      DO 97 JN=1,65
      IF(A2A.NE.A1A(JN)) GO TO 97
      DC(1,JN)=DC(1,JN)+XX(1)
      GO TO 96
   97 CONTINUE
   96 CONTINUE
      READ(9,595)
  595 FORMAT(/////)
      GO TO 95
   99 CONTINUE
C***********************************************************************
C    READ ACTINIDE GRAM SAS2H DATA
  100 READ(9,600,END=990) A2D
      IF(A2D.NE.A1D) GO TO 100
  600 FORMAT(101X,A9)
      READ(9,601,END=990) A2I
      IF(A2I.NE.A1I) GO TO 100
  601 FORMAT(//,44X,A29)
      READ(9,602,END=990) A2K
      IF(A2K.NE.A1K) GO TO 100
  602 FORMAT(44X,A30)
      READ(9,603)
  603 FORMAT(1X)
  105 CONTINUE
      DO 106 K=1,53
      READ(9,604) A2A,XX(1)
```

```
 604 FORMAT(2X,A8,E10.2)
     IF(A2A.EQ.A1L) GO TO 109
     DO 107 JN=1,65
     IF(A2A.NE.A1A(JN)) GO TO 107
     DG(1,JN)=DG(1,JN)+XX(1)
     GO TO 106
 107 CONTINUE
 106 CONTINUE
     READ(9,605)
 605 FORMAT(/////)
     GO TO 105
 109 CONTINUE
C***********************************************************************
C    READ ACTINIDE CURIE SAS2H DATA
 110 READ(9,610,END=990) A2D
     IF(A2D.NE.A1D) GO TO 110
 610 FORMAT(101X,A9)
     READ(9,611,END=990) A2J
     IF(A2J.NE.A1J) GO TO 110
 611 FORMAT(//,46X,A29)
     READ(9,612,END=990) A2K
     IF(A2K.NE.A1K) GO TO 110
 612 FORMAT(46X,A30)
     READ(9,613)
 613 FORMAT(1X)
 115 CONTINUE
     DO 116 K=1,53
     READ(9,614) A2A,XX(1)
 614 FORMAT(2X,A8,E10.2)
     IF(A2A.EQ.A1L) GO TO 119
     DO 117 JN=1,65
     IF(A2A.NE.A1A(JN)) GO TO 117
     DC(1,JN)=DC(1,JN)+XX(1)
     GO TO 116
 117 CONTINUE
 116 CONTINUE
     READ(9,615)
 615 FORMAT(/////)
     GO TO 115
 119 CONTINUE
C***********************************************************************
C    READ FISSION PRODUCT GRAM SAS2H DATA
 120 READ(9,620,END=990) A2E
     IF(A2E.NE.A1E) GO TO 120
 620 FORMAT(94X,A16)
     READ(9,621,END=990) A2I
     IF(A2I.NE.A1I) GO TO 120
 621 FORMAT(//,44X,A29)
     READ(9,622,END=990) A2K
     IF(A2K.NE.A1K) GO TO 120
 622 FORMAT(44X,A30)
     READ(9,623)
 623 FORMAT(1X)
 125 CONTINUE
     DO 126 K=1,53
```

```
      READ(9,624) A2A,XX(1)
  624 FORMAT(2X,A8,E10.2)
      IF(A2A.EQ.A1L) GO TO 129
      DO 127 JN=1,65
      IF(A2A.NE.A1A(JN)) GO TO 127
      DG(1,JN)=DG(1,JN)+XX(1)
      GO TO 126
  127 CONTINUE
  126 CONTINUE
      READ(9,625)
  625 FORMAT(/////)
      GO TO 125
  129 CONTINUE
C***********************************************************************
C     READ FISSION PRODUCTS CURIE SAS2H DATA
  130 READ(9,630,END=990) A2E
      IF(A2E.NE.A1E) GO TO 130
  630 FORMAT(94X,A16)
      READ(9,631,END=990) A2J
      IF(A2J.NE.A1J) GO TO 130
  631 FORMAT(//,46X,A29)
      READ(9,632,END=990) A2K
      IF(A2K.NE.A1K) GO TO 130
  632 FORMAT(46X,A30)
      READ(9,633)
  633 FORMAT(1X)
  135 CONTINUE
      DO 136 K=1,53
      READ(9,634) A2A,XX(1)
  634 FORMAT(2X,A8,E10.2)
      IF(A2A.EQ.A1L) GO TO 139
      DO 137 JN=1,65
      IF(A2A.NE.A1A(JN)) GO TO 137
      DC(1,JN)=DC(1,JN)+XX(1)
      GO TO 136
  137 CONTINUE
  136 CONTINUE
      READ(9,635)
  635 FORMAT(/////)
      GO TO 135
  139 CONTINUE
C***********************************************************************
C     CALCULATE GRAM DATA
  990 CONTINUE
      DO 140 J=1,65
  140 DG(2,J)=B1B(NT,J)*CW(J)
C***********************************************************************
C     CALCULATE CURIE DATA
      DO 150 J=1,65
  150 DC(2,J)=B1B(NT,J)*CL(J)*CA/CC
C***********************************************************************
C     CALCULATE DETAILED CURIE DATA
      DO 160 I=1,NT
      DO 160 J=1,65
  160 B1C(I,J)=B1B(I,J)*CL(J)*CA/CC
```

```
      DO 170 J=1,65
      XX(1)=B1C(1,J)
      DO 171 I=2,N1
  171 IF(XX(1).LT.B1C(I,J)) XX(1)=B1C(I,J)
      B1D(1,J)=XX(1)
      IF(N2.EQ.0) GO TO 170
      NX=N1+1
      NX1=NX+1
      NY=N1+N2
      XX(2)=B1C(NX,J)
      DO 172 I=NX1,NY
  172 IF(XX(2).LT.B1C(I,J)) XX(2)=B1C(I,J)
      B1D(2,J)=XX(2)
      IF(N3.EQ.0) GO TO 170
      NX=N1+N2+1
      NX1=NX+1
      NY=N1+N2+N3
      XX(3)=B1C(NX,J)
      DO 173 I=NX1,NY
  173 IF(XX(3).LT.B1C(I,J)) XX(3)=B1C(I,J)
      B1D(3,J)=XX(3)
  170 CONTINUE
      DO 175 J=1,65
      B1E(1,J)=B1D(1,J)*NA1/POWER
      B1E(2,J)=B1D(2,J)*NA2/POWER
      B1E(3,J)=B1D(3,J)*NA3/POWER
      B1E(4,J)=B1E(1,J)+B1E(2,J)+B1E(3,J)
  175 CONTINUE
C*********************************************************************
C     PRINT DATA TO UNIT 6
      WRITE(6,352) A1A
      WRITE(6,353)
      DO 300 I=1,IN
      WRITE(6,350) B1A(I)
      WRITE(6,351) (B1B(I,J),J=1,65)
  300 CONTINUE
      WRITE(6,354)
      DO 305 I=1,NT
      WRITE(6,350) B1A(I)
      WRITE(6,351) (B1C(I,J),J=1,65)
  305 CONTINUE
  350 FORMAT(/,2X,A10)
  351 FORMAT(2X,1P12E10.2)
  352 FORMAT(12(2X,A8))
  353 FORMAT(/,2X,'ASSEMBLY ISOTOPIC DATA IN GRAM ATOMS')
  354 FORMAT(/,2X,'ASSEMBLY ISOTOPIC DATA IN CURIES')
      WRITE(6,355)
      DO 310 J=1,65
  310 WRITE(6,356) A1A(J), CW(J),CT(J),CL(J)
     1,DG(1,J),DG(2,J),DC(1,J),DC(2,J)
  355 FORMAT(//,3X,'ISOTOPE',7X,'AT WT',' DECAY(SEC)',' LAMBDA(1/S)'
     1,'   SAS2H GRAMS','    CALC GRAMS'
     2,'  SAS2H CURIES','   CALC CURIES')
  356 FORMAT(2X,A8,F12.2,1P2E12.2,1P4E15.4)
      WRITE(6,370)
```

```
      DO 320 J=1,65
  320 WRITE(6,371) A1A(J),(B1D(I,J),I=1,3),(B1E(I,J),I=1,4)
  370 FORMAT(//,3X,'ISOTOPE',6X,'ASSM CI 1',6X,'ASSM CI 2'
     1,6X,'ASSM CI 3',2X,'BATCH CI/MW 1',2X,'BATCH CI/MW 2'
     2,2X,'BATCH CI/MW 3',2X,'BATCH CI/MW T')
  371 FORMAT(2X,A8,1P7E15.4)
C*********************************************************************
C   PRINT DATA TO UNIT 7 FOR EXCEL
      DO 330 J=1,65
  330 WRITE(7,380) B1E(4,J)
  380 FORMAT(1PE15.5)
C*********************************************************************
C   PRINT DATA IN UNIT 8 FOR RADTRAD
      DO 340 K=1,6
  340 WRITE(8,390) ANIF(K)
      KT=6
      DO 342 J=1,65
      DO 343 K=1,5
      KT=KT+1
  343 WRITE(8,390) ANIF(KT)
      KT=KT+1
      WRITE(8,392) B1E(4,J)
      DO 344 K=1,3
      KT=KT+1
  344 WRITE(8,390) ANIF(KT)
  342 CONTINUE
      WRITE(8,390) ANIF(592)
  390 FORMAT(A80)
  392 FORMAT(2X,1PE10.4)
C*********************************************************************
C   END OF PROGRAM
  995 CONTINUE
      CLOSE(6)
      CLOSE(7)
      CLOSE(8)
      CLOSE(9)
      CLOSE(10)
      STOP
      END
      SUBROUTINE START
C
C*********************************************************************
C*                                                                   *
C* ROUTINE TO GET THE REQUIRED DATA TO GET STARTED                   *
C*                                                                   *
C*********************************************************************
C
      CHARACTER INFP*8,INFE*8,INFN*8,INFO*8,INFI*8
   10 CONTINUE
      PRINT 11
   11 FORMAT(/////,2X,'WHAT IS THE NAME OF THE INPUT FILE ',
     +     '(8 CHARACTERS LENGTH)',/,'  ? ')
      READ(*,50) INFI
   50 FORMAT(A8)
      IF(IERROR .EQ. 0) GO TO 12
```

```
      PRINT 60
   60 FORMAT(' CANNOT FIND FILE       PLEASE TRY AGAIN',///)
      GO TO 10
   12 OPEN(10,FILE=INFI,STATUS='OLD',IOSTAT=IERROR)
      READ(10,50) INFP
      READ(10,50) INFE
      READ(10,50) INFN
      READ(10,50) INFO
      OPEN(6,FILE=INFP,STATUS='UNKNOWN')
      OPEN(7,FILE=INFE,STATUS='UNKNOWN')
      OPEN(8,FILE=INFN,STATUS='UNKNOWN')
      OPEN(9,FILE=INFO,STATUS='OLD',IOSTAT=IERROR)
      RETURN
      END
```

ATTACHMENT F
SAS2H EDIT CODE INPUT FILE (CRCB.SED)

```
CRCB.PUN
CRCB.XLS
CRCB.NIF
CRCB.OUT
 2754.0
 15 11  7
 73 72 72
 Nuclide Inventory Name:
 Normalized MACCS Sample 3412 MWth PWR Core Inventory
 Power Level:
  0.1000E+01
 Nuclides:
  65
 Nuclide 001:
 Co-58
  7
  0.6117120000E+07
  0.5800E+02
  0.2553E+03
 none    0.0000E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 002:
 Co-60
  7
  0.1663401096E+09
  0.6000E+02
  0.1953E+03
 none    0.0000E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 003:
 Kr-85
  1
  0.3382974720E+09
  0.8500E+02
  0.1960E+03
 none    0.0000E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 004:
 Kr-85m
  1
  0.1612800000E+05
  0.8500E+02
  0.9181E+04
 Kr-85   0.2100E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 005:
 Kr-87
```

1
0.4578000000E+04
0.8700E+02
0.1678E+05
Rb-87 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 006:
Kr-88
1
0.1022400000E+05
0.8800E+02
0.2269E+05
Rb-88 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 007:
Rb-86
3
0.1612224000E+07
0.8600E+02
0.1496E+02
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 008:
Sr-89
5
0.4363200000E+07
0.8900E+02
0.2844E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 009:
Sr-90
5
0.9189573120E+09
0.9000E+02
0.1535E+04
Y-90 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 010:
Sr-91
5
0.3420000000E+05
0.9100E+02
0.3656E+05
Y-91m 0.5800E+00
Y-91 0.4200E+00
none 0.0000E+00
Nuclide 011:
Sr-92
5

0.9756000000E+04
0.9200E+02
0.3805E+05
Y-92 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 012:
Y-90
9
0.2304000000E+06
0.9000E+02
0.1647E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 013:
Y-91
9
0.5055264000E+07
0.9100E+02
0.3465E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 014:
Y-92
9
0.1274400000E+05
0.9200E+02
0.3819E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 015:
Y-93
9
0.3636000000E+05
0.9300E+02
0.4320E+05
Zr-93 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 016:
Zr-95
9
0.5527872000E+07
0.9500E+02
0.4377E+05
Nb-95m 0.7000E-02
Nb-95 0.9900E+00
none 0.0000E+00
Nuclide 017:
Zr-97
9
0.6084000000E+05

0.9700E+02
0.4562E+05
Nb-97m 0.9500E+00
Nb-97 0.5300E-01
none 0.0000E+00
Nuclide 018:
Nb-95
9
0.3036960000E+07
0.9500E+02
0.4138E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 019:
Mo-99
7
0.2376000000E+06
0.9900E+02
0.4830E+05
Tc-99m 0.8800E+00
Tc-99 0.1200E+00
none 0.0000E+00
Nuclide 020:
Tc-99m
7
0.2167200000E+05
0.9900E+02
0.4169E+05
Tc-99 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 021:
Ru-103
7
0.3393792000E+07
0.1030E+03
0.3598E+05
Rh-103m 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 022:
Ru-105
7
0.1598400000E+05
0.1050E+03
0.2340E+05
Rh-105 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 023:
Ru-106
7
0.3181248000E+08
0.1060E+03

0.8175E+04
Rh-106 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 024:
Rh-105
7
0.1272960000E+06
0.1050E+03
0.1621E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 025:
Sb-127
4
0.3326400000E+06
0.1270E+03
0.2208E+04
Te-127m 0.1800E+00
Te-127 0.8200E+00
none 0.0000E+00
Nuclide 026:
Sb-129
4
0.1555200000E+05
0.1290E+03
0.7820E+04
Te-129m 0.2200E+00
Te-129 0.7700E+00
none 0.0000E+00
Nuclide 027:
Te-127
4
0.3366000000E+05
0.1270E+03
0.2132E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 028:
Te-127m
4
0.9417600000E+07
0.1270E+03
0.2823E+03
Te-127 0.9800E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 029:
Te-129
4
0.4176000000E+04
0.1290E+03
0.7341E+04

I-129 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 030:
Te-129m
4
0.2903040000E+07
0.1290E+03
0.1935E+04
Te-129 0.6500E+00
I-129 0.3500E+00
none 0.0000E+00
Nuclide 031:
Te-131m
4
0.1080000000E+06
0.1310E+03
0.3707E+04
Te-131 0.2200E+00
I-131 0.7800E+00
none 0.0000E+00
Nuclide 032:
Te-132
4
0.2815200000E+06
0.1320E+03
0.3690E+05
I-132 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 033:
I-131
2
0.6946560000E+06
0.1310E+03
0.2540E+05
Xe-131m 0.1100E-01
none 0.0000E+00
none 0.0000E+00
Nuclide 034:
I-132
2
0.8280000000E+04
0.1320E+03
0.3743E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 035:
I-133
2
0.7488000000E+05
0.1330E+03
0.5370E+05
Xe-133m 0.2900E-01

Xe-133 0.9700E+00
none 0.0000E+00
Nuclide 036:
I-134
2
0.3156000000E+04
0.1340E+03
0.5893E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 037:
I-135
2
0.2379600000E+05
0.1350E+03
0.5063E+05
Xe-135m 0.1500E+00
Xe-135 0.8500E+00
none 0.0000E+00
Nuclide 038:
Xe-133
1
0.4531680000E+06
0.1330E+03
0.5372E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 039:
Xe-135
1
0.3272400000E+05
0.1350E+03
0.1008E+05
Cs-135 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 040:
Cs-134
3
0.6507177120E+08
0.1340E+03
0.3425E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 041:
Cs-136
3
0.1131840000E+07
0.1360E+03
0.1042E+04
none 0.0000E+00
none 0.0000E+00

none 0.0000E+00
Nuclide 042:
Cs-137
3
0.9467280000E+09
0.1370E+03
0.1915E+04
Ba-137m 0.9500E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 043:
Ba-139
6
0.4962000000E+04
0.1390E+03
0.4976E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 044:
Ba-140
6
0.1100736000E+07
0.1400E+03
0.4924E+05
La-140 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 045:
La-140
9
0.1449792000E+06
0.1400E+03
0.5032E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 046:
La-141
9
0.1414800000E+05
0.1410E+03
0.4615E+05
Ce-141 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 047:
La-142
9
0.5550000000E+04
0.1420E+03
0.4449E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00

Nuclide 048:
Ce-141
8
0.2808086400E+07
0.1410E+03
0.4476E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 049:
Ce-143
8
0.1188000000E+06
0.1430E+03
0.4352E+05
Pr-143 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 050:
Ce-144
8
0.2456352000E+08
0.1440E+03
0.2697E+05
Pr-144m 0.1800E-01
Pr-144 0.9800E+00
none 0.0000E+00
Nuclide 051:
Pr-143
9
0.1171584000E+07
0.1430E+03
0.4273E+05
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 052:
Nd-147
9
0.9486720000E+06
0.1470E+03
0.1911E+05
Pm-147 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 053:
Np-239
8
0.2034720000E+06
0.2390E+03
0.5120E+06
Pu-239 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 054:

Pu-238
8
0.2768863824E+10
0.2380E+03
0.2902E+02
U-234 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 055:
Pu-239
8
0.7594336440E+12
0.2390E+03
0.6545E+01
U-235 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 056:
Pu-240
8
0.2062920312E+12
0.2400E+03
0.8254E+01
U-236 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 057:
Pu-241
8
0.4544294400E+09
0.2410E+03
0.1390E+04
U-237 0.2400E-04
Am-241 0.1000E+01
none 0.0000E+00
Nuclide 058:
Am-241
9
0.1363919472E+11
0.2410E+03
0.9181E+00
Np-237 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 059:
Cm-242
9
0.1406592000E+08
0.2420E+03
0.3514E+03
Pu-238 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 060:
Cm-244

```
 9
 0.571508136E+9
 0.2440E+03
 0.2056E+02
Pu-240  0.1000E+01
none    0.0000E+00
none    0.0000E+00
Nuclide 061:
Kr-83m
 1
 6.6960000000E+03
 0.8300E+02
 1.0000E+00
Kr-83   0.1000E+01
none    0.0000E+00
none    0.0000E+00
Nuclide 062:
Xe-131m
 1
 1.0282000000E+06
 0.1310E+03
 1.0000E+00
Xe-131  0.1000E+01
none    0.0000E+00
none    0.0000E+00
Nuclide 063:
Xe-133m
 1
 1.8922000000E+05
 0.1330E+03
 1.0000E+00
Xe-133  0.1000E+01
none    0.0000E+00
none    0.0000E+00
Nuclide 064:
Xe-135m
 1
 9.1800000000E+02
 0.1350E+03
 1.0000E+00
Xe-135  0.1000E+01
none    0.0000E+00
none    0.0000E+00
Nuclide 065:
Xe-138
 1
 8.4600000000E+02
 0.1380E+03
 1.0000E+00
none    0.0000E+00
none    0.0000E+00
none    0.0000E+00
End of Nuclear Inventory File
```

ATTACHMENT G
SAS2H EDIT CODE PUNCH FILE (CRCB.PUN)

POWER = 2754.000 MWTH
N1 = 15
N2 = 11
N3 = 7
NT = 33
NA1 = 73
NA2 = 72
NA3 = 72
NAT = 217
co 58 co 60 kr 85 kr 85m kr 87 kr 88 rb 86 sr 89 sr 90 sr 91 sr 92 y 90
y 91 y 92 y 93 zr 95 zr 97 nb 95 mo 99 tc 99m ru103 ru105 ru106 rh105
sb127 sb129 te127 te127m te129 te129m te131m te132 i131 i132 i133 i134
i135 xe133 xe135 cs134 cs136 cs137 ba139 ba140 la140 la141 la142 ce141
ce143 ce144 pr143 nd147 np239 pu238 pu239 pu240 pu241 am241 cm242 cm244
kr 83m xe131m xe133m xe135m xe138

ASSEMBLY ISOTOPIC DATA IN GRAM ATOMS

46.2 d
3.52E-03 9.27E-03 9.23E-03 2.47E-04 1.44E-04 4.54E-04 3.71E-06 1.27E-01 2.06E-01 2.56E-03 7.33E-04 6.52E-05
1.60E-01 9.66E-04 1.97E-03 1.91E-01 4.85E-03 3.86E-02 1.93E-02 1.55E-03 8.45E-02 3.01E-04 2.28E-02 2.15E-03
6.30E-04 1.69E-04 5.57E-05 6.66E-04 3.99E-05 3.44E-03 5.90E-04 1.64E-02 2.67E-02 4.84E-04 6.68E-03 3.24E-04
1.99E-03 3.80E-02 8.26E-04 1.23E-03 1.64E-04 2.31E-01 4.24E-04 8.41E-02 1.09E-02 1.08E-03 4.18E-04 1.34E-01
9.10E-03 1.87E-01 8.05E-02 2.68E-02 1.40E-01 1.71E-04 1.61E+00 5.75E-02 5.72E-03 8.51E-06 1.54E-07 7.48E-09
4.52E-05 3.63E-04 4.51E-04 1.45E-05 7.02E-05

92.4 d
4.84E-03 1.84E-02 1.81E-02 2.38E-04 1.39E-04 4.37E-04 9.95E-06 1.89E-01 4.04E-01 2.47E-03 7.11E-04 1.18E-04
2.48E-01 9.36E-04 1.92E-03 3.05E-01 4.81E-03 1.01E-01 1.92E-02 1.55E-03 1.27E-01 3.48E-04 5.13E-02 2.50E-03
7.10E-04 1.76E-04 6.48E-05 1.35E-03 4.28E-05 4.95E-03 6.37E-04 1.65E-02 2.75E-02 4.88E-04 6.66E-03 3.21E-04
1.99E-03 3.81E-02 8.31E-04 5.72E-03 3.11E-04 4.61E-01 4.20E-04 9.02E-02 1.19E-02 1.07E-03 4.13E-04 1.83E-01
8.94E-03 3.50E-01 8.76E-02 2.80E-02 1.41E-01 1.07E-03 3.05E+00 2.01E-01 3.88E-02 1.19E-04 4.40E-06 4.66E-07
4.39E-05 4.44E-04 4.55E-04 1.48E-05 6.92E-05

138.6 d
5.36E-03 2.74E-02 2.67E-02 2.31E-04 1.34E-04 4.22E-04 1.66E-05 2.18E-01 5.94E-01 2.39E-03 6.92E-04 1.69E-04
2.94E-01 9.11E-04 1.88E-03 3.70E-01 4.78E-03 1.53E-01 1.92E-02 1.55E-03 1.50E-01 3.88E-04 8.39E-02 2.79E-03
7.75E-04 1.82E-04 7.24E-05 1.94E-03 4.47E-05 5.69E-03 6.75E-04 1.66E-02 2.78E-02 4.91E-04 6.65E-03 3.19E-04
1.98E-03 3.80E-02 8.31E-04 1.33E-02 4.48E-04 6.91E-01 4.17E-04 9.00E-02 1.19E-02 1.06E-03 4.09E-04 2.00E-01
8.81E-03 4.92E-01 8.70E-02 2.79E-02 1.42E-01 3.02E-03 4.25E+00 3.92E-01 1.07E-01 5.05E-04 2.80E-05 4.78E-06
4.28E-05 4.61E-04 4.58E-04 1.50E-05 6.83E-05

184.8 d
5.58E-03 3.63E-02 3.49E-02 2.25E-04 1.30E-04 4.09E-04 2.33E-05 2.29E-01 7.77E-01 2.33E-03 6.75E-04 2.19E-04
3.17E-01 8.89E-04 1.84E-03 4.07E-01 4.76E-03 1.90E-01 1.91E-02 1.54E-03 1.64E-01 4.23E-04 1.19E-01 3.04E-03
8.29E-04 1.86E-04 7.88E-05 2.46E-03 4.60E-05 6.09E-03 7.06E-04 1.67E-02 2.81E-02 4.94E-04 6.64E-03 3.18E-04
1.98E-03 3.80E-02 8.28E-04 2.38E-02 5.78E-04 9.21E-01 4.14E-04 8.94E-02 1.18E-02 1.05E-03 4.05E-04 2.06E-01
8.70E-03 6.16E-01 8.59E-02 2.78E-02 1.44E-01 6.29E-03 5.26E+00 6.12E-01 2.07E-01 1.32E-03 9.77E-05 2.38E-05
4.19E-05 4.72E-04 4.61E-04 1.52E-05 6.76E-05

230.9 d
5.68E-03 4.52E-02 4.29E-02 2.19E-04 1.27E-04 3.97E-04 2.99E-05 2.32E-01 9.53E-01 2.27E-03 6.60E-04 2.67E-04
3.26E-01 8.69E-04 1.81E-03 4.28E-01 4.74E-03 2.14E-01 1.91E-02 1.54E-03 1.73E-01 4.55E-04 1.57E-01 3.27E-03
8.76E-04 1.90E-04 8.44E-05 2.91E-03 4.71E-05 6.34E-03 7.33E-04 1.68E-02 2.83E-02 4.96E-04 6.63E-03 3.16E-04
1.98E-03 3.80E-02 8.21E-04 3.70E-02 7.04E-04 1.15E+00 4.11E-04 8.88E-02 1.18E-02 1.05E-03 4.02E-04 2.07E-01
8.59E-03 7.25E-01 8.49E-02 2.76E-02 1.45E-01 1.11E-02 6.10E+00 8.50E-01 3.32E-01 2.68E-03 2.46E-04 8.02E-05
4.10E-05 4.82E-04 4.63E-04 1.54E-05 6.70E-05

277.1 d
5.74E-03 5.39E-02 5.05E-02 2.14E-04 1.23E-04 3.86E-04 3.65E-05 2.30E-01 1.12E+00 2.21E-03 6.46E-04 3.14E-04
3.27E-01 8.51E-04 1.78E-03 4.39E-01 4.73E-03 2.27E-01 1.90E-02 1.54E-03 1.80E-01 4.84E-04 1.96E-01 3.48E-03
9.18E-04 1.93E-04 8.93E-05 3.30E-03 4.80E-05 6.53E-03 7.56E-04 1.68E-02 2.84E-02 4.98E-04 6.61E-03 3.15E-04
1.97E-03 3.79E-02 8.13E-04 5.27E-02 8.27E-04 1.38E+00 4.08E-04 8.83E-02 1.17E-02 1.04E-03 3.99E-04 2.07E-01

8.50E-03 8.20E-01 8.39E-02 2.75E-02 1.46E-01 1.76E-02 6.81E+00 1.10E+00 4.75E-01 4.64E-03 5.08E-04 2.11E-04
4.02E-05 4.91E-04 4.64E-04 1.56E-05 6.64E-05

323.3 d
5.77E-03 6.27E-02 5.80E-02 2.09E-04 1.20E-04 3.76E-04 4.31E-05 2.26E-01 1.29E+00 2.16E-03 6.33E-04 3.59E-04
3.25E-01 8.33E-04 1.75E-03 4.44E-01 4.70E-03 2.36E-01 1.90E-02 1.54E-03 1.86E-01 5.11E-04 2.37E-01 3.67E-03
9.55E-04 1.96E-04 9.36E-05 3.64E-03 4.88E-05 6.68E-03 7.76E-04 1.68E-02 2.86E-02 5.00E-04 6.60E-03 3.13E-04
1.97E-03 3.79E-02 8.02E-04 7.06E-02 9.47E-04 1.60E+00 4.06E-04 8.78E-02 1.17E-02 1.03E-03 3.96E-04 2.06E-01
8.41E-03 9.02E-01 8.30E-02 2.74E-02 1.47E-01 2.59E-02 7.40E+00 1.35E+00 6.29E-01 7.19E-03 9.14E-04 4.72E-04
3.95E-05 5.00E-04 4.66E-04 1.57E-05 6.59E-05

369.5 d
5.79E-03 7.13E-02 6.52E-02 2.04E-04 1.17E-04 3.67E-04 4.97E-05 2.21E-01 1.45E+00 2.11E-03 6.21E-04 4.03E-04
3.20E-01 8.17E-04 1.72E-03 4.44E-01 4.68E-03 2.39E-01 1.90E-02 1.54E-03 1.91E-01 5.37E-04 2.78E-01 3.85E-03
9.88E-04 1.99E-04 9.75E-05 3.94E-03 4.95E-05 6.80E-03 7.94E-04 1.69E-02 2.87E-02 5.01E-04 6.59E-03 3.12E-04
1.97E-03 3.78E-02 7.89E-04 9.07E-02 1.07E-03 1.83E+00 4.04E-04 8.74E-02 1.16E-02 1.03E-03 3.93E-04 2.05E-01
8.33E-03 9.74E-01 8.22E-02 2.73E-02 1.49E-01 3.62E-02 7.89E+00 1.61E+00 7.90E-01 1.03E-02 1.49E-03 9.32E-04
3.88E-05 5.08E-04 4.67E-04 1.58E-05 6.55E-05

415.7 d
5.80E-03 8.00E-02 7.22E-02 1.99E-04 1.15E-04 3.58E-04 5.62E-05 2.16E-01 1.61E+00 2.06E-03 6.09E-04 4.46E-04
3.15E-01 8.02E-04 1.70E-03 4.43E-01 4.67E-03 2.42E-01 1.90E-02 1.53E-03 1.95E-01 5.60E-04 3.19E-01 4.02E-03
1.02E-03 2.01E-04 1.01E-04 4.20E-03 5.01E-05 6.91E-03 8.10E-04 1.69E-02 2.88E-02 5.02E-04 6.58E-03 3.11E-04
1.97E-03 3.78E-02 7.75E-04 1.13E-01 1.18E-03 2.06E+00 4.02E-04 8.69E-02 1.16E-02 1.02E-03 3.90E-04 2.04E-01
8.26E-03 1.04E+00 8.15E-02 2.72E-02 1.50E-01 4.85E-02 8.29E+00 1.87E+00 9.53E-01 1.39E-02 2.26E-03 1.68E-03
3.81E-05 5.16E-04 4.68E-04 1.59E-05 6.50E-05

461.9 d
5.81E-03 8.86E-02 7.90E-02 1.95E-04 1.12E-04 3.50E-04 6.27E-05 2.11E-01 1.76E+00 2.02E-03 5.98E-04 4.87E-04
3.09E-01 7.88E-04 1.67E-03 4.41E-01 4.65E-03 2.41E-01 1.89E-02 1.53E-03 1.99E-01 5.83E-04 3.61E-01 4.17E-03
1.05E-03 2.03E-04 1.04E-04 4.43E-03 5.07E-05 7.00E-03 8.24E-04 1.69E-02 2.89E-02 5.03E-04 6.57E-03 3.10E-04
1.97E-03 3.77E-02 7.59E-04 1.37E-01 1.30E-03 2.28E+00 4.00E-04 8.66E-02 1.16E-02 1.02E-03 3.88E-04 2.03E-01
8.19E-03 1.09E+00 8.08E-02 2.71E-02 1.51E-01 6.29E-02 8.61E+00 2.13E+00 1.11E+00 1.80E-02 3.22E-03 2.83E-03
3.75E-05 5.23E-04 4.69E-04 1.60E-05 6.46E-05

508.1 d
5.81E-03 9.72E-02 8.55E-02 1.91E-04 1.10E-04 3.42E-04 6.92E-05 2.06E-01 1.91E+00 1.98E-03 5.88E-04 5.28E-04
3.03E-01 7.74E-04 1.65E-03 4.38E-01 4.63E-03 2.40E-01 1.89E-02 1.53E-03 2.03E-01 6.05E-04 4.03E-01 4.32E-03
1.07E-03 2.05E-04 1.07E-04 4.64E-03 5.12E-05 7.09E-03 8.37E-04 1.69E-02 2.90E-02 5.04E-04 6.56E-03 3.09E-04
1.96E-03 3.77E-02 7.43E-04 1.62E-01 1.42E-03 2.51E+00 3.98E-04 8.62E-02 1.15E-02 1.01E-03 3.86E-04 2.02E-01
8.12E-03 1.14E+00 8.01E-02 2.71E-02 1.52E-01 7.94E-02 8.86E+00 2.39E+00 1.27E+00 2.24E-02 4.40E-03 4.48E-03
3.69E-05 5.30E-04 4.70E-04 1.61E-05 6.43E-05

554.3 d
5.81E-03 1.06E-01 9.19E-02 1.87E-04 1.07E-04 3.34E-04 7.57E-05 2.01E-01 2.05E+00 1.94E-03 5.78E-04 5.67E-04
2.97E-01 7.60E-04 1.63E-03 4.35E-01 4.61E-03 2.39E-01 1.89E-02 1.53E-03 2.07E-01 6.25E-04 4.45E-01 4.47E-03
1.10E-03 2.07E-04 1.10E-04 4.82E-03 5.16E-05 7.17E-03 8.48E-04 1.70E-02 2.91E-02 5.04E-04 6.55E-03 3.08E-04
1.96E-03 3.76E-02 7.25E-04 1.89E-01 1.53E-03 2.73E+00 3.96E-04 8.59E-02 1.15E-02 1.01E-03 3.83E-04 2.01E-01
8.05E-03 1.18E+00 7.94E-02 2.70E-02 1.54E-01 9.81E-02 9.05E+00 2.64E+00 1.42E+00 2.71E-02 5.78E-03 6.78E-03
3.63E-05 5.37E-04 4.71E-04 1.62E-05 6.39E-05

600.5 d
5.80E-03 1.14E-01 9.81E-02 1.83E-04 1.05E-04 3.26E-04 8.22E-05 1.96E-01 2.19E+00 1.90E-03 5.68E-04 6.07E-04
2.91E-01 7.47E-04 1.60E-03 4.31E-01 4.59E-03 2.37E-01 1.88E-02 1.53E-03 2.10E-01 6.45E-04 4.87E-01 4.60E-03
