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AEC RESEARCH AND
DEVELOPMENT REPORT
DECEMBER 1970

**SYN -
OPERATIONAL ASPECTS OF THE
COMBINED BISYN, PERT,
AND BICYCL SYNTHESIS CODES**

M.D. KELLEY

U.S. ATOMIC ENERGY COMMISSION
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PROJECT AGREEMENT 10

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SYN - Operational Aspects of the
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Synthesis Codes

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SECTION I

ABSTRACT

1. Designation of Program - SYN
2. Computer for which the program is designed and others upon which it is operable - GE635
3. Nature of physical problem solved - SYN contains two major segments, BISYN and BICYCL. The BISYN segment solves the two-dimensional multigroup neutron diffusion theory equations in r,z or x,y geometry using a noniterative synthesis method. This approach is designed to greatly reduce the computer cost of running two-dimensional multigroup problems at the risk of some loss in accuracy of the detailed flux distribution. This segment also contains a perturbation and effective delayed neutron fraction calculation.

The BICYCL segment uses output from BISYN to solve the one-group neutron depletion equations. BICYCL allows the user to search on makeup or recycle isotopic compositions for a first cycle of a first core or for equilibrium concentrations. It also has provisions for fuel shuffling and the option to cycle back to BISYN in order to update the fluxes, one-group cross sections, etc.

4. Method of solution - The BISYN approach is to run one or two initial one-dimensional flux solutions in the dimension specified by the user. From the initial solution(s), group and region dependent bucklings are calculated for up to five (5) one-dimensional flux and adjoint solutions in the orthogonal dimension. These solutions are then normalized to become shape functions. Each shape function is then used to calculate flux and adjoint weighted cross sections averaged over the full span of that shape function for every region(s) in which it is to be used. Thus, region-dependent cross sections are

obtained which vary only in the dimension selected for the initial solution(s). A final solution is then performed in this dimension, using the collapsed cross sections, to generate a group and mesh dependent set of fluxes and adjoints plus an eigenvalue. The shape functions are then combined with the final solution to synthesize a two-dimensional set of fluxes and adjoints. Extensive edit routines are available to calculate power distribution, neutron balance, etc. plus a perturbation routine which will calculate $\Delta k/k$ by region, subregion, or by mesh point.

BICYCL converts the two-dimensional output data from BISYN to one-dimensional input data. Each burnable region is assigned to a fuel type with the necessary condition that all regions within a fuel type have the same initial isotopics.

BICYCL then uses the integrated form of the general time dependent differential equation $dn/dt = \text{Rate of Production} - \text{Rate of Destruction}$. This form of the equation is used in the solution of the combined thorium-uranium chain plus four independent fission product aggregates (excluding xenon and samarium which are treated separately) for each fuel type.

The program then performs the necessary search options (burnup-makeup-recycle) to obtain a requested reactivity (the reactivity calculations are done by perturbation theory). Once the reactivity is satisfied (a cycle) it then proceeds to calculate an estimate of the isotopics for the next cycle. When one cycle has the isotopics within a given epsilon of the previous cycle then the problem is considered to be at equilibrium. Interior to a cycle the fuel may be shuffled in a pre-determined manner.

5. Restrictions to the Complexity of the Problem - BISYN is restricted to:
 - a. 8 regions in either dimension
 - b. 74 intervals in either dimension (75 nodes)

- c. 16 lethargy groups
- d. 8 downscatter groups
- e. 120 different isotopes
- f. 40 isotopes per composition
- g. 64 compositions
- h. 2 initial solutions
- i. 5 shape functions
- j. Homogenization of regions for shape functions

BICYCL is restricted to:

- a. 40 fuel types
 - b. 20 time steps
 - c. 5 shuffling sequences/fuel type
 - d. 26 isotopes in burner chain
 - e. the same restrictions as BISYN
6. Typical Running Time - A BISYN problem with 6 radial regions, 5 axial regions, 2 initial solutions, 4 shape function solutions, average edit control plus a BICYCL problem with 20 fuel types, 29 regions, recycle search option, and minimum edit control used approximately 6 minutes of GE635 processor time.
7. Unusual Features of the Program - BISYN may calculate shape functions in non-multiplying regions (blankets, reflectors) using a leakage source from the shape function of an adjacent region, or may be set up simply by copying a previous shape function with the fluxes in lethargy groups X+1 to IMAX set equal to the flux in group X. The program has the option of checking for negative total removal cross sections by group(s) and region(s) plus noting where they occur. The user has the option of zeroing out the buckling or the removal cross section before the flux solution is run. If no action was taken on encountering negative removal cross sections and the flux becomes

negative then the user has the option of a) terminating the problem; b) setting to zero those buckling values corresponding to those groups and regions for which the flux was negative; or c) setting to zero those removal cross sections corresponding to those groups and regions for which the flux was negative.

BICYCL uses multigroup perturbation theory for calculating reactivity ignoring all matrix terms (i.e., just $v\Sigma_f - \Sigma_a$). The program, on option, may recycle fuel from any one fuel type to any other fuel type.

8. Related and Auxiliary Program - RAPFU, FUMBLE, TROUT, and the NPOST-RWSBT system of input/output routines.
9. Status - production.
10. References - "BISYN - A Two-Dimensional Synthesis Program," P. Greebler, et al, GEAP-4922, July, 1965, General Electric Company and Supplement No. 1.

"BISYN-PERT - A Two-Dimensional Perturbation Module for the BISYN System," M. D. Kelley, T. R. Jones, GEAP-10046, April, 1969, General Electric Company.

"BICYCL - A Computer Code for Two-Dimensional Analysis of Equilibrium Fuel Cycles", P. C. Vaughan, et al, GEAP-13556, General Electric Company.
11. Machine Requirements - 51K of fast memory, 2 tape drives and 821, 760 words of peripheral storage. Computer must have the ability to segment.
12. Programming Languages Used - FORTRAN-IV, GMAP.
13. Operating System or Monitor Under Which Program is Executed - GECOS III, SDL-1.
14. Other Programming or Operating Information or Restrictions - Read after write statements are permissible in the NPOST-RWSBT system of I/O routines.

15. Material Available - Source tape and subroutine writeups.

SECTION II

INTRODUCTION

SYN is a combination of the BISYN,^(1,2) PERT,⁽³⁾ and BICYCL⁽⁴⁾ programs which have been interconnected into one interrelated system. The original reports still serve as a user's manual for the complete system, while this report is designed to describe SYN from a programming viewpoint.

Section III gives the physics specifications for two modules which have been added to BISYN^(1,2) for calculating an effective delayed neutron fraction (BETCAL) and for calculating reactor dependent data which can be input directly into the FUMBLE⁽⁵⁾ code (BUMBLE).

Section IV describes the modular structure of SYN, the file structure, the libraries used plus flow diagrams of the main decision making routines.

Section V gives the reader a glimpse of NED GE635 operating environment. This section, while not pertinent to this report, was given in lieu of a separate installation report.

Section VI gives the input formats for the entire system and Section VII gives an example of the output for a combined BISYN-BICYCL problem.

SECTION III

MODULE DESCRIPTION

A. EFFECTIVE DELAYED NEUTRON FRACTION CALCULATION

1. Purpose

To calculate an effective delayed neutron fraction for a particular reactor system.

2. Discussion

The effective number of delayed neutrons ($\bar{\beta}_{n,m,k\ell}$) in delayed neutron group n due to fissions in material m in spatial region $k\ell$ is defined as

$$\bar{\beta}_{n,m,k\ell} = \frac{\beta_{n,m}}{K_{eff} FI} \int_{V_{k\ell}} \int_E \int_{E'} d^3r dE dE' [\nu(E) \sigma_f(E)]_{m,k\ell} N_{m,k\ell} \phi(E, \vec{r}) f_n(E') \phi^+(E', \vec{r}) \quad (3-1)$$

where it is assumed the atom density, $N_{m,k\ell}$, for fissionable material m , as well as $\nu(E) \sigma_f(E)$ are independent of location within region, $k\ell$. The quantity K_{eff} is the criticality factor, $V_{k\ell}$ is the volume of region $k\ell$, $\beta_{n,m}$ is the true number of delayed neutrons in groups n due to fissions in material m ; f_n is the delayed neutron spectrum for group n and FI is the conventional denominator for a perturbation calculation as given by Equation (IIJ-59) of the BISYN⁽¹⁾ report.

Equation (3-1) may be rewritten as

$$\bar{\beta}_{n,m,k\ell} = \frac{\beta_{n,m}}{K_{eff} FI} \sum_i \sum_j (\phi^i, \phi^{+i})_{k\ell} \nu_{i,m} (\sigma_f)_{i,m} N_{m,k\ell} f_{n,j} \quad (3-2)$$

where $(\phi^i, \phi^{+i})_{k\ell} = \int_{V_{k\ell}} \int_E \phi(E, \vec{r}) \phi^+(E, \vec{r}) d^3r.$

3. INPUT

$$K_{\text{eff}}; FI; \beta_{n,m}; (\phi^i, \phi^{+j})_{k\ell}; v_{i,m}; (\sigma_f)_{i,m}; N_{m,k\ell}; f_{n,j}$$

4. OUTPUT

$$B_{n,m} = \sum_{k\ell} \beta_{n,m,k\ell} \quad \text{for } 1 \leq n \leq 6, 1 \leq m \leq 10$$

$$BB_n = \sum_m \sum_{k\ell} \bar{\beta}_{n,m,k\ell} \quad \text{for } 1 \leq n \leq 6$$

$$BET = \sum_n \sum_m \sum_{k\ell} \bar{\beta}_{n,m,k\ell}$$

$$BSET_{nr} = \sum_n \sum_m \sum_{k\ell_{nr}} \bar{\beta}_{n,m,k\ell} \quad \text{for } 1 \leq nr \leq 10$$

$$B1_{n,m,nr} = \sum_{k\ell_{nr}} \bar{\beta}_{n,m,k\ell} \quad \text{for } 1 \leq nr \leq 10$$

Where

nr = set number containing region(s) $k\ell$.

5. DATA PROCESSING

a. Set up the following table of $\beta_{n,m}$

TABLE I

DELAYED NEUTRON FRACTION FOR DELAY
GROUP N AND ISOTOPE M

<u>Delay Group</u>	<u>U-238</u>	<u>PU-239</u>	<u>PU-240</u>	<u>PU-241</u>	<u>PU-242</u>	<u>U-235</u>	<u>U-236</u>
1	.000192	.000078	.000075	.000137	.000188	.000244	.000304
2	.002028	.000571	.000726	.001338	.001829	.001365	.001704
3	.002398	.000441	.000511	.000941	.001286	.001205	.001504
4	.005742	.000669	.000931	.001715	.002345	.002609	.003256
5	.003330	.000210	.000340	.000627	.000858	.000820	.001024
6	.001110	.000071	.000077	.000142	.000194	.000167	.000208

<u>Delay Group</u>	<u>Th-232</u>	<u>U-233</u>	<u>Not Used</u>
1	.000690	.000230	.0
2	.003045	.000732	.0
3	.003146	.000606	.0
4	.009054	.000846	.0
5	.003492	.000195	.0
6	.000873	.000061	.0

- b. Read (from CLASS 34 - see Section VI, page 6-27) $f_{n,j}$
- c. Read (from CLASS 35 - see Section VI, Page 6-28) material list, and optionally, region set data.
- d. Read (from CLASS 36 - see Section VI, Page 6-29), $\beta_{n,m}$ and overlay TABLE I, if provided. (optional)
- e. Process current files to locate and store data needed to calculate Equation 3-2.
- f. Calculate Equation 3-2.
- g. Edit BET; BB_n ; and $B_{n,m}$.
- h. Edit set data if provided.
- i. Return to calling program (BIED).

B. FUMBLE INPUT CALCULATION

1. Purpose

To calculate material worth for selected isotopes by region and combine them with other data so as to punch cards in FUMBLE⁽⁵⁾ format.

2. Discussion

The material worth per atom for selected isotopes in each region is calculated by the equation,

$$W_{m,kl} = \frac{\sum_i \sum_j v_{i,m} (\sigma_f)_{i,m} x_j (\phi^i, \phi^{+j})_{kl} - \sum_i (\sigma_a)_{i,m} (\phi^i, \phi^{+i})}{FI} \quad (3-3)$$

where: FI = perturbation denominator integral, and

$$(\phi^i, \phi^{+j})_{kl} = \int_{kl} \phi^i \phi^{+j} dv \text{ for region } kl.$$

3. Input

$$v_{i,m}; (\sigma_f)_{i,m}; x_j; (\phi^i, \phi^{+j})_{kl}; (\sigma_a)_{i,m}; FI$$

4. Output

$$V_{kl}; \phi_{kl}; N_{m,kl}; (\sigma_c)_{m,kl}; (\sigma_f)_{m,kl}; W_{m,kl}$$

5. Data Processing

- a. Read (from CLASS 37 - See Section VI, page 6-29) the list of material names that are to be used for each isotope.
- b. Read in $N_{m,mc}$ from working Class 100.
- c. Read in one group cross section data (σ_f - CLASS 84, and σ_c - CLASS 85)
- d. Set region order (1 dimensional) to correspond to lowest composition number (1) to highest composition number desired (MCMAXP = NOPT(20))
- e. Read cross section data ($(\sigma_c)_{i,m}$ and $(\sigma_f)_{i,m}$) from working CLASS 108.
- f. Sort input material list.
- g. Start loop on two-dimensional regions (k, ℓ).
Find corresponding one-dimensional region ($k\ell$).
Calculate $W_{m,k\ell}$ (Equation 3-3) and store $N_{m,k\ell}$, $(\sigma_c)_{m,k\ell}$, $(\sigma_f)_{m,k\ell}$ for each isotope m .
End loop on two-dimensional regions (k, ℓ).
- h. Edit data depending upon NOPT (19).
NOPT (19) = 1 = Print and Punch data.
NOPT (19) > 1 = Print data only.
- i. Read in regional volumes and integrated fluxes.
- j. Sort volumes and fluxes from two-dimensional scheme to one-dimensional.
- k. Print or Print and Punch volumes and fluxes in specified format.
- l. Print or Print and Punch $N_{m,k\ell}$, $(\sigma_c)_{m,k\ell}$, $(\sigma_f)_{m,k\ell}$, $W_{m,k\ell}$ in specified format.
- m. Return to calling program (BIED)

SECTION IV

CODE ENVIRONMENTA. Modular Structure

SYN is a pathologically connected collection of modules which are divided into two segments, BISYN and BICYCL. Each of these segments is further divided into links (or core loads) where each link is composed of a driver routine (sub-main) and its subordinates. Any service routines which are used by a majority of the links are loaded with the main routine so as to conserve memory and reduce load time.

The BISYN segment uses blank common rather extensively where the first 2550 locations are truly common and the remaining locations are used as a buffer. The BICYCL segment uses labeled common which is equivalenced to various areas of blank common so as to conserve memory.

The BISYN segment has essentially the same functional capabilities as cited in previous reports.^(1,2) The main routine of the BISYN segment (MNBISN) has been relegated to a subroutine status subordinate to the SYN main routine to conform to the new link structure. The following modules of the BISYN segment have been altered from the released 1108 version of August 1969:

MNBISN - Old module name was BISYN. Changed to a subroutine and added the flexibility of initially reading the burner (BICYCL) data plus the provision for cycling back from the BICYCL segment and recalculating fluxes and cross sections as requested. Also altered to include the perturbation linkage.

BGIN - Added necessary data statements to include the BICYCL input class data plus working classes for BICYCL, perturbation, BETCAL and BUMBLE routines.

SIXSYM - Old module name was BBLOK. Added necessary data statements to include the added storage caused by the changes in BGIN.

BGIP - Changes were made in the clearing of certain locations of common.

BRIN - Changes were made to add the perturbation and burner options to class 88.

BIED - Altered to include the calls for both BETCAL and BUMBLE.

BETCAL - New routine (see Section III, page 3-1).

BUMBLE - New routine (see Section III, page 3-4).

BIPUNCH - Eliminated an error in the DCE package.

BWRAP - Changed the wrapup procedure to only wrapup the first three lines (tapes files are never wrapped up).

The BISYN segment has the following functional breakdown:

LINK - LINKA (Loads below SYN)

MNBISN - This is the main routine of BISYN which controls the loading of the various links on an optional basis.

BERR - An error routine which loads the error link BISERR. All errors are processed through this routine.

BRECOV - This routine initializes the error recovery system (ERRSYS) so that a module may recover from various hardware traps.

LINK - BISGIN (Loads below LINKA)

- BGIN - A routine to process card input and provide peripheral space for each class of data.
- SIXSYM - A block data subprogram which gives the blocking factor, number of blocks assigned, etc. for each line.
- GINP - A service routine which interprets card data and writes the data in the proper class on the assigned line. Uses various other routines to transfer data, retrieve data, etc.
- VERSION - A routine to print out the version of the code that is currently being used.

LINK - BISGIP (Overlays link BISGIN)

- BGIP - Initializes some memory locations, checks for proper cross section information and clears certain arrays depending upon whether the data is overlay data or new data.
- BRIN - Transfers certain input data from peripheral to memory.
- PICOR - Prints a composition vs region map.
- INPE - Prints the input edit.

LINK - BISGEM (Overlays link BISGIP)

- BGEM - Driver routine.
- BGEOM - Calculates geometry data.
- BMACRO - Calculates macroscopic cross section data by composition.
- BHOMO - Homogenizes macroscopic cross section data for any shape function if needed and places cross section data for each solution in the proper class.

LINK - BISYNA (Overlays link BISGEM)

- BISA - Driver routine for initial and shape function solutions. Performs various data checks for negative solutions and attempts to recover.
- BDBSQ - Calculates group dependent bucking from the initial solution(s) to be used in the shape function solutions.
- BFLUX - Calculates flux coefficients and solves the diffusion equation.
- BADJT - Calculates the adjoint flux.
- DFLUX - Calculates the flux for a low or non-multiplying shape function.
- DADJT - Calculates the adjoint flux for a low or non-multiplying shape function.
- BCONV - Convergence routine for the flux and adjoint routines.

LINK - BISYNB (Overlays link BISYNA)

- BISB - Driver routine for calculating the final solution fluxes and adjoints.
- BFIN - Collapses the cross section data in the orthogonal dimension using the shape functions as weighting factors.
- CADJT - Calculates the adjoint flux for the final solution.
- NORM - Normalizes the fluxes and adjoints into shape functions.
- CFLUX - Calculates the coefficients and fluxes for the final solution.
- BCONV - Convergence routine.

LINK - BISEA (Overlays link BISYNB)

- BIEA - Driver routine for this edit series.
- SHAPE - Edits the shape functions.
- MACRO - Edits the macroscopic cross section data.
- ITRE - Edits iteration data for each solution.
- FINAL - Edits final solution fluxes and adjoints.
- FLXC - Calculates the synthesized fluxes and adjoints.

LINK - BISEB (Overlays link BISEA)

- BIEB - Driver routine for this edit series.
- IFLC - Calculates integrated fluxes by group and region.
- PWRC - Calculates power by region and power density by mesh.
- PWRE - Edits the power and volume by region plus the power density by point.
- POWC - Calculates integrated and average power densities.
- POWE - Edits integrated and average power densities.
- FLXE - Edits synthesized fluxes and adjoints.
- IFLE - Edits integrated fluxes.

LINK - BISEC (Overlays link BISEB)

- BIEC - Driver routine for this edit series.
- NBC - Neutron balance calculation.
- MBE - Material balance edit.
- NBE - Neutron balance edit.
- OGE - One group cross section edit.
- CRE - Conversion ratio edit.

LINK - BISPUN (Overlays link BISEC)

- BIPNCH - Punches card data for input to RAPFU. (6)

LINK - BISED (Overlays link BISPUN)

- BIED - Driver routine for this series of edits.
- BETCAL - Calculates and edits an effective beta.
- BUMBLE - Calculates and edits data for input to FUMBLE. (5)
- PIE - Edits perturbation integrals.
- PIEC - Calculates perturbation integrals.
- AB - Calculate point-wise data.
- GI - Calculate general volume integral.
- DI - Calculate diffusion integral.

LINK - BISWRP (Overlays link BISED)

BWRAP - Wraps up designated peripheral files on tape for later restart.

LINK - BISERR (Overlays link BISWRP)

BERS - Error routine to process diagnostic and quite.

LINK - BISPER (Overlay link BISERR)

PERTE - Processes perturbation data and acts as a main to the following links.

BSADD - Computes base addresses.

EDIT1 - Edits $\Delta K/K$ for a region or subregion.

MOVE - Moves data files as K dimension changes.

READID - Reads the class identification of a given dataset.

RENU1 - Reads and checks cross section file information.

RENU2 - Processes an isotope from the cross section file.

RESORT - Changes certain data from fixed to variable dimensions.

TRANFR - Shifts data from composition dependent to region dependent.

LINK - L1 (Loads below link BISPER)

PERST - Sets base address and positions files.

DIPERT - Calculates diffusion integral for a sub-region.

GIDI - Drives DIPERT and GIPERT.

GIPERT - Calculates general volume integral for a sub-region.

POSID - Positions and checks working class identification on peripheral storage.

LINK - L2 (Overlays link L1)

PERCLG - Driver routine for this link.

CALGRL - Branches to proper routine for calculating cross section perturbations for a region or sub-region calculation.

GIRL - Multiple entry routine whose entry point is dependent upon the type of perturbation desired.

LINK - L3 (Overlays link L2)

PERCLD - Driver routine for this link.

CALDLM - Branches to proper routine for calculating cross section perturbations for a point-wise calculation.

DLMC - Multiple entry routine whose entry point is dependent upon the type of point-wise perturbation desired.

LINK - L4 (Loads below link L3)

PEREDT - Driver routine for this link.

EDIT2 - Calculates and edits the $\Delta K/K$ values for each mesh point requested.

The BICYCL segment has the same functional capabilities as given in the BICYCL⁽⁴⁾ report. The main routine of this segment is MNBURN which is equivalent in link structure to the loading area of MNBISN (LINKB overlays LINKA). The rest of the links are loaded below MNBURN. The BICYCL segment has the following functional breakdown:

LINK - LINKB (Overlays link LINKA)

MNBURN - Driver routine for this link structure.

ØØPS - Error routine which processes all errors encountered in this segment.

LINK - LINK1 (Loads below LINKB)

PINCØR - Reads the input from peripheral storage and processes it.

LINK - LINK2 (Overlays link LINK1)

DIFFOP - Interface between BISYN data and BICYCL input data (i.e., ϕ , σ_f , σ_c , etc.).

LINK - LINK3 (Overlays link LINK2)

INIT - Does a few initial calculations and initiates the reading of the cross section file.

