

SANDIA REPORT

SAND2008-6997

Unlimited Release

Printed April 2010

Radionuclide Inventories: ORIGEN2.2 Isotopic Depletion Calculation for High Burnup Low-Enriched Uranium and Weapons-Grade Mixed-Oxide Pressurized-Water Reactor Fuel Assemblies

Pamela Longmire, James D. Smith, Kyle W. Ross, and Randall O. Gauntt

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550

Sandia National Laboratories is a multiprogram laboratory operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Company, for the U.S. Department of Energy's National Nuclear Security Administration under Contract DE-AC04-94AL85000.

Approved for public release; further dissemination unlimited.



Sandia National Laboratories

Issued by Sandia National Laboratories, operated for the United States Department of Energy by Sandia Corporation.

NOTICE: This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government, nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors, or their employees, make any warranty, express or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represent that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government, any agency thereof, or any of their contractors or subcontractors. The views and opinions expressed herein do not necessarily state or reflect those of the United States Government, any agency thereof, or any of their contractors.

Printed in the United States of America. This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from
U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831

Telephone: (865) 576-8401
Facsimile: (865) 576-5728
E-Mail: reports@adonis.osti.gov
Online ordering: <http://www.osti.gov/bridge>

Available to the public from
U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Rd.
Springfield, VA 22161

Telephone: (800) 553-6847
Facsimile: (703) 605-6900
E-Mail: orders@ntis.fedworld.gov
Online order: <http://www.ntis.gov/help/ordermethods.asp?loc=7-4-0#online>



Radionuclide Inventories: ORIGEN2.2 Isotopic Depletion Calculation for High Burnup Low-Enriched Uranium and Weapons-Grade Mixed-Oxide Pressurized-Water Reactor Fuel Assemblies

Pamela Longmire and Randall O. Gauntt, 6762
Reactor Modeling and Analysis

James D. Smith, 6774
Adv. Nuclear Fuel Cell Tech.
Sandia National Laboratories
P.O. Box 5800
Albuquerque, New Mexico 87185-0748

Kyle W. Ross
Los Alamos National Laboratory
P.O. Box 1663
Los Alamos, New Mexico 87545

Abstract

The Oak Ridge National Laboratory computer code, ORIGEN2.2 (CCC-371, 2002), was used to obtain the elemental composition of irradiated low-enriched uranium (LEU)/mixed-oxide (MOX) pressurized-water reactor fuel assemblies. Described in this report are the input parameters for the ORIGEN2.2 calculations. The rationale for performing the ORIGEN2.2 calculation was to generate inventories to be used to populate MELCOR radionuclide classes. Therefore the ORIGEN2.2 output was subsequently manipulated. The procedures performed in this data reduction process are also described herein.

A listing of the ORIGEN2.2 input deck for two-cycle MOX is provided in the appendix. The final output from this data reduction process was three tables containing the radionuclide inventories for LEU/MOX in elemental form. Masses, thermal powers, and activities were reported for each category.

TABLE OF CONTENTS

BACKGROUND	9
ORIGEN2.2 INPUT: DESCRIPTION.....	9
DATA REDUCTION PROCEDURE.....	14
ASSEMBLING 40/60 MOX/LEU CORE	14
REFERENCES	23
APPENDIX – ORIGEN2.2: INPUT DECK.....	25

LIST OF FIGURES

Figure 1. Plausible Loading Pattern for 40% MOX Core.....	15
Figure 2. Typical Loading Pattern for LEU Core.....	16

LIST OF TABLES

Table 1. Reactor Operating Details and Fuel Assembly Data.	9
Table 2. Cycle Burnup Implemented in ORIGEN2.2 Runs.....	10
Table 3. Selected ORIGEN2.2 Keyword Description.	10
Table 4. Fuel Assembly Structural Material Mass Distribution.	11
Table 5. Assumed Initial Actinide Compositions of 1 Metric Ton of Heavy Metal in Reference LWRs.....	12
Table 6. Assumed Initial Non-Actinide Compositions of 1 Metric Ton of Heavy Metal in Reference LWRs.....	12
Table 7. Assumed Elemental Compositions of Light Water Reactor Fuel-Assembly Structural Materials (in grams).	13
Table 8. Fraction Cutoff for Summary Tables in ORIGEN2.2 Output.	13
Table 9. Number of Assemblies in 40% MOX Core by Type and Condition.	15
Table 10. Number of Assemblies in LEU Core by Condition.....	16

ACRONYMS

ANS	American Nuclear Society
BOC	beginning of cycle
DOE	Department of Energy
EOC	end of cycle
LEU	low-enriched uranium
LWR	light water reactor
MOX	mixed-oxide
MTIHM	metric tons initial heavy metal
MTU	metric tons uranium
MWd	megawatt-day
MW _{th}	megawatt, thermal
Pu	plutonium
PuO ₂	plutonium dioxide
PWR	pressurized-water reactor
U	uranium
UO ₂	uranium dioxide
WG-Pu	weapons-grade plutonium

BACKGROUND

The U.S. Department of Energy (DOE) has committed to the disposal of surplus weapons-grade plutonium (WG-Pu) in commercial light water reactors (LWRs). The mission reactors identified for this project are Catawba Units 1 and 2 and McGuire Units 1 and 2. These are Westinghouse pressurized water reactors (PWRs) licensed to produce 3411 MW_{th} thermal power. The reactor cores house 193 fuel assemblies of the 17 × 17 design, with 264 fuel pins per assembly. The WG-Pu mixed-oxide (MOX) fuel assemblies are based on the Framatome/COGEMA Fuels Advanced Mark-BW 17 × 17 fuel assembly. The ceramic plutonium dioxide (PuO₂)-and-uranium dioxide (UO₂) fuel pellets in WG-Pu MOX fuel contain between 2 to 5% fissile plutonium (Ellis 2000). The isotopic composition vector of the WG-Pu MOX fuel is 93.6% ²³⁹Pu, 5.9% ²⁴⁰Pu, 0.4% ²⁴¹Pu, and 0.1% ²⁴²Pu, and the UO₂ component has an enrichment of 0.25 wt% ²³⁵U.

ORIGEN2.2 INPUT: DESCRIPTION

Enrichments used in this analysis were 4.364 weight percent (wt%) Pu for the MOX fuel assemblies and 4.236 wt% U²³⁵. Listed in Table 1 are other parameter values used in the ORIGEN2.2 calculation.

Table 1. Reactor Operating Details and Fuel Assembly Data.

Parameter	Value
Reactor design	Westinghouse PWR, four-loop cooling system
Thermal power	3411 MW(t)
Specific power level	38.7 kW/kgHM
UO ₂ feed assemblies (40% MOX)	48
MOX feed assemblies (40% MOX)	36
Fuel cycle duration	495 days [18 months]
Heavy metal loading/assembly	463.3 kg
Weight of fuel if UO ₂	220,213 lb [99,887.0 kg]
Cladding weight	56,841 lb (of Zircaloy-4) [25,782.7 kg]
Reference: ORNL/TM-1999/255; p. 6&7.	

Mission goals were taken into account in determining end of cycle (EOC) values which calculate low-enriched uranium (LEU)/MOX PWR fuel assembly inventories. One mission goal is to achieve at least one cycle of reactor irradiation on all MOX fuel assemblies while achieving a burnup of at least 20,000 megawatt-day (MWd)/metric tons initial heavy metal (MTIHM). The specified assembly average MOX fuel burnup limit is 45,000 MWd/MTIHM (Duke Power 2001). Thus, in the ORIGEN2.2 model MOX fuel assemblies were irradiated for up to two cycles (average discharge burnup of 38,313 MWd/MTIHM). The criterion used for the LEU burnup is the current operational limit of 60,00 MWd/metric tons uranium (MTU). In the model, LEU fuel assemblies were irradiated for three cycles attaining a maximum discharge burnup of 57,470 MWd/MTIHM. Table 2 lists EOC burnup values used in the ORIGEN2.2 runs.

Table 2. Cycle Burnup Implemented in ORIGEN2.2 Runs.

Fuel Cycle	Burnup (MWd/MTIHM)
1	19,157
2	38,313
3	57,470

Presented in the appendix is the two-cycle MOX input deck accompanied by a detailed description of the ORIGEN2.2 command keywords. Table 3 is provided as a quick reference listing command keywords used in the input deck and is intended to facilitate the discussion that follows explaining input deck entries.

Table 3. Selected ORIGEN2.2 Keyword Description.

Command keyword	Description
ADD	Add two vectors
BAS	Case basis
BUP	Burnup calculation
CUT	Cutoff fractions for summary tables
DEC	Decay
END	Terminate execution
HED	Vector headings
INP	Read input composition, continuous removal rate, and continuous feed rate
IRF	Flux irradiation
IRP	Specific power irradiation
LIB	Library print control
LIP	Library print control
MOV	Move nuclide composition from vector to vector
OPTA	Specify actinide nuclide output table options
OPTF	Specify fission product nuclide output table options
OPTL	Specify activation product output table options
OUT	Print calculated results
PCH	Punch an output vector
PHO	Read photon libraries
RDA	Read comments regarding case being input
TIT	Case title

The input deck is organized as follows: Libraries containing decay, photon, and cross section data are invoked; initial composition for fuel and structural materials including impurities, cladding (zircaloy-4), and other materials (e.g., SS-302, SS-304, inconel-718, and microbrazed-50) are input; and irradiated assembly hardware (grid spacers, end fittings, plenum springs, etc.) is also included in the calculation. Table 4 lists the fuel assembly structural material mass distribution assumed. The exposure time intervals and specific power irradiation (38.7

kW/kgHM) are specified on IRP (specific power irradiation) cards. An 87-day refueling outage is represented as the decay period displayed on the DEC (decay) card. This input sequence is repeated for each material. The information contained in Tables 5 through 7 (i.e., initial composition of fuel and structural materials) is found after the END statement in the ORIGEN2.2 input deck. Edits are produced for fuel only and on an assembly basis. The ORIGEN2.2 output is directed to summary tables. With respect to cutoff values (Table 8), activation product, actinide, and fission product data are output to each summary table.

Activation products consist of nearly all naturally occurring nuclides, their neutron absorption products, and the decay daughters of these products. Actinides contain the isotopes of the elements thorium through einsteinium (atomic numbers 90 through 99) that appear in significant amounts in discharged reactor fuels plus their decay daughters. Fission products consist of nuclides produced by actinide fission plus their decay and capture products.

Table 4. Fuel Assembly Structural Material Mass Distribution.

	Material	Mass	
		kg/MTIHM	kg/assembly
Fuel zone			
Cladding	Zircaloy-4	223.0	102.9
Fuel channel ^a	--	--	--
Grid spacers	Inconel 718	12.8	5.9
Grid-spacer springs	Inconel 718		
Grid-brazing material	Nicrobraz 50	2.6	1.2
Miscellaneous	SS 304	9.9	4.6
Fuel-gas plenum zone			
Cladding	Zircaloy-4	12.0	5.5
Fuel channel ^a	--	--	--
Plenum spring	SS 302	4.2	1.9
End fitting zone			
Top end fitting	SS 304	14.8	6.8
Bottom end fitting	SS-304	12.4	5.7
Expansion springs	--	--	--
Total		291.7	134.5
Reference: ORNL/TM-6051.			
^a Assumed to be discarded with fuel assembly, channels are often reused with fresh fuel.			

Table 5. Assumed Initial Actinide Compositions of 1 Metric Ton of Heavy Metal in Reference Light Water Reactors.

Actinide Composition of Oxide Fuel					
	Nuclide	Quantity (g)	Nuclide	Quantity (g)	
	$^{234}_{92}\text{U}$	22.95	$^{239}_{94}\text{Pu}$	40,847.04	
	$^{235}_{92}\text{U}$	2500	$^{240}_{94}\text{Pu}$	2,574.76	
	$^{238}_{92}\text{U}$	953,837.05	$^{241}_{94}\text{Pu}$	174.56	
			$^{242}_{94}\text{Pu}$	43.64	
Reference: ORNL/TM-8591/V1-R1; Table 3.4, p. 3-27.					

Table 6. Assumed Initial Non-Actinide Compositions of 1 Metric Ton of Heavy Metal in Reference Light Water Reactors.

Non-Actinide Composition of Oxide Fuel					
Element	Atomic Number	Quantity (g)	Element	Atomic Number	Quantity (g)
Li	3	1.00E+00	Mn	25	1.07E+00
B	5	1.00E+00	Fe	26	1.80E+01
C	6	8.96E+01	Co	27	1.00E+00
N	7	2.50E+01	Ni	28	2.40E+01
O	8	1.34E+05	Cu	29	1.00E+00
F	9	1.07E+01	Zn	30	4.03E+01
Na	11	1.50E+01	Mo	42	1.00E+01
Mg	12	2.00E+01	Ag	47	1.00E-01
Al	13	1.67E+01	Cd	48	2.50E+01
Si	14	1.21E+01	In	49	2.00E+00
P	15	3.50E+01	Sn	50	4.00E+00
Cl	17	5.30E+00	Gd	64	2.50E+00
Ca	20	2.00E+00	W	74	2.00E+00
Ti	22	1.00E+00	Pb	82	1.00E+00
V	23	3.00E+00	Bi	83	4.00E-01
Cr	24	4.00E+00			
Reference: ORNL/TM-8591/V1-R1; Table 3.4, p. 3-27.					

Table 7. Assumed Elemental Compositions of Light Water Reactor Fuel-Assembly Structural Materials (in grams).

Element	Atomic Number	Zircaloy-4	Inconel-718	SS-302	SS-304	Nicrobraz 50
H	1	0.013	0	0	0	0
B	5	0.00033	0	0	0	0.05
C	6	0.120	0.4	1.5	0.8	0.1
N	7	0.080	1.3	1.3	1.3	0.066
O	8	0.950	0	0	0	0.043
Al	13	0.024	5.992	0	0	0.1
Si	14	0	1.997	10.0	10.0	0.511
P	15	0	0	0.45	0.45	103.244
S	16	0.035	0.07	0.3	0.3	0.1
Ti	22	0.020	7.99	0	0	0.1
V	23	0.020	0	0	0	0
Cr	24	1.250	189.753	180.0	190.0	149.709
Mn	25	0.020	1.997	20.0	20.0	0.1
Fe	26	2.250	179.766	697.74	688.44	0.471
Co	27	0.010	4.694	0.8	0.8	0.381
Ni	28	0.020	519.625	89.2	89.2	744.438
Cu	29	0.020	0.999	0	0	0
Zr	40	979.11	0	0	0	0.1
Nb	41	0	55.458	0	0	0
Mo	42	0	29.961	0	0	0
Cd	48	0.00025	0	0	0	0
Sn	50	16.0	0	0	0	0
Hf	72	0.078	0	0	0	0
W	74	0.020	0	0	0	0.1
U	92	0.0002	0	0	0	0
Density, g/cm ³	--	6.56	8.19	8.02	8.02	--
Reference: ORNL/TM-8591/V1-R1; Table 3.3, p. 3-26.						

Table 8. Fraction Cutoff for Summary Tables in ORIGEN2.2 Output.

Table Number	Description of Table	Units	Cutoff Value
5	Composition	Grams	1.0E-10
7	Radioactivity (total)	Curies	1.0E-10
9	Thermal power	Watts	1.0E-10

DATA REDUCTION PROCEDURE

FORTTRAN code was written to extract desired data from the voluminous ORIGEN2.2 output files. Included in the appendix is a listing of the source code and subroutines used in the data extraction procedure. Using the fuel-only case, the first step was to separate out calculated values for mass, activity, and thermal power. This data was stored in individual files for each cycle. Each file was then sorted by element using Microsoft Excel and stored as text files. These text files served as input for the next subroutine that summed results by element. The massaged ORIGEN2.2 output requisite to generate the 40/60 MOX/LEU core are provided in tables located in the appendix. There are tables for each irradiation cycle grouped according to fuel type (i.e., LEU and MOX) and further separated by mass, radioactivity, and thermal power, respectively. Reported in these tables for each element are values at initial fuel charge, fuel discharge, and 1-, 2-, 12-, and 24-hr decay periods. These values were combined to assemble the 40/60 MOX/LEU core.

ASSEMBLING 40/60 MOX/LEU CORE

A plausible 40% MOX, 60% LEU (40/60 MOX/LEU) loading pattern for the Catawba and McGuire units is shown in Figure 1 (Ellis 2000). There are a total of 193 fuel assemblies in the four-loop Westinghouse core. Of these assemblies, 117 are LEU and 76 are MOX. Table 9 lists the conditions of the assemblies (i.e., fresh fuel, once-, twice, or three times burned) at the beginning of cycle (BOC) and EOC. Figure 2 represents the configuration for a typical LEU loading pattern (Ellis 2000). Table 10 lists the conditions for those assemblies. Because accident analyses typically assume EOC conditions, the MELCOR MOX and LEU core descriptions were assembled based on the EOC assembly conditions of Tables 9 and 10.

1					L-2	M-1	L-2	M-1	L-2	M-1	L-2				
2			L-2	L-1	M-0	L-0	M-0	L-0	M-0	L-0	M-0	L-1	L-2		
3		L-2	M-0	M-0	L-0	M-1	M-1	L-0	M-1	M-1	L-0	M-0	M-0	L-2	
4		L-1	M-0	L-1	L-1	M-1	L-0	L-1	L-0	M-1	L-1	L-1	M-0	L-1	
5	L-2	M-0	L-0	L-1	M-1	M-0	L-1	L-0	L-1	M-0	M-1	L-1	L-0	M-0	L-2
6	M-1	L-0	M-1	M-1	M-0	L-1	L-0	L-1	L-0	L-1	M-0	M-1	M-1	L-0	M-1
7	L-2	M-0	M-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	M-1	M-0	L-2
8	M-1	L-0	L-0	L-1	L-0	L-1	L-0	L-2	L-0	L-1	L-0	L-1	L-0	L-0	M-1
9	L-2	M-0	M-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	M-1	M-0	L-2
10	M-1	L-0	M-1	M-1	M-0	L-1	L-0	L-1	L-0	L-1	M-0	M-1	M-1	L-0	M-1
11	L-2	M-0	L-0	L-1	M-1	M-0	L-1	L-0	L-1	M-0	M-1	L-1	L-0	M-0	L-2
12		L-1	M-0	L-1	L-1	M-1	L-0	L-1	L-0	M-1	L-1	L-1	M-0	L-1	
13		L-2	M-0	M-0	L-0	M-1	M-1	L-0	M-1	M-1	L-0	M-0	M-0	L-2	
14			L-2	L-1	M-0	L-0	M-0	L-0	M-0	L-0	M-0	L-1	L-2		
15					L-2	M-1	L-2	M-1	L-2	M-1	L-2				
	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A

Figure 1. Plausible Loading Pattern for 40% MOX Core.

Table 9. Number of Assemblies in 40% MOX Core by Type and Condition.

Cycles Previously in Core	BOC		EOC	
	LEU	MOX	LEU	MOX
Feed	48	36	-	-
Once	44	40	48	36
Twice	25	-	44	40
Three times	-	-	25	-

1					L-2	L-1	L-2	L-1	L-2	L-1	L-2				
2			L-2	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-2		
3		L-2	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-2	
4		L-1	L-0	L-1	L-1	L-1	L-0	L-2	L-0	L-1	L-1	L-1	L-0	L-1	
5	L-2	L-0	L-1	L-1	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-1	L-1	L-0	L-2
6	L-0	L-1	L-0	L-1	L-0	L-2	L-0	L-2	L-0	L-2	L-0	L-1	L-0	L-1	L-0
7	L-2	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-2
8	L-0	L-1	L-0	L-2	L-0	L-2	L-0	L-2	L-0	L-2	L-0	L-2	L-0	L-1	L-0
9	L-2	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-2
10	L-0	L-1	L-0	L-1	L-0	L-2	L-0	L-2	L-0	L-2	L-0	L-1	L-0	L-1	L-0
11	L-2	L-0	L-1	L-1	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-1	L-1	L-0	L-2
12		L-1	L-0	L-1	L-1	L-1	L-0	L-2	L-0	L-1	L-1	L-1	L-0	L-1	
13		L-2	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-2	
14			L-2	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-0	L-1	L-2		
15					L-2	L-1	L-2	L-1	L-2	L-1	L-2				
	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A

Figure 2. Typical Loading Pattern for LEU Core.

Table 10. Number of Assemblies in LEU Core by Condition.

Cycles Previously in Core	BOC	EOC
Feed	80	-
Once	76	80
Twice	37	76
Three times	-	37

The mass and power units of the ORIGEN results were grams of element per 1,000 kilograms of fuel and watts (generated by an element) per 1,000 kilograms of fuel, respectively. The ORIGEN results by element were specific to assembly type and condition, i.e., dependent upon whether the assembly was a MOX or LEU assembly and whether it was once-, twice-, or three times burned. The mass and power units required by MELCOR on input are kilograms of element and watts per kilogram of element, respectively. The mass and power inputs by element to MELCOR needed to be distinct between assembly type, i.e., MOX or LEU, in order for the differing fission product release characteristics of the two fuels to be managed. The following manipulations were performed in a spreadsheet to convert and collect the ORIGEN results into MELCOR input reflecting the fission product inventories and decay powers associated with the collective LEU and collective MOX assemblies of the core:

- The ORIGEN mass results were multiplied by the mass of fuel per assembly (461.4 kilograms) to give the mass of each element in an assembly in kilograms.
- The combined mass of each element associated with each combination of assembly type and condition was then accumulated consistent with the number of assemblies of given type and condition in the core.
- The total mass of each element associated separately with the MOX and LEU fuel types was then accumulated.
- The ORIGEN power results by element were divided by 1,000 to convert watts per 1,000 kilograms of fuel to watts per kilograms of fuel.
- The powers were then multiplied by the mass of fuel per assembly to give the power per assembly generated by each element.
- The combined power of each element associated with each combination of assembly type and condition was then accumulated consistent with the number of assemblies of given type and condition in the core.
- The total power of each element associated with the MOX and LEU fuel types was then separately accumulated.
- The total power of each element associated with a particular fuel type was then divided by the total mass of the element associated with the fuel type to determine the power per unit mass of the element specific to fuel type in Watts per kilogram of the element.

Mass and powers per unit mass were not input to MELCOR for all (or even most) of the elements in the ORIGEN results. Elements that were included were limited to those with meaningful decay powers. Accordingly, input to MELCOR were the masses and powers per unit mass for 37 ²³⁵U-associated (LEU) elements and 37 Pu-associated (MOX) elements such that 99.9% of the total decay heat power reported for the 91 total elements in the ORIGEN results was captured.

The MOX- and LEU-distinct element masses and powers per unit element mass formed from the ORIGEN results were input to MELCOR along with a specification for combining the individual elements into radionuclide classes. The combination of elements into classes was done in accordance with MELCOR default schema per Table 11. The 37 ORIGEN elements included in the MELCOR input are identified in Table 11. Note that while this table calls out only 37 elements and 13 classes, 74 elements and 26 classes were actually defined to account for LEU-versus MOX-associated radionuclides.

Table 11. Radionuclide Class Constitutive Elements.

Class #	Class Name	Representative Element	Constitutive Elements
1	Noble Gases	Xe	Kr, Xe
2	Alkali Metals	Cs	Cs, Rb
3	Alkaline Earths	Ba	Ba, Sr
4	Halogens	I	Br, I
5	Chalcogens	Te	Se, Te
6	Platinoids	Ru	Pd, Rh, Ru
7	Transition Metals	Mo	Mo, Nb, Tc
8	Tetravalents	Ce	Ce, Np, Pu, Zr
9	Trivalents	La	Cm, Eu, La, Nd, Pm, Pr, Sm, Y
10	Uranium	U	U
11	More Volatile Main Group Metals	Cd	As, Cd, Sb
12	Less Volatile Main Group Metals	Sn	Ag, Ge, In, Sn
13	Boron	B	B

Table 12 identifies the radionuclide class mass inventories input to MELCOR for the LEU and MOX cores. The masses in this table relate to core condition at reactor shutdown. Included in Table 12 for comparison purposes is the radionuclide mass inventory at shutdown per standard American Nuclear Society (ANS) calculation assuming a reactor operating at 3411 MW_{th} for 548 days. (Note that with the exception of certain class combinations, MELCOR radionuclide inventories are fixed in time. Also note that the oxygen identified in the ORIGEN results has not been included in the MELCOR radionuclide class inventories. This is because the oxygen bound up in the ceramic UO₂ and PuO₂ fuel is accounted for in the radionuclide inventory by default, i.e., without specific radionuclide user input.)

Tables 13 through 17 identify the radionuclide class powers input to MELCOR for the LEU and MOX cores at shutdown, and at 1 hour, 2 hours, 12 hours, and 24 hours after shutdown, respectively. (Note that the values in these tables are watts rather than watts per unit element mass as actually input to MELCOR.) Included in Table 13, again for comparison purposes, are the radionuclide class powers at shutdown per standard ANS calculation.

Figure 3 shows the time history of fission product decay power for the LEU and MOX cores as well as per standard ANS calculation.

Table 12. Radionuclide Class Masses at Shutdown (kg).

Class #	Representative Element	Standard ANS Calculation	LEU Core	40% MOX Core		
				LEU Assemblies	MOX Assemblies	Total
1	Xe	3.421E+02	5.178E+02	3.187E+02	1.694E+02	4.882E+02
2	Cs	1.907E+02	2.910E+02	1.787E+02	1.009E+02	2.796E+02
3	Ba	1.501E+02	2.200E+02	1.352E+02	5.492E+01	1.901E+02
4	I	1.470E+01	2.346E+01	1.444E+01	1.137E+01	2.581E+01
5	Te	3.002E+01	4.865E+01	2.998E+01	2.050E+01	5.048E+01
6	Ru	2.111E+02	3.592E+02	2.221E+02	1.874E+02	4.095E+02
7	Mo	2.490E+02	3.728E+02	2.292E+02	1.208E+02	3.500E+02
8	Ce	4.393E+02	1.489E+03	9.134E+02	1.300E+03	2.213E+03
9	La	4.076E+02	6.996E+02	4.305E+02	2.105E+02	6.410E+02
10	U	8.458E+04	8.502E+04	5.151E+04	3.288E+04	8.439E+04
11	Cd	9.970E-01	1.491E+01	9.256E+00	8.470E+00	1.773E+01
12	Sn	5.662E+00	1.484E+01	9.166E+00	9.360E+00	1.853E+01
13	B	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Table 13. Radionuclide Class Powers at Shutdown (Watts).

Class #	Representative Element	Standard ANS Calculation	LEU Core	40% MOX Core		
				LEU Assemblies	MOX Assemblies	Total
1	Xe	1.793E+07	1.432E+07	8.657E+06	4.148E+06	1.281E+07
2	Cs	3.287E+07	2.717E+07	1.644E+07	8.033E+06	2.447E+07
3	Ba	2.241E+07	1.957E+07	1.184E+07	6.157E+06	1.800E+07
4	I	2.502E+07	2.110E+07	1.278E+07	7.045E+06	1.982E+07
5	Te	1.038E+07	8.804E+06	5.332E+06	2.885E+06	8.217E+06
6	Ru	4.437E+06	5.216E+06	3.194E+06	3.186E+06	6.380E+06
7	Mo	3.436E+07	3.576E+07	2.176E+07	1.670E+07	3.846E+07
8	Ce	1.505E+07	1.685E+07	1.024E+07	6.069E+06	1.631E+07
9	La	4.254E+07	3.913E+07	2.372E+07	1.361E+07	3.732E+07
10	U	4.482E+06	5.126E+06	3.128E+06	1.751E+06	4.879E+06
11	Cd	7.992E+06	7.608E+06	4.615E+06	2.857E+06	7.472E+06
12	Sn	1.864E+06	2.965E+06	1.804E+06	1.255E+06	3.059E+06
13	B	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Totals		2.193E+08	2.036E+08	1.235E+08	7.370E+07	1.972E+08

Table 14. Radionuclide Class Powers 1 Hour After Shutdown (Watts).

Class #	Representative Element	LEU Core	40% MOX Core		
			LEU Assemblies	MOX Assemblies	Total
1	Xe	1.695E+06	1.024E+06	5.128E+05	1.537E+06
2	Cs	2.899E+06	1.758E+06	8.933E+05	2.652E+06
3	Ba	3.345E+06	2.024E+06	9.963E+05	3.020E+06
4	I	8.375E+06	5.081E+06	3.240E+06	8.321E+06
5	Te	1.860E+06	1.128E+06	7.045E+05	1.833E+06
6	Ru	1.813E+06	1.109E+06	1.125E+06	2.233E+06
7	Mo	3.707E+06	2.249E+06	1.423E+06	3.672E+06
8	Ce	7.125E+06	4.341E+06	2.449E+06	6.790E+06
9	La	1.215E+07	7.370E+06	4.202E+06	1.157E+07
10	U	1.032E+06	6.301E+05	3.081E+05	9.382E+05
11	Cd	8.321E+05	5.063E+05	3.898E+05	8.960E+05
12	Sn	2.341E+05	1.430E+05	1.256E+05	2.685E+05
13	B	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Totals		4.507E+07	2.736E+07	1.637E+07	4.373E+07

Table 15. Radionuclide Class Powers 2 Hours After Shutdown (Watts).

Class #	Representative Element	LEU Core	40% MOX Core		
			LEU Assemblies	MOX Assemblies	Total
1	Xe	1.317E+06	7.959E+05	4.155E+05	1.211E+06
2	Cs	1.449E+06	8.804E+05	4.148E+05	1.295E+06
3	Ba	2.655E+06	1.606E+06	7.711E+05	2.377E+06
4	I	6.898E+06	4.185E+06	2.692E+06	6.877E+06
5	Te	1.033E+06	6.269E+05	4.094E+05	1.036E+06
6	Ru	1.667E+06	1.020E+06	1.035E+06	2.055E+06
7	Mo	3.096E+06	1.877E+06	1.132E+06	3.009E+06
8	Ce	7.016E+06	4.274E+06	2.410E+06	6.684E+06
9	La	1.024E+07	6.211E+06	3.528E+06	9.738E+06
10	U	3.306E+05	2.023E+05	6.185E+04	2.641E+05
11	Cd	4.933E+05	3.003E+05	2.393E+05	5.395E+05
12	Sn	1.802E+05	1.101E+05	9.934E+04	2.094E+05
13	B	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Totals		3.637E+07	2.209E+07	1.321E+07	3.530E+07

Table 16. Radionuclide Class Powers 12 Hours After Shutdown (Watts).

Class #	Representative Element	LEU Core	40% MOX Core		
			LEU Assemblies	MOX Assemblies	Total
1	Xe	5.442E+05	3.298E+05	2.186E+05	5.484E+05
2	Cs	3.091E+05	1.910E+05	9.534E+04	2.864E+05
3	Ba	1.235E+06	7.470E+05	3.569E+05	1.104E+06
4	I	3.677E+06	2.232E+06	1.491E+06	3.723E+06
5	Te	3.967E+05	2.410E+05	1.746E+05	4.156E+05
6	Ru	1.179E+06	7.213E+05	7.452E+05	1.467E+06
7	Mo	2.457E+06	1.490E+06	8.867E+05	2.376E+06
8	Ce	6.093E+06	3.712E+06	2.090E+06	5.802E+06
9	La	6.330E+06	3.845E+06	2.231E+06	6.076E+06
10	U	1.790E+05	1.097E+05	1.070E+04	1.204E+05
11	Cd	1.302E+05	7.938E+04	6.623E+04	1.456E+05
12	Sn	7.860E+04	4.817E+04	4.689E+04	9.506E+04
13	B	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Totals		2.261E+07	1.375E+07	8.413E+06	2.216E+07

Table 17. Radionuclide Class Powers 24 Hours After Shutdown (Watts).

Class #	Representative Element	LEU Core	40% MOX Core		
			LEU Assemblies	MOX Assemblies	Total
1	Xe	3.669E+05	2.225E+05	1.489E+05	3.714E+05
2	Cs	2.472E+05	1.536E+05	8.098E+04	2.346E+05
3	Ba	9.512E+05	5.758E+05	2.842E+05	8.600E+05
4	I	2.783E+06	1.690E+06	1.138E+06	2.828E+06
5	Te	3.290E+05	1.998E+05	1.439E+05	3.437E+05
6	Ru	1.040E+06	6.362E+05	6.593E+05	1.296E+06
7	Mo	1.938E+06	1.175E+06	6.965E+05	1.871E+06
8	Ce	5.236E+06	3.190E+06	1.792E+06	4.982E+06
9	La	5.433E+06	3.301E+06	1.952E+06	5.253E+06
10	U	1.698E+05	1.041E+05	1.017E+04	1.143E+05
11	Cd	7.497E+04	4.576E+04	3.890E+04	8.466E+04
12	Sn	5.758E+04	3.531E+04	3.452E+04	6.984E+04
13	B	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Totals		1.863E+07	1.133E+07	6.979E+06	1.831E+07

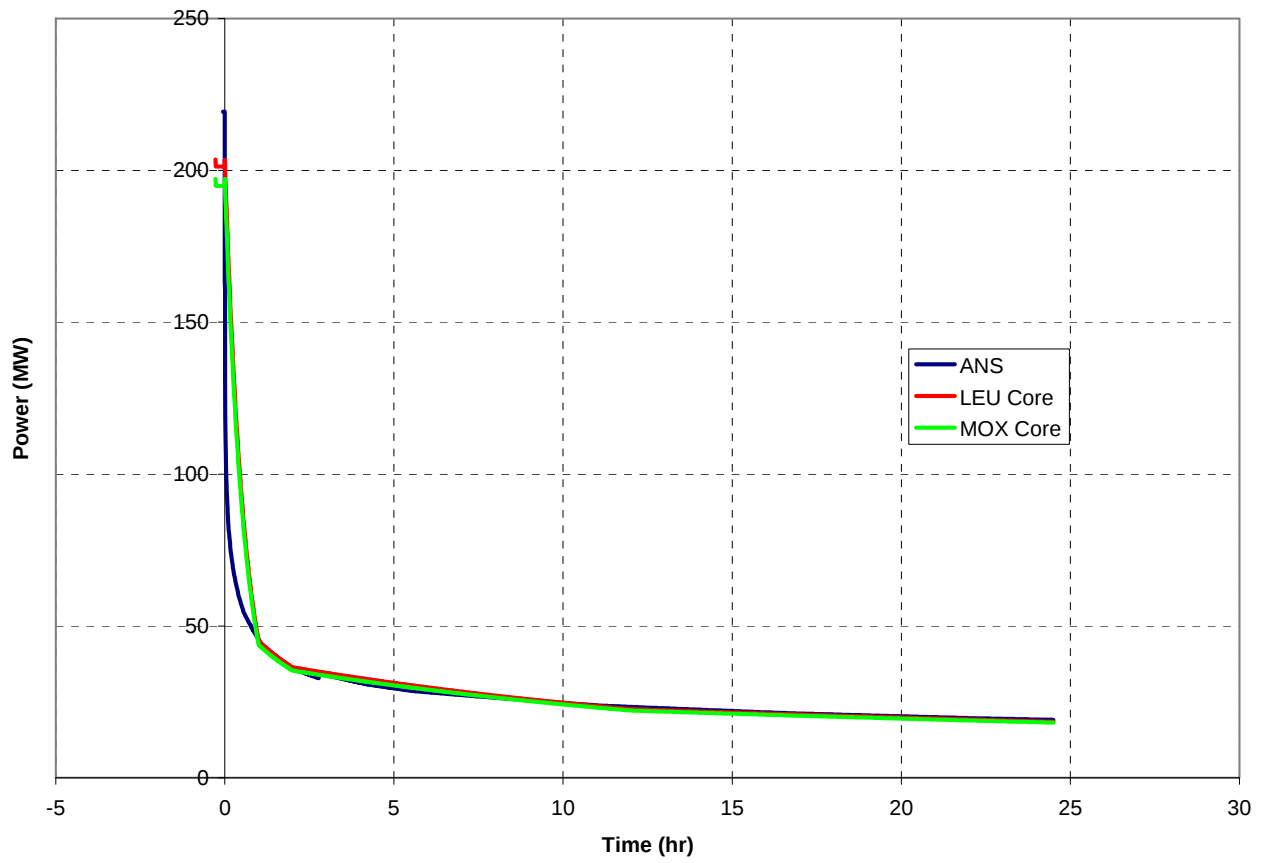


Figure 3. Fission Product Decay Power.

REFERENCES

Croff, A.G., M.A. Bjerke, G.W. Morrison, and L.M. Petrie, 1978, *Revised Uranium-Plutonium Cycle PWR and BWR Models for the ORIGEN Computer Code*. ORNL/TM-6051. Oak Ridge National Laboratory, Oak Ridge, TN.

Duke Power, 2001, *Nuclear Design Methodology Using CASMO-4/SIMULATE-3 MOX*. DPC-NE-1005P, Revision 0.

Ellis, R.J., 2000, *System Definition Document: Reactor Data Necessary for Modeling Plutonium Disposition in Catawba Nuclear Station Units 1 and 2*. ORNL/TM-1999/255. Oak Ridge National Laboratory, Oak Ridge, TN.

Roddy, J.W., H.C. Claiborne, R.C. Ashline, P.J. Johnson, and B.T. Rhyne, 1986, *Physical and Decay Characteristics of Commercial LWR Spent Fuel*. ORNL/TM-9591/V1 & R1. Oak Ridge National Laboratory, Oak Ridge, TN.