1.12E-03 2.08E-04 1.12E-04 4.99E-03 5.20E-05 7.24E-03 8.59E-04 1.70E-02 2.91E-02 5.05E-04 6.54E-03 3.07E-04
1.96E-03 3.76E-02 7.07E-04 2.18E-01 1.65E-03 2.95E+00 3.94E-04 8.55E-02 1.15E-02 1.00E-03 3.81E-04 2.00E-01
7.99E-03 1.21E+00 7.88E-02 2.69E-02 1.56E-01 1.19E-01 9.19E+00 2.88E+00 1.57E+00 3.19E-02 7.37E-03 9.87E-03
3.57E-05 5.44E-04 4.72E-04 1.63E-05 6.36E-05

646.7 d
5.79E-03 1.23E-01 1.04E-01 1.80E-04 1.03E-04 3.19E-04 8.87E-05 1.92E-01 2.33E+00 1.86E-03 5.58E-04 6.44E-04
2.85E-01 7.35E-04 1.58E-03 4.28E-01 4.58E-03 2.35E-01 1.88E-02 1.52E-03 2.13E-01 6.65E-04 5.28E-01 4.73E-03
1.14E-03 2.10E-04 1.15E-04 5.14E-03 5.24E-05 7.30E-03 8.70E-04 1.70E-02 2.92E-02 5.05E-04 6.53E-03 3.06E-04
1.96E-03 3.75E-02 6.89E-04 2.48E-01 1.76E-03 3.18E+00 3.93E-04 8.52E-02 1.14E-02 9.99E-04 3.79E-04 1.99E-01
7.93E-03 1.24E+00 7.82E-02 2.69E-02 1.57E-01 1.42E-01 9.29E+00 3.12E+00 1.71E+00 3.68E-02 9.15E-03 1.39E-02
3.52E-05 5.51E-04 4.72E-04 1.64E-05 6.32E-05

668.3 d

5.80E-03 1.27E-01 1.07E-01 1.78E-04 1.02E-04 3.16E-04 9.22E-05 1.90E-01 2.39E+00 1.84E-03 5.54E-04 6.62E-04
2.82E-01 7.29E-04 1.57E-03 4.27E-01 4.58E-03 2.34E-01 1.88E-02 1.56E-03 2.15E-01 6.75E-04 5.48E-01 4.72E-03
1.15E-03 2.11E-04 1.18E-04 5.21E-03 5.27E-05 7.33E-03 8.75E-04 1.70E-02 2.92E-02 5.09E-04 6.50E-03 3.06E-04
1.96E-03 3.94E-02 6.83E-04 2.62E-01 1.82E-03 3.28E+00 3.92E-04 8.50E-02 1.14E-02 9.98E-04 3.78E-04 1.99E-01
7.90E-03 1.25E+00 7.79E-02 2.68E-02 1.59E-01 1.54E-01 9.32E+00 3.22E+00 1.77E+00 3.90E-02 1.00E-02 1.62E-02
3.49E-05 5.54E-04 5.15E-04 1.64E-05 6.31E-05

702.7 d
5.64E-03 1.31E-01 1.10E-01 1.25E-04 7.12E-05 2.21E-04 8.25E-05 1.66E-01 2.46E+00 1.29E-03 3.90E-04 6.71E-04
2.52E-01 5.13E-04 1.11E-03 3.86E-01 3.29E-03 2.27E-01 1.34E-02 1.09E-03 1.89E-01 4.94E-04 5.60E-01 3.58E-03
8.29E-04 1.51E-04 8.85E-05 5.03E-03 3.88E-05 6.30E-03 6.27E-04 1.21E-02 2.13E-02 3.62E-04 4.63E-03 2.18E-04
1.40E-03 2.83E-02 6.54E-04 2.79E-01 1.53E-03 3.40E+00 2.79E-04 6.41E-02 8.70E-03 7.09E-04 2.68E-04 1.69E-01
5.59E-03 1.24E+00 5.94E-02 2.00E-02 1.26E-01 1.69E-01 9.51E+00 3.32E+00 1.86E+00 4.39E-02 1.08E-02 1.94E-02
2.46E-05 4.52E-04 3.68E-04 1.17E-05 4.48E-05

767.4 d
5.53E-03 1.39E-01 1.15E-01 1.22E-04 6.94E-05 2.15E-04 8.32E-05 1.42E-01 2.58E+00 1.26E-03 3.82E-04 7.04E-04
2.18E-01 5.03E-04 1.09E-03 3.41E-01 3.28E-03 2.04E-01 1.34E-02 1.08E-03 1.69E-01 5.10E-04 5.84E-01 3.80E-03
8.47E-04 1.53E-04 8.77E-05 4.73E-03 3.84E-05 5.59E-03 6.38E-04 1.21E-02 2.07E-02 3.61E-04 4.64E-03 2.17E-04
1.40E-03 2.67E-02 6.44E-04 3.12E-01 1.57E-03 3.61E+00 2.77E-04 6.02E-02 8.12E-03 7.05E-04 2.66E-04 1.47E-01
5.54E-03 1.21E+00 5.30E-02 1.91E-02 1.27E-01 2.01E-01 9.74E+00 3.52E+00 2.02E+00 5.28E-02 1.27E-02 2.67E-02
2.42E-05 4.14E-04 3.44E-04 1.18E-05 4.45E-05

832.0 d
5.49E-03 1.46E-01 1.20E-01 1.19E-04 6.77E-05 2.09E-04 8.76E-05 1.30E-01 2.70E+00 1.23E-03 3.75E-04 7.37E-04
2.00E-01 4.93E-04 1.07E-03 3.18E-01 3.26E-03 1.85E-01 1.34E-02 1.08E-03 1.64E-01 5.24E-04 6.08E-01 3.91E-03
8.63E-04 1.54E-04 8.85E-05 4.56E-03 3.85E-05 5.44E-03 6.46E-04 1.21E-02 2.07E-02 3.61E-04 4.63E-03 2.16E-04
1.39E-03 2.67E-02 6.33E-04 3.44E-01 1.68E-03 3.83E+00 2.76E-04 5.99E-02 8.09E-03 7.01E-04 2.65E-04 1.42E-01
5.50E-03 1.18E+00 5.24E-02 1.91E-02 1.27E-01 2.34E-01 9.91E+00 3.71E+00 2.16E+00 6.16E-02 1.50E-02 3.56E-02
2.37E-05 4.17E-04 3.44E-04 1.18E-05 4.43E-05

896.7 d
5.47E-03 1.53E-01 1.25E-01 1.16E-04 6.61E-05 2.04E-04 9.24E-05 1.23E-01 2.81E+00 1.21E-03 3.68E-04 7.69E-04
1.89E-01 4.84E-04 1.06E-03 3.04E-01 3.25E-03 1.73E-01 1.33E-02 1.08E-03 1.64E-01 5.38E-04 6.33E-01 4.00E-03
8.78E-04 1.55E-04 8.95E-05 4.47E-03 3.87E-05 5.43E-03 6.53E-04 1.21E-02 2.08E-02 3.62E-04 4.62E-03 2.15E-04
1.39E-03 2.67E-02 6.20E-04 3.78E-01 1.79E-03 4.04E+00 2.75E-04 5.97E-02 8.07E-03 6.98E-04 2.63E-04 1.40E-01
5.45E-03 1.16E+00 5.19E-02 1.90E-02 1.28E-01 2.70E-01 1.00E+01 3.90E+00 2.29E+00 7.00E-02 1.76E-02 4.63E-02
2.34E-05 4.22E-04 3.45E-04 1.19E-05 4.40E-05

961.4 d
5.45E-03 1.61E-01 1.29E-01 1.14E-04 6.47E-05 1.99E-04 9.71E-05 1.19E-01 2.92E+00 1.18E-03 3.62E-04 7.99E-04
1.82E-01 4.76E-04 1.05E-03 2.96E-01 3.25E-03 1.67E-01 1.33E-02 1.08E-03 1.66E-01 5.51E-04 6.58E-01 4.09E-03
8.92E-04 1.56E-04 9.05E-05 4.44E-03 3.90E-05 5.46E-03 6.60E-04 1.21E-02 2.08E-02 3.62E-04 4.62E-03 2.14E-04
1.39E-03 2.66E-02 6.06E-04 4.11E-01 1.90E-03 4.26E+00 2.74E-04 5.94E-02 8.06E-03 6.95E-04 2.62E-04 1.39E-01
5.41E-03 1.14E+00 5.15E-02 1.90E-02 1.29E-01 3.08E-01 1.01E+01 4.10E+00 2.40E+00 7.79E-02 2.04E-02 5.90E-02
2.30E-05 4.26E-04 3.45E-04 1.19E-05 4.38E-05

1026.0 d
5.43E-03 1.68E-01 1.34E-01 1.11E-04 6.32E-05 1.95E-04 1.02E-04 1.15E-01 3.03E+00 1.16E-03 3.56E-04 8.29E-04
1.77E-01 4.68E-04 1.03E-03 2.91E-01 3.24E-03 1.62E-01 1.33E-02 1.08E-03 1.67E-01 5.63E-04 6.83E-01 4.18E-03
9.06E-04 1.57E-04 9.16E-05 4.44E-03 3.92E-05 5.50E-03 6.66E-04 1.21E-02 2.08E-02 3.62E-04 4.61E-03 2.14E-04
1.39E-03 2.66E-02 5.92E-04 4.45E-01 2.01E-03 4.47E+00 2.73E-04 5.92E-02 8.05E-03 6.92E-04 2.60E-04 1.38E-01
5.37E-03 1.12E+00 5.12E-02 1.89E-02 1.30E-01 3.48E-01 1.01E+01 4.28E+00 2.49E+00 8.53E-02 2.33E-02 7.38E-02
2.26E-05 4.30E-04 3.45E-04 1.20E-05 4.36E-05

1090.7 d
5.40E-03 1.75E-01 1.38E-01 1.09E-04 6.19E-05 1.90E-04 1.06E-04 1.12E-01 3.14E+00 1.13E-03 3.50E-04 8.58E-04
1.72E-01 4.60E-04 1.02E-03 2.88E-01 3.22E-03 1.59E-01 1.33E-02 1.08E-03 1.69E-01 5.75E-04 7.08E-01 4.26E-03
9.18E-04 1.57E-04 9.28E-05 4.47E-03 3.94E-05 5.53E-03 6.71E-04 1.21E-02 2.08E-02 3.62E-04 4.60E-03 2.13E-04
1.39E-03 2.66E-02 5.77E-04 4.78E-01 2.12E-03 4.68E+00 2.71E-04 5.90E-02 8.04E-03 6.89E-04 2.59E-04 1.37E-01
5.34E-03 1.10E+00 5.08E-02 1.89E-02 1.30E-01 3.90E-01 1.01E+01 4.46E+00 2.58E+00 9.21E-02 2.64E-02 9.08E-02
2.23E-05 4.34E-04 3.46E-04 1.20E-05 4.34E-05

1155.4 d
5.37E-03 1.82E-01 1.42E-01 1.07E-04 6.06E-05 1.86E-04 1.11E-04 1.10E-01 3.24E+00 1.11E-03 3.44E-04 8.87E-04
1.69E-01 4.52E-04 1.01E-03 2.85E-01 3.20E-03 1.57E-01 1.33E-02 1.07E-03 1.71E-01 5.86E-04 7.33E-01 4.33E-03
9.29E-04 1.58E-04 9.39E-05 4.50E-03 3.96E-05 5.56E-03 6.77E-04 1.21E-02 2.09E-02 3.62E-04 4.59E-03 2.13E-04
1.39E-03 2.65E-02 5.62E-04 5.12E-01 2.23E-03 4.89E+00 2.70E-04 5.88E-02 8.03E-03 6.86E-04 2.58E-04 1.37E-01

5.30E-03 1.08E+00 5.05E-02 1.89E-02 1.31E-01 4.33E-01 1.00E+01 4.64E+00 2.65E+00 9.82E-02 2.95E-02 1.10E-01
2.19E-05 4.38E-04 3.46E-04 1.21E-05 4.32E-05

1220.1 d
5.34E-03 1.90E-01 1.46E-01 1.05E-04 5.93E-05 1.82E-04 1.16E-04 1.07E-01 3.34E+00 1.09E-03 3.39E-04 9.14E-04
1.65E-01 4.45E-04 9.93E-04 2.82E-01 3.20E-03 1.56E-01 1.32E-02 1.07E-03 1.73E-01 5.97E-04 7.57E-01 4.40E-03
9.40E-04 1.59E-04 9.49E-05 4.54E-03 3.98E-05 5.59E-03 6.82E-04 1.21E-02 2.09E-02 3.62E-04 4.59E-03 2.12E-04
1.39E-03 2.65E-02 5.46E-04 5.45E-01 2.34E-03 5.10E+00 2.69E-04 5.86E-02 8.02E-03 6.83E-04 2.57E-04 1.36E-01
5.27E-03 1.07E+00 5.02E-02 1.88E-02 1.32E-01 4.77E-01 9.96E+00 4.80E+00 2.71E+00 1.04E-01 3.25E-02 1.32E-01
2.16E-05 4.41E-04 3.46E-04 1.21E-05 4.30E-05

1284.7 d
5.31E-03 1.97E-01 1.50E-01 1.03E-04 5.81E-05 1.78E-04 1.20E-04 1.04E-01 3.43E+00 1.07E-03 3.33E-04 9.41E-04
1.62E-01 4.38E-04 9.80E-04 2.81E-01 3.19E-03 1.54E-01 1.32E-02 1.07E-03 1.74E-01 6.07E-04 7.81E-01 4.47E-03
9.51E-04 1.59E-04 9.60E-05 4.59E-03 3.99E-05 5.62E-03 6.86E-04 1.21E-02 2.09E-02 3.62E-04 4.58E-03 2.11E-04
1.39E-03 2.65E-02 5.30E-04 5.79E-01 2.45E-03 5.31E+00 2.68E-04 5.84E-02 8.02E-03 6.80E-04 2.55E-04 1.36E-01
5.23E-03 1.05E+00 4.98E-02 1.88E-02 1.33E-01 5.22E-01 9.85E+00 4.96E+00 2.75E+00 1.08E-01 3.55E-02 1.56E-01
2.13E-05 4.45E-04 3.46E-04 1.21E-05 4.29E-05

1336.6 d
5.33E-03 2.02E-01 1.53E-01 1.01E-04 5.71E-05 1.75E-04 1.25E-04 1.02E-01 3.51E+00 1.05E-03 3.29E-04 9.62E-04
1.59E-01 4.32E-04 9.71E-04 2.79E-01 3.18E-03 1.53E-01 1.32E-02 1.07E-03 1.75E-01 6.16E-04 8.00E-01 4.44E-03
9.58E-04 1.60E-04 9.71E-05 4.63E-03 4.01E-05 5.64E-03 6.90E-04 1.21E-02 2.09E-02 3.62E-04 4.57E-03 2.11E-04
1.38E-03 2.64E-02 5.22E-04 6.07E-01 2.56E-03 5.47E+00 2.68E-04 5.83E-02 8.01E-03 6.78E-04 2.54E-04 1.35E-01
5.20E-03 1.04E+00 5.11E-02 1.88E-02 1.35E-01 5.59E-01 9.78E+00 5.07E+00 2.80E+00 1.11E-01 3.79E-02 1.78E-01
2.11E-05 4.50E-04 3.42E-04 1.22E-05 4.27E-05

1358.0 d
5.08E-03 2.03E-01 1.53E-01 6.02E-05 3.40E-05 1.04E-04 1.04E-04 9.14E-02 3.52E+00 6.28E-04 1.96E-04 9.47E-04
1.45E-01 2.58E-04 5.80E-04 2.56E-01 1.93E-03 1.51E-01 7.94E-03 6.60E-04 1.54E-01 3.71E-04 7.92E-01 2.71E-03
5.80E-04 9.60E-05 6.62E-05 4.46E-03 2.54E-05 4.84E-03 4.09E-04 7.32E-03 1.40E-02 2.20E-04 2.72E-03 1.26E-04
8.29E-04 1.73E-02 4.70E-04 6.11E-01 1.97E-03 5.51E+00 1.60E-04 4.21E-02 5.90E-03 4.06E-04 1.52E-04 1.15E-01
3.10E-03 1.02E+00 3.82E-02 1.32E-02 8.89E-02 5.72E-01 9.86E+00 5.09E+00 2.82E+00 1.15E-01 3.73E-02 1.84E-01
1.26E-05 3.65E-04 2.22E-04 7.27E-06 2.55E-05

1465.7 d
4.58E-03 2.07E-01 1.56E-01 5.88E-05 3.32E-05 1.01E-04 8.76E-05 6.58E-02 3.60E+00 6.13E-04 1.93E-04 9.69E-04
1.06E-01 2.53E-04 5.71E-04 1.93E-01 1.92E-03 1.18E-01 7.90E-03 6.41E-04 1.14E-01 3.78E-04 7.58E-01 2.87E-03
5.81E-04 9.64E-05 6.14E-05 3.67E-03 2.43E-05 3.57E-03 4.14E-04 7.27E-03 1.25E-02 2.17E-04 2.73E-03 1.26E-04
8.28E-04 1.59E-02 4.63E-04 6.29E-01 1.76E-03 5.70E+00 1.59E-04 3.47E-02 4.95E-03 4.04E-04 1.51E-04 8.41E-02
3.08E-03 9.14E-01 2.94E-02 1.13E-02 8.84E-02 6.30E-01 9.97E+00 5.18E+00 2.90E+00 1.33E-01 3.60E-02 2.16E-01
1.24E-05 2.80E-04 2.22E-04 7.29E-06 2.54E-05

1573.5 d
4.46E-03 2.11E-01 1.58E-01 5.77E-05 3.25E-05 9.90E-05 8.93E-05 5.88E-02 3.68E+00 6.01E-04 1.90E-04 9.89E-04
9.41E-02 2.49E-04 5.64E-04 1.73E-01 1.91E-03 1.00E-01 7.89E-03 6.40E-04 1.09E-01 3.84E-04 7.33E-01 2.91E-03
5.88E-04 9.68E-05 6.07E-05 3.29E-03 2.43E-05 3.44E-03 4.18E-04 7.27E-03 1.26E-02 2.17E-04 2.73E-03 1.25E-04
8.27E-04 1.59E-02 4.54E-04 6.46E-01 1.84E-03 5.89E+00 1.59E-04 3.46E-02 4.94E-03 4.02E-04 1.50E-04 8.07E-02
3.06E-03 8.34E-01 2.92E-02 1.13E-02 8.79E-02 6.86E-01 1.00E+01 5.28E+00 2.96E+00 1.48E-01 3.69E-02 2.51E-01
1.22E-05 2.81E-04 2.23E-04 7.32E-06 2.53E-05

1681.3 d
4.39E-03 2.14E-01 1.60E-01 5.66E-05 3.18E-05 9.68E-05 9.13E-05 5.62E-02 3.75E+00 5.90E-04 1.87E-04 1.01E-03
8.95E-02 2.45E-04 5.58E-04 1.66E-01 1.90E-03 9.29E-02 7.88E-03 6.40E-04 1.09E-01 3.90E-04 7.14E-01 2.95E-03
5.95E-04 9.72E-05 6.06E-05 3.11E-03 2.44E-05 3.45E-03 4.21E-04 7.27E-03 1.26E-02 2.17E-04 2.72E-03 1.25E-04
8.26E-04 1.59E-02 4.44E-04 6.63E-01 1.92E-03 6.08E+00 1.58E-04 3.45E-02 4.94E-03 4.01E-04 1.50E-04 8.01E-02
3.04E-03 7.71E-01 2.90E-02 1.12E-02 8.75E-02 7.42E-01 9.98E+00 5.39E+00 3.00E+00 1.61E-01 3.90E-02 2.89E-01
1.20E-05 2.82E-04 2.23E-04 7.34E-06 2.52E-05

1789.1 d
4.33E-03 2.18E-01 1.62E-01 5.56E-05 3.12E-05 9.49E-05 9.32E-05 5.46E-02 3.82E+00 5.79E-04 1.84E-04 1.03E-03
8.71E-02 2.42E-04 5.52E-04 1.63E-01 1.90E-03 9.01E-02 7.87E-03 6.39E-04 1.10E-01 3.95E-04 7.01E-01 2.99E-03
6.00E-04 9.75E-05 6.08E-05 3.04E-03 2.45E-05 3.46E-03 4.24E-04 7.27E-03 1.26E-02 2.17E-04 2.72E-03 1.25E-04
8.25E-04 1.59E-02 4.33E-04 6.80E-01 2.00E-03 6.27E+00 1.58E-04 3.44E-02 4.94E-03 3.99E-04 1.49E-04 7.98E-02
3.03E-03 7.22E-01 2.89E-02 1.12E-02 8.70E-02 7.96E-01 9.90E+00 5.51E+00 3.01E+00 1.72E-01 4.17E-02 3.29E-01
1.19E-05 2.83E-04 2.23E-04 7.36E-06 2.51E-05

1896.9 d

4.26E-03 2.21E-01 1.63E-01 5.47E-05 3.06E-05 9.30E-05 9.50E-05 5.34E-02 3.88E+00 5.70E-04 1.82E-04 1.05E-03
8.54E-02 2.39E-04 5.46E-04 1.62E-01 1.89E-03 8.88E-02 7.86E-03 6.38E-04 1.11E-01 3.99E-04 6.92E-01 3.02E-03
6.05E-04 9.78E-05 6.12E-05 3.02E-03 2.46E-05 3.47E-03 4.26E-04 7.26E-03 1.26E-02 2.17E-04 2.71E-03 1.24E-04
8.24E-04 1.59E-02 4.21E-04 6.96E-01 2.07E-03 6.45E+00 1.57E-04 3.43E-02 4.94E-03 3.98E-04 1.48E-04 7.96E-02
3.01E-03 6.84E-01 2.87E-02 1.12E-02 8.66E-02 8.49E-01 9.77E+00 5.62E+00 3.02E+00 1.81E-01 4.47E-02 3.71E-01
1.17E-05 2.85E-04 2.23E-04 7.38E-06 2.50E-05

2004.9 d
4.29E-03 2.25E-01 1.65E-01 5.38E-05 3.01E-05 9.12E-05 9.94E-05 5.23E-02 3.95E+00 5.60E-04 1.79E-04 1.07E-03
8.39E-02 2.35E-04 5.40E-04 1.60E-01 1.89E-03 8.81E-02 7.85E-03 6.38E-04 1.11E-01 4.04E-04 6.86E-01 3.05E-03
6.09E-04 9.80E-05 6.15E-05 3.02E-03 2.46E-05 3.48E-03 4.27E-04 7.26E-03 1.26E-02 2.17E-04 2.71E-03 1.24E-04
8.23E-04 1.58E-02 4.15E-04 7.15E-01 2.19E-03 6.64E+00 1.57E-04 3.42E-02 4.93E-03 3.96E-04 1.48E-04 7.93E-02
2.99E-03 6.53E-01 2.86E-02 1.12E-02 8.82E-02 9.03E-01 9.67E+00 5.71E+00 3.04E+00 1.88E-01 4.77E-02 4.18E-01
1.16E-05 2.88E-04 2.23E-04 7.38E-06 2.49E-05

ASSEMBLY ISOTOPIC DATA IN CURIES

46.2 d
6.49E+03 6.29E+02 3.08E+02 1.73E+05 3.55E+05 5.01E+05 2.60E+01 3.28E+05 2.53E+03 8.45E+05 8.48E+05 3.19E+03
3.57E+05 8.55E+05 6.05E+05 3.90E+05 9.04E+05 1.44E+05 9.17E+05 8.08E+05 2.81E+05 2.12E+05 8.00E+03 1.90E+05
2.14E+04 1.20E+05 1.86E+04 7.98E+02 1.08E+05 1.34E+04 5.71E+04 6.57E+05 4.34E+05 6.65E+05 1.01E+06 1.16E+06
9.49E+05 9.47E+05 2.84E+05 2.13E+02 1.63E+03 2.74E+03 9.52E+05 8.61E+05 8.48E+05 8.68E+05 8.51E+05 5.38E+05
8.61E+05 8.58E+04 7.75E+05 3.19E+05 7.76E+06 6.98E-01 2.39E+01 3.14E+00 1.42E+02 7.04E-03 1.24E-01 1.48E-04
7.62E+04 3.98E+03 2.69E+04 1.78E+05 9.36E+05

92.4 d
8.92E+03 1.25E+03 6.04E+02 1.67E+05 3.43E+05 4.82E+05 6.97E+01 4.89E+05 4.97E+03 8.15E+05 8.22E+05 5.75E+03
5.54E+05 8.29E+05 5.90E+05 6.22E+05 8.97E+05 3.77E+05 9.13E+05 8.08E+05 4.22E+05 2.46E+05 1.80E+04 2.21E+05
2.41E+04 1.25E+05 2.16E+04 1.62E+03 1.16E+05 1.92E+04 6.16E+04 6.61E+05 4.47E+05 6.71E+05 1.00E+06 1.15E+06
9.49E+05 9.49E+05 2.86E+05 9.91E+02 3.09E+03 5.47E+03 9.43E+05 9.24E+05 9.26E+05 8.60E+05 8.41E+05 7.35E+05
8.46E+05 1.61E+05 8.43E+05 3.33E+05 7.82E+06 4.37E+00 4.53E+01 1.10E+01 9.64E+02 9.84E-02 3.53E+00 9.21E-03
7.40E+04 4.87E+03 2.71E+04 1.82E+05 9.23E+05

138.6 d
9.88E+03 1.86E+03 8.90E+02 1.62E+05 3.31E+05 4.66E+05 1.16E+02 5.64E+05 7.30E+03 7.89E+05 8.00E+05 8.26E+03
6.56E+05 8.07E+05 5.78E+05 7.56E+05 8.93E+05 5.71E+05 9.13E+05 8.08E+05 4.99E+05 2.74E+05 2.94E+04 2.47E+05
2.64E+04 1.30E+05 2.41E+04 2.32E+03 1.21E+05 2.21E+04 6.53E+04 6.65E+05 4.52E+05 6.75E+05 1.00E+06 1.14E+06
9.45E+05 9.47E+05 2.86E+05 2.30E+03 4.45E+03 8.19E+03 9.36E+05 9.22E+05 9.26E+05 8.52E+05 8.32E+05 8.04E+05
8.34E+05 2.26E+05 8.37E+05 3.32E+05 7.87E+06 1.23E+01 6.31E+01 2.14E+01 2.66E+03 4.18E-01 2.25E+01 9.45E-02
7.21E+04 5.06E+03 2.73E+04 1.84E+05 9.11E+05

184.8 d
1.03E+04 2.46E+03 1.16E+03 1.57E+05 3.21E+05 4.51E+05 1.63E+02 5.92E+05 9.55E+03 7.69E+05 7.81E+05 1.07E+04
7.08E+05 7.87E+05 5.65E+05 8.31E+05 8.88E+05 7.11E+05 9.08E+05 8.03E+05 5.45E+05 2.99E+05 4.17E+04 2.69E+05
2.82E+04 1.32E+05 2.63E+04 2.95E+03 1.24E+05 2.37E+04 6.83E+04 6.69E+05 4.56E+05 6.79E+05 1.00E+06 1.14E+06
9.45E+05 9.47E+05 2.85E+05 4.12E+03 5.74E+03 1.09E+04 9.29E+05 9.16E+05 9.18E+05 8.44E+05 8.24E+05 8.28E+05
8.23E+05 2.83E+05 8.27E+05 3.31E+05 7.99E+06 2.57E+01 7.81E+01 3.34E+01 5.14E+03 1.09E+00 7.84E+01 4.70E-01
7.06E+04 5.18E+03 2.75E+04 1.87E+05 9.02E+05

230.9 d
1.05E+04 3.07E+03 1.43E+03 1.53E+05 3.13E+05 4.38E+05 2.09E+02 6.00E+05 1.17E+04 7.49E+05 7.63E+05 1.31E+04
7.28E+05 7.69E+05 5.56E+05 8.74E+05 8.85E+05 7.98E+05 9.08E+05 8.03E+05 5.75E+05 3.21E+05 5.51E+04 2.90E+05
2.98E+04 1.35E+05 2.81E+04 3.49E+03 1.27E+05 2.46E+04 7.09E+04 6.73E+05 4.60E+05 6.82E+05 9.99E+05 1.13E+06
9.45E+05 9.47E+05 2.83E+05 6.41E+03 6.99E+03 1.36E+04 9.23E+05 9.10E+05 9.18E+05 8.44E+05 8.18E+05 8.32E+05
8.13E+05 3.33E+05 8.17E+05 3.28E+05 8.04E+06 4.53E+01 9.06E+01 4.64E+01 8.25E+03 2.22E+00 1.97E+02 1.59E+00
6.91E+04 5.29E+03 2.76E+04 1.89E+05 8.94E+05

277.1 d
1.06E+04 3.66E+03 1.68E+03 1.50E+05 3.04E+05 4.26E+05 2.56E+02 5.95E+05 1.38E+04 7.29E+05 7.47E+05 1.53E+04
7.30E+05 7.53E+05 5.47E+05 8.96E+05 8.82E+05 8.49E+05 9.03E+05 8.03E+05 5.99E+05 3.42E+05 6.88E+04 3.08E+05
3.12E+04 1.37E+05 2.98E+04 3.95E+03 1.30E+05 2.54E+04 7.31E+04 6.73E+05 4.61E+05 6.85E+05 9.96E+05 1.13E+06
9.40E+05 9.44E+05 2.80E+05 9.13E+03 8.21E+03 1.64E+04 9.16E+05 9.04E+05 9.11E+05 8.36E+05 8.12E+05 8.32E+05
8.04E+05 3.76E+05 8.07E+05 3.27E+05 8.10E+06 7.18E+01 1.01E+02 6.00E+01 1.18E+04 3.84E+00 4.08E+02 4.17E+00
6.77E+04 5.39E+03 2.77E+04 1.92E+05 8.86E+05

323.3 d
1.06E+04 4.26E+03 1.93E+03 1.46E+05 2.96E+05 4.15E+05 3.02E+02 5.84E+05 1.59E+04 7.13E+05 7.32E+05 1.75E+04
7.26E+05 7.38E+05 5.38E+05 9.05E+05 8.77E+05 8.81E+05 9.03E+05 8.03E+05 6.19E+05 3.61E+05 8.31E+04 3.25E+05

3.25E+04 1.40E+05 3.12E+04 4.36E+03 1.32E+05 2.60E+04 7.51E+04 6.73E+05 4.65E+05 6.87E+05 9.95E+05 1.12E+06
9.40E+05 9.44E+05 2.76E+05 1.22E+04 9.40E+03 1.90E+04 9.12E+05 8.99E+05 9.11E+05 8.28E+05 8.06E+05 8.28E+05
7.96E+05 4.14E+05 7.99E+05 3.26E+05 8.15E+06 1.06E+02 1.10E+02 7.36E+01 1.56E+04 5.95E+00 7.33E+02 9.33E+00
6.66E+04 5.49E+03 2.78E+04 1.93E+05 8.79E+05

369.5 d
1.07E+04 4.84E+03 2.17E+03 1.43E+05 2.89E+05 4.05E+05 3.48E+02 5.71E+05 1.78E+04 6.96E+05 7.18E+05 1.97E+04
7.14E+05 7.23E+05 5.29E+05 9.06E+05 8.73E+05 8.93E+05 9.03E+05 8.03E+05 6.35E+05 3.79E+05 9.75E+04 3.41E+05
3.36E+04 1.42E+05 3.25E+04 4.72E+03 1.34E+05 2.64E+04 7.68E+04 6.77E+05 4.66E+05 6.89E+05 9.93E+05 1.12E+06
9.40E+05 9.42E+05 2.72E+05 1.57E+04 1.06E+04 2.17E+04 9.07E+05 8.95E+05 9.03E+05 8.28E+05 8.00E+05 8.24E+05
7.88E+05 4.47E+05 7.91E+05 3.25E+05 8.26E+06 1.48E+02 1.17E+02 8.78E+01 1.96E+04 8.52E+00 1.20E+03 1.84E+01
6.54E+04 5.57E+03 2.78E+04 1.94E+05 8.74E+05

415.7 d
1.07E+04 5.43E+03 2.41E+03 1.39E+05 2.84E+05 3.95E+05 3.94E+02 5.58E+05 1.98E+04 6.80E+05 7.04E+05 2.18E+04
7.03E+05 7.10E+05 5.22E+05 9.04E+05 8.70E+05 9.02E+05 9.03E+05 7.98E+05 6.48E+05 3.95E+05 1.12E+05 3.56E+05
3.47E+04 1.43E+05 3.37E+04 5.03E+03 1.35E+05 2.69E+04 7.84E+04 6.77E+05 4.68E+05 6.90E+05 9.92E+05 1.11E+06
9.40E+05 9.42E+05 2.67E+05 1.96E+04 1.17E+04 2.44E+04 9.03E+05 8.90E+05 9.03E+05 8.20E+05 7.94E+05 8.20E+05
7.82E+05 4.77E+05 7.84E+05 3.24E+05 8.32E+06 1.98E+02 1.23E+02 1.02E+02 2.37E+04 1.15E+01 1.81E+03 3.32E+01
6.42E+04 5.66E+03 2.79E+04 1.95E+05 8.67E+05

461.9 d
1.07E+04 6.01E+03 2.63E+03 1.36E+05 2.76E+05 3.86E+05 4.39E+02 5.45E+05 2.16E+04 6.66E+05 6.92E+05 2.38E+04
6.90E+05 6.98E+05 5.13E+05 8.99E+05 8.67E+05 8.99E+05 8.98E+05 7.98E+05 6.62E+05 4.12E+05 1.27E+05 3.69E+05
3.57E+04 1.45E+05 3.47E+04 5.31E+03 1.37E+05 2.72E+04 7.97E+04 6.77E+05 4.69E+05 6.91E+05 9.90E+05 1.11E+06
9.40E+05 9.39E+05 2.61E+05 2.37E+04 1.29E+04 2.70E+04 8.98E+05 8.87E+05 9.03E+05 8.20E+05 7.90E+05 8.16E+05
7.75E+05 5.00E+05 7.78E+05 3.22E+05 8.37E+06 2.57E+02 1.28E+02 1.16E+02 2.76E+04 1.49E+01 2.58E+03 5.59E+01
6.32E+04 5.74E+03 2.80E+04 1.97E+05 8.62E+05

508.1 d
1.07E+04 6.60E+03 2.85E+03 1.34E+05 2.71E+05 3.77E+05 4.85E+02 5.33E+05 2.35E+04 6.53E+05 6.80E+05 2.58E+04
6.77E+05 6.85E+05 5.07E+05 8.93E+05 8.64E+05 8.96E+05 8.98E+05 7.98E+05 6.75E+05 4.27E+05 1.41E+05 3.82E+05
3.64E+04 1.46E+05 3.57E+04 5.56E+03 1.38E+05 2.76E+04 8.10E+04 6.77E+05 4.71E+05 6.93E+05 9.88E+05 1.10E+06
9.35E+05 9.39E+05 2.56E+05 2.81E+04 1.41E+04 2.98E+04 8.94E+05 8.83E+05 8.95E+05 8.12E+05 7.86E+05 8.12E+05
7.68E+05 5.23E+05 7.71E+05 3.22E+05 8.43E+06 3.24E+02 1.32E+02 1.30E+02 3.16E+04 1.85E+01 3.53E+03 8.86E+01
6.22E+04 5.82E+03 2.80E+04 1.98E+05 8.58E+05

554.3 d
1.07E+04 7.20E+03 3.06E+03 1.31E+05 2.64E+05 3.69E+05 5.30E+02 5.20E+05 2.52E+04 6.40E+05 6.68E+05 2.78E+04
6.63E+05 6.73E+05 5.01E+05 8.88E+05 8.60E+05 8.93E+05 8.98E+05 7.98E+05 6.88E+05 4.41E+05 1.56E+05 3.96E+05
3.74E+04 1.47E+05 3.67E+04 5.77E+03 1.39E+05 2.79E+04 8.20E+04 6.81E+05 4.73E+05 6.93E+05 9.87E+05 1.10E+06
9.35E+05 9.37E+05 2.50E+05 3.27E+04 1.52E+04 3.24E+04 8.89E+05 8.80E+05 8.95E+05 8.12E+05 7.79E+05 8.08E+05
7.62E+05 5.41E+05 7.64E+05 3.21E+05 8.54E+06 4.00E+02 1.34E+02 1.44E+02 3.53E+04 2.24E+01 4.64E+03 1.34E+02
6.12E+04 5.89E+03 2.81E+04 1.99E+05 8.52E+05

600.5 d
1.07E+04 7.74E+03 3.27E+03 1.28E+05 2.59E+05 3.60E+05 5.76E+02 5.07E+05 2.69E+04 6.27E+05 6.57E+05 2.97E+04
6.50E+05 6.61E+05 4.92E+05 8.80E+05 8.57E+05 8.86E+05 8.94E+05 7.98E+05 6.98E+05 4.55E+05 1.71E+05 4.07E+05
3.81E+04 1.48E+05 3.73E+04 5.98E+03 1.41E+05 2.81E+04 8.31E+04 6.81E+05 4.73E+05 6.94E+05 9.85E+05 1.10E+06
9.35E+05 9.37E+05 2.44E+05 3.78E+04 1.64E+04 3.50E+04 8.85E+05 8.76E+05 8.95E+05 8.04E+05 7.75E+05 8.04E+05
7.56E+05 5.55E+05 7.58E+05 3.20E+05 8.65E+06 4.85E+02 1.36E+02 1.57E+02 3.90E+04 2.64E+01 5.91E+03 1.95E+02
6.02E+04 5.97E+03 2.81E+04 2.00E+05 8.48E+05

646.7 d
1.07E+04 8.35E+03 3.47E+03 1.26E+05 2.54E+05 3.52E+05 6.21E+02 4.96E+05 2.86E+04 6.14E+05 6.45E+05 3.15E+04
6.36E+05 6.51E+05 4.86E+05 8.74E+05 8.54E+05 8.79E+05 8.94E+05 7.93E+05 7.08E+05 4.69E+05 1.85E+05 4.19E+05
3.88E+04 1.50E+05 3.83E+04 6.16E+03 1.42E+05 2.84E+04 8.42E+04 6.81E+05 4.74E+05 6.94E+05 9.84E+05 1.09E+06
9.35E+05 9.34E+05 2.37E+05 4.30E+04 1.75E+04 3.77E+04 8.82E+05 8.73E+05 8.87E+05 8.03E+05 7.71E+05 8.00E+05
7.50E+05 5.69E+05 7.53E+05 3.20E+05 8.71E+06 5.79E+02 1.38E+02 1.70E+02 4.25E+04 3.04E+01 7.34E+03 2.75E+02
5.93E+04 6.05E+03 2.81E+04 2.02E+05 8.43E+05

668.3 d
1.07E+04 8.62E+03 3.57E+03 1.25E+05 2.52E+05 3.49E+05 6.46E+02 4.91E+05 2.94E+04 6.07E+05 6.41E+05 3.24E+04
6.30E+05 6.45E+05 4.82E+05 8.70E+05 8.55E+05 8.75E+05 8.94E+05 8.14E+05 7.15E+05 4.76E+05 1.92E+05 4.18E+05
3.91E+04 1.50E+05 3.93E+04 6.24E+03 1.42E+05 2.85E+04 8.46E+04 6.81E+05 4.74E+05 7.00E+05 9.79E+05 1.09E+06
9.35E+05 9.81E+05 2.35E+05 4.54E+04 1.81E+04 3.89E+04 8.80E+05 8.71E+05 8.87E+05 8.02E+05 7.69E+05 8.00E+05
7.48E+05 5.74E+05 7.50E+05 3.19E+05 8.82E+06 6.28E+02 1.38E+02 1.76E+02 4.40E+04 3.22E+01 8.02E+03 3.20E+02
5.88E+04 6.08E+03 3.07E+04 2.02E+05 8.42E+05

702.7 d
1.04E+04 8.89E+03 3.67E+03 8.75E+04 1.76E+05 2.44E+05 5.78E+02 4.29E+05 3.02E+04 4.26E+05 4.51E+05 3.28E+04
5.63E+05 4.54E+05 3.41E+05 7.88E+05 6.14E+05 8.49E+05 6.37E+05 5.68E+05 6.29E+05 3.49E+05 1.96E+05 3.17E+05
2.82E+04 1.08E+05 2.95E+04 6.03E+03 1.05E+05 2.45E+04 6.07E+04 4.85E+05 3.46E+05 4.98E+05 6.98E+05 7.79E+05
6.68E+05 7.05E+05 2.25E+05 4.83E+04 1.52E+04 4.03E+04 6.26E+05 6.57E+05 6.77E+05 5.70E+05 5.45E+05 6.79E+05
5.29E+05 5.69E+05 5.72E+05 2.38E+05 6.99E+06 6.89E+02 1.41E+02 1.81E+02 4.62E+04 3.63E+01 8.66E+03 3.83E+02
4.15E+04 4.96E+03 2.19E+04 1.44E+05 5.98E+05

767.4 d
1.02E+04 9.44E+03 3.83E+03 8.54E+04 1.71E+05 2.37E+05 5.83E+02 3.67E+05 3.17E+04 4.16E+05 4.42E+05 3.44E+04
4.87E+05 4.45E+05 3.35E+05 6.96E+05 6.12E+05 7.61E+05 6.37E+05 5.63E+05 5.62E+05 3.60E+05 2.05E+05 3.36E+05
2.88E+04 1.09E+05 2.92E+04 5.67E+03 1.04E+05 2.17E+04 6.17E+04 4.85E+05 3.36E+05 4.96E+05 6.99E+05 7.76E+05
6.68E+05 6.65E+05 2.22E+05 5.41E+04 1.56E+04 4.28E+04 6.22E+05 6.17E+05 6.32E+05 5.67E+05 5.41E+05 5.91E+05
5.24E+05 5.55E+05 5.10E+05 2.27E+05 7.04E+06 8.20E+02 1.45E+02 1.92E+02 5.02E+04 4.37E+01 1.02E+04 5.28E+02
4.08E+04 4.54E+03 2.05E+04 1.45E+05 5.94E+05

832.0 d
1.01E+04 9.91E+03 4.00E+03 8.33E+04 1.67E+05 2.31E+05 6.13E+02 3.36E+05 3.32E+04 4.06E+05 4.34E+05 3.60E+04
4.47E+05 4.37E+05 3.29E+05 6.48E+05 6.09E+05 6.92E+05 6.37E+05 5.63E+05 5.45E+05 3.70E+05 2.13E+05 3.46E+05
2.93E+04 1.10E+05 2.95E+04 5.46E+03 1.04E+05 2.11E+04 6.25E+04 4.85E+05 3.36E+05 4.96E+05 6.98E+05 7.72E+05
6.63E+05 6.65E+05 2.18E+05 5.96E+04 1.67E+04 4.54E+04 6.20E+05 6.14E+05 6.30E+05 5.63E+05 5.39E+05 5.71E+05