TROUTF - Reads the cross sections for a requested isotope.

LINK - LINK4 (Overlays link LINK3)

CONPHI - Adjusts search concentrations to meet equilibrium and to preserve the enrichment of the previous iteration.

LINK - LINK5 (Overlays link LINK4)

- GHOUL - Driver routine for a non-shuffling problem.
- FICN - Calculates isotopic concentrations and burnup as a function of time.
- AVCOMN - Calculates the regional concentrations at the beginning (N^+) and end (N^-) of a refueling interval for the non-shuffling problem.

LINK - LINK6 (Overlays link LINK5)

- SHUFF - Driver routine for a shuffling problem.
- FICN - See above.

LINK - LINK7 (Overlays link LINK6)

- TIKTOK - Driver routine for the first cycle of a first core calculation (problem type 1).
- FICN - See above.

LINK - LINK8 (Overlays link LINK7)

- PERTUR - Perturbation routine for calculating reactivity.

LINK - LINK9 (Overlays link LINK8)

- TEXT1 - Edit routine for equilibrium problem (problem type 2).

LINK - LINK10 (Overlays link LINK9)

- TEXT2 - Edit routine for the first cycle of a first core calculation (problem type 1).

LINK - LINK11 (Overlays link LINK10)

CONK - Adjusts search concentrations to meet a requested reactivity.

LINK - LINK12 (Overlays link LINK11)

BURNOP - Interface between BICYCL data and input data to BISYN.

As noted previously, BICYCL uses labeled common while BISYN uses blank common. In order to conserve memory size, it was necessary to equivalence the labeled common areas of BICYCL to blank common locations of BISYN. On the GE-635, this is a relatively simple manner as the \$ EQUATE control card has this option. The following is the common location relative to BISYN and a list of the labeled common areas which are equated to it.

<u>Location</u>	<u>Labeled Common Blocks</u>
3001	BLK1
5241	BLK3
5353	BLK4
6393	BLK6
8473	BLK9
9513	BLK10
11593	BLK13
12000	BUFFER
12657	BLK2, BLK12
14361	BLK11, BLK20, BLK21
17689	BLK15
18289	BLK17, BLK19, BLK22
22385	BLK16, BLK18
22641	BLK23

B. File Structure

The SYN file structure is composed of three main elements - line, class and record. SYN requires a total of eighteen peripheral files (other than input and output) when using both the BISYN and BICYCL segments. Each of these files consists of various classes of data which is controlled by the data statements in module BGIN. These data statements give the class number, line number, number of words per record, initial clearing value, first dimension of a two or three dimensional array, second dimension of a three dimensional array and the class name for every class that uses the NPOST - RWSBT system of Input/Output service routines.

The length of each line is dependent upon how many classes are assigned to the line and the blocking factor for the line. The block data routine SIXSYM defines a line to be either scratch (0) or read only (1), the file control character (file code), the blocking factor, the type of peripheral device (0 = disc, 1 = tape, 2 = disc), the number of blocks on the line and a variable which is initially input as zero but during execution, it will contain the number of the next block to be processed. Note, that in SYN, there is a difference of two between the line number and the file code when the line number is greater than four (i.e., line number 5 equals file code 7).

The NPOST - RWSBT system of service routines uses the above information to store and retrieve data. All writing of data, using these routines, is performed in multiples of the blocking factor. Thus, the length of each class of data is usually one block for identification purposes plus the number of records times the number of blocks per record. An array called POST or IPOST which is dimensioned three by N (where N is the number of classes) contains in the first word, the starting block on the line - the line number - the number of blocks in the class. The second word is the class identification word and the third word contains either the number of records and number of words per record or just the number of words per record. The latter case is prevalent in classes which are not input while the former is the case in classes which are input.

SYN has two special files. Line 5 (file code 7) is reserved for the input cross section file and line 6 (file code 8) is reserved for wrap-up-restart options. The cross section file is generated by the TROUT⁽⁷⁾ program and is in MUG⁽⁷⁾ format.

Table II gives the peripheral storage for each of the file codes used in SYN. The SYN system uses two tapes (07, 08) and 821,760 words of DSS270 (see Section V) peripheral storage.

TABLE II

SYN FILE STORAGE

<u>File Code</u>	<u>Blocking Factor</u>	<u>Device</u>	<u>Number of Links*</u>
1	128	Disc	25
2	128	Disc	7
3	128	Disc	7
4	128	Disc	8
7	128	Tape	-
8	1920	Tape	-
9	128	Disc	10
10	128	Disc	32
11	128	Disc	30
12	128	Disc	11
13	128	Disc	11
14	640	Disc	8
15	640	Disc	19
16	640	Disc	8
17	128	Disc	5
18	640	Disc	14
19	640	Disc	5
20	128	Disc	16

File code 5 is reserved for input only.

File code 6 is reserved for output only.

File code 43 is reserved for punched card output only.

File code 33 is reserved for alternate output.

* There are 3840 words per link.

C. Libraries Used

SYN uses the MUG formatted cross section library as stated previously plus the GE-NED standard system library.

D. Non-FORTRAN Standard Routines

NPOST-RWSBT - These routines perform all major input/output operations because of their speed, ease of use and flexibility. NPOST is the book-keeper and drives RWSBT. These routines make use of the ability of a computer to transfer data directly from memory to peripheral without using intermediate buffers. Various entries to these routines allows the user to read, write, space backwards, space forward, set the blocksize on a line, rewind, rewind with lock out (tape only), write the ID block, read the ID block (it automatically positions to the block before trying to read it), and performs various class assignments. (An all FORTRAN compatible version is available).

IDFTAP - This routine merely relates file names to file codes (ITAPA = file code 1), etc.

BANNER - This routine was designed to print a banner on remote output (different output channel than the normal "SYSOUT"). This routine may be deleted.

BITA - This routine manipulates bits. Any number of bits from one word may be inserted in any other word. A FORTRAN equivalent is available.

CASE - This routine determines the beginning and end of input data by recognizing a preset card form. It also determines if the input is overlay data (dependent case).

CHKTAP - This routine checks for a GE standard label on a tape. This routine is available as a dummy.

ERRSYS - This routine allows the program to regain control after various aborts occur. A dummy routine may replace it.

FSUP - This routine suppresses floating point zeros on output.

GINP - This Generalized Input Program processes and writes all of the class data. It also performs various data checks. Uses NIPS to interpret BCD card information and convert it to the proper binary configuration.

ISUP - This routine suppresses integer zeros on output.

LINK - A GE system routine to load a link (or core load).

LLINK - This routine differs from LINK in that the program regains control after a call to LLINK but it does not regain control after a call to LINK.

NIPS - A routine to convert a free style BCD data field into the appropriate floating point, integer or BCD form.

NFXBCD - A routine to convert a floating point number to BCD.

E. FLOW DIAGRAMS

SYN

START

LOAD BISYN
SEGMENTLINK-LINKASAVE
BISYN COMMON
AREA
(3000 LOCATIONS)LOAD BICYCL
SEGMENTLINK - LINKBRESTORE
BISYN
COMMON

SECTION V

OPERATING ENVIRONMENT

The SYN system operates under the General Electric Comprehensive Operating Supervisor (GECOS III, SDL-1). This operating environment controls two processors which utilize approximately 175 basic instructions with a fixed point add time of 1.8 microseconds. Both floating point and double precision instructions are hard-wired. The processors operate on 36-bit (single precision) or 72-bit (double precision) words.

The GE-635 has four memory modules of 32K ($K = 1024$) words connected to each memory controller. The memory cycle time is 1 microsecond for a double word fetch from memory (72 bits plus 2 parity bits).

The I/O Controller (IOC) is the device which controls all input and output from the peripheral hardware. It operates as a slave computer controlled by the processor so that I/O can be processed while the processor is busy with other chores. This ability to operate independently allows "parallel" "task" or "con" routine adaptation, i.e., an I/O order may be initiated and the IOC processes that order while the program is performing various other calculations. The NPOST-RWSBT I/O routines can operate in the "task" mode but must be synchronous (i.e., the order must be forced to completion before the data can be used). FORTRAN I/O cannot operate in the "task" mode.

The GE-635 has two IOC's, each capable of handling six high-speed channels with a maximum data transfer rate of 400 Kc (400,000 6-bit characters per second) and ten standard-speed channels with a maximum transfer rate of 25 Kc. The high-speed channels are used for discs, tapes, etc., and the standard-speed channels are used for printers, card readers, etc.

Tied to these basic modules are a number of peripheral devices. They are:

- 1) DSS270 - Disc Storage Subsystem
Sixteen units of 15.3 million 6-bit characters (2.5 million words, 650 links*). Maximum transfer rate of 333 Kc with an average access time of 26 milliseconds. They have a built-in blocking factor of 64 words.
- 2) MTH373 - Magnetic Tape Handler
Twenty-two units of eighteen million 6-bit characters per 2400-foot reel at 800 bpi with a transfer rate of 120 Kc. They have a recording speed of 150 inches per second and a rewind speed of 300 ips.
- 3) High-Speed Printer
Three printers at 1200 lines per minute with 46 of the most used characters or 940 lines per minute with all 64 standard characters. They can print 132 characters per line, 10 characters per horizontal inch, 6-8 lines per vertical inch.
- 4) Card Reader
Two card readers at 900 cards-per-minute (80 columns to a card).
- 5) Card Punch
Two card punches, one at 100 cards-per-minute and one at 300 cards-per-minute.
- 6) Datanet-30 Communications Processor
The Datanet-30 has 16 K words (18-bit) of memory with a 7 microsecond memory cycle. It can handle 4 GE-115 (remote terminals) channels and 20 teletype channels.

* There are 3840 words per link.

Figure 1 gives a schematic layout of the GE-635 computer system.

The GE-NED standard system library is quite comprehensive and much too long to be given in a report of this type. Subroutine write-ups will be sent with the released version of the code for those referenced.

FIGURE 1

SCHEMATIC OF THE GE635 COMPUTER CONFIGURATION

SECTION VI

INPUTA. Input Description

The SYN System is operational on the GE-635 and is designed to run multi-cases of data with the availability of overlay cases. Input data cards are designated by classes where each data card is broken into fixed and variable format fields. The fixed fields are Columns 1-20 and contain information pertaining to class, record and starting address for storing card data into core memory. The variable format fields are Columns 21-80 and contain the data to be input to the program in NIPS-type format. The fixed and variable field formats and the NIPS format will be discussed in Section VI-C. Special features and required or optional data are discussed below.

1. Independent Case

An independent case is one in which all input is read for that case. No data is taken from a previous case. The independent case card format is found in Section VI-C.

2. Dependent Case

For a dependent case all input is saved from the last case, either independent or dependent, and only the data to be changed need be entered in the data cards. The dependent case card format is found in Section VI-C.

3. Wrapup Feature

The Wrapup Feature enables the user to save all input data plus some working class data on a save tape and use the data at a later time. To use the WRAPUP module see the wrapup, restart card description in Section VI-C.

4. Restart Feature

The restart feature enables the user to: (1) overlay data from the original case, (2) add data to be used in later modules, or (3) rerun any desired calculations. Use of the restart feature is found in Section VI-C under the wrapup, restart card description.

4. Restart Feature (continued)

- a. The Restart Case must be an independent case with the wrapup, restart card as the only required input.
- b. Any data to be added or overlayed follow the wrapup, restart card.

5. Required and Optional Input

Card formats are described in Section VI-C.

a. Required Input

(1) IDENT CARD	- Charge information
(2) SELECT CARD	- Selects the program and assigns the peripherals.
(3) TAPE CARD(s)	- Overlays the peripheral assignments brought in by the SELECT CARD.
(4) INCODE CARD	- Transliterates IBM characters to a GE compatible set.
(5) CASE CARD	- Identifies the problem.
(6) WRAPUP-RESTART CARD	- Contains information for wrapup and restart options.
(7) CLASS CARDS	- Contains the data necessary for running the problem.
(8) 999 CARD	- Last data card.
(9) LAST CARD	- Last case card.

B. CONTROL

SYN is controlled by the GECOS III operating environment on the GE-635. The main routine (SYN) is loaded at execution time after all peripheral storage requirements have been met. The main routine then calls for LINKA to be loaded which in turn controls the loading of various other links by the input options as requested by the user.

1. File Definitions

File Code 01	- Scratch	} Those file codes are the only ones saved in the wrapup routine.
File " 02	- Scratch	
File " 03	- Scratch	
File " 04	- Scratch	
File " 05	- Input	
File " 06	- Output (SYSOUT, REMOTE or BMC)	

1. File Definitions (continued)

File Code 07	-	Cross Section Library in MUG ⁽⁵⁾ Format.
File " 08	-	Wrapup - Restart
File " 09	-	Scratch
File " 10	-	Scratch
File " 11	-	Scratch
File " 12	-	Scratch
File " 13	-	Scratch
File " 14	-	Scratch
File " 15	-	Scratch
File " 16	-	Scratch
File " 17	-	Scratch
File " 18	-	Scratch
File " 19	-	Scratch
File " 20	-	Scratch
File " 33	-	Output (SYSOUT or BMC)
File " 43	-	Punched Card Output

2. Deck Setup

A series of problems (cases) may be run, but the user should be aware of the time (6 min. of processor) and output (10,000 lines) limitations. The time limitation may be changed by inputting a LIMITS CARD after the SELECT CARD which overlays the time variable. The output limitation may be overcome by going to Bulk Media Conversion (BMC) on SYSOUT.

a. Deck Setup for Standard Run

IDENT CARD

SELECT CARD

LIMITS CARD (to overlay the processor time, optional)

TAPE CARD(s) (to define the cross section library tape,
program tape, wrapup-restart tape etc.)

INCODE CARD

CASE CARD (Independent only)

DATA CARDS

999 CARD

2. Deck Setup (continued)

a. Deck Setup for Standard Run (continued)

CASE CARD (dependent or independent)

DATA CARDS

999 CARD

LAST CARD

ENDJOB CARD

b. Deck Setup for BMC run

The deck setup for a BMC run requires only two extra cards from those given in the preceding section. They are the

- 1) TAPE CARD (to define the BMC output tape) and the
- 2) SELECT CARD (to select the BMC PRINT routine--
this card is placed after the LAST
CARD and before the ENDJOB CARD.)

3. Limitation and Errors

a. Limitations of SYN System

16 energy groups.

16 energy groups which can have an inelastic source.

8 downscatter groups from any one group.

8 regions in each dimension.

74 mesh intervals in each dimension.

40 materials in a composition.

64 compositions in a problem

120 different materials for all compositions.

2 initial solutions.

5 shape function solutions.

40 fuel types.

20 time steps (or batches) per fuel type.

5 spatial sequences per fuel type (shuffling only)

26 isotopes in burner chain.

3. Limitation and Errors (continued)b. Errors

Error numbers will be defined below. For all errors, except Number 28, the system will go to the next independent case.

<u>Number</u>	<u>Error Definition</u>
1	$0 \geq \text{IMAX} > 16$ or $0 \geq \text{NREGX} > 8$ or $0 \geq \text{NREGY} > 8$. Check starting location of Class 2 card to insure that JMAX, NREGX and NREGY were in their proper location.
2	Number of mesh points in one dimension exceeds 75. Note that the number of mesh points equals one plus the number of mesh intervals.
3	Class 88 was not input. Check deck setup and make sure that 88 was punched in columns 2 and 3.
4	$0 \geq \text{MCMAX} \geq 64$. Check to see if MCMAX is properly defined on the CLASS 2 card. Also check to see if the composition number was properly punched on the Class 5 cards.
5	Not used.
6	File name cannot be found on mounted file tape. The tape dictionary will be printed out -- check to see if your file is in this list; if it is -- check for mispunched characters i.e. ϕ 's vs 0's etc. Otherwise the wrong tape has been mounted.
7	File name read-in does not agree with file name input on data card. This is caused by a mispositioning of the tape and is probably indicative of a faulty tape.
8	IMAX input did not agree with IMAX from file tape. Check file definition.
9	A material number is negative. Check starting locations on Class 5 cards. Also check for illegal characters and blanks or commas in the data fields.

3. Limitation and Errors(continued)b. Errors (continued)

<u>Number</u>	<u>Error Definition</u>
10	More than 120 different materials have been specified in the problem.
11	No materials were specified in one of the compositions. Check Class 5 to insure that all material compositions have been specified up to and including MCMAX.
12	Two materials in the same composition have the same name. The material name is printed out. Check all compositions that have this material.
13	You requested a material which cannot be found in the cross section file. The requested material number is printed out.
14	You have met the maximum number of iterations in a particular solution. The solution number is printed out. Check input for stringent convergence criteria or erroneous material concentrations.
15	You have requested a composition in the composition map (Class 8) which is greater than MCMAX.
16-19	Not used.
20	Negative fluxes were encountered in a particular solution and either you requested this error exit or the appropriate error action was taken but the program still arrived at a negative solution.
21-24	Not used.
25	Illegal index encountered in shape function solution. You probably requested the use of a solution that has not yet been calculated -- check your Class 7 input.
26	Not used.

3. Limitation and Errors (continued)b. Errors (continued)

<u>Number</u>	<u>Error Definition</u>
27	The class in the error message could not be found -- see programmer.
28	ERRSYS error exit -- see programmer. This is probably due to faulty tapes.
29	Not used.
30	Material number in buffer does not agree with the material number expected. This is another tape mispositioning problem.

C. CARD FORMATS

Each Class Card has fixed fields (columns 1-20) and variable format fields (columns 21-80). the fixed field portion is used for identification of the input data and the location for storing the data in core memory. The variable format fields are used for the input data and follow the rules for NIPS input found later in this section. Format and description of each input card follows.

1. Control Cardsa. IDENT CARD

<u>Column</u>	<u>Content</u>
1	\$
8-12	IDENT
16-19	XXXX - charge number (i.e., P110)
20	,
21-29	AAAAA - Routing information (i.e., MDKΔSV200)
30	,
31-35	SYN

1. Control Cards (continued)

b. SELECT CARD

<u>Column</u>	<u>Content</u>
1	\$
8-13	SELECT
16-20	SYN

c. LIMITS CARD (optional)

<u>Column</u>	<u>Content</u>
1	\$
8-13	LIMITS
16-17	XX

- Where XX represents the maximum desired processor time in hundredths of an hour.

d. TAPE CARD(S)

<u>Column</u>	<u>Content</u>
1	\$
8-11	TAPE
16-17	XX
18	,
19-22	CCTT

- Where XX represents the desired file code (i.e., H*,07,06,33 or 08)

- Where CC represents the desired channel (i.e. X2 or A7 or B9 etc.) and T is the action to be taken (i.e., D = Dismount, S = Save for next activity, R = Release and C = Dismount tape, remove write ring and continue.) First disposition is for normal termination and the second disposition is used if an abort occurs.

1. Control Cards (continued)d. TAPE CARD(S) (continued)

<u>Column</u>	<u>Content</u>	
23-24	,,	
25-28	IIII	- Where IIII represents the desired reel number to be used (i.e., 7568)
29-30	,,	
31-42	12X's	- Where these X's represent the tape label.

e. INCODE CARD

<u>Column</u>	<u>Content</u>
1	\$
8-13	INCODE
16-19	IBMF

2. DATA CARDSa. Case Card

<u>Column</u>	<u>Content</u>
1	) = independent case (= dependent case
2-5	BISY
6-8	III - Where III represents the user's initials.
9	*
10-14	AAAAA - Where AAAAA represents the case identification in alphanumeric.

b. WRAPUP-RESTART CARD

This fixed format card must be the first card following each independent CASE card and contains wrapup and restart information.

b. WRAPUP-RESTART CARD (continued)

<u>Column</u>	<u>Content</u>
13-18	Wrapup case ID (6 BCD characters)
20	6
21-23	Wrapup Option, three BCD-characters as follows: = NEW (Preformat new wrapup tape) = NON or Blank (No wrapup tape provided)
43-48	Restart case ID (6 BCD characters)
50	6
51-53	Restart option, three BCD characters as follows: = YES (Restart) = NON or Blank (No restart tape provided)

c. CLASS CARDS

The following description will be the general format found on all Class cards. Rules governing NIPS style input format will also be discussed. Note: Numbers discussed in columns 1-20 must always be right justified in their respective columns.

1. General Format

<u>Column</u>	<u>Definition</u>
1-3	CLASS number
4-6	Record number
7-9	I, loading index of first value in data field (this index is either the first dimension of a multi-dimensional array or it may be the computed algorithm $I + \text{IMAX} * (J-1) + \text{IMAX} * \text{JMAX} * (K-1)$ etc.)
10-12	J, 2nd index of a two or three dimensional array.
13-15	K, 3rd index of a three-dimensional array.

16-17

Repeat option, defined as follows:

- IR Record insert: all data for this record will be inserted in record L (Col 18-20)
- IJ J insert: all values for N=J will be inserted for J=L.
- IK K insert: all values for K=K will be inserted for K=L.
- RR Record repeat: repeat this record through record L.

NOTE: The four options above cause columns 21-80 to be ignored.

- RJ J repeat: repeat the values on this card for all locations J through L.
- RK K repeat: repeat the values on this card for all locations K through L.
- RØ Record overlay: values on this card will be loaded for this record through record L.

18-20

L, termination index of option in Columns 16-17.

21-80

Input data using NIPS format.

2. NIPS Format (Variable Format)

2a. Only 20 characters have any meaning; they are:

+ - . 0 1 2 3 4 5 6 7 8 9 E H R S () \$

All other characters are interpreted as a blank, and will be denoted by the symbol Δ.

- 2b. One or more Δ 's are used to separate entities and may be in the form of a blank, comma, etc.
- 2c. Numerical data have the usual configuration.
 Integer: Δ (optional sign) (sequence of digits)
 *Floating point: Δ (optional sign) (sequence of digits with one decimal point)
 Scaled floating point: (floating point) (optional E) (sign) (sequence of digits)
- 2d. BCD (Hollerith) data must always be preceded by the number of BCD characters and an H followed by the BCD data. $\Delta 6HXXXXXX$.
- 2e. Repeat loading of a word may be accomplished by following the word with $\Delta Rnnn$ where nnn is a positive integer (not preceded by a Δ) representing the number of times the word is loaded.
- 2f. Skipping location(s) is accomplished by entering the configuration $\Delta Snnn$, where nnn is a positive integer (not preceded by a Δ) representing the number of locations to be skipped.
- 2g. Comments may be mixed with data by entering a Δ (" before the comments. Parentheses may be included within the comments; the comments are terminated by the")" which is associated (in the usual sense) with the first left parentheses . If the complete card is to be used as a comment card then columns 1-20 must be identical to either the preceding data card or the following data card so the comment card will not be rejected as an invalid input card.