CCC-371, 2002, *ORIGEN 2.2: Isotope Generation and Depletion Code Matrix Exponential Method*. Radiation Safety Information Computational Center. Oak Ridge National Laboratory, Oak Ridge, TN.

APPENDIX – ORIGEN2.2: INPUT DECK

```

-1
-1
-1
RDA *   PWR 4.364% MOX FUEL & ASSEMBLY HARDWARE, 38300 MWD/MT
RDA **  CROSS SECTION LIBRARY = PWRPUPU, 2 CYCLES
RDA *** REFERENCE: ORNL/TM-9591/V1&R1, TABLES 3.1-3.4
RDA **** JD SMITH, SNL/6406/(505)844.0531, CREATED TUE 24 FEB 03
RDA      -1 = FRESH LWR FUEL WITH IMPURITIES (1 MT = 1000 KG)
RDA      -2 = FRESH ZIRCALOY-4 COMPOSITION (1 KG)
RDA      -3 = FRESH SS-304 COMPOSITION (1 KG)
RDA      -4 = FRESH SS-302 COMPOSITION (1 KG)
RDA      -5 = FRESH INCONEL-718 COMPOSITION (1 KG)
RDA      -6 = FRESH NICROBRAZE-50 COMPOSITION (1 KG)
RDA      NOTE: VECTOR CONTENT CHANGES INDICATED ON RDA CARDS

CUT      5 1.0E-10 7 1.0E-10 9 1.0E-10 -1

LIP      0 0 0
RDA      DECAF LIB      XSECT LIB      VARIABLE XSECT LIB
LIB      0      1 2 3      210 211 212      9 50 0 1      3
RDA      PHOTON LIB
PHO      101 102 103 10

TIT INITIAL UNIT QUANTITIES OF FUEL AND STRUCTURAL MATERIALS
RDA READ FUEL COMPOSITION INCLUDING IMPURITIES (1000 KG)
INP      -1 1 -1 -1 1 1
RDA READ ZIRCALOY-4 COMPOSITION (1.0 KG)
INP      -2 1 -1 -1 1 1
RDA READ SS-304 COMPOSITION (1.0 KG)
INP      -3 1 -1 -1 1 1
RDA READ SS-302 COMPOSITION (1.0 KG)
INP      -4 1 -1 -1 1 1
RDA READ INCONEL-718 COMPOSITION (1.0 KG)
INP      -5 1 -1 -1 1 1
RDA READ NICROBRAZE-50 COMPOSITION (1.0 KG)
INP      -6 1 -1 -1 1 1

TIT IRRADIATION OF 1 MTIHM 4.364% MOX PWR FUEL
MOV      -1 1 0 1.0
PCH      1 1 1
HED      1      FUEL ONLY CHARGE
BUP
IRP      99 38.7 1 2 4 2 BURNUP= 3,831 MWD/MTIHM
IRP      198 38.7 2 3 4 0 BURNUP= 7,663 MWD/MTIHM
IRP      297 38.7 3 4 4 0 BURNUP= 11,494 MWD/MTIHM
IRP      396 38.7 4 5 4 0 BURNUP= 15,325 MWD/MTIHM
IRP      495 38.7 5 6 4 0 BURNUP= 19,156 MWD/MTIHM
DEC      582 6 7 4 0 DECAY FOR 87 DAYS
IRP      681 38.7 7 8 4 0 BURNUP= 22,989 MWD/MTIHM
IRP      780 38.7 8 9 4 0 BURNUP= 26,819 MWD/MTIHM
IRP      897 38.7 9 10 4 0 BURNUP= 30,650 MWD/MTIHM
IRP      978 38.7 10 11 4 0 BURNUP= 34,482 MWD/MTIHM
IRP      1077 38.7 11 12 4 0 BURNUP= 38,313 MWD/MTIHM
BUP

```

RDA -10 = IRRADIATED FUEL AT DISCHARGE
 MOV 12 -10 0 1.0
 PCH -10 -10 -10

RDA IRRADIATION OF ZIRCALOY-4 AT 1.000 FLUX (FUEL ZONE)
 TIT IRRADIATION OF ZIRCALOY-4 CLADDING AT 1.000 FLUX
 MOV -2 1 0 223.0 ZIRCALOY-4 CLADDING (KG/MTIHM), TABLE 3.2

PCH 1 1 1
 HED 1
 IRF 99 -1.0 1 2 4 2 BURNUP= 3,831 MWD/MTIHM
 IRF 198 -1.0 2 3 4 0 BURNUP= 7,663 MWD/MTIHM
 IRF 297 -1.0 3 4 4 0 BURNUP= 11,494 MWD/MTIHM
 IRF 396 -1.0 4 5 4 0 BURNUP= 15,325 MWD/MTIHM
 IRF 495 -1.0 5 6 4 0 BURNUP= 19,156 MWD/MTIHM
 DEC 582 6 7 4 0 DECAY FOR 87 DAYS
 IRF 681 -1.0 7 8 4 0 BURNUP= 22,989 MWD/MTIHM
 IRF 780 -1.0 8 9 4 0 BURNUP= 26,819 MWD/MTIHM
 IRF 897 -1.0 9 10 4 0 BURNUP= 30,650 MWD/MTIHM
 IRF 978 -1.0 10 11 4 0 BURNUP= 34,482 MWD/MTIHM
 IRF 1077 -1.0 11 12 4 0 BURNUP= 38,313 MWD/MTIHM
 RDA -9 = IRRADIATED ZIRCALOY-4 CLADDING AT DISCHARGE
 MOV 12 -9 0 1.0
 PCH -9 -9 -9

RDA IRRADIATION OF INC-718 + NIC-50 AT 1.000 FLUX (FUEL ZONE)
 TIT IRRADIATION OF INCONEL-718 + MICROBRAZE-50 AT 1.000 FLUX
 MOV -5 1 0 12.8 INCONEL-718 GRID SPACERS (KG/MTIHM), TABLE 3.2
 ADD -6 1 0 2.6 MICROBRAZE-50 GRID-BRAZING (KG/MTIHM), TABLE 3.2

PCH 1 1 1
 HED 1
 IRF 99 -1.0 1 2 4 2 BURNUP= 3,831 MWD/MTIHM
 IRF 198 -1.0 2 3 4 0 BURNUP= 7,663 MWD/MTIHM
 IRF 297 -1.0 3 4 4 0 BURNUP= 11,494 MWD/MTIHM
 IRF 396 -1.0 4 5 4 0 BURNUP= 15,325 MWD/MTIHM
 IRF 495 -1.0 5 6 4 0 BURNUP= 19,156 MWD/MTIHM
 DEC 582 6 7 4 0 DECAY FOR 87 DAYS
 IRF 681 -1.0 7 8 4 0 BURNUP= 22,989 MWD/MTIHM
 IRF 780 -1.0 8 9 4 0 BURNUP= 26,819 MWD/MTIHM
 IRF 897 -1.0 9 10 4 0 BURNUP= 30,650 MWD/MTIHM
 IRF 978 -1.0 10 11 4 0 BURNUP= 34,482 MWD/MTIHM
 IRF 1077 -1.0 11 12 4 0 BURNUP= 38,313 MWD/MTIHM
 RDA -8 = IRRADIATED INCONEL-718 AND MICROBRAZE-50 AT DISCHARGE
 MOV 12 -8 0 1.0
 PCH -8 -8 -8

RDA IRRADIATION OF SS-304 CHANNEL AT 1.000 FLUX (FUEL ZONE)
 TIT IRRADIATION OF SS-304 MISCELLANEOUS/CHANNEL AT 1.000 FLUX
 MOV -3 1 0 9.9 SS-304 CHANNEL (KG/MTIHM), TABLE 3.2

PCH 1 1 1
 HED 1
 IRF 99 -1.0 1 2 4 2 BURNUP= 3,831 MWD/MTIHM
 IRF 198 -1.0 2 3 4 0 BURNUP= 7,663 MWD/MTIHM
 IRF 297 -1.0 3 4 4 0 BURNUP= 11,494 MWD/MTIHM
 IRF 396 -1.0 4 5 4 0 BURNUP= 15,325 MWD/MTIHM
 IRF 495 -1.0 5 6 4 0 BURNUP= 19,156 MWD/MTIHM
 DEC 582 6 7 4 0 DECAY FOR 87 DAYS
 IRF 681 -1.0 7 8 4 0 BURNUP= 22,989 MWD/MTIHM

HED	-10	FUEL DIS		
HED	-1	FUEL CHG		
MOV	-1	1	0	1.0
MOV	-10	2	0	1.0

RDA	*****	DECAY MODULE	*****	
DEC	0.5	2	4	5 2
DEC	1.0	4	3	5 0
DEC	3.0	3	4	5 0
DEC	5.0	4	5	5 0
DEC	10.0	5	6	5 0

Specify Activation Product Output Options

OPTL 4*8 7 8 7 8 7 8 8*8 5*7 8

Specify Options for Actinide Nuclide Output Table

OPTA 4*8 7 8 7 8 7 8 8*8 5*7 8

Specify Fission Product Nuclide Output Options

OPTF 4*8 7 8 7 8 7 8 8*8 5*7 8

OUT	6	1	-1	0
-----	---	---	----	---

TIT ORIGEN2 V2.2, PWR ASSEMBLY, PU-ENRICHED UO2 (PWRPUPU)

BAS FCF MARK-BW17X17 4.364% MOX ASSEMBLY, 38300 MWD/MTIHM, 2 CYCLE

Specify Activation Product Output Options

OPTL 4*8 7 8 7 8 7 8 8*8 5*7 8

Specify Options for Actinide Nuclide Output Table

OPTA 4*8 7 8 7 8 7 8 8*8 5*7 8

Specify Fission Product Nuclide Output Options

OPTF 4*8 7 8 7 8 7 8 8*8 5*7 8

MOV	-10	1	0	0.4633
-----	-----	---	---	--------

ADD	-9	1	0	0.4633
ADD	-8	1	0	0.4633
ADD	-7	1	0	0.4633
ADD	-6	1	0	0.4633
ADD	-5	1	0	0.4633

HED	1	ASSY DIS		
-----	---	----------	--	--

RDA	*****	DECAY MODULE	*****	
DEC	0.5	1	3	5 2
DEC	1.0	3	2	5 0
DEC	3.0	2	3	5 0
DEC	5.0	3	4	5 0
DEC	10.0	4	5	5 0

OUT	5	1	-1	0
-----	---	---	----	---

END

2	922340	22.95	922350	2500.	922380	953837.05	942420	43.64		MOX4.364
2	942390	40847.04	942400	2574.76	942410	174.56	0	0.0		MOX4.364
4	030000	1.0	050000	1.0	060000	89.4	070000	25.0		IMPURITIES
4	080000	134454.	090000	10.7	110000	15.0	120000	2.0		IMPURITIES
4	130000	16.7	140000	12.1	150000	35.0	170000	5.3		IMPURITIES
4	200000	2.0	220000	1.0	230000	3.0	240000	4.0		IMPURITIES
4	250000	1.7	260000	18.0	270000	1.0	280000	24.0		IMPURITIES
4	290000	1.0	300000	40.3	420000	10.0	470000	0.1		IMPURITIES
4	480000	25.0	490000	2.0	500000	4.0	640000	2.5		IMPURITIES
4	740000	2.0	820000	1.0	830000	0.4	0	0.0		IMPURITIES
0										
4	400000	979.11	500000	16.0	260000	2.25	240000	1.25		ZIRC-4
4	280000	0.02	130000	0.024	050000	0.00033	480000	0.00025		ZIRC-4
4	060000	0.120	270000	0.010	290000	0.020	720000	0.078		ZIRC-4
4	010000	0.013	250000	0.020	070000	0.080	080000	0.950		ZIRC-4
4	160000	0.035	220000	0.020	740000	0.020	230000	0.020		ZIRC-4
5	920000	0.0002	0	0.0						ZIRC-4
0										
4	260000	688.44	240000	190.0	280000	89.2	250000	20.0		SS-304
4	060000	0.8	150000	0.45	160000	0.3	140000	10.0		SS-304
4	070000	1.3	270000	0.8	0	0.0				SS-304
0										
4	260000	697.74	240000	180.0	280000	89.2	250000	20.0		SS-302
4	060000	1.5	150000	0.45	160000	0.3	140000	10.0		SS-302
4	070000	1.3	270000	0.8	0	0.0				SS-302
0										
4	260000	179.766	240000	189.753	280000	519.625	130000	5.992		INC-718
4	060000	0.4	270000	4.694	290000	0.999	250000	1.997		INC-718
4	420000	29.961	070000	1.3	410000	55.458	160000	0.07		INC-718
4	140000	1.997	220000	7.99	0	0.0				INC-718
0										
4	260000	0.471	240000	149.709	280000	744.438	400000	0.1		NICR-50
4	130000	0.1	050000	0.05	060000	0.1	270000	0.381		NICR-50
4	250000	0.1	070000	0.066	080000	0.043	150000	103.244		NICR-50
4	160000	0.1	140000	0.511	220000	0.1	740000	0.1		NICR-50
0										

DESCRIPTION OF ORIGEN2.2 COMMAND KEYWORDS

ADD -Add Two Vectors

<i>Function</i>	Adds the nuclide concentration data in one vector to that in another vector, nuclide by nuclide.
<i>Remarks</i>	1. Vector NADD(1) may be subtracted from vector NADD(2) by setting RADD(1) = -1.0. (CAUTION: Negative nuclide concentrations can result in fatal errors.) 2. The information in vector RADD(1) is not altered by the ADD command. 3. Vector NADD(2) will have the same headings as vector NADD(1) after the ADD command has been executed.

BAS - Case Basis

<i>Function</i>	Supplies case basis printed in ORIGEN2 output.
<i>Remarks</i>	The BAS command only supplies an alphanumeric message. The user is responsible for the consistency of the basis, the input material masses, specific power, etc.

BUP - Burnup Calculation

<i>Function</i>	Defines the basis and calculates the average burnup, flux, and specific power for an irradiation.
<i>Remarks</i>	A BUP command must appear both before and after the statements constituting the fuel irradiation upon which the burnup calculation is to be based. Other commands may be present between the BUP statements.

CUT- Cutoff Fractions for Summary Tables

<i>Function</i>	Override default cutoff fractions for summary output tables.
<i>Remarks</i>	1. If an output value for a particular nuclide is less than the cutoff <i>fraction</i> multiplied by the total table value for all vectors being tested (see Sect. 4.5 for additional details on which <i>vectors</i> are tested), then that particular nuclide is not printed. 2. Table number 28 can be used to override the default value for ERR, presently set at 1.0E-25. ERR is used in logical IF statements instead of 0.0. 3. An integer -1 must follow RCUT(NT) unless all 28 cutoff fractions are specified. 4. The default cutoff fractions for the first 26 tables (see Table 4.3) are 0.001; for Table 27 the <i>cutoff</i> is 0.01. 5. The [NCUT(I),RCUT(I)] may continue onto subsequent cards. No operational command is used on the additional cards. 6. The application of the cutoff value to photon tables is somewhat different; it is discussed in Sect. 0.2.2.

Table 4.3 Description of ORIGEN2 output table

Table Number	Description of table	Units
1	Isotopic composition of each element	Atom fraction
2	Isotopic composition of each element	Weight fraction
3	Composition	Gram-atoms
4	Composition	Atom fraction
5	Composition	Grams
6	Composition	Weight fraction
7	Radioactivity (total)	Ci
8	Radioactivity (total)	Fractional
9	Thermal power	Watts
10	Thermal power	Fractional
11	Radioactivity (total)	Bq
12	Radioactivity (total)	Fractional
13	Radioactive inhalation hazard	m ³ air
14	Radioactive inhalation hazard	Fractional
15	Radioactive inhalation hazard	m ³ water
16	Radioactive inhalation hazard	Fractional
17	Chemical ingestion hazard	m ³ water
18	Chemical ingestion hazard	Fractional
19	Neutron absorption rate	neutrons/sec
20	Neutron absorption rate	Fractional
21	Neutron-induced fission rate	fissions/sec
22	Neutron-induced fission rate	Fractional
23	Radioactivity (alpha)	Ci
24	Radioactivity (alpha)	Fractional
25	(alpha,n) neutron production	neutrons/sec
26	Spontaneous fission neutron production	neutrons/sec
27	Photon emission rate	Photons/sec
28	Set test parameter ERR	-

DEC - Decay

<i>Function</i>	Decay for a single interval
Data sequence	DEC DEC(1), NDEC(1), . . . NDEC(4) DEC(1) = time at which this decay interval ends NDEC(1) = number of the vector where the material composition at the beginning of this decay interval is stored NDEC(2) = number of the vector where the material composition at the end of this decay interval is to be stored NDEC(3) = time units of DEC(1); see Table 4.2 NDEC(4) = specification of time at which this decay interval begins: 0 = starting time is the end of the previous IRF, IRP, or DEC interval. All reactivity and burnup information is retained, and MIRR is not altered. Used for continuing irradiation/decay on the same output page. 1 = starting time is set to zero. All reactivity and burnup information is retained, and MIRR is set to zero. Used for beginning a new irradiation on the same output page. 2 = starting time is set to zero. All reactivity and burnup information and MIRR are set to zero. Used to begin a new irradiation/decay on a new output page. 3 = same as NDEC(4) = 0 except that the first seven lines of the reactivity and burnup information are set to zero. Used for continuing irradiation to a new output page. 4 = same as NDEC(4) = 1 except that the first seven lines of the reactivity and burnup information are set to zero. Used to begin the decay following irradiation on a new output page while retaining the average irradiation parameters.
Remarks	1. The total number of IRF+IRP+DEC commands must be .LE.150. 2. The "reactivity and burnup information" referred to in NDEC(4) consists of seven lines of data characteristic of an individual vector (e.g., time, infinite multiplication factor, neutron flux) and three lines containing irradiation parameters (e.g., burnup) averaged over the range of the BUP commands. (Sect. 4.14)

END - Terminate Execution

<i>Function</i>	Terminate execution
Remarks	none

HED - Vector Headings

Function	Allows alphanumeric vector headings to be specified.
Remarks	1. The heading is moved with the vector when the MOV and ADD commands are used. 2. If a HED command is to be used to label either a vector of input concentrations [vector NINP(1), Sect. 4.6] or the vectors resulting <i>from</i> a PRO command [vectors NPRO(2) and NPRO(3), Sect. 4.24], the HED command must follow the INP or <i>PRO</i> command. 3. If A(1) is an apostrophe or asterisk (*), the ten characters immediately <i>following</i> A(1) are taken as the vector heading. This allows for the inclusion of leading blanks.

INP - Read Input Composition, Continuous Removal Rate, and Continuous Feed Rate

Function	Calls for nuclide composition, continuous nuclide feed rate, or continuous elemental removal rate to be read.										
Data sequence	INP NINP(1), . . . , NINP(6) where INP = command keyword NINP(1) = number of vector in which initial compositions are to be stored NINP(2) = read nuclide composition: .EQ.0 = no .EQ.1 = yes; units are g/basis unit (read on unit 5) .EQ.2 = yes; units are g-atoms/basis unit (read on unit 5) .EQ.-1 = yes; units are g/basis unit (read on unit 4). .EQ.-2 = yes; units are g-atoms/basis unit (read on unit 4) NINP(3) = read continuous nuclide feed rate: .LE.0 = no .EQ.1 = yes; units are g/(time) (basis unit) .EQ.2 = yes; units are g-atoms/(time)(basis unit) See NINP(5) for specification of <i>time units</i>. NINP(4) = read element removal rate per unit time: .LT.0 = no read; no propagation .EQ.0 = no read, but propagate previously read values .GT.0 = read NINP(4) data pairs (see Sect. 6.3) See NINP(6) for specification of time units. NINP(5) = time units of continuous nuclide feed rate data (see Table 4.2) NINP(6) = time units of continuous elemental removal rate data (see Table 4.2) Table 4.2. Time unit designation <table> <tr> <td>1 = seconds</td><td>6 = stable</td></tr> <tr> <td>2 = minutes</td><td>7 = 10^3 years(kY)</td></tr> <tr> <td>3 = hours</td><td>8 = 10^6 years (MY)</td></tr> <tr> <td>4 = days</td><td>9 = 10^9 years (GY)</td></tr> <tr> <td>5 = years</td><td></td></tr> </table>	1 = seconds	6 = stable	2 = minutes	7 = 10^3 years(kY)	3 = hours	8 = 10^6 years (MY)	4 = days	9 = 10^9 years (GY)	5 = years	
1 = seconds	6 = stable										
2 = minutes	7 = 10^3 years(kY)										
3 = hours	8 = 10^6 years (MY)										
4 = days	9 = 10^9 years (GY)										
5 = years											
Remarks	User is responsible for the consistency of the <i>calculational</i> basis with the input masses.										

IRF- Flux Irradiation

Function	Irradiation for a single interval with the neutron flux specified.
Data sequence	IRF RIRF(1), RIRF(2), NIRF(1)... NIRF(4) RIRF(1) = time at which this irradiation interval ends RIRF(2) = if RIRF(2).GT.0.0, this is the neutron flux during this irradiation interval in neutrons cm² sec⁻¹. If RIRF(2).LT.0.0, the neutron flux is given by: NEWFLUX = OLDFLUX* [-RIRF(2)] where NEWFLUX = flux to be used during this interval, neutrons cm⁻² sec⁻¹ OLDFLUX = flux for the same time period from the previous irradiation, neutrons cm⁻² sec⁻¹ NIRF(1) = number of the vector where the material composition at the beginning of this irradiation interval is stored NIRF(2) = number of the vector where the material composition at the end of this irradiation interval is to be stored NIRF(3) = time units of RIRF(1); see Table 4.2 NIRF(4) = specification of time at which this irradiation interval begins: 5 = starting time is the end of the previous IRF, IRP, or DEC interval. All reactivity and burnup information is retained, and MIRR is not altered. Used for continuing irradiation/decay on the same output page. 6 = starting time is set to zero. All reactivity and burnup information is retained, and MIRR is set to zero. Used for beginning a new irradiation on the same output page. 7 = starting time is set to zero. All reactivity and burnup information and MIRR are set to zero. Used to begin a new irradiation/decay on a new output page. 8 = same as NIRF(4) = 0 except that the first seven lines of the irradiation information are set to zero. Used for continuing irradiation to a new output page. 9 = same as NIRF(4) = 1 except that the first seven lines of the reactivity and burnup information are set to zero. Used to begin the decay following irradiation on a new output page while retaining the average irradiation parameters.
Remarks	1. The total number of IRF+IRP+DEC commands must be .LE.150. 2. For this option to be used, the time steps for the current irradiation and decay sequence must correspond exactly to those in the previous sequence. The fluxes from the previous irradiation are not altered if [-RIRF(2)] is less than zero. 3. The "reactivity and burnup information" referred to in NIRF(4) consists of seven lines of data characteristic of an individual vector (e.g., time, infinite multiplication factor, neutron flux) and three lines containing irradiation parameters (e.g., burnup) averaged over the range of the BUP commands (Sect. 4.14). Also, see Sect. 8.2.2. 4. Internal ORIGEN2 parameters related to the flux/specific power calculations are printed on unit 15 (see Sect. 8.2.1).

IRP - Specific Power Irradiation

Function	Irradiation for a single interval with the specific power specified.
Data sequence	IRP RIRP(1), RIRP(2), NIRP(1)... NIRP(4) RIRP(1) = time at which this irradiation interval ends RIRP(2) = power level during this irradiation interval if RIRP(2).GT.0.0 = MW(t) per unit of fuel input if RIRP(2).LT.0.0 = the power is given by: NEWPOWER = OLDPOWER* [-RIRP(2)] where NEWPOWER = power to be used during this interval, MW(t) NIRP(1) = number of the vector where the material composition at the beginning of this irradiation interval is stored NIRP(2) = number of the vector where the material composition at the end of this irradiation interval is to be stored NIRP(3) = time units of RIRP(1); see Table 4.2 NIRP(4) = specification of time at which this irradiation interval begins: 0 = starting time is the end of the previous IRF, IRP, or DEC interval. All reactivity and burnup information is retained, and MIRR is not altered. Used for continuing irradiation/decay on the same output page. 1 = starting time is set to zero. All reactivity and burnup information is retained, and MIRR is set to zero. Used for beginning a new irradiation on the same output page. 2 = starting time is set to zero. All reactivity and burnup information and MIRR are set to zero. Used to begin a new irradiation/decay on a new output page. 3 = same as NIRP(4) = 0 except that the first seven lines of the irradiation information are set to zero. Used for continuing irradiation to a new output page. 4 = same as NIRP(4) = 1 except that the first seven lines of the reactivity and burnup information are set to zero. Used to begin the decay following irradiation on a new output page while retaining the average irradiation parameters.
Remarks	1. The total number of IRF+IRP+DEC commands must be .LE.150. 2. For this option to be used, the time steps for the current irradiation and decay sequence must correspond exactly to those in the previous sequence. The powers from the previous irradiation are not altered if [-RIRP(2)] is less than zero. 3. The "reactivity and burnup information" referred to in NIRP(4) consists of seven lines of data characteristic of an individual vector (e.g., time, infinite multiplication factor, neutron flux) and three lines containing irradiation parameters (e.g., burnup) averaged over the range of the BUP commands (Sect. 4.14). 4. Internal ORIGEN2 parameters related to the flux/specific power calculations are printed on unit 15 (see Sect. 8.2.1).

LIB - Read Decay and Cross-Section Libraries

Function	Read decay and cross-section libraries; substitute decay
----------	--

	and cross-section cards and cards with non-standard reactions.
Data sequence	LIB NLIB(1), . . . NLIB(11) LIB = command keyword NLIB(1) = control character for printing matrix of non-zero reaction rates (array A) for the libraries read. If NLIB(1).GT.0 - print .LE.0 - no print NLIB(2) = identification number of light nuclide decay library to be read; see Table 4.4 NLIB(3) = identification number of actinide nuclide decay library to be read; see Table 4.4 NLIB(4) = identification number of fission product nuclide decay library to be read; see Table 4.4 NLIB(5) - identification number of light nuclide cross-section library to be read; see Table 4.4 NLIB(6) - identification number of actinide nuclide cross-section library to be read; see Table 4.4 NLIB(7) = identification number of fission product nuclide yield and cross-section library to be read; see Table 4.4 If NLIB(2-7).EQ.0 - no read .GT.0 - <i>normal</i> read on unit NLIB(8) .LT.0 - normal read on unit NLIB(8) and substitute card read on unit (9) NLIB(8) - <i>number</i> of input unit for normal reading of the bulk of the libraries NLIB(9) - number of input unit for reading substitute cards NLIB(10) - number of non-standard reactions to be read If NLIB(10).EQ.0 - no read .GT.0 - non-standard reactions read on unit NLIB(8) .LT.0 - non-standard reactions read on unit NLIB(9) NLIB(11) - control character identifying the set of actinides with <i>direct</i> fission product yields; see Table 4.5 NLIB(12) - <i>control</i> character identifying the set of variable actinide cross sections to be used; see Table 4.4
Remarks	1. If substitute cards are to be read, the LPU command(s) (Sect. 4.20) must precede the LIB command in which the cards are to be read. 2. See Sect-. 5 for library format details.

Table 4.4 Number of ORIGEN2 data libraries

Type of library	AP [NLIB(2 or 5)]	ACT [NLIB(3 or 6)]	FP [NLIB(4 or 7)]	NLIB(12)
Decay	1	2	3	
PWR; ²³⁵ U enriched UO ₂ : 33,000 MWd/metric ton	204	205	206	1
PWR; ²³⁵ U enriched UO ₂ : in a self-generated Pu recycle reactor	207	208	209	2
PWR: Pu-enriched UO ₂ : in a self-generate Pu recycle reactor	210	211	212	3
PWR: ²³⁵ U enriched UO ₂ : 50,000 MWd/metric ton	219	220	221	9
Thermal: 0.0253 eV cross sections	201	202	203	0
PWR fueled with ThO ₂ , BWR & LMFBR reactor information not included in table.				

AP = Activation product

ACT = Actinide

FP = Fission product

Table 4.5. Actinide sets with direct fission product yields

NLIB(11)	Actinides with direct fission product yields
1	^{235,238} U, ^{239,241} Pu
2	²³² Th, ^{233,235} U, ²³⁹ Pu
3	²³² Th, ^{233,235,238} U, ^{239,241+Pu}
4	^{232+Th, +233,234,238} U, ^{239,241} Pu, ²⁴⁵ Cm, ²⁵² Cf

LIP - Library Print Control

Function	Controls the printing of the input data libraries.
Data sequence	LIP NLIP(1), NLIP(2), NLIP(3) where LIP - command keyword NLIP(1) = control character for decay library print NLIP(2) = control character for cross-section library print NLIP(3) = control character for photon library print If NLIP(I).EQ.0 - no print .GT.0 - print library

MOV - Move Nuclide Composition from Vector to Vector

Function	Moves (i.e., copies) the nuclide concentration data in one vector to another vector, nuclide by nuclide.
Remarks	1. Vector NMOV(2) can be zeroed by moving another vector to NMOV(2) with RMOV(1)=0.0. 2. The information in vector NMOV(1) is not destroyed by the MOV command. 3. Vector NMOV(2) will have the same heading as vector NMOV(1) after the MOV command has been executed.

OPTA - Specify Options for Actinide Nuclide Output Table

Function	Specifies which output table types (nuclide, element, or summary) are to be printed for the actinide nuclides.
Data sequence	OPTA NOPTA(1),...,NOPTA(24) NOPTA(I) = control character indicating which output table types are to be printed for the actinide nuclides; see

	Table 4.6 I = table number; see Table 4.3 for output table description.
Remarks	1. The NOPTA(I) must all be on a single card. 2. If NOPTA(1) is less than 1, only a summary grams table is printed for all nuclides (including actinides and fission products) until new commands (after an STP, Sect, 4.29) are read. 3. Only the first 24 tables in Table 4.3 are controlled by the OPTA command.

OPTF - Specify Options for Fission Product Nuclide Output Table

Function	Specifies which output table types (nuclide, element, or summary) are to be printed for the fission products.
Data sequence	OPTF NOPTF(1),...,NOPTF(24) NOPTF(I) = control character indicating which output table types are to be printed for the fission product nuclides; see Table 4.6 I = table number; see Table 4.3 for output table description.
Remarks	1. The NOPTF(I) must all be on a single card. 2. If NOPTF(1) is less than 1, only a summary grams table is printed for all nuclides (including actinides and fission products) until new commands (after an STP, Sect, 4.29) are read. 3. Only the first 24 tables in Table 4.3 are controlled by the OPTF command.

OPTL - Specify Activation Product Output Options

Function	Specifies which output table types (nuclide, element, or summary) are to be printed for the activation products.
Data sequence	OPTL NOPTL(1),...,NOPTL(24) NOPTL(I) = control character indicating which output table types are to be printed for the activation products; see Table 4.6 I = table number; see Table 4.3 for output table description.
Remarks	1. The NOPTL(I) must all be on a single card. 2. If NOPTL(1) is less than 1, only a summary grams table is printed for all nuclides (including actinides and fission products) until new commands (after an STP, Sect, 4.29) are read. 3. Only the first 24 tables in Table 4.3 are controlled by the OPTL command.

Table 4.6 Specification of output table types to be printed.

NOPTL(I) NOPTA(I) NOPTF(I)	Table type printed		
	Nuclide	Element	Summary
1	YES	YES	YES
2	YES	YES	NO
3	YES	NO	YES
4	NO	YES	YES
5	YES	NO	NO
6	NO	YES	NO
7	NO	NO	YES
8	NO	NO	NO

OUT- Print Calculated Results

Function	Calls for the calculated <i>results in some</i> or all of the output vectors to be printed.
Remarks	1. If NOUT(2).NE.1, a REC command must be employed (Sect. 4.8).

PCH- Punch an Output Vector

Function	Punch a designated output vector In ORICEN2-readable format or write it to a disk file.
Remarks	1. Format of punched output is [2X,I2,4(1X,I6,2X,1PE10.4)]; see Sect. 6.1 for details. 2. Units of punched output are g-atoms. 3. The last record (card) written by each PCH command is 0 BURNUP FLUX SPECIFIC POWER. The burnup, flux, and specific power are average values produced by the BUP command and must be present for a file read on unit 4 [NINP(2).LT.0]. These parameters are not necessary for input material compositions read with NINP(2).GT.0.

PHO - Read Photon Libraries

Function	Read the <i>photon</i> production rate per disintegration in 18 <i>energy groups</i> .
Data sequence	PHO NFHO(1), . . . NPHO(4) where PHO - command keyword NPHO(1) = identification number of activation product photon library to be read; see Table 4.4 NPHO(2) = identification number of actinide nuclide photon library to be read; see Table 4.4 NPHO(3) = identification number of fission product nuclide photon library to be read; see Table 4.4 If NPHO(1-3).LE.0 - no read .GT.0 - read NPHO(4) - number <i>of</i> input unit an which the photon libraries are to be read.

RDA- Read Comments Regarding Case Being Input

Function	Prints alphanumeric comments among <i>the</i> listing of the operational commands being input.
Remarks	These comments are printed in the listing created when ORIGEN2 is interpreting the commands, which is separate from the card input echo (described in Sect. 2.6).