5.20E+05 5.41E+05 5.04E+05 2.27E+05 7.04E+06 9.55E+02 1.47E+02 2.02E+02 5.37E+04 5.09E+01 1.20E+04 7.04E+02
3.99E+04 4.58E+03 2.05E+04 1.45E+05 5.91E+05

896.7 d
1.01E+04 1.04E+04 4.17E+03 8.12E+04 1.63E+05 2.25E+05 6.47E+02 3.18E+05 3.45E+04 3.99E+05 4.26E+05 3.76E+04
4.22E+05 4.29E+05 3.26E+05 6.21E+05 6.07E+05 6.46E+05 6.32E+05 5.63E+05 5.45E+05 3.80E+05 2.22E+05 3.54E+05
2.99E+04 1.10E+05 2.98E+04 5.36E+03 1.05E+05 2.11E+04 6.32E+04 4.85E+05 3.38E+05 4.98E+05 6.96E+05 7.69E+05
6.63E+05 6.65E+05 2.14E+05 6.55E+04 1.78E+04 4.79E+04 6.17E+05 6.11E+05 6.28E+05 5.61E+05 5.35E+05 5.63E+05
5.16E+05 5.32E+05 4.99E+05 2.26E+05 7.10E+06 1.10E+03 1.48E+02 2.13E+02 5.69E+04 5.79E+01 1.41E+04 9.15E+02
3.94E+04 4.63E+03 2.06E+04 1.46E+05 5.87E+05

961.4 d
1.00E+04 1.09E+04 4.30E+03 7.98E+04 1.60E+05 2.20E+05 6.80E+02 3.08E+05 3.59E+04 3.89E+05 4.19E+05 3.91E+04
4.06E+05 4.21E+05 3.23E+05 6.04E+05 6.05E+05 6.23E+05 6.32E+05 5.63E+05 5.52E+05 3.89E+05 2.31E+05 3.62E+05
3.03E+04 1.11E+05 3.02E+04 5.32E+03 1.05E+05 2.12E+04 6.38E+04 4.85E+05 3.38E+05 4.98E+05 6.96E+05 7.65E+05
6.63E+05 6.63E+05 2.09E+05 7.12E+04 1.89E+04 5.05E+04 6.15E+05 6.08E+05 6.27E+05 5.59E+05 5.33E+05 5.59E+05
5.12E+05 5.23E+05 4.96E+05 2.26E+05 7.15E+06 1.26E+03 1.50E+02 2.24E+02 5.96E+04 6.44E+01 1.64E+04 1.17E+03
3.88E+04 4.67E+03 2.06E+04 1.46E+05 5.84E+05

1026.0 d
1.00E+04 1.14E+04 4.47E+03 7.77E+04 1.56E+05 2.15E+05 7.14E+02 2.97E+05 3.73E+04 3.83E+05 4.12E+05 4.05E+04
3.95E+05 4.14E+05 3.16E+05 5.94E+05 6.04E+05 6.04E+05 6.32E+05 5.63E+05 5.55E+05 3.97E+05 2.40E+05 3.70E+05
3.08E+04 1.12E+05 3.05E+04 5.32E+03 1.06E+05 2.14E+04 6.44E+04 4.85E+05 3.38E+05 4.98E+05 6.95E+05 7.65E+05
6.63E+05 6.63E+05 2.04E+05 7.71E+04 1.99E+04 5.30E+04 6.13E+05 6.06E+05 6.27E+05 5.56E+05 5.29E+05 5.55E+05
5.08E+05 5.14E+05 4.93E+05 2.25E+05 7.21E+06 1.42E+03 1.50E+02 2.33E+02 6.19E+04 7.05E+01 1.87E+04 1.46E+03
3.81E+04 4.72E+03 2.06E+04 1.47E+05 5.82E+05

1090.7 d
9.95E+03 1.19E+04 4.60E+03 7.63E+04 1.53E+05 2.10E+05 7.42E+02 2.90E+05 3.86E+04 3.73E+05 4.05E+05 4.20E+04
3.84E+05 4.07E+05 3.13E+05 5.88E+05 6.00E+05 5.93E+05 6.32E+05 5.63E+05 5.62E+05 4.06E+05 2.48E+05 3.77E+05
3.12E+04 1.12E+05 3.09E+04 5.36E+03 1.06E+05 2.15E+04 6.49E+04 4.85E+05 3.38E+05 4.98E+05 6.93E+05 7.62E+05
6.63E+05 6.63E+05 1.99E+05 8.28E+04 2.10E+04 5.55E+04 6.08E+05 6.04E+05 6.26E+05 5.54E+05 5.27E+05 5.51E+05
5.05E+05 5.05E+05 4.89E+05 2.25E+05 7.21E+06 1.59E+03 1.50E+02 2.43E+02 6.41E+04 7.62E+01 2.12E+04 1.79E+03
3.76E+04 4.76E+03 2.06E+04 1.47E+05 5.79E+05

1155.4 d
9.89E+03 1.24E+04 4.74E+03 7.49E+04 1.50E+05 2.05E+05 7.77E+02 2.84E+05 3.98E+04 3.66E+05 3.98E+05 4.34E+04
3.77E+05 4.00E+05 3.10E+05 5.82E+05 5.98E+05 5.86E+05 6.32E+05 5.58E+05 5.69E+05 4.14E+05 2.57E+05 3.83E+05
3.16E+04 1.13E+05 3.13E+04 5.39E+03 1.07E+05 2.16E+04 6.55E+04 4.85E+05 3.39E+05 4.98E+05 6.92E+05 7.62E+05
6.63E+05 6.60E+05 1.94E+05 8.87E+04 2.21E+04 5.80E+04 6.06E+05 6.02E+05 6.25E+05 5.51E+05 5.25E+05 5.51E+05
5.02E+05 4.96E+05 4.86E+05 2.25E+05 7.26E+06 1.77E+03 1.48E+02 2.53E+02 6.58E+04 8.12E+01 2.37E+04 2.17E+03
3.69E+04 4.81E+03 2.06E+04 1.49E+05 5.76E+05

1220.1 d
9.84E+03 1.29E+04 4.87E+03 7.35E+04 1.46E+05 2.01E+05 8.12E+02 2.77E+05 4.11E+04 3.60E+05 3.92E+05 4.47E+04
3.68E+05 3.94E+05 3.05E+05 5.76E+05 5.96E+05 5.82E+05 6.27E+05 5.58E+05 5.75E+05 4.21E+05 2.66E+05 3.90E+05

3.20E+04 1.13E+05 3.16E+04 5.44E+03 1.08E+05 2.17E+04 6.60E+04 4.85E+05 3.39E+05 4.98E+05 6.92E+05 7.58E+05
6.63E+05 6.60E+05 1.88E+05 9.44E+04 2.32E+04 6.05E+04 6.04E+05 6.00E+05 6.24E+05 5.49E+05 5.23E+05 5.46E+05
4.99E+05 4.91E+05 4.83E+05 2.24E+05 7.32E+06 1.95E+03 1.48E+02 2.62E+02 6.73E+04 8.60E+01 2.61E+04 2.61E+03
3.64E+04 4.84E+03 2.06E+04 1.49E+05 5.74E+05

1284.7 d
9.78E+03 1.34E+04 5.00E+03 7.21E+04 1.43E+05 1.96E+05 8.40E+02 2.69E+05 4.22E+04 3.53E+05 3.85E+05 4.60E+04
3.62E+05 3.88E+05 3.01E+05 5.72E+05 5.94E+05 5.75E+05 6.27E+05 5.58E+05 5.79E+05 4.28E+05 2.74E+05 3.96E+05
3.23E+04 1.13E+05 3.20E+04 5.50E+03 1.08E+05 2.18E+04 6.64E+04 4.85E+05 3.39E+05 4.98E+05 6.90E+05 7.54E+05
6.63E+05 6.60E+05 1.83E+05 1.00E+05 2.43E+04 6.30E+04 6.02E+05 5.98E+05 6.24E+05 5.46E+05 5.19E+05 5.46E+05
4.95E+05 4.82E+05 4.79E+05 2.24E+05 7.38E+06 2.13E+03 1.46E+02 2.71E+02 6.83E+04 8.93E+01 2.85E+04 3.08E+03
3.59E+04 4.88E+03 2.06E+04 1.49E+05 5.72E+05

1336.6 d
9.82E+03 1.37E+04 5.10E+03 7.07E+04 1.41E+05 1.93E+05 8.75E+02 2.64E+05 4.32E+04 3.46E+05 3.81E+05 4.71E+04
3.55E+05 3.83E+05 2.98E+05 5.69E+05 5.93E+05 5.72E+05 6.27E+05 5.58E+05 5.82E+05 4.35E+05 2.81E+05 3.93E+05
3.26E+04 1.14E+05 3.24E+04 5.55E+03 1.08E+05 2.19E+04 6.67E+04 4.85E+05 3.39E+05 4.98E+05 6.89E+05 7.54E+05
6.58E+05 6.58E+05 1.80E+05 1.05E+05 2.54E+04 6.49E+04 6.02E+05 5.97E+05 6.23E+05 5.45E+05 5.17E+05 5.42E+05
4.92E+05 4.77E+05 4.92E+05 2.24E+05 7.49E+06 2.28E+03 1.45E+02 2.77E+02 6.96E+04 9.18E+01 3.04E+04 3.52E+03
3.56E+04 4.94E+03 2.04E+04 1.50E+05 5.70E+05

1358.0 d
9.36E+03 1.38E+04 5.10E+03 4.21E+04 8.39E+04 1.15E+05 7.28E+02 2.36E+05 4.33E+04 2.07E+05 2.27E+05 4.63E+04
3.24E+05 2.28E+05 1.78E+05 5.21E+05 3.60E+05 5.64E+05 3.77E+05 3.44E+05 5.12E+05 2.62E+05 2.78E+05 2.40E+05
1.97E+04 6.84E+04 2.21E+04 5.34E+03 6.86E+04 1.88E+04 3.96E+04 2.93E+05 2.27E+05 3.02E+05 4.10E+05 4.50E+05
3.95E+05 4.31E+05 1.62E+05 1.06E+05 1.95E+04 6.53E+04 3.59E+05 4.31E+05 4.59E+05 3.26E+05 3.09E+05 4.62E+05
2.93E+05 4.68E+05 3.68E+05 1.57E+05 4.93E+06 2.33E+03 1.46E+02 2.78E+02 7.01E+04 9.51E+01 2.99E+04 3.64E+03
2.12E+04 4.01E+03 1.32E+04 8.94E+04 3.40E+05

1465.7 d
8.44E+03 1.41E+04 5.20E+03 4.11E+04 8.19E+04 1.11E+05 6.13E+02 1.70E+05 4.43E+04 2.02E+05 2.23E+05 4.74E+04
2.37E+05 2.24E+05 1.75E+05 3.95E+05 3.57E+05 4.42E+05 3.75E+05 3.34E+05 3.79E+05 2.67E+05 2.66E+05 2.54E+05
1.98E+04 6.87E+04 2.05E+04 4.40E+03 6.57E+04 1.39E+04 4.00E+04 2.91E+05 2.03E+05 2.98E+05 4.11E+05 4.50E+05
3.95E+05 3.96E+05 1.59E+05 1.09E+05 1.75E+04 6.76E+04 3.57E+05 3.55E+05 3.85E+05 3.25E+05 3.07E+05 3.38E+05
2.91E+05 4.19E+05 2.83E+05 1.34E+05 4.90E+06 2.57E+03 1.48E+02 2.83E+02 7.21E+04 1.10E+02 2.89E+04 4.27E+03
2.09E+04 3.07E+03 1.32E+04 8.96E+04 3.39E+05

1573.5 d
8.22E+03 1.43E+04 5.27E+03 4.04E+04 8.02E+04 1.09E+05 6.25E+02 1.52E+05 4.52E+04 1.98E+05 2.20E+05 4.84E+04
2.10E+05 2.20E+05 1.73E+05 3.54E+05 3.57E+05 3.74E+05 3.75E+05 3.34E+05 3.62E+05 2.71E+05 2.57E+05 2.58E+05
2.00E+04 6.90E+04 2.02E+04 3.94E+03 6.57E+04 1.34E+04 4.04E+04 2.91E+05 2.05E+05 2.98E+05 4.11E+05 4.47E+05
3.95E+05 3.96E+05 1.56E+05 1.12E+05 1.83E+04 6.99E+04 3.57E+05 3.54E+05 3.84E+05 3.23E+05 3.05E+05 3.24E+05
2.90E+05 3.83E+05 2.81E+05 1.34E+05 4.87E+06 2.80E+03 1.48E+02 2.88E+02 7.35E+04 1.22E+02 2.96E+04 4.96E+03
2.06E+04 3.08E+03 1.33E+04 9.00E+04 3.37E+05

1681.3 d
8.09E+03 1.45E+04 5.34E+03 3.96E+04 7.85E+04 1.07E+05 6.39E+02 1.45E+05 4.61E+04 1.95E+05 2.16E+05 4.94E+04
2.00E+05 2.17E+05 1.71E+05 3.38E+05 3.55E+05 3.47E+05 3.75E+05 3.34E+05 3.62E+05 2.75E+05 2.50E+05 2.61E+05
2.02E+04 6.92E+04 2.02E+04 3.73E+03 6.59E+04 1.34E+04 4.07E+04 2.91E+05 2.05E+05 2.98E+05 4.10E+05 4.47E+05
3.94E+05 3.96E+05 1.53E+05 1.15E+05 1.91E+04 7.21E+04 3.55E+05 3.53E+05 3.84E+05 3.22E+05 3.05E+05 3.22E+05
2.88E+05 3.54E+05 2.79E+05 1.33E+05 4.85E+06 3.03E+03 1.48E+02 2.94E+02 7.45E+04 1.33E+02 3.13E+04 5.71E+03
2.02E+04 3.09E+03 1.33E+04 9.02E+04 3.36E+05

1789.1 d
7.98E+03 1.48E+04 5.40E+03 3.89E+04 7.70E+04 1.05E+05 6.53E+02 1.41E+05 4.70E+04 1.91E+05 2.13E+05 5.04E+04
1.94E+05 2.14E+05 1.70E+05 3.32E+05 3.54E+05 3.36E+05 3.74E+05 3.33E+05 3.66E+05 2.79E+05 2.46E+05 2.65E+05
2.04E+04 6.95E+04 2.03E+04 3.64E+03 6.62E+04 1.34E+04 4.10E+04 2.91E+05 2.05E+05 2.98E+05 4.10E+05 4.47E+05
3.94E+05 3.96E+05 1.49E+05 1.18E+05 1.98E+04 7.44E+04 3.55E+05 3.52E+05 3.84E+05 3.21E+05 3.03E+05 3.21E+05
2.87E+05 3.31E+05 2.78E+05 1.33E+05 4.82E+06 3.25E+03 1.47E+02 3.01E+02 7.48E+04 1.42E+02 3.35E+04 6.50E+03
2.01E+04 3.11E+03 1.33E+04 9.05E+04 3.35E+05

1896.9 d
7.85E+03 1.50E+04 5.44E+03 3.83E+04 7.55E+04 1.03E+05 6.65E+02 1.38E+05 4.77E+04 1.88E+05 2.10E+05 5.13E+04
1.91E+05 2.12E+05 1.68E+05 3.30E+05 3.52E+05 3.32E+05 3.74E+05 3.33E+05 3.69E+05 2.82E+05 2.43E+05 2.67E+05
2.06E+04 6.97E+04 2.04E+04 3.62E+03 6.65E+04 1.35E+04 4.12E+04 2.91E+05 2.05E+05 2.98E+05 4.08E+05 4.43E+05
3.93E+05 3.96E+05 1.45E+05 1.21E+05 2.05E+04 7.65E+04 3.52E+05 3.51E+05 3.84E+05 3.20E+05 3.01E+05 3.20E+05
2.85E+05 3.14E+05 2.76E+05 1.33E+05 4.80E+06 3.46E+03 1.45E+02 3.07E+02 7.50E+04 1.50E+02 3.59E+04 7.33E+03
1.97E+04 3.13E+03 1.33E+04 9.07E+04 3.33E+05

2004.9 d

7.90E+03	1.53E+04	5.50E+03	3.76E+04	7.43E+04	1.01E+05	6.96E+02	1.35E+05	4.86E+04	1.85E+05	2.07E+05	5.23E+04
1.87E+05	2.08E+05	1.66E+05	3.26E+05	3.52E+05	3.29E+05	3.73E+05	3.33E+05	3.69E+05	2.85E+05	2.41E+05	2.70E+05
2.07E+04	6.98E+04	2.05E+04	3.62E+03	6.65E+04	1.35E+04	4.13E+04	2.91E+05	2.05E+05	2.98E+05	4.08E+05	4.43E+05
3.93E+05	3.94E+05	1.43E+05	1.24E+05	2.17E+04	7.87E+04	3.52E+05	3.50E+05	3.84E+05	3.18E+05	3.01E+05	3.19E+05
2.83E+05	3.00E+05	2.75E+05	1.33E+05	4.89E+06	3.68E+03	1.44E+02	3.11E+02	7.55E+04	1.55E+02	3.83E+04	8.26E+03
1.95E+04	3.16E+03	1.33E+04	9.07E+04	3.32E+05							

ISOTOPE	AT WT	DECAY(SEC)	LAMBDA(1/S)	SAS2H GRAMS	CALC GRAMS	SAS2H CURIES	CALC CURIES
co 58	58.00	6.12E+06	1.13E-07	2.4900E-01	2.4882E-01	7.9000E+03	7.9042E+03
co 60	60.00	1.66E+08	4.17E-09	1.3500E+01	1.3500E+01	1.5300E+04	1.5272E+04
kr 85	85.00	3.38E+08	2.05E-09	1.4000E+01	1.4025E+01	5.5100E+03	5.5019E+03
kr 85m	85.00	1.61E+04	4.30E-05	4.5700E-03	4.5730E-03	3.7600E+04	3.7639E+04
kr 87	87.00	4.57E+03	1.52E-04	2.6200E-03	2.6187E-03	7.4100E+04	7.4284E+04
kr 88	88.00	1.02E+04	6.78E-05	8.0200E-03	8.0256E-03	1.0100E+05	1.0065E+05
rb 86	86.00	1.61E+06	4.30E-07	8.5500E-03	8.5484E-03	6.9700E+02	6.9602E+02
sr 89	89.00	4.36E+06	1.59E-07	4.6503E+00	4.6550E+00	1.3501E+05	1.3520E+05
sr 90	90.00	9.18E+08	7.55E-10	3.5500E+02	3.5550E+02	5.0200E+04	4.8566E+04
sr 91	91.00	3.42E+04	2.03E-05	5.1001E-02	5.0961E-02	1.8400E+05	1.8476E+05
sr 92	92.00	9.76E+03	7.10E-05	1.6500E-02	1.6468E-02	2.0700E+05	2.0702E+05
y 90	90.00	2.31E+05	3.00E-06	9.5997E-02	9.6297E-02	5.2188E+04	5.2333E+04
y 91	91.00	5.05E+06	1.37E-07	7.6323E+00	7.6372E+00	1.8706E+05	1.8735E+05
y 92	92.00	1.27E+04	5.44E-05	2.1602E-02	2.1622E-02	2.0802E+05	2.0808E+05
y 93	93.00	3.67E+04	1.89E-05	5.0200E-02	5.0220E-02	1.6800E+05	1.6593E+05
zr 95	95.00	5.53E+06	1.25E-07	1.5220E+01	1.5181E+01	3.2700E+05	3.2598E+05
zr 97	97.00	6.05E+04	1.15E-05	1.8330E-01	1.8323E-01	3.4980E+05	3.5242E+05
nb 95	95.00	3.02E+06	2.29E-07	8.3720E+00	8.3657E+00	3.2960E+05	3.2886E+05
mo 99	99.00	2.37E+05	2.92E-06	7.7702E-01	7.7717E-01	3.7301E+05	3.7312E+05
tc 99m	99.00	2.16E+04	3.20E-05	6.3100E-02	6.3162E-02	3.3300E+05	3.3272E+05
ru103	103.00	3.39E+06	2.04E-07	1.1500E+01	1.1433E+01	3.7000E+05	3.6914E+05
ru105	105.00	1.60E+04	4.34E-05	4.2400E-02	4.2420E-02	2.8500E+05	2.8519E+05
ru106	106.00	3.22E+07	2.15E-08	7.2700E+01	7.2716E+01	2.4100E+05	2.4063E+05
rh105	105.00	1.27E+05	5.44E-06	3.2000E-01	3.2025E-01	2.7000E+05	2.7004E+05
sb127	127.00	3.32E+05	2.09E-06	7.7400E-02	7.7343E-02	2.0700E+04	2.0711E+04
sb129	129.00	1.58E+04	4.38E-05	1.2600E-02	1.2642E-02	6.9800E+04	6.9808E+04
te127	127.00	3.38E+04	2.05E-05	7.8102E-03	7.8107E-03	2.0601E+04	2.0507E+04
te127m	127.00	9.42E+06	7.36E-08	3.8301E-01	3.8355E-01	3.6201E+03	3.6184E+03
te129	129.00	4.18E+03	1.66E-04	3.1700E-03	3.1734E-03	6.6500E+04	6.6468E+04
te129m	129.00	2.90E+06	2.39E-07	4.4900E-01	4.4892E-01	1.3500E+04	1.3526E+04
te131m	131.00	1.17E+05	5.94E-06	5.6000E-02	5.5937E-02	4.4700E+04	4.1306E+04
te132	132.00	2.82E+05	2.46E-06	9.5800E-01	9.5832E-01	2.9100E+05	2.9084E+05
i131	131.00	6.95E+05	9.98E-07	1.6500E+00	1.6506E+00	2.0400E+05	2.0466E+05
i132	132.00	8.21E+03	8.44E-05	2.8600E-02	2.8644E-02	2.9800E+05	2.9830E+05
i133	133.00	7.49E+04	9.26E-06	3.6000E-01	3.6043E-01	4.0800E+05	4.0836E+05
i134	134.00	3.16E+03	2.20E-04	1.6600E-02	1.6616E-02	4.4400E+05	4.4332E+05
i135	135.00	2.37E+04	2.93E-05	1.1100E-01	1.1110E-01	3.9300E+05	3.9262E+05
xe133	133.00	4.53E+05	1.53E-06	2.1000E+00	2.1014E+00	3.9400E+05	3.9355E+05
xe135	135.00	3.28E+04	2.12E-05	5.6100E-02	5.6025E-02	1.4200E+05	1.4294E+05
cs134	134.00	6.51E+07	1.06E-08	9.5800E+01	9.5810E+01	1.2400E+05	1.2388E+05
cs136	136.00	1.14E+06	6.10E-07	2.9700E-01	2.9784E-01	2.1700E+04	2.1733E+04
cs137	137.00	9.51E+08	7.29E-10	9.0900E+02	9.0968E+02	7.9100E+04	7.8745E+04
ba139	139.00	5.03E+03	1.38E-04	2.1800E-02	2.1823E-02	3.4800E+05	3.5249E+05
ba140	140.00	1.10E+06	6.29E-07	4.7900E+00	4.7880E+00	3.5000E+05	3.5030E+05
la140	140.00	1.45E+05	4.78E-06	6.9100E-01	6.9020E-01	3.8400E+05	3.8369E+05
la141	141.00	1.40E+04	4.94E-05	5.5900E-02	5.5836E-02	3.1700E+05	3.1825E+05
la142	142.00	5.54E+03	1.25E-04	2.1000E-02	2.1016E-02	3.0500E+05	3.0121E+05
ce141	141.00	2.81E+06	2.47E-07	1.1200E+01	1.1181E+01	3.1900E+05	3.1865E+05
ce143	143.00	1.19E+05	5.81E-06	4.2800E-01	4.2757E-01	2.8500E+05	2.8296E+05
ce144	144.00	2.46E+07	2.82E-08	9.4000E+01	9.4032E+01	2.9900E+05	2.9965E+05
pr143	143.00	1.17E+06	5.91E-07	4.0800E+00	4.0898E+00	2.7500E+05	2.7525E+05
nd147	147.00	9.49E+05	7.31E-07	1.6500E+00	1.6464E+00	1.3300E+05	1.3321E+05
np239	239.00	2.03E+05	3.41E-06	2.1100E+01	2.1080E+01	4.8900E+06	4.8911E+06
pu238	238.00	2.77E+09	2.51E-10	2.1500E+02	2.1491E+02	3.6800E+03	3.6840E+03
pu239	239.00	7.60E+11	9.12E-13	2.3100E+03	2.3111E+03	1.4400E+02	1.4356E+02
pu240	240.00	2.07E+11	3.35E-12	1.3700E+03	1.3704E+03	3.1100E+02	3.1143E+02
pu241	241.00	4.54E+08	1.53E-09	7.3200E+02	7.3264E+02	7.5700E+04	7.5533E+04

am241	241.00	1.36E+10	5.08E-11	4.5200E+01	4.5308E+01	1.5500E+02	1.5545E+02
cm242	242.00	1.41E+07	4.93E-08	1.1600E+01	1.1543E+01	3.8300E+04	3.8263E+04
cm244	244.00	5.71E+08	1.21E-09	1.0200E+02	1.0199E+02	8.2600E+03	8.2628E+03
kr 83m	83.00	6.70E+03	1.04E-04	9.6100E-04	9.6280E-04	1.9800E+04	1.9547E+04
xe131m	131.00	1.03E+06	6.74E-07	3.7700E-02	3.7728E-02	3.1600E+03	3.1605E+03
xe133m	133.00	1.89E+05	3.66E-06	2.9600E-02	2.9659E-02	1.3300E+04	1.3298E+04
xe135m	135.00	9.18E+02	7.55E-04	9.9700E-04	9.9630E-04	9.0800E+04	9.0709E+04
xe138	138.00	8.46E+02	8.19E-04	3.4300E-03	3.4362E-03	3.3200E+05	3.3210E+05

ISOTOPE	ASSM CI 1	ASSM CI 2	ASSM CI 3	BATCH CI/MW 1	BATCH CI/MW 2	BATCH CI/MW 3	BATCH CI/MW T
co 58	1.0705E+04	1.0392E+04	9.3598E+03	2.8375E+02	2.7167E+02	2.4470E+02	8.0012E+02
co 60	8.6205E+03	1.3711E+04	1.5272E+04	2.2850E+02	3.5847E+02	3.9928E+02	9.8625E+02
kr 85	3.5679E+03	5.1018E+03	5.5019E+03	9.4575E+01	1.3338E+02	1.4384E+02	3.7180E+02
kr 85m	1.7280E+05	8.7451E+04	4.2117E+04	4.5805E+03	2.2863E+03	1.1011E+03	7.9679E+03
kr 87	3.5538E+05	1.7572E+05	8.3909E+04	9.4200E+03	4.5939E+03	2.1937E+03	1.6208E+04
kr 88	5.0104E+05	2.4390E+05	1.1478E+05	1.3281E+04	6.3764E+03	3.0007E+03	2.2658E+04
rb 86	6.4560E+02	8.7527E+02	7.2823E+02	1.7113E+01	2.2883E+01	1.9039E+01	5.9034E+01
sr 89	5.9974E+05	4.2913E+05	2.3628E+05	1.5897E+04	1.1219E+04	6.1773E+03	3.3293E+04
sr 90	2.9386E+04	4.3156E+04	4.8566E+04	7.7892E+02	1.1283E+03	1.2697E+03	3.1769E+03
sr 91	8.4460E+05	4.2560E+05	2.0719E+05	2.2388E+04	1.1127E+04	5.4168E+03	3.8931E+04
sr 92	8.4775E+05	4.5105E+05	2.2668E+05	2.2471E+04	1.1792E+04	5.9264E+03	4.0190E+04
y 90	3.2374E+04	4.7062E+04	5.2333E+04	8.5814E+02	1.2304E+03	1.3682E+03	3.4567E+03
y 91	7.3008E+05	5.6265E+05	3.2377E+05	1.9352E+04	1.4710E+04	8.4647E+03	4.2527E+04
y 92	8.5531E+05	4.5423E+05	2.2845E+05	2.2671E+04	1.1875E+04	5.9725E+03	4.0519E+04
y 93	6.0534E+05	3.4108E+05	1.7822E+05	1.6046E+04	8.9171E+03	4.6594E+03	2.9622E+04
zr 95	9.0572E+05	7.8822E+05	5.2140E+05	2.4008E+04	2.0607E+04	1.3631E+04	5.8246E+04
zr 97	9.0408E+05	6.1416E+05	3.5969E+05	2.3964E+04	1.6057E+04	9.4037E+03	4.9425E+04
nb 95	9.0187E+05	8.4884E+05	5.6383E+05	2.3906E+04	2.2192E+04	1.4741E+04	6.0839E+04
mo 99	9.1734E+05	6.3691E+05	3.7740E+05	2.4316E+04	1.6651E+04	9.8666E+03	5.0834E+04
tc 99m	8.1355E+05	5.6844E+05	3.4419E+05	2.1565E+04	1.4861E+04	8.9985E+03	4.5424E+04
ru103	7.1500E+05	6.2853E+05	5.1214E+05	1.8952E+04	1.6432E+04	1.3389E+04	4.8774E+04
ru105	4.7649E+05	4.3484E+05	2.8519E+05	1.2630E+04	1.1368E+04	7.4559E+03	3.1455E+04
ru106	1.9222E+05	2.8062E+05	2.7781E+05	5.0953E+03	7.3364E+03	7.2631E+03	1.9695E+04
rh105	4.1879E+05	3.9577E+05	2.7004E+05	1.1101E+04	1.0347E+04	7.0599E+03	2.8507E+04
sb127	3.9110E+04	3.2580E+04	2.0711E+04	1.0367E+03	8.5177E+02	5.4147E+02	2.4299E+03
sb129	1.5030E+05	1.1397E+05	6.9808E+04	3.9840E+03	2.9797E+03	1.8251E+03	8.7888E+03
te127	3.9345E+04	3.2377E+04	2.2073E+04	1.0429E+03	8.4645E+02	5.7708E+02	2.4664E+03
te127m	6.2422E+03	6.0265E+03	5.3436E+03	1.6546E+02	1.5756E+02	1.3970E+02	4.6272E+02
te129	1.4239E+05	1.0835E+05	6.8629E+04	3.7744E+03	2.8326E+03	1.7942E+03	8.4012E+03
te129m	2.8490E+04	2.4487E+04	1.8812E+04	7.5518E+02	6.4017E+02	4.9182E+02	1.8872E+03
te131m	8.4644E+04	6.6748E+04	4.1306E+04	2.2437E+03	1.7450E+03	1.0799E+03	5.0686E+03
te132	6.8102E+05	4.8473E+05	2.9324E+05	1.8052E+04	1.2673E+04	7.6664E+03	3.8391E+04
i131	4.7429E+05	3.4597E+05	2.2740E+05	1.2572E+04	9.0451E+03	5.9451E+03	2.7562E+04
i132	6.9971E+05	4.9763E+05	3.0243E+05	1.8547E+04	1.3010E+04	7.9066E+03	3.9464E+04
i133	1.0066E+06	6.9918E+05	4.1137E+05	2.6681E+04	1.8279E+04	1.0755E+04	5.5715E+04
i134	1.1584E+06	7.7939E+05	4.5047E+05	3.0705E+04	2.0376E+04	1.1777E+04	6.2858E+04
i135	9.4934E+05	6.6788E+05	3.9548E+05	2.5164E+04	1.7461E+04	1.0339E+04	5.2964E+04
xe133	9.8137E+05	7.0490E+05	4.3091E+05	2.6013E+04	1.8429E+04	1.1266E+04	5.5707E+04
xe135	2.8622E+05	2.2525E+05	1.6188E+05	7.5867E+03	5.8890E+03	4.2321E+03	1.7708E+04
cs134	4.5395E+04	1.0517E+05	1.2388E+05	1.2033E+03	2.7496E+03	3.2388E+03	7.1917E+03
cs136	1.8061E+04	2.5405E+04	2.1733E+04	4.7875E+02	6.6418E+02	5.6818E+02	1.7111E+03
cs137	3.8898E+04	6.4870E+04	7.8745E+04	1.0311E+03	1.6959E+03	2.0587E+03	4.7857E+03
ba139	9.5195E+05	6.2640E+05	3.5923E+05	2.5233E+04	1.6377E+04	9.3915E+03	5.1001E+04
ba140	9.2389E+05	6.5655E+05	4.3122E+05	2.4489E+04	1.7165E+04	1.1274E+04	5.2928E+04
la140	9.2614E+05	6.7709E+05	4.5918E+05	2.4549E+04	1.7702E+04	1.2005E+04	5.4255E+04
la141	8.6795E+05	5.6979E+05	3.2628E+05	2.3007E+04	1.4897E+04	8.5303E+03	4.6433E+04
la142	8.5073E+05	5.4544E+05	3.0935E+05	2.2550E+04	1.4260E+04	8.0877E+03	4.4898E+04
ce141	8.3178E+05	6.7909E+05	4.6210E+05	2.2048E+04	1.7754E+04	1.2081E+04	5.1883E+04
ce143	8.6118E+05	5.2901E+05	2.9337E+05	2.2827E+04	1.3830E+04	7.6698E+03	4.4327E+04
ce144	5.7360E+05	5.6901E+05	4.6805E+05	1.5204E+04	1.4876E+04	1.2237E+04	4.2317E+04
pr143	8.4307E+05	5.7167E+05	3.6764E+05	2.2347E+04	1.4946E+04	9.6115E+03	4.6904E+04
nd147	3.3303E+05	2.3788E+05	1.5700E+05	8.8275E+03	6.2190E+03	4.1045E+03	1.9151E+04
np239	8.8173E+06	7.4863E+06	4.9299E+06	2.3372E+05	1.9572E+05	1.2889E+05	5.5833E+05
pu238	6.2828E+02	2.2806E+03	3.6840E+03	1.6654E+01	5.9623E+01	9.6314E+01	1.7259E+02
pu239	1.3837E+02	1.4995E+02	1.4846E+02	3.6676E+00	3.9201E+00	3.8813E+00	1.1469E+01
pu240	1.7562E+02	2.7652E+02	3.1143E+02	4.6551E+00	7.2293E+00	8.1418E+00	2.0026E+01
pu241	4.3978E+04	6.9570E+04	7.5533E+04	1.1657E+03	1.8188E+03	1.9747E+03	4.9593E+03

am241	3.2247E+01	9.1781E+01	1.5545E+02	8.5478E-01	2.3995E+00	4.0640E+00	7.3183E+00
cm242	8.0217E+03	3.0402E+04	3.8263E+04	2.1263E+02	7.9483E+02	1.0004E+03	2.0078E+03
cm244	3.2023E+02	3.5186E+03	8.2628E+03	8.4884E+00	9.1990E+01	2.1602E+02	3.1650E+02
kr 83m	7.6166E+04	4.1453E+04	2.1232E+04	2.0189E+03	1.0837E+03	5.5509E+02	3.6577E+03
xe131m	6.0795E+03	4.9602E+03	4.0055E+03	1.6115E+02	1.2968E+02	1.0472E+02	3.9554E+02
xe133m	3.0710E+04	2.1944E+04	1.3298E+04	8.1402E+02	5.7370E+02	3.4765E+02	1.7354E+03
xe135m	2.0158E+05	1.4995E+05	9.0709E+04	5.3431E+03	3.9203E+03	2.3715E+03	1.1635E+04
xe138	9.3627E+05	5.9751E+05	3.4010E+05	2.4818E+04	1.5621E+04	8.8915E+03	4.9330E+04

ATTACHMENT H
SAS2H EDIT CODE NUCLEAR INVENTORY FILE (CRCB.NIF)

```
Nuclide Inventory Name:
Normalized MACCS Sample 3412 MWth PWR Core Inventory
Power Level:
 0.1000E+01
Nuclides:
 65
Nuclide 001:
Co-58
 7
 0.6117120000E+07
 0.5800E+02
 8.0012E+02
none    0.0000E+00
none    0.0000E+00
none    0.0000E+00
Nuclide 002:
Co-60
 7
 0.1663401096E+09
 0.6000E+02
 9.8625E+02
none    0.0000E+00
none    0.0000E+00
none    0.0000E+00
Nuclide 003:
Kr-85
 1
 0.3382974720E+09
 0.8500E+02
 3.7180E+02
none    0.0000E+00
none    0.0000E+00
none    0.0000E+00
Nuclide 004:
Kr-85m
 1
 0.1612800000E+05
 0.8500E+02
 7.9679E+03
Kr-85   0.2100E+00
none    0.0000E+00
none    0.0000E+00
Nuclide 005:
Kr-87
 1
 0.4578000000E+04
 0.8700E+02
 1.6208E+04
Rb-87   0.1000E+01
none    0.0000E+00
none    0.0000E+00
Nuclide 006:
Kr-88
 1
 0.1022400000E+05
 0.8800E+02
 2.2658E+04
Rb-88   0.1000E+01
none    0.0000E+00
none    0.0000E+00
Nuclide 007:
Rb-86
 3
```

0.1612224000E+07
0.8600E+02
5.9034E+01
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 008:
Sr-89
5
0.4363200000E+07
0.8900E+02
3.3293E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 009:
Sr-90
5
0.9189573120E+09
0.9000E+02
3.1769E+03
Y-90 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 010:
Sr-91
5
0.3420000000E+05
0.9100E+02
3.8931E+04
Y-91m 0.5800E+00
Y-91 0.4200E+00
none 0.0000E+00
Nuclide 011:
Sr-92
5
0.9756000000E+04
0.9200E+02
4.0190E+04
Y-92 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 012:
Y-90
9
0.2304000000E+06
0.9000E+02
3.4567E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 013:
Y-91
9
0.5055264000E+07
0.9100E+02
4.2527E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 014:
Y-92
9
0.1274400000E+05
0.9200E+02
4.0519E+04
none 0.0000E+00
none 0.0000E+00

none 0.0000E+00
Nuclide 015:
Y-93
9
0.3636000000E+05
0.9300E+02
2.9622E+04
Zr-93 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 016:
Zr-95
9
0.5527872000E+07
0.9500E+02
5.8246E+04
Nb-95m 0.7000E-02
Nb-95 0.9900E+00
none 0.0000E+00
Nuclide 017:
Zr-97
9
0.6084000000E+05
0.9700E+02
4.9425E+04
Nb-97m 0.9500E+00
Nb-97 0.5300E-01
none 0.0000E+00
Nuclide 018:
Nb-95
9
0.3036960000E+07
0.9500E+02
6.0839E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 019:
Mo-99
7
0.2376000000E+06
0.9900E+02
5.0834E+04
Tc-99m 0.8800E+00
Tc-99 0.1200E+00
none 0.0000E+00
Nuclide 020:
Tc-99m
7
0.2167200000E+05
0.9900E+02
4.5424E+04
Tc-99 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 021:
Ru-103
7
0.3393792000E+07
0.1030E+03
4.8774E+04
Rh-103m 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 022:
Ru-105
7
0.1598400000E+05

0.1050E+03
3.1455E+04
Rh-105 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 023:
Ru-106
7
0.3181248000E+08
0.1060E+03
1.9695E+04
Rh-106 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 024:
Rh-105
7
0.1272960000E+06
0.1050E+03
2.8507E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 025:
Sb-127
4
0.3326400000E+06
0.1270E+03
2.4299E+03
Te-127m 0.1800E+00
Te-127 0.8200E+00
none 0.0000E+00
Nuclide 026:
Sb-129
4
0.1555200000E+05
0.1290E+03
8.7888E+03
Te-129m 0.2200E+00
Te-129 0.7700E+00
none 0.0000E+00
Nuclide 027:
Te-127
4
0.3366000000E+05
0.1270E+03
2.4664E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 028:
Te-127m
4
0.9417600000E+07
0.1270E+03
4.6272E+02
Te-127 0.9800E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 029:
Te-129
4
0.4176000000E+04
0.1290E+03
8.4012E+03
I-129 0.1000E+01