*A floating point number must have a decimal point punched in the input card or it will be interpreted as an integer.

- 2h. A dollar sign will speed card conversion when only a few of the input Columns 21-80 are used on a card. The dollar sign, after the last data value on the card, will terminate the processing on the rest of the card, thereby eliminating processing of many blanks out to column 80 on the card. The dollar "\$" does not have to be preceded with a blank.
- 2i. The data in Columns 21 through 80 are interpreted (i.e., Integer, Floating, or BCD) and stored in memory according to the fixed data in columns 1 through 20. The starting location (I) is incremented by the number of values interpreted plus the number of skips or repeats.
3. CLASS Definitions
- CLASS 88
- Options for determining which modules are to be executed (must be input for every independent case). Instructions which are defined by other input, such as WRAPUP, running of portions of the edits, are set up by the code.

<u>Column</u>	<u>Content</u>
2-3	88
7-9	Starting location for loading first data value on card.
21-80	Data

Starting Location

1	$\delta_{\text{ONED}} = 0$, do not calculate one dimensional solutions.
	$\delta_{\text{ONED}} = 1$, calculate one dimensional solutions.

- 2 $\delta_{\text{EDIT}} = 0$, do not run edit modules. (Warning: This option would give you nothing more than an input edit.)
 $\delta_{\text{EDIT}} = 1$, run edit modules.
- 3 $\delta_{\text{PERT}} = 0$, do not run perturbation modules.
 $\delta_{\text{PERT}} = 1$, run perturbation modules.
- 4 $\delta_{\text{BURN}} = 0$, do not run BICYCL
 $\delta_{\text{BURN}} = 1$, run BICYCL

CLASS 2 - General Data

<u>Column</u>	<u>Content</u>
3	2
7-9	Starting location for loading first data value on card.
21-80	Data

Starting Location

- 1 File Name (BCD)
- 2 IMAX - Number of lethargy groups. (Integer)
- 3 MCMAX - Number of compositions. (Integer)
- 4 NREGX - Number of regions in the X1 direction. (Integer)
- 5 IGEOMX - Geometry indicator for X1 direction: (Integer)
 0 = Slab geometry
 1 = Cylindrical geometry.
- 6 NREGY - Number of regions in the X2 direction. (Integer)
- 7 IGEOMY - Geometry indicator for X2 direction: (Integer)
 0 = Slab geometry
 1 = Cylindrical geometry.
- 8 IDIN - Number of initial solutions. (Integer)
- 9 NSHAPE - Number of shape function solutions. (Integer)
- 10 POWER - Power in watts; (Floating Point)
 If not input, POWER = 1.0.
- 11 CRX - Geometry constant for X direction: (Floating Point)
 If not input, CRX = 1.0.
 (This is normally input as 1.0.)

- 12 CRY - Geometry constant for Y direction; (Floating Point)
If not input, CRY = 1.0.
(This is normally input as 1.0)
- 13 RZX - Distance from reference line to mesh point 1 in X
direction; (Floating Point) If not input, RZX = 0.0.
- 14 RZY - Distance from reference line to mesh point 1 in
Y direction; (Floating Point) If not input, RZY = 0.0.
- 15 IDDS - Option to homogenize the diffusion coefficients
using series or parallel averaging: (shape
function homogenization only). (Integer)
0 = series averaging,
1 = parallel averaging, If not input, IDDS=0.

The following two cards can be used for two lines of case description
on printout (optional - either or both cards)

<u>Column</u>	<u>Content</u>
3	2
8-9	20 - first line of printout.
8-9	30 - second line of printout.
21-23	57H
24-80	Data - Hollerith information anywhere within Columns 24-80.

CLASS 3 - Geometry Data

<u>Column</u>	<u>Content</u>
3	3
6	1 = Record 1 = geometry for X1 direction; 2 = Record 2 = geometry for X2 direction.
7-9	Starting location of first data value on card.
21-80	Data - $m_1, R_1, m_2, R_2, \dots, m_k, R_k$, where: m = Number of mesh <u>intervals</u> in Region k or ℓ for indicated direction, (Integer), and R = Distance from reference point to right boundary of Region k for indicated direction. (Floating Point) <u>Do not</u> count m and R as pairs for the purpose of Columns 7-9.

CLASS 4 - Buckling sets

<u>Column</u>	<u>Content</u>
3	4
7-9	i, the group number for the first buckling value on the card.
10-12	j, the buckling set number. A maximum of 20 sets is allowed.
21-80	Data - Bucklings (Floating Point)

CLASS 5 - Material numbers and their nuclear density

<u>Column</u>	<u>Content</u>
3	5
7-9	Starting location for loading first material number and its nuclear density. Maximum of 40 materials per composition is allowed.
10-12	Composition number.
21-80	Data - $m, N_m; m, N_m; \dots$ where: m = Material number, (Integer) and N_m = Nuclear density of that material. (Floating Point) <u>Do not</u> count m and N_m as pairs for columns 7-9.

CLASS 6 - Boundary condition sets

<u>Columns</u>	<u>Content</u>
3	6
7-9	i, the group number of the first value on the card.
10-12	j, the boundary condition set number. Maximum of 10 sets is allowed.
21-80	Data - Boundary condition values (Floating Point)

CLASS 7 - Flux - Adjoint Solution Data

<u>Column</u>	<u>Content</u>
3	7
7-9	i, the starting location (for this solution) of the first value on the card.
10-12	j, the solution number (numbered sequentially); a total of $IDIN + NSHAPE + 1$ solutions must be input.
21-80	Data

Starting location

- 1 IDS, Type of solution: (Integer)
 0= Multiplying region,
 1 = Non-multiplying region,
 2 = Copy (use) a previous solution.
- 2 Reference solution number, if IDS = 2 or 1. (Integer)
- 3 X; where a reference solution is used, copy fluxes
 for Groups 1 to X, and set Groups
 X + 1 to IMAX equal to Group X if IDS = 2 only. (Integer)
- 4 Left region boundary for cross-section homogenization.(Integer)
- 5 Right region boundary for cross-section homogenization.(Integer)
- 6 Maximum number of flux iterations. (Integer)
- 7 Maximum number of acceleration cycles. (Integer)
- 8 Maximum number of iterations per acceleration cycle. (Integer)
- 9 ϵ_1 , convergence criterion on Δk . (Floating point)
- 10 ϵ_2 , Convergence criterion on Fission Source. (Floating point)
- 11 γ_G , ratio of second mode buckling to first mode buckling
 in direction of calculation. (Floating point)
- 12 L, leakage probability in direction of calculation. (Floating point)
- 13-20 For initial solution(s): buckling set number to be used
 in each region. For shape function solution(s):
 initial solution (used to generate orthogonal bucklings)
 to be used in each region. For final solution: Solution number
 (shape function number + IDIN) to be used in each region. (Integers)
- 21 Boundary condition set number to be used at left boundary.(Integer)
- 22 Boundary condition set number to be used at right boundary.(Integer)
- 23 Option to save iteration data in addition to results of
 each solution (flux and adjoint): (Integer)
 0 = save results only,
 1 = save results and iteration data.
- 24 Option to check for negative total removal cross-sections:(Integer)
 0 = do not check for negative total removal,
 1 = check for negative total removal,
 2 = take course of action as indicated in Word 25 before
 entering flux solution if negative removal cross sections
 were encountered.

25

Option indicates course of action to be taken if negative fluxes are encountered (Integer). For the first initial solution when IDIN=1, 0 = error exit.

For the first initial solution when IDIN=2, 0 = run second initial solution, then error exit.

For the second initial solution:

0 = error exit,

1 = copy the first initial solution and continue.

For the first shape function solution:

0 = error exit,

1 = set all negative total removal cross-sections to 0.0 re -try solution,

2 = set those negative bucklings to 0.0 for which the removal cross section was negative and re-try solution.

For all other shape function solutions:

0 = error exit,

1 = set all negative total removal cross-sections to 0.0 and re-try solution,

2 = set those negative bucklings to 0.0 for which the removal cross section was negative and re-try solution,

3 = copy the previous shape function.

For the final solution,

0 = error exit.

CLASS 8 - Composition and Buckling Maps

<u>Column</u>	<u>Content</u>
3	8
6	1= Record 1 = Composition Map
	2= Record 2 = Buckling Map (used only if x,y geometry)

7-9 k, region number (X1 direction) for the first value on the card.

10-12 ℓ , region number (X2 direction) for the values on the card.

21-80 Data - composition numbers or buckling set numbers. (Integers)

CLASS 9 - Edit Options

<u>Column</u>	<u>Content</u>
3	9
7-9	Starting location for first value on the card.
21-80	Data (Integers)

Starting Location

1	Input Edit: 0 = do not edit, 1 = edit input.
2	Macroscopic Cross-Section Edit (δ_{MCSE}): 0 = do not edit, 1 = edit $D, \Sigma_f, v\Sigma_f, \Sigma_c, \Sigma_{er}, \Sigma_R$ for compositions indicated in CLASS 17, 2 = edit $D, \Sigma_f, v\Sigma_f, \Sigma_c, \Sigma_{er}, \Sigma_R, (\Sigma_{in})_{i \rightarrow j}$ for compositions indicated in CLASS 17.
3	Solution Result Edit (Reactivity) 0 = edit iteration summary only 1 = edit results as indicated in CLASS 7 (Location 23) (i.e., iteration data)
4	Shape Function Edit (δ_{SFE}): 0 = do not edit, 1 = edit the normalized shape functions as indicated in CLASS 18.

- 5 Final Solution Edit (δ_{FFE}):
 0 = do not edit,
 1 = edit the final solution fluxes,
 2 = edit the final solution fluxes and adjoints.
- 6 Power and Flux Normalization (δ_{PFN}):
 0 = do not normalize,
 1 = normalize power and flux over the regions indicated
 in CLASS 10.
- 7 Regional Power and Volume Edit (δ_{PKL}):
 0 = do not edit,
 1 = edit power and volume by region.
- 8 Power Density Edit (δ_{PMN}):
 0 = do not edit,
 1 = edit the power density by mesh block for columns
 indicated in CLASS 19,
 2 = edit the power density by mesh block for rows
 indicated in CLASS 19,
 3 = edit the power density for the entire mesh.
- 9 Integrated Power Density Edit (Columns and/or Rows) (δ_{PIC}):
 0 = do not edit,
 1 = integrate and average power density in the X2 direction
 for the columns indicated in CLASS 20, record 1,
 2 = integrate and average power density in the X1 direction
 for the rows indicated in CLASS 20, record 2,
 3 = integrate and average power density in both directions,
 for the columns indicated in CLASS 20, record 1 - and for
 the rows indicated in CLASS 20, record 2.
- 10 Integrated Power Density Edit (Sections) (δ_{REG})

 0 = do not edit,
 1 = integrate and average power density for the sections
 described in CLASS 21.

- 11 Synthesized Flux Edit (δ_{FE}):
0 = do not edit,
1 = edit fluxes,
2 = edit fluxes and adjoints.
- 12 Integrated Flux Edit (δ_{IFE}):
0 = do not edit,
1 = edit region integrated fluxes.
- 13 Material Balance Edit (δ_{MB}):
0 = do not edit,
1 = edit material balance for each region,
2 = edit material balance for each section described
 in CLASS 22.
- 14 Conversion Ratio and Total Breeding Ratio Edit (δ_C):
0 = do not edit,
1 = edit conversion ratio and total breeding ratio in each
 region for the materials specified in CLASS 23 (plus,
 optionally, CLASS 24).
- 15 Neutron Balance Edit (δ_{NB}):
0 = do not edit,
1 = edit neutron balance for each section described
 in CLASS 25.
2 = edit neutron balance for each region.
- 16 One Group Cross-section Edit (δ_{OGE}):
0 = do not edit,
1 = edit one group cross-sections for each region.
2 = Punch cards in RAPFU format.
- 17 Perturbation Integral Edit (δ_{PIE}):
0 = do not edit,
1 = edit perturbation integrals for each region.
- 18 Effective Beta Calculation (δ_{PBE}):
0 = do not edit,
1 = edit effective Beta data (See classes 34,35, and 36)

- 19 FUMBLE Input Data Calculation (δ_{FUM})
 0 = do not edit,
 1 = edit and punch FUMBLE data.
 2 = edit FUMBLE data only.
- 20 FUMBLE composition option (used only if Word 19 > 0)
 MCMAXP - Input maximum composition number to be edited
 or punched.

CLASS 10 - Power Normalization Indicators

<u>Column</u>	<u>Content</u>
2-3	10
7-9	k, region number (X1 direction) for the first value on the card,
10-12	ℓ , region number (X2 direction) for the values on the card.
21-80	Data - $\delta_{k,\ell}$ (Integers) 0 = region (k, ℓ) is not used. 1 = the region (K, ℓ) is used.

CLASS 11 - $D_{i,mc}$ - Macroscopic Overlay

<u>Column</u>	<u>Content</u>
2-3	11
7-9	i, group number for the first value on the card,
10-12	mc, composition where data is to be loaded.
21-80	Data (Floating Point)

CLASS 12 - $(\nu_{\Sigma f})_{i,mc}$ - Macroscopic Overlay

<u>Column</u>	<u>Content</u>
2-3	12
7-9	i, group number for the first value on the card.
10-12	mc, composition where data is to be loaded,
21-80	Data (Floating Point)

CLASS 13 - $(\Sigma_R)_{i,mc}$ - Macroscopic Overlay

<u>Column</u>	<u>Content</u>
2-3	13
7-9	i, group number for the first value on the card,
10-12	mc, composition where data is to be loaded.
21-80	Data (Floating Point)

CLASS 14 - $(\Sigma_f)_{i,mc}$ - Macroscopic Overlay

<u>Column</u>	<u>Content</u>
2-3	14
7-9	i, group number for the first value on the card.
10-12	mc, composition where data is to be loaded.
21-80	Data (Floating Point)

CLASS 15 - $(\Sigma_c)_{i,mc}$ - Macroscopic Overlay

<u>Column</u>	<u>Content</u>
2-3	15
7-9	i, group number for the first value on the card.
10-12	mc, composition where data is to be loaded.
21-80	Data (Floating Point)

CLASS 16 - $(\Sigma_{in})_{i \rightarrow j,mc}$ - Macroscopic Overlay

<u>Column</u>	<u>Content</u>
2-31	16
3-6	mc, composition where data is to be loaded,
7-9	j, the group number to which neutrons are scattered for the first value on the card.
10-12	i, the group number from which neutrons are scattered for the values on the card.
21-80	Data (Floating Point)

CLASS 17 - Compositions to be edited in Macroscopic Cross
Section Edit.

If all compositions are to be edited, this class may
be omitted.

<u>Column</u>	<u>Content</u>
2-3	17
7-9	Starting location for the first value on the card.
21-80	Data - Mc's (Integer)

Class 18 - Shape Function Edit Indicators

<u>Column</u>	<u>Content</u>
2-3	18
7-9	Starting location for the first value on the card.
21-80	Data - δ_s : (Integer) 0 = do not edit this shape function, 1 = edit flux, 2 = edit flux and adjoint, 3 = edit B^2 , 4 = edit flux and B^2 , 5 = edit flux, adjoint, and B^2 .

Class 19 - Columns or Rows of the Power Density Mesh to be Edited

<u>Column</u>	<u>Content</u>
2-3	19
7-9	Starting location of first value on the card.
21-80	Data - $ICL_1, ICR_1, ICL_2, ICR_2, \dots$ Where edit from column (row) ICL_N to ICR_N is indicated for a maximum of 8 sets (Integer). <u>Do not</u> count ICL, ICR as pairs for columns 7-9.

CLASS 20 - Data for Directional Power Density Integration

<u>Column</u>	<u>Content</u>
2-3	20
6	1 = Record 1 = Data for column integration, 2 = Record 2 = data for row integration.
7-9	Starting location within the set for the first value on the card.
10-12	Starting set number for the card.
21-80	Data - KOL, L ₁ , L ₂ , or KOW, K ₁ , K ₂ , etc. (Integer)

Starting Location

1	Column (row) number.
2	Lower limit of integration (region number).
3	Upper limit of integration (region number).

Maximum of 10 sets per record is allowed.

CLASS 21 - Data for Sectional Power Density Integration

<u>Column</u>	<u>Content</u>
2-3	21
7-9	Starting location for the first value on the card within the region description list for each section.
10-12	Region description (a maximum of 64 region descriptions per section).

13-15 Section number (a maximum of 10 sections).
 21-80 Data - $(k, \ell)_1, (k, \ell)_2, \dots$ etc. (Integer)

Starting Location

1 k, Region designation - X1 direction.
 2 ℓ , Region designation - X2 direction.

CLASS 22 - Data for Sectional Material Balance (if word 13, class 9 = 2)

<u>Column</u>	<u>Content</u>
2-3	22
7-9	Starting location for the first value on the card within the region description list for each section.
10-12	Region description number (A maximum of 64 region descriptions per section).
13-15	Section number (A maximum of 10 sections).
21-80	Data - $(k, \ell)_1, (k, \ell)_2, \dots$ etc. (Integer)

Starting Location

1 k, Region designation - X direction
 2 ℓ , Region designation - Y direction

CLASS 23 - Conversion Ratio and Total Breeding Ratio Material Numbers

<u>Column</u>	<u>Content</u>
2-3	23
7-9	Starting location within the set of the first value on the card.
10-12	Set number: 1 = Materials for numerator calculation, 2 = Materials for denominator calculation.
21-80	Data - Material numbers. (Integer)

CLASS 24 - Conversion Ratio Reference Material Data

<u>Column</u>	<u>Content</u>
2-3	24
7-9	Starting location.
21-80	Data

Starting Location

1	Material number of reference material for numerator. (Integer)
2	Material number of reference material for denominator. (Integer)
3	Decay constant for (2). (Floating Point)
4	Load factor for (2). (Floating Point)

CLASS 25 - Data for Sectional Neutron Balance (if word 15, Class 9 = 1)

<u>Column</u>	<u>Content</u>
2-3	25
7-9	Starting location for the first value on the card within the region description list for each section.
10-12	Region description number (a maximum of 64 region descriptions per section).
12-15	Section number (a maximum of 10 sections).
21-80	Data - $(k, \ell)_1, (k, \ell)_2, \dots$ etc. (Integer)

Starting Location

1	k, Region designation - X direction.
2	ℓ , Region designation - Y direction.

CLASS 34 - Data for Beta Calculation (if word 18, Class 9 = 1)

- $1 \leq I \leq 6$ - number of delay groups.
 $1 \leq J \leq \text{IMAX}$ - number of lethargy groups

<u>Column</u>	<u>Content</u>
2-3	34
7-9	Delay group index for first input value
10-12	Lethargy group number.
21-80	Data - $f_{I,J}$ (Floating Point)

CLASS 35 - Data for Beta Calculation (if word 18, Class 9 = 1)

$1 \leq I \leq 12$ - number of materials in list.

$1 \leq J \leq 10$ - Number of isotopes.

<u>Column</u>	<u>Content</u>
2-3	35
4-6	Record number = 1.
7-9	Material list index ≤ 12 .
10-12	Isotope index ≤ 10 .
21-80	Data - $ISO_{I,J}$ (Integer)

(NOTE: Material numbers given in the data field must be identical to those given in CLASS 5).

<u>Isotope Index</u>	<u>Isotope</u>
1	U-238
2	Pu-239
3	Pu-240
4	Pu-241
5	Pu-242
6	U-235
7	U-236
8	Th-232
9	U-233
10	not used at present

Records 2-11 provide for edits over specific groups of regions and are optional. If input, Record 2 is considered to be the core.

<u>Column</u>	<u>Content</u>
2-3	35
4-6	Record number $2 \leq \text{IREC} \leq 11$
7-9	Region list index of first input value.
10-12	1
21-80	Data - $(k, \ell)_1, (k, \ell)_2, \dots$ etc. (Integer)

CLASS 36 - Data for Beta Calculation (if word 18, Class 9 = 1)
This class provides for overlaying the built in values of Beta.

<u>Column</u>	<u>Content</u>
2-3	36
7-9	Delay group index of first input value
10-12	Isotope index.
21-80	Data - BETA (I,J) (Floating Point)

CLASS 37 - Data for FUMBLE Calculation (if word 19, class 9 > 0)
Data can be given for up to 13 isotopes with one record per isotope.

<u>Column</u>	<u>Content</u>
2-3	37
4-6	Record number ≤ 13 .
7-9	Material list index of first input value.
21-80	Data - $M_1, M_2, M_3, \dots$ etc. (Integer)

(NOTE: Data is output in the order of the record index i.e., the material list defines the isotope).

The previous class data was only pertinent to running the BISYN segment (except perturbation). The following class data is needed if the BICYCL segment is to be executed (Word 4 of Class 88 = 1).

CLASS 52 (Required)

<u>Column</u>	<u>Content</u>
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2-3	52
-----	----

8-9	Starting location for loading first data value on the card.
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21-80	Data
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<u>Starting Location</u>	<u>Analytic Symbol</u>	<u>Built-in Value</u>	<u>Definition</u>
1	ITYPE	0	Problem type (1 or 2) (Integer)
2	qmax	40	Number of fuel types $\leq$ 40. (Integer)
3	klmax*	64	Number of regions $\leq$ 64. (Integer)
4	nmax	20	Number of time steps $\leq$ 20. (Integer)
5	IMAX	16	Number of lethargy groups $\leq$ 16. (Integer)
6	itmax	0	Maximum number of iterations on desired burnup. (Integer).
7	ikmax	5	Maximum number of iterations on desired reactivity. (Integer).
8	iφmax	5	Maximum number of iterations on equilibrium. (Integer)

*User is cautioned to calculate klmax correctly. See class 53 where algorithm is defined.

Word	Analytic Symbol	Built-In Value	Definition
9	δ_{SH}	0	Search type indicator. (Integer) 0 = makeup 1 = recycle (Type 2 only) 2 = burnable poison search (Type 1 only)
10	δ_{shuf}	0	Shuffling indicator. (Integer) 0 = no shuffling 1 = shuffle (For Type 2 only)
11	N_{ϵ_1}	0	Switch from ϵ_2 to ϵ_3 when $i_\phi = N_{\epsilon_1}$ (Integer) (For Type 2 only)
12	N_{ϵ_2}	0	Recalculate flux and 1 group avg. cross sections every N_{ϵ_2} iterations. (Integer)
13	δ_{xs}	0	Xenon-Samarium option. (Integer) 0 = Ignore X_e and S_m 1 = X_e and S_m buildup (Equilibrium only)
14	δ_{edit}	0	Edit Option. (Integer) (See description following).
15	δ_{en}	0	Edit option. (Integer) (See description following).
16	δ_{cr}	0	Edit Option. (Integer) (See description following).
17	δ_{mcr}	0	Edit Option. (Integer) (See description following).
18	k_{TEST}	1.0	Desired reactivity. (Floating Point)
19	$\bar{B}$	0.0	Desired average burnup (MWD/ T_e) (Floating Point)
20	Δt	0.0	Time interval (days) (Floating Point)
21	ϵ_1	0.0	Convergence criterion on desired average burnup. (Floating Point).