TIT-Case Title

Function	Supplies case title printed in OBIGEN2 output.
----------	--

FORTRAN SOURCE CODE AND SUBROUTINES

```

program ORIGEN_DATA_REDUCTION
!
!   Written by: Pamela Longmire, SNL/6415/(505)845.0493, CREATED TUE 31 MAY 03
!
  IMPLICIT NONE

  integer:: i
  integer:: atomic_number
  integer:: rn_class
  character (len=9):: nuclide_number
  character (len=2) :: chemical_element
  character (len=2) :: class_name

  OPEN(UNIT=1,FILE="c:\MOX\ATM_ELEMENT_CLASS_rev.TXT")
  OPEN(UNIT=10,FILE="c:\MOX\ATM_ELEMENT_CLASS.OUT", STATUS='old')

!
!   Reference: NUREG/CR-6119 Rev 2, RN Package Reference Manual (RN-RM-10)
!   RN classes specified in the MELCOR manual are being read into a file for
!   later use in this code.
!
  DO i=1,100
    READ(1,10) atomic_number,chemical_element,rn_class,class_name
    WRITE(10,12) atomic_number,chemical_element,rn_class,class_name
10    FORMAT(I3,A2,I2,A2)
12    FORMAT(I3,2X,A2,2X,I2,2X,A2)
  END DO

!
!   Preparation of ORIGEN2 V2.2 data: each line of the output is read sequentially
!   as a character string of length 132 characters. Comparisons are made to determine
!   whether the desired information is being read and if so to capture and write it to
!   a file.
!
  CALL LEU_CYCLE_1
  CALL LEU_CYCLE_2
  CALL LEU_CYCLE_3
  CALL MOX_CYCLE_1
  CALL MOX_CYCLE_2
!   CALL sort_by_elements
  CALL add_like_elements

END PROGRAM ORIGEN_DATA_REDUCTION

SUBROUTINE LEU_CYCLE_1

  real::fuel_charge
  real::fuel_discharge
  real::decay_1HR
  real::decay_2HR
  real::decay_12HR
  real::decay_24HR
  character (len=9):: nuclide_number
  character (len=2) :: chemical_element
  character (132) FUEL_ONLY_GRAMS_LINE1
  character (132) FUEL_ONLY_CURIES_LINE1
  character (132) FUEL_ONLY_WATTS_LINE1
  character (132) FUEL_ONLY_LINE2
  character (132) CHECK_4_LINE1
  character (132) CHECK_4_LINE2
  character (132) WHOLE_LINE
  character (35) TITLE_PWR_ASSEMBLY
  character (39) TABLE_5_HEADING
  character (40) TABLE_7_HEADING
  character (39) TABLE_9_HEADING
  character (2) ELEMENT_LIST_END
  real::aSUB_1
  real::aSUB_2

```

```

real::aSUB_3
real::aSUB_4
real::aSUB_5
real::aSUB_6
logical grams
logical watts
logical curies

! ***** LEU - 1 CYCLE *****

      OPEN(UNIT=2,FILE="c:\MOX\leu_4236_1cycle_19157mwd.txt",SHARED)
      OPEN(UNIT=20,FILE="c:\MOX\leu_4236_1cycle_19157mwd.out",SHARED)
      OPEN(UNIT=21,FILE="c:\MOX\leu_grams_1cycle_19157mwd.out",SHARED)
      OPEN(UNIT=22,FILE="c:\MOX\leu_curies_1cycle_19157mwd.out",SHARED)
      OPEN(UNIT=23,FILE="c:\MOX\leu_watts_1cycle_19157mwd.out",SHARED)

!
! SUMTOT resides at the end of the list of elements/nuclides since
! the interest is in elements that are two characters in length
! SUMTOT was truncated in order to compare it to elements in column one.
! The variable ELEMENT_LIST_END is used for this purpose in this code.
!

      ELEMENT_LIST_END='SU'

!
! Several lines appear in the heading of each printed page of the ORIGEN2
! V2.2 output file. The following lines were selected from these heading
! lines and are used to search for the desired information for inclusion
! into the file that will be used for comparison and then subsequently
! merged with RN class information from MELCOR.
!

      FUEL_ONLY_GRAMS_LINE1="                    5 SUMMARY TABLE:
&CONCENTRATIONS, GRAMS      "

      FUEL_ONLY_CURIES_LINE1="                    7 SUMMARY TABLE:
&RADIOACTIVITY,  CURIES     "

      FUEL_ONLY_WATTS_LINE1="                    9 SUMMARY TABLE:
&THERMAL POWER,  WATTS      "

      FUEL_ONLY_LINE2="          FUEL CHG  FUEL DIS
&      1.0HR      2.0HR      12.0HR      24.0HR
&                                "

      DO WHILE (WHOLE_LINE.NE.'EOF')

        READ(2,21) WHOLE_LINE
        WRITE(20,21) WHOLE_LINE

        grams=.false.
        watts=.false.
        curies=.false.

        IF (WHOLE_LINE.EQ.FUEL_ONLY_GRAMS_LINE1) THEN
          grams=.true.

          READ(2,21) WHOLE_LINE
          WRITE(20,21) WHOLE_LINE

          READ(2,21) WHOLE_LINE
          WRITE(20,21) WHOLE_LINE

        ENDIF

        IF (WHOLE_LINE.EQ.FUEL_ONLY_WATTS_LINE1) THEN
          watts=.true.

          READ(2,21) WHOLE_LINE
          WRITE(20,21) WHOLE_LINE

```

```

        READ(2,21) WHOLE_LINE
        WRITE(20,21) WHOLE_LINE

ENDIF

IF (WHOLE_LINE.EQ.FUEL_ONLY_CURIES_LINE1) THEN
    curies=.true.

    READ(2,21) WHOLE_LINE
    WRITE(20,21) WHOLE_LINE

    READ(2,21) WHOLE_LINE
    WRITE(20,21) WHOLE_LINE

ENDIF

! ***** MASS READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. grams) THEN
    READ(2,21) WHOLE_LINE
    WRITE(20,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)

    IF (nuclide_number.EQ.( "          ")) then
        chemical_element=WHOLE_LINE(:2)

        DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(21,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

            READ(2,21) WHOLE_LINE
            chemical_element=WHOLE_LINE(:2)

        ENDDO

    ENDIF
ENDIF

! ***** RADIOACTIVITY READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. curies) THEN
    READ(2,21) WHOLE_LINE
    WRITE(20,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)

    IF (nuclide_number.EQ.( "          ")) then
        chemical_element=WHOLE_LINE(:2)

        DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(22,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

            READ(2,21) WHOLE_LINE
            chemical_element=WHOLE_LINE(:2)

        ENDDO

    ENDIF
ENDIF

! ***** POWER READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. watts) THEN

```

```

        READ(2,21) WHOLE_LINE
        WRITE(20,21) WHOLE_LINE
            nuclide_number=WHOLE_LINE(3:12)

        IF (nuclide_number.EQ.( "          ")) then
            chemical_element=WHOLE_LINE(:2)

            DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

                READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                     aSUB_6

                WRITE(23,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                     aSUB_5,aSUB_6

                READ(2,21) WHOLE_LINE
                chemical_element=WHOLE_LINE(:2)
            ENDDO

        ENDIF
    ENDIF

121  FORMAT(11x,5(e9.3,1x),e9.3)
21   FORMAT(A132)
25   FORMAT(A2,9X,5(e9.3,1X),e9.3)

ENDDO

END SUBROUTINE

!
! *****
!

SUBROUTINE LEU_CYCLE_2

real::fuel_charge
real::fuel_discharge
real::decay_1HR
real::decay_2HR
real::decay_12HR
real::decay_24HR
character (len=9):: nuclide_number
character (len=2) :: chemical_element
character (132) FUEL_ONLY_GRAMS_LINE1
character (132) FUEL_ONLY_CURIES_LINE1
character (132) FUEL_ONLY_WATTS_LINE1
character (132) FUEL_ONLY_LINE2
character (132) CHECK_4_LINE1
character (132) CHECK_4_LINE2
character (132) WHOLE_LINE
character (35) TITLE_PWR_ASSEMBLY
character (39) TABLE_5_HEADING
character (40) TABLE_7_HEADING
character (39) TABLE_9_HEADING
character (2) ELEMENT_LIST_END
real::aSUB_1
real::aSUB_2
real::aSUB_3
real::aSUB_4
real::aSUB_5
real::aSUB_6
logical grams
logical watts
logical curies

! ***** LEU - 2 CYCLE *****

OPEN(UNIT=3,FILE="c:\MOX\leu_4236_2cycle_38313mwd.txt",SHARED)
OPEN(UNIT=30,FILE="c:\MOX\leu_4236_2cycle_38313mwd.out",SHARED)
OPEN(UNIT=31,FILE="c:\MOX\leu_grams_2cycle_38313mwd.out",SHARED)
OPEN(UNIT=32,FILE="c:\MOX\leu_curies_2cycle_38313mwd.out",SHARED)

```

```

OPEN(UNIT=33,FILE="c:\MOX\leu_watts_2cycle_38313mwd.out",SHARED)

!
! SUMTOT resides at the end of the list of elements/nuclides since
! the interest is in elements that are two characters in length
! SUMTOT was truncated in order to compare it to elements in column one.
! The variable ELEMENT_LIST_END is used for this purpose in this code.
!

ELEMENT_LIST_END='SU'

!
! Several lines appear in the heading of each printed page of the ORIGEN2
! V2.2 output file. The following lines were selected from these heading
! lines and are used to search for the desired information for inclusion
! into the file that will be used for comparison and then subsequently
! merged with RN class information from MELCOR.
!

      FUEL_ONLY_GRAMS_LINE1="                    5 SUMMARY TABLE:
&CONCENTRATIONS, GRAMS      "

      FUEL_ONLY_CURIES_LINE1="                    7 SUMMARY TABLE:
&RADIOACTIVITY,  CURIES     "

      FUEL_ONLY_WATTS_LINE1="                    9 SUMMARY TABLE:
&THERMAL POWER,  WATTS      "

      FUEL_ONLY_LINE2="          FUEL CHG  FUEL DIS
&      1.0HR    2.0HR    12.0HR    24.0HR
&                                "

DO WHILE (WHOLE_LINE.NE.'EOF')

  READ(3,21) WHOLE_LINE
  WRITE(30,21) WHOLE_LINE

  grams=.false.
  watts=.false.
  curies=.false.

  IF (WHOLE_LINE.EQ.FUEL_ONLY_GRAMS_LINE1) THEN
    grams=.true.

    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE

    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE

  endif

  IF (WHOLE_LINE.EQ.FUEL_ONLY_WATTS_LINE1) THEN
    watts=.true.

    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE

    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE

  endif

  IF (WHOLE_LINE.EQ.FUEL_ONLY_CURIES_LINE1) THEN
    curies=.true.

    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE

    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE

```

```

endif

! ***** MASS READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. grams) THEN
    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)

    IF (nuclide_number.EQ.( "          ")) then
        chemical_element=WHOLE_LINE(:2)

        DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(31,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

            READ(3,21) WHOLE_LINE
            chemical_element=WHOLE_LINE(:2)
            ENDDO

        ENDIF
    ENDIF

! ***** RADIOACTIVITY READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. curies) THEN
    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)

    IF (nuclide_number.EQ.( "          ")) then
        chemical_element=WHOLE_LINE(:2)

        DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(32,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

            READ(3,21) WHOLE_LINE
            chemical_element=WHOLE_LINE(:2)
            ENDDO

        ENDIF
    ENDIF

! ***** POWER READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. watts) THEN
    READ(3,21) WHOLE_LINE
    WRITE(30,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)

    IF (nuclide_number.EQ.( "          ")) then
        chemical_element=WHOLE_LINE(:2)

        DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(33,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

```

```

        READ(3,21) WHOLE_LINE
        chemical_element=WHOLE_LINE(:2)
        enddo

        ENDIF
    ENDIF

121  FORMAT(11x,5(e9.3,1x),e9.3)
21   FORMAT(A132)
25   FORMAT(A2,9X,5(e9.3,1X),e9.3)

    ENDDO

    END SUBROUTINE

!
! *****
!
    SUBROUTINE LEU_CYCLE_3

    real::fuel_charge
    real::fuel_discharge
    real::decay_1HR
    real::decay_2HR
    real::decay_12HR
    real::decay_24HR
    character (len=9):: nuclide_number
    character (len=2) :: chemical_element
    character (132) FUEL_ONLY_GRAMS_LINE1
    character (132) FUEL_ONLY_CURIES_LINE1
    character (132) FUEL_ONLY_WATTS_LINE1
    character (132) FUEL_ONLY_LINE2
    character (132) CHECK_4_LINE1
    character (132) CHECK_4_LINE2
    character (132) WHOLE_LINE
    character (35) TITLE_PWR_ASSEMBLY
    character (39) TABLE_5_HEADING
    character (40) TABLE_7_HEADING
    character (39) TABLE_9_HEADING
    character (2) ELEMENT_LIST_END
    real::aSUB_1
    real::aSUB_2
    real::aSUB_3
    real::aSUB_4
    real::aSUB_5
    real::aSUB_6
    logical grams
    logical watts
    logical curies

! ***** LEU - 3 CYCLE *****

    OPEN(UNIT=4, FILE="c:\MOX\leu_4236_3cycle_57470mwd.txt", SHARED)
    OPEN(UNIT=40, FILE="c:\MOX\leu_4236_3cycle_57470mwd.out", SHARED)
    OPEN(UNIT=41, FILE="c:\MOX\leu_grams_3cycle_57470mwd.out", SHARED)
    OPEN(UNIT=42, FILE="c:\MOX\leu_curies_3cycle_57470mwd.out", SHARED)
    OPEN(UNIT=43, FILE="c:\MOX\leu_watts_3cycle_57470mwd.out", SHARED)

!
!
! SUMTOT resides at the end of the list of elements/nuclides since
! the interest is in elements that are two characters in length
! SUMTOT was truncated in order to compare it to elements in column one.
! The variable ELEMENT_LIST_END is used for this purpose in this code.
!

    ELEMENT_LIST_END='SU'

!
! Several lines appear in the heading of each printed page of the ORIGEN2
! V2.2 output file. The following lines were selected from these heading

```

```
! lines and are used to search for the desired information for inclusion
! into the file that will be used for comparison and then subsequently
! merged with RN class information from MELCOR.
!
```

```
FUEL_ONLY_GRAMS_LINE1="          5 SUMMARY TABLE:
&CONCENTRATIONS, GRAMS      "
```

```
FUEL_ONLY_CURIES_LINE1="          7 SUMMARY TABLE:
&RADIOACTIVITY,  CURIES     "
```

```
FUEL_ONLY_WATTS_LINE1="          9 SUMMARY TABLE:
&THERMAL POWER,  WATTS      "
```

```
FUEL_ONLY_LINE2="          FUEL CHG  FUEL DIS
&    1.0HR    2.0HR    12.0HR    24.0HR
&                                "
```

```
DO WHILE (WHOLE_LINE.NE.'EOF')
```

```
  READ(4,21) WHOLE_LINE
  WRITE(40,21) WHOLE_LINE
```

```
  grams=.false.
  watts=.false.
  curies=.false.
```

```
  IF (WHOLE_LINE.EQ.FUEL_ONLY_GRAMS_LINE1) THEN
    grams=.true.
```

```
    READ(4,21) WHOLE_LINE
    WRITE(40,21) WHOLE_LINE
```

```
    READ(4,21) WHOLE_LINE
    WRITE(40,21) WHOLE_LINE
```

```
  endif
```

```
  IF (WHOLE_LINE.EQ.FUEL_ONLY_WATTS_LINE1) THEN
    watts=.true.
```

```
    READ(4,21) WHOLE_LINE
    WRITE(40,21) WHOLE_LINE
```

```
    READ(4,21) WHOLE_LINE
    WRITE(40,21) WHOLE_LINE
```

```
  endif
```

```
  IF (WHOLE_LINE.EQ.FUEL_ONLY_CURIES_LINE1) THEN
    curies=.true.
```

```
    READ(4,21) WHOLE_LINE
    WRITE(40,21) WHOLE_LINE
```

```
    READ(4,21) WHOLE_LINE
    WRITE(40,21) WHOLE_LINE
```

```
  endif
```

```
! ***** MASS READING *****
```

```
  IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. grams) THEN
    READ(4,21) WHOLE_LINE
    WRITE(40,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)
```

```
    IF (nuclide_number.EQ.( "          ")) then
      chemical_element=WHOLE_LINE(:2)
```

```
      DO WHILE (chemical_element.NE.ELEMENT_LIST_END)
```

```

        READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

        WRITE(41,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

        READ(4,21) WHOLE_LINE
        chemical_element=WHOLE_LINE(:2)
        ENDDO

    ENDIF
ENDIF

! ***** RADIOACTIVITY READING *****

    IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. curies) THEN
        READ(4,21) WHOLE_LINE
        WRITE(40,21) WHOLE_LINE
        nuclide_number=WHOLE_LINE(3:12)

        IF (nuclide_number.EQ.( "          ")) then
            chemical_element=WHOLE_LINE(:2)

            DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

                READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

                WRITE(42,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

                READ(4,21) WHOLE_LINE
                chemical_element=WHOLE_LINE(:2)
                ENDDO

            ENDIF
        ENDIF

! ***** POWER READING *****

    IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. watts) THEN
        READ(4,21) WHOLE_LINE
        WRITE(40,21) WHOLE_LINE
        nuclide_number=WHOLE_LINE(3:12)

        IF (nuclide_number.EQ.( "          ")) then
            chemical_element=WHOLE_LINE(:2)

            DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

                READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

                WRITE(43,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

                READ(4,21) WHOLE_LINE
                chemical_element=WHOLE_LINE(:2)
                ENDDO

            ENDIF
        ENDIF

121  FORMAT(11x,5(e9.3,1x),e9.3)
21   FORMAT(A132)
25   FORMAT(A2,9X,5(e9.3,1X),e9.3)

    ENDDO

    END SUBROUTINE

```

```

!
! *****
!
SUBROUTINE MOX_CYCLE_1

real::fuel_charge
real::fuel_discharge
real::decay_1HR
real::decay_2HR
real::decay_12HR
real::decay_24HR
character (len=9):: nuclide_number
character (len=2) :: chemical_element
character (132) FUEL_ONLY_GRAMS_LINE1
character (132) FUEL_ONLY_CURIES_LINE1
character (132) FUEL_ONLY_WATTS_LINE1
character (132) FUEL_ONLY_LINE2
character (132) CHECK_4_LINE1
character (132) CHECK_4_LINE2
character (132) WHOLE_LINE
character (35) TITLE_PWR_ASSEMBLY
character (39) TABLE_5_HEADING
character (40) TABLE_7_HEADING
character (39) TABLE_9_HEADING
character (2) ELEMENT_LIST_END
real::aSUB_1
real::aSUB_2
real::aSUB_3
real::aSUB_4
real::aSUB_5
real::aSUB_6
logical grams
logical watts
logical curies

! ***** MOX - 1 CYCLE *****

OPEN(UNIT=5, FILE="c:\MOX\mox_4364_1cycle_19157mwd.txt", SHARED)
OPEN(UNIT=50, FILE="c:\MOX\mox_4364_1cycle_19157mwd.out", SHARED)
OPEN(UNIT=51, FILE="c:\MOX\mox_grams_1cycle_19157mwd.out", SHARED)
OPEN(UNIT=52, FILE="c:\MOX\mox_curies_1cycle_19157mwd.out", SHARED)
OPEN(UNIT=53, FILE="c:\MOX\mox_watts_1cycle_19157mwd.out", SHARED)

!
! SUMTOT resides at the end of the list of elements/nuclides since
! the interest is in elements that are two characters in length
! SUMTOT was truncated in order to compare it to elements in column one.
! The variable ELEMENT_LIST_END is used for this purpose in this code.
!

ELEMENT_LIST_END='SU'

!
! Several lines appear in the heading of each printed page of the ORIGEN2
! V2.2 output file. The following lines were selected from these heading
! lines and are used to search for the desired information for inclusion
! into the file that will be used for comparison and then subsequently
! merged with RN class information from MELCOR.
!

FUEL_ONLY_GRAMS_LINE1="          5 SUMMARY TABLE:
&CONCENTRATIONS, GRAMS      "

FUEL_ONLY_CURIES_LINE1="          7 SUMMARY TABLE:
&RADIOACTIVITY,  CURIES     "

FUEL_ONLY_WATTS_LINE1="          9 SUMMARY TABLE:
&THERMAL POWER,  WATTS      "

```

```

FUEL_ONLY_LINE2="          FUEL CHG  FUEL DIS
&      1.0HR      2.0HR      12.0HR      24.0HR
&                                     "

DO WHILE (WHOLE_LINE.NE.'EOF')

    READ(5,21) WHOLE_LINE
    WRITE(50,21) WHOLE_LINE

    grams=.false.
    watts=.false.
    curies=.false.

    IF (WHOLE_LINE.EQ.FUEL_ONLY_GRAMS_LINE1) THEN
        grams=.true.

        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE

        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE

    endif

    IF (WHOLE_LINE.EQ.FUEL_ONLY_WATTS_LINE1) THEN
        watts=.true.

        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE

        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE

    endif

    IF (WHOLE_LINE.EQ.FUEL_ONLY_CURIES_LINE1) THEN
        curies=.true.

        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE

        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE

    endif

! ***** MASS READING *****

    IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. grams) THEN
        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE
        nuclide_number=WHOLE_LINE(3:12)

        IF (nuclide_number.EQ.( "          ")) then
            chemical_element=WHOLE_LINE(:2)

            DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

                READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                     aSUB_6

                WRITE(51,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                     aSUB_5,aSUB_6

                READ(5,21) WHOLE_LINE
                chemical_element=WHOLE_LINE(:2)
            enddo

        ENDIF
    ENDIF

```

```

! ***** RADIOACTIVITY READING *****

      IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. curies) THEN
        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE
        nuclide_number=WHOLE_LINE(3:12)

        IF (nuclide_number.EQ.( "          ")) then
          chemical_element=WHOLE_LINE(:2)

          DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(52,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

            READ(5,21) WHOLE_LINE
            chemical_element=WHOLE_LINE(:2)
            enddo

          ENDIF
        ENDIF

! ***** POWER READING *****

      IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. watts) THEN
        READ(5,21) WHOLE_LINE
        WRITE(50,21) WHOLE_LINE
        nuclide_number=WHOLE_LINE(3:12)

        IF (nuclide_number.EQ.( "          ")) then
          chemical_element=WHOLE_LINE(:2)

          DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(53,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

            READ(5,21) WHOLE_LINE
            chemical_element=WHOLE_LINE(:2)
            enddo

          ENDIF
        ENDIF

121  FORMAT(11x,5(e9.3,1x),e9.3)
21   FORMAT(A132)
25   FORMAT(A2,9X,5(e9.3,1x),e9.3)

      ENDDO

      END SUBROUTINE

!
! *****
!

      SUBROUTINE MOX_CYCLE_2

      real::fuel_charge
      real::fuel_discharge
      real::decay_1HR
      real::decay_2HR
      real::decay_12HR
      real::decay_24HR
      character (len=9):: nuclide_number
      character (len=2) :: chemical_element

```

```

character (132) FUEL_ONLY_GRAMS_LINE1
character (132) FUEL_ONLY_CURIES_LINE1
character (132) FUEL_ONLY_WATTS_LINE1
character (132) FUEL_ONLY_LINE2
character (132) CHECK_4_LINE1
character (132) CHECK_4_LINE2
character (132) WHOLE_LINE
character (35) TITLE_PWR_ASSEMBLY
character (39) TABLE_5_HEADING
character (40) TABLE_7_HEADING
character (39) TABLE_9_HEADING
character (2) ELEMENT_LIST_END
real::aSUB_1
real::aSUB_2
real::aSUB_3
real::aSUB_4
real::aSUB_5
real::aSUB_6
logical grams
logical watts
logical curies

! ***** MOX - 2 CYCLE *****

OPEN(UNIT=6, FILE="c:\MOX\mox_4364_2cycle_38313mwd.txt", SHARED)
OPEN(UNIT=60, FILE="c:\MOX\mox_4364_2cycle_38313mwd.out", SHARED)
OPEN(UNIT=61, FILE="c:\MOX\mox_grams_2cycle_38313mwd.out", SHARED)
OPEN(UNIT=62, FILE="c:\MOX\mox_curies_2cycle_38313mwd.out", SHARED)
OPEN(UNIT=63, FILE="c:\MOX\mox_watts_2cycle_38313mwd.out", SHARED)

!
! SUMTOT resides at the end of the list of elements/nuclides since
! the interest is in elements that are two characters in length
! SUMTOT was truncated in order to compare it to elements in column one.
! The variable ELEMENT_LIST_END is used for this purpose in this code.
!

ELEMENT_LIST_END='SU'

!
! Several lines appear in the heading of each printed page of the ORIGEN2
! V2.2 output file. The following lines were selected from these heading
! lines and are used to search for the desired information for inclusion
! into the file that will be used for comparison and then subsequently
! merged with RN class information from MELCOR.
!

FUEL_ONLY_GRAMS_LINE1="                    5 SUMMARY TABLE:
&CONCENTRATIONS, GRAMS      "

FUEL_ONLY_CURIES_LINE1="                    7 SUMMARY TABLE:
&RADIOACTIVITY,  CURIES     "

FUEL_ONLY_WATTS_LINE1="                    9 SUMMARY TABLE:
&THERMAL POWER,  WATTS      "

FUEL_ONLY_LINE2="          FUEL CHG  FUEL DIS
&      1.0HR    2.0HR    12.0HR    24.0HR
&                                "

DO WHILE (WHOLE_LINE.NE.'EOF')

  READ(6,21) WHOLE_LINE
  WRITE(60,21) WHOLE_LINE

  grams=.false.
  watts=.false.
  curies=.false.

  IF (WHOLE_LINE.EQ.FUEL_ONLY_GRAMS_LINE1) THEN

```

```

grams=.true.

    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE

    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE

endif

IF (WHOLE_LINE.EQ.FUEL_ONLY_WATTS_LINE1) THEN
    watts=.true.

    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE

    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE

endif

IF (WHOLE_LINE.EQ.FUEL_ONLY_CURIES_LINE1) THEN
    curies=.true.

    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE

    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE

endif

! ***** MASS READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. grams) THEN
    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)

    IF (nuclide_number.EQ.( "          ")) then
        chemical_element=WHOLE_LINE(:2)

        DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

            WRITE(61,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                                aSUB_5,aSUB_6

            READ(6,21) WHOLE_LINE
            chemical_element=WHOLE_LINE(:2)
            ENDDO

        ENDIF
    ENDIF

! ***** RADIOACTIVITY READING *****

IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. curies) THEN
    READ(6,21) WHOLE_LINE
    WRITE(60,21) WHOLE_LINE
    nuclide_number=WHOLE_LINE(3:12)

    IF (nuclide_number.EQ.( "          ")) then
        chemical_element=WHOLE_LINE(:2)

        DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

            READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                                aSUB_6

```

```

        WRITE(62,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                aSUB_5,aSUB_6

        READ(6,21) WHOLE_LINE
        chemical_element=WHOLE_LINE(:2)
        ENDDO

    ENDIF
ENDIF

! ***** POWER READING *****

    IF (WHOLE_LINE.EQ.FUEL_ONLY_LINE2 .and. watts) THEN
        READ(6,21) WHOLE_LINE
        WRITE(60,21) WHOLE_LINE
        nuclide_number=WHOLE_LINE(3:12)

        IF (nuclide_number.EQ.( "          ")) then
            chemical_element=WHOLE_LINE(:2)

            DO WHILE (chemical_element.NE.ELEMENT_LIST_END)

                READ(WHOLE_LINE,121) aSUB_1,aSUB_2,aSUB_3,aSUB_4,aSUB_5,
&                aSUB_6

                WRITE(63,25) chemical_element,aSUB_1,aSUB_2,aSUB_3,aSUB_4,
&                aSUB_5,aSUB_6

                READ(6,21) WHOLE_LINE
                chemical_element=WHOLE_LINE(:2)
                ENDDO

            ENDIF
        ENDIF

121  FORMAT(11X,5(e9.3,1X),e9.3)
21   FORMAT(A132)
25   FORMAT(A2,9X,5(e9.3,1X),e9.3)

    ENDDO

END SUBROUTINE

```

```

SUBROUTINE add_like_elements

  LOGICAL :: L
  CHARACTER (2) :: element
  CHARACTER (2) :: string_a
  CHARACTER (2) :: string_b
  REAL :: COMP_1, COMP_2, COMP_3, COMP_4, COMP_5, COMP_6
  REAL :: COMP_1_a, COMP_2_a, COMP_3_a, COMP_4_a, COMP_5_a, COMP_6_a
  REAL :: COMP_1_b, COMP_2_b, COMP_3_b, COMP_4_b, COMP_5_b, COMP_6_b

  OPEN(UNIT=101, FILE="C:\MOX\LEU_GRAMS_1CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=102, FILE="C:\MOX\LEU_GRAMS_1CYCLE.OUT", SHARED)

  OPEN(UNIT=103, FILE="C:\MOX\LEU_CURIES_1CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=104, FILE="C:\MOX\LEU_CURIES_1CYCLE.OUT", SHARED)

  OPEN(UNIT=105, FILE="C:\MOX\LEU_WATTS_1CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=106, FILE="C:\MOX\LEU_WATTS_1CYCLE.OUT", SHARED)

  OPEN(UNIT=107, FILE="C:\MOX\LEU_GRAMS_2CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=108, FILE="C:\MOX\LEU_GRAMS_2CYCLE.OUT", SHARED)

  OPEN(UNIT=109, FILE="C:\MOX\LEU_CURIES_2CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=110, FILE="C:\MOX\LEU_CURIES_2CYCLE.OUT", SHARED)

  OPEN(UNIT=111, FILE="C:\MOX\LEU_WATTS_2CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=112, FILE="C:\MOX\LEU_WATTS_2CYCLE.OUT", SHARED)

  OPEN(UNIT=113, FILE="C:\MOX\LEU_GRAMS_3CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=114, FILE="C:\MOX\LEU_GRAMS_3CYCLE.OUT", SHARED)

  OPEN(UNIT=115, FILE="C:\MOX\LEU_CURIES_3CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=116, FILE="C:\MOX\LEU_CURIES_3CYCLE.OUT", SHARED)

  OPEN(UNIT=117, FILE="C:\MOX\LEU_WATTS_3CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=118, FILE="C:\MOX\LEU_WATTS_3CYCLE.OUT", SHARED)

  OPEN(UNIT=119, FILE="C:\MOX\MOX_GRAMS_1CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=120, FILE="C:\MOX\MOX_GRAMS_1CYCLE.OUT", SHARED)

  OPEN(UNIT=121, FILE="C:\MOX\MOX_CURIES_1CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=122, FILE="C:\MOX\MOX_CURIES_1CYCLE.OUT", SHARED)

  OPEN(UNIT=123, FILE="C:\MOX\MOX_WATTS_1CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=124, FILE="C:\MOX\MOX_WATTS_1CYCLE.OUT", SHARED)

  OPEN(UNIT=125, FILE="C:\MOX\MOX_GRAMS_2CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=126, FILE="C:\MOX\MOX_GRAMS_2CYCLE.OUT", SHARED)

  OPEN(UNIT=127, FILE="C:\MOX\MOX_CURIES_2CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=128, FILE="C:\MOX\MOX_CURIES_2CYCLE.OUT", SHARED)

  OPEN(UNIT=129, FILE="C:\MOX\MOX_WATTS_2CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=130, FILE="C:\MOX\MOX_WATTS_2CYCLE.OUT", SHARED)

  DO WHILE (element.NE.'EOF')

    READ(101,250) element,COMP_1,COMP_2,COMP_3,COMP_4,COMP_5,COMP_6
      string_a=element
      COMP_1_a=COMP_1
      COMP_2_a=COMP_2
      COMP_3_a=COMP_3
      COMP_4_a=COMP_4
      COMP_5_a=COMP_5
      COMP_6_a=COMP_6

    READ(101,250) element,COMP_1,COMP_2,COMP_3,COMP_4,COMP_5,COMP_6
      string_b=element
      COMP_1_b=COMP_1
      COMP_2_b=COMP_2
      COMP_3_b=COMP_3

```

```

        COMP_4_b=COMP_4
        COMP_5_b=COMP_5
        COMP_6_b=COMP_6

!      L=LLT(string_b,string_a)

!      IF (L==.true.) THEN
        IF (LLT(string_a,string_b)) THEN
            COMP_1=COMP_1_a+COMP_1_b
            COMP_2=COMP_2_a+COMP_2_b
            COMP_3=COMP_3_a+COMP_3_b
            COMP_4=COMP_4_a+COMP_4_b
            COMP_5=COMP_5_a+COMP_5_b
            COMP_6=COMP_6_a+COMP_6_b
            WRITE(102,251) string_a,COMP_1,COMP_2,COMP_3,COMP_4,
&                        COMP_5,COMP_6
        ELSE

!      IF llt(string_a,string_b) THEN
            WRITE(102,251) string_a,COMP_1_a,COMP_2_a,COMP_3_a,
&                        COMP_4_a,COMP_5_a,COMP_6_a
            WRITE(102,251) string_b,COMP_1_b,COMP_2_b,COMP_3_b,
&                        COMP_4_b,COMP_5_b,COMP_6_b

            ENDIF

        END DO

250      FORMAT(A2,6X,5(e8.2,8X),e8.2)
251      FORMAT(A2,9X,5(e9.3,1X),e9.3)

END SUBROUTINE

```

```

PROGRAM ORIGEN_DATA_REDUCTION_collect_elements_POWER

  CALL populate_element_array

END PROGRAM ORIGEN_TO_RN_CLASSES_collect_elements_POWER

SUBROUTINE populate_element_array

!   INTEGER :: I, J, K, JJ
!   INTEGER :: NREC_L1, NREC_L2, NREC_L3, NREC_M1, NREC_M2
!   INTEGER :: NEWREC_L1, NEWREC_L2, NEWREC_L3, NEWREC_M1, NEWREC_M2

!   LEU: FIRST CYCLE
!   INTEGER :: I_L1, J_L1, K_L1, JJ_L1
!   CHARACTER (96):: sorted_line_L1
!   CHARACTER (2), DIMENSION (200) :: CHEM_ID_L1, CHEM_ID2_L1
!   REAL, DIMENSION (200)::VAR1_L1,VAR2_L1,VAR3_L1,VAR4_L1,VAR5_L1
!   REAL, DIMENSION (200)::VARX1_L1,VARX2_L1,VARX3_L1,VARX4_L1
!   REAL, DIMENSION (200)::VAR6_L1,VARX5_L1,VARX6_L1

!   LEU: SECOND CYCLE
!   INTEGER :: I_L2, J_L2, K_L2, JJ_L2
!   CHARACTER (96):: sorted_line_L2
!   CHARACTER (2), DIMENSION (200) :: CHEM_ID_L2, CHEM_ID2_L2
!   REAL, DIMENSION (200)::VAR1_L2,VAR2_L2,VAR3_L2,VAR4_L2,VAR5_L2
!   REAL, DIMENSION (200)::VARX1_L2,VARX2_L2,VARX3_L2,VARX4_L2
!   REAL, DIMENSION (200)::VAR6_L2,VARX5_L2,VARX6_L2

!   LEU: THIRD CYCLE
!   INTEGER :: I_L3, J_L3, K_L3, JJ_L3
!   CHARACTER (96):: sorted_line_L3
!   CHARACTER (2), DIMENSION (200) :: CHEM_ID_L3, CHEM_ID2_L3
!   REAL, DIMENSION (200)::VAR1_L3,VAR2_L3,VAR3_L3,VAR4_L3,VAR5_L3
!   REAL, DIMENSION (200)::VARX1_L3,VARX2_L3,VARX3_L3,VARX4_L3
!   REAL, DIMENSION (200)::VAR6_L3,VARX5_L3,VARX6_L3

!   MOX: FIRST CYCLE
!   INTEGER :: I_M1, J_M1, K_M1, JJ_M1
!   CHARACTER (96):: sorted_line_M1
!   CHARACTER (2), DIMENSION (200) :: CHEM_ID_M1, CHEM_ID2_M1
!   REAL, DIMENSION (200)::VAR1_M1,VAR2_M1,VAR3_M1,VAR4_M1,VAR5_M1
!   REAL, DIMENSION (200)::VARX1_M1,VARX2_M1,VARX3_M1,VARX4_M1
!   REAL, DIMENSION (200)::VAR6_M1,VARX5_M1,VARX6_M1

!   MOX: SECOND CYCLE
!   INTEGER :: I_M2, J_M2, K_M2, JJ_M2
!   CHARACTER (96):: sorted_line_M2
!   CHARACTER (2), DIMENSION (200) :: CHEM_ID_M2, CHEM_ID2_M2
!   REAL, DIMENSION (200)::VAR1_M2,VAR2_M2,VAR3_M2,VAR4_M2,VAR5_M2
!   REAL, DIMENSION (200)::VARX1_M2,VARX2_M2,VARX3_M2,VARX4_M2
!   REAL, DIMENSION (200)::VAR6_M2,VARX5_M2,VARX6_M2

  OPEN(UNIT=100, FILE="C:\MOX\LEU_WATTS_1CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=101, FILE="C:\MOX\LEU_WATTS_1CYCLE.OUT", SHARED)
  OPEN(UNIT=102, FILE="C:\MOX\LEU_WATTS_2CYCLE_SORTED.OUT", SHARED)
  OPEN(UNIT=103, FILE="C:\MOX\LEU_WATTS_2CYCLE.OUT", SHARED)
  OPEN(UNIT=104, FILE="C:\MOX\LEU_WATTS_3CYCLE_SORTED.OUT", SHARED)

```

```

OPEN(UNIT=105, FILE="C:\MOX\LEU_WATTS_3CYCLE.OUT", SHARED)
OPEN(UNIT=106, FILE="C:\MOX\MOX_WATTS_1CYCLE_SORTED.OUT", SHARED)
OPEN(UNIT=107, FILE="C:\MOX\MOX_WATTS_1CYCLE.OUT", SHARED)
OPEN(UNIT=108, FILE="C:\MOX\MOX_WATTS_2CYCLE_SORTED.OUT", SHARED)
OPEN(UNIT=109, FILE="C:\MOX\MOX_WATTS_2CYCLE.OUT", SHARED)

245  FORMAT(A96)
250  FORMAT(2X, 6(1X, E8.2))
251  FORMAT(A2, 9X, 5(E9.3, 1X), E9.3)

I_L1=0
J_L1=0
K_L1=0
I_L2=0
J_L2=0
K_L2=0
I_L3=0
J_L3=0
K_L3=0
I_M1=0
J_M1=0
K_M1=0
I_M2=0
J_M2=0
K_M2=0
NREC_L1=0
NREC_L2=0
NREC_L3=0
NREC_M1=0
NREC_M2=0

DO WHILE (sorted_line_L1.NE.'EOF')
  I_L1=I_L1+1
  READ(100,245) sorted_line_L1
  CHEM_ID_L1(I_L1)=sorted_line_L1(:2)
  READ(sorted_line_L1,250) VAR1_L1(I_L1),VAR2_L1(I_L1),
&                          VAR3_L1(I_L1),VAR4_L1(I_L1),
&                          VAR5_L1(I_L1),VAR6_L1(I_L1)
  NREC_L1=I_L1
ENDDO

DO WHILE (sorted_line_L2.NE.'EOF')
  I_L2=I_L2+1
  READ(102,245) sorted_line_L2
  CHEM_ID_L2(I_L2)=sorted_line_L2(:2)
  READ(sorted_line_L2,250) VAR1_L2(I_L2),VAR2_L2(I_L2),
&                          VAR3_L2(I_L2),VAR4_L2(I_L2),
&                          VAR5_L2(I_L2),VAR6_L2(I_L2)
  NREC_L2=I_L2
ENDDO

DO WHILE (sorted_line_L3.NE.'EOF')
  I_L3=I_L3+1
  READ(104,245) sorted_line_L3
  CHEM_ID_L3(I_L3)=sorted_line_L3(:2)
  READ(sorted_line_L3,250) VAR1_L3(I_L3),VAR2_L3(I_L3),
&                          VAR3_L3(I_L3),VAR4_L3(I_L3),