none 0.0000E+00
none 0.0000E+00

Nuclide 030:
Te-129m
4
0.2903040000E+07
0.1290E+03
1.8872E+03
Te-129 0.6500E+00
I-129 0.3500E+00
none 0.0000E+00
Nuclide 031:
Te-131m
4
0.1080000000E+06
0.1310E+03
5.0686E+03
Te-131 0.2200E+00
I-131 0.7800E+00
none 0.0000E+00
Nuclide 032:
Te-132
4
0.2815200000E+06
0.1320E+03
3.8391E+04
I-132 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 033:
I-131
2
0.6946560000E+06
0.1310E+03
2.7562E+04
Xe-131m 0.1100E-01
none 0.0000E+00
none 0.0000E+00
Nuclide 034:
I-132
2
0.8280000000E+04
0.1320E+03
3.9464E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 035:
I-133
2
0.7488000000E+05
0.1330E+03
5.5715E+04
Xe-133m 0.2900E-01
Xe-133 0.9700E+00
none 0.0000E+00
Nuclide 036:
I-134
2
0.3156000000E+04
0.1340E+03
6.2858E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 037:
I-135
2
0.2379600000E+05
0.1350E+03

5.2964E+04
Xe-135m 0.1500E+00
Xe-135 0.8500E+00
none 0.0000E+00
Nuclide 038:
Xe-133
1
0.4531680000E+06
0.1330E+03
5.5707E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 039:
Xe-135
1
0.3272400000E+05
0.1350E+03
1.7708E+04
Cs-135 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 040:
Cs-134
3
0.6507177120E+08
0.1340E+03
7.1917E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 041:
Cs-136
3
0.1131840000E+07
0.1360E+03
1.7111E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 042:
Cs-137
3
0.9467280000E+09
0.1370E+03
4.7857E+03
Ba-137m 0.9500E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 043:
Ba-139
6
0.4962000000E+04
0.1390E+03
5.1001E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 044:
Ba-140
6
0.1100736000E+07
0.1400E+03
5.2928E+04
La-140 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 045:

La-140
9
0.1449792000E+06
0.1400E+03
5.4255E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 046:
La-141
9
0.1414800000E+05
0.1410E+03
4.6433E+04
Ce-141 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 047:
La-142
9
0.5550000000E+04
0.1420E+03
4.4898E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 048:
Ce-141
8
0.2808086400E+07
0.1410E+03
5.1883E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 049:
Ce-143
8
0.1188000000E+06
0.1430E+03
4.4327E+04
Pr-143 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 050:
Ce-144
8
0.2456352000E+08
0.1440E+03
4.2317E+04
Pr-144m 0.1800E-01
Pr-144 0.9800E+00
none 0.0000E+00
Nuclide 051:
Pr-143
9
0.1171584000E+07
0.1430E+03
4.6904E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 052:
Nd-147
9
0.9486720000E+06
0.1470E+03
1.9151E+04

Pm-147 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 053:
Np-239
8
0.2034720000E+06
0.2390E+03
5.5833E+05
Pu-239 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 054:
Pu-238
8
0.2768863824E+10
0.2380E+03
1.7259E+02
U-234 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 055:
Pu-239
8
0.7594336440E+12
0.2390E+03
1.1469E+01
U-235 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 056:
Pu-240
8
0.2062920312E+12
0.2400E+03
2.0026E+01
U-236 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 057:
Pu-241
8
0.4544294400E+09
0.2410E+03
4.9593E+03
U-237 0.2400E-04
Am-241 0.1000E+01
none 0.0000E+00
Nuclide 058:
Am-241
9
0.1363919472E+11
0.2410E+03
7.3183E+00
Np-237 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 059:
Cm-242
9
0.1406592000E+08
0.2420E+03
2.0078E+03
Pu-238 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 060:
Cm-244

9
0.571508136E+9
0.2440E+03
3.1650E+02
Pu-240 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 061:
Kr-83m
1
6.6960000000E+03
0.8300E+02
3.6577E+03
Kr-83 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 062:
Xe-131m
1
1.0282000000E+06
0.1310E+03
3.9554E+02
Xe-131 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 063:
Xe-133m
1
1.8922000000E+05
0.1330E+03
1.7354E+03
Xe-133 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 064:
Xe-135m
1
9.1800000000E+02
0.1350E+03
1.1635E+04
Xe-135 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 065:
Xe-138
1
8.4600000000E+02
0.1380E+03
4.9330E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
End of Nuclear Inventory File

SAS2H EDIT CODE NUCLEAR INVENTORY FILE (CRCB63.NIF)

```
Nuclide Inventory Name:
 Normalized MACCS Sample 3412 MWth PWR Core Inventory
 Power Level:
  0.1000E+01
 Nuclides:
  63
 Nuclide 001:
 Co-58
  7
  0.6117120000E+07
  0.5800E+02
  8.0012E+02
 none    0.0000E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 002:
 Co-60
  7
  0.1663401096E+09
  0.6000E+02
  9.8625E+02
 none    0.0000E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 003:
 Kr-85
  1
  0.3382974720E+09
  0.8500E+02
  3.7180E+02
 none    0.0000E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 004:
 Kr-85m
  1
  0.1612800000E+05
  0.8500E+02
  7.9679E+03
 Kr-85   0.2100E+00
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 005:
 Kr-87
  1
  0.4578000000E+04
  0.8700E+02
  1.6208E+04
 Rb-87   0.1000E+01
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 006:
 Kr-88
  1
  0.1022400000E+05
  0.8800E+02
  2.2658E+04
 Rb-88   0.1000E+01
 none    0.0000E+00
 none    0.0000E+00
 Nuclide 007:
 Rb-86
  3
  0.1612224000E+07
```

0.8600E+02
5.9034E+01
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 008:
Sr-89
5
0.4363200000E+07
0.8900E+02
3.3293E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 009:
Sr-90
5
0.9189573120E+09
0.9000E+02
3.1769E+03
Y-90 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 010:
Sr-91
5
0.3420000000E+05
0.9100E+02
3.8931E+04
Y-91m 0.5800E+00
Y-91 0.4200E+00
none 0.0000E+00
Nuclide 011:
Sr-92
5
0.9756000000E+04
0.9200E+02
4.0190E+04
Y-92 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 012:
Y-90
9
0.2304000000E+06
0.9000E+02
3.4567E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 013:
Y-91
9
0.5055264000E+07
0.9100E+02
4.2527E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 014:
Y-92
9
0.1274400000E+05
0.9200E+02
4.0519E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00

Nuclide 015:
Y-93
9
0.3636000000E+05
0.9300E+02
2.9622E+04
Zr-93 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 016:
Zr-95
9
0.5527872000E+07
0.9500E+02
5.8246E+04
Nb-95m 0.7000E-02
Nb-95 0.9900E+00
none 0.0000E+00
Nuclide 017:
Zr-97
9
0.6084000000E+05
0.9700E+02
4.9425E+04
Nb-97m 0.9500E+00
Nb-97 0.5300E-01
none 0.0000E+00
Nuclide 018:
Nb-95
9
0.3036960000E+07
0.9500E+02
6.0839E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 019:
Mo-99
7
0.2376000000E+06
0.9900E+02
5.0834E+04
Tc-99m 0.8800E+00
Tc-99 0.1200E+00
none 0.0000E+00
Nuclide 020:
Tc-99m
7
0.2167200000E+05
0.9900E+02
4.5424E+04
Tc-99 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 021:
Ru-103
7
0.3393792000E+07
0.1030E+03
4.8774E+04
Rh-103m 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 022:
Ru-105
7
0.1598400000E+05
0.1050E+03

3.1455E+04
Rh-105 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 023:
Ru-106
7
0.3181248000E+08
0.1060E+03
1.9695E+04
Rh-106 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 024:
Rh-105
7
0.1272960000E+06
0.1050E+03
2.8507E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 025:
Sb-127
4
0.3326400000E+06
0.1270E+03
2.4299E+03
Te-127m 0.1800E+00
Te-127 0.8200E+00
none 0.0000E+00
Nuclide 026:
Sb-129
4
0.1555200000E+05
0.1290E+03
8.7888E+03
Te-129m 0.2200E+00
Te-129 0.7700E+00
none 0.0000E+00
Nuclide 027:
Te-127
4
0.3366000000E+05
0.1270E+03
2.4664E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 028:
Te-127m
4
0.9417600000E+07
0.1270E+03
4.6272E+02
Te-127 0.9800E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 029:
Te-129
4
0.4176000000E+04
0.1290E+03
8.4012E+03
I-129 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 030:

Te-129m
4
0.2903040000E+07
0.1290E+03
1.8872E+03
Te-129 0.6500E+00
I-129 0.3500E+00
none 0.0000E+00
Nuclide 031:
Te-131m
4
0.1080000000E+06
0.1310E+03
5.0686E+03
Te-131 0.2200E+00
I-131 0.7800E+00
none 0.0000E+00
Nuclide 032:
Te-132
4
0.2815200000E+06
0.1320E+03
3.8391E+04
I-132 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 033:
I-131
2
0.6946560000E+06
0.1310E+03
2.7562E+04
Xe-131m 0.1100E-01
none 0.0000E+00
none 0.0000E+00
Nuclide 034:
I-132
2
0.8280000000E+04
0.1320E+03
3.9464E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 035:
I-133
2
0.7488000000E+05
0.1330E+03
5.5715E+04
Xe-133m 0.2900E-01
Xe-133 0.9700E+00
none 0.0000E+00
Nuclide 036:
I-134
2
0.3156000000E+04
0.1340E+03
6.2858E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 037:
I-135
2
0.2379600000E+05
0.1350E+03
5.2964E+04

Xe-135m 0.1500E+00
Xe-135 0.8500E+00
none 0.0000E+00
Nuclide 038:
Xe-133
1
0.4531680000E+06
0.1330E+03
5.5707E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 039:
Xe-135
1
0.3272400000E+05
0.1350E+03
1.7708E+04
Cs-135 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 040:
Cs-134
3
0.6507177120E+08
0.1340E+03
7.1917E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 041:
Cs-136
3
0.1131840000E+07
0.1360E+03
1.7111E+03
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 042:
Cs-137
3
0.9467280000E+09
0.1370E+03
4.7857E+03
Ba-137m 0.9500E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 043:
Ba-139
6
0.4962000000E+04
0.1390E+03
5.1001E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 044:
Ba-140
6
0.1100736000E+07
0.1400E+03
5.2928E+04
La-140 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 045:
La-140

9
0.1449792000E+06
0.1400E+03
5.4255E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 046:
La-141
9
0.1414800000E+05
0.1410E+03
4.6433E+04
Ce-141 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 047:
La-142
9
0.5550000000E+04
0.1420E+03
4.4898E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 048:
Ce-141
8
0.2808086400E+07
0.1410E+03
5.1883E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 049:
Ce-143
8
0.1188000000E+06
0.1430E+03
4.4327E+04
Pr-143 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 050:
Ce-144
8
0.2456352000E+08
0.1440E+03
4.2317E+04
Pr-144m 0.1800E-01
Pr-144 0.9800E+00
none 0.0000E+00
Nuclide 051:
Pr-143
9
0.1171584000E+07
0.1430E+03
4.6904E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
Nuclide 052:
Nd-147
9
0.9486720000E+06
0.1470E+03
1.9151E+04
Pm-147 0.1000E+01

none 0.0000E+00
none 0.0000E+00
Nuclide 053:
Np-239
8
0.2034720000E+06
0.2390E+03
5.5833E+05
Pu-239 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 054:
Pu-238
8
0.2768863824E+10
0.2380E+03
1.7259E+02
U-234 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 055:
Pu-239
8
0.7594336440E+12
0.2390E+03
1.1469E+01
U-235 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 056:
Pu-240
8
0.2062920312E+12
0.2400E+03
2.0026E+01
U-236 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 057:
Pu-241
8
0.4544294400E+09
0.2410E+03
4.9593E+03
U-237 0.2400E-04
Am-241 0.1000E+01
none 0.0000E+00
Nuclide 058:
Am-241
9
0.1363919472E+11
0.2410E+03
7.3183E+00
Np-237 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 059:
Cm-242
9
0.1406592000E+08
0.2420E+03
2.0078E+03
Pu-238 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 060:
Cm-244
9

0.571508136E+9
0.2440E+03
3.1650E+02
Pu-240 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 061:
Xe-133m
1
1.8922000000E+05
0.1330E+03
1.7354E+03
Xe-133 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 062:
Xe-135m
1
9.1800000000E+02
0.1350E+03
1.1635E+04
Xe-135 0.1000E+01
none 0.0000E+00
none 0.0000E+00
Nuclide 063:
Xe-138
1
8.4600000000E+02
0.1380E+03
4.9330E+04
none 0.0000E+00
none 0.0000E+00
none 0.0000E+00
End of Nuclear Inventory File

ATTACHMENT I
LOADING PATTERN COMPARISONS

Loading Pattern Comparisons with Total Activities Integrated over Infinity							
MWt	1						
(Rem/Ci)/(Sv/Bq)	3.70E+12						
BR(m3/s)	3.50E-04						
Vcr(cf-m3)	289194	8189.06					
f	0.059784						
	FGR 12	FGR 11					
	Table 2.1	Table 2.1	pwr_def	50A2	50B2	50C2	50D2
	CLOUD	INHALED	nlf				
	SHINE	CHRONIC					
	Sv-m3/Bq-s	Sv/Bq	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	4.76E-14	2.94E-09	2.5530E+02	7.6371E+02	7.5954E+02	7.5604E+02	7.6815E+02
Co-60	1.26E-13	5.91E-08	1.9530E+02	8.0950E+02	7.9190E+02	7.7298E+02	8.5313E+02
Kr-85	1.19E-16	0.00E+00	1.9600E+02	3.7046E+02	3.6202E+02	3.5620E+02	3.8397E+02
Kr-85m	7.48E-15	0.00E+00	9.1810E+03	8.5580E+03	8.6539E+03	8.7172E+03	8.6281E+03
Kr-87	4.12E-14	0.00E+00	1.6780E+04	1.7441E+04	1.7718E+04	1.7811E+04	1.7621E+04
Kr-88	1.02E-13	0.00E+00	2.2690E+04	2.4510E+04	2.4842E+04	2.5051E+04	2.4745E+04
Rb-86	4.81E-15	1.79E-09	1.4960E+01	5.1338E+01	5.0196E+01	4.8653E+01	5.3721E+01
Sr-89	7.73E-17	1.12E-08	2.8440E+04	3.4343E+04	3.4765E+04	3.4920E+04	3.5413E+04
Sr-90	7.53E-18	3.51E-07	1.5350E+03	3.1862E+03	3.1129E+03	3.0572E+03	3.2756E+03
Sr-91	4.92E-14	4.55E-10	3.6560E+04	4.1835E+04	4.2307E+04	4.2634E+04	4.2218E+04
Sr-92	6.79E-14	2.18E-10	3.8050E+04	4.2721E+04	4.3174E+04	4.3494E+04	4.3019E+04
Y-90	1.90E-16	2.28E-09	1.6470E+03	3.4256E+03	3.3503E+03	3.2892E+03	3.5229E+03
Y-91	2.60E-16	1.32E-08	3.4650E+04	4.3187E+04	4.3703E+04	4.3772E+04	4.4671E+04
Y-92	1.30E-14	2.11E-10	3.8190E+04	4.3055E+04	4.3492E+04	4.3803E+04	4.3399E+04
Y-93	4.80E-15	5.82E-10	4.3200E+04	3.1084E+04	3.1397E+04	3.1500E+04	3.1304E+04
Zr-95	3.60E-14	6.39E-09	4.3770E+04	5.5816E+04	5.6037E+04	5.6057E+04	5.8067E+04
Zr-97	4.43E-14	1.17E-09	4.5620E+04	4.9673E+04	4.9821E+04	4.9853E+04	4.9772E+04
Nb-95	3.74E-14	1.57E-09	4.1380E+04	5.8020E+04	5.8250E+04	5.8284E+04	6.1265E+04
Mo-99	7.28E-15	1.07E-09	4.8300E+04	5.1077E+04	5.1044E+04	5.1045E+04	5.1031E+04
Tc-99m	5.89E-15	8.80E-12	4.1690E+04	4.5399E+04	4.5332E+04	4.5191E+04	4.5192E+04
Ru-103	2.25E-14	2.42E-09	3.5980E+04	4.2488E+04	4.2345E+04	4.1939E+04	4.3709E+04
Ru-105	3.81E-14	1.23E-10	2.3400E+04	2.7263E+04	2.6912E+04	2.6601E+04	2.7549E+04
Ru-106	1.04E-14	1.29E-07	8.1750E+03	1.5998E+04	1.5787E+04	1.5351E+04	1.7273E+04
Rh-105	3.72E-15	2.58E-10	1.6210E+04	2.5566E+04	2.5233E+04	2.4985E+04	2.5716E+04
Sb-127	3.33E-14	1.63E-09	2.2080E+03	2.2032E+03	2.1858E+03	2.1703E+03	2.2175E+03
Sb-129	7.14E-14	1.74E-10	7.8200E+03	8.4042E+03	8.3895E+03	8.3586E+03	8.4370E+03
Te-127	2.42E-16	8.60E-11	2.1320E+03	2.1875E+03	2.1775E+03	2.1600E+03	2.2286E+03
Te-127m	1.47E-16	5.81E-09	2.8230E+02	3.9505E+02	3.9372E+02	3.8771E+02	4.1603E+02
Te-129	2.75E-15	2.09E-11	7.3410E+03	7.9927E+03	7.9732E+03	7.9523E+03	8.0543E+03
Te-129m	3.34E-15	6.48E-09	1.9350E+03	1.6609E+03	1.6586E+03	1.6474E+03	1.7051E+03
Te-131m	7.46E-14	1.76E-09	3.7070E+03	4.7506E+03	4.7270E+03	4.7085E+03	4.7713E+03

Te-132	1.03E-14	2.55E-09	3.6900E+04	3.8201E+04	3.8121E+04	3.8035E+04	3.8225E+04
I-131	1.82E-14	8.89E-09	2.5400E+04	2.6575E+04	2.6593E+04	2.6518E+04	2.6607E+04
I-132	1.12E-13	1.03E-10	3.7430E+04	3.8910E+04	3.8908E+04	3.8919E+04	3.8901E+04
I-133	2.94E-14	1.58E-09	5.3700E+04	5.6062E+04	5.6090E+04	5.6147E+04	5.6083E+04
I-134	1.30E-13	3.55E-11	5.8930E+04	6.3436E+04	6.3674E+04	6.3795E+04	6.3644E+04
I-135	8.29E-14	3.32E-10	5.0630E+04	5.2991E+04	5.3104E+04	5.3124E+04	5.3144E+04
Xe-133	1.56E-15	0.00E+00	5.3720E+04	5.3133E+04	5.3166E+04	5.3156E+04	5.3087E+04
Xe-135	1.19E-14	0.00E+00	1.0080E+04	2.1438E+04	2.1464E+04	2.1582E+04	2.0738E+04
Cs-134	7.57E-14	1.25E-08	3.4250E+03	5.8042E+03	5.6011E+03	5.3887E+03	6.3258E+03
Cs-136	1.06E-13	1.98E-09	1.0420E+03	1.6333E+03	1.5657E+03	1.5278E+03	1.6054E+03
Cs-137	2.73E-14	8.63E-09	1.9150E+03	4.3837E+03	4.2479E+03	4.1457E+03	4.5277E+03
Ba-139	2.17E-15	4.64E-11	4.9760E+04	5.1891E+04	5.1973E+04	5.2158E+04	5.1927E+04
Ba-140	8.58E-15	1.01E-09	4.9240E+04	5.1445E+04	5.1565E+04	5.1623E+04	5.1755E+04
La-140	1.17E-13	1.31E-09	5.0320E+04	5.3175E+04	5.3446E+04	5.3306E+04	5.3617E+04
La-141	2.39E-15	1.57E-10	4.6150E+04	4.7174E+04	4.7312E+04	4.7418E+04	4.7179E+04
La-142	1.44E-13	6.84E-11	4.4490E+04	4.5940E+04	4.6060E+04	4.6231E+04	4.6073E+04
Ce-141	3.43E-15	2.42E-09	4.4760E+04	4.9047E+04	4.9178E+04	4.9343E+04	5.0387E+04
Ce-143	1.29E-14	9.16E-10	4.3520E+04	4.5725E+04	4.5953E+04	4.6119E+04	4.5903E+04
Ce-144	2.77E-15	1.01E-07	2.6970E+04	4.0567E+04	4.0647E+04	4.0333E+04	4.3005E+04
Pr-143	2.10E-17	2.19E-09	4.2730E+04	4.6000E+04	4.6249E+04	4.6365E+04	4.6428E+04
Nd-147	6.19E-15	1.85E-09	1.9110E+04	1.8619E+04	1.8679E+04	1.8669E+04	1.8726E+04
Np-239	7.69E-15	6.78E-10	5.1200E+05	4.8322E+05	4.7780E+05	4.7408E+05	4.8512E+05
Pu-238	4.88E-18	7.79E-05	2.9020E+01	1.3689E+02	1.2556E+02	1.1817E+02	1.4318E+02
Pu-239	4.24E-18	8.33E-05	6.5450E+00	1.1989E+01	1.1956E+01	1.1924E+01	1.2124E+01
Pu-240	4.75E-18	8.33E-05	8.2540E+00	1.7232E+01	1.6791E+01	1.6422E+01	1.7865E+01
Pu-241	7.25E-20	1.34E-06	1.3900E+03	4.4622E+03	4.3439E+03	4.2637E+03	4.6295E+03
Am-241	8.18E-16	1.20E-04	9.1810E-01	6.9722E+00	6.9094E+00	6.6825E+00	8.0364E+00
Cm-242	5.69E-18	4.67E-06	3.5140E+02	1.5296E+03	1.3894E+03	1.3308E+03	1.5594E+03
Cm-244	4.91E-18	6.70E-05	2.0560E+01	1.5169E+02	1.2678E+02	1.1322E+02	1.5667E+02
cloudshine			1.4482E+00	1.5731E+00	1.5767E+00	1.5771E+00	1.5872E+00
Inhaled chronic			2.4454E+03	7.5251E+03	6.9796E+03	6.6570E+03	7.8247E+03
TEDE Dose			2.4469E+03	7.5267E+03	6.9812E+03	6.6585E+03	7.8263E+03
Fraction			1.0000	3.0760	2.8531	2.7212	3.1985

	50E2	50F2	40A2	40B2	40C2	40D2	40E2
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.6866E+02	7.4941E+02	7.7069E+02	7.6622E+02	7.6281E+02	7.7372E+02	7.7549E+02
Co-60	8.4027E+02	7.3230E+02	9.0822E+02	8.8744E+02	8.6992E+02	9.5723E+02	9.4439E+02
Kr-85	3.8022E+02	3.4285E+02	3.4904E+02	3.4254E+02	3.3655E+02	3.6133E+02	3.5814E+02
Kr-85m	8.4819E+03	8.7994E+03	8.1846E+03	8.3389E+03	8.4071E+03	8.2871E+03	8.1013E+03
Kr-87	1.7312E+04	1.7993E+04	1.6728E+04	1.6950E+04	1.7155E+04	1.6951E+04	1.6508E+04
Kr-88	2.4251E+04	2.5280E+04	2.3406E+04	2.3779E+04	2.4036E+04	2.3708E+04	2.3130E+04
Rb-86	5.3675E+01	4.5873E+01	5.3275E+01	5.2068E+01	5.0528E+01	5.5644E+01	5.5163E+01
Sr-89	3.4119E+04	3.5195E+04	3.2271E+04	3.2725E+04	3.2993E+04	3.3319E+04	3.2020E+04
Sr-90	3.2805E+03	2.9389E+03	2.9753E+03	2.9141E+03	2.8592E+03	3.0525E+03	3.0623E+03
Sr-91	4.1456E+04	4.2973E+04	4.0074E+04	4.0818E+04	4.1168E+04	4.0610E+04	3.9656E+04
Sr-92	4.2387E+04	4.3771E+04	4.1251E+04	4.1752E+04	4.2088E+04	4.1646E+04	4.0864E+04
Y-90	3.5392E+03	3.1631E+03	3.2305E+03	3.1621E+03	3.1069E+03	3.3163E+03	3.3257E+03
Y-91	4.3102E+04	4.3903E+04	4.0782E+04	4.1329E+04	4.1560E+04	4.2261E+04	4.0694E+04
Y-92	4.2718E+04	4.4131E+04	4.1565E+04	4.2075E+04	4.2400E+04	4.1980E+04	4.1190E+04
Y-93	3.0884E+04	3.1742E+04	3.0142E+04	3.0593E+04	3.0705E+04	3.0450E+04	3.0021E+04
Zr-95	5.6167E+04	5.5866E+04	5.4575E+04	5.4906E+04	5.4886E+04	5.6766E+04	5.4851E+04
Zr-97	4.9727E+04	4.9964E+04	4.9514E+04	4.9617E+04	4.9717E+04	4.9591E+04	4.9548E+04
Nb-95	5.8578E+04	5.7859E+04	5.6730E+04	5.6966E+04	5.7005E+04	5.9875E+04	5.7187E+04
Mo-99	5.1072E+04	5.1106E+04	5.0729E+04	5.0861E+04	5.0870E+04	5.0856E+04	5.0875E+04
Tc-99m	4.5345E+04	4.5335E+04	4.5040E+04	4.5138E+04	4.5179E+04	4.5009E+04	4.5139E+04
Ru-103	4.2783E+04	4.0582E+04	4.4974E+04	4.4820E+04	4.4430E+04	4.6329E+04	4.5342E+04
Ru-105	2.7824E+04	2.6069E+04	3.0441E+04	3.0094E+04	2.9764E+04	3.0772E+04	3.0997E+04
Ru-106	1.6439E+04	1.4254E+04	1.8473E+04	1.8230E+04	1.7724E+04	1.9911E+04	1.8969E+04
Rh-105	2.6079E+04	2.4576E+04	2.8193E+04	2.7822E+04	2.7579E+04	2.8295E+04	2.8666E+04
Sb-127	2.2335E+03	2.1441E+03	2.3835E+03	2.3662E+03	2.3520E+03	2.4028E+03	2.4101E+03
Sb-129	8.4507E+03	8.3180E+03	8.7024E+03	8.6674E+03	8.6394E+03	8.7234E+03	8.7667E+03
Te-127	2.2104E+03	2.1212E+03	2.3678E+03	2.3583E+03	2.3402E+03	2.4170E+03	2.3914E+03
Te-127m	4.0032E+02	3.6864E+02	4.2778E+02	4.2664E+02	4.2005E+02	4.5012E+02	4.3306E+02
Te-129	8.0400E+03	7.8975E+03	8.2816E+03	8.2619E+03	8.2453E+03	8.3372E+03	8.3225E+03
Te-129m	1.6712E+03	1.6197E+03	1.7265E+03	1.7243E+03	1.7120E+03	1.7734E+03	1.7377E+03
Te-131m	4.7952E+03	4.6680E+03	5.0134E+03	4.9934E+03	4.9706E+03	5.0364E+03	5.0544E+03
Te-132	3.8277E+04	3.8146E+04	3.8207E+04	3.8261E+04	3.8314E+04	3.8231E+04	3.8414E+04
I-131	2.6664E+04	2.6511E+04	2.6784E+04	2.6821E+04	2.6807E+04	2.6878E+04	2.6943E+04
I-132	3.9050E+04	3.8914E+04	3.9196E+04	3.9155E+04	3.9156E+04	3.9130E+04	3.9285E+04
I-133	5.6115E+04	5.6172E+04	5.5823E+04	5.5920E+04	5.5926E+04	5.5920E+04	5.5876E+04
I-134	6.3471E+04	6.3841E+04	6.3016E+04	6.3270E+04	6.3275E+04	6.3147E+04	6.3014E+04
I-135	5.3142E+04	5.3093E+04	5.2970E+04	5.2932E+04	5.2951E+04	5.2983E+04	5.3117E+04
Xe-133	5.3230E+04	5.3201E+04	5.2855E+04	5.2977E+04	5.2972E+04	5.2992E+04	5.2956E+04
Xe-135	2.1287E+04	2.1978E+04	1.8178E+04	1.8208E+04	1.8308E+04	1.7564E+04	1.8027E+04
Cs-134	6.1936E+03	4.8894E+03	6.2752E+03	6.0735E+03	5.8408E+03	6.8401E+03	6.6893E+03
Cs-136	1.6963E+03	1.4735E+03	1.6207E+03	1.5578E+03	1.5209E+03	1.5981E+03	1.6849E+03
Cs-137	4.5622E+03	3.9361E+03	4.3782E+03	4.2464E+03	4.1403E+03	4.5221E+03	4.5564E+03

Ba-139	5.1821E+04	5.2252E+04	5.1357E+04	5.1547E+04	5.1583E+04	5.1453E+04	5.1287E+04
Ba-140	5.1420E+04	5.1702E+04	5.0859E+04	5.1034E+04	5.1127E+04	5.1249E+04	5.0901E+04
La-140	5.3197E+04	5.3216E+04	5.2604E+04	5.2885E+04	5.2739E+04	5.2832E+04	5.2650E+04
La-141	4.7150E+04	4.7509E+04	4.6677E+04	4.6859E+04	4.6967E+04	4.6795E+04	4.6640E+04
La-142	4.5846E+04	4.6350E+04	4.5260E+04	4.5522E+04	4.5630E+04	4.5439E+04	4.5201E+04
Ce-141	4.9310E+04	4.9113E+04	4.8539E+04	4.8695E+04	4.8588E+04	4.9780E+04	4.8543E+04
Ce-143	4.5592E+04	4.6284E+04	4.4854E+04	4.5173E+04	4.5354E+04	4.5086E+04	4.4738E+04
Ce-144	4.1237E+04	3.9663E+04	3.9400E+04	3.9506E+04	3.9203E+04	4.1712E+04	3.9948E+04
Pr-143	4.5933E+04	4.6481E+04	4.5068E+04	4.5316E+04	4.5465E+04	4.5475E+04	4.4959E+04
Nd-147	1.8661E+04	1.8698E+04	1.8485E+04	1.8508E+04	1.8539E+04	1.8562E+04	1.8531E+04
Np-239	4.8867E+05	4.6814E+05	5.4333E+05	5.3745E+05	5.3218E+05	5.4506E+05	5.4884E+05
Pu-238	1.5025E+02	1.0313E+02	1.4313E+02	1.3240E+02	1.2522E+02	1.4984E+02	1.5580E+02
Pu-239	1.2057E+01	1.1809E+01	1.1357E+01	1.1329E+01	1.1306E+01	1.1411E+01	1.1405E+01
Pu-240	1.7820E+01	1.5631E+01	1.8658E+01	1.8250E+01	1.7917E+01	1.9288E+01	1.9201E+01
Pu-241	4.6156E+03	4.0709E+03	4.5911E+03	4.4965E+03	4.4088E+03	4.7375E+03	4.7153E+03
Am-241	7.2471E+00	5.9891E+00	6.5722E+00	6.5867E+00	6.4261E+00	7.6240E+00	6.7824E+00
Cm-242	1.6679E+03	1.2243E+03	1.7396E+03	1.6138E+03	1.5540E+03	1.7858E+03	1.8709E+03
Cm-244	1.8075E+02	8.7257E+01	2.3182E+02	1.9616E+02	1.7634E+02	2.4012E+02	2.7313E+02
cloudshine	1.5761E+00	1.5745E+00	1.5746E+00	1.5790E+00	1.5788E+00	1.5883E+00	1.5773E+00
Inhaled chronic	8.1732E+03	6.0101E+03	8.6547E+03	8.0210E+03	7.6333E+03	9.0015E+03	9.4094E+03
TEDE Dose	8.1748E+03	6.0117E+03	8.6562E+03	8.0226E+03	7.6349E+03	9.0031E+03	9.4110E+03
Fraction	3.3409	2.4569	3.5377	3.2787	3.1203	3.6794	3.8461

	40F2	CRAA	CRAB	CRBA	CRBB	CRCA	CRCB
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.5481E+02	7.5657E+02	7.6574E+02	7.6706E+02	7.7381E+02	7.9676E+02	8.0013E+02
Co-60	8.2544E+02	8.0033E+02	8.9568E+02	8.3233E+02	9.3252E+02	8.7943E+02	9.8625E+02
Kr-85	3.2532E+02	3.6096E+02	3.4009E+02	3.7648E+02	3.5481E+02	3.9627E+02	3.7180E+02
Kr-85m	8.4759E+03	8.0930E+03	7.6901E+03	8.2339E+03	7.8216E+03	8.3363E+03	7.9679E+03
Kr-87	1.7354E+04	1.6514E+04	1.5629E+04	1.6797E+04	1.5918E+04	1.7016E+04	1.6208E+04
Kr-88	2.4301E+04	2.3127E+04	2.1798E+04	2.3500E+04	2.2257E+04	2.3815E+04	2.2658E+04
Rb-86	4.7524E+01	5.6953E+01	5.8313E+01	5.5814E+01	5.7286E+01	5.7011E+01	5.9034E+01