22	ϵ_2	1.0E-4	Convergence criterion on desired reactivity. (Floating Point)
23	ϵ_3	0.0	Convergence criterion on desired reactivity. (Floating Point) (When $i_\phi = N\epsilon_1$ switch from ϵ_2 to ϵ_3)
24	F	0.0	Plant load factor. (Floating Point)
25	ΔNI	0.05	Initial guess on reactivity response to concentration. (Floating Point)

Edit Options

a. $\delta_{edit}=0$

Problem Type 2

Edit the following quantities after the last iteration on equilibrium:

- (1) c Number of iterations on equilibrium.
- (2) (K^+) Reactivity at the beginning of a refueling interval (latest value).
- (3) (K^-) Reactivity at the end of a refueling interval (latest value).
- (4) $D_{q,n}$ Total burnup (MWD/Te) of each fuel type at every time step $1 \leq n \leq n_q$
 $1 \leq q \leq q_{max}$
- (5) BC Average burnup over specified fuel types at discharge (MWD/Te)
- (6) Δt Operating interval (in days).
- (7) $(NO)_{m,q}$ Total initial concentration of each isotope in each fuel type
 $1 \leq m \leq 26$
 $1 \leq q \leq q_{max}$
- (8) $(NM)_{m,q}$ Initial makeup concentration of each isotope in each fuel type
 $1 \leq m \leq 15$
 $1 \leq q \leq q_{max}$
- (9) $(NR)_{m,q}$ Initial recycle concentration of each isotope in each fuel type.
 $1 \leq m \leq 15$
 $1 \leq q \leq q_{max}$

(10) $(ND)_{m,q}$ Initial density preserving concentration in each fuel type.

$$\begin{aligned} 1 &\leq m \leq 21 \\ 1 &\leq q \leq q_{\max} \end{aligned}$$

(11) $(EO)_{m,q}$ Initial enrichment of each isotope in each fuel type

$$\begin{aligned} 1 &\leq m \leq 21 \\ 1 &\leq q \leq q_{\max} \end{aligned}$$

(12) $(N)_{m,n,q}$ Concentration of each isotope in each fuel type for each step

$$\begin{aligned} 1 &\leq m \leq 26 \\ 1 &\leq n \leq n_{\max} \\ 1 &\leq q \leq q_{\max}. \end{aligned}$$

=1 Edit Items (1) through (12) after each iteration on reactivity.

=2 Edit after each iteration on reactivity, Items (1) through (11) and replace Item 12 with

$N_{k\ell}^{m,n}$ Concentration of each isotope in each region for each step

$$\begin{aligned} 1 &\leq m \leq 26 \\ 1 &\leq n \leq n_{\max} \\ 1 &\leq k\ell \leq k\ell_{\max} \end{aligned}$$

b. $\delta_{en}=1$

Edit the following quantities after the last iteration an equilibrium:

(1) $(NA)_{m,q}$ Average concentration of each isotope in each fuel type

$$\begin{aligned} 1 &\leq m \leq 26 \\ 1 &\leq q \leq q_{\max} \end{aligned}$$

- (2) $(EA)_{m,q}$ Average enrichment of each isotope in each fuel type

$$1 \leq m \leq 21$$

$$1 \leq q \leq q_{\max}$$

- (3) $(NF)_{m,q}$ Final concentration of each isotope in each fuel type

$$1 \leq m \leq 26$$

$$1 \leq q \leq q_{\max}$$

- (4) $(EF)_{m,q}$ Final enrichment of each isotope in each fuel type

$$1 \leq m \leq 21$$

$$1 \leq q \leq q_{\max}$$

= 0

c. $\delta_{cr} = 1$

Bypass these edits.

Edit the following quantities after the last iteration on equilibrium:

- (1) ICR_q Instantaneous conversion ratio for each fuel type

$$1 \leq q \leq q_{\max}$$

- (2) IBR_q Instantaneous breeding ratio for each fuel type

$$1 \leq q \leq q_{\max}$$

- (3) IBR Total instantaneous breeding ratio.

= 0

d. $\delta_{mcr} = 1$

Bypass these edits.

Edit the following:

- (1) MCR_q Mass conversion ratios for each fuel type

$$1 \leq q \leq q_{\max}$$

- (2) MCR Total maxx conversion ratio.

a. $\delta_{edit} = 0$

Problem Type 1

Edit the following quantities after the last iteration on reactivity.

- (1) i Number of iterations on reactivity.
- (2) k_n Reactivity for each time step
 $1 \leq n \leq n_{\max}$
- (3) t_n Time (in days) for each time step.
 $1 \leq n \leq n_{\max}$
- (4) $B_{q,n}$ Total burnup (MWD/Te) for each fuel type and each time step
 $1 \leq q \leq q_{\max}$
 $1 \leq n \leq n_{\max}$
- (5) BC Average burnup over specified fuel types at the end of all steps (MWD/Te).
- (6) $(NO)_{m,q}$ Total initial concentration of each isotope in each fuel type
 $1 \leq m \leq 26$
 $1 \leq q \leq q_{\max}$
- (7) $(NM)_{m,q}$ Initial makeup concentration of each isotope in each fuel type
 $1 \leq m \leq 15$
 $1 \leq q \leq q_{\max}$
- (8) $(ND)_{m,q}$ Initial density preserving concentration of each isotope in each fuel type
 $1 \leq m \leq 21$
 $1 \leq q \leq q_{\max}$
- (9) $(EO)_{m,q}$ Initial enrichment of each isotope in each fuel type
 $1 \leq m \leq 21$
 $1 \leq q \leq q_{\max}$
- (10) $(N)_{m,n,q}$ Concentration of each isotope in each fuel type for each time step
 $1 \leq m \leq 26$
 $1 \leq n \leq n_{\max}$
 $1 \leq q \leq q_{\max}$

=1 Edit Items (1) through (10) after each iteration on reactivity.

=2 Edit, after each iteration on reactivity, Items (1) through (9) and replace Item (11) with:

$N_{k\ell}^{m,n}$ Concentration of each isotope in each region for each time step

$$\begin{aligned} 1 &\leq m \leq 26 \\ 1 &\leq n \leq n_{\max} \\ 1 &\leq k_{\ell} \leq k_{\ell\max} \end{aligned}$$

b. δ_{en} Same as for Problem Type 2

c. δ_{cr} Same as for Problem Type 2

d. δ_{mer} Same as for Problem Type 2

CLASS 53 (Required) Built-in value: 0

Fuel Type for each region, k_{ℓ}

$$1 \leq k_{\ell} \leq 64$$

<u>Column</u>	<u>Content</u>
2-3	53
8-9	Starting location for loading data
21-80	Data (Integer)

Region k_{ℓ} must match region (K,L) in BISYN and is found by using the algorithm

$$k_{\ell} = 8 * (L-1) + K$$

Where K is the horizontal region index (X1 direction) and L is the vertical region index (X2 direction).

CLASS 54 (Optional*) Built-in value: 0.0 (If not input)

Initial makeup concentration for isotope m in fuel type q

$$1 \leq m \leq 15$$

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	54
8-9	Isotope number (1st Index)
11-12	The fuel type number (2nd index)
21-80	Data - concentrations $(NM)_{m,q}$ (Floating Point)

CLASS 55 (Required) Built-in value: 0.0 (If not input)

Initial density concentration for isotope m in fuel type q

$$1 \leq m \leq 15$$

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	55
8-9	Isotope number (1st index)
11-12	The fuel type number (2nd index)
21-80	Data - concentrations $(ND)_{m,q}$ (Floating Point)

CLASS 56 (Optional*) Built-in value: 0.0 (If not input)

Initial recycle concentration for isotope m in fuel type q.

$$1 \leq m \leq 15$$

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	56
8-9	Isotope number (1st index)
11-12	The fuel type number (2nd index)
21-80	Data - concentrations $(NR)_{m,q}$ (Floating Point)

CLASS 57 (Optional*) Built-in value: 0.0 (if not input)

Initial burnable poison concentration for isotope m' in fuel type q

$$1 \leq m' \leq 5$$

corresponding to

$$22 \leq m \leq 26$$

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	57
8-9	Isotope number (1st index)(where m' = 1 corresponds to m = 22, etc.)
11-12	Fuel type number (2nd index)
21-80	Data - concentrations - $(NB)_{m,q}$ (Floating Point)

CLASS 58 (Required) Built-in value: 0

Material number for each isotope m in each fuel type q

$$1 \leq m \leq 26$$

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	58
8-9	Isotope number (1st index)
11-12	Fuel type number (2nd index)
21-80	Data - material numbers (from BISYN Class 5) (Integer)

*At least one of classes 54, 56, or 57 must be input.

NOTE: Bisyn's Input Class 5 must contain all the material numbers shown in Class 58 for every region assigned to fuel type q even though the density may be zero.

CLASS 59 (Optional) Built-in value: 0 (If not input)

Indicator for each fuel type q, whether or not this fuel type is used to calculate average burnup, BC.

$$1 \leq q \leq 40$$

0 = not used
1 = used

<u>Column</u>	<u>Content</u>
2-3	59
8-9	Starting location for first value on card
21-80	Data (Integer)

CLASS 60 (Optional) This class provides the overlay capability for the standard isotopic data (Table III)

1st set of 26 words overlays the atomic mass for isotopes 1 thru 26.

2nd set of 26 words overlays the fission energy for isotopes 1 thru 26.

3rd set of 26 words overlays the Xenon fission yield in fractions of fissions.

4th set of 26 words overlays the Samarium fission yield in fractions of fissions.

5th set of 26 words overlays the decay constant.

Contains a maximum of 26 x 5 words.

<u>Column</u>	<u>Content</u>
2-3	60
8-9	The isotope number (1 st index)
12	The set number (2 nd index)
21-80	Data - overlay's for set N. (floating point)

TABLE III
STANDARD ISOTOPIC DATA

Isotope Index, m	Physics Symbol	A_m (amu)	$(FE)_m$ (Mev/fission)	X_m	Y_m	λ_m (sec ⁻¹)
1	Th ²³²	232	197	.055	.00705	-
2	Pu ²³³	233	197	.055	.00705	2.9279x10 ⁻⁷
3	U ²³³	233	198	.060	.00979	-
4	U ²³⁴	234	198	.055	.00705	-
5	U ²³⁵	235	200	.064	.0183	-
6	U ²³⁶	236	200	.055	.00705	-
7	Np ²³⁷	237	200	.064	.0183	-
8	U ²³⁸	238	202	.060	.0355	-
9	Np ²³⁹	239	202	.060	.0355	3.4432x10 ⁻⁶
10	Pu ²³⁹	239	206	.072	.0256	-
11	Pu ²⁴⁰	240	206	.060	.0355	-
12	Pu ²⁴¹	241	208	.065	.0230	1.665x10 ⁻⁹
13	Pu ²⁴²	242	208	.060	.0355	-
14	Am ²⁴³	243	208	.072	.0256	-
15	Am ²⁴¹	241	208	.072	.0256	-
16	FPA-1	-	-	-	-	-
17	FPA-2	-	-	-	-	-
18	FPA-3	-	-	-	-	-
19	FPA-4	-	-	-	-	-
20	X _e	-	-	-	-	2.10888x10 ⁻⁵
21	Sm	-	-	-	-	-
22	BP-1	-	-	-	-	-
23	BP-2	-	-	-	-	-
24	BP-3	-	-	-	-	-
25	BP-4	-	-	-	-	-
26	BP-5	-	-	-	-	-

CLASS 61 (Required if $\delta_{shuf} = 0$ when running Problem Type 2.)

This class consists of 4 records.

a. Record 1: δ_q , indicator for one of the 3 following modes of burnup:
 Built-in value of 1 (if not input)

0 = meet burnup, B_q

1 = burn n_q cycles

2 = burn same number of cycles as fuel type τ_q .

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	61
6	1
8-9	Starting location for loading data
21-80	Data - δ_q (Integer)

b. Record 2: Burnup for fuel type q (must be input if $\delta_q = 0$)

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	61
6	2
8-9	Starting location for loading data
21-80	Data - B_q (Floating Point)

- c. Record 3: Number of cycles for fuel type q (must be input if $\delta_q = 1$)

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	61
6	3
8-9	Starting location for loading data
21-80	Data - N_q (Integer)

- d. Record 4: Burn same number of cycles as fuel type τ_q (must be input if $\delta_q = 2$)

<u>Column</u>	<u>Content</u>
2-3	61
6	4
8-9	Starting location for loading data
21-80	Data - τ_q (Integer)

CLASS 62 (Required if $\delta_{\text{shuf}} = 1$ and ITYPE = 2) Built-in value: 0

This class has a maximum of 40 records, each containing the spatial shuffling sequence for each fuel type. Each record may have a maximum of $2 \times 20 \times 5$ words. The data is given in sets of two as $(k\ell, nk\ell)_k$ where $k\ell$ is the region number and $nk\ell$ is the number of operating cycles for which the fuel resides in this region in step k of spatial sequence sq .

$$\begin{aligned} 1 &\leq k \leq 20 \\ 1 &\leq sq \leq 5 \end{aligned}$$

- Each region in fuel type q must appear in one and only one spatial sequence.
- All regions in a spatial sequence which have the same $nk\ell$ value must have the same volumes.
- Regions in a spatial sequence which have different values of $nk\ell$ must have volumes which differ by the same ratio as do the $nk\ell$ values.

- d. The total number of operating cycles obtained by summing the n_k for a spatial sequence must be the same for all spatial sequences in a fuel type, and must be ≤ 20 .

<u>Column</u>	<u>Content</u>
2-3	62
5-6	Fuel type number
9	1 = Region for the first k value on the card 2 = Number of operating cycles for this region.
11-12	Step k for the first sequence value appearing on the card.
15	Sequence number.
21-80	Data - Region number, followed by number of operating cycles, for step k of spatial sequence sq. (Integer)

CLASS 63 (At least 1 record is required if ITYPE=2)

Built-in value: 0.0.

This class has a maximum of 40 records, one for each fuel type. It contains the fraction of isotope m recycled from fuel type q' to fuel type q. Therefore each record may contain a maximum of 15 x 40 words.

$$\sum_{q=1}^{q_{\max}} (\Gamma_m)_{q',q} \text{ must be } \leq 1.0 \text{ for each } 1 \leq m \leq 15,$$

$$1 \leq q' \leq q_{\max}.$$

<u>Column</u>	<u>Content</u>
2-3	63
5-6	Fuel type number
8-9	Isotope number for first value of q' appearing on the card.
11-12	Number of contributing fuel type, q'
21-80	Data - Recycle fraction. $(F_m)_{q',q}$ (Floating Point)

CLASS 64 (Optional) Built-in value: 1

This class has a maximum of 40 records, one for each fuel type. Each record may contain a maximum of 15 x 40 words, indicating whether $(F_m)_{q',q}$ may be adjusted if needed.

0 = do not adjust
1 = adjust

<u>Column</u>	<u>Content</u>
2-3	64
5-6	Fuel type number.
8-9	Isotope number for first value of q' appearing on the card.
11-12	Number of contributing fuel type, q'
21-80	Data - indicator (0 or 1). (Integer)

CLASS 65 (Optional) Built =in value: 0.001 (if not input)

Convergence criterion on equilibrium, for each isotope m in each fuel type q

$$1 \leq m \leq 26$$

$$1 \leq q \leq 40$$

<u>Column</u>	<u>Content</u>
2-3	65
8-9	Isotope number (1 st index)
11-12	Fuel type number (2 nd index)
21-80	Data -- convergence criterion $(\Delta N)_{m,q}$ (Floating Point)

d. 999 Card - Last data card in case

<u>Column</u>	<u>Content</u>
1-3	999

The combined BISYN-BICYCL input data is considered to be one case. If the perturbation option is requested (word 3, class 88 = 1), then the perturbation data must be input as a dependent case (see Section V-2-a for a description of a dependent case card) immediately following the class 999 card of the BISYN-BICYCL case.

The perturbation module has its own reading procedure so that while the following cards are called class cards (they have the same type of format) they have no relation whatsoever to the class structure of BISYN-BICYCL.

A perturbation run must be initiated by a dependent case card. For each $\delta k/k$ calculation, the input will be terminated by a class 666 card with the last $\delta k/k$ calculation terminated by a class 999 card.

Class 30 - Must be the first card following the case card; thereafter, it will be input following a Class 666 card. The format of the Class 30 card will be described for the region, sub-region, and pointwise perturbation.

Class 30 - Regionwise perturbation.

Columns 30 - Content

2-3	30
6	1
21-80	File name (BCD). If user wants to perturb materials in a cross section file different from the file input from BISYN's Class 2, enter new file name. If file name is not to be changed, enter the characters "S1" or leave blank.

Class 30 - Sub-region perturbation.

Columns Content

2-3	30
6	2
21-80	Data

Starting Location Contents

1	File name (BCD). If user wants to perturb materials in a cross section file different from the file input from BISYN's Class 2, enter new file name. If file name is not to be changed, enter the characters "S1".
---	--

<u>Starting Location</u>	<u>Contents</u>
2	M1, first mesh point for perturbing mesh interval M1 to M2 in the X1 dimension. (Integer)
3	M2, last mesh point for perturbing mesh interval M1 to M2. M1 and/or M2 mesh points can be on a region boundary, but the mesh interval M1 to M2 can not cross a region boundary. Also note that M2 must be greater than M1. (Integer)
4	N1, first mesh point for perturbing mesh interval N1 to N2 in the X2 dimension. (Integer)
5	N2, last mesh point for perturbing mesh interval N1 to N2. (Integer)
	N1 and/or N2 mesh points can be on a region boundary, but the mesh interval N1 to N2 can not cross a region boundary. Also note that N2 must be greater than N1. (Integer)

Class 30 - Pointwise perturbation.

<u>Columns</u>	<u>Contents</u>
2-3	30
6	3
17-18	Mesh point coordinate indicator. X1 = mesh points in the X1 dimension will be perturbed by columns. X2 = mesh points in the X2 dimension will be perturbed by rows. XX = All mesh points will be perturbed.
21-80	Data

Starting LocationContents

1	File name (BCD). If user wants to perturb materials in a cross-section file different from the file input from BISYN's Class 2, enter new file name. If file name is not to be changed, enter the characters "S1".
2-80	Not applicable if Columns 17-18 equal "XX".
2-80	If Columns 17-18 equal "X1", enter the mesh points in the X1 dimension which are to be perturbed by columns. (Integer)
2-80	If Columns 17-18 equal "X2", enter the mesh points in the X2 direction which are to be perturbed by rows. (Integer)
	Enter as many Pointwise perturbation Class 30 cards as needed to define the problem.

The following is the general format of all perturbation class input.

ColumnsContents

1-3	Class Number
4-6	Material number to be perturbed. Leave blank if not applicable.
7-9	Lethargy group index of first input value.
10-12	Downscattering group index of first input value.
13-14	Region number to be perturbed in the X1 dimension. May be left blank if the problem is not a region perturbation (k).

<u>Columns</u>	<u>Contents</u>
15-16	Region number to be perturbed in the X2 dimension. May be left blank if the problem is not a region perturbation. (ℓ)
17-18	KJ = The perturbation data entered on this card will be repeated for regions, k through k' in the X1 dimension (see columns 19-20). LJ = The perturbation entered on this card will be repeated for regions ℓ thru ℓ' in the X2 dimension.
****	NOTE: An "LJ" repeat is suggested whenever a choice is possible due to data handling characteristics.
19-20	Region number repeat stop (k' or ℓ'): The region repeat started by an entry in Columns 17-18 will be terminated at the region number entered in these columns.

The following class cards do not reiterate the usage of columns 17 through 20 as these columns are general and may be applied to any card.

Class 31 - $\delta(N_m)_{k,\ell}$

<u>Columns</u>	<u>Contents</u>
2-3	31
4-6	m, Material number to be perturbed.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in nuclear density for Material m and Region, k, ℓ (Floating Point)

CLASS 32 - $\delta(\sigma_{tr})_{m,i,\ell,k}$

<u>Columns</u>	<u>Contents</u>
2-3	32
4-6	m, Material number to be perturbed.
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in σ_{tr} for Material m, Group(s) i, and Region k, ℓ (Floating Point)

CLASS 33 - $\delta(\sigma_f)_{m,i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	33
4-6	m, Material to be perturbed.
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (σ_{er}) for Material m, Group(s) i, and Region k, ℓ . (Floating Point)

CLASS 34 - $\delta(\sigma_c)_{m,i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	34
4-6	m, Material number to be perturbed.
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in σ_c for Material m, Group(s) i, and Region k, ℓ . (Floating Point)

CLASS 35 - $\delta(\sigma_{er})_{m,i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	35
4-6	m, Material number to be perturbed.
8-9	i, Lethargy group index of first input value
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (σ_{er}) for Material m, Group (s) i, and Region k, ℓ . (Floating Point)

CLASS 36 - $\delta(\sigma_{in})_{m,i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	36
4-6	m, Material number to be perturbed.
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (σ_{in}) for Material m, Group(s), i, and Region k, ℓ . (Floating Point)

CLASS 37 - $\delta(\sigma_{sh})_{m,i,\ell,k}$ (only used for materials 990-999)

<u>Columns</u>	<u>Content</u>
2-3	37
4-6	m, Material number to be perturbed.
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (σ_{sh}) for Material m, Group(s) i, and Region k, ℓ . (Floating Point)

CLASS 38 - $\delta(v\sigma_f)_{m,i,\ell,k}$

<u>Columns</u>	<u>Contents</u>
2-3	38
4-6	m, Material number to be perturbed.
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in $(v\sigma_f)$ for Material m, Group(s) i, and Region k, ℓ . (Floating Point)

CLASS 39 - $\delta(\sigma_{in})_{m,i,j,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	39
4-6	m, Material number to be perturbed.
8 9	i, Lethargy group index.
11-12	j, Down scattering group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (σ_{in}) for Material m, Groups i,j, and Region k, ℓ . (Floating Point)

CLASS 40 - $\delta(D)_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	40
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (D) for Group(s) i and Region k, ℓ . (Floating Point)

CLASS 41 - $\delta(\Sigma_f)_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	41
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (Σ_f) for Group(s) i and Region k, ℓ .(Floating Point)

CLASS 42 - $\delta(\Sigma_c)_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	42,
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (Σ_c) for Group(s) i and Region k, ℓ .(Floating Point)

CLASS 43 - $\delta(\Sigma_{er})_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	43
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (Σ_{er}) for Group(s) i and Region k, ℓ .(Floating Point)

CLASS 44 - $\delta(\Sigma_{in})_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	44
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (Σ_{in}) for Group(s) i and Region k, ℓ .(Floating Point)

CLASS 45 - $\delta(\Sigma_{SG})_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	45
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (Σ_{SG}) for Group(s) i and Region k, ℓ . (Floating Point)

CLASS 46 - $\delta(v\Sigma_f)_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	46
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in $(v\Sigma_f)$ for Group(s) i and Region k, ℓ .(Floating Point)

CLASS 47 - $\delta(\chi)_{i,k,\ell}$

<u>Columns</u>	<u>Content</u>
2-3	47
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (χ) for Group(s) i and Region k, ℓ . (Floating Point)

CLASS 48 - $\delta(B^2)_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	48
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (B^2) for Group(s) i and Region k, ℓ . (Floating Point)

CLASS 49 - $\delta(\Sigma_{in})_{i,j,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	49
8-9	i, Lethargy group index.
11-12	j, Down scattering group of first input value.
13-14	k, Region number to be perturbed in the X1 dimension.
15-16	ℓ , Region number to be perturbed in the X2 dimension.
21-80	Data, Change in (Σ_{in}) for Group(s) i,j and Region k, ℓ . (Floating Point)

CLASS 50 - $\delta(\Sigma_{tr})_{i,\ell,k}$

<u>Columns</u>	<u>Content</u>
2-3	50
8-9	i, Lethargy group index of first input value.
13-14	k, Region number to be perturbed in the X1 direction.
15-16	ℓ , Region number to be perturbed in the X2 direction.
21-80	Data, Change in (Σ_{tr}) for Group(s) i and Region k, ℓ . (Floating Point)

CLASS 666 - This card will terminate reading of input and initiate a $\delta k/k$ calculation.