```

```

&                                VAR5_L3(I_L3),VAR6_L3(I_L3)
NREC_L3=I_L3
ENDDO

DO WHILE (sorted_line_M1.NE.'EOF')
  I_M1=I_M1+1
  READ(106,245) sorted_line_M1
  CHEM_ID_M1(I_M1)=sorted_line_M1(:2)
  READ(sorted_line_M1,250) VAR1_M1(I_M1),VAR2_M1(I_M1),
&                                VAR3_M1(I_M1),VAR4_M1(I_M1),
&                                VAR5_M1(I_M1),VAR6_M1(I_M1)
  NREC_M1=I_M1
ENDDO

DO WHILE (sorted_line_M2.NE.'EOF')
  I_M2=I_M2+1
  READ(108,245) sorted_line_M2
  CHEM_ID_M2(I_M2)=sorted_line_M2(:2)
  READ(sorted_line_M2,250) VAR1_M2(I_M2),VAR2_M2(I_M2),
&                                VAR3_M2(I_M2),VAR4_M2(I_M2),
&                                VAR5_M2(I_M2),VAR6_M2(I_M2)
  NREC_M2=I_M2
ENDDO

J_L1=J_L1+1
JJ_L1=1
DO WHILE (J_L1.LT.NREC_L1)

  IF (CHEM_ID_L1(J_L1).EQ.CHEM_ID_L1(J_L1+1)) THEN
    CHEM_ID2_L1(JJ_L1)=CHEM_ID_L1(J_L1+1)
    VARX1_L1(JJ_L1)=VAR1_L1(J_L1)+VAR1_L1(J_L1+1)
    VARX2_L1(JJ_L1)=VAR2_L1(J_L1)+VAR2_L1(J_L1+1)
    VARX3_L1(JJ_L1)=VAR3_L1(J_L1)+VAR3_L1(J_L1+1)
    VARX4_L1(JJ_L1)=VAR4_L1(J_L1)+VAR4_L1(J_L1+1)
    VARX5_L1(JJ_L1)=VAR5_L1(J_L1)+VAR5_L1(J_L1+1)
    VARX6_L1(JJ_L1)=VAR6_L1(J_L1)+VAR6_L1(J_L1+1)
    J_L1=J_L1+1
  ELSE
    CHEM_ID2_L1(JJ_L1)=CHEM_ID_L1(J_L1)
    VARX1_L1(JJ_L1)=VAR1_L1(J_L1)
    VARX2_L1(JJ_L1)=VAR2_L1(J_L1)
    VARX3_L1(JJ_L1)=VAR3_L1(J_L1)
    VARX4_L1(JJ_L1)=VAR4_L1(J_L1)
    VARX5_L1(JJ_L1)=VAR5_L1(J_L1)
    VARX6_L1(JJ_L1)=VAR6_L1(J_L1)
  ENDIF

  J_L1=J_L1+1
  JJ_L1=JJ_L1+1
ENDDO

NEWREC_L1=JJ_L1-1

J_L2=J_L2+1
JJ_L2=1
DO WHILE (J_L2.LT.NREC_L2)

```

```

      IF (CHEM_ID_L2(J_L2).EQ.CHEM_ID_L2(J_L2+1)) THEN
        CHEM_ID2_L2(JJ_L2)=CHEM_ID_L2(J_L2+1)
        VARX1_L2(JJ_L2)=VAR1_L2(J_L2)+VAR1_L2(J_L2+1)
        VARX2_L2(JJ_L2)=VAR2_L2(J_L2)+VAR2_L2(J_L2+1)
        VARX3_L2(JJ_L2)=VAR3_L2(J_L2)+VAR3_L2(J_L2+1)
        VARX4_L2(JJ_L2)=VAR4_L2(J_L2)+VAR4_L2(J_L2+1)
        VARX5_L2(JJ_L2)=VAR5_L2(J_L2)+VAR5_L2(J_L2+1)
        VARX6_L2(JJ_L2)=VAR6_L2(J_L2)+VAR6_L2(J_L2+1)
        J_L2=J_L2+1
      ELSE
        CHEM_ID2_L2(JJ_L2)=CHEM_ID_L2(J_L2)
        VARX1_L2(JJ_L2)=VAR1_L2(J_L2)
        VARX2_L2(JJ_L2)=VAR2_L2(J_L2)
        VARX3_L2(JJ_L2)=VAR3_L2(J_L2)
        VARX4_L2(JJ_L2)=VAR4_L2(J_L2)
        VARX5_L2(JJ_L2)=VAR5_L2(J_L2)
        VARX6_L2(JJ_L2)=VAR6_L2(J_L2)
      ENDIF

      J_L2=J_L2+1
      JJ_L2=JJ_L2+1
    ENDDO

    NEWREC_L2=JJ_L2-1

    J_L3=J_L3+1
    JJ_L3=1
    DO WHILE (J_L3.LT.NREC_L3)

      IF (CHEM_ID_L3(J_L3).EQ.CHEM_ID_L3(J_L3+1)) THEN
        CHEM_ID2_L3(JJ_L3)=CHEM_ID_L3(J_L3+1)
        VARX1_L3(JJ_L3)=VAR1_L3(J_L3)+VAR1_L3(J_L3+1)
        VARX2_L3(JJ_L3)=VAR2_L3(J_L3)+VAR2_L3(J_L3+1)
        VARX3_L3(JJ_L3)=VAR3_L3(J_L3)+VAR3_L3(J_L3+1)
        VARX4_L3(JJ_L3)=VAR4_L3(J_L3)+VAR4_L3(J_L3+1)
        VARX5_L3(JJ_L3)=VAR5_L3(J_L3)+VAR5_L3(J_L3+1)
        VARX6_L3(JJ_L3)=VAR6_L3(J_L3)+VAR6_L3(J_L3+1)
        J_L3=J_L3+1
      ELSE
        CHEM_ID2_L3(JJ_L3)=CHEM_ID_L3(J_L3)
        VARX1_L3(JJ_L3)=VAR1_L3(J_L3)
        VARX2_L3(JJ_L3)=VAR2_L3(J_L3)
        VARX3_L3(JJ_L3)=VAR3_L3(J_L3)
        VARX4_L3(JJ_L3)=VAR4_L3(J_L3)
        VARX5_L3(JJ_L3)=VAR5_L3(J_L3)
        VARX6_L3(JJ_L3)=VAR6_L3(J_L3)
      ENDIF

      J_L3=J_L3+1
      JJ_L3=JJ_L3+1
    ENDDO

    NEWREC_L3=JJ_L3-1

    J_M1=J_M1+1
    JJ_M1=1
    DO WHILE (J_M1.LT.NREC_M1)

```

```

      IF (CHEM_ID_M1(J_M1).EQ.CHEM_ID_M1(J_M1+1)) THEN
        CHEM_ID2_M1(JJ_M1)=CHEM_ID_M1(J_M1+1)
        VARX1_M1(JJ_M1)=VAR1_M1(J_M1)+VAR1_M1(J_M1+1)
        VARX2_M1(JJ_M1)=VAR2_M1(J_M1)+VAR2_M1(J_M1+1)
        VARX3_M1(JJ_M1)=VAR3_M1(J_M1)+VAR3_M1(J_M1+1)
        VARX4_M1(JJ_M1)=VAR4_M1(J_M1)+VAR4_M1(J_M1+1)
        VARX5_M1(JJ_M1)=VAR5_M1(J_M1)+VAR5_M1(J_M1+1)
        VARX6_M1(JJ_M1)=VAR6_M1(J_M1)+VAR6_M1(J_M1+1)
        J_M1=J_M1+1
      ELSE
        CHEM_ID2_M1(JJ_M1)=CHEM_ID_M1(J_M1)
        VARX1_M1(JJ_M1)=VAR1_M1(J_M1)
        VARX2_M1(JJ_M1)=VAR2_M1(J_M1)
        VARX3_M1(JJ_M1)=VAR3_M1(J_M1)
        VARX4_M1(JJ_M1)=VAR4_M1(J_M1)
        VARX5_M1(JJ_M1)=VAR5_M1(J_M1)
        VARX6_M1(JJ_M1)=VAR6_M1(J_M1)
      ENDIF

      J_M1=J_M1+1
      JJ_M1=JJ_M1+1
      ENDDO

      NEWREC_M1=JJ_M1-1

      J_M2=J_M2+1
      JJ_M2=1
      DO WHILE (J_M2.LT.NREC_M2)

        IF (CHEM_ID_M2(J_M2).EQ.CHEM_ID_M2(J_M2+1)) THEN
          CHEM_ID2_M2(JJ_M2)=CHEM_ID_M2(J_M2+1)
          VARX1_M2(JJ_M2)=VAR1_M2(J_M2)+VAR1_M2(J_M2+1)
          VARX2_M2(JJ_M2)=VAR2_M2(J_M2)+VAR2_M2(J_M2+1)
          VARX3_M2(JJ_M2)=VAR3_M2(J_M2)+VAR3_M2(J_M2+1)
          VARX4_M2(JJ_M2)=VAR4_M2(J_M2)+VAR4_M2(J_M2+1)
          VARX5_M2(JJ_M2)=VAR5_M2(J_M2)+VAR5_M2(J_M2+1)
          VARX6_M2(JJ_M2)=VAR6_M2(J_M2)+VAR6_M2(J_M2+1)
          J_M2=J_M2+1
        ELSE
          CHEM_ID2_M2(JJ_M2)=CHEM_ID_M2(J_M2)
          VARX1_M2(JJ_M2)=VAR1_M2(J_M2)
          VARX2_M2(JJ_M2)=VAR2_M2(J_M2)
          VARX3_M2(JJ_M2)=VAR3_M2(J_M2)
          VARX4_M2(JJ_M2)=VAR4_M2(J_M2)
          VARX5_M2(JJ_M2)=VAR5_M2(J_M2)
          VARX6_M2(JJ_M2)=VAR6_M2(J_M2)
        ENDIF

        J_M2=J_M2+1
        JJ_M2=JJ_M2+1
        ENDDO

        NEWREC_M2=JJ_M2-1

      DO K_L1=1,NEWREC_L1

```

```

        WRITE(101, 251)
          CHEM_ID2_L1(K_L1), VARX1_L1(K_L1), VARX2_L1(K_L1),
&          VARX3_L1(K_L1), VARX4_L1(K_L1), VARX5_L1(K_L1),
&          VARX6_L1(K_L1)
      ENDDO

      DO K_L2=1, NEWREC_L2
        WRITE(103, 251)
          CHEM_ID2_L2(K_L2), VARX1_L2(K_L2), VARX2_L2(K_L2),
&          VARX3_L2(K_L2), VARX4_L2(K_L2), VARX5_L2(K_L2),
&          VARX6_L2(K_L2)
      ENDDO

      DO K_L3=1, NEWREC_L3
        WRITE(105, 251)
          CHEM_ID2_L3(K_L3), VARX1_L3(K_L3), VARX2_L3(K_L3),
&          VARX3_L3(K_L3), VARX4_L3(K_L3), VARX5_L3(K_L3),
&          VARX6_L3(K_L3)
      ENDDO

      DO K_M1=1, NEWREC_M1
        WRITE(107, 251)
          CHEM_ID2_M1(K_M1), VARX1_M1(K_M1), VARX2_M1(K_M1),
&          VARX3_M1(K_M1), VARX4_M1(K_M1), VARX5_M1(K_M1),
&          VARX6_M1(K_M1)
      ENDDO

      DO K_M2=1, NEWREC_M2
        WRITE(109, 251)
          CHEM_ID2_M2(K_M2), VARX1_M2(K_M2), VARX2_M2(K_M2),
&          VARX3_M2(K_M2), VARX4_M2(K_M2), VARX5_M2(K_M2),
&          VARX6_M2(K_M2)
      ENDDO

      END SUBROUTINE

```

OUTPUT FILES

MASS (Grams)

CYCLE 1: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.207E-01	0.207E-01	0.207E-01	0.207E-01	0.207E-01
HE	0.000E+00	0.121E+01	0.121E+01	0.121E+01	0.121E+01	0.121E+01
LI	0.100E+01	0.109E+01	0.109E+01	0.109E+01	0.109E+01	0.109E+01
BE	0.000E+00	0.315E-03	0.315E-03	0.315E-03	0.315E-03	0.315E-03
B	0.100E+01	0.829E+00	0.829E+00	0.829E+00	0.829E+00	0.829E+00
C	0.894E+02	0.931E+02	0.931E+02	0.931E+02	0.931E+02	0.931E+02
N	0.250E+02	0.250E+02	0.250E+02	0.250E+02	0.250E+02	0.250E+02
O	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06
F	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02
NE	0.000E+00	0.172E-03	0.172E-03	0.172E-03	0.172E-03	0.172E-03
NA	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02
MG	0.200E+01	0.201E+01	0.201E+01	0.201E+01	0.201E+01	0.201E+01
AL	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02
SI	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02
P	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02
S	0.000E+00	0.575E-02	0.575E-02	0.575E-02	0.575E-02	0.576E-02
CL	0.530E+01	0.530E+01	0.530E+01	0.530E+01	0.530E+01	0.530E+01
AR	0.000E+00	0.543E-03	0.543E-03	0.543E-03	0.543E-03	0.543E-03
K	0.000E+00	0.253E-03	0.253E-03	0.253E-03	0.253E-03	0.253E-03
CA	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01
SC	0.000E+00	0.240E-04	0.240E-04	0.240E-04	0.240E-04	0.240E-04
TI	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
V	0.300E+01	0.299E+01	0.299E+01	0.299E+01	0.299E+01	0.299E+01
CR	0.400E+01	0.401E+01	0.401E+01	0.401E+01	0.401E+01	0.401E+01
MN	0.170E+01	0.167E+01	0.167E+01	0.167E+01	0.167E+01	0.167E+01
FE	0.180E+02	0.180E+02	0.180E+02	0.180E+02	0.180E+02	0.180E+02
CO	0.100E+01	0.997E+00	0.997E+00	0.997E+00	0.997E+00	0.997E+00
NI	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02
CU	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
ZN	0.403E+02	0.403E+02	0.403E+02	0.403E+02	0.403E+02	0.403E+02
GA	0.000E+00	0.135E-01	0.135E-01	0.135E-01	0.135E-01	0.135E-01
GE	0.000E+00	0.381E-04	0.381E-04	0.381E-04	0.381E-04	0.381E-04
ZR	0.000E+00	0.455E-04	0.455E-04	0.455E-04	0.456E-04	0.456E-04
MO	0.100E+02	0.996E+01	0.996E+01	0.996E+01	0.996E+01	0.996E+01
TC	0.000E+00	0.454E-02	0.454E-02	0.454E-02	0.455E-02	0.455E-02
RU	0.000E+00	0.216E-02	0.216E-02	0.216E-02	0.216E-02	0.216E-02
PD	0.000E+00	0.132E-03	0.132E-03	0.132E-03	0.132E-03	0.132E-03
AG	0.100E+00	0.786E-01	0.786E-01	0.786E-01	0.786E-01	0.786E-01
CD	0.250E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02
IN	0.200E+01	0.343E+00	0.343E+00	0.343E+00	0.343E+00	0.343E+00
SN	0.400E+01	0.568E+01	0.568E+01	0.568E+01	0.568E+01	0.568E+01
SB	0.000E+00	0.192E-02	0.192E-02	0.192E-02	0.192E-02	0.192E-02
TE	0.000E+00	0.202E-03	0.202E-03	0.202E-03	0.202E-03	0.202E-03
EU	0.000E+00	0.301E-03	0.301E-03	0.301E-03	0.301E-03	0.302E-03
GD	0.250E+01	0.248E+01	0.248E+01	0.248E+01	0.248E+01	0.248E+01
TB	0.000E+00	0.214E-01	0.214E-01	0.214E-01	0.214E-01	0.214E-01
DY	0.000E+00	0.383E-02	0.383E-02	0.383E-02	0.384E-02	0.384E-02
TA	0.000E+00	0.907E-04	0.907E-04	0.907E-04	0.908E-04	0.910E-04
W	0.200E+01	0.191E+01	0.191E+01	0.191E+01	0.191E+01	0.191E+01
RE	0.000E+00	0.852E-01	0.852E-01	0.852E-01	0.852E-01	0.853E-01
OS	0.000E+00	0.666E-02	0.666E-02	0.666E-02	0.667E-02	0.667E-02

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
PB	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
BI	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00
HE	0.000E+00	0.158E-01	0.158E-01	0.158E-01	0.159E-01	0.159E-01
TH	0.000E+00	0.120E-02	0.120E-02	0.120E-02	0.120E-02	0.120E-02
PA	0.000E+00	0.172E-03	0.172E-03	0.172E-03	0.173E-03	0.173E-03
U	0.100E+07	0.974E+06	0.974E+06	0.974E+06	0.974E+06	0.974E+06
NP	0.000E+00	0.286E+03	0.286E+03	0.285E+03	0.277E+03	0.269E+03
PU	0.000E+00	0.638E+04	0.638E+04	0.638E+04	0.639E+04	0.640E+04
AM	0.000E+00	0.177E+02	0.177E+02	0.177E+02	0.177E+02	0.178E+02
CM	0.000E+00	0.239E+01	0.239E+01	0.239E+01	0.239E+01	0.240E+01
H	0.000E+00	0.315E-01	0.315E-01	0.315E-01	0.315E-01	0.315E-01
LI	0.000E+00	0.183E-03	0.183E-03	0.183E-03	0.183E-03	0.183E-03
BE	0.000E+00	0.875E-04	0.875E-04	0.875E-04	0.875E-04	0.875E-04
C	0.000E+00	0.154E-04	0.154E-04	0.154E-04	0.154E-04	0.154E-04
ZN	0.000E+00	0.324E-02	0.324E-02	0.324E-02	0.323E-02	0.323E-02
GA	0.000E+00	0.375E-04	0.335E-04	0.318E-04	0.225E-04	0.185E-04
GE	0.000E+00	0.393E+00	0.393E+00	0.393E+00	0.393E+00	0.393E+00
AS	0.000E+00	0.120E+00	0.120E+00	0.120E+00	0.119E+00	0.119E+00
SE	0.000E+00	0.352E+02	0.352E+02	0.352E+02	0.352E+02	0.352E+02
BR	0.000E+00	0.138E+02	0.138E+02	0.138E+02	0.138E+02	0.138E+02
KR	0.000E+00	0.244E+03	0.244E+03	0.244E+03	0.244E+03	0.244E+03
RB	0.000E+00	0.228E+03	0.228E+03	0.228E+03	0.228E+03	0.228E+03
SR	0.000E+00	0.645E+03	0.645E+03	0.645E+03	0.645E+03	0.644E+03
Y	0.000E+00	0.330E+03	0.330E+03	0.330E+03	0.330E+03	0.330E+03
ZR	0.000E+00	0.225E+04	0.225E+04	0.225E+04	0.225E+04	0.225E+04
NB	0.000E+00	0.483E+02	0.483E+02	0.483E+02	0.483E+02	0.483E+02
MO	0.000E+00	0.185E+04	0.185E+04	0.185E+04	0.185E+04	0.185E+04
TC	0.000E+00	0.476E+03	0.476E+03	0.476E+03	0.476E+03	0.477E+03
RU	0.000E+00	0.126E+04	0.126E+04	0.126E+04	0.126E+04	0.126E+04
RH	0.000E+00	0.249E+03	0.249E+03	0.249E+03	0.249E+03	0.249E+03
PD	0.000E+00	0.410E+03	0.410E+03	0.410E+03	0.410E+03	0.410E+03
AG	0.000E+00	0.289E+02	0.289E+02	0.289E+02	0.290E+02	0.290E+02
CD	0.000E+00	0.363E+02	0.363E+02	0.363E+02	0.363E+02	0.363E+02
IN	0.000E+00	0.198E+01	0.198E+01	0.198E+01	0.198E+01	0.198E+01
SN	0.000E+00	0.440E+02	0.440E+02	0.440E+02	0.440E+02	0.440E+02
SB	0.000E+00	0.171E+02	0.171E+02	0.171E+02	0.170E+02	0.170E+02
TE	0.000E+00	0.258E+03	0.258E+03	0.258E+03	0.257E+03	0.257E+03
I	0.000E+00	0.131E+03	0.131E+03	0.131E+03	0.130E+03	0.129E+03
XE	0.000E+00	0.299E+04	0.299E+04	0.299E+04	0.299E+04	0.299E+04
CS	0.000E+00	0.168E+04	0.168E+04	0.168E+04	0.168E+04	0.168E+04
BA	0.000E+00	0.815E+03	0.814E+03	0.814E+03	0.814E+03	0.813E+03
LA	0.000E+00	0.737E+03	0.736E+03	0.736E+03	0.736E+03	0.736E+03
CE	0.000E+00	0.179E+04	0.179E+04	0.179E+04	0.179E+04	0.179E+04
PR	0.000E+00	0.639E+03	0.639E+03	0.639E+03	0.640E+03	0.640E+03
ND	0.000E+00	0.206E+04	0.206E+04	0.206E+04	0.206E+04	0.206E+04
PM	0.000E+00	0.146E+03	0.146E+03	0.146E+03	0.145E+03	0.145E+03
SM	0.000E+00	0.375E+03	0.375E+03	0.375E+03	0.375E+03	0.376E+03
EU	0.000E+00	0.633E+02	0.633E+02	0.633E+02	0.634E+02	0.634E+02
GD	0.000E+00	0.194E+02	0.194E+02	0.194E+02	0.194E+02	0.195E+02
TB	0.000E+00	0.906E+00	0.906E+00	0.906E+00	0.907E+00	0.908E+00
DY	0.000E+00	0.405E+00	0.405E+00	0.405E+00	0.406E+00	0.406E+00
HO	0.000E+00	0.267E-01	0.267E-01	0.267E-01	0.267E-01	0.267E-01
ER	0.000E+00	0.117E-01	0.117E-01	0.118E-01	0.118E-01	0.118E-01
TM	0.000E+00	0.458E-05	0.458E-05	0.458E-05	0.459E-05	0.461E-05

CYCLE 2: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.348E-01	0.348E-01	0.348E-01	0.348E-01	0.348E-01
HE	0.000E+00	0.261E+01	0.261E+01	0.261E+01	0.261E+01	0.261E+01
LI	0.100E+01	0.108E+01	0.108E+01	0.108E+01	0.108E+01	0.108E+01
BE	0.000E+00	0.732E-03	0.732E-03	0.732E-03	0.732E-03	0.732E-03
B	0.100E+01	0.829E+00	0.829E+00	0.829E+00	0.829E+00	0.829E+00
C	0.894E+02	0.976E+02	0.976E+02	0.976E+02	0.976E+02	0.976E+02
N	0.250E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02
O	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06
F	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02
NE	0.000E+00	0.386E-03	0.386E-03	0.386E-03	0.386E-03	0.386E-03
NA	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02
MG	0.200E+01	0.203E+01	0.203E+01	0.203E+01	0.203E+01	0.203E+01
AL	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02
SI	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02
P	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02
S	0.000E+00	0.126E-01	0.126E-01	0.126E-01	0.126E-01	0.126E-01
CL	0.530E+01	0.531E+01	0.531E+01	0.531E+01	0.531E+01	0.531E+01
AR	0.000E+00	0.122E-02	0.122E-02	0.122E-02	0.122E-02	0.122E-02
K	0.000E+00	0.565E-03	0.565E-03	0.565E-03	0.565E-03	0.565E-03
CA	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01
SC	0.000E+00	0.680E-04	0.680E-04	0.680E-04	0.680E-04	0.680E-04
TI	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
V	0.300E+01	0.298E+01	0.298E+01	0.298E+01	0.298E+01	0.298E+01
CR	0.400E+01	0.403E+01	0.403E+01	0.403E+01	0.403E+01	0.403E+01
MN	0.170E+01	0.164E+01	0.164E+01	0.164E+01	0.164E+01	0.164E+01
FE	0.180E+02	0.181E+02	0.181E+02	0.181E+02	0.181E+02	0.181E+02
CO	0.100E+01	0.979E+00	0.979E+00	0.979E+00	0.979E+00	0.979E+00
NI	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02
CU	0.100E+01	0.102E+01	0.102E+01	0.102E+01	0.102E+01	0.102E+01
ZN	0.403E+02	0.402E+02	0.402E+02	0.402E+02	0.402E+02	0.402E+02
GA	0.000E+00	0.301E-01	0.301E-01	0.301E-01	0.301E-01	0.301E-01
GE	0.000E+00	0.191E-03	0.191E-03	0.191E-03	0.191E-03	0.191E-03
ZR	0.000E+00	0.102E-03	0.102E-03	0.102E-03	0.102E-03	0.102E-03
MO	0.100E+02	0.991E+01	0.991E+01	0.991E+01	0.991E+01	0.991E+01
TC	0.000E+00	0.949E-02	0.949E-02	0.949E-02	0.949E-02	0.950E-02
RU	0.000E+00	0.550E-02	0.550E-02	0.550E-02	0.550E-02	0.550E-02
PD	0.000E+00	0.254E-03	0.254E-03	0.254E-03	0.254E-03	0.254E-03
AG	0.100E+00	0.615E-01	0.615E-01	0.615E-01	0.615E-01	0.615E-01
CD	0.250E+02	0.248E+02	0.248E+02	0.248E+02	0.248E+02	0.248E+02
IN	0.200E+01	0.887E-01	0.887E-01	0.887E-01	0.887E-01	0.887E-01
SN	0.400E+01	0.594E+01	0.594E+01	0.594E+01	0.594E+01	0.594E+01
SB	0.000E+00	0.393E-02	0.393E-02	0.393E-02	0.393E-02	0.393E-02
TE	0.000E+00	0.879E-03	0.879E-03	0.879E-03	0.880E-03	0.880E-03
EU	0.000E+00	0.768E-03	0.768E-03	0.768E-03	0.768E-03	0.768E-03
GD	0.250E+01	0.245E+01	0.245E+01	0.245E+01	0.245E+01	0.245E+01
TB	0.000E+00	0.441E-01	0.441E-01	0.441E-01	0.441E-01	0.441E-01
DY	0.000E+00	0.129E-01	0.129E-01	0.129E-01	0.129E-01	0.129E-01
HO	0.000E+00	0.238E-03	0.238E-03	0.238E-03	0.238E-03	0.238E-03
ER	0.000E+00	0.255E-04	0.255E-04	0.255E-04	0.256E-04	0.257E-04
TA	0.000E+00	0.212E-03	0.212E-03	0.212E-03	0.212E-03	0.212E-03
W	0.200E+01	0.181E+01	0.181E+01	0.181E+01	0.181E+01	0.181E+01
RE	0.000E+00	0.159E+00	0.159E+00	0.159E+00	0.159E+00	0.159E+00
OS	0.000E+00	0.297E-01	0.297E-01	0.298E-01	0.298E-01	0.298E-01
PB	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
BI	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00
HE	0.000E+00	0.310E+00	0.310E+00	0.310E+00	0.310E+00	0.311E+00
TH	0.000E+00	0.211E-02	0.211E-02	0.211E-02	0.211E-02	0.211E-02

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
PA	0.000E+00	0.492E-03	0.492E-03	0.492E-03	0.492E-03	0.492E-03
U	0.100E+07	0.949E+06	0.949E+06	0.949E+06	0.949E+06	0.949E+06
NP	0.000E+00	0.732E+03	0.731E+03	0.730E+03	0.720E+03	0.710E+03
PU	0.000E+00	0.104E+05	0.104E+05	0.104E+05	0.104E+05	0.104E+05
AM	0.000E+00	0.137E+03	0.137E+03	0.137E+03	0.137E+03	0.137E+03
CM	0.000E+00	0.439E+02	0.439E+02	0.439E+02	0.439E+02	0.439E+02
H	0.000E+00	0.643E-01	0.643E-01	0.643E-01	0.643E-01	0.643E-01
LI	0.000E+00	0.243E-03	0.243E-03	0.243E-03	0.243E-03	0.243E-03
BE	0.000E+00	0.175E-03	0.175E-03	0.175E-03	0.175E-03	0.175E-03
C	0.000E+00	0.307E-04	0.307E-04	0.307E-04	0.307E-04	0.307E-04
ZN	0.000E+00	0.707E-02	0.707E-02	0.707E-02	0.706E-02	0.705E-02
GA	0.000E+00	0.469E-04	0.427E-04	0.407E-04	0.303E-04	0.257E-04
GE	0.000E+00	0.770E+00	0.770E+00	0.770E+00	0.770E+00	0.770E+00
AS	0.000E+00	0.233E+00	0.233E+00	0.233E+00	0.232E+00	0.232E+00
SE	0.000E+00	0.669E+02	0.669E+02	0.669E+02	0.669E+02	0.669E+02
BR	0.000E+00	0.256E+02	0.256E+02	0.256E+02	0.256E+02	0.256E+02
KR	0.000E+00	0.446E+03	0.446E+03	0.446E+03	0.446E+03	0.446E+03
RB	0.000E+00	0.415E+03	0.415E+03	0.415E+03	0.415E+03	0.415E+03
SR	0.000E+00	0.111E+04	0.111E+04	0.111E+04	0.111E+04	0.111E+04
Y	0.000E+00	0.575E+03	0.575E+03	0.575E+03	0.574E+03	0.574E+03
ZR	0.000E+00	0.423E+04	0.423E+04	0.423E+04	0.423E+04	0.423E+04
NB	0.000E+00	0.450E+02	0.450E+02	0.450E+02	0.450E+02	0.449E+02
MO	0.000E+00	0.378E+04	0.378E+04	0.378E+04	0.378E+04	0.378E+04
TC	0.000E+00	0.896E+03	0.896E+03	0.896E+03	0.896E+03	0.897E+03
RU	0.000E+00	0.272E+04	0.272E+04	0.272E+04	0.272E+04	0.271E+04
RH	0.000E+00	0.454E+03	0.454E+03	0.454E+03	0.454E+03	0.454E+03
PD	0.000E+00	0.132E+04	0.132E+04	0.132E+04	0.132E+04	0.132E+04
AG	0.000E+00	0.780E+02	0.781E+02	0.781E+02	0.781E+02	0.781E+02
CD	0.000E+00	0.116E+03	0.116E+03	0.116E+03	0.116E+03	0.116E+03
IN	0.000E+00	0.238E+01	0.238E+01	0.238E+01	0.238E+01	0.238E+01
SN	0.000E+00	0.100E+03	0.100E+03	0.100E+03	0.100E+03	0.100E+03
SB	0.000E+00	0.352E+02	0.351E+02	0.351E+02	0.350E+02	0.350E+02
TE	0.000E+00	0.544E+03	0.544E+03	0.544E+03	0.544E+03	0.543E+03
I	0.000E+00	0.270E+03	0.270E+03	0.270E+03	0.269E+03	0.268E+03
XE	0.000E+00	0.608E+04	0.608E+04	0.608E+04	0.608E+04	0.608E+04
CS	0.000E+00	0.328E+04	0.328E+04	0.328E+04	0.328E+04	0.328E+04
BA	0.000E+00	0.165E+04	0.165E+04	0.165E+04	0.165E+04	0.165E+04
LA	0.000E+00	0.143E+04	0.143E+04	0.143E+04	0.143E+04	0.143E+04
CE	0.000E+00	0.320E+04	0.320E+04	0.320E+04	0.320E+04	0.320E+04
PR	0.000E+00	0.128E+04	0.128E+04	0.128E+04	0.128E+04	0.128E+04
ND	0.000E+00	0.433E+04	0.433E+04	0.433E+04	0.434E+04	0.434E+04
PM	0.000E+00	0.154E+03	0.154E+03	0.154E+03	0.154E+03	0.154E+03
SM	0.000E+00	0.848E+03	0.848E+03	0.848E+03	0.848E+03	0.848E+03
EU	0.000E+00	0.195E+03	0.195E+03	0.195E+03	0.196E+03	0.196E+03
GD	0.000E+00	0.866E+02	0.867E+02	0.867E+02	0.867E+02	0.868E+02
TB	0.000E+00	0.278E+01	0.278E+01	0.278E+01	0.278E+01	0.278E+01
DY	0.000E+00	0.139E+01	0.139E+01	0.139E+01	0.139E+01	0.139E+01
HO	0.000E+00	0.138E+00	0.138E+00	0.138E+00	0.138E+00	0.138E+00
ER	0.000E+00	0.502E-01	0.502E-01	0.502E-01	0.502E-01	0.503E-01
TM	0.000E+00	0.459E-04	0.459E-04	0.459E-04	0.460E-04	0.461E-04
YB	0.000E+00	0.681E-05	0.681E-05	0.681E-05	0.683E-05	0.684E-05

CYCLE 3: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.454E-01	0.454E-01	0.454E-01	0.454E-01	0.454E-01
HE	0.000E+00	0.440E+01	0.440E+01	0.440E+01	0.440E+01	0.440E+01
LI	0.100E+01	0.107E+01	0.107E+01	0.107E+01	0.107E+01	0.107E+01
BE	0.000E+00	0.131E-02	0.131E-02	0.131E-02	0.131E-02	0.131E-02
B	0.100E+01	0.840E+00	0.840E+00	0.840E+00	0.840E+00	0.840E+00
C	0.894E+02	0.104E+03	0.104E+03	0.104E+03	0.104E+03	0.104E+03
N	0.250E+02	0.248E+02	0.248E+02	0.248E+02	0.248E+02	0.248E+02
O	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06
F	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02
NE	0.000E+00	0.661E-03	0.661E-03	0.661E-03	0.661E-03	0.661E-03
NA	0.150E+02	0.149E+02	0.149E+02	0.149E+02	0.149E+02	0.149E+02
MG	0.200E+01	0.205E+01	0.205E+01	0.205E+01	0.205E+01	0.205E+01
AL	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02
SI	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02
P	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02
S	0.000E+00	0.214E-01	0.214E-01	0.214E-01	0.215E-01	0.215E-01
CL	0.530E+01	0.531E+01	0.531E+01	0.531E+01	0.531E+01	0.531E+01
AR	0.000E+00	0.209E-02	0.209E-02	0.209E-02	0.209E-02	0.209E-02
K	0.000E+00	0.966E-03	0.966E-03	0.966E-03	0.966E-03	0.966E-03
CA	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01
SC	0.000E+00	0.124E-03	0.124E-03	0.124E-03	0.124E-03	0.124E-03
TI	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
V	0.300E+01	0.296E+01	0.296E+01	0.296E+01	0.296E+01	0.296E+01
CR	0.400E+01	0.404E+01	0.404E+01	0.404E+01	0.404E+01	0.404E+01
MN	0.170E+01	0.161E+01	0.161E+01	0.161E+01	0.161E+01	0.161E+01
FE	0.180E+02	0.181E+02	0.181E+02	0.181E+02	0.181E+02	0.181E+02
CO	0.100E+01	0.948E+00	0.948E+00	0.948E+00	0.948E+00	0.948E+00
NI	0.240E+02	0.241E+02	0.241E+02	0.241E+02	0.241E+02	0.241E+02
CU	0.100E+01	0.104E+01	0.104E+01	0.104E+01	0.104E+01	0.104E+01
ZN	0.403E+02	0.402E+02	0.402E+02	0.402E+02	0.402E+02	0.402E+02
GA	0.000E+00	0.514E-01	0.514E-01	0.514E-01	0.514E-01	0.514E-01
GE	0.000E+00	0.559E-03	0.559E-03	0.559E-03	0.559E-03	0.559E-03
ZR	0.000E+00	0.173E-03	0.173E-03	0.173E-03	0.173E-03	0.173E-03
MO	0.100E+02	0.985E+01	0.985E+01	0.985E+01	0.985E+01	0.985E+01
TC	0.000E+00	0.148E-01	0.148E-01	0.148E-01	0.148E-01	0.148E-01
RU	0.000E+00	0.107E-01	0.107E-01	0.107E-01	0.107E-01	0.107E-01
PD	0.000E+00	0.365E-03	0.365E-03	0.365E-03	0.365E-03	0.365E-03
AG	0.100E+00	0.486E-01	0.486E-01	0.486E-01	0.486E-01	0.486E-01
CD	0.250E+02	0.246E+02	0.246E+02	0.246E+02	0.246E+02	0.246E+02
IN	0.200E+01	0.547E-01	0.547E-01	0.547E-01	0.547E-01	0.547E-01
SN	0.400E+01	0.599E+01	0.599E+01	0.599E+01	0.599E+01	0.599E+01
SB	0.000E+00	0.616E-02	0.616E-02	0.616E-02	0.616E-02	0.616E-02
TE	0.000E+00	0.209E-02	0.209E-02	0.209E-02	0.209E-02	0.209E-02
EU	0.000E+00	0.989E-03	0.989E-03	0.989E-03	0.989E-03	0.989E-03
GD	0.250E+01	0.241E+01	0.241E+01	0.241E+01	0.241E+01	0.241E+01
TB	0.000E+00	0.680E-01	0.680E-01	0.680E-01	0.680E-01	0.680E-01
DY	0.000E+00	0.295E-01	0.295E-01	0.295E-01	0.295E-01	0.295E-01
HO	0.000E+00	0.170E-02	0.170E-02	0.170E-02	0.170E-02	0.170E-02
ER	0.000E+00	0.335E-03	0.335E-03	0.335E-03	0.336E-03	0.336E-03
TA	0.000E+00	0.315E-03	0.315E-03	0.315E-03	0.315E-03	0.315E-03
W	0.200E+01	0.172E+01	0.172E+01	0.172E+01	0.172E+01	0.172E+01
RE	0.000E+00	0.213E+00	0.213E+00	0.213E+00	0.213E+00	0.213E+00
OS	0.000E+00	0.747E-01	0.747E-01	0.747E-01	0.747E-01	0.748E-01
PB	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
BI	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00
HE	0.000E+00	0.126E+01	0.126E+01	0.126E+01	0.127E+01	0.127E+01
TH	0.000E+00	0.241E-02	0.241E-02	0.241E-02	0.241E-02	0.241E-02