Sr-89	3.3256E+04	3.0917E+04	2.8884E+04	3.3379E+04	3.1210E+04	3.5707E+04	3.3293E+04
Sr-90	2.7603E+03	3.1039E+03	2.8978E+03	3.2403E+03	3.0213E+03	3.4089E+03	3.1769E+03
Sr-91	4.1566E+04	3.9640E+04	3.7654E+04	4.0271E+04	3.8405E+04	4.0764E+04	3.8931E+04
Sr-92	4.2432E+04	4.0830E+04	3.9044E+04	4.1358E+04	3.9662E+04	4.1796E+04	4.0190E+04
Y-90	2.9951E+03	3.3543E+03	3.1681E+03	3.5041E+03	3.2910E+03	3.6722E+03	3.4567E+03
Y-91	4.1780E+04	3.8785E+04	3.6620E+04	4.2149E+04	3.9690E+04	4.5220E+04	4.2527E+04
Y-92	4.2761E+04	4.1127E+04	3.9343E+04	4.1681E+04	3.9989E+04	4.2119E+04	4.0519E+04
Y-93	3.0914E+04	2.9963E+04	2.8917E+04	3.0299E+04	2.9294E+04	3.0515E+04	2.9622E+04
Zr-95	5.4721E+04	5.0470E+04	4.9288E+04	5.5086E+04	5.3813E+04	5.9702E+04	5.8246E+04
Zr-97	4.9794E+04	4.9365E+04	4.9092E+04	4.9529E+04	4.9256E+04	4.9653E+04	4.9425E+04
Nb-95	5.6720E+04	5.0614E+04	4.9550E+04	5.6497E+04	5.5176E+04	6.2342E+04	6.0839E+04
Mo-99	5.0924E+04	5.0814E+04	5.0565E+04	5.0986E+04	5.0612E+04	5.1033E+04	5.0834E+04
Tc-99m	4.5135E+04	4.5069E+04	4.4932E+04	4.5615E+04	4.5383E+04	4.5629E+04	4.5425E+04
Ru-103	4.3118E+04	4.1201E+04	4.3471E+04	4.2198E+04	4.4643E+04	4.5977E+04	4.8774E+04
Ru-105	2.9225E+04	2.7963E+04	3.0964E+04	2.7898E+04	3.1033E+04	2.8261E+04	3.1455E+04
Ru-106	1.6490E+04	1.5672E+04	1.7934E+04	1.5830E+04	1.8149E+04	1.7072E+04	1.9695E+04
Rh-105	2.7148E+04	2.5968E+04	2.8408E+04	2.5782E+04	2.8294E+04	2.5970E+04	2.8507E+04
Sb-127	2.3251E+03	2.2269E+03	2.3965E+03	2.2308E+03	2.4052E+03	2.2536E+03	2.4299E+03
Sb-129	8.6117E+03	8.4352E+03	8.7158E+03	8.4621E+03	8.7430E+03	8.5132E+03	8.7888E+03
Te-127	2.3000E+03	2.2228E+03	2.3918E+03	2.2259E+03	2.4012E+03	2.2840E+03	2.4665E+03
Te-127m	3.9997E+02	3.7161E+02	4.0023E+02	3.8324E+02	4.1533E+02	4.2651E+02	4.6272E+02
Te-129	8.1921E+03	8.0095E+03	8.2792E+03	8.0242E+03	8.3013E+03	8.1098E+03	8.4012E+03
Te-129m	1.6862E+03	1.6103E+03	1.6685E+03	1.6688E+03	1.7352E+03	1.8146E+03	1.8872E+03
Te-131m	4.9396E+03	4.7666E+03	5.0156E+03	4.7763E+03	5.0281E+03	4.8115E+03	5.0686E+03
Te-132	3.8151E+04	3.8088E+04	3.8194E+04	3.8218E+04	3.8250E+04	3.8264E+04	3.8391E+04
I-131	2.6754E+04	2.6449E+04	2.6662E+04	2.6856E+04	2.7112E+04	2.7306E+04	2.7562E+04
I-132	3.9123E+04	3.9029E+04	3.9247E+04	3.9210E+04	3.9463E+04	3.9283E+04	3.9464E+04
I-133	5.6044E+04	5.5808E+04	5.5571E+04	5.5860E+04	5.5703E+04	5.5952E+04	5.5715E+04
I-134	6.3425E+04	6.2926E+04	6.2270E+04	6.3172E+04	6.2517E+04	6.3232E+04	6.2858E+04
I-135	5.3087E+04	5.2878E+04	5.2753E+04	5.2928E+04	5.2928E+04	5.3014E+04	5.2964E+04
Xe-133	5.3010E+04	5.3720E+04	5.3524E+04	5.4878E+04	5.4551E+04	5.6100E+04	5.5707E+04
Xe-135	1.8670E+04	2.1504E+04	1.8264E+04	2.1368E+04	1.8108E+04	2.0907E+04	1.7708E+04
Cs-134	5.3142E+03	6.1864E+03	6.6446E+03	6.2985E+03	6.7933E+03	6.6694E+03	7.1917E+03
Cs-136	1.4692E+03	1.9187E+03	1.9005E+03	1.7954E+03	1.7798E+03	1.7293E+03	1.7111E+03
Cs-137	3.9354E+03	4.3290E+03	4.3197E+03	4.5202E+03	4.5108E+03	4.7919E+03	4.7857E+03

Ba-139	5.1733E+04	5.1138E+04	5.0492E+04	5.1423E+04	5.0776E+04	5.1590E+04	5.1001E+04
Ba-140	5.1190E+04	5.0344E+04	4.9754E+04	5.1892E+04	5.1301E+04	5.3572E+04	5.2928E+04
La-140	5.2656E+04	5.1130E+04	5.0641E+04	5.2888E+04	5.2295E+04	5.4848E+04	5.4255E+04
La-141	4.7073E+04	4.6533E+04	4.5965E+04	4.6746E+04	4.6199E+04	4.6875E+04	4.6433E+04
La-142	4.5800E+04	4.5130E+04	4.4384E+04	4.5334E+04	4.4748E+04	4.5538E+04	4.4898E+04
Ce-141	4.8488E+04	4.6022E+04	4.5390E+04	4.9322E+04	4.8479E+04	5.2726E+04	5.1883E+04
Ce-143	4.5517E+04	4.4685E+04	4.3694E+04	4.4977E+04	4.3986E+04	4.5220E+04	4.4327E+04
Ce-144	3.8725E+04	3.6423E+04	3.5328E+04	3.9656E+04	3.8451E+04	4.3643E+04	4.2317E+04
Pr-143	4.5659E+04	4.3089E+04	4.2056E+04	4.6261E+04	4.5151E+04	4.7964E+04	4.6905E+04
Nd-147	1.8562E+04	1.8371E+04	1.8215E+04	1.8824E+04	1.8668E+04	1.9339E+04	1.9151E+04
Np-239	5.2476E+05	4.9686E+05	5.5158E+05	4.9383E+05	5.5211E+05	4.9840E+05	5.5833E+05
Pu-238	1.1025E+02	1.4479E+02	1.4889E+02	1.5117E+02	1.5641E+02	1.6702E+02	1.7259E+02
Pu-239	1.1223E+01	1.1702E+01	1.1146E+01	1.1958E+01	1.1339E+01	1.2186E+01	1.1469E+01
Pu-240	1.7216E+01	1.6592E+01	1.7882E+01	1.7542E+01	1.8890E+01	1.8707E+01	2.0026E+01
Pu-241	4.2509E+03	4.2850E+03	4.3884E+03	4.5783E+03	4.6642E+03	4.8799E+03	4.9593E+03
Am-241	5.8233E+00	5.8306E+00	5.4728E+00	6.7536E+00	6.3071E+00	7.8861E+00	7.3183E+00
Cm-242	1.4403E+03	1.7003E+03	1.8768E+03	1.7411E+03	1.9383E+03	1.8075E+03	2.0078E+03
Cm-244	1.3801E+02	1.9796E+02	2.9316E+02	1.9071E+02	2.8569E+02	2.1060E+02	3.1650E+02
cloudshine	1.5771E+00	1.5393E+00	1.5362E+00	1.5629E+00	1.5618E+00	1.5904E+00	1.5909E+00
Inhaled chronic	6.8628E+03	8.0653E+03	9.2948E+03	8.2775E+03	9.5269E+03	8.9587E+03	1.0328E+04
TEDE Dose	6.8644E+03	8.0668E+03	9.2963E+03	8.2791E+03	9.5284E+03	8.9602E+03	1.0329E+04
Fraction	2.8054	3.2968	3.7993	3.3836	3.8941	3.6619	4.2214

	CRDA	CRDD						
	Ci/MWt	Ci/MWt						
Co-58	7.3185E+02	7.4057E+02						
Co-60	6.6039E+02	7.4207E+02						
Kr-85	3.1593E+02	2.9986E+02						
Kr-85m	8.8432E+03	8.5114E+03						
Kr-87	1.8075E+04	1.7421E+04						
Kr-88	2.5377E+04	2.4418E+04						
Rb-86	4.3194E+01	4.4934E+01						
Sr-89	3.3496E+04	3.1864E+04						
Sr-90	2.6820E+03	2.5316E+03						
Sr-91	4.3261E+04	4.1697E+04						
Sr-92	4.3951E+04	4.2625E+04						
Y-90	2.8958E+03	2.7504E+03						
Y-91	4.1595E+04	3.9658E+04						
Y-92	4.4316E+04	4.2952E+04						
Y-93	3.1827E+04	3.1098E+04						
Zr-95	5.1889E+04	5.0875E+04						
Zr-97	4.9962E+04	4.9858E+04						
Nb-95	5.1937E+04	5.1092E+04						
Mo-99	5.1119E+04	5.1119E+04						
Tc-99m	4.5815E+04	4.5404E+04						
Ru-103	3.9450E+04	4.1548E+04						
Ru-105	2.5410E+04	2.8499E+04						
Ru-106	1.2899E+04	1.4920E+04						
Rh-105	2.3666E+04	2.6249E+04						
Sb-127	2.1032E+03	2.2801E+03						
Sb-129	8.2803E+03	8.5609E+03						
Te-127	2.1185E+03	2.2998E+03						
Te-127m	3.4855E+02	3.7782E+02						
Te-129	7.8361E+03	8.1129E+03						
Te-129m	1.5699E+03	1.6327E+03						
Te-131m	4.6014E+03	4.8606E+03						
Te-132	3.8037E+04	3.8194E+04						
I-131	2.6494E+04	2.6750E+04						
I-132	3.9048E+04	3.9319E+04						
I-133	5.6277E+04	5.6039E+04						
I-134	6.3941E+04	6.3518E+04						
I-135	5.3188E+04	5.2999E+04						
Xe-133	5.4358E+04	5.4162E+04						
Xe-135	2.2738E+04	1.9373E+04						
Cs-134	4.2426E+03	4.6121E+03						
Cs-136	1.4686E+03	1.4686E+03						
Cs-137	3.5327E+03	3.5327E+03						

Ba-139	5.2269E+04	5.1826E+04						
Ba-140	5.1324E+04	5.0798E+04						
La-140	5.1753E+04	5.1322E+04						
La-141	4.7582E+04	4.7137E+04						
La-142	4.6418E+04	4.5855E+04						
Ce-141	4.6857E+04	4.6381E+04						
Ce-143	4.6407E+04	4.5659E+04						
Ce-144	3.6308E+04	3.5349E+04						
Pr-143	4.5380E+04	4.4506E+04						
Nd-147	1.8601E+04	1.8461E+04						
Np-239	4.6293E+05	5.1802E+05						
Pu-238	8.1416E+01	8.8231E+01						
Pu-239	1.1439E+01	1.0959E+01						
Pu-240	1.3968E+01	1.5515E+01						
Pu-241	3.6186E+03	3.8335E+03						
Am-241	4.4945E+00	4.4541E+00						
Cm-242	1.0433E+03	1.2470E+03						
Cm-244	6.0693E+01	9.7622E+01						
cloudshine	1.5572E+00	1.5593E+00						
Inhaled chronic	5.0624E+03	5.7640E+03						
TEDE Dose	5.0639E+03	5.7656E+03						
Fraction	2.0696	2.3563						

Loading Pattern Comparisons with Total Activities Integrated over 30 Days							
MWt	1						
(Rem/Ci)/(Sv/Bq)	3.70E+12						
BR(m3/s)	3.50E-04						
Vcr(cf-m3)	289194	8189.06					
f	0.059784						
t(sec)	2592000						
	FGR 12	FGR 11	Release	Decay	rf/dc*		
	Table 2.1	Table 2.1	Fraction	Constant	(1-exp	pwr_def	50A2
	CLOUD	INHALED			(-dc*t))	nif	
	SHINE	CHRONIC					
	Sv-m3/Bq-s	Sv/Bq		1/sec		Ci/MWt	Ci/MWt
Co-58	4.76E-14	2.94E-09	1.0000	1.13E-07	2.25E+06	2.5530E+02	7.6371E+02
Co-60	1.26E-13	5.91E-08	1.0000	4.17E-09	2.58E+06	1.9530E+02	8.0950E+02
Kr-85	1.19E-16	0.00E+00	1.0000	2.05E-09	2.59E+06	1.9600E+02	3.7046E+02
Kr-85m	7.48E-15	0.00E+00	1.0000	4.30E-05	2.33E+04	9.1810E+03	8.5580E+03
Kr-87	4.12E-14	0.00E+00	1.0000	1.52E-04	6.58E+03	1.6780E+04	1.7441E+04
Kr-88	1.02E-13	0.00E+00	1.0000	6.78E-05	1.47E+04	2.2690E+04	2.4510E+04
Rb-86	4.81E-15	1.79E-09	1.0000	4.30E-07	1.56E+06	1.4960E+01	5.1338E+01
Sr-89	7.73E-17	1.12E-08	1.0000	1.59E-07	2.12E+06	2.8440E+04	3.4343E+04
Sr-90	7.53E-18	3.51E-07	1.0000	7.55E-10	2.59E+06	1.5350E+03	3.1862E+03
Sr-91	4.92E-14	4.55E-10	1.0000	2.03E-05	4.93E+04	3.6560E+04	4.1835E+04
Sr-92	6.79E-14	2.18E-10	1.0000	7.10E-05	1.41E+04	3.8050E+04	4.2721E+04
Y-90	1.90E-16	2.28E-09	1.0000	3.00E-06	3.33E+05	1.6470E+03	3.4256E+03
Y-91	2.60E-16	1.32E-08	1.0000	1.37E-07	2.18E+06	3.4650E+04	4.3187E+04
Y-92	1.30E-14	2.11E-10	1.0000	5.44E-05	1.84E+04	3.8190E+04	4.3055E+04
Y-93	4.80E-15	5.82E-10	1.0000	1.89E-05	5.29E+04	4.3200E+04	3.1084E+04
Zr-95	3.60E-14	6.39E-09	1.0000	1.25E-07	2.21E+06	4.3770E+04	5.5816E+04
Zr-97	4.43E-14	1.17E-09	1.0000	1.15E-05	8.70E+04	4.5620E+04	4.9673E+04
Nb-95	3.74E-14	1.57E-09	1.0000	2.29E-07	1.95E+06	4.1380E+04	5.8020E+04
Mo-99	7.28E-15	1.07E-09	1.0000	2.92E-06	3.42E+05	4.8300E+04	5.1077E+04
Tc-99m	5.89E-15	8.80E-12	1.0000	3.20E-05	3.13E+04	4.1690E+04	4.5399E+04
Ru-103	2.25E-14	2.42E-09	1.0000	2.04E-07	2.01E+06	3.5980E+04	4.2488E+04
Ru-105	3.81E-14	1.23E-10	1.0000	4.34E-05	2.30E+04	2.3400E+04	2.7263E+04
Ru-106	1.04E-14	1.29E-07	1.0000	2.15E-08	2.52E+06	8.1750E+03	1.5998E+04
Rh-105	3.72E-15	2.58E-10	1.0000	5.44E-06	1.84E+05	1.6210E+04	2.5566E+04
Sb-127	3.33E-14	1.63E-09	1.0000	2.09E-06	4.76E+05	2.2080E+03	2.2032E+03
Sb-129	7.14E-14	1.74E-10	1.0000	4.38E-05	2.28E+04	7.8200E+03	8.4042E+03
Te-127	2.42E-16	8.60E-11	1.0000	2.05E-05	4.88E+04	2.1320E+03	2.1875E+03
Te-127m	1.47E-16	5.81E-09	1.0000	7.36E-08	2.36E+06	2.8230E+02	3.9505E+02
Te-129	2.75E-15	2.09E-11	1.0000	1.66E-04	6.02E+03	7.3410E+03	7.9927E+03
Te-129m	3.34E-15	6.48E-09	1.0000	2.39E-07	1.93E+06	1.9350E+03	1.6609E+03
Te-131m	7.46E-14	1.76E-09	1.0000	5.94E-06	1.68E+05	3.7070E+03	4.7506E+03
Te-132	1.03E-14	2.55E-09	1.0000	2.46E-06	4.06E+05	3.6900E+04	3.8201E+04
I-131	1.82E-14	8.89E-09	1.0000	9.98E-07	9.27E+05	2.5400E+04	2.6575E+04
I-132	1.12E-13	1.03E-10	1.0000	8.44E-05	1.18E+04	3.7430E+04	3.8910E+04

I-133	2.94E-14	1.58E-09	1.0000	9.26E-06	1.08E+05	5.3700E+04	5.6062E+04
I-134	1.30E-13	3.55E-11	1.0000	2.20E-04	4.55E+03	5.8930E+04	6.3436E+04
I-135	8.29E-14	3.32E-10	1.0000	2.93E-05	3.41E+04	5.0630E+04	5.2991E+04
Xe-133	1.56E-15	0.00E+00	1.0000	1.53E-06	6.41E+05	5.3720E+04	5.3133E+04
Xe-135	1.19E-14	0.00E+00	1.0000	2.12E-05	4.72E+04	1.0080E+04	2.1438E+04
Cs-134	7.57E-14	1.25E-08	1.0000	1.06E-08	2.56E+06	3.4250E+03	5.8042E+03
Cs-136	1.06E-13	1.98E-09	1.0000	6.10E-07	1.30E+06	1.0420E+03	1.6333E+03
Cs-137	2.73E-14	8.63E-09	1.0000	7.29E-10	2.59E+06	1.9150E+03	4.3837E+03
Ba-139	2.17E-15	4.64E-11	1.0000	1.38E-04	7.25E+03	4.9760E+04	5.1891E+04
Ba-140	8.58E-15	1.01E-09	1.0000	6.29E-07	1.28E+06	4.9240E+04	5.1445E+04
La-140	1.17E-13	1.31E-09	1.0000	4.78E-06	2.09E+05	5.0320E+04	5.3175E+04
La-141	2.39E-15	1.57E-10	1.0000	4.94E-05	2.02E+04	4.6150E+04	4.7174E+04
La-142	1.44E-13	6.84E-11	1.0000	1.25E-04	8.00E+03	4.4490E+04	4.5940E+04
Ce-141	3.43E-15	2.42E-09	1.0000	2.47E-07	1.91E+06	4.4760E+04	4.9047E+04
Ce-143	1.29E-14	9.16E-10	1.0000	5.81E-06	1.72E+05	4.3520E+04	4.5725E+04
Ce-144	2.77E-15	1.01E-07	1.0000	2.82E-08	2.50E+06	2.6970E+04	4.0567E+04
Pr-143	2.10E-17	2.19E-09	1.0000	5.91E-07	1.33E+06	4.2730E+04	4.6000E+04
Nd-147	6.19E-15	1.85E-09	1.0000	7.31E-07	1.16E+06	1.9110E+04	1.8619E+04
Np-239	7.69E-15	6.78E-10	1.0000	3.41E-06	2.93E+05	5.1200E+05	4.8322E+05
Pu-238	4.88E-18	7.79E-05	1.0000	2.51E-10	2.59E+06	2.9020E+01	1.3689E+02
Pu-239	4.24E-18	8.33E-05	1.0000	9.12E-13	2.59E+06	6.5450E+00	1.1989E+01
Pu-240	4.75E-18	8.33E-05	1.0000	3.35E-12	2.59E+06	8.2540E+00	1.7232E+01
Pu-241	7.25E-20	1.34E-06	1.0000	1.53E-09	2.59E+06	1.3900E+03	4.4622E+03
Am-241	8.18E-16	1.20E-04	1.0000	5.08E-11	2.59E+06	9.1810E-01	6.9722E+00
Cm-242	5.69E-18	4.67E-06	1.0000	4.93E-08	2.43E+06	3.5140E+02	1.5296E+03
Cm-244	4.91E-18	6.70E-05	1.0000	1.21E-09	2.59E+06	2.0560E+01	1.5169E+02
cloudshine						3.9925E+05	5.0517E+05
Inhaled chronic						5.7299E+09	1.8686E+10
TEDE Dose						5.7303E+09	1.8687E+10
Fraction						1.0000	3.2610

	50B2	50C2	50D2	50E2	50F2	40A2	40B2
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.5954E+02	7.5604E+02	7.6815E+02	7.6866E+02	7.4941E+02	7.7069E+02	7.6622E+02
Co-60	7.9190E+02	7.7298E+02	8.5313E+02	8.4027E+02	7.3230E+02	9.0822E+02	8.8744E+02
Kr-85	3.6202E+02	3.5620E+02	3.8397E+02	3.8022E+02	3.4285E+02	3.4904E+02	3.4254E+02
Kr-85m	8.6539E+03	8.7172E+03	8.6281E+03	8.4819E+03	8.7994E+03	8.1846E+03	8.3389E+03
Kr-87	1.7718E+04	1.7811E+04	1.7621E+04	1.7312E+04	1.7993E+04	1.6728E+04	1.6950E+04
Kr-88	2.4842E+04	2.5051E+04	2.4745E+04	2.4251E+04	2.5280E+04	2.3406E+04	2.3779E+04
Rb-86	5.0196E+01	4.8653E+01	5.3721E+01	5.3675E+01	4.5873E+01	5.3275E+01	5.2068E+01
Sr-89	3.4765E+04	3.4920E+04	3.5413E+04	3.4119E+04	3.5195E+04	3.2271E+04	3.2725E+04
Sr-90	3.1129E+03	3.0572E+03	3.2756E+03	3.2805E+03	2.9389E+03	2.9753E+03	2.9141E+03
Sr-91	4.2307E+04	4.2634E+04	4.2218E+04	4.1456E+04	4.2973E+04	4.0074E+04	4.0818E+04
Sr-92	4.3174E+04	4.3494E+04	4.3019E+04	4.2387E+04	4.3771E+04	4.1251E+04	4.1752E+04
Y-90	3.3503E+03	3.2892E+03	3.5229E+03	3.5392E+03	3.1631E+03	3.2305E+03	3.1621E+03
Y-91	4.3703E+04	4.3772E+04	4.4671E+04	4.3102E+04	4.3903E+04	4.0782E+04	4.1329E+04
Y-92	4.3492E+04	4.3803E+04	4.3399E+04	4.2718E+04	4.4131E+04	4.1565E+04	4.2075E+04
Y-93	3.1397E+04	3.1500E+04	3.1304E+04	3.0884E+04	3.1742E+04	3.0142E+04	3.0593E+04
Zr-95	5.6037E+04	5.6057E+04	5.8067E+04	5.6167E+04	5.5866E+04	5.4575E+04	5.4906E+04
Zr-97	4.9821E+04	4.9853E+04	4.9772E+04	4.9727E+04	4.9964E+04	4.9514E+04	4.9617E+04
Nb-95	5.8250E+04	5.8284E+04	6.1265E+04	5.8578E+04	5.7859E+04	5.6730E+04	5.6966E+04
Mo-99	5.1044E+04	5.1045E+04	5.1031E+04	5.1072E+04	5.1106E+04	5.0729E+04	5.0861E+04
Tc-99m	4.5332E+04	4.5191E+04	4.5192E+04	4.5345E+04	4.5335E+04	4.5040E+04	4.5138E+04
Ru-103	4.2345E+04	4.1939E+04	4.3709E+04	4.2783E+04	4.0582E+04	4.4974E+04	4.4820E+04
Ru-105	2.6912E+04	2.6601E+04	2.7549E+04	2.7824E+04	2.6069E+04	3.0441E+04	3.0094E+04
Ru-106	1.5787E+04	1.5351E+04	1.7273E+04	1.6439E+04	1.4254E+04	1.8473E+04	1.8230E+04
Rh-105	2.5233E+04	2.4985E+04	2.5716E+04	2.6079E+04	2.4576E+04	2.8193E+04	2.7822E+04
Sb-127	2.1858E+03	2.1703E+03	2.2175E+03	2.2335E+03	2.1441E+03	2.3835E+03	2.3662E+03
Sb-129	8.3895E+03	8.3586E+03	8.4370E+03	8.4507E+03	8.3180E+03	8.7024E+03	8.6674E+03
Te-127	2.1775E+03	2.1600E+03	2.2286E+03	2.2104E+03	2.1212E+03	2.3678E+03	2.3583E+03
Te-127m	3.9372E+02	3.8771E+02	4.1603E+02	4.0032E+02	3.6864E+02	4.2778E+02	4.2664E+02
Te-129	7.9732E+03	7.9523E+03	8.0543E+03	8.0400E+03	7.8975E+03	8.2816E+03	8.2619E+03
Te-129m	1.6586E+03	1.6474E+03	1.7051E+03	1.6712E+03	1.6197E+03	1.7265E+03	1.7243E+03
Te-131m	4.7270E+03	4.7085E+03	4.7713E+03	4.7952E+03	4.6680E+03	5.0134E+03	4.9934E+03
Te-132	3.8121E+04	3.8035E+04	3.8225E+04	3.8277E+04	3.8146E+04	3.8207E+04	3.8261E+04
I-131	2.6593E+04	2.6518E+04	2.6607E+04	2.6664E+04	2.6511E+04	2.6784E+04	2.6821E+04
I-132	3.8908E+04	3.8919E+04	3.8901E+04	3.9050E+04	3.8914E+04	3.9196E+04	3.9155E+04
I-133	5.6090E+04	5.6147E+04	5.6083E+04	5.6115E+04	5.6172E+04	5.5823E+04	5.5920E+04
I-134	6.3674E+04	6.3795E+04	6.3644E+04	6.3471E+04	6.3841E+04	6.3016E+04	6.3270E+04
I-135	5.3104E+04	5.3124E+04	5.3144E+04	5.3142E+04	5.3093E+04	5.2970E+04	5.2932E+04
Xe-133	5.3166E+04	5.3156E+04	5.3087E+04	5.3230E+04	5.3201E+04	5.2855E+04	5.2977E+04
Xe-135	2.1464E+04	2.1582E+04	2.0738E+04	2.1287E+04	2.1978E+04	1.8178E+04	1.8208E+04
Cs-134	5.6011E+03	5.3887E+03	6.3258E+03	6.1936E+03	4.8894E+03	6.2752E+03	6.0735E+03
Cs-136	1.5657E+03	1.5278E+03	1.6054E+03	1.6963E+03	1.4735E+03	1.6207E+03	1.5578E+03
Cs-137	4.2479E+03	4.1457E+03	4.5277E+03	4.5622E+03	3.9361E+03	4.3782E+03	4.2464E+03

Ba-139	5.1973E+04	5.2158E+04	5.1927E+04	5.1821E+04	5.2252E+04	5.1357E+04	5.1547E+04
Ba-140	5.1565E+04	5.1623E+04	5.1755E+04	5.1420E+04	5.1702E+04	5.0859E+04	5.1034E+04
La-140	5.3446E+04	5.3306E+04	5.3617E+04	5.3197E+04	5.3216E+04	5.2604E+04	5.2885E+04
La-141	4.7312E+04	4.7418E+04	4.7179E+04	4.7150E+04	4.7509E+04	4.6677E+04	4.6859E+04
La-142	4.6060E+04	4.6231E+04	4.6073E+04	4.5846E+04	4.6350E+04	4.5260E+04	4.5522E+04
Ce-141	4.9178E+04	4.9343E+04	5.0387E+04	4.9310E+04	4.9113E+04	4.8539E+04	4.8695E+04
Ce-143	4.5953E+04	4.6119E+04	4.5903E+04	4.5592E+04	4.6284E+04	4.4854E+04	4.5173E+04
Ce-144	4.0647E+04	4.0333E+04	4.3005E+04	4.1237E+04	3.9663E+04	3.9400E+04	3.9506E+04
Pr-143	4.6249E+04	4.6365E+04	4.6428E+04	4.5933E+04	4.6481E+04	4.5068E+04	4.5316E+04
Nd-147	1.8679E+04	1.8669E+04	1.8726E+04	1.8661E+04	1.8698E+04	1.8485E+04	1.8508E+04
Np-239	4.7780E+05	4.7408E+05	4.8512E+05	4.8867E+05	4.6814E+05	5.4333E+05	5.3745E+05
Pu-238	1.2556E+02	1.1817E+02	1.4318E+02	1.5025E+02	1.0313E+02	1.4313E+02	1.3240E+02
Pu-239	1.1956E+01	1.1924E+01	1.2124E+01	1.2057E+01	1.1809E+01	1.1357E+01	1.1329E+01
Pu-240	1.6791E+01	1.6422E+01	1.7865E+01	1.7820E+01	1.5631E+01	1.8658E+01	1.8250E+01
Pu-241	4.3439E+03	4.2637E+03	4.6295E+03	4.6156E+03	4.0709E+03	4.5911E+03	4.4965E+03
Am-241	6.9094E+00	6.6825E+00	8.0364E+00	7.2471E+00	5.9891E+00	6.5722E+00	6.5867E+00
Cm-242	1.3894E+03	1.3308E+03	1.5594E+03	1.6679E+03	1.2243E+03	1.7396E+03	1.6138E+03
Cm-244	1.2678E+02	1.1322E+02	1.5667E+02	1.8075E+02	8.7257E+01	2.3182E+02	1.9616E+02
cloudshine	5.0406E+05	5.0141E+05	5.2348E+05	5.1119E+05	4.9361E+05	5.1077E+05	5.0993E+05
Inhaled chronic	1.7290E+10	1.6463E+10	1.9447E+10	2.0345E+10	1.4805E+10	2.1574E+10	1.9948E+10
TEDE Dose	1.7291E+10	1.6464E+10	1.9448E+10	2.0345E+10	1.4805E+10	2.1575E+10	1.9949E+10
Fraction	3.0174	2.8731	3.3939	3.5505	2.5837	3.7650	3.4813

	40C2	40D2	40E2	40F2	CRAA	CRAB	CRBA
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.6281E+02	7.7372E+02	7.7549E+02	7.5481E+02	7.5657E+02	7.6574E+02	7.6706E+02
Co-60	8.6992E+02	9.5723E+02	9.4439E+02	8.2544E+02	8.0033E+02	8.9568E+02	8.3233E+02
Kr-85	3.3655E+02	3.6133E+02	3.5814E+02	3.2532E+02	3.6096E+02	3.4009E+02	3.7648E+02
Kr-85m	8.4071E+03	8.2871E+03	8.1013E+03	8.4759E+03	8.0930E+03	7.6901E+03	8.2339E+03
Kr-87	1.7155E+04	1.6951E+04	1.6508E+04	1.7354E+04	1.6514E+04	1.5629E+04	1.6797E+04
Kr-88	2.4036E+04	2.3708E+04	2.3130E+04	2.4301E+04	2.3127E+04	2.1798E+04	2.3500E+04
Rb-86	5.0528E+01	5.5644E+01	5.5163E+01	4.7524E+01	5.6953E+01	5.8313E+01	5.5814E+01
Sr-89	3.2993E+04	3.3319E+04	3.2020E+04	3.3256E+04	3.0917E+04	2.8884E+04	3.3379E+04
Sr-90	2.8592E+03	3.0525E+03	3.0623E+03	2.7603E+03	3.1039E+03	2.8978E+03	3.2403E+03
Sr-91	4.1168E+04	4.0610E+04	3.9656E+04	4.1566E+04	3.9640E+04	3.7654E+04	4.0271E+04
Sr-92	4.2088E+04	4.1646E+04	4.0864E+04	4.2432E+04	4.0830E+04	3.9044E+04	4.1358E+04
Y-90	3.1069E+03	3.3163E+03	3.3257E+03	2.9951E+03	3.3543E+03	3.1681E+03	3.5041E+03
Y-91	4.1560E+04	4.2261E+04	4.0694E+04	4.1780E+04	3.8785E+04	3.6620E+04	4.2149E+04
Y-92	4.2400E+04	4.1980E+04	4.1190E+04	4.2761E+04	4.1127E+04	3.9343E+04	4.1681E+04
Y-93	3.0705E+04	3.0450E+04	3.0021E+04	3.0914E+04	2.9963E+04	2.8917E+04	3.0299E+04
Zr-95	5.4886E+04	5.6766E+04	5.4851E+04	5.4721E+04	5.0470E+04	4.9288E+04	5.5086E+04
Zr-97	4.9717E+04	4.9591E+04	4.9548E+04	4.9794E+04	4.9365E+04	4.9092E+04	4.9529E+04
Nb-95	5.7005E+04	5.9875E+04	5.7187E+04	5.6720E+04	5.0614E+04	4.9550E+04	5.6497E+04
Mo-99	5.0870E+04	5.0856E+04	5.0875E+04	5.0924E+04	5.0814E+04	5.0565E+04	5.0986E+04
Tc-99m	4.5179E+04	4.5009E+04	4.5139E+04	4.5135E+04	4.5069E+04	4.4932E+04	4.5615E+04
Ru-103	4.4430E+04	4.6329E+04	4.5342E+04	4.3118E+04	4.1201E+04	4.3471E+04	4.2198E+04
Ru-105	2.9764E+04	3.0772E+04	3.0997E+04	2.9225E+04	2.7963E+04	3.0964E+04	2.7898E+04
Ru-106	1.7724E+04	1.9911E+04	1.8969E+04	1.6490E+04	1.5672E+04	1.7934E+04	1.5830E+04
Rh-105	2.7579E+04	2.8295E+04	2.8666E+04	2.7148E+04	2.5968E+04	2.8408E+04	2.5782E+04
Sb-127	2.3520E+03	2.4028E+03	2.4101E+03	2.3251E+03	2.2269E+03	2.3965E+03	2.2308E+03
Sb-129	8.6394E+03	8.7234E+03	8.7667E+03	8.6117E+03	8.4352E+03	8.7158E+03	8.4621E+03
Te-127	2.3402E+03	2.4170E+03	2.3914E+03	2.3000E+03	2.2228E+03	2.3918E+03	2.2259E+03
Te-127m	4.2005E+02	4.5012E+02	4.3306E+02	3.9997E+02	3.7161E+02	4.0023E+02	3.8324E+02
Te-129	8.2453E+03	8.3372E+03	8.3225E+03	8.1921E+03	8.0095E+03	8.2792E+03	8.0242E+03
Te-129m	1.7120E+03	1.7734E+03	1.7377E+03	1.6862E+03	1.6103E+03	1.6685E+03	1.6688E+03
Te-131m	4.9706E+03	5.0364E+03	5.0544E+03	4.9396E+03	4.7666E+03	5.0156E+03	4.7763E+03
Te-132	3.8314E+04	3.8231E+04	3.8414E+04	3.8151E+04	3.8088E+04	3.8194E+04	3.8218E+04
I-131	2.6807E+04	2.6878E+04	2.6943E+04	2.6754E+04	2.6449E+04	2.6662E+04	2.6856E+04
I-132	3.9156E+04	3.9130E+04	3.9285E+04	3.9123E+04	3.9029E+04	3.9247E+04	3.9210E+04
I-133	5.5926E+04	5.5920E+04	5.5876E+04	5.6044E+04	5.5808E+04	5.5571E+04	5.5860E+04
I-134	6.3275E+04	6.3147E+04	6.3014E+04	6.3425E+04	6.2926E+04	6.2270E+04	6.3172E+04
I-135	5.2951E+04	5.2983E+04	5.3117E+04	5.3087E+04	5.2878E+04	5.2753E+04	5.2928E+04
Xe-133	5.2972E+04	5.2992E+04	5.2956E+04	5.3010E+04	5.3720E+04	5.3524E+04	5.4878E+04
Xe-135	1.8308E+04	1.7564E+04	1.8027E+04	1.8670E+04	2.1504E+04	1.8264E+04	2.1368E+04
Cs-134	5.8408E+03	6.8401E+03	6.6893E+03	5.3142E+03	6.1864E+03	6.6446E+03	6.2985E+03
Cs-136	1.5209E+03	1.5981E+03	1.6849E+03	1.4692E+03	1.9187E+03	1.9005E+03	1.7954E+03
Cs-137	4.1403E+03	4.5221E+03	4.5564E+03	3.9354E+03	4.3290E+03	4.3197E+03	4.5202E+03

Ba-139	5.1583E+04	5.1453E+04	5.1287E+04	5.1733E+04	5.1138E+04	5.0492E+04	5.1423E+04
Ba-140	5.1127E+04	5.1249E+04	5.0901E+04	5.1190E+04	5.0344E+04	4.9754E+04	5.1892E+04
La-140	5.2739E+04	5.2832E+04	5.2650E+04	5.2656E+04	5.1130E+04	5.0641E+04	5.2888E+04
La-141	4.6967E+04	4.6795E+04	4.6640E+04	4.7073E+04	4.6533E+04	4.5965E+04	4.6746E+04
La-142	4.5630E+04	4.5439E+04	4.5201E+04	4.5800E+04	4.5130E+04	4.4384E+04	4.5334E+04
Ce-141	4.8588E+04	4.9780E+04	4.8543E+04	4.8488E+04	4.6022E+04	4.5390E+04	4.9322E+04
Ce-143	4.5354E+04	4.5086E+04	4.4738E+04	4.5517E+04	4.4685E+04	4.3694E+04	4.4977E+04
Ce-144	3.9203E+04	4.1712E+04	3.9948E+04	3.8725E+04	3.6423E+04	3.5328E+04	3.9656E+04
Pr-143	4.5465E+04	4.5475E+04	4.4959E+04	4.5659E+04	4.3089E+04	4.2056E+04	4.6261E+04
Nd-147	1.8539E+04	1.8562E+04	1.8531E+04	1.8562E+04	1.8371E+04	1.8215E+04	1.8824E+04
Np-239	5.3218E+05	5.4506E+05	5.4884E+05	5.2476E+05	4.9686E+05	5.5158E+05	4.9383E+05
Pu-238	1.2522E+02	1.4984E+02	1.5580E+02	1.1025E+02	1.4479E+02	1.4889E+02	1.5117E+02
Pu-239	1.1306E+01	1.1411E+01	1.1405E+01	1.1223E+01	1.1702E+01	1.1146E+01	1.1958E+01
Pu-240	1.7917E+01	1.9288E+01	1.9201E+01	1.7216E+01	1.6592E+01	1.7882E+01	1.7542E+01
Pu-241	4.4088E+03	4.7375E+03	4.7153E+03	4.2509E+03	4.2850E+03	4.3884E+03	4.5783E+03
Am-241	6.4261E+00	7.6240E+00	6.7824E+00	5.8233E+00	5.8306E+00	5.4728E+00	6.7536E+00
Cm-242	1.5540E+03	1.7858E+03	1.8709E+03	1.4403E+03	1.7003E+03	1.8768E+03	1.7411E+03
Cm-244	1.7634E+02	2.4012E+02	2.7313E+02	1.3801E+02	1.9796E+02	2.9316E+02	1.9071E+02
cloudshine	5.0700E+05	5.2921E+05	5.1675E+05	4.9928E+05	4.7732E+05	4.8261E+05	5.0419E+05
inhaled chronic	1.8953E+10	2.2456E+10	2.3510E+10	1.6976E+10	2.0083E+10	2.3235E+10	2.0611E+10
TEDE Dose	1.8954E+10	2.2457E+10	2.3510E+10	1.6976E+10	2.0084E+10	2.3236E+10	2.0612E+10
Fraction	3.3077	3.9189	4.1028	2.9626	3.5048	4.0549	3.5969

	CRBB	CRCA	CRCB	CRDA	CRDB		
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt		