<u>Columns</u>	<u>Content</u>
1-3	666
4-80	Blank

Class 999 - Must be the last card in the perturbation case. This card can also be used to terminate reading of data for the last $\delta k/k$ calculation in the perturbation case.

<u>Columns</u>	<u>Content</u>
1-3	999
4-80	Blank

LAST Card - last card after all cases.

<u>Columns</u>	<u>Content</u>
1	)
2-5	LAST
9	*
10-80	Blank

f. SELECT CARD (Optional for BMC Print)

<u>COLUMN</u>	<u>Content</u>
1	\$
8-13	SELECT
16-23	BMCPRINT

g. ENDJOB CARD

<u>COLUMN</u>	<u>CONTENT</u>
1	\$
8-13	ENDJOB

START OF CASE 1B1SY

022670 0151.4

XX

THIS VERSION OF SYN IS DESIGNATED (VERSION A) EFFECTIVE DATE = NOVEMBER 1, 1969

XX

GEAP-13612

7	1	13	4	1	0	1	2	2	2	2	S3	1	2	0	1	0												
7	1	1	5	1	0	0	S2	3	3	30	2	4	1.0-4	1.0-2	9.0	0.25												
7	1	13	5	1	0	1	2	2	2	2	S3	1	2	0	1	0												
7	1	1	6	1	0	2	5	3	4	4																		
7	1	1	7	1	0	0	S4	30	2	4	1.0-4	1.0-2	5.2691	0.19														
7	1	13	7	1	0	3	4	5	6	6	6	S2	1	2	0	1	0											
8	1	1	1	1	0	1	2	3	13	17	21																	
8	1	1	2	1	0	4	7	10	14	18	21																	
8	1	1	3	1	0	5	8	11	15	19	21																	
8	1	1	4	1	0	6	9	12	16	20	21																	
8	1	1	5	1	0	21	21	21	21	21	21																	
9	1	1	1	1	0	1	0	0	0	0	1	0	0	0	1	0	1	1										
10	1	1	1	1	0	1	1	1	1	1	0																	
10	1	1	2	1	0	1	1	1	1	1	0																	
10	1	1	3	1	0	1	1	1	1	1	0																	
10	1	1	4	1	0	1	1	1	1	1	0																	
10	1	1	5	1	0	0	0	0	0	0	0																	
23	1	1	1	1	0	284	283	287	288	404	403	400																
23	1	1	2	1	0	250	494	493	490	410																		
52	1	1	1	1	0	2	20	29	4	4	0	4	7	1	0	0	0	0	1	1	1	1	0	0	0			
52	1	20	1	1	0	365.0	0.0	1.0-3	0.0	0.6	0.05																	
53	1	1	1	1	0	1	2	3	13	17	3	4	7	10	14	18	S3	5	6	11	15	19	S3	6	9	12	16	20
54	1	10	1	1	0	1.53-4	6.68-5	3.16-5	8.29-6																			
54	1	10	2	1	3	2.11-4	9.19-5	4.36-5	1.14-5																			
55	1	8	1	1	0	7.23-3																						
55	1	10	2	1	3	6.77-3																						
55	1	5	1	1	12	3.00-5	S2	1.007-2																				
55	1	5	13	1	20	4.00-5	S2	1.226-2																				
56	1	10	1	1	0	6.11-4	2.58-4	1.26-4	3.32-5																			
56	1	10	2	1	3	8.42-4	3.88-4	1.74-4	4.58-5																			
58	1	8	1	1	0	284	280	494	404	410	420	001	R6															
58	1	8	2	1	3	283	280	493	403	410	420	001	R6															
58	1	9	1	1	12	250	260	001	280	280	490	400	410	420	001	R6												
58	1	9	13	1	20	250	260	001	280	280	490	400	410	420	001	R6												
59	1	1	1	1	0	1	R3																					
60	1	9	1	1	0	1.0-10																						
61	1	1	1	1	0	1	R20	5																				
61	1	1	1	1	0	2	2	3	2	R6	3	R3	4	R8														
63	1	10	1	1	20	0.3904	R6																					
63	2	10	1	1	20	0.1852	R6																					
63	3	10	1	1	20	0.2489	R6																					
64	1	1	1	1	20	0	R9	1	R4	0	R2																	
64	1	1	1	1	3																							
64	4	1	1	1	20	0	R15																					
64	4	1	1	1	20																							
999	1	1	1	1	0																							

COMPLETED 061N

GEAP136322

FLUX SOLUTION FOR TYPICAL LMFBR DESIGN
TO BE USED IN BYCYCL CALCULATION

INPUT EDIT

PROBLEM DESCRIPTION

NAME OF CROSS SECTION FILE	SYN04
NUMBER OF LETHARGY GROUPS	4
MAXIMUM GROUP NUMBER HAVING INELASTIC SOURCE	4
MAXIMUM NUMBER OF GROUPS ANY ONE GROUP CAN DOWNSCATTER	2
NUMBER OF COMPOSITIONS	21
POWER (WATTS)	1,25000E 09
NUMBER OF INITIAL SOLUTIONS	2
NUMBER OF SHAPE FUNCTION SOLUTIONS	4
WRAPUP	NON

GEOMETRY DATA

	X DIRECTION	Y DIRECTION
NUMBER OF REGIONS	6	5
GEOMETRY TYPE	CYLINDER	SLAB
GEOMETRY DEPENDENT CONSTANT	1.00000E 00	1.00000E 00
RADIUS TO FIRST LINE	0.	0.
NUMBER OF MESH INTERVALS IN REGION 1	30	19
MESH WIDTH (CM)	2.90000E 00	2.00000E 00
RADIUS TO RIGHT BOUNDARY (CM)	8.70000E 01	3.60000E 01
NUMBER OF MESH INTERVALS IN REGION 2	6	6
MESH WIDTH (CM)	2.30884E 00	2.16667E 00
RADIUS TO RIGHT BOUNDARY (CM)	1.06893E 02	5.10000E 01
NUMBER OF MESH INTERVALS IN REGION 3	12	6
MESH WIDTH (CM)	1.92891E 00	2.16667E 00
RADIUS TO RIGHT BOUNDARY (CM)	1.24000E 02	6.40000E 01
NUMBER OF MESH INTERVALS IN REGION 4	6	6
MESH WIDTH (CM)	2.26923E 00	2.16667E 00
RADIUS TO RIGHT BOUNDARY (CM)	1.37815E 02	7.70000E 01
NUMBER OF MESH INTERVALS IN REGION 5	6	5
MESH WIDTH (CM)	2.06410E 00	6.00000E 00
RADIUS TO RIGHT BOUNDARY (CM)	1.50000E 02	1.07000E 02
NUMBER OF MESH INTERVALS IN REGION 6	5	
MESH WIDTH (CM)	6.00000E 00	
RADIUS TO RIGHT BOUNDARY (CM)	1.80000E 02	

GEAR-13672

COMPOSITION MAP

1	2	3	13	17	21
4	7	1	14	18	21
5	8	11	15	19	21
6	9	12	16	20	21
21	21	21	21	21	21

52

***** COMPOSITION 1 *****

1	4.93000E-04	108	1.70000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	260	1.00000E-20	280	1.00000E-20	284	6.62000E-03	285	1.00000E-20
404	3.77000E-04	410	1.14000E-04	420	4.72000E-05	494	8.42000E-04		

***** COMPOSITION 2 *****

1	4.88000E-04	108	1.70000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	260	1.00000E-20	273	2.10000E-04	280	1.00000E-20	283	6.20000E-03
285	1.00000E-20	403	5.10000E-04	410	1.69000E-04	420	6.54000E-05	493	1.05000E-03

***** COMPOSITION 3 *****

1	4.88000E-04	108	1.70000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	260	1.00000E-20	273	2.10000E-04	280	1.00000E-20	283	6.20000E-03
285	1.00000E-20	403	5.10000E-04	410	1.69000E-04	420	6.54000E-05	493	1.05000E-03

***** COMPOSITION 4 *****

1	1.17000E-04	108	2.02000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	260	2.14000E-05	280	2.25000E-06	280	1.00000E-20	285	1.00000E-20
287	9.66000E-03	400	1.43000E-05	410	4.40000E-07	420	1.14000E-08	490	3.34000E-04

***** COMPOSITION 5 *****

1	7.06000E-05	108	2.02000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	250	2.29000E-05	280	1.97000E-06	280	1.00000E-20	285	1.00000E-20
287	9.76000E-03	400	9.92000E-06	410	2.65000E-07	420	5.68000E-09	490	2.74000E-04

***** COMPOSITION 6 *****

1	4.09000E-05	108	2.02000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	250	2.44000E-05	280	1.67000E-06	280	1.00000E-20	285	1.00000E-20
287	9.85000E-03	400	6.40000E-06	410	1.49000E-07	420	2.54000E-09	490	2.14000E-04

***** COMPOSITION 7 *****

1	7.81000E-05	108	2.02000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	250	2.32000E-05	280	1.82000E-06	280	1.00000E-20	285	1.00000E-20
287	9.76000E-03	400	8.68000E-06	410	2.11000E-07	420	4.15000E-09	490	2.65000E-04

***** COMPOSITION 8 *****

1	4.45000E-05	108	2.02000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	250	2.44000E-05	280	1.62000E-06	280	1.00000E-20	285	1.00000E-20
287	9.84000E-03	400	6.12000E-06	410	1.35000E-07	420	2.29000E-09	490	2.14000E-04

***** COMPOSITION 9 *****

1	2.46000E-05	108	2.02000E-02	111	8.18000E-03	124	2.53000E-03	126	9.98000E-03
128	1.55000E-03	250	2.57000E-05	280	1.36000E-06	280	1.00000E-20	285	1.00000E-20
287	9.91000E-03	400	3.92000E-06	410	7.66000E-08	420	9.40000E-10	490	1.65000E-04

***** COMPOSITION 10 *****										
1	7.81 00E-05	1.8	2.02000E-02	111	8.180 0E-03	124	2.53000E-03	126	9.98000E-03	
128	1.55 00E-03	250	2.32000E-05	260	1.820 0E-06	280	1.00000E-20	285	1.00000E-20	
287	9.76000E-03	400	8.68000E-06	410	2.110 0E-07	420	4.15000E-09	490	2.65000E-04	
***** COMPOSITION 11 *****										
1	4.450 0E-05	1.8	2.02000E-02	111	8.180 0E-03	124	2.53000E-03	126	9.98000E-03	
128	1.55000E-03	250	2.44000E-05	260	1.820 0E-06	280	1.00000E-20	285	1.00000E-20	
287	9.846 0E-03	400	6.12000E-06	410	1.35000E-07	420	2.29000E-09	490	2.14000E-04	
***** COMPOSITION 12 *****										
1	2.46000E-05	1.8	2.02000E-02	111	8.180 0E-03	124	2.53000E-03	126	9.98000E-03	
128	1.55000E-03	250	2.57000E-05	260	1.380 0E-06	280	1.00000E-20	285	1.00000E-20	
287	9.91000E-03	400	3.92000E-06	410	7.66000E-08	420	9.40000E-10	490	1.65000E-04	
***** COMPOSITION 13 *****										
1	2.05000E-04	1.8	2.45000E-02	111	5.85000E-03	124	2.73000E-03	126	1.08000E-02	
128	1.67000E-03	250	2.42000E-05	260	3.020 0E-06	280	1.00000E-20	285	1.00000E-20	
288	1.16000E-02	400	2.35000E-05	410	7.960 0E-07	420	2.45000E-08	490	4.72000E-04	
***** COMPOSITION 14 *****										
1	8.86000E-05	1.8	2.45000E-02	111	5.850 0E-03	124	2.73000E-03	126	1.08000E-02	
128	1.67000E-03	250	2.72000E-05	260	2.620 0E-06	280	1.00000E-20	285	1.00000E-20	
288	1.18000E-02	400	1.41000E-05	410	4.30000E-07	420	1.03000E-08	490	3.42000E-04	
***** COMPOSITION 15 *****										
1	5.55000E-05	1.8	2.45000E-02	111	5.85000E-03	124	2.73000E-03	126	1.08000E-02	
128	1.67000E-03	250	2.84000E-05	260	2.43000E-06	280	1.00000E-20	285	1.00000E-20	
288	1.19000E-02	400	1.08000E-05	410	3.28000E-07	420	8.32000E-09	490	2.83000E-04	
***** COMPOSITION 16 *****										
1	3.37000E-05	1.8	2.45000E-02	111	5.85000E-03	124	2.73000E-03	126	1.08000E-02	
128	1.67000E-03	250	2.97000E-05	260	2.16000E-06	280	1.00000E-20	285	1.00000E-20	
288	1.20000E-02	400	7.60000E-06	410	2.24000E-07	420	4.52000E-09	490	2.23000E-04	
***** COMPOSITION 17 *****										
1	1.08000E-04	1.8	2.45000E-02	111	5.850 0E-03	124	2.73000E-03	126	1.08000E-02	
128	1.67000E-03	250	2.70000E-05	260	2.530 0E-06	280	1.00000E-20	285	1.00000E-20	
288	1.13000E-02	400	1.43000E-05	410	3.820 0E-07	420	8.82000E-09	490	3.71000E-04	
***** COMPOSITION 18 *****										
1	4.89000E- 5	1.8	2.45000E-02	111	5.850 0E-03	124	2.73000E-03	126	1.08000E-02	
128	1.67000E- 3	250	2.91000E-05	260	2.210 0E-06	280	1.00000E-20	285	1.00000E-20	
288	1.19000E-02	400	8.97000E-06	410	2.250 0E-07	420	3.300 0E-09	490	2.69000E-04	

***** COMPOSITION 19 *****

1	3.19000E-05	108	2.45000E-02	111	5.85000E-03	124	2.73000E-03	126	1.08000E-02
128	1.67000E-03	250	2.99000E-05	260	2.08000E-06	280	1.00000E-20	285	1.00000E-20
288	1.20000E-02	400	7.10000E-06	410	1.81000E-07	420	3.16000E-09	490	2.24000E-04

***** COMPOSITION 20 *****

1	2.02000E-05	108	2.45000E-02	111	5.85000E-03	124	2.73000E-03	126	1.08000E-02
128	1.67000E-03	250	3.09000E-05	260	1.86000E-06	280	1.00000E-20	285	1.00000E-20
288	1.20000E-02	400	5.10000E-06	410	1.28000E-07	420	2.15000E-09	490	1.78000E-04

***** COMPOSITION 21 *****

111	1.09000E-02	124	7.53000E-03	126	2.97000E-02	128	4.60000E-03
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***** BUCKLING SET 1 *****

1	7.30000E-04	7.30000E-04	7.30000E-04	7.30000E-04
---	-------------	-------------	-------------	-------------

***** BOUNDARY CONDITION SET 1 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 2 *****

1	5.00000E-01	5.00000E-01	5.00000E-01	5.00000E-01
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***** BOUNDARY CONDITION SET 3 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 4 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 5 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 6 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 7 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 8 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 9 *****

1	0.	0.	0.	0.
---	----	----	----	----

***** BOUNDARY CONDITION SET 10 *****

1 0. 0. 0. 0.

***** SOLUTION DATA *****

INITIAL SOLUTION 1 (SOLUTION NO. 1)

TYPE OF SOLUTION	MULTIPLYING
LEFT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	1
RIGHT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	1
MAXIMUM NUMBER OF ITERATIONS	30
MAXIMUM NUMBER OF ACCELERATION CYCLES	2
MAXIMUM NUMBER OF ITERATIONS PER ACCELERATION CYCLE	4
CONVERGENCE CRITERION ON DELTA K	1.00000E-04
CONVERGENCE CRITERION ON FISSION SOURCE	1.00000E-02
RATIO OF SECOND MODE BUCKLING TO FIRST MODE BUCKLING	5.26910E 00
LEAKAGE PROBABILITY	1.50000E-01
BUCKLING SET TO BE USED IN EACH REGION:	
	1, 1, 1, 1, 1, 1,
LEFT BOUNDARY CONDITION SET NUMBER	1
RIGHT BOUNDARY CONDITION SET NUMBER	2
SAVE ITERATION DATA	NO
CHECK FOR NEGATIVE TOTAL REMOVAL CROSS SECTIONS	YES
COURSE OF ACTION TO BE TAKEN IF NEGATIVE FLUXES ARE ENCOUNTERED:	
ERROR EXIT	

INITIAL SOLUTION 2 (SOLUTION NO. 2)

TYPE OF SOLUTION	COPY SOLUTION NO. 1
GROUPS 4 TO 4 ARE TO BE THE SAME AS GROUP 3	

SHAPE FUNCTION SOLUTION 1 (SOLUTION NO. 3)

TYPE OF SOLUTION	MULTIPLYING
LEFT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	1
RIGHT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	1
MAXIMUM NUMBER OF ITERATIONS	30
MAXIMUM NUMBER OF ACCELERATION CYCLES	2
MAXIMUM NUMBER OF ITERATIONS PER ACCELERATION CYCLE	4
CONVERGENCE CRITERION ON DELTA K	1.00000E-04
CONVERGENCE CRITERION ON FISSION SOURCE	1.00000E-02
RATIO OF SECOND MODE BUCKLING TO FIRST MODE BUCKLING	9.00000E 00
LEAKAGE PROBABILITY	2.50000E-01
INITIAL SOLUTION TO BE USED IN EACH REGION:	
	1, 2, 2, 2, 2,
LEFT BOUNDARY CONDITION SET NUMBER	1
RIGHT BOUNDARY CONDITION SET NUMBER	2
SAVE ITERATION DATA	NO
CHECK FOR NEGATIVE TOTAL REMOVAL CROSS SECTIONS	YES
COURSE OF ACTION TO BE TAKEN IF NEGATIVE FLUXES ARE ENCOUNTERED:	
ERROR EXIT	

***** SOLUTION DATA *****

SHAPE FUNCTION SOLUTION 2 (SOLUTION NO. 4)

TYPE OF SOLUTION	MULTIPLYING
LEFT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	2
RIGHT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	2
MAXIMUM NUMBER OF ITERATIONS	30
MAXIMUM NUMBER OF ACCELERATION CYCLES	2
MAXIMUM NUMBER OF ITERATIONS PER ACCELERATION CYCLE	4
CONVERGENCE CRITERION ON DELTA K	1.00000E-04
CONVERGENCE CRITERION ON FISSION SOURCE	1.00000E-02
RATIO OF SECOND MODE BUCKLING TO FIRST MODE BUCKLING	9.00000E 00
LEAKAGE PROBABILITY	2.50000E-01
INITIAL SOLUTION TO BE USED IN EACH REGION:	
	1, 2, 2, 2, 2,
LEFT BOUNDARY CONDITION SET NUMBER	1
RIGHT BOUNDARY CONDITION SET NUMBER	2
SAVE ITERATION DATA	NO
CHECK FOR NEGATIVE TOTAL REMOVAL CROSS SECTIONS	YES
COURSE OF ACTION TO BE TAKEN IF NEGATIVE FLUXES ARE ENCOUNTERED:	
ERROR EXIT	

SHAPE FUNCTION SOLUTION 3 (SOLUTION NO. 5)

TYPE OF SOLUTION	MULTIPLYING
LEFT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	3
RIGHT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	3
MAXIMUM NUMBER OF ITERATIONS	30
MAXIMUM NUMBER OF ACCELERATION CYCLES	2
MAXIMUM NUMBER OF ITERATIONS PER ACCELERATION CYCLE	4
CONVERGENCE CRITERION ON DELTA K	1.00000E-04
CONVERGENCE CRITERION ON FISSION SOURCE	1.00000E-02
RATIO OF SECOND MODE BUCKLING TO FIRST MODE BUCKLING	9.00000E 00
LEAKAGE PROBABILITY	2.50000E-01
INITIAL SOLUTION TO BE USED IN EACH REGION:	
	1, 2, 2, 2, 2,
LEFT BOUNDARY CONDITION SET NUMBER	1
RIGHT BOUNDARY CONDITION SET NUMBER	2
SAVE ITERATION DATA	NO
CHECK FOR NEGATIVE TOTAL REMOVAL CROSS SECTIONS	YES
COURSE OF ACTION TO BE TAKEN IF NEGATIVE FLUXES ARE ENCOUNTERED:	
ERROR EXIT	

SHAPE FUNCTION SOLUTION 4 (SOLUTION NO. 6)

TYPE OF SOLUTION	COPY SOLUTION NO. 5
GROUPS 4 TO 4 ARE TO BE THE SAME AS GROUP 3	

***** SOLUTION DATA *****

FINAL SOLUTION (SOLUTION NO. 7)