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
PA	0.000E+00	0.700E-03	0.700E-03	0.700E-03	0.700E-03	0.700E-03
U	0.100E+07	0.925E+06	0.925E+06	0.925E+06	0.925E+06	0.925E+06
NP	0.000E+00	0.120E+04	0.120E+04	0.119E+04	0.118E+04	0.117E+04
PU	0.000E+00	0.142E+05	0.142E+05	0.142E+05	0.142E+05	0.142E+05
AM	0.000E+00	0.358E+03	0.358E+03	0.358E+03	0.358E+03	0.358E+03
CM	0.000E+00	0.223E+03	0.223E+03	0.223E+03	0.223E+03	0.223E+03
H	0.000E+00	0.981E-01	0.981E-01	0.981E-01	0.981E-01	0.981E-01
LI	0.000E+00	0.234E-03	0.234E-03	0.234E-03	0.234E-03	0.234E-03
BE	0.000E+00	0.262E-03	0.262E-03	0.262E-03	0.262E-03	0.262E-03
C	0.000E+00	0.462E-04	0.462E-04	0.462E-04	0.462E-04	0.462E-04
ZN	0.000E+00	0.117E-01	0.117E-01	0.117E-01	0.117E-01	0.117E-01
GA	0.000E+00	0.612E-04	0.566E-04	0.544E-04	0.425E-04	0.371E-04
GE	0.000E+00	0.114E+01	0.114E+01	0.114E+01	0.114E+01	0.114E+01
AS	0.000E+00	0.344E+00	0.344E+00	0.344E+00	0.343E+00	0.343E+00
SE	0.000E+00	0.962E+02	0.962E+02	0.962E+02	0.962E+02	0.962E+02
BR	0.000E+00	0.357E+02	0.357E+02	0.357E+02	0.357E+02	0.357E+02
KR	0.000E+00	0.616E+03	0.616E+03	0.616E+03	0.616E+03	0.616E+03
RB	0.000E+00	0.569E+03	0.569E+03	0.569E+03	0.569E+03	0.569E+03
SR	0.000E+00	0.147E+04	0.147E+04	0.147E+04	0.147E+04	0.147E+04
Y	0.000E+00	0.770E+03	0.770E+03	0.770E+03	0.770E+03	0.770E+03
ZR	0.000E+00	0.602E+04	0.602E+04	0.602E+04	0.602E+04	0.602E+04
NB	0.000E+00	0.427E+02	0.427E+02	0.427E+02	0.426E+02	0.426E+02
MO	0.000E+00	0.567E+04	0.567E+04	0.567E+04	0.567E+04	0.567E+04
TC	0.000E+00	0.124E+04	0.124E+04	0.124E+04	0.124E+04	0.124E+04
RU	0.000E+00	0.441E+04	0.441E+04	0.441E+04	0.441E+04	0.441E+04
RH	0.000E+00	0.558E+03	0.558E+03	0.558E+03	0.558E+03	0.558E+03
PD	0.000E+00	0.269E+04	0.269E+04	0.269E+04	0.269E+04	0.269E+04
AG	0.000E+00	0.131E+03	0.131E+03	0.131E+03	0.131E+03	0.131E+03
CD	0.000E+00	0.262E+03	0.262E+03	0.262E+03	0.262E+03	0.262E+03
IN	0.000E+00	0.244E+01	0.244E+01	0.244E+01	0.244E+01	0.245E+01
SN	0.000E+00	0.168E+03	0.168E+03	0.168E+03	0.168E+03	0.168E+03
SB	0.000E+00	0.540E+02	0.540E+02	0.540E+02	0.539E+02	0.539E+02
TE	0.000E+00	0.865E+03	0.865E+03	0.865E+03	0.864E+03	0.864E+03
I	0.000E+00	0.418E+03	0.418E+03	0.418E+03	0.417E+03	0.416E+03
XE	0.000E+00	0.932E+04	0.932E+04	0.932E+04	0.932E+04	0.932E+04
CS	0.000E+00	0.476E+04	0.476E+04	0.476E+04	0.476E+04	0.476E+04
BA	0.000E+00	0.259E+04	0.259E+04	0.259E+04	0.259E+04	0.259E+04
LA	0.000E+00	0.211E+04	0.211E+04	0.211E+04	0.211E+04	0.211E+04
CE	0.000E+00	0.454E+04	0.454E+04	0.454E+04	0.454E+04	0.454E+04
PR	0.000E+00	0.188E+04	0.188E+04	0.188E+04	0.188E+04	0.188E+04
ND	0.000E+00	0.662E+04	0.662E+04	0.662E+04	0.662E+04	0.662E+04
PM	0.000E+00	0.132E+03	0.132E+03	0.132E+03	0.132E+03	0.132E+03
SM	0.000E+00	0.129E+04	0.129E+04	0.129E+04	0.129E+04	0.129E+04
EU	0.000E+00	0.353E+03	0.353E+03	0.353E+03	0.353E+03	0.353E+03
GD	0.000E+00	0.269E+03	0.269E+03	0.269E+03	0.269E+03	0.269E+03
TB	0.000E+00	0.568E+01	0.568E+01	0.568E+01	0.568E+01	0.568E+01
DY	0.000E+00	0.313E+01	0.313E+01	0.313E+01	0.313E+01	0.313E+01
HO	0.000E+00	0.472E+00	0.472E+00	0.472E+00	0.472E+00	0.472E+00
ER	0.000E+00	0.180E+00	0.180E+00	0.180E+00	0.180E+00	0.181E+00
TM	0.000E+00	0.197E-03	0.197E-03	0.197E-03	0.197E-03	0.198E-03
YB	0.000E+00	0.562E-04	0.562E-04	0.562E-04	0.563E-04	0.564E-04

CYCLE 1: MOX

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.142E-01	0.142E-01	0.142E-01	0.142E-01	0.142E-01
HE	0.000E+00	0.133E+01	0.133E+01	0.133E+01	0.133E+01	0.133E+01
LI	0.100E+01	0.109E+01	0.109E+01	0.109E+01	0.109E+01	0.109E+01
BE	0.000E+00	0.383E-03	0.383E-03	0.383E-03	0.383E-03	0.383E-03
B	0.100E+01	0.842E+00	0.842E+00	0.842E+00	0.842E+00	0.842E+00
C	0.894E+02	0.935E+02	0.935E+02	0.935E+02	0.935E+02	0.935E+02
N	0.250E+02	0.250E+02	0.250E+02	0.250E+02	0.250E+02	0.250E+02
O	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06
F	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02
NE	0.000E+00	0.148E-03	0.148E-03	0.148E-03	0.148E-03	0.148E-03
NA	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02
MG	0.200E+01	0.201E+01	0.201E+01	0.201E+01	0.201E+01	0.201E+01
AL	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02
SI	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02
P	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02
S	0.000E+00	0.358E-02	0.358E-02	0.358E-02	0.359E-02	0.359E-02
CL	0.530E+01	0.530E+01	0.530E+01	0.530E+01	0.530E+01	0.530E+01
AR	0.000E+00	0.350E-03	0.350E-03	0.350E-03	0.350E-03	0.350E-03
K	0.000E+00	0.376E-03	0.376E-03	0.376E-03	0.376E-03	0.376E-03
CA	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01
SC	0.000E+00	0.155E-04	0.155E-04	0.155E-04	0.155E-04	0.155E-04
TI	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
V	0.300E+01	0.299E+01	0.299E+01	0.299E+01	0.299E+01	0.299E+01
CR	0.400E+01	0.401E+01	0.401E+01	0.401E+01	0.401E+01	0.401E+01
MN	0.170E+01	0.168E+01	0.168E+01	0.168E+01	0.168E+01	0.168E+01
FE	0.180E+02	0.180E+02	0.180E+02	0.180E+02	0.180E+02	0.180E+02
CO	0.100E+01	0.999E+00	0.999E+00	0.999E+00	0.999E+00	0.999E+00
NI	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02
CU	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
ZN	0.403E+02	0.403E+02	0.403E+02	0.403E+02	0.403E+02	0.403E+02
GA	0.000E+00	0.105E-01	0.105E-01	0.105E-01	0.105E-01	0.105E-01
GE	0.000E+00	0.266E-04	0.266E-04	0.266E-04	0.266E-04	0.266E-04
ZR	0.000E+00	0.678E-04	0.678E-04	0.678E-04	0.679E-04	0.679E-04
MO	0.100E+02	0.997E+01	0.997E+01	0.997E+01	0.997E+01	0.997E+01
TC	0.000E+00	0.361E-02	0.361E-02	0.361E-02	0.361E-02	0.362E-02
RU	0.000E+00	0.206E-02	0.206E-02	0.206E-02	0.206E-02	0.206E-02
PD	0.000E+00	0.119E-03	0.119E-03	0.119E-03	0.119E-03	0.119E-03
AG	0.100E+00	0.793E-01	0.793E-01	0.793E-01	0.793E-01	0.793E-01
CD	0.250E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02
IN	0.200E+01	0.413E+00	0.413E+00	0.413E+00	0.413E+00	0.413E+00
SN	0.400E+01	0.561E+01	0.561E+01	0.561E+01	0.561E+01	0.561E+01
SB	0.000E+00	0.185E-02	0.185E-02	0.185E-02	0.185E-02	0.185E-02
TE	0.000E+00	0.197E-03	0.197E-03	0.197E-03	0.197E-03	0.198E-03
EU	0.000E+00	0.181E-02	0.181E-02	0.181E-02	0.181E-02	0.181E-02
GD	0.250E+01	0.248E+01	0.248E+01	0.248E+01	0.248E+01	0.248E+01
TB	0.000E+00	0.221E-01	0.221E-01	0.221E-01	0.221E-01	0.221E-01
DY	0.000E+00	0.372E-02	0.372E-02	0.372E-02	0.372E-02	0.373E-02
TA	0.000E+00	0.887E-04	0.887E-04	0.888E-04	0.889E-04	0.890E-04
W	0.200E+01	0.192E+01	0.192E+01	0.192E+01	0.192E+01	0.192E+01
RE	0.000E+00	0.795E-01	0.795E-01	0.795E-01	0.796E-01	0.796E-01
OS	0.000E+00	0.509E-02	0.509E-02	0.509E-02	0.509E-02	0.510E-02
PB	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
BI	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00
HE	0.000E+00	0.108E+00	0.108E+00	0.108E+00	0.108E+00	0.108E+00
U	0.956E+06	0.945E+06	0.945E+06	0.945E+06	0.945E+06	0.945E+06
NP	0.000E+00	0.138E+03	0.138E+03	0.137E+03	0.129E+03	0.121E+03
PU	0.436E+05	0.356E+05	0.356E+05	0.356E+05	0.356E+05	0.356E+05

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
AM	0.000E+00	0.842E+02	0.843E+02	0.843E+02	0.844E+02	0.846E+02
CM	0.000E+00	0.119E+02	0.119E+02	0.119E+02	0.119E+02	0.119E+02
H	0.000E+00	0.421E-01	0.421E-01	0.421E-01	0.421E-01	0.421E-01
LI	0.000E+00	0.205E-03	0.205E-03	0.205E-03	0.205E-03	0.205E-03
BE	0.000E+00	0.853E-04	0.853E-04	0.853E-04	0.853E-04	0.853E-04
C	0.000E+00	0.150E-04	0.150E-04	0.150E-04	0.150E-04	0.150E-04
ZN	0.000E+00	0.932E-04	0.916E-04	0.902E-04	0.777E-04	0.650E-04
GA	0.000E+00	0.488E-04	0.446E-04	0.426E-04	0.313E-04	0.262E-04
GE	0.000E+00	0.349E+00	0.348E+00	0.348E+00	0.348E+00	0.348E+00
AS	0.000E+00	0.119E+00	0.119E+00	0.119E+00	0.118E+00	0.118E+00
SE	0.000E+00	0.262E+02	0.262E+02	0.262E+02	0.262E+02	0.262E+02
BR	0.000E+00	0.108E+02	0.108E+02	0.108E+02	0.107E+02	0.107E+02
KR	0.000E+00	0.129E+03	0.129E+03	0.129E+03	0.128E+03	0.128E+03
RB	0.000E+00	0.110E+03	0.110E+03	0.110E+03	0.110E+03	0.110E+03
SR	0.000E+00	0.292E+03	0.292E+03	0.292E+03	0.291E+03	0.291E+03
Y	0.000E+00	0.150E+03	0.150E+03	0.150E+03	0.150E+03	0.150E+03
ZR	0.000E+00	0.153E+04	0.153E+04	0.153E+04	0.153E+04	0.153E+04
NB	0.000E+00	0.391E+02	0.391E+02	0.391E+02	0.390E+02	0.390E+02
MO	0.000E+00	0.174E+04	0.174E+04	0.174E+04	0.174E+04	0.174E+04
TC	0.000E+00	0.466E+03	0.466E+03	0.466E+03	0.466E+03	0.467E+03
RU	0.000E+00	0.185E+04	0.185E+04	0.184E+04	0.184E+04	0.184E+04
RH	0.000E+00	0.434E+03	0.434E+03	0.434E+03	0.435E+03	0.435E+03
PD	0.000E+00	0.116E+04	0.116E+04	0.116E+04	0.116E+04	0.116E+04
AG	0.000E+00	0.108E+03	0.108E+03	0.108E+03	0.108E+03	0.108E+03
CD	0.000E+00	0.926E+02	0.926E+02	0.926E+02	0.927E+02	0.927E+02
IN	0.000E+00	0.312E+01	0.312E+01	0.312E+01	0.313E+01	0.313E+01
SN	0.000E+00	0.665E+02	0.665E+02	0.665E+02	0.665E+02	0.665E+02
SB	0.000E+00	0.270E+02	0.270E+02	0.270E+02	0.269E+02	0.269E+02
TE	0.000E+00	0.362E+03	0.362E+03	0.362E+03	0.361E+03	0.361E+03
I	0.000E+00	0.210E+03	0.210E+03	0.210E+03	0.209E+03	0.208E+03
XE	0.000E+00	0.301E+04	0.301E+04	0.301E+04	0.301E+04	0.301E+04
CS	0.000E+00	0.180E+04	0.180E+04	0.180E+04	0.180E+04	0.180E+04
BA	0.000E+00	0.723E+03	0.723E+03	0.723E+03	0.722E+03	0.722E+03
LA	0.000E+00	0.652E+03	0.652E+03	0.652E+03	0.652E+03	0.652E+03
CE	0.000E+00	0.154E+04	0.154E+04	0.154E+04	0.154E+04	0.154E+04
PR	0.000E+00	0.580E+03	0.580E+03	0.580E+03	0.580E+03	0.580E+03
ND	0.000E+00	0.174E+04	0.174E+04	0.174E+04	0.174E+04	0.174E+04
PM	0.000E+00	0.138E+03	0.138E+03	0.138E+03	0.138E+03	0.138E+03
SM	0.000E+00	0.435E+03	0.435E+03	0.435E+03	0.435E+03	0.435E+03
EU	0.000E+00	0.105E+03	0.105E+03	0.105E+03	0.105E+03	0.105E+03
GD	0.000E+00	0.482E+02	0.482E+02	0.482E+02	0.482E+02	0.483E+02
TB	0.000E+00	0.320E+01	0.320E+01	0.320E+01	0.320E+01	0.320E+01
DY	0.000E+00	0.155E+01	0.155E+01	0.155E+01	0.155E+01	0.155E+01
HO	0.000E+00	0.947E-01	0.947E-01	0.947E-01	0.947E-01	0.947E-01
ER	0.000E+00	0.435E-01	0.435E-01	0.435E-01	0.435E-01	0.436E-01
TM	0.000E+00	0.208E-04	0.208E-04	0.208E-04	0.209E-04	0.209E-04

CYCLE 2: MOX

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.260E-01	0.260E-01	0.260E-01	0.260E-01	0.259E-01
HE	0.000E+00	0.280E+01	0.280E+01	0.280E+01	0.280E+01	0.280E+01
LI	0.100E+01	0.109E+01	0.109E+01	0.109E+01	0.109E+01	0.109E+01
BE	0.000E+00	0.870E-03	0.870E-03	0.870E-03	0.870E-03	0.870E-03
B	0.100E+01	0.831E+00	0.831E+00	0.831E+00	0.831E+00	0.831E+00
C	0.894E+02	0.982E+02	0.982E+02	0.982E+02	0.982E+02	0.982E+02
N	0.250E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02	0.249E+02
O	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06	0.134E+06
F	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02	0.107E+02
NE	0.000E+00	0.321E-03	0.321E-03	0.321E-03	0.321E-03	0.321E-03
NA	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02	0.150E+02
MG	0.200E+01	0.202E+01	0.202E+01	0.202E+01	0.202E+01	0.202E+01
AL	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02	0.167E+02
SI	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02	0.121E+02
P	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02	0.350E+02
S	0.000E+00	0.756E-02	0.756E-02	0.756E-02	0.757E-02	0.757E-02
CL	0.530E+01	0.530E+01	0.530E+01	0.530E+01	0.530E+01	0.530E+01
AR	0.000E+00	0.755E-03	0.755E-03	0.755E-03	0.755E-03	0.755E-03
K	0.000E+00	0.815E-03	0.815E-03	0.815E-03	0.815E-03	0.815E-03
CA	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01	0.200E+01
SC	0.000E+00	0.420E-04	0.420E-04	0.420E-04	0.420E-04	0.420E-04
TI	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
V	0.300E+01	0.299E+01	0.299E+01	0.299E+01	0.299E+01	0.299E+01
CR	0.400E+01	0.401E+01	0.401E+01	0.401E+01	0.401E+01	0.401E+01
MN	0.170E+01	0.166E+01	0.166E+01	0.166E+01	0.166E+01	0.166E+01
FE	0.180E+02	0.180E+02	0.180E+02	0.180E+02	0.180E+02	0.180E+02
CO	0.100E+01	0.991E+00	0.991E+00	0.991E+00	0.991E+00	0.991E+00
NI	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02	0.240E+02
CU	0.100E+01	0.101E+01	0.101E+01	0.101E+01	0.101E+01	0.101E+01
ZN	0.403E+02	0.403E+02	0.403E+02	0.403E+02	0.403E+02	0.403E+02
GA	0.000E+00	0.228E-01	0.228E-01	0.228E-01	0.228E-01	0.228E-01
GE	0.000E+00	0.125E-03	0.125E-03	0.125E-03	0.125E-03	0.125E-03
ZR	0.000E+00	0.147E-03	0.147E-03	0.147E-03	0.147E-03	0.147E-03
MO	0.100E+02	0.993E+01	0.993E+01	0.993E+01	0.993E+01	0.993E+01
TC	0.000E+00	0.734E-02	0.734E-02	0.734E-02	0.734E-02	0.735E-02
RU	0.000E+00	0.495E-02	0.495E-02	0.495E-02	0.495E-02	0.495E-02
PD	0.000E+00	0.223E-03	0.223E-03	0.223E-03	0.223E-03	0.223E-03
AG	0.100E+00	0.636E-01	0.636E-01	0.636E-01	0.636E-01	0.636E-01
CD	0.250E+02	0.248E+02	0.248E+02	0.248E+02	0.248E+02	0.248E+02
IN	0.200E+01	0.111E+00	0.111E+00	0.111E+00	0.111E+00	0.111E+00
SN	0.400E+01	0.592E+01	0.592E+01	0.592E+01	0.592E+01	0.592E+01
SB	0.000E+00	0.367E-02	0.367E-02	0.367E-02	0.367E-02	0.367E-02
TE	0.000E+00	0.818E-03	0.819E-03	0.819E-03	0.819E-03	0.820E-03
EU	0.000E+00	0.316E-02	0.316E-02	0.316E-02	0.316E-02	0.316E-02
GD	0.250E+01	0.245E+01	0.245E+01	0.245E+01	0.245E+01	0.245E+01
TB	0.000E+00	0.443E-01	0.443E-01	0.443E-01	0.443E-01	0.443E-01
DY	0.000E+00	0.122E-01	0.122E-01	0.122E-01	0.122E-01	0.122E-01
HO	0.000E+00	0.134E-03	0.134E-03	0.134E-03	0.134E-03	0.134E-03
ER	0.000E+00	0.164E-04	0.164E-04	0.164E-04	0.165E-04	0.165E-04
TA	0.000E+00	0.206E-03	0.206E-03	0.206E-03	0.206E-03	0.206E-03
W	0.200E+01	0.183E+01	0.183E+01	0.183E+01	0.183E+01	0.183E+01
RE	0.000E+00	0.148E+00	0.148E+00	0.148E+00	0.148E+00	0.148E+00
OS	0.000E+00	0.217E-01	0.217E-01	0.217E-01	0.217E-01	0.218E-01
PB	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01	0.100E+01
BI	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00	0.400E+00
HE	0.000E+00	0.110E+01	0.110E+01	0.110E+01	0.110E+01	0.110E+01
TH	0.000E+00	0.140E-03	0.140E-03	0.140E-03	0.140E-03	0.140E-03

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
U	0.956E+06	0.931E+06	0.931E+06	0.931E+06	0.931E+06	0.931E+06
NP	0.000E+00	0.221E+03	0.221E+03	0.220E+03	0.210E+03	0.200E+03
PU	0.436E+05	0.294E+05	0.294E+05	0.294E+05	0.294E+05	0.294E+05
AM	0.000E+00	0.372E+03	0.372E+03	0.372E+03	0.372E+03	0.372E+03
CM	0.000E+00	0.104E+03	0.104E+03	0.104E+03	0.104E+03	0.104E+03
H	0.000E+00	0.813E-01	0.813E-01	0.813E-01	0.813E-01	0.813E-01
LI	0.000E+00	0.326E-03	0.326E-03	0.326E-03	0.326E-03	0.326E-03
BE	0.000E+00	0.172E-03	0.172E-03	0.172E-03	0.172E-03	0.172E-03
C	0.000E+00	0.302E-04	0.302E-04	0.302E-04	0.302E-04	0.302E-04
ZN	0.000E+00	0.101E-03	0.992E-04	0.977E-04	0.842E-04	0.704E-04
GA	0.000E+00	0.536E-04	0.492E-04	0.469E-04	0.348E-04	0.292E-04
GE	0.000E+00	0.701E+00	0.701E+00	0.701E+00	0.701E+00	0.701E+00
AS	0.000E+00	0.232E+00	0.232E+00	0.232E+00	0.232E+00	0.231E+00
SE	0.000E+00	0.514E+02	0.514E+02	0.514E+02	0.514E+02	0.514E+02
BR	0.000E+00	0.204E+02	0.204E+02	0.204E+02	0.204E+02	0.204E+02
KR	0.000E+00	0.255E+03	0.255E+03	0.255E+03	0.255E+03	0.255E+03
RB	0.000E+00	0.218E+03	0.218E+03	0.218E+03	0.218E+03	0.218E+03
SR	0.000E+00	0.552E+03	0.552E+03	0.552E+03	0.552E+03	0.552E+03
Y	0.000E+00	0.283E+03	0.283E+03	0.283E+03	0.283E+03	0.283E+03
ZR	0.000E+00	0.301E+04	0.301E+04	0.301E+04	0.301E+04	0.301E+04
NB	0.000E+00	0.387E+02	0.387E+02	0.387E+02	0.387E+02	0.387E+02
MO	0.000E+00	0.358E+04	0.358E+04	0.358E+04	0.358E+04	0.358E+04
TC	0.000E+00	0.887E+03	0.887E+03	0.887E+03	0.887E+03	0.888E+03
RU	0.000E+00	0.358E+04	0.358E+04	0.358E+04	0.358E+04	0.358E+04
RH	0.000E+00	0.755E+03	0.755E+03	0.756E+03	0.756E+03	0.756E+03
PD	0.000E+00	0.272E+04	0.272E+04	0.272E+04	0.272E+04	0.272E+04
AG	0.000E+00	0.193E+03	0.193E+03	0.193E+03	0.193E+03	0.193E+03
CD	0.000E+00	0.254E+03	0.254E+03	0.254E+03	0.254E+03	0.254E+03
IN	0.000E+00	0.374E+01	0.374E+01	0.374E+01	0.375E+01	0.376E+01
SN	0.000E+00	0.138E+03	0.138E+03	0.138E+03	0.138E+03	0.138E+03
SB	0.000E+00	0.491E+02	0.491E+02	0.491E+02	0.490E+02	0.490E+02
TE	0.000E+00	0.710E+03	0.710E+03	0.710E+03	0.710E+03	0.709E+03
I	0.000E+00	0.397E+03	0.396E+03	0.396E+03	0.395E+03	0.395E+03
XE	0.000E+00	0.610E+04	0.610E+04	0.610E+04	0.610E+04	0.610E+04
CS	0.000E+00	0.353E+04	0.353E+04	0.353E+04	0.353E+04	0.354E+04
BA	0.000E+00	0.151E+04	0.151E+04	0.151E+04	0.151E+04	0.151E+04
LA	0.000E+00	0.131E+04	0.131E+04	0.131E+04	0.131E+04	0.131E+04
CE	0.000E+00	0.287E+04	0.287E+04	0.287E+04	0.286E+04	0.286E+04
PR	0.000E+00	0.118E+04	0.118E+04	0.118E+04	0.119E+04	0.119E+04
ND	0.000E+00	0.374E+04	0.374E+04	0.374E+04	0.374E+04	0.374E+04
PM	0.000E+00	0.160E+03	0.160E+03	0.160E+03	0.160E+03	0.160E+03
SM	0.000E+00	0.919E+03	0.919E+03	0.919E+03	0.920E+03	0.920E+03
EU	0.000E+00	0.280E+03	0.280E+03	0.280E+03	0.281E+03	0.281E+03
GD	0.000E+00	0.139E+03	0.139E+03	0.139E+03	0.139E+03	0.139E+03
TB	0.000E+00	0.683E+01	0.683E+01	0.683E+01	0.684E+01	0.684E+01
DY	0.000E+00	0.370E+01	0.370E+01	0.370E+01	0.371E+01	0.371E+01
HO	0.000E+00	0.343E+00	0.343E+00	0.343E+00	0.343E+00	0.343E+00
ER	0.000E+00	0.147E+00	0.147E+00	0.147E+00	0.147E+00	0.147E+00
TM	0.000E+00	0.149E-03	0.149E-03	0.149E-03	0.149E-03	0.149E-03
YB	0.000E+00	0.231E-04	0.231E-04	0.231E-04	0.231E-04	0.232E-04

THERMAL POWER (Watts)

CYCLE 1: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.546E-02	0.546E-02	0.546E-02	0.546E-02	0.546E-02
HE	0.000E+00	0.263E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.686E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.104E-02	0.479E-09	0.479E-09	0.479E-09	0.479E-09
B	0.000E+00	0.103E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.488E+00	0.667E-04	0.667E-04	0.667E-04	0.667E-04
N	0.000E+00	0.779E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.952E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.132E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.183E-01	0.145E-30	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.639E+01	0.586E+01	0.559E+01	0.352E+01	0.202E+01
MG	0.000E+00	0.214E-01	0.264E-03	0.326E-05	0.933E-11	0.627E-11
AL	0.000E+00	0.100E+01	0.145E-05	0.246E-08	0.185E-10	0.124E-10
SI	0.000E+00	0.140E+00	0.108E+00	0.826E-01	0.587E-02	0.246E-03
P	0.000E+00	0.699E+00	0.696E+00	0.694E+00	0.680E+00	0.664E+00
S	0.000E+00	0.212E-01	0.210E-01	0.209E-01	0.209E-01	0.208E-01
CL	0.000E+00	0.102E+00	0.332E-01	0.109E-01	0.700E-05	0.684E-05
AR	0.000E+00	0.556E-05	0.541E-05	0.530E-05	0.505E-05	0.499E-05
K	0.000E+00	0.816E-04	0.749E-04	0.705E-04	0.405E-04	0.209E-04
CA	0.000E+00	0.123E-02	0.154E-03	0.145E-03	0.144E-03	0.144E-03
SC	0.000E+00	0.936E-03	0.734E-03	0.601E-03	0.459E-03	0.441E-03
TI	0.000E+00	0.560E-03	0.410E-06	0.300E-09	0.000E+00	0.000E+00
V	0.145E-16	0.148E+01	0.225E-04	0.344E-09	0.136E-16	0.136E-16
CR	0.000E+00	0.571E-02	0.381E-02	0.381E-02	0.377E-02	0.372E-02
MN	0.000E+00	0.279E+01	0.213E+01	0.163E+01	0.115E+00	0.876E-02
FE	0.000E+00	0.392E-02	0.392E-02	0.392E-02	0.390E-02	0.387E-02
CO	0.000E+00	0.140E+01	0.134E+01	0.134E+01	0.134E+01	0.134E+01
NI	0.000E+00	0.144E-01	0.110E-01	0.836E-02	0.598E-03	0.873E-04
CU	0.000E+00	0.670E-01	0.349E-01	0.330E-01	0.191E-01	0.993E-02
ZN	0.000E+00	0.454E+00	0.379E+00	0.343E+00	0.302E+00	0.296E+00
GA	0.000E+00	0.171E-02	0.260E-03	0.572E-04	0.150E-04	0.833E-05
GE	0.000E+00	0.100E-06	0.359E-07	0.359E-07	0.350E-07	0.340E-07
Y	0.000E+00	0.291E-05	0.289E-05	0.286E-05	0.262E-05	0.236E-05
ZR	0.000E+00	0.134E-04	0.133E-04	0.133E-04	0.128E-04	0.124E-04
NB	0.000E+00	0.105E-02	0.104E-02	0.103E-02	0.989E-03	0.945E-03
MO	0.000E+00	0.589E+00	0.503E+00	0.493E+00	0.444E+00	0.391E+00
TC	0.000E+00	0.541E-01	0.781E-02	0.760E-03	0.387E-07	0.387E-07
RU	0.000E+00	0.107E-05	0.107E-05	0.107E-05	0.106E-05	0.105E-05
RH	0.000E+00	0.557E-06	0.353E-11	0.319E-11	0.230E-11	0.181E-11
PD	0.000E+00	0.713E-04	0.645E-04	0.608E-04	0.361E-04	0.194E-04
AG	0.000E+00	0.452E+00	0.359E-01	0.359E-01	0.358E-01	0.358E-01
CD	0.000E+00	0.111E+01	0.108E+01	0.106E+01	0.905E+00	0.784E+00
IN	0.171E-13	0.219E+02	0.610E+01	0.290E+01	0.997E-01	0.916E-01
SN	0.000E+00	0.758E-01	0.656E-01	0.652E-01	0.631E-01	0.608E-01
SB	0.000E+00	0.488E-02	0.484E-02	0.483E-02	0.470E-02	0.455E-02
TE	0.000E+00	0.160E-03	0.160E-03	0.160E-03	0.160E-03	0.160E-03
I	0.000E+00	0.873E-08	0.165E-08	0.313E-09	0.372E-14	0.189E-14
PM	0.000E+00	0.313E-08	0.248E-08	0.199E-08	0.387E-09	0.201E-09
SM	0.000E+00	0.313E-08	0.262E-08	0.251E-08	0.215E-08	0.180E-08
EU	0.000E+00	0.960E-03	0.958E-03	0.957E-03	0.941E-03	0.922E-03
GD	0.137E-14	0.238E+00	0.185E+00	0.178E+00	0.123E+00	0.792E-01
TB	0.000E+00	0.686E-01	0.685E-01	0.684E-01	0.676E-01	0.667E-01
DY	0.000E+00	0.478E-03	0.325E-03	0.242E-03	0.129E-04	0.607E-06
HO	0.000E+00	0.213E-04	0.208E-04	0.203E-04	0.159E-04	0.119E-04

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
ER	0.000E+00	0.253E-07	0.260E-10	0.259E-10	0.251E-10	0.242E-10
TA	0.000E+00	0.259E-03	0.258E-03	0.257E-03	0.249E-03	0.239E-03
W	0.000E+00	0.805E+00	0.781E+00	0.759E+00	0.570E+00	0.404E+00
RE	0.000E+00	0.153E+00	0.128E+00	0.121E+00	0.825E-01	0.528E-01
OS	0.000E+00	0.314E-06	0.307E-06	0.304E-06	0.282E-06	0.264E-06
IR	0.000E+00	0.115E-06	0.114E-06	0.114E-06	0.114E-06	0.113E-06
PB	0.266E-17	0.489E-06	0.396E-06	0.321E-06	0.393E-07	0.316E-08
BI	0.000E+00	0.782E-04	0.778E-04	0.773E-04	0.730E-04	0.681E-04
PO	0.000E+00	0.951E-03	0.951E-03	0.951E-03	0.951E-03	0.951E-03
BI	0.000E+00	0.541E-05	0.541E-05	0.542E-05	0.541E-05	0.567E-05
PO	0.000E+00	0.238E-04	0.238E-04	0.238E-04	0.238E-04	0.243E-04
RN	0.000E+00	0.121E-04	0.121E-04	0.121E-04	0.121E-04	0.121E-04
RA	0.000E+00	0.109E-04	0.109E-04	0.109E-04	0.109E-04	0.109E-04
TH	0.000E+00	0.488E-03	0.470E-03	0.461E-03	0.391E-03	0.330E-03
PA	0.000E+00	0.333E-02	0.329E-02	0.325E-02	0.298E-02	0.272E-02
U	0.797E-01	0.468E+05	0.905E+04	0.261E+04	0.123E+04	0.117E+04
NP	0.000E+00	0.416E+05	0.412E+05	0.408E+05	0.360E+05	0.311E+05
PU	0.000E+00	0.937E+02	0.861E+02	0.794E+02	0.460E+02	0.372E+02
AM	0.000E+00	0.418E+02	0.245E+02	0.203E+02	0.128E+02	0.801E+01
CM	0.000E+00	0.184E+03	0.184E+03	0.184E+03	0.185E+03	0.185E+03
H	0.000E+00	0.102E-01	0.102E-01	0.102E-01	0.102E-01	0.102E-01
CO	0.000E+00	0.936E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.186E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.152E+02	0.229E-09	0.289E-12	0.200E-12	0.175E-12
ZN	0.000E+00	0.981E+02	0.893E-01	0.879E-01	0.758E-01	0.633E-01
GA	0.000E+00	0.649E+03	0.170E+01	0.158E+01	0.120E+01	0.101E+01
GE	0.000E+00	0.244E+04	0.236E+02	0.180E+02	0.540E+01	0.255E+01
AS	0.000E+00	0.106E+05	0.985E+02	0.811E+02	0.617E+01	0.314E+01
SE	0.000E+00	0.221E+05	0.182E+03	0.291E+02	0.113E-01	0.801E-02
BR	0.000E+00	0.649E+05	0.164E+04	0.584E+03	0.461E+02	0.294E+02
KR	0.000E+00	0.847E+05	0.146E+05	0.106E+05	0.783E+03	0.628E+02
RB	0.000E+00	0.165E+06	0.136E+05	0.956E+04	0.828E+03	0.485E+02
SR	0.000E+00	0.136E+06	0.257E+05	0.224E+05	0.961E+04	0.617E+04
Y	0.000E+00	0.207E+06	0.393E+05	0.341E+05	0.165E+05	0.918E+04
ZR	0.000E+00	0.978E+05	0.183E+05	0.179E+05	0.150E+05	0.128E+05
NB	0.000E+00	0.196E+06	0.279E+05	0.273E+05	0.213E+05	0.162E+05
MO	0.000E+00	0.721E+05	0.723E+04	0.603E+04	0.537E+04	0.473E+04
TC	0.000E+00	0.926E+05	0.619E+04	0.184E+04	0.132E+04	0.119E+04
RU	0.000E+00	0.192E+05	0.973E+04	0.899E+04	0.552E+04	0.471E+04
RH	0.000E+00	0.191E+05	0.465E+04	0.425E+04	0.382E+04	0.360E+04
PD	0.000E+00	0.224E+04	0.563E+03	0.503E+03	0.298E+03	0.162E+03
AG	0.000E+00	0.297E+04	0.687E+03	0.649E+03	0.460E+03	0.324E+03
CD	0.000E+00	0.163E+04	0.155E+03	0.127E+03	0.540E+02	0.421E+02
IN	0.000E+00	0.702E+04	0.241E+03	0.155E+03	0.388E+02	0.253E+02
SN	0.000E+00	0.179E+05	0.113E+04	0.743E+03	0.116E+03	0.930E+02
SB	0.000E+00	0.726E+05	0.822E+04	0.471E+04	0.117E+04	0.638E+03
TE	0.000E+00	0.814E+05	0.209E+05	0.115E+05	0.421E+04	0.350E+04
I	0.000E+00	0.182E+06	0.916E+05	0.759E+05	0.401E+05	0.303E+05
XE	0.000E+00	0.912E+05	0.667E+04	0.584E+04	0.548E+04	0.406E+04
CS	0.000E+00	0.164E+06	0.194E+05	0.639E+04	0.104E+04	0.103E+04
BA	0.000E+00	0.978E+05	0.149E+05	0.100E+05	0.532E+04	0.516E+04
LA	0.000E+00	0.169E+06	0.676E+05	0.558E+05	0.327E+05	0.310E+05
CE	0.000E+00	0.394E+05	0.104E+05	0.101E+05	0.884E+04	0.759E+04
PR	0.000E+00	0.558E+05	0.208E+05	0.162E+05	0.126E+05	0.117E+05
ND	0.000E+00	0.692E+04	0.307E+04	0.256E+04	0.163E+04	0.156E+04
PM	0.000E+00	0.721E+04	0.414E+04	0.405E+04	0.365E+04	0.326E+04
SM	0.000E+00	0.886E+03	0.575E+03	0.536E+03	0.441E+03	0.361E+03
EU	0.000E+00	0.832E+03	0.748E+03	0.717E+03	0.653E+03	0.626E+03
GD	0.000E+00	0.206E+02	0.116E+02	0.111E+02	0.765E+01	0.489E+01