Co-58	7.7381E+02	7.9676E+02	8.0013E+02	7.3185E+02	7.4057E+02		
Co-60	9.3252E+02	8.7943E+02	9.8625E+02	6.6039E+02	7.4207E+02		
Kr-85	3.5481E+02	3.9627E+02	3.7180E+02	3.1593E+02	2.9986E+02		
Kr-85m	7.8216E+03	8.3363E+03	7.9679E+03	8.8432E+03	8.5114E+03		
Kr-87	1.5918E+04	1.7016E+04	1.6208E+04	1.8075E+04	1.7421E+04		
Kr-88	2.2257E+04	2.3815E+04	2.2658E+04	2.5377E+04	2.4418E+04		
Rb-86	5.7286E+01	5.7011E+01	5.9034E+01	4.3194E+01	4.4934E+01		
Sr-89	3.1210E+04	3.5707E+04	3.3293E+04	3.3496E+04	3.1864E+04		
Sr-90	3.0213E+03	3.4089E+03	3.1769E+03	2.6820E+03	2.5316E+03		
Sr-91	3.8405E+04	4.0764E+04	3.8931E+04	4.3261E+04	4.1697E+04		
Sr-92	3.9662E+04	4.1796E+04	4.0190E+04	4.3951E+04	4.2625E+04		
Y-90	3.2910E+03	3.6722E+03	3.4567E+03	2.8958E+03	2.7504E+03		
Y-91	3.9690E+04	4.5220E+04	4.2527E+04	4.1595E+04	3.9658E+04		
Y-92	3.9989E+04	4.2119E+04	4.0519E+04	4.4316E+04	4.2952E+04		
Y-93	2.9294E+04	3.0515E+04	2.9622E+04	3.1827E+04	3.1098E+04		
Zr-95	5.3813E+04	5.9702E+04	5.8246E+04	5.1889E+04	5.0875E+04		
Zr-97	4.9256E+04	4.9653E+04	4.9425E+04	4.9962E+04	4.9858E+04		
Nb-95	5.5176E+04	6.2342E+04	6.0839E+04	5.1937E+04	5.1092E+04		
Mo-99	5.0612E+04	5.1033E+04	5.0834E+04	5.1119E+04	5.1119E+04		
Tc-99m	4.5383E+04	4.5629E+04	4.5425E+04	4.5815E+04	4.5404E+04		
Ru-103	4.4643E+04	4.5977E+04	4.8774E+04	3.9450E+04	4.1548E+04		
Ru-105	3.1033E+04	2.8261E+04	3.1455E+04	2.5410E+04	2.8499E+04		
Ru-106	1.8149E+04	1.7072E+04	1.9695E+04	1.2899E+04	1.4920E+04		
Rh-105	2.8294E+04	2.5970E+04	2.8507E+04	2.3666E+04	2.6249E+04		
Sb-127	2.4052E+03	2.2536E+03	2.4299E+03	2.1032E+03	2.2801E+03		
Sb-129	8.7430E+03	8.5132E+03	8.7888E+03	8.2803E+03	8.5609E+03		
Te-127	2.4012E+03	2.2840E+03	2.4665E+03	2.1185E+03	2.2998E+03		
Te-127m	4.1533E+02	4.2651E+02	4.6272E+02	3.4855E+02	3.7782E+02		
Te-129	8.3013E+03	8.1098E+03	8.4012E+03	7.8361E+03	8.1129E+03		
Te-129m	1.7352E+03	1.8146E+03	1.8872E+03	1.5699E+03	1.6327E+03		
Te-131m	5.0281E+03	4.8115E+03	5.0686E+03	4.6014E+03	4.8606E+03		
Te-132	3.8250E+04	3.8264E+04	3.8391E+04	3.8037E+04	3.8194E+04		
I-131	2.7112E+04	2.7306E+04	2.7562E+04	2.6494E+04	2.6750E+04		
I-132	3.9463E+04	3.9283E+04	3.9464E+04	3.9048E+04	3.9319E+04		
I-133	5.5703E+04	5.5952E+04	5.5715E+04	5.6277E+04	5.6039E+04		
I-134	6.2517E+04	6.3232E+04	6.2858E+04	6.3941E+04	6.3518E+04		
I-135	5.2928E+04	5.3014E+04	5.2964E+04	5.3188E+04	5.2999E+04		
Xe-133	5.4551E+04	5.6100E+04	5.5707E+04	5.4358E+04	5.4162E+04		
Xe-135	1.8108E+04	2.0907E+04	1.7708E+04	2.2738E+04	1.9373E+04		
Cs-134	6.7933E+03	6.6694E+03	7.1917E+03	4.2426E+03	4.6121E+03		
Cs-136	1.7798E+03	1.7293E+03	1.7111E+03	1.4686E+03	1.4686E+03		
Cs-137	4.5108E+03	4.7919E+03	4.7857E+03	3.5327E+03	3.5327E+03		

Ba-139	5.0776E+04	5.1590E+04	5.1001E+04	5.2269E+04	5.1826E+04		
Ba-140	5.1301E+04	5.3572E+04	5.2928E+04	5.1324E+04	5.0798E+04		
La-140	5.2295E+04	5.4848E+04	5.4255E+04	5.1753E+04	5.1322E+04		
La-141	4.6199E+04	4.6875E+04	4.6433E+04	4.7582E+04	4.7137E+04		
La-142	4.4748E+04	4.5538E+04	4.4898E+04	4.6418E+04	4.5855E+04		
Ce-141	4.8479E+04	5.2726E+04	5.1883E+04	4.6857E+04	4.6381E+04		
Ce-143	4.3986E+04	4.5220E+04	4.4327E+04	4.6407E+04	4.5659E+04		
Ce-144	3.8451E+04	4.3643E+04	4.2317E+04	3.6308E+04	3.5349E+04		
Pr-143	4.5151E+04	4.7964E+04	4.6905E+04	4.5380E+04	4.4506E+04		
Nd-147	1.8668E+04	1.9339E+04	1.9151E+04	1.8601E+04	1.8461E+04		
Np-239	5.5211E+05	4.9840E+05	5.5833E+05	4.6293E+05	5.1802E+05		
Pu-238	1.5641E+02	1.6702E+02	1.7259E+02	8.1416E+01	8.8231E+01		
Pu-239	1.1339E+01	1.2186E+01	1.1469E+01	1.1439E+01	1.0959E+01		
Pu-240	1.8890E+01	1.8707E+01	2.0026E+01	1.3968E+01	1.5515E+01		
Pu-241	4.6642E+03	4.8799E+03	4.9593E+03	3.6186E+03	3.8335E+03		
Am-241	6.3071E+00	7.8861E+00	7.3183E+00	4.4945E+00	4.4541E+00		
Cm-242	1.9383E+03	1.8075E+03	2.0078E+03	1.0433E+03	1.2470E+03		
Cm-244	2.8569E+02	2.1060E+02	3.1650E+02	6.0693E+01	9.7622E+01		
cloudshine	5.0938E+05	5.3788E+05	5.4325E+05	4.6368E+05	4.6917E+05		
inhaled chronic	2.3812E+10	2.2345E+10	2.5855E+10	1.2388E+10	1.4170E+10		
TEDE Dose	2.3812E+10	2.2346E+10	2.5855E+10	1.2389E+10	1.4170E+10		
Fraction	4.1555	3.8996	4.5120	2.1619	2.4728		

Loading Pattern Comparisons with Weighted Activities Integrated over Infinity							
MWt	1						
(Rem/Ci)/(Sv/Bq)	3.70E+12						
BR(m3/s)	3.50E-04						
Vcr(cf-m3)	289194	8189.06					
f	0.059784						
	FGR 12	FGR 11	Release				
	Table 2.1	Table 2.1	Fraction	pwr_def	50A2	50B2	50C2
	CLOUD	INHALED		nif			
	SHINE	CHRONIC					
	Sv-m3/Bq-s	Sv/Bq		Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	4.76E-14	2.94E-09	0.0025	2.5530E+02	7.6371E+02	7.5954E+02	7.5604E+02
Co-60	1.26E-13	5.91E-08	0.0025	1.9530E+02	8.0950E+02	7.9190E+02	7.7298E+02
Kr-85	1.19E-16	0.00E+00	1.0000	1.9600E+02	3.7046E+02	3.6202E+02	3.5620E+02
Kr-85m	7.48E-15	0.00E+00	1.0000	9.1810E+03	8.5580E+03	8.6539E+03	8.7172E+03
Kr-87	4.12E-14	0.00E+00	1.0000	1.6780E+04	1.7441E+04	1.7718E+04	1.7811E+04
Kr-88	1.02E-13	0.00E+00	1.0000	2.2690E+04	2.4510E+04	2.4842E+04	2.5051E+04
Rb-86	4.81E-15	1.79E-09	0.3000	1.4960E+01	5.1338E+01	5.0196E+01	4.8653E+01
Sr-89	7.73E-17	1.12E-08	0.0200	2.8440E+04	3.4343E+04	3.4765E+04	3.4920E+04
Sr-90	7.53E-18	3.51E-07	0.0200	1.5350E+03	3.1862E+03	3.1129E+03	3.0572E+03
Sr-91	4.92E-14	4.55E-10	0.0200	3.6560E+04	4.1835E+04	4.2307E+04	4.2634E+04
Sr-92	6.79E-14	2.18E-10	0.0200	3.8050E+04	4.2721E+04	4.3174E+04	4.3494E+04
Y-90	1.90E-16	2.28E-09	0.0002	1.6470E+03	3.4256E+03	3.3503E+03	3.2892E+03
Y-91	2.60E-16	1.32E-08	0.0002	3.4650E+04	4.3187E+04	4.3703E+04	4.3772E+04
Y-92	1.30E-14	2.11E-10	0.0002	3.8190E+04	4.3055E+04	4.3492E+04	4.3803E+04
Y-93	4.80E-15	5.82E-10	0.0002	4.3200E+04	3.1084E+04	3.1397E+04	3.1500E+04
Zr-95	3.60E-14	6.39E-09	0.0002	4.3770E+04	5.5816E+04	5.6037E+04	5.6057E+04
Zr-97	4.43E-14	1.17E-09	0.0002	4.5620E+04	4.9673E+04	4.9821E+04	4.9853E+04
Nb-95	3.74E-14	1.57E-09	0.0002	4.1380E+04	5.8020E+04	5.8250E+04	5.8284E+04
Mo-99	7.28E-15	1.07E-09	0.0025	4.8300E+04	5.1077E+04	5.1044E+04	5.1045E+04
Tc-99m	5.89E-15	8.80E-12	0.0025	4.1690E+04	4.5399E+04	4.5332E+04	4.5191E+04
Ru-103	2.25E-14	2.42E-09	0.0025	3.5980E+04	4.2488E+04	4.2345E+04	4.1939E+04
Ru-105	3.81E-14	1.23E-10	0.0025	2.3400E+04	2.7263E+04	2.6912E+04	2.6601E+04
Ru-106	1.04E-14	1.29E-07	0.0025	8.1750E+03	1.5998E+04	1.5787E+04	1.5351E+04
Rh-105	3.72E-15	2.58E-10	0.0025	1.6210E+04	2.5566E+04	2.5233E+04	2.4985E+04
Sb-127	3.33E-14	1.63E-09	0.0500	2.2080E+03	2.2032E+03	2.1858E+03	2.1703E+03
Sb-129	7.14E-14	1.74E-10	0.0500	7.8200E+03	8.4042E+03	8.3895E+03	8.3586E+03
Te-127	2.42E-16	8.60E-11	0.0500	2.1320E+03	2.1875E+03	2.1775E+03	2.1600E+03
Te-127m	1.47E-16	5.81E-09	0.0500	2.8230E+02	3.9505E+02	3.9372E+02	3.8771E+02
Te-129	2.75E-15	2.09E-11	0.0500	7.3410E+03	7.9927E+03	7.9732E+03	7.9523E+03
Te-129m	3.34E-15	6.48E-09	0.0500	1.9350E+03	1.6609E+03	1.6586E+03	1.6474E+03
Te-131m	7.46E-14	1.76E-09	0.0500	3.7070E+03	4.7506E+03	4.7270E+03	4.7085E+03
Te-132	1.03E-14	2.55E-09	0.0500	3.6900E+04	3.8201E+04	3.8121E+04	3.8035E+04
I-131	1.82E-14	8.89E-09	0.4000	2.5400E+04	2.6575E+04	2.6593E+04	2.6518E+04
I-132	1.12E-13	1.03E-10	0.4000	3.7430E+04	3.8910E+04	3.8908E+04	3.8919E+04

I-133	2.94E-14	1.58E-09	0.4000	5.3700E+04	5.6062E+04	5.6090E+04	5.6147E+04
I-134	1.30E-13	3.55E-11	0.4000	5.8930E+04	6.3436E+04	6.3674E+04	6.3795E+04
I-135	8.29E-14	3.32E-10	0.4000	5.0630E+04	5.2991E+04	5.3104E+04	5.3124E+04
Xe-133	1.56E-15	0.00E+00	1.0000	5.3720E+04	5.3133E+04	5.3166E+04	5.3156E+04
Xe-135	1.19E-14	0.00E+00	1.0000	1.0080E+04	2.1438E+04	2.1464E+04	2.1582E+04
Cs-134	7.57E-14	1.25E-08	0.3000	3.4250E+03	5.8042E+03	5.6011E+03	5.3887E+03
Cs-136	1.06E-13	1.98E-09	0.3000	1.0420E+03	1.6333E+03	1.5657E+03	1.5278E+03
Cs-137	2.73E-14	8.63E-09	0.3000	1.9150E+03	4.3837E+03	4.2479E+03	4.1457E+03
Ba-139	2.17E-15	4.64E-11	0.0200	4.9760E+04	5.1891E+04	5.1973E+04	5.2158E+04
Ba-140	8.58E-15	1.01E-09	0.0200	4.9240E+04	5.1445E+04	5.1565E+04	5.1623E+04
La-140	1.17E-13	1.31E-09	0.0002	5.0320E+04	5.3175E+04	5.3446E+04	5.3306E+04
La-141	2.39E-15	1.57E-10	0.0002	4.6150E+04	4.7174E+04	4.7312E+04	4.7418E+04
La-142	1.44E-13	6.84E-11	0.0002	4.4490E+04	4.5940E+04	4.6060E+04	4.6231E+04
Ce-141	3.43E-15	2.42E-09	0.0005	4.4760E+04	4.9047E+04	4.9178E+04	4.9343E+04
Ce-143	1.29E-14	9.16E-10	0.0005	4.3520E+04	4.5725E+04	4.5953E+04	4.6119E+04
Ce-144	2.77E-15	1.01E-07	0.0005	2.6970E+04	4.0567E+04	4.0647E+04	4.0333E+04
Pr-143	2.10E-17	2.19E-09	0.0002	4.2730E+04	4.6000E+04	4.6249E+04	4.6365E+04
Nd-147	6.19E-15	1.85E-09	0.0002	1.9110E+04	1.8619E+04	1.8679E+04	1.8669E+04
Np-239	7.69E-15	6.78E-10	0.0005	5.1200E+05	4.8322E+05	4.7780E+05	4.7408E+05
Pu-238	4.88E-18	7.79E-05	0.0005	2.9020E+01	1.3689E+02	1.2556E+02	1.1817E+02
Pu-239	4.24E-18	8.33E-05	0.0005	6.5450E+00	1.1989E+01	1.1956E+01	1.1924E+01
Pu-240	4.75E-18	8.33E-05	0.0005	8.2540E+00	1.7232E+01	1.6791E+01	1.6422E+01
Pu-241	7.25E-20	1.34E-06	0.0005	1.3900E+03	4.4622E+03	4.3439E+03	4.2637E+03
Am-241	8.18E-16	1.20E-04	0.0002	9.1810E-01	6.9722E+00	6.9094E+00	6.6825E+00
Cm-242	5.69E-18	4.67E-06	0.0002	3.5140E+02	1.5296E+03	1.3894E+03	1.3308E+03
Cm-244	4.91E-18	6.70E-05	0.0002	2.0560E+01	1.5169E+02	1.2678E+02	1.1322E+02
cloudshine				2.9223E-01	3.1576E-01	3.1726E-01	3.1802E-01
Inhaled chronic				2.9200E+01	3.6837E+01	3.6433E+01	3.6047E+01
TEDE Dose				2.9492E+01	3.7153E+01	3.6750E+01	3.6365E+01
Fraction				1.0000	1.2598	1.2461	1.2330

	50D2	50E2	50F2	40A2	40B2	40C2	40D2
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.6815E+02	7.6866E+02	7.4941E+02	7.7069E+02	7.6622E+02	7.6281E+02	7.7372E+02
Co-60	8.5313E+02	8.4027E+02	7.3230E+02	9.0822E+02	8.8744E+02	8.6992E+02	9.5723E+02
Kr-85	3.8397E+02	3.8022E+02	3.4285E+02	3.4904E+02	3.4254E+02	3.3655E+02	3.6133E+02
Kr-85m	8.6281E+03	8.4819E+03	8.7994E+03	8.1846E+03	8.3389E+03	8.4071E+03	8.2871E+03
Kr-87	1.7621E+04	1.7312E+04	1.7993E+04	1.6728E+04	1.6950E+04	1.7155E+04	1.6951E+04
Kr-88	2.4745E+04	2.4251E+04	2.5280E+04	2.3406E+04	2.3779E+04	2.4036E+04	2.3708E+04
Rb-86	5.3721E+01	5.3675E+01	4.5873E+01	5.3275E+01	5.2068E+01	5.0528E+01	5.5644E+01
Sr-89	3.5413E+04	3.4119E+04	3.5195E+04	3.2271E+04	3.2725E+04	3.2993E+04	3.3319E+04
Sr-90	3.2756E+03	3.2805E+03	2.9389E+03	2.9753E+03	2.9141E+03	2.8592E+03	3.0525E+03
Sr-91	4.2218E+04	4.1456E+04	4.2973E+04	4.0074E+04	4.0818E+04	4.1168E+04	4.0610E+04
Sr-92	4.3019E+04	4.2387E+04	4.3771E+04	4.1251E+04	4.1752E+04	4.2088E+04	4.1646E+04
Y-90	3.5229E+03	3.5392E+03	3.1631E+03	3.2305E+03	3.1621E+03	3.1069E+03	3.3163E+03
Y-91	4.4671E+04	4.3102E+04	4.3903E+04	4.0782E+04	4.1329E+04	4.1560E+04	4.2261E+04
Y-92	4.3399E+04	4.2718E+04	4.4131E+04	4.1565E+04	4.2075E+04	4.2400E+04	4.1980E+04
Y-93	3.1304E+04	3.0884E+04	3.1742E+04	3.0142E+04	3.0593E+04	3.0705E+04	3.0450E+04
Zr-95	5.8067E+04	5.6167E+04	5.5866E+04	5.4575E+04	5.4906E+04	5.4886E+04	5.6766E+04
Zr-97	4.9772E+04	4.9727E+04	4.9964E+04	4.9514E+04	4.9617E+04	4.9717E+04	4.9591E+04
Nb-95	6.1265E+04	5.8578E+04	5.7859E+04	5.6730E+04	5.6966E+04	5.7005E+04	5.9875E+04
Mo-99	5.1031E+04	5.1072E+04	5.1106E+04	5.0729E+04	5.0861E+04	5.0870E+04	5.0856E+04
Tc-99m	4.5192E+04	4.5345E+04	4.5335E+04	4.5040E+04	4.5138E+04	4.5179E+04	4.5009E+04
Ru-103	4.3709E+04	4.2783E+04	4.0582E+04	4.4974E+04	4.4820E+04	4.4430E+04	4.6329E+04
Ru-105	2.7549E+04	2.7824E+04	2.6069E+04	3.0441E+04	3.0094E+04	2.9764E+04	3.0772E+04
Ru-106	1.7273E+04	1.6439E+04	1.4254E+04	1.8473E+04	1.8230E+04	1.7724E+04	1.9911E+04
Rh-105	2.5716E+04	2.6079E+04	2.4576E+04	2.8193E+04	2.7822E+04	2.7579E+04	2.8295E+04
Sb-127	2.2175E+03	2.2335E+03	2.1441E+03	2.3835E+03	2.3662E+03	2.3520E+03	2.4028E+03
Sb-129	8.4370E+03	8.4507E+03	8.3180E+03	8.7024E+03	8.6674E+03	8.6394E+03	8.7234E+03
Te-127	2.2286E+03	2.2104E+03	2.1212E+03	2.3678E+03	2.3583E+03	2.3402E+03	2.4170E+03
Te-127m	4.1603E+02	4.0032E+02	3.6864E+02	4.2778E+02	4.2664E+02	4.2005E+02	4.5012E+02
Te-129	8.0543E+03	8.0400E+03	7.8975E+03	8.2816E+03	8.2619E+03	8.2453E+03	8.3372E+03
Te-129m	1.7051E+03	1.6712E+03	1.6197E+03	1.7265E+03	1.7243E+03	1.7120E+03	1.7734E+03
Te-131m	4.7713E+03	4.7952E+03	4.6680E+03	5.0134E+03	4.9934E+03	4.9706E+03	5.0364E+03
Te-132	3.8225E+04	3.8277E+04	3.8146E+04	3.8207E+04	3.8261E+04	3.8314E+04	3.8231E+04
I-131	2.6607E+04	2.6664E+04	2.6511E+04	2.6784E+04	2.6821E+04	2.6807E+04	2.6878E+04
I-132	3.8901E+04	3.9050E+04	3.8914E+04	3.9196E+04	3.9155E+04	3.9156E+04	3.9130E+04
I-133	5.6083E+04	5.6115E+04	5.6172E+04	5.5823E+04	5.5920E+04	5.5926E+04	5.5920E+04
I-134	6.3644E+04	6.3471E+04	6.3841E+04	6.3016E+04	6.3270E+04	6.3275E+04	6.3147E+04
I-135	5.3144E+04	5.3142E+04	5.3093E+04	5.2970E+04	5.2932E+04	5.2951E+04	5.2983E+04
Xe-133	5.3087E+04	5.3230E+04	5.3201E+04	5.2855E+04	5.2977E+04	5.2972E+04	5.2992E+04
Xe-135	2.0738E+04	2.1287E+04	2.1978E+04	1.8178E+04	1.8208E+04	1.8308E+04	1.7564E+04
Cs-134	6.3258E+03	6.1936E+03	4.8894E+03	6.2752E+03	6.0735E+03	5.8408E+03	6.8401E+03
Cs-136	1.6054E+03	1.6963E+03	1.4735E+03	1.6207E+03	1.5578E+03	1.5209E+03	1.5981E+03
Cs-137	4.5277E+03	4.5622E+03	3.9361E+03	4.3782E+03	4.2464E+03	4.1403E+03	4.5221E+03

Ba-139	5.1927E+04	5.1821E+04	5.2252E+04	5.1357E+04	5.1547E+04	5.1583E+04	5.1453E+04
Ba-140	5.1755E+04	5.1420E+04	5.1702E+04	5.0859E+04	5.1034E+04	5.1127E+04	5.1249E+04
La-140	5.3617E+04	5.3197E+04	5.3216E+04	5.2604E+04	5.2885E+04	5.2739E+04	5.2832E+04
La-141	4.7179E+04	4.7150E+04	4.7509E+04	4.6677E+04	4.6859E+04	4.6967E+04	4.6795E+04
La-142	4.6073E+04	4.5846E+04	4.6350E+04	4.5260E+04	4.5522E+04	4.5630E+04	4.5439E+04
Ce-141	5.0387E+04	4.9310E+04	4.9113E+04	4.8539E+04	4.8695E+04	4.8588E+04	4.9780E+04
Ce-143	4.5903E+04	4.5592E+04	4.6284E+04	4.4854E+04	4.5173E+04	4.5354E+04	4.5086E+04
Ce-144	4.3005E+04	4.1237E+04	3.9663E+04	3.9400E+04	3.9506E+04	3.9203E+04	4.1712E+04
Pr-143	4.6428E+04	4.5933E+04	4.6481E+04	4.5068E+04	4.5316E+04	4.5465E+04	4.5475E+04
Nd-147	1.8726E+04	1.8661E+04	1.8698E+04	1.8485E+04	1.8508E+04	1.8539E+04	1.8562E+04
Np-239	4.8512E+05	4.8867E+05	4.6814E+05	5.4333E+05	5.3745E+05	5.3218E+05	5.4506E+05
Pu-238	1.4318E+02	1.5025E+02	1.0313E+02	1.4313E+02	1.3240E+02	1.2522E+02	1.4984E+02
Pu-239	1.2124E+01	1.2057E+01	1.1809E+01	1.1357E+01	1.1329E+01	1.1306E+01	1.1411E+01
Pu-240	1.7865E+01	1.7820E+01	1.5631E+01	1.8658E+01	1.8250E+01	1.7917E+01	1.9288E+01
Pu-241	4.6295E+03	4.6156E+03	4.0709E+03	4.5911E+03	4.4965E+03	4.4088E+03	4.7375E+03
Am-241	8.0364E+00	7.2471E+00	5.9891E+00	6.5722E+00	6.5867E+00	6.4261E+00	7.6240E+00
Cm-242	1.5594E+03	1.6679E+03	1.2243E+03	1.7396E+03	1.6138E+03	1.5540E+03	1.7858E+03
Cm-244	1.5667E+02	1.8075E+02	8.7257E+01	2.3182E+02	1.9616E+02	1.7634E+02	2.4012E+02
cloudshine	3.1719E-01	3.1555E-01	3.1865E-01	3.1075E-01	3.1220E-01	3.1303E-01	3.1222E-01
inhaled chronic	3.7538E+01	3.7521E+01	3.5279E+01	3.7286E+01	3.6902E+01	3.6522E+01	3.8056E+01
TEDE Dose	3.7856E+01	3.7837E+01	3.5598E+01	3.7596E+01	3.7214E+01	3.6835E+01	3.8368E+01
Fraction	1.2836	1.2829	1.2070	1.2748	1.2618	1.2490	1.3010

	40E2	40F2	CRAA	CRAB	CRBA	CRBB	CRCA
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.7549E+02	7.5481E+02	7.5657E+02	7.6574E+02	7.6706E+02	7.7381E+02	7.9676E+02
Co-60	9.4439E+02	8.2544E+02	8.0033E+02	8.9568E+02	8.3233E+02	9.3252E+02	8.7943E+02
Kr-85	3.5814E+02	3.2532E+02	3.6096E+02	3.4009E+02	3.7648E+02	3.5481E+02	3.9627E+02
Kr-85m	8.1013E+03	8.4759E+03	8.0930E+03	7.6901E+03	8.2339E+03	7.8216E+03	8.3363E+03
Kr-87	1.6508E+04	1.7354E+04	1.6514E+04	1.5629E+04	1.6797E+04	1.5918E+04	1.7016E+04
Kr-88	2.3130E+04	2.4301E+04	2.3127E+04	2.1798E+04	2.3500E+04	2.2257E+04	2.3815E+04
Rb-86	5.5163E+01	4.7524E+01	5.6953E+01	5.8313E+01	5.5814E+01	5.7286E+01	5.7011E+01
Sr-89	3.2020E+04	3.3256E+04	3.0917E+04	2.8884E+04	3.3379E+04	3.1210E+04	3.5707E+04
Sr-90	3.0623E+03	2.7603E+03	3.1039E+03	2.8978E+03	3.2403E+03	3.0213E+03	3.4089E+03
Sr-91	3.9656E+04	4.1566E+04	3.9640E+04	3.7654E+04	4.0271E+04	3.8405E+04	4.0764E+04
Sr-92	4.0864E+04	4.2432E+04	4.0830E+04	3.9044E+04	4.1358E+04	3.9662E+04	4.1796E+04
Y-90	3.3257E+03	2.9951E+03	3.3543E+03	3.1681E+03	3.5041E+03	3.2910E+03	3.6722E+03
Y-91	4.0694E+04	4.1780E+04	3.8785E+04	3.6620E+04	4.2149E+04	3.9690E+04	4.5220E+04
Y-92	4.1190E+04	4.2761E+04	4.1127E+04	3.9343E+04	4.1681E+04	3.9989E+04	4.2119E+04
Y-93	3.0021E+04	3.0914E+04	2.9963E+04	2.8917E+04	3.0299E+04	2.9294E+04	3.0515E+04
Zr-95	5.4851E+04	5.4721E+04	5.0470E+04	4.9288E+04	5.5086E+04	5.3813E+04	5.9702E+04
Zr-97	4.9548E+04	4.9794E+04	4.9365E+04	4.9092E+04	4.9529E+04	4.9256E+04	4.9653E+04
Nb-95	5.7187E+04	5.6720E+04	5.0614E+04	4.9550E+04	5.6497E+04	5.5176E+04	6.2342E+04
Mo-99	5.0875E+04	5.0924E+04	5.0814E+04	5.0565E+04	5.0986E+04	5.0612E+04	5.1033E+04
Tc-99m	4.5139E+04	4.5135E+04	4.5069E+04	4.4932E+04	4.5615E+04	4.5383E+04	4.5629E+04
Ru-103	4.5342E+04	4.3118E+04	4.1201E+04	4.3471E+04	4.2198E+04	4.4643E+04	4.5977E+04
Ru-105	3.0997E+04	2.9225E+04	2.7963E+04	3.0964E+04	2.7898E+04	3.1033E+04	2.8261E+04
Ru-106	1.8969E+04	1.6490E+04	1.5672E+04	1.7934E+04	1.5830E+04	1.8149E+04	1.7072E+04
Rh-105	2.8666E+04	2.7148E+04	2.5968E+04	2.8408E+04	2.5782E+04	2.8294E+04	2.5970E+04
Sb-127	2.4101E+03	2.3251E+03	2.2269E+03	2.3965E+03	2.2308E+03	2.4052E+03	2.2536E+03
Sb-129	8.7667E+03	8.6117E+03	8.4352E+03	8.7158E+03	8.4621E+03	8.7430E+03	8.5132E+03
Te-127	2.3914E+03	2.3000E+03	2.2228E+03	2.3918E+03	2.2259E+03	2.4012E+03	2.2840E+03
Te-127m	4.3306E+02	3.9997E+02	3.7161E+02	4.0023E+02	3.8324E+02	4.1533E+02	4.2651E+02
Te-129	8.3225E+03	8.1921E+03	8.0095E+03	8.2792E+03	8.0242E+03	8.3013E+03	8.1098E+03
Te-129m	1.7377E+03	1.6862E+03	1.6103E+03	1.6685E+03	1.6688E+03	1.7352E+03	1.8146E+03
Te-131m	5.0544E+03	4.9396E+03	4.7666E+03	5.0156E+03	4.7763E+03	5.0281E+03	4.8115E+03
Te-132	3.8414E+04	3.8151E+04	3.8088E+04	3.8194E+04	3.8218E+04	3.8250E+04	3.8264E+04
I-131	2.6943E+04	2.6754E+04	2.6449E+04	2.6662E+04	2.6856E+04	2.7112E+04	2.7306E+04
I-132	3.9285E+04	3.9123E+04	3.9029E+04	3.9247E+04	3.9210E+04	3.9463E+04	3.9283E+04
I-133	5.5876E+04	5.6044E+04	5.5808E+04	5.5571E+04	5.5860E+04	5.5703E+04	5.5952E+04
I-134	6.3014E+04	6.3425E+04	6.2926E+04	6.2270E+04	6.3172E+04	6.2517E+04	6.3232E+04
I-135	5.3117E+04	5.3087E+04	5.2878E+04	5.2753E+04	5.2928E+04	5.2928E+04	5.3014E+04
Xe-133	5.2956E+04	5.3010E+04	5.3720E+04	5.3524E+04	5.4878E+04	5.4551E+04	5.6100E+04
Xe-135	1.8027E+04	1.8670E+04	2.1504E+04	1.8264E+04	2.1368E+04	1.8108E+04	2.0907E+04
Cs-134	6.6893E+03	5.3142E+03	6.1864E+03	6.6446E+03	6.2985E+03	6.7933E+03	6.6694E+03
Cs-136	1.6849E+03	1.4692E+03	1.9187E+03	1.9005E+03	1.7954E+03	1.7798E+03	1.7293E+03
Cs-137	4.5564E+03	3.9354E+03	4.3290E+03	4.3197E+03	4.5202E+03	4.5108E+03	4.7919E+03

Ba-139	5.1287E+04	5.1733E+04	5.1138E+04	5.0492E+04	5.1423E+04	5.0776E+04	5.1590E+04
Ba-140	5.0901E+04	5.1190E+04	5.0344E+04	4.9754E+04	5.1892E+04	5.1301E+04	5.3572E+04
La-140	5.2650E+04	5.2656E+04	5.1130E+04	5.0641E+04	5.2888E+04	5.2295E+04	5.4848E+04
La-141	4.6640E+04	4.7073E+04	4.6533E+04	4.5965E+04	4.6746E+04	4.6199E+04	4.6875E+04
La-142	4.5201E+04	4.5800E+04	4.5130E+04	4.4384E+04	4.5334E+04	4.4748E+04	4.5538E+04
Ce-141	4.8543E+04	4.8488E+04	4.6022E+04	4.5390E+04	4.9322E+04	4.8479E+04	5.2726E+04
Ce-143	4.4738E+04	4.5517E+04	4.4685E+04	4.3694E+04	4.4977E+04	4.3986E+04	4.5220E+04
Ce-144	3.9948E+04	3.8725E+04	3.6423E+04	3.5328E+04	3.9656E+04	3.8451E+04	4.3643E+04
Pr-143	4.4959E+04	4.5659E+04	4.3089E+04	4.2056E+04	4.6261E+04	4.5151E+04	4.7964E+04
Nd-147	1.8531E+04	1.8562E+04	1.8371E+04	1.8215E+04	1.8824E+04	1.8668E+04	1.9339E+04
Np-239	5.4884E+05	5.2476E+05	4.9686E+05	5.5158E+05	4.9383E+05	5.5211E+05	4.9840E+05
Pu-238	1.5580E+02	1.1025E+02	1.4479E+02	1.4889E+02	1.5117E+02	1.5641E+02	1.6702E+02
Pu-239	1.1405E+01	1.1223E+01	1.1702E+01	1.1146E+01	1.1958E+01	1.1339E+01	1.2186E+01
Pu-240	1.9201E+01	1.7216E+01	1.6592E+01	1.7882E+01	1.7542E+01	1.8890E+01	1.8707E+01
Pu-241	4.7153E+03	4.2509E+03	4.2850E+03	4.3884E+03	4.5783E+03	4.6642E+03	4.8799E+03
Am-241	6.7824E+00	5.8233E+00	5.8306E+00	5.4728E+00	6.7536E+00	6.3071E+00	7.8861E+00
Cm-242	1.8709E+03	1.4403E+03	1.7003E+03	1.8768E+03	1.7411E+03	1.9383E+03	1.8075E+03
Cm-244	2.7313E+02	1.3801E+02	1.9796E+02	2.9316E+02	1.9071E+02	2.8569E+02	2.1060E+02
cloudshine	3.1030E-01	3.1403E-01	3.1042E-01	3.0406E-01	3.1256E-01	3.0666E-01	3.1426E-01
Inhaled chronic	3.8035E+01	3.5716E+01	3.6831E+01	3.7277E+01	3.7564E+01	3.8057E+01	3.8739E+01
TEDE Dose	3.8346E+01	3.6030E+01	3.7141E+01	3.7581E+01	3.7876E+01	3.8363E+01	3.9054E+01
Fraction	1.3002	1.2217	1.2594	1.2743	1.2843	1.3008	1.3242

	CRCB	CRDA	CRDB					
	Ci/MWt	Ci/MWt	Ci/MWt					
Co-58	8.0013E+02	7.3185E+02	7.4057E+02					
Co-60	9.8625E+02	6.6039E+02	7.4207E+02					
Kr-85	3.7180E+02	3.1593E+02	2.9986E+02					
Kr-85m	7.9679E+03	8.8432E+03	8.5114E+03					
Kr-87	1.6208E+04	1.8075E+04	1.7421E+04					
Kr-88	2.2658E+04	2.5377E+04	2.4418E+04					
Rb-86	5.9034E+01	4.3194E+01	4.4934E+01					
Sr-89	3.3293E+04	3.3496E+04	3.1864E+04					
Sr-90	3.1769E+03	2.6820E+03	2.5316E+03					
Sr-91	3.8931E+04	4.3261E+04	4.1697E+04					
Sr-92	4.0190E+04	4.3951E+04	4.2625E+04					
Y-90	3.4567E+03	2.8958E+03	2.7504E+03					
Y-91	4.2527E+04	4.1595E+04	3.9658E+04					
Y-92	4.0519E+04	4.4316E+04	4.2952E+04					
Y-93	2.9622E+04	3.1827E+04	3.1098E+04					
Zr-95	5.8246E+04	5.1889E+04	5.0875E+04					
Zr-97	4.9425E+04	4.9962E+04	4.9858E+04					
Nb-95	6.0839E+04	5.1937E+04	5.1092E+04					
Mo-99	5.0834E+04	5.1119E+04	5.1119E+04					
Tc-99m	4.5425E+04	4.5815E+04	4.5404E+04					
Ru-103	4.8774E+04	3.9450E+04	4.1548E+04					
Ru-105	3.1455E+04	2.5410E+04	2.8499E+04					
Ru-106	1.9695E+04	1.2899E+04	1.4920E+04					
Rh-105	2.8507E+04	2.3666E+04	2.6249E+04					
Sb-127	2.4299E+03	2.1032E+03	2.2801E+03					
Sb-129	8.7888E+03	8.2803E+03	8.5609E+03					
Te-127	2.4665E+03	2.1185E+03	2.2998E+03					
Te-127m	4.6272E+02	3.4855E+02	3.7782E+02					
Te-129	8.4012E+03	7.8361E+03	8.1129E+03					
Te-129m	1.8872E+03	1.5699E+03	1.6327E+03					
Te-131m	5.0686E+03	4.6014E+03	4.8606E+03					
Te-132	3.8391E+04	3.8037E+04	3.8194E+04					
I-131	2.7562E+04	2.6494E+04	2.6750E+04					
I-132	3.9464E+04	3.9048E+04	3.9319E+04					
I-133	5.5715E+04	5.6277E+04	5.6039E+04					
I-134	6.2858E+04	6.3941E+04	6.3518E+04					
I-135	5.2964E+04	5.3188E+04	5.2999E+04					
Xe-133	5.5707E+04	5.4358E+04	5.4162E+04					
Xe-135	1.7708E+04	2.2738E+04	1.9373E+04					
Cs-134	7.1917E+03	4.2426E+03	4.6121E+03					
Cs-136	1.7111E+03	1.4686E+03	1.4686E+03					
Cs-137	4.7857E+03	3.5327E+03	3.5327E+03					

Ba-139	5.1001E+04	5.2269E+04	5.1826E+04					
Ba-140	5.2928E+04	5.1324E+04	5.0798E+04					
La-140	5.4255E+04	5.1753E+04	5.1322E+04					
La-141	4.6433E+04	4.7582E+04	4.7137E+04					
La-142	4.4898E+04	4.6418E+04	4.5855E+04					
Ce-141	5.1883E+04	4.6857E+04	4.6381E+04					
Ce-143	4.4327E+04	4.6407E+04	4.5659E+04					
Ce-144	4.2317E+04	3.6308E+04	3.5349E+04					
Pr-143	4.6905E+04	4.5380E+04	4.4506E+04					
Nd-147	1.9151E+04	1.8601E+04	1.8461E+04					
Np-239	5.5833E+05	4.6293E+05	5.1802E+05					
Pu-238	1.7259E+02	8.1416E+01	8.8231E+01					
Pu-239	1.1469E+01	1.1439E+01	1.0959E+01					
Pu-240	2.0026E+01	1.3968E+01	1.5515E+01					
Pu-241	4.9593E+03	3.6186E+03	3.8335E+03					
Am-241	7.3183E+00	4.4945E+00	4.4541E+00					
Cm-242	2.0078E+03	1.0433E+03	1.2470E+03					
Cm-244	3.1650E+02	6.0693E+01	9.7622E+01					
cloudshine	3.0895E-01	3.1923E-01	3.1445E-01					
Inhaled chronic	3.9259E+01	3.3995E+01	3.4397E+01					