TYPE OF SOLUTION	MULTIPLYING
LEFT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	0
RIGHT REGION BOUNDARY FOR CROSS SECTION HOMOGENIZATION	0
MAXIMUM NUMBER OF ITERATIONS	30
MAXIMUM NUMBER OF ACCELERATION CYCLES	2
MAXIMUM NUMBER OF ITERATIONS PER ACCELERATION CYCLE	4
CONVERGENCE CRITERION ON DELTA K	1.00000E-04
CONVERGENCE CRITERION ON FISSION SOURCE	1.00000E-02
RATIO OF SECOND MODE BUCKLING TO FIRST MODE BUCKLING	5.26910E 00
LEAKAGE PROBABILITY	1.90000E-01
SHAPE FUNCTION TO BE USED IN EACH REGION:	
1, 2, 3, 4, 4, 4,	
LEFT BOUNDARY CONDITION SET NUMBER	1
RIGHT BOUNDARY CONDITION SET NUMBER	2
SAVE ITERATION DATA	NO
CHECK FOR NEGATIVE TOTAL REMOVAL CROSS SECTIONS	YES
COURSE OF ACTION TO BE TAKEN IF NEGATIVE FLUXES ARE ENCOUNTERED:	
ERROR EXIT	

***** EDITS *****

MACROSCOPIC DATA	NO
SOLUTION RESULTS	NO
SHAPE FUNCTION SOLUTIONS	NO
FINAL SOLUTION	NO
POWER AND FLUX NORMALIZATION	YES
REGIONAL POWER AND VOLUME	YES
POWER DENSITY	NO
INTEGRATED POWER DENSITY (DIRECTIONAL)	NO
INTEGRATED POWER DENSITY (SECTIONAL)	NO
SYNTHESIZED FLUX	NO
INTEGRATED FLUX	YES
MATERIAL BALANCE	NO
CONVERSION RATIO AND TOTAL BREEDING RATIO	YES
NEUTRON BALANCE	NO
ONE GROUP CROSS SECTIONS	YES
PERTURBATION INTEGRALS	YES

POWER NORMALIZATION MAP

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*****
*      *      *      *      *
* 1 1 1 1 1 1 1 1 1 1
* 1 1 1 1 1 1 1 1 1 1
* 1 1 1 1 1 1 1 1 1 1
* 1 1 1 1 1 1 1 1 1 1
* 1 1 1 1 1 1 1 1 1 1
* 1 1 1 1 1 1 1 1 1 1
* 1 1 1 1 1 1 1 1 1 1
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COMPLETED BGIP

COMPLETED BGRH

COMPLETED BISA

COMPLETED BISS

714

GEAR-13672

ITERATION SUMMARY

SOLUTION	NUMBER OF FLUX ITERATIONS	REACTIVITY	CONVERGENCE INDICATOR	NUMBER OF ADJOINT ITERATIONS	REACTIVITY	CONVERGENCE INDICATOR
1	8	1.01562E 00	2	8	1.01593E 00	2
3	7	1.02740E 00	2	7	1.02736E 00	2
4	7	1.01804E 00	2	7	1.01802E 00	2
5	7	1.01601E 00	2	7	1.01599E 00	2
7	9	1.02207E 00	2	8	1.02201E 00	2

DEFINITION OF CONVERGENCE INDICATOR

1. CONVERGED ON EPSL 1 OR EPSL 2
2. CONVERGED ON EPSL 1 AND 2
3. MAXIMUM NUMBER OF ITERATIONS REACHED
4. EDIT FORCED
5. CONVERGED (NON-MULTIPLYING REGION)

COMPLETED B1EA

REGIONAL POWER EDIT

TOTAL REACTOR POWER = 1.25000E 09 WATTS

POWER NORM. FACTOR = 1.90903E 15

	1	2	3	4	5	6
5	0.	0.	0.	0.	0.	0.
4	1.04545E 07	2.11778E 06	3.04163E 06	1.25177E 06	5.76199E 05	0.
3	2.20143E 07	4.88287E 06	7.02379E 06	3.00892E 06	1.34562E 06	0.
2	4.47931E 07	1.09967E 07	1.58580E 07	6.72435E 06	2.90692E 06	0.
1	5.40902E 08	2.03308E 08	2.95321E 08	5.18432E 07	2.16291E 07	0.

REGIONAL VOLUME EDIT

	1	2	3	4	5	6
5	7.13361E 05	2.45264E 05	4.90528E 05	3.35711E 05	3.35711E 05	9.33053E 05
4	3.09123E 05	1.06281E 05	2.12562E 05	1.45475E 05	1.45475E 05	4.04323E 05
3	3.09123E 05	1.06281E 05	2.12562E 05	1.45475E 05	1.45475E 05	4.04323E 05
2	3.09123E 05	1.06281E 05	2.12562E 05	1.45475E 05	1.45475E 05	4.04323E 05
1	9.03591E 05	3.10668E 05	6.21336E 05	4.25234E 05	4.25233E 05	1.18187E 06

7.16

CEAP13672

INTEGRATED FLUX

GROUP 1

REGION	1	2	3	4	5	6
5	5.36938E 19	9.99397E 18	1.38298E 19	3.86502E 18	1.51157E 18	1.10004E 18
4	7.44935E 19	1.59802E 19	2.24669E 19	6.27882E 18	2.45559E 18	1.78705E 18
3	1.60304E 20	3.92835E 19	5.56010E 19	1.55388E 19	6.07708E 18	4.42258E 18
2	3.42972E 20	9.72767E 19	1.38620E 20	3.87400E 19	1.51508E 19	1.10260E 19
1	2.40140E 21	7.85457E 20	1.12488E 21	3.14928E 20	1.23165E 20	8.96334E 19

GROUP 2

REGION	1	2	3	4	5	6
5	1.67777E 20	3.71113E 19	5.37500E 19	2.03579E 19	1.00599E 19	7.83958E 18
4	2.29414E 20	5.49343E 19	7.95686E 19	3.01367E 19	1.48922E 19	1.16053E 19
3	4.33982E 20	1.12387E 20	1.63190E 20	6.17933E 19	3.05354E 19	2.37959E 19
2	7.43576E 20	2.06501E 20	3.00771E 20	1.13917E 20	5.82927E 19	4.38683E 19
1	3.87575E 21	1.15108E 21	1.68410E 21	6.37856E 20	3.15199E 20	2.45631E 20

GROUP 3

REGION	1	2	3	4	5	6
5	9.09724E 19	2.12975E 19	3.14587E 19	1.38891E 19	8.30722E 18	9.06967E 18
4	9.29501E 19	2.33004E 19	3.43624E 19	1.51711E 19	9.07398E 18	9.90679E 18
3	1.53491E 20	4.08007E 19	6.02203E 19	2.65874E 19	1.59022E 19	1.73617E 19
2	2.36175E 20	5.48798E 19	9.99693E 19	4.23690E 19	2.53413E 19	2.76671E 19
1	1.07255E 21	2.97791E 20	4.42067E 20	1.95174E 20	1.16736E 20	1.27450E 20

GROUP 4

REGION	1	2	3	4	5	6
5	7.72061E 19	1.86384E 19	2.72604E 19	3.08988E 18	2.60727E 18	6.88510E 18
4	3.91947E 19	1.01632E 19	1.47943E 19	3.37507E 18	2.84792E 18	7.52059E 18
3	4.64494E 19	1.27190E 19	1.84580E 19	5.91484E 18	4.99099E 18	1.31799E 19
2	5.91077E 19	1.60928E 19	2.33359E 19	9.42572E 18	7.99350E 18	2.10031E 19
1	2.04693E 20	5.09163E 19	7.36005E 19	4.34199E 19	3.66381E 19	9.67514E 19

COMPLETED BEEB

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CONVERSION RATIO EDIT

	1	2	3	4	5	6
5	0.	0.	0.	0.	0.	0.
4	5.36030E 00	6.71581E 00	6.73842E 00	6.65498E 00	7.85368E 00	0.
3	4.33508E 00	5.43085E 00	5.45233E 00	5.28773E 00	6.43405E 00	0.
2	3.54405E 00	4.38733E 00	4.40661E 00	4.31378E 00	5.35879E 00	0.
1	9.45178E-01	7.00905E-01	7.04031E-01	3.02291E 00	3.87583E 00	0.

BREEDING RATIO EDIT

TOTAL BREEDING RATIO = 1.32675E 00

	1	2	3	4	5	6
5	0.	0.	0.	0.	0.	0.
4	4.42085E-02	1.09999E-02	1.60461E-02	6.95305E-03	4.15077E-03	0.
3	7.18001E-02	1.90512E-02	2.77967E-02	1.29145E-02	7.67027E-03	0.
2	1.13444E-01	3.16433E-02	4.62368E-02	2.20491E-02	1.28851E-02	0.
1	4.15155E-01	1.16002E-01	1.69862E-01	1.12964E-01	6.49123E-02	0.

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ONE GROUP CROSS SECTION EDIT

REGION 1,1

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	4.01103E-01	0.	108	0.	8.03747E-04	0.
111	0.	1.90250E-03	0.	124	0.	1.17645E-02	0.
126	0.	1.39873E-02	0.	128	0.	2.22085E-02	0.
260	1.23705E-01	4.50150E-01	3.29747E-01	283	4.48527E-02	3.35745E-01	1.24841E-01
284	4.48527E-02	2.90203E-01	1.24841E-01	285	4.48489E-02	2.85268E-01	1.24869E-01
404	3.56744E-01	4.19014E-01	1.09606E 00	410	2.51744E 00	4.04604E-01	7.46388E 00
420	2.88153E-01	5.52078E-01	9.51605E-01	494	1.76669E 00	4.50142E-01	5.17831E 00

REGION 2,1

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	3.76253E-01	0.	108	0.	8.69036E-04	0.
111	0.	1.79974E-03	0.	124	0.	1.15959E-02	0.
126	0.	1.33080E-02	0.	128	0.	2.27141E-02	0.
260	1.33754E-01	4.27408E-01	3.56533E-01	273	0.	4.94949E-01	0.
280	4.84961E-02	3.15165E-01	1.34982E-01	283	4.84920E-02	2.77653E-01	1.35012E-01
285	4.84920E-02	2.72569E-01	1.35012E-01	403	3.78234E-01	3.90190E-01	1.16305E 00
410	2.43754E 00	3.79846E-01	7.23526E 00	420	3.10628E-01	5.23892E-01	1.02605E 00
		493	1.74491E 00	4.11101E-01	5.12339E 00		

REGION 3,1

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	3.77876E-01	0.	108	0.	8.56494E-04	0.
111	0.	1.81776E-03	0.	124	0.	1.16259E-02	0.
126	0.	1.33746E-02	0.	128	0.	2.26050E-02	0.
260	1.31823E-01	4.28480E-01	3.51387E-01	273	0.	4.97960E-01	0.
280	4.77962E-02	3.16761E-01	1.33034E-01	283	4.77922E-02	2.79329E-01	1.33064E-01
285	4.77922E-02	2.74221E-01	1.33064E-01	403	3.74170E-01	3.91995E-01	1.15027E 00
410	2.44361E 00	3.82132E-01	7.29202E 00	420	3.06324E-01	5.26484E-01	1.01179E 00
		493	1.74464E 00	4.13744E-01	5.12118E 00		

REGION 4,1

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	4.49361E-01	0.	108	0.	6.68369E-04	0.
111	0.	2.10216E-03	0.	124	0.	1.20801E-02	0.
126	0.	1.53129E-02	0.	128	0.	2.11373E-02	0.
260	2.07378E 00	7.10340E-01	5.04589E 00	260	1.02869E-01	4.94504E-01	2.74207E-01
280	3.72980E-02	3.75676E-01	1.03813E-01	285	3.72948E-02	3.09941E-01	1.03837E-01
288	3.65219E-02	3.08250E-01	1.01636E-01	400	3.12792E-01	4.87875E-01	9.57277E-01
410	2.67339E 00	4.52899E-01	7.90953E 00	420	2.41605E-01	6.07339E-01	7.97416E-01
		490	1.83335E 00	5.32743E-01	5.35412E 00		

REGION 5,1

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	5.58594E-01	0.	108	0.	5.26276E-04	0.
111	0.	2.41167E-03	0.	124	0.	1.26428E-02	0.
126	0.	1.79037E-02	0.	128	0.	2.02829E-02	0.
250	2.33573E 00	8.93343E-01	5.66268E 00	260	8.09995E-02	5.94041E-01	2.15911E-01

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280	2.93686E-02	4.59927E-01	8.17431E-02	285	2.93661E-02	3.54476E-01	8.17617E-02
288	2.87575E-02	3.50970E-01	8.00287E-02	400	2.66017E-01	6.06719E-01	8.10368E-01
410	2.99729E-00	5.48987E-01	8.84590E-00	420	1.92270E-01	7.15445E-01	6.34112E-01
		490	1.95566E-00	6.92590E-01	5.68826E-00		

REGION 6,1

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	2.96254E-03	0.	124	0.	1.36987E-02	0.
126	0.	2.59164E-02	0.	128	0.	2.07278E-02	0.

REGION 1,2

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	4.76184E-01	0.	108	0.	6.27564E-04	0.
111	0.	2.17572E-03	0.	124	0.	1.22034E-02	0.
126	0.	1.59484E-02	0.	128	0.	2.08632E-02	0.
280	2.13822E-00	7.52861E-01	5.19723E-00	280	9.65887E-02	5.19124E-01	2.57466E-01
288	3.50209E-02	3.96226E-01	9.74755E-02	285	3.58179E-02	3.20685E-01	9.74977E-02
287	3.42922E-02	3.20759E-01	9.54311E-02	400	2.99360E-01	5.17022E-01	9.18090E-01
410	2.79921E-00	4.76479E-01	8.13988E-00	420	2.27502E-01	6.34121E-01	7.50715E-01
		490	1.86274E-00	5.71655E-01	5.43372E-00		

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REGION 2,2

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	4.71351E-01	0.	108	0.	6.39241E-04	0.
111	0.	2.15611E-03	0.	124	0.	1.21702E-02	0.
126	0.	1.58178E-02	0.	128	0.	2.09513E-02	0.
250	2.12570E-00	7.44552E-01	5.16811E-00	260	9.83860E-02	5.14717E-01	2.62257E-01
280	3.56726E-02	3.92231E-01	9.92893E-02	285	3.56695E-02	3.18245E-01	9.93119E-02
287	3.49303E-02	3.18349E-01	9.72068E-02	400	3.03176E-01	5.11594E-01	9.27084E-01
410	2.73780E-00	4.71713E-01	8.09572E-00	420	2.31527E-01	6.28720E-01	7.64046E-01
		490	1.85815E-00		5.64268E-01	5.42189E-00	

REGION 3,2

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	4.73142E-01	0.	108	0.	6.27346E-04	0.
111	0.	2.17687E-03	0.	124	0.	1.22081E-02	0.
126	0.	1.58992E-02	0.	128	0.	2.08534E-02	0.
250	2.13218E-00	7.48945E-01	5.18270E-00	260	9.65551E-02	5.16253E-01	2.57376E-01
280	3.50087E-02	3.94326E-01	9.74416E-02	285	3.50058E-02	3.20218E-01	9.74637E-02
287	3.42803E-02	3.20338E-01	9.53979E-02	400	2.99327E-01	5.13973E-01	9.14975E-01
410	2.74554E-00	4.74537E-01	8.11740E-00	420	2.27430E-01	6.31845E-01	7.50478E-01
		490	1.85855E-00		5.67843E-01	5.42167E-00	

REGION 4,2

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	5.11117E-01	0.	108	0.	4.79096E-04	0.
111	0.	2.43349E-03	0.	124	0.	1.26652E-02	0.
126	0.	1.71757E-02	0.	128	0.	1.96764E-02	0.
250	2.24451E-00	8.24198E-01	5.44040E-00	260	7.37379E-02	5.50131E-01	1.96555E-01
280	2.67357E-02	4.30364E-01	7.44149E-02	285	2.67335E-02	3.47513E-01	7.44318E-02
288	2.61794E-02	3.45096E-01	7.28542E-02	400	2.51167E-01	5.59424E-01	7.63544E-01
410	2.98201E-00	5.20013E-01	8.50473E-00	420	1.76353E-01	6.82775E-01	5.81312E-01
		490	1.88489E-00		6.32295E-01	5.48019E-00	

REGION 5,2

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	6.34616E-01	0.	108	0.	3.65751E-04	0.
111	0.	2.74910E-03	0.	124	0.	1.32796E-02	0.
126	0.	2.00005E-02	0.	128	0.	1.91693E-02	0.
250	2.53425E-00	1.01538E-00	6.12585E-00	260	5.62929E-02	6.62291E-01	1.50054E-01
280	2.04108E-02	5.24175E-01	5.68098E-02	285	2.04088E-02	3.95136E-01	5.68227E-02
288	1.99859E-02	3.90586E-01	5.56183E-02	400	2.13672E-01	6.92732E-01	6.45832E-01
410	3.24052E-00	6.25275E-01	9.54448E-00	420	1.36679E-01	8.00443E-01	4.50065E-01
		490	2.02985E-00		8.11605E-01	5.88230E-00	

REGION 6,2

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.31149E-03	0.	124	0.	1.43649E-02	0.
126	0.	2.88811E-02	0.	128	0.	2.00286E-02	0.

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REGION 1,3

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	5.45668E-01	0.	108	0.	5.10333E-04	0.
111	0.	2.38897E-03	0.	124	0.	1.25675E-02	0.
126	0.	1.76493E-02	0.	128	0.	2.00562E-02	0.
250	2.30819E-00	8.65182E-01	5.59558E-00	260	7.85456E-02	5.82717E-01	2.09370E-01
280	2.84769E-02	4.50482E-01	7.92668E-02	285	2.84769E-02	3.50316E-01	7.92848E-02
287	2.78863E-02	3.49821E-01	7.76043E-02	400	2.60862E-01	5.93142E-01	7.94153E-01
410	2.96331E-00	5.39314E-01	8.74534E-00	420	1.86992E-01	7.05320E-01	6.16576E-01
		490	1.93685E-00	6.73899E-01	5.63274E-00		

REGION 2,3

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	5.61447E-01	0.	108	0.	4.84071E-04	0.
111	0.	2.43952E-03	0.	124	0.	1.26564E-02	0.
126	0.	1.80396E-02	0.	128	0.	1.98788E-02	0.
250	2.34698E-00	8.90836E-01	5.68652E-00	260	7.45036E-02	5.97108E-01	1.98596E-01
280	2.70133E-02	4.62908E-01	7.51876E-02	285	2.70110E-02	3.57213E-01	7.52047E-02
287	2.64512E-02	3.56592E-01	7.36106E-02	400	2.52244E-01	6.10479E-01	7.67080E-01
410	3.01120E-00	5.53712E-01	8.88338E-00	420	1.77906E-01	7.21572E-01	5.86494E-01
		490	1.95368E-00	6.97290E-01	5.67791E-00		

ONE GROUP CROSS SECTION EDIT

REGION 3,3

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	5.63997E-01	0.	108	0.	4.72649E-04	0.
111	0.	2.46295E-03	0.	124	0.	1.27016E-02	0.
126	0.	1.81389E-02	0.	128	0.	1.97908E-02	0.
250	2.35923E-00	8.96412E-01	5.70540E-00	260	7.27456E-02	5.99295E-01	1.93910E-01
280	2.63759E-02	4.65618E-01	7.34135E-02	285	2.63737E-02	3.59532E-01	7.34302E-02
287	2.58271E-02	3.58923E-01	7.18737E-02	400	2.48550E-01	6.13690E-01	7.55460E-01
410	3.02111E-00	5.57200E-01	8.91144E-00	420	1.73959E-01	7.25384E-01	5.73424E-01
		490	1.95508E-00	7.02050E-01	5.68063E-00		

REGION 4,3

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	5.59316E-01	0.	108	0.	3.57712E-04	0.
111	0.	2.68495E-03	0.	124	0.	1.31397E-02	0.
126	0.	1.85959E-02	0.	128	0.	1.88039E-02	0.
250	2.37939E-00	9.11512E-01	5.74453E-00	260	5.50556E-02	5.93102E-01	1.46756E-01
280	1.99620E-02	4.72821E-01	5.55611E-02	285	1.99603E-02	3.76264E-01	5.55738E-02
288	1.95466E-02	3.73254E-01	5.43958E-02	400	2.11679E-01	6.14976E-01	6.39396E-01
410	3.04178E-00	5.71292E-01	8.96219E-00	420	1.34350E-01	7.39707E-01	4.42243E-01
		490	1.92849E-00	7.10123E-01	5.59107E-00		

REGION 5,3

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	6.92322E-01	0.	108	0.	2.67201E-04	0.
111	0.	2.99815E-03	0.	124	0.	1.37697E-02	0.
126	0.	2.15607E-02	0.	128	0.	1.85600E-02	0.
250	2.68276E-00	1.11417E-00	6.47391E-00	260	4.11251E-02	7.13720E-01	1.09623E-01
280	1.49110E-02	5.72706E-01	4.15027E-02	285	1.49096E-02	4.25433E-01	4.15121E-02
288	1.46008E-02	4.26066E-01	4.06322E-02	400	1.81551E-01	7.57747E-01	5.44864E-01
410	3.42235E-00	6.82159E-01	1.00683E-01	420	1.02379E-01	8.63206E-01	3.36548E-01
		490	2.08917E-00	9.02002E-01	6.04070E-00		

REGION 6,3

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.55370E-03	0.	124	0.	1.48476E-02	0.
126	0.	3.09687E-02	0.	128	0.	1.97114E-02	0.