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
TB	0.000E+00	0.966E+01	0.426E+01	0.376E+01	0.359E+01	0.350E+01
DY	0.000E+00	0.715E+00	0.497E+00	0.376E+00	0.407E-01	0.206E-01
HO	0.000E+00	0.154E+00	0.153E+00	0.151E+00	0.136E+00	0.120E+00
ER	0.000E+00	0.647E-03	0.714E-04	0.712E-04	0.690E-04	0.665E-04

CYCLE 2: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.839E-02	0.839E-02	0.839E-02	0.838E-02	0.838E-02
HE	0.000E+00	0.236E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.889E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.135E-02	0.177E-08	0.177E-08	0.177E-08	0.177E-08
B	0.000E+00	0.134E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.629E+00	0.150E-03	0.150E-03	0.150E-03	0.150E-03
N	0.000E+00	0.100E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.123E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.170E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.236E-01	0.187E-30	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.823E+01	0.754E+01	0.720E+01	0.454E+01	0.261E+01
MG	0.000E+00	0.276E-01	0.340E-03	0.419E-05	0.155E-10	0.104E-10
AL	0.000E+00	0.129E+01	0.187E-05	0.320E-08	0.306E-10	0.206E-10
SI	0.000E+00	0.181E+00	0.139E+00	0.106E+00	0.757E-02	0.317E-03
P	0.000E+00	0.900E+00	0.896E+00	0.894E+00	0.876E+00	0.855E+00
S	0.000E+00	0.262E-01	0.258E-01	0.258E-01	0.257E-01	0.256E-01
CL	0.000E+00	0.131E+00	0.428E-01	0.140E-01	0.151E-04	0.150E-04
AR	0.000E+00	0.745E-05	0.719E-05	0.701E-05	0.658E-05	0.651E-05
K	0.000E+00	0.107E-03	0.987E-04	0.929E-04	0.533E-04	0.275E-04
CA	0.000E+00	0.159E-02	0.205E-03	0.193E-03	0.192E-03	0.191E-03
SC	0.000E+00	0.134E-02	0.107E-02	0.897E-03	0.713E-03	0.689E-03
TI	0.000E+00	0.723E-03	0.529E-06	0.387E-09	0.000E+00	0.000E+00
V	0.145E-16	0.189E+01	0.289E-04	0.441E-09	0.125E-16	0.125E-16
CR	0.000E+00	0.742E-02	0.483E-02	0.483E-02	0.478E-02	0.472E-02
MN	0.000E+00	0.353E+01	0.270E+01	0.206E+01	0.146E+00	0.121E-01
FE	0.000E+00	0.544E-02	0.543E-02	0.543E-02	0.540E-02	0.536E-02
CO	0.000E+00	0.259E+01	0.252E+01	0.251E+01	0.251E+01	0.251E+01
NI	0.000E+00	0.189E-01	0.144E-01	0.110E-01	0.838E-03	0.174E-03
CU	0.000E+00	0.882E-01	0.447E-01	0.423E-01	0.245E-01	0.127E-01
ZN	0.000E+00	0.624E+00	0.528E+00	0.482E+00	0.429E+00	0.420E+00
GA	0.000E+00	0.493E-02	0.750E-03	0.165E-03	0.434E-04	0.241E-04
GE	0.000E+00	0.647E-06	0.232E-06	0.232E-06	0.226E-06	0.220E-06
Y	0.000E+00	0.376E-05	0.373E-05	0.370E-05	0.338E-05	0.304E-05
ZR	0.000E+00	0.170E-04	0.170E-04	0.169E-04	0.163E-04	0.157E-04
NB	0.000E+00	0.136E-02	0.135E-02	0.134E-02	0.128E-02	0.122E-02
MO	0.000E+00	0.749E+00	0.638E+00	0.626E+00	0.563E+00	0.496E+00
TC	0.000E+00	0.950E-01	0.100E-01	0.977E-03	0.807E-07	0.808E-07
RU	0.000E+00	0.754E-05	0.753E-05	0.753E-05	0.747E-05	0.741E-05
RH	0.000E+00	0.861E-06	0.491E-10	0.438E-10	0.308E-10	0.241E-10
PD	0.000E+00	0.188E-03	0.171E-03	0.161E-03	0.958E-04	0.515E-04
AG	0.000E+00	0.349E+00	0.316E-01	0.316E-01	0.315E-01	0.314E-01
CD	0.000E+00	0.143E+01	0.139E+01	0.135E+01	0.116E+01	0.100E+01
IN	0.171E-13	0.297E+01	0.908E+00	0.506E+00	0.109E+00	0.100E+00
SN	0.000E+00	0.104E+00	0.906E-01	0.901E-01	0.873E-01	0.842E-01
SB	0.000E+00	0.108E-01	0.107E-01	0.107E-01	0.103E-01	0.989E-02
TE	0.000E+00	0.334E-03	0.334E-03	0.334E-03	0.334E-03	0.334E-03
I	0.000E+00	0.130E-06	0.247E-07	0.467E-08	0.257E-12	0.131E-12
PM	0.000E+00	0.940E-08	0.760E-08	0.623E-08	0.170E-08	0.103E-08
SM	0.000E+00	0.306E-08	0.230E-08	0.216E-08	0.184E-08	0.154E-08
EU	0.000E+00	0.725E-02	0.723E-02	0.722E-02	0.709E-02	0.694E-02
GD	0.137E-14	0.315E+00	0.247E+00	0.238E+00	0.164E+00	0.106E+00
TB	0.000E+00	0.174E+00	0.174E+00	0.174E+00	0.172E+00	0.170E+00
DY	0.000E+00	0.735E-02	0.499E-02	0.372E-02	0.200E-03	0.104E-04
HO	0.000E+00	0.756E-03	0.737E-03	0.719E-03	0.560E-03	0.415E-03
ER	0.000E+00	0.219E-05	0.106E-07	0.106E-07	0.103E-07	0.991E-08
TA	0.000E+00	0.845E-03	0.842E-03	0.839E-03	0.807E-03	0.772E-03
W	0.000E+00	0.844E+00	0.819E+00	0.796E+00	0.598E+00	0.424E+00

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
RE	0.000E+00	0.364E+00	0.305E+00	0.289E+00	0.196E+00	0.125E+00
OS	0.000E+00	0.871E-05	0.857E-05	0.849E-05	0.786E-05	0.737E-05
IR	0.000E+00	0.745E-05	0.744E-05	0.743E-05	0.733E-05	0.724E-05
PT	0.000E+00	0.207E-08	0.205E-08	0.204E-08	0.191E-08	0.176E-08
PB	0.266E-17	0.630E-06	0.511E-06	0.414E-06	0.507E-07	0.407E-08
BI	0.000E+00	0.101E-03	0.100E-03	0.996E-04	0.940E-04	0.877E-04
PO	0.000E+00	0.125E-02	0.125E-02	0.125E-02	0.125E-02	0.125E-02
TL	0.000E+00	0.219E-04	0.219E-04	0.225E-04	0.219E-04	0.230E-04
PB	0.000E+00	0.494E-05	0.494E-05	0.494E-05	0.494E-05	0.493E-05
BI	0.000E+00	0.441E-04	0.441E-04	0.441E-04	0.441E-04	0.462E-04
PO	0.000E+00	0.194E-03	0.194E-03	0.194E-03	0.194E-03	0.198E-03
RN	0.000E+00	0.985E-04	0.985E-04	0.985E-04	0.984E-04	0.984E-04
RA	0.000E+00	0.890E-04	0.890E-04	0.890E-04	0.890E-04	0.890E-04
TH	0.000E+00	0.928E-03	0.866E-03	0.842E-03	0.695E-03	0.565E-03
PA	0.000E+00	0.783E-02	0.767E-02	0.755E-02	0.653E-02	0.559E-02
U	0.797E-01	0.602E+05	0.123E+05	0.407E+04	0.229E+04	0.217E+04
NP	0.000E+00	0.546E+05	0.540E+05	0.534E+05	0.471E+05	0.406E+05
PU	0.000E+00	0.541E+03	0.489E+03	0.444E+03	0.218E+03	0.158E+03
AM	0.000E+00	0.462E+03	0.185E+03	0.124E+03	0.698E+02	0.416E+02
CM	0.000E+00	0.164E+04	0.165E+04	0.165E+04	0.165E+04	0.164E+04
BK	0.000E+00	0.238E-04	0.194E-04	0.158E-04	0.255E-05	0.936E-06
H	0.000E+00	0.209E-01	0.209E-01	0.209E-01	0.209E-01	0.209E-01
CO	0.000E+00	0.114E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.216E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.154E+02	0.175E-09	0.271E-12	0.197E-12	0.172E-12
ZN	0.000E+00	0.889E+02	0.109E+00	0.108E+00	0.926E-01	0.774E-01
GA	0.000E+00	0.558E+03	0.202E+01	0.189E+01	0.146E+01	0.123E+01
GE	0.000E+00	0.205E+04	0.227E+02	0.173E+02	0.512E+01	0.242E+01
AS	0.000E+00	0.868E+04	0.962E+02	0.791E+02	0.602E+01	0.305E+01
SE	0.000E+00	0.179E+05	0.164E+03	0.261E+02	0.105E-01	0.752E-02
BR	0.000E+00	0.507E+05	0.146E+04	0.563E+03	0.925E+02	0.669E+02
KR	0.000E+00	0.677E+05	0.118E+05	0.854E+04	0.644E+03	0.601E+02
RB	0.000E+00	0.136E+06	0.110E+05	0.772E+04	0.675E+03	0.463E+02
SR	0.000E+00	0.120E+06	0.215E+05	0.187E+05	0.793E+04	0.507E+04
Y	0.000E+00	0.191E+06	0.342E+05	0.296E+05	0.144E+05	0.804E+04
ZR	0.000E+00	0.966E+05	0.174E+05	0.171E+05	0.142E+05	0.121E+05
NB	0.000E+00	0.204E+06	0.269E+05	0.262E+05	0.204E+05	0.154E+05
MO	0.000E+00	0.863E+05	0.744E+04	0.619E+04	0.551E+04	0.486E+04
TC	0.000E+00	0.122E+06	0.709E+04	0.196E+04	0.136E+04	0.122E+04
RU	0.000E+00	0.275E+05	0.126E+05	0.116E+05	0.677E+04	0.564E+04
RH	0.000E+00	0.332E+05	0.831E+04	0.767E+04	0.700E+04	0.670E+04
PD	0.000E+00	0.326E+04	0.101E+04	0.910E+03	0.540E+03	0.293E+03
AG	0.000E+00	0.472E+04	0.109E+04	0.103E+04	0.748E+03	0.541E+03
CD	0.000E+00	0.199E+04	0.195E+03	0.160E+03	0.703E+02	0.551E+02
IN	0.000E+00	0.823E+04	0.312E+03	0.199E+03	0.500E+02	0.331E+02
SN	0.000E+00	0.188E+05	0.134E+04	0.890E+03	0.142E+03	0.115E+03
SB	0.000E+00	0.743E+05	0.924E+04	0.544E+04	0.144E+04	0.821E+03
TE	0.000E+00	0.788E+05	0.205E+05	0.115E+05	0.450E+04	0.373E+04
I	0.000E+00	0.181E+06	0.921E+05	0.766E+05	0.412E+05	0.312E+05
XE	0.000E+00	0.870E+05	0.636E+04	0.558E+04	0.537E+04	0.403E+04
CS	0.000E+00	0.159E+06	0.209E+05	0.827E+04	0.304E+04	0.301E+04
BA	0.000E+00	0.934E+05	0.148E+05	0.100E+05	0.548E+04	0.532E+04
LA	0.000E+00	0.162E+06	0.659E+05	0.547E+05	0.323E+05	0.306E+05
CE	0.000E+00	0.387E+05	0.100E+05	0.976E+04	0.854E+04	0.736E+04
PR	0.000E+00	0.576E+05	0.216E+05	0.172E+05	0.137E+05	0.127E+05
ND	0.000E+00	0.778E+04	0.316E+04	0.261E+04	0.161E+04	0.154E+04
PM	0.000E+00	0.908E+04	0.509E+04	0.497E+04	0.447E+04	0.400E+04
SM	0.000E+00	0.159E+04	0.112E+04	0.106E+04	0.879E+03	0.724E+03
EU	0.000E+00	0.254E+04	0.240E+04	0.235E+04	0.222E+04	0.215E+04

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
GD	0.000E+00	0.366E+02	0.220E+02	0.211E+02	0.145E+02	0.930E+01
TB	0.000E+00	0.212E+02	0.129E+02	0.121E+02	0.118E+02	0.116E+02
DY	0.000E+00	0.270E+01	0.185E+01	0.139E+01	0.106E+00	0.339E-01
HO	0.000E+00	0.568E+00	0.557E+00	0.547E+00	0.453E+00	0.365E+00
ER	0.000E+00	0.394E-02	0.428E-03	0.426E-03	0.413E-03	0.398E-03
TM	0.000E+00	0.748E-04	0.748E-04	0.748E-04	0.745E-04	0.743E-04

CYCLE 3: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.966E-02	0.966E-02	0.966E-02	0.966E-02	0.966E-02
HE	0.000E+00	0.313E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.113E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.174E-02	0.465E-08	0.465E-08	0.465E-08	0.465E-08
B	0.000E+00	0.172E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.801E+00	0.256E-03	0.256E-03	0.256E-03	0.256E-03
N	0.000E+00	0.128E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.156E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.216E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.300E-01	0.238E-30	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.105E+02	0.959E+01	0.915E+01	0.577E+01	0.331E+01
MG	0.000E+00	0.351E-01	0.433E-03	0.534E-05	0.251E-10	0.169E-10
AL	0.000E+00	0.164E+01	0.239E-05	0.410E-08	0.496E-10	0.333E-10
SI	0.000E+00	0.230E+00	0.176E+00	0.135E+00	0.963E-02	0.403E-03
P	0.000E+00	0.114E+01	0.114E+01	0.114E+01	0.112E+01	0.109E+01
S	0.000E+00	0.317E-01	0.313E-01	0.313E-01	0.311E-01	0.310E-01
CL	0.000E+00	0.168E+00	0.547E-01	0.179E-01	0.250E-04	0.247E-04
AR	0.000E+00	0.102E-04	0.967E-05	0.930E-05	0.847E-05	0.837E-05
K	0.000E+00	0.144E-03	0.132E-03	0.124E-03	0.714E-04	0.368E-04
CA	0.000E+00	0.203E-02	0.263E-03	0.247E-03	0.247E-03	0.246E-03
SC	0.000E+00	0.192E-02	0.157E-02	0.135E-02	0.111E-02	0.108E-02
TI	0.000E+00	0.923E-03	0.676E-06	0.494E-09	0.000E+00	0.000E+00
V	0.145E-16	0.240E+01	0.366E-04	0.558E-09	0.112E-16	0.112E-16
CR	0.000E+00	0.954E-02	0.602E-02	0.602E-02	0.595E-02	0.588E-02
MN	0.000E+00	0.439E+01	0.336E+01	0.257E+01	0.183E+00	0.155E-01
FE	0.000E+00	0.746E-02	0.745E-02	0.745E-02	0.740E-02	0.735E-02
CO	0.000E+00	0.376E+01	0.367E+01	0.367E+01	0.366E+01	0.365E+01
NI	0.000E+00	0.244E-01	0.186E-01	0.142E-01	0.114E-02	0.280E-03
CU	0.000E+00	0.116E+00	0.565E-01	0.535E-01	0.310E-01	0.161E-01
ZN	0.000E+00	0.806E+00	0.683E+00	0.624E+00	0.557E+00	0.546E+00
GA	0.000E+00	0.107E-01	0.163E-02	0.361E-03	0.956E-04	0.530E-04
GE	0.000E+00	0.241E-05	0.865E-06	0.863E-06	0.842E-06	0.818E-06
Y	0.000E+00	0.481E-05	0.476E-05	0.472E-05	0.431E-05	0.387E-05
ZR	0.000E+00	0.215E-04	0.214E-04	0.213E-04	0.206E-04	0.198E-04
NB	0.000E+00	0.174E-02	0.172E-02	0.171E-02	0.163E-02	0.156E-02
MO	0.000E+00	0.937E+00	0.797E+00	0.781E+00	0.702E+00	0.619E+00
TC	0.000E+00	0.155E+00	0.127E-01	0.124E-02	0.126E-06	0.126E-06
RU	0.000E+00	0.286E-04	0.286E-04	0.286E-04	0.283E-04	0.281E-04
RH	0.000E+00	0.247E-05	0.383E-09	0.342E-09	0.231E-09	0.181E-09
PD	0.000E+00	0.362E-03	0.332E-03	0.314E-03	0.187E-03	0.100E-03
AG	0.000E+00	0.244E+00	0.218E-01	0.218E-01	0.217E-01	0.217E-01
CD	0.000E+00	0.180E+01	0.175E+01	0.171E+01	0.147E+01	0.127E+01
IN	0.171E-13	0.846E+00	0.337E+00	0.251E+00	0.115E+00	0.104E+00
SN	0.000E+00	0.132E+00	0.115E+00	0.115E+00	0.111E+00	0.107E+00
SB	0.000E+00	0.188E-01	0.187E-01	0.186E-01	0.178E-01	0.170E-01
TE	0.000E+00	0.524E-03	0.524E-03	0.524E-03	0.522E-03	0.522E-03
I	0.000E+00	0.832E-06	0.157E-06	0.298E-07	0.460E-11	0.235E-11
PM	0.000E+00	0.146E-07	0.119E-07	0.988E-08	0.307E-08	0.194E-08
SM	0.000E+00	0.475E-08	0.352E-08	0.329E-08	0.281E-08	0.235E-08
EU	0.000E+00	0.153E-01	0.152E-01	0.152E-01	0.149E-01	0.146E-01
GD	0.137E-14	0.412E+00	0.325E+00	0.313E+00	0.216E+00	0.139E+00
TB	0.000E+00	0.329E+00	0.329E+00	0.329E+00	0.326E+00	0.323E+00
DY	0.000E+00	0.389E-01	0.264E-01	0.197E-01	0.106E-02	0.619E-04
HO	0.000E+00	0.679E-02	0.662E-02	0.646E-02	0.502E-02	0.371E-02
ER	0.000E+00	0.363E-04	0.469E-06	0.468E-06	0.454E-06	0.437E-06
TM	0.000E+00	0.427E-07	0.427E-07	0.427E-07	0.426E-07	0.424E-07
TA	0.000E+00	0.161E-02	0.160E-02	0.160E-02	0.153E-02	0.146E-02

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
W	0.000E+00	0.825E+00	0.801E+00	0.778E+00	0.585E+00	0.416E+00
RE	0.000E+00	0.622E+00	0.521E+00	0.493E+00	0.334E+00	0.212E+00
OS	0.000E+00	0.788E-04	0.778E-04	0.771E-04	0.714E-04	0.669E-04
IR	0.000E+00	0.100E-03	0.998E-04	0.996E-04	0.973E-04	0.953E-04
PT	0.000E+00	0.491E-07	0.488E-07	0.485E-07	0.453E-07	0.418E-07
PB	0.266E-17	0.802E-06	0.650E-06	0.527E-06	0.645E-07	0.519E-08
BI	0.000E+00	0.128E-03	0.127E-03	0.127E-03	0.120E-03	0.112E-03
PO	0.000E+00	0.160E-02	0.160E-02	0.160E-02	0.160E-02	0.160E-02
TL	0.000E+00	0.783E-04	0.783E-04	0.804E-04	0.783E-04	0.820E-04
PB	0.000E+00	0.176E-04	0.176E-04	0.176E-04	0.176E-04	0.176E-04
BI	0.000E+00	0.158E-03	0.158E-03	0.158E-03	0.158E-03	0.165E-03
PO	0.000E+00	0.694E-03	0.694E-03	0.694E-03	0.693E-03	0.708E-03
RN	0.000E+00	0.352E-03	0.352E-03	0.352E-03	0.351E-03	0.351E-03
RA	0.000E+00	0.318E-03	0.318E-03	0.318E-03	0.318E-03	0.318E-03
TH	0.000E+00	0.141E-02	0.127E-02	0.124E-02	0.104E-02	0.874E-03
PA	0.000E+00	0.128E-01	0.125E-01	0.123E-01	0.104E-01	0.872E-02
U	0.797E-01	0.754E+05	0.156E+05	0.536E+04	0.312E+04	0.296E+04
NP	0.000E+00	0.704E+05	0.697E+05	0.688E+05	0.607E+05	0.523E+05
PU	0.000E+00	0.132E+04	0.120E+04	0.109E+04	0.539E+03	0.393E+03
AM	0.000E+00	0.165E+04	0.536E+03	0.301E+03	0.146E+03	0.821E+02
CM	0.000E+00	0.370E+04	0.370E+04	0.370E+04	0.370E+04	0.369E+04
BK	0.000E+00	0.249E-02	0.202E-02	0.164E-02	0.250E-03	0.804E-04
CF	0.000E+00	0.298E-03	0.298E-03	0.298E-03	0.298E-03	0.298E-03
H	0.000E+00	0.319E-01	0.319E-01	0.319E-01	0.319E-01	0.319E-01
CO	0.000E+00	0.139E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.253E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.163E+02	0.134E-09	0.253E-12	0.192E-12	0.168E-12
ZN	0.000E+00	0.842E+02	0.132E+00	0.130E+00	0.112E+00	0.934E-01
GA	0.000E+00	0.498E+03	0.239E+01	0.225E+01	0.175E+01	0.149E+01
GE	0.000E+00	0.178E+04	0.229E+02	0.173E+02	0.509E+01	0.240E+01
AS	0.000E+00	0.729E+04	0.979E+02	0.805E+02	0.620E+01	0.315E+01
SE	0.000E+00	0.147E+05	0.153E+03	0.243E+02	0.102E-01	0.739E-02
BR	0.000E+00	0.400E+05	0.137E+04	0.584E+03	0.154E+03	0.116E+03
KR	0.000E+00	0.550E+05	0.974E+04	0.706E+04	0.541E+03	0.582E+02
RB	0.000E+00	0.114E+06	0.904E+04	0.636E+04	0.565E+03	0.484E+02
SR	0.000E+00	0.110E+06	0.185E+05	0.161E+05	0.667E+04	0.423E+04
Y	0.000E+00	0.182E+06	0.308E+05	0.265E+05	0.129E+05	0.721E+04
ZR	0.000E+00	0.981E+05	0.171E+05	0.168E+05	0.139E+05	0.117E+05
NB	0.000E+00	0.216E+06	0.267E+05	0.260E+05	0.201E+05	0.151E+05
MO	0.000E+00	0.101E+06	0.793E+04	0.659E+04	0.587E+04	0.517E+04
TC	0.000E+00	0.151E+06	0.810E+04	0.214E+04	0.144E+04	0.130E+04
RU	0.000E+00	0.354E+05	0.155E+05	0.142E+05	0.803E+04	0.660E+04
RH	0.000E+00	0.467E+05	0.118E+05	0.109E+05	0.998E+04	0.960E+04
PD	0.000E+00	0.439E+04	0.155E+04	0.140E+04	0.833E+03	0.452E+03
AG	0.000E+00	0.708E+04	0.154E+04	0.146E+04	0.108E+04	0.805E+03
CD	0.000E+00	0.240E+04	0.241E+03	0.198E+03	0.891E+02	0.702E+02
IN	0.000E+00	0.959E+04	0.384E+03	0.245E+03	0.630E+02	0.422E+02
SN	0.000E+00	0.202E+05	0.157E+04	0.105E+04	0.173E+03	0.140E+03
SB	0.000E+00	0.780E+05	0.105E+05	0.631E+04	0.175E+04	0.103E+04
TE	0.000E+00	0.786E+05	0.208E+05	0.119E+05	0.489E+04	0.404E+04
I	0.000E+00	0.186E+06	0.954E+05	0.796E+05	0.436E+05	0.331E+05
XE	0.000E+00	0.855E+05	0.626E+04	0.552E+04	0.544E+04	0.412E+04
CS	0.000E+00	0.160E+06	0.239E+05	0.112E+05	0.587E+04	0.582E+04
BA	0.000E+00	0.923E+05	0.151E+05	0.104E+05	0.582E+04	0.565E+04
LA	0.000E+00	0.161E+06	0.667E+05	0.555E+05	0.332E+05	0.313E+05
CE	0.000E+00	0.390E+05	0.982E+04	0.958E+04	0.838E+04	0.723E+04
PR	0.000E+00	0.596E+05	0.217E+05	0.173E+05	0.137E+05	0.126E+05
ND	0.000E+00	0.878E+04	0.336E+04	0.274E+04	0.165E+04	0.158E+04
PM	0.000E+00	0.103E+05	0.543E+04	0.528E+04	0.471E+04	0.419E+04

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
SM	0.000E+00	0.236E+04	0.173E+04	0.164E+04	0.138E+04	0.114E+04
EU	0.000E+00	0.598E+04	0.578E+04	0.570E+04	0.546E+04	0.529E+04
GD	0.000E+00	0.589E+02	0.387E+02	0.372E+02	0.256E+02	0.164E+02
TB	0.000E+00	0.405E+02	0.294E+02	0.283E+02	0.278E+02	0.275E+02
DY	0.000E+00	0.802E+01	0.547E+01	0.409E+01	0.263E+00	0.530E-01
HO	0.000E+00	0.204E+01	0.200E+01	0.195E+01	0.155E+01	0.118E+01
ER	0.000E+00	0.188E-01	0.155E-02	0.155E-02	0.150E-02	0.144E-02
TM	0.000E+00	0.427E-03	0.427E-03	0.427E-03	0.425E-03	0.423E-03

CYCLE 1: MOX

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.366E-02	0.366E-02	0.366E-02	0.365E-02	0.365E-02
HE	0.000E+00	0.530E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.364E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.558E-03	0.755E-09	0.755E-09	0.755E-09	0.755E-09
B	0.000E+00	0.727E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.737E+00	0.428E-04	0.428E-04	0.428E-04	0.428E-04
N	0.000E+00	0.118E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.994E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.107E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.215E-01	0.171E-30	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.412E+01	0.378E+01	0.361E+01	0.228E+01	0.131E+01
MG	0.000E+00	0.312E-01	0.385E-03	0.475E-05	0.834E-11	0.560E-11
AL	0.000E+00	0.700E+00	0.217E-05	0.370E-08	0.165E-10	0.111E-10
SI	0.000E+00	0.210E+00	0.161E+00	0.124E+00	0.878E-02	0.368E-03
P	0.000E+00	0.435E+00	0.432E+00	0.431E+00	0.423E+00	0.412E+00
S	0.000E+00	0.156E-01	0.152E-01	0.152E-01	0.151E-01	0.151E-01
CL	0.000E+00	0.656E-01	0.214E-01	0.700E-02	0.422E-05	0.413E-05
AR	0.000E+00	0.785E-05	0.763E-05	0.748E-05	0.712E-05	0.705E-05
K	0.000E+00	0.123E-03	0.113E-03	0.106E-03	0.609E-04	0.314E-04
CA	0.000E+00	0.756E-03	0.954E-04	0.895E-04	0.892E-04	0.888E-04
SC	0.000E+00	0.989E-03	0.846E-03	0.754E-03	0.645E-03	0.617E-03
TI	0.000E+00	0.399E-03	0.292E-06	0.214E-09	0.000E+00	0.000E+00
V	0.145E-16	0.926E+00	0.141E-04	0.216E-09	0.139E-16	0.139E-16
CR	0.000E+00	0.371E-02	0.237E-02	0.236E-02	0.234E-02	0.231E-02
MN	0.000E+00	0.211E+01	0.162E+01	0.124E+01	0.902E-01	0.984E-02
FE	0.000E+00	0.252E-02	0.252E-02	0.252E-02	0.250E-02	0.248E-02
CO	0.000E+00	0.732E+00	0.685E+00	0.684E+00	0.682E+00	0.682E+00
NI	0.000E+00	0.933E-02	0.709E-02	0.540E-02	0.384E-03	0.542E-04
CU	0.000E+00	0.456E-01	0.238E-01	0.225E-01	0.130E-01	0.678E-02
ZN	0.000E+00	0.340E+00	0.281E+00	0.252E+00	0.220E+00	0.214E+00
GA	0.000E+00	0.121E-02	0.180E-03	0.361E-04	0.792E-05	0.439E-05
GE	0.000E+00	0.438E-07	0.150E-07	0.150E-07	0.146E-07	0.142E-07
Y	0.000E+00	0.439E-05	0.435E-05	0.431E-05	0.395E-05	0.355E-05
ZR	0.000E+00	0.201E-04	0.200E-04	0.199E-04	0.193E-04	0.186E-04
NB	0.000E+00	0.159E-02	0.157E-02	0.156E-02	0.149E-02	0.142E-02
MO	0.000E+00	0.491E+00	0.406E+00	0.397E+00	0.357E+00	0.315E+00
TC	0.000E+00	0.503E-01	0.774E-02	0.753E-03	0.307E-07	0.308E-07
RU	0.000E+00	0.898E-06	0.898E-06	0.897E-06	0.891E-06	0.883E-06
RH	0.000E+00	0.655E-06	0.312E-11	0.286E-11	0.215E-11	0.169E-11
PD	0.000E+00	0.615E-04	0.553E-04	0.521E-04	0.309E-04	0.166E-04
AG	0.000E+00	0.444E+00	0.340E-01	0.340E-01	0.340E-01	0.339E-01
CD	0.000E+00	0.114E+01	0.111E+01	0.108E+01	0.928E+00	0.803E+00
IN	0.171E-13	0.249E+02	0.718E+01	0.340E+01	0.959E-01	0.876E-01
SN	0.000E+00	0.735E-01	0.635E-01	0.631E-01	0.610E-01	0.588E-01
SB	0.000E+00	0.474E-02	0.471E-02	0.470E-02	0.457E-02	0.443E-02
TE	0.000E+00	0.158E-03	0.158E-03	0.158E-03	0.158E-03	0.158E-03
I	0.000E+00	0.726E-08	0.138E-08	0.260E-09	0.198E-14	0.100E-14
PM	0.000E+00	0.254E-08	0.245E-08	0.239E-08	0.187E-08	0.140E-08
SM	0.000E+00	0.564E-08	0.510E-08	0.496E-08	0.426E-08	0.357E-08
EU	0.000E+00	0.380E-02	0.379E-02	0.379E-02	0.373E-02	0.366E-02
GD	0.137E-14	0.248E+00	0.196E+00	0.189E+00	0.132E+00	0.862E-01
TB	0.000E+00	0.696E-01	0.695E-01	0.694E-01	0.686E-01	0.677E-01
DY	0.000E+00	0.288E-03	0.202E-03	0.150E-03	0.800E-05	0.356E-06
HO	0.000E+00	0.156E-04	0.152E-04	0.148E-04	0.115E-04	0.860E-05
ER	0.000E+00	0.141E-07	0.347E-10	0.346E-10	0.335E-10	0.323E-10
TA	0.000E+00	0.240E-03	0.239E-03	0.238E-03	0.232E-03	0.225E-03
W	0.000E+00	0.757E+00	0.735E+00	0.714E+00	0.536E+00	0.380E+00

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
RE	0.000E+00	0.118E+00	0.994E-01	0.941E-01	0.642E-01	0.413E-01
OS	0.000E+00	0.144E-06	0.139E-06	0.138E-06	0.126E-06	0.117E-06
IR	0.000E+00	0.442E-07	0.441E-07	0.441E-07	0.439E-07	0.436E-07
PB	0.266E-17	0.312E-06	0.253E-06	0.205E-06	0.251E-07	0.202E-08
BI	0.000E+00	0.674E-04	0.670E-04	0.666E-04	0.629E-04	0.587E-04
PO	0.000E+00	0.809E-03	0.809E-03	0.809E-03	0.809E-03	0.809E-03
PO	0.000E+00	0.401E-05	0.401E-05	0.401E-05	0.401E-05	0.410E-05
TH	0.000E+00	0.151E-03	0.150E-03	0.150E-03	0.146E-03	0.142E-03
PA	0.000E+00	0.176E-02	0.175E-02	0.175E-02	0.173E-02	0.172E-02
U	0.124E-01	0.454E+05	0.797E+04	0.159E+04	0.260E+03	0.247E+03
NP	0.000E+00	0.408E+05	0.404E+05	0.399E+05	0.353E+05	0.305E+05
PU	0.971E+02	0.264E+03	0.246E+03	0.230E+03	0.150E+03	0.129E+03
AM	0.000E+00	0.150E+03	0.958E+02	0.823E+02	0.533E+02	0.340E+02
CM	0.000E+00	0.892E+03	0.892E+03	0.892E+03	0.893E+03	0.893E+03
H	0.000E+00	0.137E-01	0.137E-01	0.137E-01	0.137E-01	0.137E-01
CO	0.000E+00	0.981E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.182E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.118E+02	0.106E-09	0.940E-13	0.568E-13	0.497E-13
ZN	0.000E+00	0.587E+02	0.130E+00	0.128E+00	0.110E+00	0.921E-01
GA	0.000E+00	0.344E+03	0.232E+01	0.219E+01	0.172E+01	0.147E+01
GE	0.000E+00	0.120E+04	0.225E+02	0.170E+02	0.499E+01	0.236E+01
AS	0.000E+00	0.495E+04	0.964E+02	0.791E+02	0.558E+01	0.270E+01
SE	0.000E+00	0.101E+05	0.136E+03	0.217E+02	0.947E-02	0.686E-02
BR	0.000E+00	0.260E+05	0.996E+03	0.374E+03	0.421E+02	0.285E+02
KR	0.000E+00	0.378E+05	0.731E+04	0.530E+04	0.399E+03	0.330E+02
RB	0.000E+00	0.843E+05	0.676E+04	0.475E+04	0.412E+03	0.247E+02
SR	0.000E+00	0.894E+05	0.146E+05	0.126E+05	0.505E+04	0.311E+04
Y	0.000E+00	0.156E+06	0.254E+05	0.216E+05	0.102E+05	0.539E+04
ZR	0.000E+00	0.877E+05	0.158E+05	0.155E+05	0.129E+05	0.108E+05
NB	0.000E+00	0.205E+06	0.249E+05	0.242E+05	0.186E+05	0.140E+05
MO	0.000E+00	0.102E+06	0.721E+04	0.591E+04	0.526E+04	0.464E+04
TC	0.000E+00	0.152E+06	0.818E+04	0.201E+04	0.130E+04	0.116E+04
RU	0.000E+00	0.381E+05	0.168E+05	0.154E+05	0.872E+04	0.716E+04
RH	0.000E+00	0.408E+05	0.116E+05	0.107E+05	0.994E+04	0.952E+04
PD	0.000E+00	0.400E+04	0.141E+04	0.128E+04	0.756E+03	0.410E+03
AG	0.000E+00	0.521E+04	0.136E+04	0.130E+04	0.937E+03	0.672E+03
CD	0.000E+00	0.204E+04	0.211E+03	0.173E+03	0.756E+02	0.592E+02
IN	0.000E+00	0.844E+04	0.330E+03	0.212E+03	0.538E+02	0.355E+02
SN	0.000E+00	0.184E+05	0.162E+04	0.108E+04	0.173E+03	0.139E+03
SB	0.000E+00	0.718E+05	0.109E+05	0.666E+04	0.181E+04	0.103E+04
TE	0.000E+00	0.687E+05	0.198E+05	0.116E+05	0.502E+04	0.413E+04
I	0.000E+00	0.169E+06	0.898E+05	0.751E+05	0.421E+05	0.322E+05
XE	0.000E+00	0.767E+05	0.742E+04	0.665E+04	0.583E+04	0.419E+04
CS	0.000E+00	0.138E+06	0.174E+05	0.601E+04	0.134E+04	0.132E+04
BA	0.000E+00	0.826E+05	0.136E+05	0.921E+04	0.496E+04	0.481E+04
LA	0.000E+00	0.145E+06	0.610E+05	0.506E+05	0.300E+05	0.285E+05
CE	0.000E+00	0.356E+05	0.882E+04	0.860E+04	0.752E+04	0.648E+04
PR	0.000E+00	0.525E+05	0.170E+05	0.129E+05	0.986E+04	0.907E+04
ND	0.000E+00	0.845E+04	0.309E+04	0.252E+04	0.153E+04	0.146E+04
PM	0.000E+00	0.950E+04	0.442E+04	0.429E+04	0.386E+04	0.344E+04
SM	0.000E+00	0.154E+04	0.885E+03	0.810E+03	0.653E+03	0.530E+03
EU	0.000E+00	0.152E+04	0.132E+04	0.125E+04	0.112E+04	0.106E+04
GD	0.000E+00	0.508E+02	0.286E+02	0.274E+02	0.189E+02	0.121E+02
TB	0.000E+00	0.268E+02	0.134E+02	0.122E+02	0.118E+02	0.115E+02
DY	0.000E+00	0.212E+01	0.151E+01	0.114E+01	0.113E+00	0.525E-01
HO	0.000E+00	0.510E+00	0.503E+00	0.496E+00	0.432E+00	0.369E+00
ER	0.000E+00	0.204E-02	0.296E-03	0.295E-03	0.286E-03	0.276E-03
TM	0.000E+00	0.206E-04	0.206E-04	0.206E-04	0.205E-04	0.204E-04