TEDE Dose	3.9568E+01	3.4314E+01	3.4712E+01					
Fraction	1.3416	1.1635	1.1770					

Loading Pattern Comparisons with Weighted Activities Integrated over 30 Days							
MWt	1						
(Rem/Ci)/(Sv/Bq)	3.70E+12						
BR(m3/s)	3.50E-04						
Vcr(cf-m3)	289194	8189.06					
f	0.059784						
t(sec)	2592000						
	FGR 12	FGR 11	Release	Decay	rf/dc*		
	Table 2.1	Table 2.1	Fraction	Constant	(1-exp	pwr_def	50A2
	CLOUD	INHALED			(-dc*t))	nif	
	SHINE	CHRONIC					
	Sv-m3/Bq-s	Sv/Bq		1/sec		Ci/MWt	Ci/MWt
Co-58	4.76E-14	2.94E-09	0.0025	1.13E-07	5.62E+03	2.5530E+02	7.6371E+02
Co-60	1.26E-13	5.91E-08	0.0025	4.17E-09	6.45E+03	1.9530E+02	8.0950E+02
Kr-85	1.19E-16	0.00E+00	1.0000	2.05E-09	2.59E+06	1.9600E+02	3.7046E+02
Kr-85m	7.48E-15	0.00E+00	1.0000	4.30E-05	2.33E+04	9.1810E+03	8.5580E+03
Kr-87	4.12E-14	0.00E+00	1.0000	1.52E-04	6.58E+03	1.6780E+04	1.7441E+04
Kr-88	1.02E-13	0.00E+00	1.0000	6.78E-05	1.47E+04	2.2690E+04	2.4510E+04
Rb-86	4.81E-15	1.79E-09	0.3000	4.30E-07	4.69E+05	1.4960E+01	5.1338E+01
Sr-89	7.73E-17	1.12E-08	0.0200	1.59E-07	4.25E+04	2.8440E+04	3.4343E+04
Sr-90	7.53E-18	3.51E-07	0.0200	7.55E-10	5.18E+04	1.5350E+03	3.1862E+03
Sr-91	4.92E-14	4.55E-10	0.0200	2.03E-05	9.85E+02	3.6560E+04	4.1835E+04
Sr-92	6.79E-14	2.18E-10	0.0200	7.10E-05	2.82E+02	3.8050E+04	4.2721E+04
Y-90	1.90E-16	2.28E-09	0.0002	3.00E-06	6.66E+01	1.6470E+03	3.4256E+03
Y-91	2.60E-16	1.32E-08	0.0002	1.37E-07	4.36E+02	3.4650E+04	4.3187E+04
Y-92	1.30E-14	2.11E-10	0.0002	5.44E-05	3.68E+00	3.8190E+04	4.3055E+04
Y-93	4.80E-15	5.82E-10	0.0002	1.89E-05	1.06E+01	4.3200E+04	3.1084E+04
Zr-95	3.60E-14	6.39E-09	0.0002	1.25E-07	4.43E+02	4.3770E+04	5.5816E+04
Zr-97	4.43E-14	1.17E-09	0.0002	1.15E-05	1.74E+01	4.5620E+04	4.9673E+04
Nb-95	3.74E-14	1.57E-09	0.0002	2.29E-07	3.91E+02	4.1380E+04	5.8020E+04
Mo-99	7.28E-15	1.07E-09	0.0025	2.92E-06	8.56E+02	4.8300E+04	5.1077E+04
Tc-99m	5.89E-15	8.80E-12	0.0025	3.20E-05	7.81E+01	4.1690E+04	4.5399E+04
Ru-103	2.25E-14	2.42E-09	0.0025	2.04E-07	5.03E+03	3.5980E+04	4.2488E+04
Ru-105	3.81E-14	1.23E-10	0.0025	4.34E-05	5.76E+01	2.3400E+04	2.7263E+04
Ru-106	1.04E-14	1.29E-07	0.0025	2.15E-08	6.30E+03	8.1750E+03	1.5998E+04
Rh-105	3.72E-15	2.58E-10	0.0025	5.44E-06	4.60E+02	1.6210E+04	2.5566E+04
Sb-127	3.33E-14	1.63E-09	0.0500	2.09E-06	2.38E+04	2.2080E+03	2.2032E+03
Sb-129	7.14E-14	1.74E-10	0.0500	4.38E-05	1.14E+03	7.8200E+03	8.4042E+03
Te-127	2.42E-16	8.60E-11	0.0500	2.05E-05	2.44E+03	2.1320E+03	2.1875E+03
Te-127m	1.47E-16	5.81E-09	0.0500	7.36E-08	1.18E+05	2.8230E+02	3.9505E+02
Te-129	2.75E-15	2.09E-11	0.0500	1.66E-04	3.01E+02	7.3410E+03	7.9927E+03
Te-129m	3.34E-15	6.48E-09	0.0500	2.39E-07	9.66E+04	1.9350E+03	1.6609E+03
Te-131m	7.46E-14	1.76E-09	0.0500	5.94E-06	8.42E+03	3.7070E+03	4.7506E+03
Te-132	1.03E-14	2.55E-09	0.0500	2.46E-06	2.03E+04	3.6900E+04	3.8201E+04
I-131	1.82E-14	8.89E-09	0.4000	9.98E-07	3.71E+05	2.5400E+04	2.6575E+04
I-132	1.12E-13	1.03E-10	0.4000	8.44E-05	4.74E+03	3.7430E+04	3.8910E+04

I-133	2.94E-14	1.58E-09	0.4000	9.26E-06	4.32E+04	5.3700E+04	5.6062E+04
I-134	1.30E-13	3.55E-11	0.4000	2.20E-04	1.82E+03	5.8930E+04	6.3436E+04
I-135	8.29E-14	3.32E-10	0.4000	2.93E-05	1.37E+04	5.0630E+04	5.2991E+04
Xe-133	1.56E-15	0.00E+00	1.0000	1.53E-06	6.41E+05	5.3720E+04	5.3133E+04
Xe-135	1.19E-14	0.00E+00	1.0000	2.12E-05	4.72E+04	1.0080E+04	2.1438E+04
Cs-134	7.57E-14	1.25E-08	0.3000	1.06E-08	7.67E+05	3.4250E+03	5.8042E+03
Cs-136	1.06E-13	1.98E-09	0.3000	6.10E-07	3.91E+05	1.0420E+03	1.6333E+03
Cs-137	2.73E-14	8.63E-09	0.3000	7.29E-10	7.77E+05	1.9150E+03	4.3837E+03
Ba-139	2.17E-15	4.64E-11	0.0200	1.38E-04	1.45E+02	4.9760E+04	5.1891E+04
Ba-140	8.58E-15	1.01E-09	0.0200	6.29E-07	2.56E+04	4.9240E+04	5.1445E+04
La-140	1.17E-13	1.31E-09	0.0002	4.78E-06	4.18E+01	5.0320E+04	5.3175E+04
La-141	2.39E-15	1.57E-10	0.0002	4.94E-05	4.05E+00	4.6150E+04	4.7174E+04
La-142	1.44E-13	6.84E-11	0.0002	1.25E-04	1.60E+00	4.4490E+04	4.5940E+04
Ce-141	3.43E-15	2.42E-09	0.0005	2.47E-07	9.57E+02	4.4760E+04	4.9047E+04
Ce-143	1.29E-14	9.16E-10	0.0005	5.81E-06	8.61E+01	4.3520E+04	4.5725E+04
Ce-144	2.77E-15	1.01E-07	0.0005	2.82E-08	1.25E+03	2.6970E+04	4.0567E+04
Pr-143	2.10E-17	2.19E-09	0.0002	5.91E-07	2.65E+02	4.2730E+04	4.6000E+04
Nd-147	6.19E-15	1.85E-09	0.0002	7.31E-07	2.32E+02	1.9110E+04	1.8619E+04
Np-239	7.69E-15	6.78E-10	0.0005	3.41E-06	1.47E+02	5.1200E+05	4.8322E+05
Pu-238	4.88E-18	7.79E-05	0.0005	2.51E-10	1.30E+03	2.9020E+01	1.3689E+02
Pu-239	4.24E-18	8.33E-05	0.0005	9.12E-13	1.30E+03	6.5450E+00	1.1989E+01
Pu-240	4.75E-18	8.33E-05	0.0005	3.35E-12	1.30E+03	8.2540E+00	1.7232E+01
Pu-241	7.25E-20	1.34E-06	0.0005	1.53E-09	1.29E+03	1.3900E+03	4.4622E+03
Am-241	8.18E-16	1.20E-04	0.0002	5.08E-11	5.18E+02	9.1810E-01	6.9722E+00
Cm-242	5.69E-18	4.67E-06	0.0002	4.93E-08	4.87E+02	3.5140E+02	1.5296E+03
Cm-244	4.91E-18	6.70E-05	0.0002	1.21E-09	5.18E+02	2.0560E+01	1.5169E+02
cloudshine						2.0183E+04	2.6753E+04
inhaled chronic						3.1620E+07	4.9117E+07
TEDE Dose						3.1640E+07	4.9143E+07
Fraction						1.0000	1.5532

	50B2	50C2	50D2	50E2	50F2	40A2	40B2
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.5954E+02	7.5604E+02	7.6815E+02	7.6866E+02	7.4941E+02	7.7069E+02	7.6622E+02
Co-60	7.9190E+02	7.7298E+02	8.5313E+02	8.4027E+02	7.3230E+02	9.0822E+02	8.8744E+02
Kr-85	3.6202E+02	3.5620E+02	3.8397E+02	3.8022E+02	3.4285E+02	3.4904E+02	3.4254E+02
Kr-85m	8.6539E+03	8.7172E+03	8.6281E+03	8.4819E+03	8.7994E+03	8.1846E+03	8.3389E+03
Kr-87	1.7718E+04	1.7811E+04	1.7621E+04	1.7312E+04	1.7993E+04	1.6728E+04	1.6950E+04
Kr-88	2.4842E+04	2.5051E+04	2.4745E+04	2.4251E+04	2.5280E+04	2.3406E+04	2.3779E+04
Rb-86	5.0196E+01	4.8653E+01	5.3721E+01	5.3675E+01	4.5873E+01	5.3275E+01	5.2068E+01
Sr-89	3.4765E+04	3.4920E+04	3.5413E+04	3.4119E+04	3.5195E+04	3.2271E+04	3.2725E+04
Sr-90	3.1129E+03	3.0572E+03	3.2756E+03	3.2805E+03	2.9389E+03	2.9753E+03	2.9141E+03
Sr-91	4.2307E+04	4.2634E+04	4.2218E+04	4.1456E+04	4.2973E+04	4.0074E+04	4.0818E+04
Sr-92	4.3174E+04	4.3494E+04	4.3019E+04	4.2387E+04	4.3771E+04	4.1251E+04	4.1752E+04
Y-90	3.3503E+03	3.2892E+03	3.5229E+03	3.5392E+03	3.1631E+03	3.2305E+03	3.1621E+03
Y-91	4.3703E+04	4.3772E+04	4.4671E+04	4.3102E+04	4.3903E+04	4.0782E+04	4.1329E+04
Y-92	4.3492E+04	4.3803E+04	4.3399E+04	4.2718E+04	4.4131E+04	4.1565E+04	4.2075E+04
Y-93	3.1397E+04	3.1500E+04	3.1304E+04	3.0884E+04	3.1742E+04	3.0142E+04	3.0593E+04
Zr-95	5.6037E+04	5.6057E+04	5.8067E+04	5.6167E+04	5.5866E+04	5.4575E+04	5.4906E+04
Zr-97	4.9821E+04	4.9853E+04	4.9772E+04	4.9727E+04	4.9964E+04	4.9514E+04	4.9617E+04
Nb-95	5.8250E+04	5.8284E+04	6.1265E+04	5.8578E+04	5.7859E+04	5.6730E+04	5.6966E+04
Mo-99	5.1044E+04	5.1045E+04	5.1031E+04	5.1072E+04	5.1106E+04	5.0729E+04	5.0861E+04
Tc-99m	4.5332E+04	4.5191E+04	4.5192E+04	4.5345E+04	4.5335E+04	4.5040E+04	4.5138E+04
Ru-103	4.2345E+04	4.1939E+04	4.3709E+04	4.2783E+04	4.0582E+04	4.4974E+04	4.4820E+04
Ru-105	2.6912E+04	2.6601E+04	2.7549E+04	2.7824E+04	2.6069E+04	3.0441E+04	3.0094E+04
Ru-106	1.5787E+04	1.5351E+04	1.7273E+04	1.6439E+04	1.4254E+04	1.8473E+04	1.8230E+04
Rh-105	2.5233E+04	2.4985E+04	2.5716E+04	2.6079E+04	2.4576E+04	2.8193E+04	2.7822E+04
Sb-127	2.1858E+03	2.1703E+03	2.2175E+03	2.2335E+03	2.1441E+03	2.3835E+03	2.3662E+03
Sb-129	8.3895E+03	8.3586E+03	8.4370E+03	8.4507E+03	8.3180E+03	8.7024E+03	8.6674E+03
Te-127	2.1775E+03	2.1600E+03	2.2286E+03	2.2104E+03	2.1212E+03	2.3678E+03	2.3583E+03
Te-127m	3.9372E+02	3.8771E+02	4.1603E+02	4.0032E+02	3.6864E+02	4.2778E+02	4.2664E+02
Te-129	7.9732E+03	7.9523E+03	8.0543E+03	8.0400E+03	7.8975E+03	8.2816E+03	8.2619E+03
Te-129m	1.6586E+03	1.6474E+03	1.7051E+03	1.6712E+03	1.6197E+03	1.7265E+03	1.7243E+03
Te-131m	4.7270E+03	4.7085E+03	4.7713E+03	4.7952E+03	4.6680E+03	5.0134E+03	4.9934E+03
Te-132	3.8121E+04	3.8035E+04	3.8225E+04	3.8277E+04	3.8146E+04	3.8207E+04	3.8261E+04
I-131	2.6593E+04	2.6518E+04	2.6607E+04	2.6664E+04	2.6511E+04	2.6784E+04	2.6821E+04
I-132	3.8908E+04	3.8919E+04	3.8901E+04	3.9050E+04	3.8914E+04	3.9196E+04	3.9155E+04
I-133	5.6090E+04	5.6147E+04	5.6083E+04	5.6115E+04	5.6172E+04	5.5823E+04	5.5920E+04
I-134	6.3674E+04	6.3795E+04	6.3644E+04	6.3471E+04	6.3841E+04	6.3016E+04	6.3270E+04
I-135	5.3104E+04	5.3124E+04	5.3144E+04	5.3142E+04	5.3093E+04	5.2970E+04	5.2932E+04
Xe-133	5.3166E+04	5.3156E+04	5.3087E+04	5.3230E+04	5.3201E+04	5.2855E+04	5.2977E+04
Xe-135	2.1464E+04	2.1582E+04	2.0738E+04	2.1287E+04	2.1978E+04	1.8178E+04	1.8208E+04
Cs-134	5.6011E+03	5.3887E+03	6.3258E+03	6.1936E+03	4.8894E+03	6.2752E+03	6.0735E+03
Cs-136	1.5657E+03	1.5278E+03	1.6054E+03	1.6963E+03	1.4735E+03	1.6207E+03	1.5578E+03
Cs-137	4.2479E+03	4.1457E+03	4.5277E+03	4.5622E+03	3.9361E+03	4.3782E+03	4.2464E+03

Ba-139	5.1973E+04	5.2158E+04	5.1927E+04	5.1821E+04	5.2252E+04	5.1357E+04	5.1547E+04
Ba-140	5.1565E+04	5.1623E+04	5.1755E+04	5.1420E+04	5.1702E+04	5.0859E+04	5.1034E+04
La-140	5.3446E+04	5.3306E+04	5.3617E+04	5.3197E+04	5.3216E+04	5.2604E+04	5.2885E+04
La-141	4.7312E+04	4.7418E+04	4.7179E+04	4.7150E+04	4.7509E+04	4.6677E+04	4.6859E+04
La-142	4.6060E+04	4.6231E+04	4.6073E+04	4.5846E+04	4.6350E+04	4.5260E+04	4.5522E+04
Ce-141	4.9178E+04	4.9343E+04	5.0387E+04	4.9310E+04	4.9113E+04	4.8539E+04	4.8695E+04
Ce-143	4.5953E+04	4.6119E+04	4.5903E+04	4.5592E+04	4.6284E+04	4.4854E+04	4.5173E+04
Ce-144	4.0647E+04	4.0333E+04	4.3005E+04	4.1237E+04	3.9663E+04	3.9400E+04	3.9506E+04
Pr-143	4.6249E+04	4.6365E+04	4.6428E+04	4.5933E+04	4.6481E+04	4.5068E+04	4.5316E+04
Nd-147	1.8679E+04	1.8669E+04	1.8726E+04	1.8661E+04	1.8698E+04	1.8485E+04	1.8508E+04
Np-239	4.7780E+05	4.7408E+05	4.8512E+05	4.8867E+05	4.6814E+05	5.4333E+05	5.3745E+05
Pu-238	1.2556E+02	1.1817E+02	1.4318E+02	1.5025E+02	1.0313E+02	1.4313E+02	1.3240E+02
Pu-239	1.1956E+01	1.1924E+01	1.2124E+01	1.2057E+01	1.1809E+01	1.1357E+01	1.1329E+01
Pu-240	1.6791E+01	1.6422E+01	1.7865E+01	1.7820E+01	1.5631E+01	1.8658E+01	1.8250E+01
Pu-241	4.3439E+03	4.2637E+03	4.6295E+03	4.6156E+03	4.0709E+03	4.5911E+03	4.4965E+03
Am-241	6.9094E+00	6.6825E+00	8.0364E+00	7.2471E+00	5.9891E+00	6.5722E+00	6.5867E+00
Cm-242	1.3894E+03	1.3308E+03	1.5594E+03	1.6679E+03	1.2243E+03	1.7396E+03	1.6138E+03
Cm-244	1.2678E+02	1.1322E+02	1.5667E+02	1.8075E+02	8.7257E+01	2.3182E+02	1.9616E+02
cloudshine	2.6306E+04	2.5870E+04	2.7647E+04	2.7554E+04	2.4916E+04	2.7414E+04	2.6983E+04
Inhaled chronic	4.8051E+07	4.7118E+07	5.0848E+07	5.0759E+07	4.5149E+07	5.0140E+07	4.9091E+07
TEDE Dose	4.8077E+07	4.7144E+07	5.0876E+07	5.0786E+07	4.5174E+07	5.0167E+07	4.9118E+07
Fraction	1.5195	1.4900	1.6080	1.6051	1.4278	1.5856	1.5524

	40C2	40D2	40E2	40F2	CRAA	CRAB	CRBA
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt
Co-58	7.6281E+02	7.7372E+02	7.7549E+02	7.5481E+02	7.5657E+02	7.6574E+02	7.6706E+02
Co-60	8.6992E+02	9.5723E+02	9.4439E+02	8.2544E+02	8.0033E+02	8.9568E+02	8.3233E+02
Kr-85	3.3655E+02	3.6133E+02	3.5814E+02	3.2532E+02	3.6096E+02	3.4009E+02	3.7648E+02
Kr-85m	8.4071E+03	8.2871E+03	8.1013E+03	8.4759E+03	8.0930E+03	7.6901E+03	8.2339E+03
Kr-87	1.7155E+04	1.6951E+04	1.6508E+04	1.7354E+04	1.6514E+04	1.5629E+04	1.6797E+04
Kr-88	2.4036E+04	2.3708E+04	2.3130E+04	2.4301E+04	2.3127E+04	2.1798E+04	2.3500E+04
Rb-86	5.0528E+01	5.5644E+01	5.5163E+01	4.7524E+01	5.6953E+01	5.8313E+01	5.5814E+01
Sr-89	3.2993E+04	3.3319E+04	3.2020E+04	3.3256E+04	3.0917E+04	2.8884E+04	3.3379E+04
Sr-90	2.8592E+03	3.0525E+03	3.0623E+03	2.7603E+03	3.1039E+03	2.8978E+03	3.2403E+03
Sr-91	4.1168E+04	4.0610E+04	3.9656E+04	4.1566E+04	3.9640E+04	3.7654E+04	4.0271E+04
Sr-92	4.2088E+04	4.1646E+04	4.0864E+04	4.2432E+04	4.0830E+04	3.9044E+04	4.1358E+04
Y-90	3.1069E+03	3.3163E+03	3.3257E+03	2.9951E+03	3.3543E+03	3.1681E+03	3.5041E+03
Y-91	4.1560E+04	4.2261E+04	4.0694E+04	4.1780E+04	3.8785E+04	3.6620E+04	4.2149E+04
Y-92	4.2400E+04	4.1980E+04	4.1190E+04	4.2761E+04	4.1127E+04	3.9343E+04	4.1681E+04
Y-93	3.0705E+04	3.0450E+04	3.0021E+04	3.0914E+04	2.9963E+04	2.8917E+04	3.0299E+04
Zr-95	5.4886E+04	5.6766E+04	5.4851E+04	5.4721E+04	5.0470E+04	4.9288E+04	5.5086E+04
Zr-97	4.9717E+04	4.9591E+04	4.9548E+04	4.9794E+04	4.9365E+04	4.9092E+04	4.9529E+04
Nb-95	5.7005E+04	5.9875E+04	5.7187E+04	5.6720E+04	5.0614E+04	4.9550E+04	5.6497E+04
Mo-99	5.0870E+04	5.0856E+04	5.0875E+04	5.0924E+04	5.0814E+04	5.0565E+04	5.0986E+04
Tc-99m	4.5179E+04	4.5009E+04	4.5139E+04	4.5135E+04	4.5069E+04	4.4932E+04	4.5615E+04
Ru-103	4.4430E+04	4.6329E+04	4.5342E+04	4.3118E+04	4.1201E+04	4.3471E+04	4.2198E+04
Ru-105	2.9764E+04	3.0772E+04	3.0997E+04	2.9225E+04	2.7963E+04	3.0964E+04	2.7898E+04
Ru-106	1.7724E+04	1.9911E+04	1.8969E+04	1.6490E+04	1.5672E+04	1.7934E+04	1.5830E+04
Rh-105	2.7579E+04	2.8295E+04	2.8666E+04	2.7148E+04	2.5968E+04	2.8408E+04	2.5782E+04
Sb-127	2.3520E+03	2.4028E+03	2.4101E+03	2.3251E+03	2.2269E+03	2.3965E+03	2.2308E+03
Sb-129	8.6394E+03	8.7234E+03	8.7667E+03	8.6117E+03	8.4352E+03	8.7158E+03	8.4621E+03
Te-127	2.3402E+03	2.4170E+03	2.3914E+03	2.3000E+03	2.2228E+03	2.3918E+03	2.2259E+03
Te-127m	4.2005E+02	4.5012E+02	4.3306E+02	3.9997E+02	3.7161E+02	4.0023E+02	3.8324E+02
Te-129	8.2453E+03	8.3372E+03	8.3225E+03	8.1921E+03	8.0095E+03	8.2792E+03	8.0242E+03
Te-129m	1.7120E+03	1.7734E+03	1.7377E+03	1.6862E+03	1.6103E+03	1.6685E+03	1.6688E+03
Te-131m	4.9706E+03	5.0364E+03	5.0544E+03	4.9396E+03	4.7666E+03	5.0156E+03	4.7763E+03
Te-132	3.8314E+04	3.8231E+04	3.8414E+04	3.8151E+04	3.8088E+04	3.8194E+04	3.8218E+04
I-131	2.6807E+04	2.6878E+04	2.6943E+04	2.6754E+04	2.6449E+04	2.6662E+04	2.6856E+04
I-132	3.9156E+04	3.9130E+04	3.9285E+04	3.9123E+04	3.9029E+04	3.9247E+04	3.9210E+04
I-133	5.5926E+04	5.5920E+04	5.5876E+04	5.6044E+04	5.5808E+04	5.5571E+04	5.5860E+04
I-134	6.3275E+04	6.3147E+04	6.3014E+04	6.3425E+04	6.2926E+04	6.2270E+04	6.3172E+04
I-135	5.2951E+04	5.2983E+04	5.3117E+04	5.3087E+04	5.2878E+04	5.2753E+04	5.2928E+04
Xe-133	5.2972E+04	5.2992E+04	5.2956E+04	5.3010E+04	5.3720E+04	5.3524E+04	5.4878E+04
Xe-135	1.8308E+04	1.7564E+04	1.8027E+04	1.8670E+04	2.1504E+04	1.8264E+04	2.1368E+04
Cs-134	5.8408E+03	6.8401E+03	6.6893E+03	5.3142E+03	6.1864E+03	6.6446E+03	6.2985E+03
Cs-136	1.5209E+03	1.5981E+03	1.6849E+03	1.4692E+03	1.9187E+03	1.9005E+03	1.7954E+03
Cs-137	4.1403E+03	4.5221E+03	4.5564E+03	3.9354E+03	4.3290E+03	4.3197E+03	4.5202E+03

Ba-139	5.1583E+04	5.1453E+04	5.1287E+04	5.1733E+04	5.1138E+04	5.0492E+04	5.1423E+04
Ba-140	5.1127E+04	5.1249E+04	5.0901E+04	5.1190E+04	5.0344E+04	4.9754E+04	5.1892E+04
La-140	5.2739E+04	5.2832E+04	5.2650E+04	5.2656E+04	5.1130E+04	5.0641E+04	5.2888E+04
La-141	4.6967E+04	4.6795E+04	4.6640E+04	4.7073E+04	4.6533E+04	4.5965E+04	4.6746E+04
La-142	4.5630E+04	4.5439E+04	4.5201E+04	4.5800E+04	4.5130E+04	4.4384E+04	4.5334E+04
Ce-141	4.8588E+04	4.9780E+04	4.8543E+04	4.8488E+04	4.6022E+04	4.5390E+04	4.9322E+04
Ce-143	4.5354E+04	4.5086E+04	4.4738E+04	4.5517E+04	4.4685E+04	4.3694E+04	4.4977E+04
Ce-144	3.9203E+04	4.1712E+04	3.9948E+04	3.8725E+04	3.6423E+04	3.5328E+04	3.9656E+04
Pr-143	4.5465E+04	4.5475E+04	4.4959E+04	4.5659E+04	4.3089E+04	4.2056E+04	4.6261E+04
Nd-147	1.8539E+04	1.8562E+04	1.8531E+04	1.8562E+04	1.8371E+04	1.8215E+04	1.8824E+04
Np-239	5.3218E+05	5.4506E+05	5.4884E+05	5.2476E+05	4.9686E+05	5.5158E+05	4.9383E+05
Pu-238	1.2522E+02	1.4984E+02	1.5580E+02	1.1025E+02	1.4479E+02	1.4889E+02	1.5117E+02
Pu-239	1.1306E+01	1.1411E+01	1.1405E+01	1.1223E+01	1.1702E+01	1.1146E+01	1.1958E+01
Pu-240	1.7917E+01	1.9288E+01	1.9201E+01	1.7216E+01	1.6592E+01	1.7882E+01	1.7542E+01
Pu-241	4.4088E+03	4.7375E+03	4.7153E+03	4.2509E+03	4.2850E+03	4.3884E+03	4.5783E+03
Am-241	6.4261E+00	7.6240E+00	6.7824E+00	5.8233E+00	5.8306E+00	5.4728E+00	6.7536E+00
Cm-242	1.5540E+03	1.7858E+03	1.8709E+03	1.4403E+03	1.7003E+03	1.8768E+03	1.7411E+03
Cm-244	1.7634E+02	2.4012E+02	2.7313E+02	1.3801E+02	1.9796E+02	2.9316E+02	1.9071E+02
cloudshine	2.6526E+04	2.8402E+04	2.8266E+04	2.5534E+04	2.7534E+04	2.8152E+04	2.7831E+04
inhaled chronic	4.8125E+07	5.1978E+07	5.1883E+07	4.6080E+07	4.9327E+07	5.0347E+07	5.0772E+07
TEDE Dose	4.8152E+07	5.2006E+07	5.1911E+07	4.6105E+07	4.9355E+07	5.0375E+07	5.0800E+07
Fraction	1.5219	1.6437	1.6407	1.4572	1.5599	1.5921	1.6056

	CRBB	CRCA	CRCB	CRDA	CRDB		
	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt	Ci/MWt		
Co-58	7.7381E+02	7.9676E+02	8.0013E+02	7.3185E+02	7.4057E+02		
Co-60	9.3252E+02	8.7943E+02	9.8625E+02	6.6039E+02	7.4207E+02		
Kr-85	3.5481E+02	3.9627E+02	3.7180E+02	3.1593E+02	2.9986E+02		
Kr-85m	7.8216E+03	8.3363E+03	7.9679E+03	8.8432E+03	8.5114E+03		
Kr-87	1.5918E+04	1.7016E+04	1.6208E+04	1.8075E+04	1.7421E+04		
Kr-88	2.2257E+04	2.3815E+04	2.2658E+04	2.5377E+04	2.4418E+04		
Rb-86	5.7286E+01	5.7011E+01	5.9034E+01	4.3194E+01	4.4934E+01		
Sr-89	3.1210E+04	3.5707E+04	3.3293E+04	3.3496E+04	3.1864E+04		
Sr-90	3.0213E+03	3.4089E+03	3.1769E+03	2.6820E+03	2.5316E+03		
Sr-91	3.8405E+04	4.0764E+04	3.8931E+04	4.3261E+04	4.1697E+04		
Sr-92	3.9662E+04	4.1796E+04	4.0190E+04	4.3951E+04	4.2625E+04		
Y-90	3.2910E+03	3.6722E+03	3.4567E+03	2.8958E+03	2.7504E+03		
Y-91	3.9690E+04	4.5220E+04	4.2527E+04	4.1595E+04	3.9658E+04		
Y-92	3.9989E+04	4.2119E+04	4.0519E+04	4.4316E+04	4.2952E+04		
Y-93	2.9294E+04	3.0515E+04	2.9622E+04	3.1827E+04	3.1098E+04		
Zr-95	5.3813E+04	5.9702E+04	5.8246E+04	5.1889E+04	5.0875E+04		
Zr-97	4.9256E+04	4.9653E+04	4.9425E+04	4.9962E+04	4.9858E+04		
Nb-95	5.5176E+04	6.2342E+04	6.0839E+04	5.1937E+04	5.1092E+04		
Mo-99	5.0612E+04	5.1033E+04	5.0834E+04	5.1119E+04	5.1119E+04		
Tc-99m	4.5383E+04	4.5629E+04	4.5425E+04	4.5815E+04	4.5404E+04		
Ru-103	4.4643E+04	4.5977E+04	4.8774E+04	3.9450E+04	4.1548E+04		
Ru-105	3.1033E+04	2.8261E+04	3.1455E+04	2.5410E+04	2.8499E+04		
Ru-106	1.8149E+04	1.7072E+04	1.9695E+04	1.2899E+04	1.4920E+04		
Rh-105	2.8294E+04	2.5970E+04	2.8507E+04	2.3666E+04	2.6249E+04		
Sb-127	2.4052E+03	2.2536E+03	2.4299E+03	2.1032E+03	2.2801E+03		
Sb-129	8.7430E+03	8.5132E+03	8.7888E+03	8.2803E+03	8.5609E+03		
Te-127	2.4012E+03	2.2840E+03	2.4665E+03	2.1185E+03	2.2998E+03		
Te-127m	4.1533E+02	4.2651E+02	4.6272E+02	3.4855E+02	3.7782E+02		
Te-129	8.3013E+03	8.1098E+03	8.4012E+03	7.8361E+03	8.1129E+03		
Te-129m	1.7352E+03	1.8146E+03	1.8872E+03	1.5699E+03	1.6327E+03		
Te-131m	5.0281E+03	4.8115E+03	5.0686E+03	4.6014E+03	4.8606E+03		
Te-132	3.8250E+04	3.8264E+04	3.8391E+04	3.8037E+04	3.8194E+04		
I-131	2.7112E+04	2.7306E+04	2.7562E+04	2.6494E+04	2.6750E+04		
I-132	3.9463E+04	3.9283E+04	3.9464E+04	3.9048E+04	3.9319E+04		
I-133	5.5703E+04	5.5952E+04	5.5715E+04	5.6277E+04	5.6039E+04		
I-134	6.2517E+04	6.3232E+04	6.2858E+04	6.3941E+04	6.3518E+04		
I-135	5.2928E+04	5.3014E+04	5.2964E+04	5.3188E+04	5.2999E+04		
Xe-133	5.4551E+04	5.6100E+04	5.5707E+04	5.4358E+04	5.4162E+04		
Xe-135	1.8108E+04	2.0907E+04	1.7708E+04	2.2738E+04	1.9373E+04		
Cs-134	6.7933E+03	6.6694E+03	7.1917E+03	4.2426E+03	4.6121E+03		
Cs-136	1.7798E+03	1.7293E+03	1.7111E+03	1.4686E+03	1.4686E+03		
Cs-137	4.5108E+03	4.7919E+03	4.7857E+03	3.5327E+03	3.5327E+03		

Ba-139	5.0776E+04	5.1590E+04	5.1001E+04	5.2269E+04	5.1826E+04		
Ba-140	5.1301E+04	5.3572E+04	5.2928E+04	5.1324E+04	5.0798E+04		
La-140	5.2295E+04	5.4848E+04	5.4255E+04	5.1753E+04	5.1322E+04		
La-141	4.6199E+04	4.6875E+04	4.6433E+04	4.7582E+04	4.7137E+04		
La-142	4.4748E+04	4.5538E+04	4.4898E+04	4.6418E+04	4.5855E+04		
Ce-141	4.8479E+04	5.2726E+04	5.1883E+04	4.6857E+04	4.6381E+04		
Ce-143	4.3986E+04	4.5220E+04	4.4327E+04	4.6407E+04	4.5659E+04		
Ce-144	3.8451E+04	4.3643E+04	4.2317E+04	3.6308E+04	3.5349E+04		
Pr-143	4.5151E+04	4.7964E+04	4.6905E+04	4.5380E+04	4.4506E+04		
Nd-147	1.8668E+04	1.9339E+04	1.9151E+04	1.8601E+04	1.8461E+04		
Np-239	5.5211E+05	4.9840E+05	5.5833E+05	4.6293E+05	5.1802E+05		
Pu-238	1.5641E+02	1.6702E+02	1.7259E+02	8.1416E+01	8.8231E+01		
Pu-239	1.1339E+01	1.2186E+01	1.1469E+01	1.1439E+01	1.0959E+01		
Pu-240	1.8890E+01	1.8707E+01	2.0026E+01	1.3968E+01	1.5515E+01		
Pu-241	4.6642E+03	4.8799E+03	4.9593E+03	3.6186E+03	3.8335E+03		
Am-241	6.3071E+00	7.8861E+00	7.3183E+00	4.4945E+00	4.4541E+00		
Cm-242	1.9383E+03	1.8075E+03	2.0078E+03	1.0433E+03	1.2470E+03		
Cm-244	2.8569E+02	2.1060E+02	3.1650E+02	6.0693E+01	9.7622E+01		
cloudshine	2.8525E+04	2.8659E+04	2.9396E+04	2.3701E+04	2.4229E+04		
inhaled chronic	5.1848E+07	5.3296E+07	5.4461E+07	4.1873E+07	4.2728E+07		
TEDE Dose	5.1877E+07	5.3325E+07	5.4491E+07	4.1896E+07	4.2752E+07		
Fraction	1.6396	1.6854	1.7222	1.3242	1.3512		

ATTACHMENT J
NOBLE GAS COMPARISONS

Noble Gas Dose Fractions Assuming Infinite Exposure:							
POWER	2754	MWT					
	TID-14844	Decay Con	Half-Life	DCF	DCF	Dose	Dose
	Ci/MWT	1/sec	sec	sv-m3/bq-s	R-m3/ci-s	Rem-m3	Fraction
					3.70E+12		
XE-131M	2.595E+02	6.815E-07	1.017E+06	3.890E-16	1.439E-03	1.509E+09	8.566E-04
XE-133M	1.384E+03	3.663E-06	1.892E+05	1.370E-15	5.069E-03	5.275E+09	2.994E-03
XE-133	**5.622E+04**	**1.528E-06**	**4.536E+05**	**1.560E-15**	**5.772E-03**	**5.849E+11**	**3.319E-01**
XE-135M	1.557E+04	7.380E-04	9.392E+02	2.040E-14	7.548E-02	4.386E+09	2.489E-03
XE-135	**5.363E+04**	**2.115E-05**	**3.277E+04**	**1.190E-14**	**4.403E-02**	**3.075E+11**	**1.745E-01**
XE-138	4.775E+04	8.151E-04	8.504E+02	5.770E-14	2.135E-01	3.444E+10	1.955E-02
KR-83M	4.152E+03	1.052E-04	6.589E+03	1.500E-18	5.550E-06	6.033E+05	3.424E-07
KR-85M	**1.297E+04**	**4.297E-05**	**1.613E+04**	**7.480E-15**	**2.768E-02**	**2.301E+10**	**1.306E-02**
KR-85	**4.102E+02**	**2.054E-09**	**3.375E+08**	**1.190E-16**	**4.403E-04**	**2.422E+11**	**1.374E-01**
KR-87	**2.335E+04**	**1.514E-04**	**4.578E+03**	**4.120E-14**	**1.524E-01**	**6.475E+10**	**3.675E-02**
KR-88	**3.200E+04**	**6.731E-05**	**1.030E+04**	**1.020E-13**	**3.774E-01**	**4.941E+11**	**2.804E-01**
						1.762E+12	1.000E+00

Noble Gas Dose Fractions Assuming 30 Day Exposure:							
POWER	2754	MWT					
	TID-14844	Decay Con	Half-Life	DCF	DCF	Dose	Dose
	Ci/MWT	1/sec	sec	sv-m3/bq-s	R-m3/ci-s	Rem-m3	Fraction
					3.70E+12		
XE-131M	2.595E+02	6.815E-07	1.017E+06	3.890E-16	1.439E-03	1.251E+09	8.289E-04
XE-133M	1.384E+03	3.663E-06	1.892E+05	1.370E-15	5.069E-03	5.274E+09	3.493E-03
XE-133	**5.622E+04**	**1.528E-06**	**4.536E+05**	**1.560E-15**	**5.772E-03**	**5.737E+11**	**3.800E-01**
XE-135M	1.557E+04	7.380E-04	9.392E+02	2.040E-14	7.548E-02	4.386E+09	2.905E-03
XE-135	**5.363E+04**	**2.115E-05**	**3.277E+04**	**1.190E-14**	**4.403E-02**	**3.075E+11**	**2.037E-01**
XE-138	4.775E+04	8.151E-04	8.504E+02	5.770E-14	2.135E-01	3.444E+10	2.281E-02
KR-83M	4.152E+03	1.052E-04	6.589E+03	1.500E-18	5.550E-06	6.033E+05	3.996E-07
KR-85M	**1.297E+04**	**4.297E-05**	**1.613E+04**	**7.480E-15**	**2.768E-02**	**2.301E+10**	**1.524E-02**
KR-85	**4.102E+02**	**2.054E-09**	**3.375E+08**	**1.190E-16**	**4.403E-04**	**1.286E+09**	**8.517E-04**
KR-87	**2.335E+04**	**1.514E-04**	**4.578E+03**	**4.120E-14**	**1.524E-01**	**6.475E+10**	**4.289E-02**
KR-88	**3.200E+04**	**6.731E-05**	**1.030E+04**	**1.020E-13**	**3.774E-01**	**4.941E+11**	**3.273E-01**
						1.510E+12	1.000E+00

ATTACHMENT K
CRCB BURNUP STEP COMPARISONS

CRCB Burnup Step Comparisons with Total Activities								
Assms/Power	0.0003631							
(Rem/Ci)/(Sv/Bq)	3.70E+12							
BR(m3/s)	3.50E-04							
Vcr(cf-m3)	289194	8189.06						
f	0.059784							
	FGR 12	FGR 11	Release					
	Table 2.1	Table 2.1	Fraction					
	CLOUD	INHALED						
	SHINE	CHRONIC						