REGION 1,4

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	6.66189E-01	0.	108	0.	4.31518E-04	0.
111	0.	2.62111E-03	0.	124	0.	1.30041E-02	0.
126	0.	2.02286E-02	0.	128	0.	1.98159E-02	0.
250	2.58128E-00	1.04477E-00	6.24392E-00	260	6.64151E-02	6.92933E-01	1.77033E-01
280	2.40807E-02	5.38511E-01	6.70249E-02	285	2.40786E-02	3.90784E-01	6.70402E-02
287	2.35796E-02	3.89010E-01	6.56192E-02	400	2.34437E-01	7.21209E-01	7.11291E-01
410	3.30269E-00	6.36342E-01	9.73210E-00	420	1.59285E-01	8.14477E-01	5.24949E-01
		490	2.08433E-00	8.43888E-01	6.04616E-00		

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REGION 2,4

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	6.98429E-01	0.	108	0.	3.87105E-04	0.
111	0.	2.71420E-03	0.	124	0.	1.31713E-02	0.
126	0.	2.4998E-02	0.	128	0.	1.95397E-02	0.
250	2.65892E-00	1.09606E-00	6.42658E-00	260	5.95795E-02	7.22353E-01	1.58814E-01
280	2.16022E-02	5.63451E-01	6.01265E-02	285	2.16004E-02	4.04067E-01	6.01402E-02
287	2.11527E-02	4.2116E-01	5.88654E-02	400	2.19826E-01	7.56339E-01	6.65399E-01
410	3.39869E-00	6.64875E-01	1.08094E-01	420	1.43882E-01	8.46620E-01	4.73958E-01
		490	2.12008E-00		8.91136E-01	6.14351E-00	

REGION 3,4

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	7.02470E-01	0.	108	0.	3.75723E-04	0.
111	0.	2.74082E-03	0.	124	0.	1.32243E-02	0.
126	0.	2.11293E-02	0.	128	0.	1.94596E-02	0.
250	2.67093E-00	1.10385E-00	6.45349E-00	260	5.78278E-02	7.25874E-01	1.54145E-01
280	2.09671E-02	5.67273E-01	5.83987E-02	285	2.09653E-02	4.06916E-01	5.83720E-02
287	2.05508E-02	4.04861E-01	5.71347E-02	400	2.16139E-01	7.61141E-01	6.53803E-01
410	3.41275E-00	6.69564E-01	1.00496E-01	420	1.39934E-01	8.51740E-01	4.60888E-01
		490	2.12343E-00		8.98556E-01	6.15178E-00	

ONE GROUP CROSS SECTION EDIT

REGION 4,4

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	6.04097E-01	0.	108	0.	2.88850E-04	0.
111	0.	2.90666E-03	0.	124	0.	1.36103E-02	0.
126	0.	1.98593E-02	0.	128	0.	1.84396E-02	0.
250	2.49305E-00	9.90050E-01	6.02083E-00	260	4.44570E-02	6.32286E-01	1.18504E-01
280	1.61191E-02	5.11890E-01	4.48652E-02	285	1.61178E-02	4.02023E-01	4.48754E-02
288	1.57837E-02	3.98416E-01	4.39242E-02	400	1.89344E-01	6.66106E-01	5.69159E-01
410	3.18503E-00	6.17098E-01	9.37543E-00	420	1.12204E-01	7.89359E-01	3.62375E-01
		490	1.97461E-00		7.82651E-01	5.71492E-00	

REGION 5,4

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
1	0.	7.46387E-01	0.	108	0.	2.12129E-04	0.
111	0.	3.22015E-03	0.	124	0.	1.42546E-02	0.
126	0.	2.29724E-02	0.	128	0.	1.83666E-02	0.
250	2.81844E-00	1.20445E-00	6.79440E-00	260	3.26483E-02	7.61298E-01	8.70270E-02
280	1.18376E-02	6.17797E-01	3.29480E-02	285	1.18365E-02	4.52912E-01	3.29555E-02
288	1.15912E-02	4.46740E-01	3.22570E-02	400	1.63631E-01	8.18219E-01	4.88524E-01
410	3.58821E-00	7.33817E-01	1.05487E-01	420	8.28700E-02	9.19196E-01	2.72069E-01
		490	2.14954E-00		9.86787E-01	6.20689E-00	

REGION 6,4

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.76230E-03	0.	124	0.	1.52949E-02	0.
126	0.	3.28134E-02	0.	128	0.	1.97023E-02	0.

REGION 1,5

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.09525E-03	0.	124	0.	1.39175E-02	0.
125	0.	2.77845E-02	0.	128	0.	2.95342E-02	0.

REGION 2,5

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.22707E-03	0.	124	0.	1.41503E-02	0.
126	0.	2.91598E-02	0.	128	0.	2.02417E-02	0.

REGION 3,5

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.26319E-03	0.	124	0.	1.42150E-02	0.
126	0.	2.93916E-02	0.	128	0.	2.01595E-02	0.

REGION 4,5

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.27119E-03	0.	124	0.	1.44683E-02	0.

126 0. 2.19543E-02 0.

128 0. 1.84940E-02 0.

REGION 5,5

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	3.58789E-03	0.	124	0.	1.51243E-02	0.
126	0.	2.53421E-02	0.	128	0.	1.85699E-02	0.

REGION 6,5

MATERIAL	FISSION	CAPTURE	NU * FISSION	MATERIAL	FISSION	CAPTURE	NU * FISSION
111	0.	4.08903E-03	0.	124	0.	1.60394E-02	0.
126	0.	3.57675E-02	0.	128	0.	2.00533E-02	0.

COMPLETED BIEC

PERTURBATION INTEGRAL EDIT

UNPERTURBED FISSION INTEGRAL = 1.93840E 22

PERTURBED DERIVATIVE

GROUP 1

REGION	1	2	3	4	5	6
5	2.92212E 18	4.14219E 17	4.95848E 17	1.11523E 17	2.34710E 16	6.79310E 15
4	8.21141E 18	1.55542E 18	1.93374E 18	4.48974E 17	9.45500E 16	2.70778E 16
3	2.92077E 19	7.06767E 18	8.79687E 18	2.12355E 18	4.50325E 17	1.28792E 17
2	9.68786E 19	2.99536E 19	3.83677E 19	9.58205E 18	2.04446E 18	5.84557E 17
1	1.48135E 20	6.13336E 19	1.66838E 20	9.11956E 19	2.12530E 19	6.05483E 18

GROUP 2

REGION	1	2	3	4	5	6
5	6.02267E 18	9.56608E 17	1.13289E 18	2.78374E 17	7.30409E 16	2.37222E 16
4	1.45419E 19	2.94518E 18	3.58665E 18	9.50752E 17	2.53279E 17	8.24142E 16
3	4.46071E 19	1.10291E 19	1.37474E 19	3.83410E 18	1.03864E 18	3.40220E 17
2	1.08346E 20	3.15482E 19	4.13505E 19	1.27010E 19	3.54548E 18	1.17602E 18
1	1.60281E 20	6.55998E 19	1.65320E 20	9.88739E 19	3.15414E 19	1.09969E 19

GROUP 3

REGION	1	2	3	4	5	6
5	1.40801E 18	2.15905E 17	2.63978E 17	6.44073E 16	1.62878E 16	7.48283E 15
4	2.35699E 18	4.93612E 17	6.15578E 17	1.65349E 17	4.20547E 16	1.94612E 16
3	8.88655E 18	2.19870E 18	2.73087E 18	7.19881E 17	1.82588E 17	8.41870E 16
2	2.17628E 19	5.88071E 18	7.79852E 18	2.33414E 18	6.02524E 17	2.84090E 17
1	3.23026E 19	1.26076E 19	3.20884E 19	1.83169E 19	5.01826E 18	2.53660E 18

GROUP 4

REGION	1	2	3	4	5	6
5	4.95015E 17	8.15408E 16	1.11829E 17	1.28979E 16	2.14006E 15	3.15319E 15
4	-2.40010E 16	3.79562E 16	7.53341E 16	3.28709E 16	4.94861E 15	7.90153E 15
3	1.74569E 18	4.40192E 17	5.83033E 17	1.43619E 17	2.26960E 16	3.48016E 16
2	1.94972E 18	2.42118E 17	5.99145E 17	4.55179E 17	4.98282E 16	1.04526E 17
1	3.52773E 18	1.43112E 18	4.81326E 18	3.28206E 18	-2.65302E 17	5.90634E 17

GEAR13672

PERTURBATION INTEGRAL EDIT

VOLUME INTEGRAL

REGION 1,1

GROUP	J	1	2	3	4
1	1	5.42491E 23	4.26287E 23	3.40875E 23	3.80609E 23
2	2	8.71840E 23	6.84710E 23	5.47199E 23	6.11150E 23
3	3	2.40595E 23	1.88886E 23	1.50895E 23	1.68561E 23
4	4	4.56743E 22	3.58358E 22	2.86090E 22	3.19672E 22

REGION 2,1

GROUP	J	1	2	3	4
1	1	1.49510E 23	1.21097E 23	1.01044E 23	1.14655E 23
2	2	2.17861E 23	1.76363E 23	1.47062E 23	1.66901E 23
3	3	3.61054E 22	2.84002E 22	2.28388E 22	2.29492E 22
4	4	3.51227E 21	2.69143E 21	2.40447E 21	2.27088E 21

REGION 3,1

GROUP	J	1	2	3	4
1	1	1.60794E 23	1.29097E 23	1.06920E 23	1.22870E 23
2	2	2.37289E 23	1.90306E 23	1.57391E 23	1.81048E 23
3	3	6.17376E 22	4.94789E 22	4.08817E 22	4.70539E 22
4	4	1.02040E 22	8.17328E 21	6.74874E 21	7.76720E 21

REGION 4,1

GROUP	J	1	2	3	4
1	1	2.54874E 22	1.71860E 22	1.20217E 22	1.18010E 22
2	2	4.68675E 22	3.38887E 22	2.35077E 22	2.31978E 22
3	3	1.39739E 22	1.01688E 22	7.08745E 21	6.97399E 21
4	4	3.10031E 21	2.25559E 21	1.59270E 21	1.54682E 21

REGION 5,1

GROUP	J	1	2	3	4
1	1	4.40448E 21	2.94861E 21	1.80989E 21	1.99018E 21
2	2	1.10988E 22	7.42166E 21	4.55195E 21	5.00496E 21
3	3	4.02329E 21	2.68670E 21	1.64660E 21	1.81025E 21
4	4	1.20694E 21	8.03863E 20	4.92511E 20	5.41025E 20

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PERTURBATION INTEGRAL EDIT

VOLUME INTEGRAL

REGION 6,1

GROUP	J	1	2	3	4
1	1.26680E 21	7.93381E 20	4.91698E 20	4.92118E 20	
2	3.49197E 21	2.18819E 21	1.35595E 21	1.35739E 21	
3	1.74788E 21	1.09094E 21	6.74916E 20	6.72316E 20	
4	1.20925E 21	7.46523E 20	4.60062E 20	4.52250E 20	

REGION 1,2

GROUP	1	2	3	4
1	4.08566E 22	2.90635E 22	1.99181E 22	2.21123E 22
2	8.75101E 22	6.20944E 22	4.23773E 22	4.70388E 22
3	2.76953E 22	1.96016E 22	1.33532E 22	1.48216E 22
4	6.85661E 21	4.84988E 21	3.29304E 21	3.65482E 21

REGION 2,2

GROUP	1	2	3	4
1	9.00081E 21	6.96640E 21	4.59295E 21	5.00714E 21
2	1.87513E 22	1.36309E 22	9.47090E 21	1.03064E 22
3	5.84073E 21	4.23881E 21	2.93590E 21	3.19253E 21
4	1.48772E 21	1.03323E 21	7.11837E 20	7.73005E 20

REGION 3,2

GROUP	1	2	3	4
1	9.98808E 21	6.95903E 21	4.83391E 21	5.34680E 21
2	2.02692E 22	1.46324E 22	1.01018E 22	1.11634E 22
3	6.38370E 21	4.60278E 21	3.16400E 21	3.49558E 21
4	1.53125E 21	1.10495E 21	7.53135E 20	8.30694E 20

REGION 4,2

GROUP	1	2	3	4
1	1.40054E 21	9.26419E 20	5.43509E 20	5.33530E 20
2	3.96079E 21	2.61307E 21	1.50879E 21	1.48890E 21
3	1.44486E 21	9.46573E 20	5.45431E 20	5.39715E 20
4	3.20574E 20	2.09961E 20	1.20943E 20	1.19715E 20

PERTURBATION INTEGRAL EDIT

VOLUME INTEGRAL

REGION 5,2

GROUP	J	1	2	3	4
1		2.62649E 20	1.58946E 20	8.18264E 19	8.99771E 19
2		9.48074E 20	5.71423E 20	2.92131E 20	3.21232E 20
3		4.16011E 20	2.56095E 20	1.27437E 20	1.40103E 20
4		1.24799E 20	7.46288E 19	3.81175E 19	4.16721E 19

REGION 6,2

GROUP	J	1	2	3	4
1		7.55388E 19	4.27677E 19	2.22300E 19	2.22490E 19
2		2.98289E 20	1.68477E 20	8.70285E 19	8.71208E 19
3		1.80732E 20	1.01551E 20	5.22345E 19	5.20333E 19
4		1.25037E 20	6.94912E 19	3.56061E 19	3.50015E 19

REGION 1,3

GROUP	J	1	2	3	4
1		1.08672E 22	7.05081E 21	4.19613E 21	4.69004E 21
2		2.92004E 22	1.89237E 22	1.12459E 22	1.25737E 22
3		1.02809E 22	6.65795E 21	3.95321E 21	4.42089E 21
4		3.08171E 21	1.99304E 21	1.18142E 21	1.32183E 21

REGION 2,3

GROUP	J	1	2	3	4
1		1.91219E 21	1.25890E 21	7.30522E 20	7.75999E 20
2		5.40461E 21	3.55252E 21	2.05615E 21	2.18450E 21
3		1.94845E 21	1.27958E 21	7.39515E 20	7.85754E 20
4		6.00066E 20	3.93468E 20	2.26828E 20	2.41048E 20

REGION 3,3

GROUP	J	1	2	3	4
1		2.01781E 21	1.32676E 21	7.64879E 20	8.25134E 20
2		5.80788E 21	3.81093E 21	2.18957E 21	2.36430E 21
3		2.11960E 21	1.38914E 21	7.96571E 20	8.60640E 20
4		6.42874E 20	4.25778E 20	2.40741E 20	2.60665E 20

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PERTURBATION INTEGRAL EDIT

VOLUME INTEGRAL

REGION 4,3

GROUP	J	1	2	3	4
1	2.94744E 20	1.76625E 20	8.60005E 19	8.44216E 19	
2	1.13491E 21	6.77029E 20	3.27032E 20	3.22720E 20	
3	4.79744E 20	2.85454E 20	1.37318E 20	1.35879E 20	
4	1.06441E 20	6.33251E 19	3.04488E 19	3.01396E 19	

REGION 5,3

GROUP	J	1	2	3	4
1	5.52743E 19	3.03037E 19	1.29476E 19	1.42372E 19	
2	2.71658E 20	1.48621E 20	6.33197E 19	6.96273E 19	
3	1.38130E 20	7.54308E 19	3.20836E 19	3.52725E 19	
4	4.14374E 19	2.25690E 19	9.59648E 18	1.05418E 19	

REGION 6,3

GROUP	J	1	2	3	4
1	1.58971E 19	8.15381E 18	3.51749E 18	3.52090E 18	
2	8.54709E 19	4.38191E 19	1.88635E 19	1.88835E 19	
3	6.00091E 19	3.06287E 19	1.31506E 19	1.30999E 19	
4	4.15165E 19	2.09591E 19	8.96422E 18	8.81200E 18	

REGION 1,4

GROUP	J	1	2	3	4
1	2.71162E 21	1.64001E 21	9.10611E 20	1.01125E 21	
2	8.52565E 21	5.03280E 21	2.79399E 21	3.10205E 21	
3	3.33946E 21	2.01420E 21	1.11813E 21	1.24040E 21	
4	1.36994E 21	8.22774E 20	4.56736E 20	5.09541E 20	

REGION 2,4

GROUP	J	1	2	3	4
1	3.03784E 20	2.35727E 20	1.23446E 20	1.30132E 20	
2	1.30834E 21	8.04156E 20	4.20491E 20	4.43099E 20	
3	2.47227E 20	3.36142E 20	1.75709E 20	1.85025E 20	
4	2.30916E 20	1.41646E 20	7.39918E 19	7.77766E 19	

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PERTURBATION INTEGRAL EDIT

VOLUME INTEGRAL

REGION 3,4

GROUP	J	1	2	3	4
1	4.01044E 20	2.47581E 20	1.28630E 20	1.37616E 20	
2	1.39810E 21	8.62314E 20	4.47505E 20	4.78958E 20	
3	5.92747E 20	3.65305E 20	1.89426E 20	2.02692E 20	
4	2.47082E 20	1.52149E 20	7.88666E 19	8.42114E 19	

REGION 4,4

GROUP	J	1	2	3	4
1	5.85810E 19	3.29591E 19	1.44628E 19	1.41972E 19	
2	2.73201E 20	1.53194E 20	6.68389E 19	6.59578E 19	
3	1.38180E 20	7.51770E 19	3.26546E 19	3.23124E 19	
4	2.97663E 19	1.66530E 19	7.24080E 18	7.16726E 18	

REGION 5,4

GROUP	J	1	2	3	4
1	1.09859E 19	5.65481E 18	2.17740E 18	2.39429E 18	
2	6.58947E 19	3.36290E 19	1.29413E 19	1.42305E 19	
3	3.86280E 19	1.98362E 19	7.62955E 18	8.38787E 18	
4	1.19880E 19	5.93501E 18	2.28207E 18	2.50686E 18	

REGION 6,4

GROUP	J	1	2	3	4
1	3.18939E 18	1.52154E 18	5.91540E 17	5.92045E 17	
2	2.05749E 19	9.91910E 18	3.85833E 18	3.85942E 18	
3	1.67815E 19	8.03949E 18	3.12724E 18	3.11520E 18	
4	1.16101E 19	5.51166E 18	2.13171E 18	2.09552E 18	

REGION 1,5

GROUP	J	1	2	3	4
1	8.74897E 20	4.83643E 20	2.70677E 20	2.68508E 20	
2	2.78279E 21	1.54183E 21	8.63482E 20	8.57541E 20	
3	1.47329E 21	8.13004E 20	4.54792E 20	4.49678E 20	
4	1.16557E 21	8.36001E 20	3.54555E 20	3.46673E 20	

GEAR-13672

PERTURBATION INTEGRAL EDIT

VOLUME INTEGRAL

REGION 2,5

GROUP	J	1	2	3	4
1		9.69354E 19	9.71290E 19	3.02602E 19	2.91615E 19
2		3.63451E 20	2.14348E 20	1.13570E 20	1.09453E 20
3		2.02672E 20	1.19228E 20	6.31372E 19	6.06246E 19
4		1.63788E 20	9.56916E 19	5.05629E 19	4.81981E 19

REGION 3,5

GROUP	J	1	2	3	4
1		9.89888E 19	9.93818E 19	3.13036E 19	3.06548E 19
2		3.84738E 20	2.30786E 20	1.21598E 20	1.19149E 20
3		2.17747E 20	1.30305E 20	6.85941E 19	6.70020E 19
4		1.74267E 20	1.03675E 20	5.45045E 19	5.27479E 19

REGION 4,5

GROUP	J	1	2	3	4
1		1.44594E 19	7.90519E 18	3.51968E 18	3.45506E 18
2		7.51813E 19	4.10002E 19	1.81618E 19	1.79223E 19
3		4.92842E 19	2.67801E 19	1.18247E 19	1.17008E 19
4		1.09347E 19	5.94614E 18	2.62200E 18	2.59537E 18

REGION 5,5

GROUP	J	1	2	3	4
1		2.71143E 18	1.35530E 18	5.29895E 17	5.82676E 17
2		1.79958E 19	9.00032E 18	3.51647E 18	3.86677E 18
3		1.41961E 19	7.07559E 18	2.76277E 18	3.03737E 18
4		4.28687E 18	2.11702E 18	8.26369E 17	9.07769E 17

REGION 6,5

GROUP	J	1	2	3	4
1		7.29875E 17	3.64939E 17	1.43953E 17	1.44081E 17
2		5.66199E 18	2.65364E 18	1.04759E 18	1.04670E 18
3		6.16475E 18	2.87305E 18	1.13242E 18	1.12806E 18
4		4.26499E 18	1.96502E 18	7.71924E 17	7.98817E 17

COMPLETED BIED

CEAP 19672

START OF CASE (BISY

022670 000000

7-84

CEAP-13672.

PERTURBATION INPUT CARDS

CLASS MATL I J K L RP1 DATA

30	1			S1 \$
31	1	1	1	-2.47-5 \$
31	284	1	1	-3.31-4 \$
31	404	1	1	-1.89-5 \$
31	410	1	1	-5.70-5 \$
31	420	1	1	-2.36-6 \$
31	474	1	1	-4.21-5 \$
666				

PERTURBATION EDIT

PERTURBED REMOVAL INTEGRAL = -0.6395468953E 21

PERTURBED DIFFUSION INTEGRAL = 0.1087901307E 20

PERTURBED BUCKLING INTEGRAL = 0.

PERTURBED SCATTERING INTEGRAL = -0.8683260046E 20

PERTURBED FISSION INTEGRAL = -0.1185752449E 22

UNPERTURBED FISSION INTEGRAL = 0.1938395413E 23

(DELTA K OVER K) 1 = -0.3472751705E-01

(DELTA K OVER K) 2 = -0.3260315768E-01

CEAP13672

PERTURBATION INPUT CARDS

CLASS MATL 1 J K L RPT DATA

31 1 S1 \$
31 111 2 1 -8.18-3 \$
999

PERTURBATION EDIT

PERTURBED REMOVAL INTEGRAL = -0.4883662446E 21

PERTURBED DIFFUSION INTEGRAL = 0.3494502930E 20

PERTURBED BUCKLING INTEGRAL = 0.

PERTURBED SCATTERING INTEGRAL = -0.4277463423E 21

PERTURBED FISSION INTEGRAL = 0.

UNPERTURBED FISSION INTEGRAL = 0.1938395413E 23

(DELTA K OVER K) 1 = 0.1353753556E-02

(DELTA K OVER K) 2 = 0.1353753556E-02

GEAP-13672

(BISY CASE ID NO,

CASE SEQUENCE NO. 2 022670 0151.4

PAGE NO. 1

MET REACTIVITY CRITERIA AT ITERATION NO. 3. THIS IS CYCLE 1

7.37

GEAP13672

(BISY CASE ID NO.

CASE SEQUENCE NO. 2 022670 0151.4

PAGE NO. 2

NET REACTIVITY CRITERIA AT ITERATION NO. 2. THIS IS CYCLE 2

7-38

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(BI\$Y CASE ID NO.

CASE SEQUENCE NO, 2 022670 0151.4

PAGE NO. 3

MET REACTIVITY CRITERIA AT ITERATION NO. 2, THIS IS CYCLE 3

7.39

GEAP13672

(BISY CASE ID NO.

CASE SEQUENCE NO. 2 022670 0151.4

PAGE NO. 4

MET REACTIVITY CRITERIA AT ITERATION NO. 1. THIS IS CYCLE 4

740

CEAP-1962

(BISY CASE ID NO,

CASE SEQUENCE NO, 2 022670 0151.4

PAGE NO. 5

NET REACTIVITY CRITERIA AT ITERATION NO, 1. THIS IS CYCLE 5

741

CEAP-19672

(BISY CASE ID NO.