CYCLE 2: MOX

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.626E-02	0.626E-02	0.626E-02	0.626E-02	0.626E-02
HE	0.000E+00	0.517E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.434E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.677E-03	0.271E-08	0.271E-08	0.271E-08	0.271E-08
B	0.000E+00	0.865E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.867E+00	0.929E-04	0.929E-04	0.929E-04	0.929E-04
N	0.000E+00	0.138E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.117E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.126E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.254E-01	0.201E-30	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.485E+01	0.445E+01	0.425E+01	0.268E+01	0.154E+01
MG	0.000E+00	0.368E-01	0.454E-03	0.559E-05	0.116E-10	0.776E-11
AL	0.000E+00	0.824E+00	0.256E-05	0.436E-08	0.228E-10	0.154E-10
SI	0.000E+00	0.247E+00	0.190E+00	0.146E+00	0.103E-01	0.433E-03
P	0.000E+00	0.512E+00	0.508E+00	0.507E+00	0.497E+00	0.485E+00
S	0.000E+00	0.182E-01	0.177E-01	0.177E-01	0.176E-01	0.175E-01
CL	0.000E+00	0.772E-01	0.252E-01	0.825E-02	0.893E-05	0.882E-05
AR	0.000E+00	0.946E-05	0.917E-05	0.898E-05	0.850E-05	0.841E-05
K	0.000E+00	0.146E-03	0.134E-03	0.126E-03	0.723E-04	0.373E-04
CA	0.000E+00	0.897E-03	0.120E-03	0.113E-03	0.112E-03	0.112E-03
SC	0.000E+00	0.122E-02	0.104E-02	0.936E-03	0.806E-03	0.773E-03
TI	0.000E+00	0.471E-03	0.344E-06	0.252E-09	0.000E+00	0.000E+00
V	0.145E-16	0.109E+01	0.166E-04	0.253E-09	0.132E-16	0.132E-16
CR	0.000E+00	0.439E-02	0.276E-02	0.276E-02	0.273E-02	0.270E-02
MN	0.000E+00	0.246E+01	0.188E+01	0.144E+01	0.107E+00	0.133E-01
FE	0.000E+00	0.324E-02	0.323E-02	0.323E-02	0.321E-02	0.319E-02
CO	0.000E+00	0.128E+01	0.122E+01	0.122E+01	0.122E+01	0.122E+01
NI	0.000E+00	0.111E-01	0.844E-02	0.643E-02	0.494E-03	0.104E-03
CU	0.000E+00	0.545E-01	0.279E-01	0.264E-01	0.153E-01	0.795E-02
ZN	0.000E+00	0.440E+00	0.370E+00	0.337E+00	0.298E+00	0.292E+00
GA	0.000E+00	0.308E-02	0.458E-03	0.920E-04	0.202E-04	0.112E-04
GE	0.000E+00	0.245E-06	0.859E-07	0.857E-07	0.836E-07	0.812E-07
SR	0.000E+00	0.656E-09	0.654E-09	0.652E-09	0.637E-09	0.626E-09
Y	0.000E+00	0.518E-05	0.513E-05	0.509E-05	0.465E-05	0.418E-05
ZR	0.000E+00	0.236E-04	0.235E-04	0.234E-04	0.226E-04	0.218E-04
NB	0.000E+00	0.187E-02	0.185E-02	0.184E-02	0.176E-02	0.168E-02
MO	0.000E+00	0.572E+00	0.473E+00	0.463E+00	0.416E+00	0.367E+00
TC	0.000E+00	0.768E-01	0.909E-02	0.885E-03	0.625E-07	0.625E-07
RU	0.000E+00	0.547E-05	0.546E-05	0.546E-05	0.542E-05	0.537E-05
RH	0.000E+00	0.772E-06	0.301E-10	0.272E-10	0.202E-10	0.160E-10
PD	0.000E+00	0.144E-03	0.131E-03	0.123E-03	0.731E-04	0.393E-04
AG	0.000E+00	0.327E+00	0.303E-01	0.303E-01	0.303E-01	0.302E-01
CD	0.000E+00	0.133E+01	0.130E+01	0.127E+01	0.109E+01	0.940E+00
IN	0.171E-13	0.430E+01	0.130E+01	0.681E+00	0.976E-01	0.895E-01
SN	0.000E+00	0.939E-01	0.822E-01	0.817E-01	0.791E-01	0.764E-01
SB	0.000E+00	0.978E-02	0.972E-02	0.968E-02	0.937E-02	0.903E-02
TE	0.000E+00	0.321E-03	0.321E-03	0.321E-03	0.321E-03	0.321E-03
I	0.000E+00	0.941E-07	0.178E-07	0.337E-08	0.116E-12	0.588E-13
PM	0.000E+00	0.883E-08	0.847E-08	0.827E-08	0.648E-08	0.483E-08
SM	0.000E+00	0.144E-07	0.134E-07	0.131E-07	0.113E-07	0.941E-08
EU	0.000E+00	0.224E-01	0.224E-01	0.224E-01	0.220E-01	0.215E-01
GD	0.137E-14	0.295E+00	0.234E+00	0.225E+00	0.156E+00	0.101E+00
TB	0.000E+00	0.162E+00	0.162E+00	0.162E+00	0.161E+00	0.159E+00
DY	0.000E+00	0.403E-02	0.282E-02	0.210E-02	0.112E-03	0.530E-05
HO	0.000E+00	0.477E-03	0.465E-03	0.453E-03	0.352E-03	0.260E-03
ER	0.000E+00	0.101E-05	0.105E-07	0.104E-07	0.101E-07	0.976E-08
TA	0.000E+00	0.746E-03	0.744E-03	0.742E-03	0.720E-03	0.696E-03

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
W	0.000E+00	0.746E+00	0.725E+00	0.704E+00	0.528E+00	0.375E+00
RE	0.000E+00	0.258E+00	0.216E+00	0.205E+00	0.139E+00	0.889E-01
OS	0.000E+00	0.345E-05	0.338E-05	0.335E-05	0.309E-05	0.288E-05
IR	0.000E+00	0.269E-05	0.269E-05	0.269E-05	0.266E-05	0.264E-05
PB	0.266E-17	0.367E-06	0.298E-06	0.241E-06	0.295E-07	0.237E-08
BI	0.000E+00	0.793E-04	0.789E-04	0.784E-04	0.740E-04	0.691E-04
PO	0.000E+00	0.100E-02	0.100E-02	0.100E-02	0.100E-02	0.100E-02
TL	0.000E+00	0.473E-05	0.473E-05	0.486E-05	0.473E-05	0.496E-05
BI	0.000E+00	0.952E-05	0.952E-05	0.952E-05	0.952E-05	0.997E-05
PO	0.000E+00	0.419E-04	0.419E-04	0.419E-04	0.419E-04	0.428E-04
RN	0.000E+00	0.212E-04	0.212E-04	0.212E-04	0.212E-04	0.212E-04
RA	0.000E+00	0.192E-04	0.192E-04	0.192E-04	0.192E-04	0.192E-04
TH	0.000E+00	0.184E-03	0.181E-03	0.180E-03	0.172E-03	0.165E-03
PA	0.000E+00	0.204E-02	0.202E-02	0.202E-02	0.196E-02	0.191E-02
U	0.124E-01	0.540E+05	0.952E+04	0.192E+04	0.346E+03	0.329E+03
NP	0.000E+00	0.487E+05	0.483E+05	0.477E+05	0.421E+05	0.364E+05
PU	0.971E+02	0.884E+03	0.790E+03	0.708E+03	0.298E+03	0.189E+03
AM	0.000E+00	0.922E+03	0.479E+03	0.377E+03	0.232E+03	0.143E+03
CM	0.000E+00	0.585E+04	0.586E+04	0.586E+04	0.586E+04	0.585E+04
BK	0.000E+00	0.369E-04	0.301E-04	0.246E-04	0.448E-05	0.203E-05
H	0.000E+00	0.264E-01	0.264E-01	0.264E-01	0.264E-01	0.264E-01
CO	0.000E+00	0.122E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.228E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.141E+02	0.117E-09	0.116E-12	0.738E-13	0.645E-13
ZN	0.000E+00	0.678E+02	0.140E+00	0.138E+00	0.119E+00	0.997E-01
GA	0.000E+00	0.386E+03	0.251E+01	0.237E+01	0.186E+01	0.159E+01
GE	0.000E+00	0.133E+04	0.212E+02	0.160E+02	0.464E+01	0.219E+01
AS	0.000E+00	0.536E+04	0.915E+02	0.751E+02	0.543E+01	0.266E+01
SE	0.000E+00	0.107E+05	0.132E+03	0.209E+02	0.891E-02	0.654E-02
BR	0.000E+00	0.272E+05	0.103E+04	0.407E+03	0.708E+02	0.512E+02
KR	0.000E+00	0.396E+05	0.723E+04	0.524E+04	0.397E+03	0.371E+02
RB	0.000E+00	0.872E+05	0.666E+04	0.469E+04	0.409E+03	0.274E+02
SR	0.000E+00	0.930E+05	0.144E+05	0.124E+05	0.497E+04	0.307E+04
Y	0.000E+00	0.162E+06	0.251E+05	0.214E+05	0.102E+05	0.542E+04
ZR	0.000E+00	0.941E+05	0.158E+05	0.155E+05	0.128E+05	0.107E+05
NB	0.000E+00	0.216E+06	0.249E+05	0.242E+05	0.186E+05	0.139E+05
MO	0.000E+00	0.110E+06	0.746E+04	0.614E+04	0.546E+04	0.481E+04
TC	0.000E+00	0.166E+06	0.850E+04	0.208E+04	0.134E+04	0.121E+04
RU	0.000E+00	0.415E+05	0.174E+05	0.159E+05	0.884E+04	0.722E+04
RH	0.000E+00	0.517E+05	0.149E+05	0.139E+05	0.131E+05	0.126E+05
PD	0.000E+00	0.481E+04	0.180E+04	0.163E+04	0.965E+03	0.524E+03
AG	0.000E+00	0.741E+04	0.177E+04	0.169E+04	0.125E+04	0.925E+03
CD	0.000E+00	0.234E+04	0.238E+03	0.196E+03	0.893E+02	0.705E+02
IN	0.000E+00	0.951E+04	0.385E+03	0.245E+03	0.628E+02	0.423E+02
SN	0.000E+00	0.198E+05	0.162E+04	0.108E+04	0.171E+03	0.137E+03
SB	0.000E+00	0.762E+05	0.107E+05	0.647E+04	0.179E+04	0.105E+04
TE	0.000E+00	0.747E+05	0.201E+05	0.117E+05	0.494E+04	0.408E+04
I	0.000E+00	0.179E+06	0.928E+05	0.775E+05	0.428E+05	0.326E+05
XE	0.000E+00	0.821E+05	0.730E+04	0.652E+04	0.584E+04	0.423E+04
CS	0.000E+00	0.148E+06	0.200E+05	0.810E+04	0.318E+04	0.315E+04
BA	0.000E+00	0.858E+05	0.142E+05	0.975E+04	0.536E+04	0.520E+04
LA	0.000E+00	0.150E+06	0.623E+05	0.518E+05	0.310E+05	0.294E+05
CE	0.000E+00	0.372E+05	0.907E+04	0.884E+04	0.774E+04	0.669E+04
PR	0.000E+00	0.565E+05	0.191E+05	0.149E+05	0.117E+05	0.108E+05
ND	0.000E+00	0.906E+04	0.325E+04	0.264E+04	0.158E+04	0.152E+04
PM	0.000E+00	0.109E+05	0.538E+04	0.524E+04	0.474E+04	0.424E+04
SM	0.000E+00	0.212E+04	0.138E+04	0.129E+04	0.106E+04	0.868E+03
EU	0.000E+00	0.294E+04	0.271E+04	0.263E+04	0.244E+04	0.236E+04
GD	0.000E+00	0.644E+02	0.394E+02	0.378E+02	0.260E+02	0.167E+02

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
TB	0.000E+00	0.422E+02	0.284E+02	0.271E+02	0.265E+02	0.262E+02
DY	0.000E+00	0.548E+01	0.386E+01	0.289E+01	0.211E+00	0.613E-01
HO	0.000E+00	0.145E+01	0.142E+01	0.139E+01	0.113E+01	0.885E+00
ER	0.000E+00	0.864E-02	0.120E-02	0.120E-02	0.116E-02	0.112E-02
TM	0.000E+00	0.225E-03	0.225E-03	0.225E-03	0.224E-03	0.223E-03

RADIOACTIVITY (Curies)

CYCLE 1: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.167E+03	0.162E+03	0.162E+03	0.162E+03	0.162E+03
HE	0.000E+00	0.283E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.184E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.185E+01	0.399E-06	0.399E-06	0.399E-06	0.399E-06
B	0.000E+00	0.130E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.289E+02	0.228E+00	0.228E+00	0.228E+00	0.228E+00
N	0.000E+00	0.180E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.333E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.316E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.149E+01	0.119E-28	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.313E+03	0.211E+03	0.202E+03	0.127E+03	0.730E+02
MG	0.000E+00	0.227E+01	0.280E-01	0.345E-03	0.103E-08	0.690E-09
AL	0.000E+00	0.558E+02	0.104E-03	0.176E-06	0.103E-08	0.691E-09
SI	0.000E+00	0.397E+02	0.304E+02	0.234E+02	0.166E+01	0.696E-01
P	0.000E+00	0.688E+02	0.686E+02	0.685E+02	0.671E+02	0.655E+02
S	0.000E+00	0.211E+02	0.211E+02	0.211E+02	0.210E+02	0.210E+02
CL	0.000E+00	0.574E+01	0.186E+01	0.611E+00	0.465E-02	0.464E-02
AR	0.000E+00	0.402E+00	0.401E+00	0.401E+00	0.398E+00	0.394E+00
K	0.000E+00	0.794E-02	0.744E-02	0.703E-02	0.405E-02	0.210E-02
CA	0.000E+00	0.344E+00	0.309E+00	0.309E+00	0.308E+00	0.308E+00
SC	0.000E+00	0.109E+00	0.904E-01	0.789E-01	0.648E-01	0.607E-01
TI	0.000E+00	0.765E-01	0.560E-04	0.409E-07	0.000E+00	0.000E+00
V	0.132E-14	0.991E+02	0.151E-02	0.231E-07	0.123E-14	0.123E-14
CR	0.000E+00	0.181E+02	0.178E+02	0.178E+02	0.176E+02	0.174E+02
MN	0.000E+00	0.187E+03	0.143E+03	0.110E+03	0.827E+01	0.117E+01
FE	0.000E+00	0.523E+01	0.523E+01	0.523E+01	0.522E+01	0.522E+01
CO	0.000E+00	0.260E+03	0.102E+03	0.983E+02	0.976E+02	0.975E+02
NI	0.000E+00	0.273E+01	0.223E+01	0.186E+01	0.750E+00	0.678E+00
CU	0.000E+00	0.242E+02	0.188E+02	0.178E+02	0.103E+02	0.535E+01
ZN	0.000E+00	0.166E+03	0.128E+03	0.109E+03	0.884E+02	0.856E+02
GA	0.000E+00	0.436E+00	0.619E-01	0.973E-02	0.791E-03	0.438E-03
GE	0.000E+00	0.730E-03	0.674E-03	0.672E-03	0.656E-03	0.637E-03
Y	0.000E+00	0.536E-03	0.531E-03	0.527E-03	0.482E-03	0.433E-03
ZR	0.000E+00	0.238E-02	0.238E-02	0.237E-02	0.230E-02	0.224E-02
NB	0.000E+00	0.117E+00	0.116E+00	0.115E+00	0.110E+00	0.106E+00
MO	0.000E+00	0.164E+03	0.155E+03	0.153E+03	0.138E+03	0.122E+03
TC	0.000E+00	0.956E+01	0.163E+01	0.159E+00	0.771E-04	0.772E-04
RU	0.000E+00	0.320E-03	0.320E-03	0.320E-03	0.318E-03	0.315E-03
RH	0.000E+00	0.780E-04	0.235E-08	0.223E-08	0.170E-08	0.132E-08
PD	0.000E+00	0.263E-01	0.241E-01	0.228E-01	0.136E-01	0.731E-02
AG	0.000E+00	0.672E+02	0.334E+01	0.333E+01	0.331E+01	0.329E+01
CD	0.000E+00	0.337E+03	0.330E+03	0.324E+03	0.282E+03	0.244E+03
IN	0.119E-10	0.192E+04	0.405E+03	0.210E+03	0.320E+02	0.301E+02
SN	0.000E+00	0.367E+02	0.348E+02	0.346E+02	0.333E+02	0.321E+02
SB	0.000E+00	0.122E+01	0.121E+01	0.121E+01	0.119E+01	0.117E+01
TE	0.000E+00	0.190E+00	0.190E+00	0.190E+00	0.190E+00	0.191E+00
I	0.000E+00	0.176E-05	0.333E-06	0.630E-07	0.261E-12	0.131E-12
PM	0.000E+00	0.301E-06	0.251E-06	0.213E-06	0.805E-07	0.536E-07
SM	0.000E+00	0.141E-05	0.131E-05	0.127E-05	0.110E-05	0.918E-06
EU	0.000E+00	0.987E-01	0.986E-01	0.984E-01	0.969E-01	0.951E-01
GD	0.105E-12	0.662E+02	0.577E+02	0.556E+02	0.387E+02	0.252E+02
TB	0.000E+00	0.140E+02	0.139E+02	0.139E+02	0.136E+02	0.132E+02
DY	0.000E+00	0.154E+00	0.703E-01	0.524E-01	0.296E-02	0.285E-03
HO	0.000E+00	0.498E-02	0.486E-02	0.474E-02	0.371E-02	0.278E-02

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
ER	0.000E+00	0.206E-04	0.129E-07	0.129E-07	0.125E-07	0.120E-07
TA	0.000E+00	0.363E-01	0.361E-01	0.360E-01	0.346E-01	0.330E-01
W	0.000E+00	0.184E+03	0.179E+03	0.174E+03	0.132E+03	0.955E+02
RE	0.000E+00	0.512E+02	0.293E+02	0.260E+02	0.179E+02	0.118E+02
OS	0.000E+00	0.300E-03	0.293E-03	0.287E-03	0.239E-03	0.206E-03
IR	0.000E+00	0.188E-04	0.187E-04	0.187E-04	0.186E-04	0.184E-04
PB	0.173E-15	0.425E-03	0.344E-03	0.279E-03	0.342E-04	0.275E-05
BI	0.000E+00	0.339E-01	0.337E-01	0.335E-01	0.316E-01	0.295E-01
PO	0.000E+00	0.297E-01	0.297E-01	0.297E-01	0.297E-01	0.297E-01
TH	0.000E+00	0.923E+00	0.905E+00	0.890E+00	0.766E+00	0.656E+00
PA	0.000E+00	0.673E+00	0.666E+00	0.661E+00	0.620E+00	0.581E+00
U	0.281E+01	0.176E+08	0.357E+07	0.117E+07	0.649E+06	0.616E+06
NP	0.000E+00	0.170E+08	0.169E+08	0.167E+08	0.148E+08	0.128E+08
PU	0.000E+00	0.114E+06	0.108E+06	0.102E+06	0.730E+05	0.653E+05
AM	0.000E+00	0.232E+05	0.171E+05	0.153E+05	0.972E+04	0.577E+04
CM	0.000E+00	0.500E+04	0.500E+04	0.501E+04	0.501E+04	0.502E+04
H	0.000E+00	0.304E+03	0.304E+03	0.304E+03	0.304E+03	0.304E+03
CO	0.000E+00	0.188E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.711E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.495E+03	0.335E-07	0.149E-09	0.124E-09	0.109E-09
ZN	0.000E+00	0.488E+04	0.590E+02	0.581E+02	0.501E+02	0.419E+02
GA	0.000E+00	0.245E+05	0.175E+03	0.158E+03	0.812E+02	0.564E+02
GE	0.000E+00	0.155E+06	0.545E+04	0.373E+04	0.564E+03	0.253E+03
AS	0.000E+00	0.462E+06	0.915E+04	0.789E+04	0.276E+04	0.217E+04
SE	0.000E+00	0.138E+07	0.174E+05	0.306E+04	0.740E+01	0.561E+01
BR	0.000E+00	0.305E+07	0.192E+06	0.109E+06	0.696E+04	0.191E+04
KR	0.000E+00	0.543E+07	0.146E+07	0.111E+07	0.118E+06	0.172E+05
RB	0.000E+00	0.751E+07	0.843E+06	0.601E+06	0.528E+05	0.377E+04
SR	0.000E+00	0.107E+08	0.376E+07	0.340E+07	0.191E+07	0.149E+07
Y	0.000E+00	0.142E+08	0.572E+07	0.527E+07	0.309E+07	0.209E+07
ZR	0.000E+00	0.106E+08	0.356E+07	0.349E+07	0.294E+07	0.251E+07
NB	0.000E+00	0.153E+08	0.526E+07	0.514E+07	0.408E+07	0.319E+07
MO	0.000E+00	0.864E+07	0.201E+07	0.186E+07	0.167E+07	0.147E+07
TC	0.000E+00	0.941E+07	0.219E+07	0.170E+07	0.157E+07	0.141E+07
RU	0.000E+00	0.348E+07	0.238E+07	0.227E+07	0.177E+07	0.165E+07
RH	0.000E+00	0.422E+07	0.258E+07	0.248E+07	0.223E+07	0.205E+07
PD	0.000E+00	0.458E+06	0.221E+06	0.204E+06	0.124E+06	0.688E+05
AG	0.000E+00	0.502E+06	0.290E+06	0.270E+06	0.178E+06	0.117E+06
CD	0.000E+00	0.144E+06	0.343E+05	0.281E+05	0.156E+05	0.129E+05
IN	0.000E+00	0.324E+06	0.448E+05	0.366E+05	0.168E+05	0.125E+05
SN	0.000E+00	0.143E+07	0.155E+06	0.998E+05	0.267E+05	0.223E+05
SB	0.000E+00	0.370E+07	0.643E+06	0.416E+06	0.147E+06	0.984E+05
TE	0.000E+00	0.838E+07	0.358E+07	0.255E+07	0.164E+07	0.143E+07
I	0.000E+00	0.123E+08	0.791E+07	0.698E+07	0.428E+07	0.324E+07
XE	0.000E+00	0.966E+07	0.327E+07	0.322E+07	0.310E+07	0.263E+07
CS	0.000E+00	0.836E+07	0.105E+07	0.416E+06	0.148E+06	0.146E+06
BA	0.000E+00	0.107E+08	0.342E+07	0.271E+07	0.186E+07	0.181E+07
LA	0.000E+00	0.107E+08	0.476E+07	0.399E+07	0.210E+07	0.187E+07
CE	0.000E+00	0.815E+07	0.460E+07	0.452E+07	0.420E+07	0.389E+07
PR	0.000E+00	0.687E+07	0.419E+07	0.380E+07	0.310E+07	0.286E+07
ND	0.000E+00	0.148E+07	0.952E+06	0.857E+06	0.671E+06	0.647E+06
PM	0.000E+00	0.141E+07	0.110E+07	0.109E+07	0.979E+06	0.864E+06
SM	0.000E+00	0.324E+06	0.277E+06	0.267E+06	0.223E+06	0.184E+06
EU	0.000E+00	0.887E+05	0.812E+05	0.783E+05	0.701E+05	0.656E+05
GD	0.000E+00	0.494E+04	0.355E+04	0.341E+04	0.235E+04	0.150E+04
TB	0.000E+00	0.167E+04	0.110E+04	0.105E+04	0.100E+04	0.965E+03
DY	0.000E+00	0.239E+03	0.123E+03	0.967E+02	0.230E+02	0.173E+02
HO	0.000E+00	0.360E+02	0.356E+02	0.353E+02	0.318E+02	0.281E+02
ER	0.000E+00	0.502E+00	0.354E-01	0.353E-01	0.342E-01	0.330E-01

CYCLE 2: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.255E+03	0.249E+03	0.249E+03	0.249E+03	0.249E+03
HE	0.000E+00	0.254E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.238E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.241E+01	0.147E-05	0.147E-05	0.147E-05	0.147E-05
B	0.000E+00	0.169E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.375E+02	0.510E+00	0.510E+00	0.510E+00	0.510E+00
N	0.000E+00	0.232E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.429E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.407E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.192E+01	0.152E-28	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.403E+03	0.272E+03	0.260E+03	0.164E+03	0.940E+02
MG	0.000E+00	0.292E+01	0.360E-01	0.444E-03	0.170E-08	0.114E-08
AL	0.000E+00	0.718E+02	0.134E-03	0.229E-06	0.171E-08	0.115E-08
SI	0.000E+00	0.511E+02	0.392E+02	0.301E+02	0.214E+01	0.896E-01
P	0.000E+00	0.886E+02	0.884E+02	0.882E+02	0.865E+02	0.844E+02
S	0.000E+00	0.260E+02	0.260E+02	0.260E+02	0.259E+02	0.258E+02
CL	0.000E+00	0.741E+01	0.240E+01	0.793E+00	0.102E-01	0.101E-01
AR	0.000E+00	0.517E+00	0.516E+00	0.516E+00	0.512E+00	0.507E+00
K	0.000E+00	0.104E-01	0.980E-02	0.926E-02	0.533E-02	0.276E-02
CA	0.000E+00	0.457E+00	0.413E+00	0.412E+00	0.411E+00	0.410E+00
SC	0.000E+00	0.154E+00	0.126E+00	0.112E+00	0.931E-01	0.879E-01
TI	0.000E+00	0.988E-01	0.723E-04	0.529E-07	0.000E+00	0.000E+00
V	0.132E-14	0.127E+03	0.194E-02	0.296E-07	0.113E-14	0.113E-14
CR	0.000E+00	0.229E+02	0.225E+02	0.225E+02	0.223E+02	0.220E+02
MN	0.000E+00	0.237E+03	0.181E+03	0.139E+03	0.107E+02	0.169E+01
FE	0.000E+00	0.957E+01	0.957E+01	0.957E+01	0.956E+01	0.955E+01
CO	0.000E+00	0.367E+03	0.181E+03	0.177E+03	0.175E+03	0.175E+03
NI	0.000E+00	0.415E+01	0.351E+01	0.302E+01	0.158E+01	0.148E+01
CU	0.000E+00	0.314E+02	0.241E+02	0.228E+02	0.132E+02	0.686E+01
ZN	0.000E+00	0.226E+03	0.176E+03	0.152E+03	0.125E+03	0.122E+03
GA	0.000E+00	0.126E+01	0.178E+00	0.281E-01	0.228E-02	0.127E-02
GE	0.000E+00	0.472E-02	0.435E-02	0.434E-02	0.424E-02	0.412E-02
Y	0.000E+00	0.692E-03	0.686E-03	0.680E-03	0.622E-03	0.559E-03
ZR	0.000E+00	0.303E-02	0.302E-02	0.301E-02	0.293E-02	0.284E-02
NB	0.000E+00	0.151E+00	0.149E+00	0.148E+00	0.143E+00	0.137E+00
MO	0.000E+00	0.208E+03	0.197E+03	0.195E+03	0.175E+03	0.154E+03
TC	0.000E+00	0.152E+02	0.209E+01	0.204E+00	0.161E-03	0.161E-03
RU	0.000E+00	0.225E-02	0.225E-02	0.225E-02	0.223E-02	0.222E-02
RH	0.000E+00	0.137E-03	0.314E-07	0.297E-07	0.225E-07	0.175E-07
PD	0.000E+00	0.694E-01	0.638E-01	0.604E-01	0.360E-01	0.194E-01
AG	0.000E+00	0.549E+02	0.352E+01	0.352E+01	0.348E+01	0.345E+01
CD	0.000E+00	0.432E+03	0.423E+03	0.415E+03	0.361E+03	0.313E+03
IN	0.119E-10	0.304E+03	0.947E+02	0.692E+02	0.352E+02	0.330E+02
SN	0.000E+00	0.511E+02	0.486E+02	0.484E+02	0.467E+02	0.450E+02
SB	0.000E+00	0.252E+01	0.251E+01	0.250E+01	0.244E+01	0.238E+01
TE	0.000E+00	0.394E+00	0.394E+00	0.394E+00	0.394E+00	0.394E+00
I	0.000E+00	0.263E-04	0.498E-05	0.941E-06	0.178E-10	0.908E-11
PM	0.000E+00	0.106E-05	0.914E-06	0.805E-06	0.395E-06	0.277E-06
SM	0.000E+00	0.127E-05	0.113E-05	0.109E-05	0.940E-06	0.786E-06
EU	0.000E+00	0.734E+00	0.733E+00	0.732E+00	0.719E+00	0.705E+00
GD	0.105E-12	0.878E+02	0.768E+02	0.741E+02	0.515E+02	0.335E+02
TB	0.000E+00	0.304E+02	0.303E+02	0.302E+02	0.297E+02	0.290E+02
DY	0.000E+00	0.236E+01	0.108E+01	0.807E+00	0.465E-01	0.528E-02
HO	0.000E+00	0.176E+00	0.172E+00	0.168E+00	0.131E+00	0.968E-01
ER	0.000E+00	0.177E-02	0.528E-05	0.526E-05	0.510E-05	0.492E-05
TM	0.000E+00	0.282E-06	0.235E-06	0.235E-06	0.235E-06	0.234E-06
TA	0.000E+00	0.120E+00	0.120E+00	0.119E+00	0.115E+00	0.109E+00

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
W	0.000E+00	0.195E+03	0.190E+03	0.184E+03	0.141E+03	0.102E+03
RE	0.000E+00	0.122E+03	0.699E+02	0.621E+02	0.427E+02	0.280E+02
OS	0.000E+00	0.836E-02	0.818E-02	0.800E-02	0.668E-02	0.574E-02
IR	0.000E+00	0.123E-02	0.122E-02	0.122E-02	0.120E-02	0.118E-02
PT	0.000E+00	0.236E-05	0.234E-05	0.233E-05	0.218E-05	0.201E-05
PB	0.173E-15	0.548E-03	0.444E-03	0.360E-03	0.440E-04	0.354E-05
BI	0.000E+00	0.437E-01	0.434E-01	0.432E-01	0.408E-01	0.380E-01
PO	0.000E+00	0.389E-01	0.389E-01	0.389E-01	0.389E-01	0.389E-01
PB	0.000E+00	0.259E-02	0.259E-02	0.259E-02	0.259E-02	0.259E-02
BI	0.000E+00	0.259E-02	0.259E-02	0.259E-02	0.259E-02	0.272E-02
PO	0.000E+00	0.425E-02	0.426E-02	0.426E-02	0.425E-02	0.433E-02
RN	0.000E+00	0.259E-02	0.259E-02	0.259E-02	0.259E-02	0.259E-02
RA	0.000E+00	0.259E-02	0.259E-02	0.259E-02	0.259E-02	0.259E-02
TH	0.000E+00	0.152E+01	0.147E+01	0.144E+01	0.117E+01	0.943E+00
PA	0.000E+00	0.155E+01	0.153E+01	0.151E+01	0.136E+01	0.122E+01
U	0.281E+01	0.227E+08	0.493E+07	0.189E+07	0.121E+07	0.115E+07
NP	0.000E+00	0.220E+08	0.218E+08	0.216E+08	0.191E+08	0.164E+08
PU	0.000E+00	0.487E+06	0.442E+06	0.404E+06	0.208E+06	0.156E+06
AM	0.000E+00	0.194E+06	0.100E+06	0.788E+05	0.475E+05	0.279E+05
CM	0.000E+00	0.448E+05	0.448E+05	0.448E+05	0.448E+05	0.448E+05
BK	0.000E+00	0.440E-02	0.376E-02	0.324E-02	0.134E-02	0.110E-02
H	0.000E+00	0.621E+03	0.621E+03	0.621E+03	0.621E+03	0.620E+03
CO	0.000E+00	0.230E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.826E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.507E+03	0.257E-07	0.145E-09	0.123E-09	0.107E-09
ZN	0.000E+00	0.445E+04	0.721E+02	0.710E+02	0.612E+02	0.512E+02
GA	0.000E+00	0.213E+05	0.202E+03	0.183E+03	0.968E+02	0.685E+02
GE	0.000E+00	0.132E+06	0.531E+04	0.363E+04	0.539E+03	0.240E+03
AS	0.000E+00	0.385E+06	0.881E+04	0.758E+04	0.259E+04	0.204E+04
SE	0.000E+00	0.113E+07	0.157E+05	0.273E+04	0.708E+01	0.547E+01
BR	0.000E+00	0.242E+07	0.170E+06	0.987E+05	0.926E+04	0.418E+04
KR	0.000E+00	0.436E+07	0.120E+07	0.913E+06	0.103E+06	0.201E+05
RB	0.000E+00	0.616E+07	0.681E+06	0.486E+06	0.442E+05	0.463E+04
SR	0.000E+00	0.932E+07	0.316E+07	0.286E+07	0.160E+07	0.125E+07
Y	0.000E+00	0.128E+08	0.494E+07	0.454E+07	0.266E+07	0.180E+07
ZR	0.000E+00	0.103E+08	0.339E+07	0.332E+07	0.278E+07	0.236E+07
NB	0.000E+00	0.154E+08	0.505E+07	0.494E+07	0.390E+07	0.302E+07
MO	0.000E+00	0.991E+07	0.207E+07	0.191E+07	0.172E+07	0.151E+07
TC	0.000E+00	0.114E+08	0.229E+07	0.175E+07	0.161E+07	0.145E+07
RU	0.000E+00	0.496E+07	0.321E+07	0.306E+07	0.237E+07	0.220E+07
RH	0.000E+00	0.651E+07	0.352E+07	0.336E+07	0.302E+07	0.278E+07
PD	0.000E+00	0.745E+06	0.392E+06	0.363E+06	0.220E+06	0.122E+06
AG	0.000E+00	0.891E+06	0.500E+06	0.467E+06	0.307E+06	0.200E+06
CD	0.000E+00	0.176E+06	0.434E+05	0.359E+05	0.204E+05	0.170E+05
IN	0.000E+00	0.390E+06	0.570E+05	0.465E+05	0.218E+05	0.164E+05
SN	0.000E+00	0.153E+07	0.181E+06	0.118E+06	0.328E+05	0.274E+05
SB	0.000E+00	0.383E+07	0.734E+06	0.489E+06	0.185E+06	0.128E+06
TE	0.000E+00	0.829E+07	0.365E+07	0.266E+07	0.174E+07	0.152E+07
I	0.000E+00	0.124E+08	0.800E+07	0.708E+07	0.439E+07	0.333E+07
XE	0.000E+00	0.931E+07	0.320E+07	0.315E+07	0.307E+07	0.263E+07
CS	0.000E+00	0.831E+07	0.129E+07	0.672E+06	0.387E+06	0.382E+06
BA	0.000E+00	0.103E+08	0.340E+07	0.270E+07	0.188E+07	0.182E+07
LA	0.000E+00	0.102E+08	0.464E+07	0.390E+07	0.207E+07	0.184E+07
CE	0.000E+00	0.809E+07	0.460E+07	0.453E+07	0.423E+07	0.393E+07
PR	0.000E+00	0.698E+07	0.424E+07	0.386E+07	0.318E+07	0.294E+07
ND	0.000E+00	0.159E+07	0.965E+06	0.862E+06	0.664E+06	0.640E+06
PM	0.000E+00	0.171E+07	0.132E+07	0.130E+07	0.117E+07	0.103E+07
SM	0.000E+00	0.619E+06	0.546E+06	0.529E+06	0.445E+06	0.368E+06
EU	0.000E+00	0.267E+06	0.254E+06	0.249E+06	0.232E+06	0.221E+06

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
GD	0.000E+00	0.902E+04	0.675E+04	0.649E+04	0.447E+04	0.286E+04
TB	0.000E+00	0.354E+04	0.266E+04	0.257E+04	0.249E+04	0.242E+04
DY	0.000E+00	0.879E+03	0.424E+03	0.324E+03	0.455E+02	0.278E+02
HO	0.000E+00	0.132E+03	0.130E+03	0.128E+03	0.106E+03	0.851E+02
ER	0.000E+00	0.306E+01	0.212E+00	0.212E+00	0.205E+00	0.198E+00
TM	0.000E+00	0.425E-01	0.380E-01	0.380E-01	0.379E-01	0.378E-01