Burnup(EFPD)	Sv-m^3/Bq-s	Sv/Bq		46.2	92.4	138.6	184.8	230.9
Co-58	4.76E-14	2.94E-09	0.0025	6.08E+03	8.48E+03	9.45E+03	9.88E+03	1.01E+04
Co-60	1.26E-13	5.91E-08	0.0025	6.30E+02	1.25E+03	1.87E+03	2.47E+03	3.07E+03
Kr-85	1.19E-16	0.00E+00	1.0000	3.09E+02	6.07E+02	8.94E+02	1.17E+03	1.44E+03
Kr-85m	7.48E-15	0.00E+00	1.0000	1.74E+05	1.68E+05	1.63E+05	1.58E+05	1.54E+05
Kr-87	4.12E-14	0.00E+00	1.0000	3.58E+05	3.43E+05	3.33E+05	3.23E+05	3.13E+05
Kr-88	1.02E-13	0.00E+00	1.0000	5.03E+05	4.84E+05	4.69E+05	4.55E+05	4.41E+05
Rb-86	4.81E-15	1.79E-09	0.3000	2.46E+01	6.65E+01	1.11E+02	1.57E+02	2.02E+02
Sr-89	7.73E-17	1.12E-08	0.0200	3.28E+05	4.91E+05	5.66E+05	5.97E+05	6.02E+05
Sr-90	7.53E-18	3.51E-07	0.0200	2.55E+03	4.99E+03	7.34E+03	9.60E+03	1.18E+04
Sr-91	4.92E-14	4.55E-10	0.0200	8.48E+05	8.18E+05	7.95E+05	7.72E+05	7.52E+05
Sr-92	6.79E-14	2.18E-10	0.0200	8.51E+05	8.26E+05	8.04E+05	7.85E+05	7.68E+05
Y-90	1.90E-16	2.28E-09	0.0002	3.15E+03	5.76E+03	8.27E+03	1.07E+04	1.31E+04
Y-91	2.60E-16	1.32E-08	0.0002	3.57E+05	5.56E+05	6.61E+05	7.10E+05	7.32E+05
Y-92	1.30E-14	2.11E-10	0.0002	8.58E+05	8.32E+05	8.11E+05	7.92E+05	7.74E+05
Y-93	4.80E-15	5.82E-10	0.0002	6.05E+05	5.93E+05	5.81E+05	5.68E+05	5.59E+05
Zr-95	3.60E-14	6.39E-09	0.0002	3.89E+05	6.20E+05	7.56E+05	8.33E+05	8.74E+05
Zr-97	4.43E-14	1.17E-09	0.0002	9.00E+05	8.96E+05	8.91E+05	8.86E+05	8.84E+05
Nb-95	3.74E-14	1.57E-09	0.0002	1.44E+05	3.77E+05	5.74E+05	7.10E+05	8.00E+05
Mo-99	7.28E-15	1.07E-09	0.0025	9.17E+05	9.13E+05	9.13E+05	9.08E+05	9.08E+05
Tc-99m	5.89E-15	8.80E-12	0.0025	8.14E+05	8.08E+05	8.08E+05	8.08E+05	8.03E+05
Ru-103	2.25E-14	2.42E-09	0.0025	2.80E+05	4.19E+05	4.96E+05	5.42E+05	5.72E+05
Ru-105	3.81E-14	1.23E-10	0.0025	2.09E+05	2.41E+05	2.68E+05	2.93E+05	3.16E+05
Ru-106	1.04E-14	1.29E-07	0.0025	7.82E+03	1.75E+04	2.87E+04	4.07E+04	5.37E+04
Rh-105	3.72E-15	2.58E-10	0.0025	1.87E+05	2.17E+05	2.42E+05	2.64E+05	2.84E+05
Sb-127	3.33E-14	1.63E-09	0.0500	2.13E+04	2.39E+04	2.61E+04	2.79E+04	2.95E+04
Sb-129	7.14E-14	1.74E-10	0.0500	1.20E+05	1.25E+05	1.29E+05	1.32E+05	1.35E+05
Te-127	2.42E-16	8.60E-11	0.0500	1.85E+04	2.14E+04	2.39E+04	2.60E+04	2.78E+04
Te-127m	1.47E-16	5.81E-09	0.0500	7.97E+02	1.61E+03	2.31E+03	2.92E+03	3.45E+03
Te-129	2.75E-15	2.09E-11	0.0500	1.08E+05	1.15E+05	1.20E+05	1.24E+05	1.27E+05
Te-129m	3.34E-15	6.48E-09	0.0500	1.33E+04	1.92E+04	2.20E+04	2.36E+04	2.45E+04
Te-131m	7.46E-14	1.76E-09	0.0500	5.69E+04	6.13E+04	6.49E+04	6.78E+04	7.04E+04

Te-132	1.03E-14	2.55E-09	0.0500	6.57E+05	6.61E+05	6.65E+05	6.69E+05	6.69E+05
I-131	1.82E-14	8.89E-09	0.4000	4.32E+05	4.47E+05	4.52E+05	4.55E+05	4.58E+05
I-132	1.12E-13	1.03E-10	0.4000	6.64E+05	6.69E+05	6.75E+05	6.79E+05	6.82E+05
I-133	2.94E-14	1.58E-09	0.4000	1.01E+06	1.01E+06	1.00E+06	1.00E+06	9.99E+05
I-134	1.30E-13	3.55E-11	0.4000	1.16E+06	1.15E+06	1.14E+06	1.14E+06	1.13E+06
I-135	8.29E-14	3.32E-10	0.4000	9.49E+05	9.49E+05	9.45E+05	9.45E+05	9.45E+05
Xe-133	1.56E-15	0.00E+00	1.0000	9.49E+05	9.49E+05	9.49E+05	9.47E+05	9.47E+05
Xe-135	1.19E-14	0.00E+00	1.0000	2.77E+05	2.78E+05	2.78E+05	2.77E+05	2.75E+05
Cs-134	7.57E-14	1.25E-08	0.3000	2.03E+02	9.48E+02	2.22E+03	3.97E+03	6.19E+03
Cs-136	1.06E-13	1.98E-09	0.3000	1.58E+03	2.96E+03	4.25E+03	5.50E+03	6.70E+03
Cs-137	2.73E-14	8.63E-09	0.3000	2.74E+03	5.48E+03	8.21E+03	1.09E+04	1.36E+04
Ba-139	2.17E-15	4.64E-11	0.0200	9.54E+05	9.45E+05	9.36E+05	9.29E+05	9.25E+05
Ba-140	8.58E-15	1.01E-09	0.0200	8.63E+05	9.25E+05	9.24E+05	9.17E+05	9.12E+05
La-140	1.17E-13	1.31E-09	0.0002	8.56E+05	9.26E+05	9.26E+05	9.26E+05	9.18E+05
La-141	2.39E-15	1.57E-10	0.0002	8.68E+05	8.60E+05	8.52E+05	8.44E+05	8.44E+05
La-142	1.44E-13	6.84E-11	0.0002	8.53E+05	8.43E+05	8.34E+05	8.26E+05	8.20E+05
Ce-141	3.43E-15	2.42E-09	0.0005	5.38E+05	7.35E+05	8.08E+05	8.28E+05	8.36E+05
Ce-143	1.29E-14	9.16E-10	0.0005	8.63E+05	8.49E+05	8.37E+05	8.26E+05	8.16E+05
Ce-144	2.77E-15	1.01E-07	0.0005	8.58E+04	1.61E+05	2.27E+05	2.84E+05	3.34E+05
Pr-143	2.10E-17	2.19E-09	0.0002	7.77E+05	8.45E+05	8.40E+05	8.30E+05	8.20E+05
Nd-147	6.19E-15	1.85E-09	0.0002	3.19E+05	3.34E+05	3.32E+05	3.31E+05	3.29E+05
Np-239	7.69E-15	6.78E-10	0.0005	7.38E+06	7.49E+06	7.54E+06	7.65E+06	7.76E+06
Pu-238	4.88E-18	7.79E-05	0.0005	6.24E-01	3.93E+00	1.12E+01	2.35E+01	4.16E+01
Pu-239	4.24E-18	8.33E-05	0.0005	2.27E+01	4.31E+01	6.01E+01	7.45E+01	8.67E+01
Pu-240	4.75E-18	8.33E-05	0.0005	2.97E+00	1.05E+01	2.06E+01	3.23E+01	4.49E+01
Pu-241	7.25E-20	1.34E-06	0.0005	1.27E+02	8.77E+02	2.44E+03	4.77E+03	7.70E+03
Am-241	8.18E-16	1.20E-04	0.0002	6.28E-03	8.93E-02	3.81E-01	1.01E+00	2.06E+00
Cm-242	5.69E-18	4.67E-06	0.0002	1.07E-01	3.13E+00	2.02E+01	7.12E+01	1.81E+02
Cm-244	4.91E-18	6.70E-05	0.0002	1.18E-04	7.51E-03	7.87E-02	3.97E-01	1.36E+00
cloudshine				2.080E-03	2.055E-03	2.034E-03	2.014E-03	1.996E-03
inhaled chronic				1.486E-01	1.561E-01	1.603E-01	1.637E-01	1.668E-01
TEDE Dose				1.506E-01	1.581E-01	1.624E-01	1.657E-01	1.688E-01
CRCB	39.429							
Cycle 1	1.966E-01	72	14.1582					
Cycle 2	1.821E-01	72	13.1098					
Cycle 3	1.513E-01	73	11.0423					
			38.3103	0.9716				

Burnup	277.1	323.3	369.5	415.7	461.9	508.1	554.3	600.5
Co-58	1.02E+04	1.03E+04	1.04E+04	1.04E+04	1.05E+04	1.05E+04	1.06E+04	1.06E+04
Co-60	3.68E+03	4.28E+03	4.87E+03	5.46E+03	6.05E+03	6.64E+03	7.20E+03	7.81E+03
Kr-85	1.70E+03	1.95E+03	2.19E+03	2.42E+03	2.65E+03	2.87E+03	3.08E+03	3.29E+03
Kr-85m	1.50E+05	1.47E+05	1.43E+05	1.41E+05	1.37E+05	1.34E+05	1.32E+05	1.29E+05
Kr-87	3.06E+05	2.99E+05	2.91E+05	2.84E+05	2.79E+05	2.71E+05	2.67E+05	2.59E+05
Kr-88	4.29E+05	4.18E+05	4.08E+05	3.97E+05	3.88E+05	3.79E+05	3.70E+05	3.61E+05
Rb-86	2.49E+02	2.95E+02	3.41E+02	3.88E+02	4.35E+02	4.82E+02	5.29E+02	5.78E+02
Sr-89	6.00E+05	5.89E+05	5.76E+05	5.64E+05	5.51E+05	5.35E+05	5.22E+05	5.09E+05
Sr-90	1.39E+04	1.60E+04	1.80E+04	1.99E+04	2.18E+04	2.36E+04	2.53E+04	2.70E+04
Sr-91	7.36E+05	7.16E+05	6.99E+05	6.86E+05	6.70E+05	6.57E+05	6.43E+05	6.27E+05
Sr-92	7.52E+05	7.37E+05	7.22E+05	7.08E+05	6.95E+05	6.82E+05	6.71E+05	6.58E+05
Y-90	1.54E+04	1.77E+04	1.98E+04	2.19E+04	2.40E+04	2.60E+04	2.79E+04	2.99E+04
Y-91	7.35E+05	7.30E+05	7.21E+05	7.08E+05	6.94E+05	6.81E+05	6.65E+05	6.52E+05
Y-92	7.58E+05	7.42E+05	7.28E+05	7.14E+05	7.00E+05	6.88E+05	6.76E+05	6.63E+05
Y-93	5.50E+05	5.41E+05	5.32E+05	5.22E+05	5.16E+05	5.07E+05	5.01E+05	4.95E+05
Zr-95	8.96E+05	9.06E+05	9.09E+05	9.05E+05	9.02E+05	8.94E+05	8.89E+05	8.81E+05
Zr-97	8.79E+05	8.76E+05	8.73E+05	8.70E+05	8.68E+05	8.63E+05	8.60E+05	8.57E+05
Nb-95	8.51E+05	8.83E+05	8.96E+05	9.01E+05	9.02E+05	8.99E+05	8.96E+05	8.89E+05
Mo-99	9.08E+05	9.03E+05	9.03E+05	9.03E+05	8.98E+05	8.98E+05	8.98E+05	8.94E+05
Tc-99m	8.03E+05	8.03E+05	8.03E+05	7.98E+05	7.98E+05	7.98E+05	7.98E+05	7.98E+05
Ru-103	5.95E+05	6.15E+05	6.29E+05	6.45E+05	6.58E+05	6.72E+05	6.85E+05	6.95E+05
Ru-105	3.36E+05	3.55E+05	3.73E+05	3.90E+05	4.07E+05	4.23E+05	4.38E+05	4.53E+05
Ru-106	6.70E+04	8.10E+04	9.51E+04	1.10E+05	1.24E+05	1.39E+05	1.53E+05	1.68E+05
Rh-105	3.03E+05	3.20E+05	3.36E+05	3.51E+05	3.65E+05	3.79E+05	3.92E+05	4.05E+05
Sb-127	3.09E+04	3.22E+04	3.33E+04	3.43E+04	3.54E+04	3.64E+04	3.71E+04	3.77E+04
Sb-129	1.37E+05	1.39E+05	1.41E+05	1.42E+05	1.45E+05	1.46E+05	1.47E+05	1.48E+05
Te-127	2.95E+04	3.09E+04	3.22E+04	3.33E+04	3.43E+04	3.53E+04	3.63E+04	3.73E+04
Te-127m	3.92E+03	4.31E+03	4.67E+03	4.98E+03	5.26E+03	5.51E+03	5.73E+03	5.93E+03
Te-129	1.29E+05	1.31E+05	1.33E+05	1.35E+05	1.36E+05	1.38E+05	1.39E+05	1.40E+05
Te-129m	2.53E+04	2.58E+04	2.63E+04	2.67E+04	2.71E+04	2.74E+04	2.78E+04	2.81E+04
Te-131m	7.26E+04	7.46E+04	7.63E+04	7.79E+04	7.93E+04	8.06E+04	8.18E+04	8.29E+04
Te-132	6.73E+05	6.73E+05	6.77E+05	6.77E+05	6.77E+05	6.77E+05	6.77E+05	6.81E+05
I-131	4.61E+05	4.65E+05	4.66E+05	4.68E+05	4.69E+05	4.71E+05	4.71E+05	4.73E+05
I-132	6.85E+05	6.86E+05	6.89E+05	6.90E+05	6.91E+05	6.91E+05	6.93E+05	6.94E+05
I-133	9.98E+05	9.96E+05	9.95E+05	9.92E+05	9.90E+05	9.88E+05	9.87E+05	9.85E+05
I-134	1.13E+06	1.12E+06	1.12E+06	1.11E+06	1.11E+06	1.10E+06	1.10E+06	1.10E+06
I-135	9.40E+05	9.40E+05	9.40E+05	9.40E+05	9.40E+05	9.35E+05	9.35E+05	9.35E+05
Xe-133	9.44E+05	9.44E+05	9.42E+05	9.42E+05	9.39E+05	9.39E+05	9.37E+05	9.37E+05
Xe-135	2.71E+05	2.68E+05	2.64E+05	2.59E+05	2.54E+05	2.49E+05	2.44E+05	2.38E+05
Cs-134	8.84E+03	1.19E+04	1.53E+04	1.91E+04	2.32E+04	2.75E+04	3.24E+04	3.73E+04
Cs-136	7.89E+03	9.06E+03	1.02E+04	1.14E+04	1.25E+04	1.37E+04	1.49E+04	1.61E+04
Cs-137	1.64E+04	1.91E+04	2.17E+04	2.44E+04	2.70E+04	2.98E+04	3.24E+04	3.51E+04
Ba-139	9.18E+05	9.14E+05	9.07E+05	9.03E+05	8.98E+05	8.94E+05	8.89E+05	8.87E+05
Ba-140	9.05E+05	9.01E+05	8.96E+05	8.92E+05	8.88E+05	8.84E+05	8.80E+05	8.77E+05
La-140	9.11E+05	9.11E+05	9.03E+05	9.03E+05	9.03E+05	8.95E+05	8.95E+05	8.95E+05
La-141	8.36E+05	8.36E+05	8.28E+05	8.20E+05	8.20E+05	8.12E+05	8.12E+05	8.04E+05

La-142	8.14E+05	8.08E+05	8.02E+05	7.96E+05	7.92E+05	7.86E+05	7.82E+05	7.75E+05
Ce-141	8.32E+05	8.28E+05	8.24E+05	8.20E+05	8.16E+05	8.12E+05	8.08E+05	8.04E+05
Ce-143	8.07E+05	7.99E+05	7.91E+05	7.84E+05	7.77E+05	7.70E+05	7.64E+05	7.57E+05
Ce-144	3.77E+05	4.15E+05	4.48E+05	4.77E+05	5.00E+05	5.23E+05	5.41E+05	5.60E+05
Pr-143	8.10E+05	8.02E+05	7.94E+05	7.86E+05	7.80E+05	7.73E+05	7.66E+05	7.59E+05
Nd-147	3.27E+05	3.26E+05	3.25E+05	3.24E+05	3.24E+05	3.22E+05	3.21E+05	3.20E+05
Np-239	7.87E+06	7.99E+06	8.10E+06	8.21E+06	8.26E+06	8.37E+06	8.54E+06	8.65E+06
Pu-238	6.61E+01	9.79E+01	1.38E+02	1.86E+02	2.42E+02	3.07E+02	3.81E+02	4.65E+02
Pu-239	9.69E+01	1.05E+02	1.13E+02	1.18E+02	1.23E+02	1.27E+02	1.30E+02	1.33E+02
Pu-240	5.84E+01	7.20E+01	8.62E+01	9.98E+01	1.14E+02	1.28E+02	1.41E+02	1.54E+02
Pu-241	1.11E+04	1.48E+04	1.86E+04	2.26E+04	2.66E+04	3.03E+04	3.40E+04	3.78E+04
Am-241	3.57E+00	5.56E+00	8.00E+00	1.08E+01	1.41E+01	1.75E+01	2.13E+01	2.51E+01
Cm-242	3.76E+02	6.82E+02	1.12E+03	1.70E+03	2.45E+03	3.35E+03	4.43E+03	5.66E+03
Cm-244	3.64E+00	8.20E+00	1.64E+01	3.00E+01	5.10E+01	8.16E+01	1.25E+02	1.83E+02
Cloudshine	1.978E-03	1.963E-03	1.950E-03	1.933E-03	1.921E-03	1.905E-03	1.894E-03	1.881E-03
Inhalation	1.699E-01	1.731E-01	1.759E-01	1.787E-01	1.816E-01	1.845E-01	1.873E-01	1.904E-01
TEDE Dose	1.719E-01	1.750E-01	1.778E-01	1.806E-01	1.835E-01	1.864E-01	1.892E-01	1.923E-01

Burnup	646.7	668.3	702.7	767.4	832.0	896.7	961.4	1026.0
Co-58	1.06E+04	1.06E+04	1.01E+04	9.78E+03	9.71E+03	9.71E+03	9.71E+03	9.71E+03
Co-60	8.42E+03	8.69E+03	8.96E+03	9.50E+03	9.98E+03	1.05E+04	1.10E+04	1.15E+04
Kr-85	3.50E+03	3.57E+03	3.67E+03	3.87E+03	4.03E+03	4.17E+03	4.33E+03	4.47E+03
Kr-85m	1.26E+05	1.25E+05	8.75E+04	8.54E+04	8.40E+04	8.19E+04	7.98E+04	7.84E+04
Kr-87	2.54E+05	2.52E+05	1.77E+05	1.72E+05	1.68E+05	1.64E+05	1.60E+05	1.57E+05
Kr-88	3.53E+05	3.49E+05	2.45E+05	2.38E+05	2.33E+05	2.27E+05	2.22E+05	2.16E+05
Rb-86	6.26E+02	6.51E+02	5.62E+02	5.61E+02	5.94E+02	6.30E+02	6.67E+02	7.07E+02
Sr-89	4.99E+05	4.91E+05	4.32E+05	3.70E+05	3.39E+05	3.21E+05	3.10E+05	3.00E+05
Sr-90	2.88E+04	2.95E+04	3.04E+04	3.20E+04	3.34E+04	3.48E+04	3.61E+04	3.75E+04
Sr-91	6.14E+05	6.10E+05	4.29E+05	4.19E+05	4.09E+05	3.99E+05	3.93E+05	3.83E+05
Sr-92	6.47E+05	6.42E+05	4.52E+05	4.44E+05	4.35E+05	4.28E+05	4.20E+05	4.13E+05
Y-90	3.17E+04	3.26E+04	3.30E+04	3.46E+04	3.62E+04	3.78E+04	3.93E+04	4.09E+04
Y-91	6.39E+05	6.32E+05	5.65E+05	4.89E+05	4.49E+05	4.24E+05	4.09E+05	3.97E+05
Y-92	6.52E+05	6.46E+05	4.56E+05	4.47E+05	4.38E+05	4.30E+05	4.22E+05	4.15E+05
Y-93	4.86E+05	4.82E+05	3.41E+05	3.35E+05	3.32E+05	3.26E+05	3.23E+05	3.16E+05
Zr-95	8.74E+05	8.70E+05	7.90E+05	6.97E+05	6.49E+05	6.22E+05	6.05E+05	5.95E+05
Zr-97	8.54E+05	8.55E+05	6.12E+05	6.09E+05	6.08E+05	6.05E+05	6.03E+05	6.02E+05
Nb-95	8.82E+05	8.79E+05	8.52E+05	7.64E+05	6.91E+05	6.49E+05	6.22E+05	6.07E+05
Mo-99	8.94E+05	8.94E+05	6.37E+05	6.37E+05	6.37E+05	6.32E+05	6.32E+05	6.32E+05
Tc-99m	7.93E+05	8.14E+05	5.68E+05	5.63E+05	5.63E+05	5.63E+05	5.63E+05	5.63E+05
Ru-103	7.08E+05	7.12E+05	6.25E+05	5.59E+05	5.45E+05	5.45E+05	5.49E+05	5.55E+05
Ru-105	4.67E+05	4.75E+05	3.47E+05	3.57E+05	3.67E+05	3.77E+05	3.87E+05	3.96E+05
Ru-106	1.83E+05	1.89E+05	1.94E+05	2.02E+05	2.11E+05	2.20E+05	2.29E+05	2.37E+05
Rh-105	4.17E+05	4.15E+05	3.14E+05	3.34E+05	3.43E+05	3.51E+05	3.59E+05	3.67E+05
Sb-127	3.88E+04	3.91E+04	2.82E+04	2.87E+04	2.93E+04	2.98E+04	3.03E+04	3.07E+04
Sb-129	1.50E+05	1.50E+05	1.08E+05	1.08E+05	1.09E+05	1.10E+05	1.10E+05	1.11E+05
Te-127	3.80E+04	3.93E+04	2.95E+04	2.92E+04	2.94E+04	2.97E+04	3.01E+04	3.05E+04
Te-127m	6.12E+03	6.21E+03	6.00E+03	5.64E+03	5.45E+03	5.34E+03	5.31E+03	5.31E+03
Te-129	1.42E+05	1.42E+05	1.05E+05	1.03E+05	1.04E+05	1.04E+05	1.05E+05	1.06E+05
Te-129m	2.83E+04	2.85E+04	2.44E+04	2.17E+04	2.11E+04	2.11E+04	2.12E+04	2.13E+04
Te-131m	8.40E+04	8.45E+04	6.07E+04	6.17E+04	6.24E+04	6.31E+04	6.37E+04	6.43E+04
Te-132	6.81E+05	6.81E+05	4.85E+05	4.85E+05	4.85E+05	4.85E+05	4.85E+05	4.85E+05
I-131	4.74E+05	4.74E+05	3.46E+05	3.36E+05	3.36E+05	3.38E+05	3.38E+05	3.38E+05
I-132	6.94E+05	7.00E+05	4.98E+05	4.96E+05	4.96E+05	4.96E+05	4.98E+05	4.98E+05
I-133	9.84E+05	9.78E+05	6.99E+05	6.99E+05	6.98E+05	6.98E+05	6.96E+05	6.95E+05
I-134	1.09E+06	1.09E+06	7.79E+05	7.76E+05	7.72E+05	7.69E+05	7.69E+05	7.65E+05
I-135	9.35E+05	9.35E+05	6.68E+05	6.68E+05	6.63E+05	6.63E+05	6.63E+05	6.63E+05
Xe-133	9.34E+05	9.81E+05	7.05E+05	6.68E+05	6.65E+05	6.65E+05	6.63E+05	6.63E+05
Xe-135	2.32E+05	2.31E+05	2.15E+05	2.11E+05	2.07E+05	2.03E+05	1.99E+05	1.94E+05
Cs-134	4.26E+04	4.50E+04	4.78E+04	5.32E+04	5.87E+04	6.43E+04	7.00E+04	7.57E+04
Cs-136	1.73E+04	1.79E+04	1.46E+04	1.49E+04	1.60E+04	1.71E+04	1.83E+04	1.94E+04
Cs-137	3.77E+04	3.89E+04	4.03E+04	4.28E+04	4.54E+04	4.79E+04	5.05E+04	5.30E+04
Ba-139	8.82E+05	8.80E+05	6.26E+05	6.24E+05	6.20E+05	6.17E+05	6.15E+05	6.13E+05
Ba-140	8.73E+05	8.71E+05	6.58E+05	6.18E+05	6.15E+05	6.11E+05	6.09E+05	6.07E+05
La-140	8.95E+05	8.87E+05	6.78E+05	6.34E+05	6.31E+05	6.30E+05	6.29E+05	6.27E+05
La-141	8.03E+05	8.02E+05	5.71E+05	5.67E+05	5.64E+05	5.62E+05	5.59E+05	5.56E+05

La-142	7.71E+05	7.69E+05	5.47E+05	5.43E+05	5.39E+05	5.37E+05	5.33E+05	5.31E+05
Ce-141	8.00E+05	8.00E+05	6.79E+05	5.95E+05	5.71E+05	5.63E+05	5.59E+05	5.55E+05
Ce-143	7.50E+05	7.48E+05	5.31E+05	5.26E+05	5.21E+05	5.18E+05	5.14E+05	5.09E+05
Ce-144	5.69E+05	5.78E+05	5.69E+05	5.55E+05	5.41E+05	5.32E+05	5.23E+05	5.14E+05
Pr-143	7.53E+05	7.50E+05	5.73E+05	5.12E+05	5.05E+05	5.01E+05	4.98E+05	4.94E+05
Nd-147	3.20E+05	3.19E+05	2.38E+05	2.27E+05	2.27E+05	2.26E+05	2.26E+05	2.26E+05
Np-239	8.76E+06	8.87E+06	6.71E+06	6.82E+06	6.88E+06	6.93E+06	7.04E+06	7.10E+06
Pu-238	5.55E+02	6.04E+02	6.65E+02	7.87E+02	9.18E+02	1.06E+03	1.20E+03	1.36E+03
Pu-239	1.34E+02	1.35E+02	1.37E+02	1.40E+02	1.41E+02	1.42E+02	1.43E+02	1.43E+02
Pu-240	1.67E+02	1.73E+02	1.79E+02	1.90E+02	2.01E+02	2.12E+02	2.23E+02	2.32E+02
Pu-241	4.12E+04	4.27E+04	4.47E+04	4.82E+04	5.14E+04	5.44E+04	5.69E+04	5.91E+04
Am-241	2.90E+01	3.08E+01	3.47E+01	4.19E+01	4.88E+01	5.53E+01	6.14E+01	6.71E+01
Cm-242	7.06E+03	7.77E+03	8.34E+03	9.79E+03	1.16E+04	1.36E+04	1.58E+04	1.81E+04
Cm-244	2.61E+02	3.04E+02	3.64E+02	4.96E+02	6.60E+02	8.60E+02	1.10E+03	1.38E+03
cloudshine	1.871E-03	1.868E-03	1.339E-03	1.327E-03	1.317E-03	1.309E-03	1.304E-03	1.296E-03
Inhalation	1.936E-01	1.948E-01	1.541E-01	1.540E-01	1.565E-01	1.596E-01	1.626E-01	1.655E-01
TEDE Dose	1.955E-01	1.966E-01	1.554E-01	1.554E-01	1.579E-01	1.609E-01	1.639E-01	1.668E-01

Burnup	1090.7	1155.4	1220.1	1284.7	1336.6	1358.0	1465.7	1573.5
Co-58	9.71E+03	9.71E+03	9.69E+03	9.69E+03	9.73E+03	9.18E+03	8.09E+03	7.90E+03
Co-60	1.20E+04	1.25E+04	1.30E+04	1.35E+04	1.39E+04	1.40E+04	1.43E+04	1.45E+04
Kr-85	4.63E+03	4.77E+03	4.90E+03	5.04E+03	5.14E+03	5.14E+03	5.20E+03	5.27E+03
Kr-85m	7.70E+04	7.49E+04	7.35E+04	7.21E+04	7.07E+04	4.21E+04	4.11E+04	4.03E+04
Kr-87	1.53E+05	1.50E+05	1.46E+05	1.43E+05	1.41E+05	8.39E+04	8.17E+04	8.00E+04
Kr-88	2.11E+05	2.05E+05	2.01E+05	1.96E+05	1.92E+05	1.15E+05	1.11E+05	1.09E+05
Rb-86	7.42E+02	7.77E+02	8.12E+02	8.54E+02	8.89E+02	7.21E+02	5.96E+02	6.14E+02
Sr-89	2.92E+05	2.84E+05	2.77E+05	2.69E+05	2.64E+05	2.36E+05	1.70E+05	1.52E+05
Sr-90	3.89E+04	4.01E+04	4.13E+04	4.24E+04	4.34E+04	4.35E+04	4.45E+04	4.54E+04
Sr-91	3.76E+05	3.66E+05	3.60E+05	3.53E+05	3.46E+05	2.07E+05	2.02E+05	1.98E+05
Sr-92	4.05E+05	3.98E+05	3.91E+05	3.85E+05	3.79E+05	2.27E+05	2.23E+05	2.19E+05
Y-90	4.23E+04	4.37E+04	4.50E+04	4.64E+04	4.74E+04	4.66E+04	4.77E+04	4.87E+04
Y-91	3.86E+05	3.77E+05	3.71E+05	3.62E+05	3.55E+05	3.24E+05	2.37E+05	2.10E+05
Y-92	4.08E+05	4.01E+05	3.94E+05	3.87E+05	3.82E+05	2.28E+05	2.24E+05	2.20E+05
Y-93	3.13E+05	3.10E+05	3.05E+05	3.01E+05	2.98E+05	1.78E+05	1.75E+05	1.73E+05
Zr-95	5.88E+05	5.82E+05	5.76E+05	5.72E+05	5.69E+05	5.21E+05	3.94E+05	3.53E+05
Zr-97	5.99E+05	5.97E+05	5.96E+05	5.94E+05	5.93E+05	3.57E+05	3.56E+05	3.56E+05
Nb-95	5.96E+05	5.89E+05	5.82E+05	5.75E+05	5.72E+05	5.64E+05	4.41E+05	3.73E+05
Mo-99	6.32E+05	6.32E+05	6.27E+05	6.27E+05	6.27E+05	3.77E+05	3.75E+05	3.75E+05
Tc-99m	5.63E+05	5.58E+05	5.58E+05	5.58E+05	5.58E+05	3.44E+05	3.34E+05	3.34E+05
Ru-103	5.62E+05	5.69E+05	5.72E+05	5.79E+05	5.82E+05	5.12E+05	3.79E+05	3.62E+05
Ru-105	4.04E+05	4.13E+05	4.21E+05	4.29E+05	4.36E+05	2.63E+05	2.67E+05	2.72E+05
Ru-106	2.46E+05	2.55E+05	2.64E+05	2.73E+05	2.79E+05	2.77E+05	2.65E+05	2.56E+05
Rh-105	3.75E+05	3.82E+05	3.89E+05	3.95E+05	3.92E+05	2.40E+05	2.53E+05	2.58E+05
Sb-127	3.12E+04	3.16E+04	3.20E+04	3.23E+04	3.26E+04	1.98E+04	1.98E+04	2.01E+04
Sb-129	1.12E+05	1.13E+05	1.13E+05	1.13E+05	1.14E+05	6.85E+04	6.87E+04	6.90E+04
Te-127	3.09E+04	3.12E+04	3.16E+04	3.20E+04	3.24E+04	2.22E+04	2.05E+04	2.03E+04
Te-127m	5.34E+03	5.38E+03	5.44E+03	5.49E+03	5.54E+03	5.34E+03	4.40E+03	3.95E+03
Te-129	1.06E+05	1.07E+05	1.07E+05	1.08E+05	1.08E+05	6.86E+04	6.57E+04	6.57E+04
Te-129m	2.15E+04	2.16E+04	2.17E+04	2.18E+04	2.19E+04	1.88E+04	1.39E+04	1.34E+04
Te-131m	6.49E+04	6.54E+04	6.60E+04	6.65E+04	6.68E+04	3.98E+04	4.02E+04	4.05E+04
Te-132	4.85E+05	4.85E+05	4.85E+05	4.85E+05	4.85E+05	2.94E+05	2.91E+05	2.91E+05
I-131	3.38E+05	3.39E+05	3.39E+05	3.39E+05	3.39E+05	2.27E+05	2.05E+05	2.05E+05
I-132	4.98E+05	4.98E+05	4.98E+05	4.98E+05	4.98E+05	3.04E+05	2.98E+05	2.98E+05
I-133	6.93E+05	6.92E+05	6.90E+05	6.90E+05	6.89E+05	4.10E+05	4.11E+05	4.11E+05
I-134	7.62E+05	7.62E+05	7.58E+05	7.54E+05	7.54E+05	4.50E+05	4.50E+05	4.47E+05
I-135	6.63E+05	6.63E+05	6.63E+05	6.63E+05	6.58E+05	3.96E+05	3.95E+05	3.95E+05
Xe-133	6.63E+05	6.60E+05	6.60E+05	6.60E+05	6.58E+05	4.33E+05	3.96E+05	3.96E+05
Xe-135	1.89E+05	1.85E+05	1.80E+05	1.76E+05	1.73E+05	1.53E+05	1.51E+05	1.48E+05
Cs-134	8.16E+04	8.75E+04	9.36E+04	9.96E+04	1.04E+05	1.05E+05	1.08E+05	1.11E+05
Cs-136	2.04E+04	2.16E+04	2.28E+04	2.40E+04	2.51E+04	1.89E+04	1.68E+04	1.77E+04
Cs-137	5.55E+04	5.80E+04	6.05E+04	6.30E+04	6.50E+04	6.53E+04	6.77E+04	7.00E+04
Ba-139	6.11E+05	6.06E+05	6.04E+05	6.02E+05	5.99E+05	3.59E+05	3.57E+05	3.57E+05
Ba-140	6.05E+05	6.02E+05	6.00E+05	5.98E+05	5.96E+05	4.31E+05	3.56E+05	3.54E+05
La-140	6.27E+05	6.26E+05	6.25E+05	6.24E+05	6.23E+05	4.59E+05	3.86E+05	3.85E+05
La-141	5.54E+05	5.51E+05	5.49E+05	5.46E+05	5.45E+05	3.26E+05	3.25E+05	3.23E+05

La-142	5.27E+05	5.25E+05	5.21E+05	5.19E+05	5.17E+05	3.09E+05	3.07E+05	3.05E+05
Ce-141	5.55E+05	5.51E+05	5.46E+05	5.46E+05	5.42E+05	4.62E+05	3.38E+05	3.24E+05
Ce-143	5.05E+05	5.02E+05	4.99E+05	4.95E+05	4.92E+05	2.94E+05	2.91E+05	2.90E+05
Ce-144	5.05E+05	4.96E+05	4.91E+05	4.82E+05	4.77E+05	4.68E+05	4.20E+05	3.83E+05
Pr-143	4.90E+05	4.86E+05	4.83E+05	4.79E+05	4.92E+05	3.68E+05	2.83E+05	2.81E+05
Nd-147	2.25E+05	2.25E+05	2.24E+05	2.24E+05	2.24E+05	1.57E+05	1.34E+05	1.34E+05
Np-239	7.21E+06	7.26E+06	7.38E+06	7.43E+06	7.60E+06	4.77E+06	4.80E+06	4.81E+06
Pu-238	1.53E+03	1.70E+03	1.87E+03	2.05E+03	2.20E+03	2.25E+03	2.48E+03	2.69E+03
Pu-239	1.43E+02	1.42E+02	1.42E+02	1.40E+02	1.40E+02	1.41E+02	1.41E+02	1.41E+02
Pu-240	2.42E+02	2.51E+02	2.60E+02	2.68E+02	2.73E+02	2.74E+02	2.80E+02	2.86E+02
Pu-241	6.11E+04	6.31E+04	6.46E+04	6.58E+04	6.71E+04	6.73E+04	6.88E+04	7.01E+04
Am-241	7.22E+01	7.68E+01	8.09E+01	8.43E+01	8.68E+01	9.01E+01	1.03E+02	1.15E+02
Cm-242	2.05E+04	2.29E+04	2.53E+04	2.77E+04	2.95E+04	2.91E+04	2.80E+04	2.87E+04
Cm-244	1.70E+03	2.08E+03	2.51E+03	2.98E+03	3.40E+03	3.52E+03	4.13E+03	4.80E+03
cloudshine	1.288E-03	1.282E-03	1.276E-03	1.269E-03	1.263E-03	7.795E-04	7.700E-04	7.655E-04
Inhalation	1.686E-01	1.719E-01	1.751E-01	1.783E-01	1.808E-01	1.428E-01	1.389E-01	1.408E-01
TEDE Dose	1.698E-01	1.732E-01	1.764E-01	1.795E-01	1.821E-01	1.435E-01	1.397E-01	1.416E-01

Burnup	1681.3	1789.1	1896.9	2004.9
Co-58	7.85E+03	7.79E+03	7.76E+03	7.81E+03
Co-60	1.47E+04	1.50E+04	1.53E+04	1.55E+04
Kr-85	5.34E+03	5.40E+03	5.47E+03	5.54E+03
Kr-85m	3.95E+04	3.88E+04	3.81E+04	3.74E+04
Kr-87	7.82E+04	7.68E+04	7.53E+04	7.38E+04
Kr-88	1.06E+05	1.04E+05	1.02E+05	9.99E+04
Rb-86	6.34E+02	6.54E+02	6.73E+02	7.00E+02
Sr-89	1.45E+05	1.41E+05	1.37E+05	1.34E+05
Sr-90	4.64E+04	4.72E+04	4.80E+04	4.88E+04
Sr-91	1.94E+05	1.90E+05	1.87E+05	1.84E+05
Sr-92	2.15E+05	2.13E+05	2.09E+05	2.06E+05
Y-90	4.99E+04	5.04E+04	5.13E+04	5.23E+04
Y-91	2.00E+05	1.94E+05	1.90E+05	1.86E+05
Y-92	2.17E+05	2.13E+05	2.11E+05	2.07E+05
Y-93	1.71E+05	1.69E+05	1.67E+05	1.65E+05
Zr-95	3.38E+05	3.32E+05	3.28E+05	3.26E+05
Zr-97	3.54E+05	3.54E+05	3.52E+05	3.51E+05
Nb-95	3.47E+05	3.36E+05	3.31E+05	3.29E+05
Mo-99	3.75E+05	3.74E+05	3.74E+05	3.73E+05
Tc-99m	3.33E+05	3.33E+05	3.33E+05	3.32E+05
Ru-103	3.62E+05	3.66E+05	3.69E+05	3.72E+05
Ru-105	2.75E+05	2.80E+05	2.83E+05	2.87E+05
Ru-106	2.50E+05	2.46E+05	2.43E+05	2.41E+05
Rh-105	2.61E+05	2.65E+05	2.67E+05	2.70E+05
Sb-127	2.03E+04	2.05E+04	2.06E+04	2.08E+04
Sb-129	6.92E+04	6.95E+04	6.97E+04	6.99E+04
Te-127	2.03E+04	2.03E+04	2.04E+04	2.06E+04
Te-127m	3.74E+03	3.65E+03	3.63E+03	3.63E+03
Te-129	6.59E+04	6.62E+04	6.65E+04	6.65E+04
Te-129m	1.34E+04	1.34E+04	1.35E+04	1.36E+04
Te-131m	4.08E+04	4.10E+04	4.13E+04	4.14E+04
Te-132	2.91E+05	2.91E+05	2.91E+05	2.90E+05
I-131	2.05E+05	2.05E+05	2.05E+05	2.05E+05
I-132	2.98E+05	2.98E+05	2.98E+05	2.98E+05
I-133	4.10E+05	4.10E+05	4.08E+05	4.08E+05
I-134	4.47E+05	4.47E+05	4.43E+05	4.43E+05
I-135	3.94E+05	3.94E+05	3.93E+05	3.93E+05
Xe-133	3.96E+05	3.96E+05	3.94E+05	3.94E+05
Xe-135	1.45E+05	1.42E+05	1.38E+05	1.37E+05
Cs-134	1.14E+05	1.17E+05	1.20E+05	1.23E+05
Cs-136	1.86E+04	1.95E+04	2.03E+04	2.14E+04
Cs-137	7.21E+04	7.44E+04	7.66E+04	7.87E+04
Ba-139	3.55E+05	3.55E+05	3.52E+05	3.52E+05
Ba-140	3.53E+05	3.52E+05	3.51E+05	3.50E+05
La-140	3.85E+05	3.85E+05	3.84E+05	3.84E+05
La-141	3.21E+05	3.21E+05	3.19E+05	3.18E+05

La-142	3.05E+05	3.03E+05	3.01E+05	3.01E+05
Ce-141	3.22E+05	3.21E+05	3.19E+05	3.18E+05
Ce-143	2.88E+05	2.87E+05	2.85E+05	2.83E+05
Ce-144	3.54E+05	3.32E+05	3.14E+05	3.00E+05
Pr-143	2.79E+05	2.77E+05	2.76E+05	2.74E+05
Nd-147	1.33E+05	1.33E+05	1.33E+05	1.33E+05
Np-239	4.84E+06	4.85E+06	4.87E+06	4.95E+06
Pu-238	2.91E+03	3.12E+03	3.33E+03	3.55E+03
Pu-239	1.40E+02	1.39E+02	1.38E+02	1.37E+02
Pu-240	2.92E+02	2.98E+02	3.03E+02	3.08E+02
Pu-241	7.08E+04	7.13E+04	7.16E+04	7.21E+04
Am-241	1.25E+02	1.33E+02	1.40E+02	1.45E+02
Cm-242	3.04E+04	3.26E+04	3.48E+04	3.71E+04
Cm-244	5.53E+03	6.33E+03	7.18E+03	8.08E+03
cloudshine	7.626E-04	7.602E-04	7.559E-04	7.540E-04
Inhalation	1.431E-01	1.454E-01	1.478E-01	1.505E-01
TEDE Dose	1.438E-01	1.462E-01	1.486E-01	1.513E-01