CYCLE 3: LEU

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.294E+03	0.287E+03	0.287E+03	0.287E+03	0.287E+03
HE	0.000E+00	0.336E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.303E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.308E+01	0.388E-05	0.388E-05	0.388E-05	0.388E-05
B	0.000E+00	0.218E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.479E+02	0.873E+00	0.873E+00	0.873E+00	0.873E+00
N	0.000E+00	0.295E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.546E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.518E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.244E+01	0.194E-28	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.512E+03	0.346E+03	0.330E+03	0.208E+03	0.120E+03
MG	0.000E+00	0.371E+01	0.458E-01	0.565E-03	0.276E-08	0.185E-08
AL	0.000E+00	0.914E+02	0.171E-03	0.293E-06	0.277E-08	0.186E-08
SI	0.000E+00	0.650E+02	0.499E+02	0.383E+02	0.272E+01	0.114E+00
P	0.000E+00	0.113E+03	0.112E+03	0.112E+03	0.110E+03	0.107E+03
S	0.000E+00	0.315E+02	0.315E+02	0.315E+02	0.314E+02	0.313E+02
CL	0.000E+00	0.947E+01	0.307E+01	0.102E+01	0.168E-01	0.168E-01
AR	0.000E+00	0.658E+00	0.657E+00	0.656E+00	0.651E+00	0.645E+00
K	0.000E+00	0.140E-01	0.131E-01	0.124E-01	0.713E-02	0.369E-02
CA	0.000E+00	0.586E+00	0.530E+00	0.529E+00	0.528E+00	0.527E+00
SC	0.000E+00	0.220E+00	0.177E+00	0.158E+00	0.135E+00	0.128E+00
TI	0.000E+00	0.126E+00	0.923E-04	0.675E-07	0.000E+00	0.000E+00
V	0.132E-14	0.161E+03	0.246E-02	0.375E-07	0.102E-14	0.102E-14
CR	0.000E+00	0.286E+02	0.281E+02	0.280E+02	0.278E+02	0.274E+02
MN	0.000E+00	0.295E+03	0.226E+03	0.173E+03	0.134E+02	0.219E+01
FE	0.000E+00	0.141E+02	0.141E+02	0.141E+02	0.141E+02	0.141E+02
CO	0.000E+00	0.470E+03	0.259E+03	0.254E+03	0.251E+03	0.251E+03
NI	0.000E+00	0.591E+01	0.508E+01	0.445E+01	0.258E+01	0.246E+01
CU	0.000E+00	0.403E+02	0.304E+02	0.288E+02	0.167E+02	0.867E+01
ZN	0.000E+00	0.290E+03	0.228E+03	0.197E+03	0.163E+03	0.158E+03
GA	0.000E+00	0.273E+01	0.388E+00	0.611E-01	0.503E-02	0.279E-02
GE	0.000E+00	0.176E-01	0.162E-01	0.162E-01	0.158E-01	0.153E-01
SR	0.000E+00	0.206E-06	0.206E-06	0.206E-06	0.203E-06	0.200E-06
Y	0.000E+00	0.883E-03	0.875E-03	0.867E-03	0.793E-03	0.713E-03
ZR	0.000E+00	0.382E-02	0.381E-02	0.380E-02	0.369E-02	0.358E-02
NB	0.000E+00	0.193E+00	0.191E+00	0.190E+00	0.182E+00	0.175E+00
MO	0.000E+00	0.260E+03	0.246E+03	0.243E+03	0.219E+03	0.193E+03
TC	0.000E+00	0.232E+02	0.266E+01	0.259E+00	0.251E-03	0.251E-03
RU	0.000E+00	0.855E-02	0.854E-02	0.854E-02	0.847E-02	0.840E-02
RH	0.000E+00	0.430E-03	0.235E-06	0.223E-06	0.169E-06	0.131E-06
PD	0.000E+00	0.135E+00	0.124E+00	0.118E+00	0.701E-01	0.377E-01
AG	0.000E+00	0.422E+02	0.324E+01	0.323E+01	0.317E+01	0.313E+01
CD	0.000E+00	0.546E+03	0.534E+03	0.524E+03	0.457E+03	0.395E+03
IN	0.119E-10	0.127E+03	0.644E+02	0.579E+02	0.370E+02	0.343E+02
SN	0.000E+00	0.652E+02	0.621E+02	0.618E+02	0.596E+02	0.575E+02
SB	0.000E+00	0.413E+01	0.410E+01	0.409E+01	0.397E+01	0.384E+01
TE	0.000E+00	0.611E+00	0.610E+00	0.610E+00	0.609E+00	0.609E+00
I	0.000E+00	0.168E-03	0.318E-04	0.601E-05	0.320E-09	0.163E-09
PM	0.000E+00	0.176E-05	0.154E-05	0.138E-05	0.734E-06	0.522E-06
SM	0.000E+00	0.195E-05	0.172E-05	0.167E-05	0.143E-05	0.120E-05
EU	0.000E+00	0.153E+01	0.153E+01	0.153E+01	0.150E+01	0.147E+01
GD	0.105E-12	0.115E+03	0.101E+03	0.973E+02	0.675E+02	0.438E+02
TB	0.000E+00	0.552E+02	0.551E+02	0.550E+02	0.540E+02	0.530E+02
DY	0.000E+00	0.125E+02	0.574E+01	0.428E+01	0.253E+00	0.338E-01
HO	0.000E+00	0.159E+01	0.155E+01	0.151E+01	0.117E+01	0.866E+00
ER	0.000E+00	0.293E-01	0.233E-03	0.232E-03	0.225E-03	0.217E-03
TM	0.000E+00	0.251E-04	0.216E-04	0.216E-04	0.216E-04	0.215E-04

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
TA	0.000E+00	0.233E+00	0.232E+00	0.231E+00	0.221E+00	0.210E+00
W	0.000E+00	0.194E+03	0.189E+03	0.184E+03	0.141E+03	0.104E+03
RE	0.000E+00	0.209E+03	0.119E+03	0.106E+03	0.728E+02	0.478E+02
OS	0.000E+00	0.759E-01	0.743E-01	0.727E-01	0.607E-01	0.522E-01
IR	0.000E+00	0.166E-01	0.165E-01	0.164E-01	0.160E-01	0.156E-01
PT	0.000E+00	0.562E-04	0.558E-04	0.554E-04	0.518E-04	0.479E-04
PB	0.173E-15	0.697E-03	0.565E-03	0.458E-03	0.561E-04	0.451E-05
BI	0.000E+00	0.556E-01	0.553E-01	0.550E-01	0.519E-01	0.484E-01
PO	0.000E+00	0.499E-01	0.499E-01	0.499E-01	0.499E-01	0.499E-01
TL	0.000E+00	0.333E-02	0.333E-02	0.342E-02	0.333E-02	0.349E-02
PB	0.000E+00	0.926E-02	0.926E-02	0.926E-02	0.926E-02	0.926E-02
BI	0.000E+00	0.926E-02	0.927E-02	0.927E-02	0.926E-02	0.970E-02
PO	0.000E+00	0.152E-01	0.152E-01	0.152E-01	0.152E-01	0.155E-01
RN	0.000E+00	0.926E-02	0.926E-02	0.926E-02	0.926E-02	0.926E-02
RA	0.000E+00	0.927E-02	0.926E-02	0.926E-02	0.926E-02	0.926E-02
TH	0.000E+00	0.188E+01	0.180E+01	0.175E+01	0.141E+01	0.111E+01
PA	0.000E+00	0.252E+01	0.247E+01	0.244E+01	0.216E+01	0.191E+01
U	0.281E+01	0.285E+08	0.630E+07	0.250E+07	0.165E+07	0.156E+07
NP	0.000E+00	0.279E+08	0.277E+08	0.274E+08	0.242E+08	0.209E+08
PU	0.000E+00	0.102E+07	0.908E+06	0.814E+06	0.338E+06	0.212E+06
AM	0.000E+00	0.601E+06	0.231E+06	0.151E+06	0.833E+05	0.480E+05
CM	0.000E+00	0.101E+06	0.101E+06	0.101E+06	0.101E+06	0.101E+06
BK	0.000E+00	0.439E+00	0.371E+00	0.317E+00	0.116E+00	0.918E-01
CF	0.000E+00	0.519E-02	0.519E-02	0.519E-02	0.519E-02	0.518E-02
H	0.000E+00	0.947E+03	0.947E+03	0.947E+03	0.947E+03	0.947E+03
CO	0.000E+00	0.279E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.970E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.541E+03	0.197E-07	0.139E-09	0.119E-09	0.104E-09
ZN	0.000E+00	0.424E+04	0.870E+02	0.857E+02	0.738E+02	0.617E+02
GA	0.000E+00	0.192E+05	0.235E+03	0.213E+03	0.115E+03	0.824E+02
GE	0.000E+00	0.117E+06	0.539E+04	0.368E+04	0.540E+03	0.239E+03
AS	0.000E+00	0.331E+06	0.887E+04	0.762E+04	0.256E+04	0.200E+04
SE	0.000E+00	0.943E+06	0.148E+05	0.253E+04	0.709E+01	0.557E+01
BR	0.000E+00	0.195E+07	0.158E+06	0.944E+05	0.127E+05	0.716E+04
KR	0.000E+00	0.357E+07	0.101E+07	0.773E+06	0.931E+05	0.223E+05
RB	0.000E+00	0.517E+07	0.562E+06	0.402E+06	0.386E+05	0.608E+04
SR	0.000E+00	0.840E+07	0.273E+07	0.246E+07	0.137E+07	0.106E+07
Y	0.000E+00	0.120E+08	0.439E+07	0.403E+07	0.235E+07	0.159E+07
ZR	0.000E+00	0.104E+08	0.333E+07	0.326E+07	0.271E+07	0.229E+07
NB	0.000E+00	0.160E+08	0.500E+07	0.489E+07	0.383E+07	0.295E+07
MO	0.000E+00	0.113E+08	0.220E+07	0.204E+07	0.183E+07	0.161E+07
TC	0.000E+00	0.136E+08	0.246E+07	0.187E+07	0.171E+07	0.154E+07
RU	0.000E+00	0.637E+07	0.403E+07	0.384E+07	0.296E+07	0.274E+07
RH	0.000E+00	0.870E+07	0.443E+07	0.422E+07	0.378E+07	0.348E+07
PD	0.000E+00	0.106E+07	0.597E+06	0.555E+06	0.335E+06	0.184E+06
AG	0.000E+00	0.139E+07	0.746E+06	0.698E+06	0.456E+06	0.294E+06
CD	0.000E+00	0.213E+06	0.540E+05	0.448E+05	0.260E+05	0.216E+05
IN	0.000E+00	0.462E+06	0.706E+05	0.578E+05	0.276E+05	0.209E+05
SN	0.000E+00	0.166E+07	0.211E+06	0.139E+06	0.398E+05	0.333E+05
SB	0.000E+00	0.406E+07	0.843E+06	0.574E+06	0.227E+06	0.161E+06
TE	0.000E+00	0.845E+07	0.382E+07	0.283E+07	0.188E+07	0.164E+07
I	0.000E+00	0.128E+08	0.833E+07	0.738E+07	0.463E+07	0.352E+07
XE	0.000E+00	0.927E+07	0.322E+07	0.318E+07	0.314E+07	0.270E+07
CS	0.000E+00	0.863E+07	0.166E+07	0.102E+07	0.703E+06	0.695E+06
BA	0.000E+00	0.103E+08	0.348E+07	0.278E+07	0.195E+07	0.190E+07
LA	0.000E+00	0.102E+08	0.469E+07	0.396E+07	0.212E+07	0.189E+07
CE	0.000E+00	0.806E+07	0.453E+07	0.445E+07	0.416E+07	0.388E+07
PR	0.000E+00	0.711E+07	0.423E+07	0.385E+07	0.315E+07	0.290E+07
ND	0.000E+00	0.174E+07	0.101E+07	0.896E+06	0.680E+06	0.655E+06

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
PM	0.000E+00	0.189E+07	0.143E+07	0.140E+07	0.125E+07	0.109E+07
SM	0.000E+00	0.948E+06	0.849E+06	0.825E+06	0.697E+06	0.578E+06
EU	0.000E+00	0.623E+06	0.605E+06	0.597E+06	0.564E+06	0.540E+06
GD	0.000E+00	0.151E+05	0.119E+05	0.114E+05	0.789E+04	0.506E+04
TB	0.000E+00	0.660E+04	0.541E+04	0.529E+04	0.516E+04	0.503E+04
DY	0.000E+00	0.259E+04	0.122E+04	0.920E+03	0.900E+02	0.414E+02
HO	0.000E+00	0.476E+03	0.466E+03	0.455E+03	0.362E+03	0.276E+03
ER	0.000E+00	0.148E+02	0.769E+00	0.767E+00	0.744E+00	0.717E+00
TM	0.000E+00	0.240E+00	0.217E+00	0.217E+00	0.216E+00	0.216E+00

CYCLE 1: MOX

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.115E+03	0.109E+03	0.109E+03	0.109E+03	0.109E+03
HE	0.000E+00	0.571E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.977E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.991E+00	0.629E-06	0.629E-06	0.629E-06	0.629E-06
B	0.000E+00	0.918E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.434E+02	0.146E+00	0.146E+00	0.146E+00	0.146E+00
N	0.000E+00	0.271E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.348E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.257E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.176E+01	0.139E-28	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.200E+03	0.136E+03	0.130E+03	0.821E+02	0.472E+02
MG	0.000E+00	0.331E+01	0.408E-01	0.503E-03	0.918E-09	0.617E-09
AL	0.000E+00	0.390E+02	0.156E-03	0.265E-06	0.920E-09	0.618E-09
SI	0.000E+00	0.593E+02	0.455E+02	0.350E+02	0.248E+01	0.104E+00
P	0.000E+00	0.428E+02	0.426E+02	0.425E+02	0.417E+02	0.407E+02
S	0.000E+00	0.153E+02	0.153E+02	0.153E+02	0.152E+02	0.152E+02
CL	0.000E+00	0.370E+01	0.120E+01	0.394E+00	0.280E-02	0.280E-02
AR	0.000E+00	0.567E+00	0.566E+00	0.566E+00	0.561E+00	0.556E+00
K	0.000E+00	0.119E-01	0.112E-01	0.106E-01	0.609E-02	0.315E-02
CA	0.000E+00	0.213E+00	0.191E+00	0.191E+00	0.191E+00	0.190E+00
SC	0.000E+00	0.127E+00	0.114E+00	0.106E+00	0.935E-01	0.874E-01
TI	0.000E+00	0.546E-01	0.399E-04	0.292E-07	0.000E+00	0.000E+00
V	0.132E-14	0.622E+02	0.948E-03	0.145E-07	0.126E-14	0.126E-14
CR	0.000E+00	0.112E+02	0.110E+02	0.110E+02	0.109E+02	0.108E+02
MN	0.000E+00	0.142E+03	0.109E+03	0.837E+02	0.691E+01	0.153E+01
FE	0.000E+00	0.350E+01	0.350E+01	0.350E+01	0.350E+01	0.350E+01
CO	0.000E+00	0.183E+03	0.596E+02	0.571E+02	0.568E+02	0.567E+02
NI	0.000E+00	0.174E+01	0.142E+01	0.118E+01	0.463E+00	0.416E+00
CU	0.000E+00	0.165E+02	0.128E+02	0.121E+02	0.703E+01	0.365E+01
ZN	0.000E+00	0.126E+03	0.958E+02	0.810E+02	0.645E+02	0.622E+02
GA	0.000E+00	0.309E+00	0.436E-01	0.666E-02	0.417E-03	0.231E-03
GE	0.000E+00	0.307E-03	0.281E-03	0.281E-03	0.274E-03	0.266E-03
Y	0.000E+00	0.808E-03	0.801E-03	0.794E-03	0.726E-03	0.653E-03
ZR	0.000E+00	0.357E-02	0.356E-02	0.355E-02	0.345E-02	0.335E-02
NB	0.000E+00	0.176E+00	0.174E+00	0.173E+00	0.166E+00	0.160E+00
MO	0.000E+00	0.134E+03	0.125E+03	0.124E+03	0.111E+03	0.981E+02
TC	0.000E+00	0.909E+01	0.161E+01	0.157E+00	0.613E-04	0.613E-04
RU	0.000E+00	0.269E-03	0.268E-03	0.268E-03	0.266E-03	0.264E-03
RH	0.000E+00	0.913E-04	0.218E-08	0.207E-08	0.159E-08	0.123E-08
PD	0.000E+00	0.226E-01	0.206E-01	0.195E-01	0.116E-01	0.625E-02
AG	0.000E+00	0.653E+02	0.312E+01	0.311E+01	0.310E+01	0.308E+01
CD	0.000E+00	0.345E+03	0.338E+03	0.332E+03	0.289E+03	0.250E+03
IN	0.119E-10	0.214E+04	0.470E+03	0.239E+03	0.306E+02	0.288E+02
SN	0.000E+00	0.353E+02	0.335E+02	0.333E+02	0.321E+02	0.309E+02
SB	0.000E+00	0.119E+01	0.119E+01	0.118E+01	0.116E+01	0.114E+01
TE	0.000E+00	0.187E+00	0.187E+00	0.187E+00	0.187E+00	0.188E+00
I	0.000E+00	0.146E-05	0.277E-06	0.525E-07	0.140E-12	0.696E-13
PM	0.000E+00	0.686E-06	0.666E-06	0.650E-06	0.509E-06	0.380E-06
SM	0.000E+00	0.270E-05	0.258E-05	0.253E-05	0.218E-05	0.183E-05
EU	0.000E+00	0.405E+00	0.404E+00	0.404E+00	0.398E+00	0.392E+00
GD	0.105E-12	0.727E+02	0.643E+02	0.622E+02	0.446E+02	0.306E+02
TB	0.000E+00	0.138E+02	0.138E+02	0.138E+02	0.134E+02	0.131E+02
DY	0.000E+00	0.826E-01	0.437E-01	0.325E-01	0.182E-02	0.159E-03
HO	0.000E+00	0.363E-02	0.354E-02	0.345E-02	0.269E-02	0.201E-02
ER	0.000E+00	0.114E-04	0.172E-07	0.172E-07	0.166E-07	0.160E-07
TA	0.000E+00	0.320E-01	0.319E-01	0.318E-01	0.308E-01	0.297E-01
W	0.000E+00	0.173E+03	0.168E+03	0.163E+03	0.124E+03	0.894E+02

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
RE	0.000E+00	0.397E+02	0.228E+02	0.203E+02	0.140E+02	0.931E+01
OS	0.000E+00	0.142E-03	0.139E-03	0.135E-03	0.111E-03	0.935E-04
IR	0.000E+00	0.722E-05	0.722E-05	0.721E-05	0.717E-05	0.713E-05
PB	0.173E-15	0.271E-03	0.220E-03	0.178E-03	0.218E-04	0.175E-05
BI	0.000E+00	0.292E-01	0.291E-01	0.289E-01	0.273E-01	0.255E-01
PO	0.000E+00	0.252E-01	0.252E-01	0.252E-01	0.252E-01	0.252E-01
TH	0.000E+00	0.354E+00	0.353E+00	0.352E+00	0.345E+00	0.338E+00
PA	0.000E+00	0.373E+00	0.372E+00	0.372E+00	0.370E+00	0.368E+00
U	0.470E+00	0.169E+08	0.300E+07	0.632E+06	0.138E+06	0.131E+06
NP	0.000E+00	0.168E+08	0.167E+08	0.165E+08	0.146E+08	0.126E+08
PU	0.211E+05	0.363E+06	0.347E+06	0.334E+06	0.265E+06	0.246E+06
AM	0.000E+00	0.876E+05	0.681E+05	0.620E+05	0.396E+05	0.236E+05
CM	0.000E+00	0.242E+05	0.242E+05	0.242E+05	0.242E+05	0.243E+05
H	0.000E+00	0.406E+03	0.406E+03	0.406E+03	0.406E+03	0.406E+03
CO	0.000E+00	0.197E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.705E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.396E+03	0.155E-07	0.440E-10	0.354E-10	0.309E-10
ZN	0.000E+00	0.308E+04	0.857E+02	0.845E+02	0.728E+02	0.608E+02
GA	0.000E+00	0.138E+05	0.224E+03	0.204E+03	0.112E+03	0.810E+02
GE	0.000E+00	0.859E+05	0.528E+04	0.360E+04	0.528E+03	0.234E+03
AS	0.000E+00	0.241E+06	0.859E+04	0.736E+04	0.238E+04	0.186E+04
SE	0.000E+00	0.677E+06	0.133E+05	0.230E+04	0.624E+01	0.481E+01
BR	0.000E+00	0.133E+07	0.125E+06	0.733E+05	0.541E+04	0.182E+04
KR	0.000E+00	0.251E+07	0.770E+06	0.590E+06	0.652E+05	0.951E+04
RB	0.000E+00	0.382E+07	0.418E+06	0.299E+06	0.264E+05	0.201E+04
SR	0.000E+00	0.676E+07	0.207E+07	0.185E+07	0.968E+06	0.730E+06
Y	0.000E+00	0.102E+08	0.354E+07	0.323E+07	0.182E+07	0.119E+07
ZR	0.000E+00	0.949E+07	0.308E+07	0.302E+07	0.251E+07	0.212E+07
NB	0.000E+00	0.151E+08	0.465E+07	0.454E+07	0.355E+07	0.272E+07
MO	0.000E+00	0.112E+08	0.199E+07	0.183E+07	0.164E+07	0.144E+07
TC	0.000E+00	0.131E+08	0.228E+07	0.168E+07	0.154E+07	0.138E+07
RU	0.000E+00	0.680E+07	0.427E+07	0.407E+07	0.311E+07	0.288E+07
RH	0.000E+00	0.805E+07	0.477E+07	0.455E+07	0.407E+07	0.373E+07
PD	0.000E+00	0.101E+07	0.546E+06	0.506E+06	0.305E+06	0.168E+06
AG	0.000E+00	0.112E+07	0.684E+06	0.639E+06	0.419E+06	0.270E+06
CD	0.000E+00	0.184E+06	0.469E+05	0.387E+05	0.219E+05	0.182E+05
IN	0.000E+00	0.408E+06	0.612E+05	0.500E+05	0.234E+05	0.176E+05
SN	0.000E+00	0.156E+07	0.214E+06	0.140E+06	0.382E+05	0.321E+05
SB	0.000E+00	0.382E+07	0.871E+06	0.598E+06	0.229E+06	0.158E+06
TE	0.000E+00	0.773E+07	0.372E+07	0.282E+07	0.190E+07	0.165E+07
I	0.000E+00	0.119E+08	0.792E+07	0.704E+07	0.449E+07	0.344E+07
XE	0.000E+00	0.892E+07	0.352E+07	0.346E+07	0.319E+07	0.266E+07
CS	0.000E+00	0.715E+07	0.960E+06	0.406E+06	0.171E+06	0.168E+06
BA	0.000E+00	0.926E+07	0.314E+07	0.249E+07	0.172E+07	0.167E+07
LA	0.000E+00	0.921E+07	0.432E+07	0.364E+07	0.192E+07	0.172E+07
CE	0.000E+00	0.714E+07	0.391E+07	0.384E+07	0.357E+07	0.332E+07
PR	0.000E+00	0.609E+07	0.341E+07	0.307E+07	0.248E+07	0.228E+07
ND	0.000E+00	0.165E+07	0.932E+06	0.827E+06	0.630E+06	0.607E+06
PM	0.000E+00	0.163E+07	0.115E+07	0.113E+07	0.101E+07	0.886E+06
SM	0.000E+00	0.514E+06	0.418E+06	0.399E+06	0.329E+06	0.269E+06
EU	0.000E+00	0.164E+06	0.147E+06	0.140E+06	0.123E+06	0.114E+06
GD	0.000E+00	0.122E+05	0.876E+04	0.842E+04	0.580E+04	0.372E+04
TB	0.000E+00	0.453E+04	0.312E+04	0.298E+04	0.287E+04	0.277E+04
DY	0.000E+00	0.650E+03	0.365E+03	0.285E+03	0.604E+02	0.440E+02
HO	0.000E+00	0.119E+03	0.117E+03	0.116E+03	0.101E+03	0.861E+02
ER	0.000E+00	0.156E+01	0.147E+00	0.146E+00	0.142E+00	0.137E+00
TM	0.000E+00	0.120E-01	0.104E-01	0.104E-01	0.104E-01	0.104E-01

CYCLE 2: MOX

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
H	0.000E+00	0.194E+03	0.186E+03	0.186E+03	0.186E+03	0.186E+03
HE	0.000E+00	0.556E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LI	0.000E+00	0.116E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
BE	0.000E+00	0.120E+01	0.225E-05	0.225E-05	0.225E-05	0.225E-05
B	0.000E+00	0.109E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
C	0.000E+00	0.513E+02	0.317E+00	0.317E+00	0.317E+00	0.317E+00
N	0.000E+00	0.319E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
O	0.000E+00	0.409E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
F	0.000E+00	0.303E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NE	0.000E+00	0.207E+01	0.164E-28	0.000E+00	0.000E+00	0.000E+00
NA	0.000E+00	0.236E+03	0.161E+03	0.153E+03	0.966E+02	0.555E+02
MG	0.000E+00	0.389E+01	0.480E-01	0.592E-03	0.127E-08	0.854E-09
AL	0.000E+00	0.460E+02	0.184E-03	0.312E-06	0.127E-08	0.856E-09
SI	0.000E+00	0.698E+02	0.536E+02	0.411E+02	0.292E+01	0.123E+00
P	0.000E+00	0.503E+02	0.502E+02	0.500E+02	0.490E+02	0.479E+02
S	0.000E+00	0.178E+02	0.178E+02	0.178E+02	0.178E+02	0.177E+02
CL	0.000E+00	0.436E+01	0.141E+01	0.467E+00	0.599E-02	0.598E-02
AR	0.000E+00	0.668E+00	0.668E+00	0.667E+00	0.662E+00	0.655E+00
K	0.000E+00	0.142E-01	0.133E-01	0.125E-01	0.722E-02	0.374E-02
CA	0.000E+00	0.267E+00	0.242E+00	0.242E+00	0.241E+00	0.241E+00
SC	0.000E+00	0.155E+00	0.138E+00	0.129E+00	0.114E+00	0.107E+00
TI	0.000E+00	0.643E-01	0.470E-04	0.344E-07	0.000E+00	0.000E+00
V	0.132E-14	0.730E+02	0.111E-02	0.170E-07	0.120E-14	0.120E-14
CR	0.000E+00	0.131E+02	0.129E+02	0.129E+02	0.127E+02	0.126E+02
MN	0.000E+00	0.166E+03	0.127E+03	0.976E+02	0.840E+01	0.215E+01
FE	0.000E+00	0.621E+01	0.621E+01	0.621E+01	0.621E+01	0.620E+01
CO	0.000E+00	0.237E+03	0.965E+02	0.936E+02	0.930E+02	0.929E+02
NI	0.000E+00	0.246E+01	0.208E+01	0.179E+01	0.943E+00	0.887E+00
CU	0.000E+00	0.195E+02	0.150E+02	0.142E+02	0.825E+01	0.428E+01
ZN	0.000E+00	0.160E+03	0.124E+03	0.107E+03	0.872E+02	0.846E+02
GA	0.000E+00	0.787E+00	0.111E+00	0.170E-01	0.106E-02	0.590E-03
GE	0.000E+00	0.175E-02	0.161E-02	0.161E-02	0.157E-02	0.152E-02
SR	0.000E+00	0.186E-06	0.185E-06	0.185E-06	0.183E-06	0.180E-06
Y	0.000E+00	0.952E-03	0.944E-03	0.935E-03	0.856E-03	0.769E-03
ZR	0.000E+00	0.420E-02	0.418E-02	0.417E-02	0.406E-02	0.393E-02
NB	0.000E+00	0.208E+00	0.206E+00	0.204E+00	0.196E+00	0.189E+00
MO	0.000E+00	0.156E+03	0.146E+03	0.144E+03	0.130E+03	0.114E+03
TC	0.000E+00	0.127E+02	0.189E+01	0.184E+00	0.125E-03	0.125E-03
RU	0.000E+00	0.163E-02	0.163E-02	0.163E-02	0.162E-02	0.161E-02
RH	0.000E+00	0.119E-03	0.203E-07	0.193E-07	0.147E-07	0.114E-07
PD	0.000E+00	0.531E-01	0.487E-01	0.461E-01	0.275E-01	0.148E-01
AG	0.000E+00	0.502E+02	0.334E+01	0.334E+01	0.331E+01	0.329E+01
CD	0.000E+00	0.404E+03	0.396E+03	0.389E+03	0.339E+03	0.293E+03
IN	0.119E-10	0.408E+03	0.115E+03	0.760E+02	0.315E+02	0.295E+02
SN	0.000E+00	0.463E+02	0.441E+02	0.439E+02	0.424E+02	0.409E+02
SB	0.000E+00	0.234E+01	0.233E+01	0.232E+01	0.227E+01	0.222E+01
TE	0.000E+00	0.379E+00	0.379E+00	0.379E+00	0.379E+00	0.379E+00
I	0.000E+00	0.190E-04	0.359E-05	0.679E-06	0.805E-11	0.409E-11
PM	0.000E+00	0.237E-05	0.230E-05	0.225E-05	0.176E-05	0.131E-05
SM	0.000E+00	0.704E-05	0.679E-05	0.667E-05	0.575E-05	0.481E-05
EU	0.000E+00	0.234E+01	0.234E+01	0.233E+01	0.230E+01	0.225E+01
GD	0.105E-12	0.836E+02	0.737E+02	0.711E+02	0.499E+02	0.329E+02
TB	0.000E+00	0.273E+02	0.273E+02	0.272E+02	0.268E+02	0.262E+02
DY	0.000E+00	0.115E+01	0.611E+00	0.455E+00	0.257E-01	0.249E-02
HO	0.000E+00	0.111E+00	0.108E+00	0.106E+00	0.821E-01	0.607E-01
ER	0.000E+00	0.814E-03	0.520E-05	0.518E-05	0.502E-05	0.484E-05
TM	0.000E+00	0.254E-06	0.213E-06	0.213E-06	0.212E-06	0.212E-06

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
TA	0.000E+00	0.101E+00	0.101E+00	0.100E+00	0.970E-01	0.932E-01
W	0.000E+00	0.172E+03	0.167E+03	0.162E+03	0.124E+03	0.898E+02
RE	0.000E+00	0.867E+02	0.497E+02	0.443E+02	0.305E+02	0.202E+02
OS	0.000E+00	0.339E-02	0.331E-02	0.323E-02	0.267E-02	0.227E-02
IR	0.000E+00	0.441E-03	0.440E-03	0.439E-03	0.435E-03	0.432E-03
PT	0.000E+00	0.664E-06	0.659E-06	0.655E-06	0.612E-06	0.565E-06
PB	0.173E-15	0.319E-03	0.259E-03	0.210E-03	0.257E-04	0.206E-05
BI	0.000E+00	0.344E-01	0.342E-01	0.340E-01	0.321E-01	0.300E-01
PO	0.000E+00	0.312E-01	0.312E-01	0.312E-01	0.312E-01	0.312E-01
TH	0.000E+00	0.380E+00	0.377E+00	0.376E+00	0.361E+00	0.349E+00
PA	0.000E+00	0.445E+00	0.443E+00	0.442E+00	0.434E+00	0.427E+00
U	0.470E+00	0.201E+08	0.359E+07	0.772E+06	0.183E+06	0.174E+06
NP	0.000E+00	0.200E+08	0.198E+08	0.196E+08	0.174E+08	0.150E+08
PU	0.211E+05	0.109E+07	0.101E+07	0.937E+06	0.581E+06	0.486E+06
AM	0.000E+00	0.466E+06	0.313E+06	0.272E+06	0.171E+06	0.101E+06
CM	0.000E+00	0.159E+06	0.159E+06	0.159E+06	0.159E+06	0.159E+06
BK	0.000E+00	0.752E-02	0.654E-02	0.575E-02	0.286E-02	0.250E-02
H	0.000E+00	0.785E+03	0.785E+03	0.785E+03	0.785E+03	0.785E+03
CO	0.000E+00	0.245E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00
NI	0.000E+00	0.881E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
CU	0.000E+00	0.475E+03	0.171E-07	0.563E-10	0.459E-10	0.402E-10
ZN	0.000E+00	0.350E+04	0.928E+02	0.915E+02	0.788E+02	0.659E+02
GA	0.000E+00	0.152E+05	0.243E+03	0.221E+03	0.121E+03	0.877E+02
GE	0.000E+00	0.911E+05	0.504E+04	0.343E+04	0.495E+03	0.218E+03
AS	0.000E+00	0.253E+06	0.816E+04	0.699E+04	0.226E+04	0.177E+04
SE	0.000E+00	0.702E+06	0.126E+05	0.214E+04	0.608E+01	0.477E+01
BR	0.000E+00	0.137E+07	0.125E+06	0.744E+05	0.710E+04	0.320E+04
KR	0.000E+00	0.259E+07	0.762E+06	0.584E+06	0.670E+05	0.124E+05
RB	0.000E+00	0.393E+07	0.413E+06	0.295E+06	0.267E+05	0.264E+04
SR	0.000E+00	0.693E+07	0.205E+07	0.183E+07	0.969E+06	0.735E+06
Y	0.000E+00	0.104E+08	0.351E+07	0.320E+07	0.182E+07	0.119E+07
ZR	0.000E+00	0.990E+07	0.308E+07	0.301E+07	0.250E+07	0.210E+07
NB	0.000E+00	0.156E+08	0.464E+07	0.454E+07	0.354E+07	0.272E+07
MO	0.000E+00	0.119E+08	0.206E+07	0.189E+07	0.170E+07	0.150E+07
TC	0.000E+00	0.141E+08	0.236E+07	0.174E+07	0.159E+07	0.143E+07
RU	0.000E+00	0.752E+07	0.467E+07	0.446E+07	0.345E+07	0.320E+07
RH	0.000E+00	0.951E+07	0.520E+07	0.496E+07	0.446E+07	0.410E+07
PD	0.000E+00	0.123E+07	0.694E+06	0.644E+06	0.388E+06	0.214E+06
AG	0.000E+00	0.155E+07	0.866E+06	0.811E+06	0.532E+06	0.343E+06
CD	0.000E+00	0.209E+06	0.536E+05	0.446E+05	0.260E+05	0.217E+05
IN	0.000E+00	0.459E+06	0.702E+05	0.573E+05	0.276E+05	0.209E+05
SN	0.000E+00	0.164E+07	0.214E+06	0.140E+06	0.392E+05	0.327E+05
SB	0.000E+00	0.400E+07	0.861E+06	0.590E+06	0.234E+06	0.166E+06
TE	0.000E+00	0.818E+07	0.377E+07	0.282E+07	0.190E+07	0.165E+07
I	0.000E+00	0.124E+08	0.813E+07	0.721E+07	0.455E+07	0.348E+07
XE	0.000E+00	0.925E+07	0.350E+07	0.344E+07	0.322E+07	0.269E+07
CS	0.000E+00	0.777E+07	0.125E+07	0.661E+06	0.397E+06	0.392E+06
BA	0.000E+00	0.960E+07	0.328E+07	0.262E+07	0.182E+07	0.177E+07
LA	0.000E+00	0.947E+07	0.440E+07	0.371E+07	0.198E+07	0.177E+07
CE	0.000E+00	0.754E+07	0.416E+07	0.409E+07	0.382E+07	0.356E+07
PR	0.000E+00	0.654E+07	0.373E+07	0.338E+07	0.276E+07	0.255E+07
ND	0.000E+00	0.175E+07	0.974E+06	0.863E+06	0.653E+06	0.629E+06
PM	0.000E+00	0.187E+07	0.136E+07	0.133E+07	0.120E+07	0.105E+07
SM	0.000E+00	0.776E+06	0.665E+06	0.641E+06	0.536E+06	0.442E+06
EU	0.000E+00	0.315E+06	0.294E+06	0.286E+06	0.263E+06	0.250E+06
GD	0.000E+00	0.160E+05	0.121E+05	0.117E+05	0.807E+04	0.520E+04
TB	0.000E+00	0.685E+04	0.538E+04	0.524E+04	0.510E+04	0.496E+04
DY	0.000E+00	0.162E+04	0.878E+03	0.669E+03	0.860E+02	0.498E+02
HO	0.000E+00	0.338E+03	0.331E+03	0.324E+03	0.263E+03	0.206E+03

element	charge	discharge	1 hr decay	2 hr decay	12 hr decay	24 hr decay
ER	0.000E+00	0.663E+01	0.597E+00	0.595E+00	0.577E+00	0.556E+00
TM	0.000E+00	0.127E+00	0.114E+00	0.114E+00	0.114E+00	0.113E+00

DISTRIBUTION

External Distribution:

- 1 Richard Lee
U.S. Nuclear Regulatory Commission
RES/DSA/FSTB
Mail Stop C3A07M
Washington, DC 20555-0001
- 1 Jay Lee
U.S. Nuclear Regulatory Commission
NROR/DSER/RSAC
Mail Stop 7 F27
Washington, DC 20555-0001
- 1 Mr. Michael Salay
U.S. Nuclear Regulatory Commission
RES/DSA/FSTB
Mail Stop C3A07M
Washington, DC 20555-0001
- 1 Mr. Mark Leonard
Dycoda, LLC
267 Los Lentes Rd. NE
Los Lunas, New Mexico 87031-9390

Internal Distribution:

3	MS0736	Dana Powers	06762
1	MS0748	Nathan Bixler	06762
5	MS0748	Randy Gauntt	06762
1	MS0748	Larry Humphries	06762
1	MS0748	Joonyub Jun	06762
1	MS0748	Don Kalinich	06762
1	MS0748	Jesse Phillips	06762
1	MS0748	K.C. Wagner	06762
1	MS1348	Scott Ashbaugh	04240
1	MS0899	Technical Library	9536 (1 electronic copy)