CASE SEQUENCE NO, 2 022670 0151.4

PAGE NO. 6

MET REACTIVITY CRITERIA AT ITERATION NO. 3. THIS IS CYCLE 6

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(B)SY CASE ID NO,

CASE SEQUENCE NO, 2 022670 0151.4

PAGE NO. 7

MET REACTIVITY CRITERIA AT ITERATION NO. 1. THIS IS CYCLE 7

REACHED MAXIMUM NUMBER OF ITERATIONS ON EQUILIBRIUM

EQUILIBRIUM ITERATION NO. 7

REACTIVITY ITERATION NO. 1

REACTIVITY AT THE BEGINNING OF A REFUELING INTERVAL

1.0254919E 00

REACTIVITY AT THE END OF A REFUELING INTERVAL

1.0000080E 00

AVERAGE BURNUP (MWD/TE)

1.1203789E 05

OPERATING INTERVAL (DAYS)

3.6500000E 02

TOTAL BURNUP

FUEL TYPE

STEP

MWD/TE

1

1

5.4182982E 04

2

1.0640316E 05

2

1

5.9949293E 04

2

1.1385838E 05

3

1

4.4203831E 04

2

8.4963876E 04

3

1.2291821E 05

4

1

7.4688467E 03

2

2.0067676E 04

5

1

3.3523419E 03

2

8.8721884E 03

6

1

1.5025205E 03

2

3.8464678E 03

7

1

5.6341301E 03

2

1.4798033E 04

8

1

2.2594582E 03

2

5.8351558E 03

9

1

9.1283597E 02

2

2.2692182E 03

10

1

3.6695029E 03

2

9.3415461E 03

3

1.6678660E 04

11

1

1.4810738E 03

2

3.6865681E 03

3

6.5436992E 03

(BISY CASE ID NO.

CASE SEQUENCE NO. 2 022670 0151.4

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TOTAL BLRNUP

FUEL TYPE

STEP

MWD/TE

12

1

6.0639979E 02

2

1.4528846E 03

3

2.5253451E 03

13

1

4.0931889E 03

2

1.0320263E 04

3

1.8307628E 04

4

2.7741631E 04

14

1

1.4817061E 03

2

3.6418392E 03

3

6.4151044E 03

4

9.7421221E 03

15

1

6.0741666E 02

2

1.4419165E 03

3

2.4909733E 03

4

3.7427213E 03

16

1

2.4712865E 02

2

5.5820599E 02

3

9.3136426E 02

4

1.3647892E 03

17

1

1.5771411E 03

2

3.8520822E 03

3

6.7553992E 03

4

1.0224221E 04

18

1

6.0102299E 02

2

1.4289207E 03

3

2.4709286E 03

4

3.7149778E 03

19

1

2.5882006E 02

2

9.9537335E 02

3

1.0071029E 03

4

1.4915344E 03

20

1

1.1052164E 02

2

2.4344691E 02

3

3.9837934E 02

4

5.7492942E 02

745

GEAP13672

FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
1	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	0.	0.	0.	0.	0.
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	7.166664E-03	0.	0.	7.166664E-03	8.405963E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	9.749857E-04	1.530000E-04	8.219857E-04	0.	1.143586E 01
	PU-240	2.997323E-04	6.660000E-05	2.331323E-04	0.	3.515637E 00
	PU-241	6.157579E-05	3.160000E-05	2.997579E-05	0.	7.222382E-01
	PU-242	2.273258E-05	8.290000E-06	1.444258E-05	0.	2.666363E-01
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
2	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	0.	0.	0.	0.	0.
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	6.682693E-03	0.	0.	6.682693E-03	7.808982E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	1.345151E-03	2.110000E-04	1.134151E-03	0.	1.971861E 01
	PU-240	4.135690E-04	9.190000E-05	3.216690E-04	0.	4.832712E 00
	PU-241	8.495970E-05	4.360000E-05	4.135970E-05	0.	9.927866E-01
	PU-242	3.132744E-05	1.140000E-05	1.992744E-05	0.	3.660732E-01
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

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CEAP13672

FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
3	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	0.	0.	0.	0.	0.
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	6.682897E-03	0.	0.	6.682897E-03	7.809221E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	1.344998E-03	2.110000E-04	1.133998E-03	0.	1.571682E 01
	PU-240	4.135256E-04	9.190000E-05	3.216256E-04	0.	4.832205E 00
	PU-241	8.495412E-05	4.360000E-05	4.135412E-05	0.	9.927214E-01
	PU-242	3.132476E-05	1.140000E-05	1.992476E-05	0.	3.660418E-01
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
5	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SH	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
6	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SH	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
7	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
9						
	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E-01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-244	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
10						
	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E-01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-244	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
11	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E-01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
12	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	3.000000E-05	0.	0.	3.000000E-05	2.970297E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.007000E-02	0.	0.	1.007000E-02	9.970297E-01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
13	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.292033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
14	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.292033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
15	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.252033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
16	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.252033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
17	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.252033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-244	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
18	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.252033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-244	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	TOTAL INITIAL CONCENTRATION	INITIAL MAKEUP CONCENTRATION	INITIAL RECYCLE CONCENTRATION	INITIAL DENSITY PRES. CONCENTRATION	INITIAL ENRICHMENT CONCENTRATION
19	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.252033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.
20	TH-232	0.	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.	0.
	U-233	0.	0.	0.	0.	0.
	U-234	0.	0.	0.	0.	0.
	U-235	4.000000E-05	0.	0.	4.000000E-05	3.252033E-01
	U-236	0.	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.	0.
	U-238	1.226000E-02	0.	0.	1.226000E-02	9.967480E 01
	NP-239	0.	0.	0.	0.	0.
	PU-239	0.	0.	0.	0.	0.
	PU-240	0.	0.	0.	0.	0.
	PU-241	0.	0.	0.	0.	0.
	PU-242	0.	0.	0.	0.	0.
	AM-243	0.	0.	0.	0.	0.
	AM-241	0.	0.	0.	0.	0.
	FPA-1	0.	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.	0.
	FPA-3	0.	0.	0.	0.	0.
	FPA-4	0.	0.	0.	0.	0.
	XE	0.	0.	0.	0.	0.
	SM	0.	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.	0.

FUEL TYPE 1

STEP ISOTOPE CONCENTRATION

1

TH-232 0.
PA-233 0.
U-233 0.
U-234 0.
U-235 0.
U-236 0.
NP-237 0.
U-238 6.6776751E-03
NP-239 1.2961047E-21
PU-239 9.4821368E-04
PU-240 3.3879374E-04
PU-241 5.2307176E-05
PU-242 2.3420668E-05

ISOTOPE CONCENTRATION

AM-243 2.5859554E-06
AM-241 2.8234714E-06
FPA-1 0.
FPA-2 0.
FPA-3 4.2432388E-04
FPA-4 5.5546276E-05
XE 0.
SM 0.
BP-1 0.
BP-2 0.
BP-3 0.
BP-4 0.
BP-5 0.

2

TH-232 0.
PA-233 0.
U-233 0.
U-234 0.
U-235 0.
U-236 0.
NP-237 0.
U-238 6.8228050E-03
NP-239 1.2076702E-21
PU-239 9.0842187E-04
PU-240 3.6896838E-04
PU-241 4.9756798E-05
PU-242 2.3577042E-05

AM-243 5.0019954E-06
AM-241 5.1447114E-06
FPA-1 0.
FPA-2 0.
FPA-3 8.3152705E-04
FPA-4 1.1124087E-04
XE 0.
SM 0.
BP-1 0.
BP-2 0.
BP-3 0.
BP-4 0.
BP-5 0.

FUEL TYPE 2

1

TH-232 0.
PA-233 0.
U-233 0.
U-234 0.
U-235 0.
U-236 0.
NP-237 0.
U-238 6.2902163E-03
NP-239 1.0277537E-21
PU-239 1.3763981E-03
PU-240 4.6782626E-04
PU-241 7.1679307E-05
PU-242 3.1881509E-05

AM-243 2.9760906E-06
AM-241 3.9256069E-06
FPA-1 0.
FPA-2 0.
FPA-3 4.6534274E-04
FPA-4 5.7498073E-05
XE 0.
SM 0.
BP-1 0.
BP-2 0.
BP-3 0.
BP-4 0.
BP-5 0.

2

TH-232 0.
PA-233 0.
U-233 0.
U-234 0.
U-235 0.
U-236 0.
NP-237 0.

AM-243 5.7669828E-06
AM-241 7.1199803E-06
FPA-1 0.
FPA-2 0.
FPA-3 8.7940299E-04
FPA-4 1.3304089E-04
XE 0.

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FUEL TYPE 2

STEP	ISOTOPE	CONCENTRATION
2	U-238	5.9207904E-03
	NP-239	9.6739343E-22
	PJ-239	1.0471518E-03
	PJ-240	4.6705622E-04
	PU-241	6.5612433E-05
	PU-242	3.1758716E-05

ISOTOPE	CONCENTRATION
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 3

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	0.
U-236	0.
NP-237	0.
U-238	6.3940393E-03
NP-239	7.6499878E-22
PU-239	1.2185879E-03
PU-240	4.4075042E-04
PU-241	7.3455583E-05
PU-242	3.1827359E-05

AM-243	2.1931365E-06
AM-241	4.0247767E-06
FPA-1	0.
FPA-2	0.
FPA-3	3.4375780E-04
FPA-4	4.9067728E-05
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

2

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	0.
U-236	0.
NP-237	0.
U-238	6.1176592E-03
NP-239	7.3193244E-22
PU-239	1.1149073E-03
PU-240	4.5722822E-04
PU-241	6.6967214E-05
PU-242	3.1493042E-05

AM-243	4.2935343E-06
AM-241	7.4014047E-06
FPA-1	0.
FPA-2	0.
FPA-3	6.5870081E-04
FPA-4	9.6691884E-05
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

3

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	0.
U-236	0.
NP-237	0.
U-238	5.8532292E-03
NP-239	7.0029535E-22
PU-239	1.0286078E-03
PU-240	4.7087448E-04
PU-241	6.3394528E-05
PU-242	3.1633362E-05

AM-243	6.2816905E-06
AM-241	1.0360204E-05
FPA-1	0.
FPA-2	0.
FPA-3	9.4960391E-04
FPA-4	1.4371483E-04
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 4

1

TH-232	0.
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AM-243	1.2786583E-11
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FUEL TYPE 4

STEP ISOTOPE CONCENTRATION

1 PA-233 0.
U-233 0.
U-234 0.
U-235 2.1653129E-05
U-236 2.0958900E-06
NP-237 6.4317218E-08
U-238 9.6747476E-03
NP-239 1.1097671E-21
PU-239 3.1195919E-04
PU-240 1.0266616E-05
PU-241 1.8617819E-07
PU-242 2.5318590E-09

ISOTOPE CONCENTRATION

AM-241 2.5163412E-09
FPA-1 0.
FPA-2 6.1866638E-06
FPA-3 7.2690720E-05
FPA-4 1.3459326E-07
XE 0.
SM 0.
BP-1 0.
BP-2 0.
BP-3 0.
BP-4 0.
BP-5 0.

2 TH-232 0.
PA-233 0.
U-233 0.
U-234 0.
U-235 1.5628600E-05
U-236 3.4680457E-06
NP-237 2.2275488E-07
U-238 9.2950091E-03
NP-239 1.0662082E-21
PU-239 5.3679552E-04
PU-240 3.5994351E-05
PU-241 1.2204105E-06
PU-242 3.4164982E-08

AM-243 1.0101694E-09
AM-241 3.3974635E-08
FPA-1 0.
FPA-2 1.0680600E-05
FPA-3 1.8983633E-04
FPA-4 1.0751073E-06
XE 0.
SM 0.
BP-1 0.
BP-2 0.
BP-3 0.
BP-4 0.
BP-5 0.

FUEL TYPE 5

1 TH-232 0.
PA-233 0.
U-233 0.
U-234 0.
U-235 2.4422369E-05
U-236 1.4874523E-06
NP-237 2.8927196E-08
U-238 9.8264499E-03
NP-239 7.0659317E-22
PU-239 2.0744327E-04
PU-240 4.9921092E-06
PU-241 5.4061629E-08
PU-242 5.0198504E-10

AM-243 9.8720564E-11
AM-241 7.3237076E-10
FPA-1 0.
FPA-2 4.0612516E-06
FPA-3 3.1428197E-05
FPA-4 2.9199266E-08
XE 0.
SM 0.
BP-1 0.
BP-2 0.
BP-3 0.
BP-4 0.
BP-5 0.

2 TH-232 0.
PA-233 0.
U-233 0.
U-234 0.
U-235 1.9881737E-05
U-236 2.6359463E-06
NP-237 1.0549953E-07
U-238 9.5887902E-03

AM-243 2.0302600E-10
AM-241 1.0726754E-08
FPA-1 0.
FPA-2 7.3768176E-06
FPA-3 6.6055658E-05
FPA-4 2.5896438E-07
XE 0.
SM 0.

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FUEL TYPE 5

STEP	ISOTOPE	CONCENTRATION
2	NP-239	6.8946469E-22
	PU-239	3.7757348E-04
	PU-240	1.6929293E-05
	PU-241	3.9414548E-07
	PU-242	7.1188331E-09

ISOTOPE	CONCENTRATION
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 6

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.6368773E-05
U-236	1.0319541E-06
NP-237	1.2982049E-08
U-238	9.9232562E-03
NP-239	4.5553378E-22
PU-239	1.3138237E-04
PU-240	1.3888594E-06
PU-241	1.6422987E-08
PU-242	9.3066407E-11

AM-243	-2.4652880E-10
AM-241	2.0280961E-10
FPA-1	0.
FPA-2	2.5863204E-06
FPA-3	1.3355678E-05
FPA-4	6.1010856E-09
XB	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.5177073E-05
U-236	1.9114902E-06
NP-237	4.8849254E-08
U-238	9.768390E-03
NP-239	4.2918676E-22
PU-239	2.4739069E-05
PU-240	7.5647137E-06
PU-241	1.8070613E-07
PU-242	1.8785121E-09

AM-243	-2.4615917E-10
AM-241	3.2316253E-09
FPA-1	0.
FPA-2	4.8625941E-06
FPA-3	3.5769854E-05
FPA-4	5.0589128E-08
XB	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 7

2

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.5082119E-05
U-236	1.7430706E-06
NP-237	4.2563190E-08
U-238	9.7502782E-03
NP-239	8.9892994E-22
PU-239	2.8831128E-04
PU-240	6.7685513E-06
PU-241	9.9442060E-08
PU-242	1.1025087E-09

AM-243	-3.4579729E-11
AM-241	1.3484958E-09
FPA-1	0.
FPA-2	5.1322469E-06
FPA-3	5.4469428E-05
FPA-4	7.0639978E-08
XB	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

TH-232	0.
PA-233	0.

AM-243	2.4665429E-10
AM-241	1.8641317E-08

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FUEL TYPE 7

STEP	ISOTOPE	CONCENTRATION
2	U-233	0.
	U-234	0.
	U-235	1.7759474E-05
	U-236	2.9892759E-06
	NP-237	1.9149942E-07
	U-238	9.4407075E-03
	NP-239	8.7038897E-22
	PU-239	4.5715299E-04
	PU-240	2.4329760E-05
	PU-241	6.7532041E-07
	PU-242	1.9062980E-08

ISOTOPE	CONCENTRATION
FPA-1	0.
FPA-2	9.0997502E-06
FPA-3	3.4653944E-04
FPA-4	5.6487860E-07
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 8

1	TH-232	0.
	PA-233	0.
	U-233	0.
	U-234	0.
	U-235	2.5623026E-05
	U-236	1.1842633E-06
	NP-237	1.7612130E-06
	U-238	9.8538645E-03
	NP-239	5.4436292E-22
	PU-239	1.6252827E-04
	PU-240	2.7888439E-06
	PU-241	2.6548892E-08
	PU-242	2.2060659E-10

AM-243	9.3454823E-11
AM-241	3.3496608E-10
FPA-1	0.
FPA-2	3.1250970E-06
FPA-3	2.0778602E-09
FPA-4	1.2594077E-08
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

2	TH-232	0.
	PA-233	0.
	U-233	0.
	U-234	0.
	U-235	2.1884648E-05
	U-236	2.1576338E-06
	NP-237	6.5603253E-08
	U-238	9.7011697E-03
	NP-239	5.3430082E-22
	PU-239	3.0236484E-06
	PU-240	1.0480271E-05
	PU-241	1.9179647E-07
	PU-242	2.7272854E-09

AM-243	7.6251915E-11
AM-241	2.1598259E-09
FPA-1	0.
FPA-2	2.8921148E-06
FPA-3	9.5682197E-05
FPA-4	1.0331842E-07
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 9

1	TH-232	0.
	PA-233	0.
	U-233	0.
	U-234	0.
	U-235	2.7334783E-05
	U-236	7.7032849E-07
	NP-237	6.9829583E-09
	U-238	9.9649688E-03
2	NP-239	3.1474763E-22

AM-243	1.0101845E-10
AM-241	1.0395308E-10
FPA-1	0.
FPA-2	1.8878757E-06
FPA-3	7.8112832E-06
FPA-4	2.0984501E-09
XE	0.
SM	0.
BP-1	0.

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FUEL TYPE 9

STEP	ISOTOPE	CONCENTRATION	ISOTOPE	CONCENTRATION
1	PU-239	9.6143307E-05	BP-2	0.
	PU-240	1.0678453E-06	BP-3	0.
	PU-241	6.4792428E-09	BP-4	0.
	PU-242	1.0110004E-10	BP-5	0.
2	TH-232	0.	AM-243	-3.8495211E-11
	PA-233	0.	AM-241	1.3887923E-09
	U-233	0.	FPA-1	0.
	J-234	0.	FPA-2	3.6093954E-06
	J-235	2.4906345E-05	FPA-3	2.0407640E-05
	J-236	1.4574966E-06	FPA-4	1.7351822E-08
	NP-237	2.6763279E-08	XE	0.
	U-238	9.8610332E-03	SM	0.
	NP-239	3.1146478E-22	BP-1	0.
	RU-239	1.8437172E-04	BP-2	0.
	PU-240	4.1197496E-06	BP-3	0.
	PU-241	4.8591299E-08	BP-4	0.
	PU-242	5.0102674E-10	BP-5	0.

FUEL TYPE 10

1	TH-232	0.	AM-243	4.4024399E-11
	PA-233	0.	AM-241	5.4523745E-10
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	3.8656859E-06
	U-235	2.4782789E-05	FPA-3	3.5026429E-05
	U-236	1.3281689E-06	FPA-4	2.6999097E-08
	NP-237	2.8379372E-08	XE	0.
	U-238	9.8359667E-03	SM	0.
	NP-239	6.6292486E-22	BP-1	0.
	RU-239	1.9821737E-04	BP-2	0.
	PU-240	3.7212390E-06	BP-3	0.
	PU-241	4.0366908E-08	BP-4	0.
	PU-242	3.4382774E-10	BP-5	0.
2	TH-232	0.	AM-243	1.2712403E-10
	PA-233	0.	AM-241	7.7766416E-09
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	7.0688509E-06
	U-235	2.0472854E-05	FPA-3	9.1461978E-05
	U-236	2.3724088E-06	FPA-4	2.1694146E-07
	NP-237	8.5824918E-08	XE	0.
	U-238	9.6073726E-03	SM	0.
	NP-239	6.4712738E-22	BP-1	0.
	PU-239	3.5688476E-04	BP-2	0.
	PU-240	1.3765845E-05	BP-3	0.
	PU-241	2.8545645E-07	BP-4	0.
	PU-242	4.6279602E-09	BP-5	0.
3	TH-232	0.	AM-243	6.1093264E-10
	PA-233	0.	AM-241	3.5505939E-08
	U-233	0.	FPA-1	0.

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FUEL TYPE 10

STEP	ISOTOPE	CONCENTRATION	ISOTOPE	CONCENTRATION
3	U-234	0.	FPA-2	9.7256853E-06
	U-235	1.6912467E-05	FPA-3	1.6550630E-04
	U-236	3.1843758E-06	FPA-4	7.3011020E-07
	NP-237	1.7747156E-07	XE	0.
	U-238	9.3840910E-03	SM	0.
	NP-239	6.3208772E-22	BP-1	0.
	PU-239	4.9009379E-04	BP-2	0.
	PU-240	2.8668667E-09	BP-3	0.
	PU-241	8.5311009E-07	BP-4	0.
	PU-242	2.0960650E-08	BP-5	0.

FUEL TYPE 11

1	TH-232	0.	AM-243	-5.2248201E-11
	PA-233	0.	AM-241	1.3970508E-10
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	2.3577743E-06
	U-235	2.6746543E-05	FPA-3	1.3368855E-05
	U-236	8.8615381E-07	FPA-4	4.7553874E-09
	NP-237	9.9284480E-09	XE	0.
	U-238	9.9341464E-03	SM	0.
	NP-239	3.8914807E-22	BP-1	0.
	PU-239	1.2095874E-04	BP-2	0.
	PU-240	1.5104398E-08	BP-3	0.
	PU-241	1.0554818E-08	BP-4	0.
	PU-242	3.4509277E-11	BP-5	0.
2	TH-232	0.	AM-243	-1.5694019E-10
	PA-233	0.	AM-241	2.1176445E-09
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	4.4624721E-06
	U-235	2.3845919E-05	FPA-3	3.4526282E-05
	U-236	1.6554290E-06	FPA-4	3.8871808E-08
	NP-237	3.6179383E-08	XE	0.
	U-238	9.8001257E-03	SM	0.
	NP-239	3.8376320E-22	BP-1	0.
	PU-239	2.2945514E-04	BP-2	0.
	PU-240	5.7729902E-06	BP-3	0.
	PU-241	7.9108318E-08	BP-4	0.
	PU-242	7.8185015E-10	BP-5	0.
3	TH-232	0.	AM-243	-7.4564127E-11
	PA-233	0.	AM-241	9.9492136E-09
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	6.3418402E-06
	U-235	2.1259864E-05	FPA-3	6.2653680E-05
	U-236	2.3209881E-06	FPA-4	1.3333379E-07
	NP-237	7.7307742E-08	XE	0.
	U-238	9.6679131E-03	SM	0.
	NP-239	3.8845098E-22	BP-1	0.
	PU-239	3.2662708E-04	BP-2	0.

FUEL TYPE 11

STEP	ISOTOPE	CONCENTRATION
3	PU-240	1.2415121E-05
	PU-241	2.4404920E-07
	PU-242	3.6639798E-09

ISOTOPE	CONCENTRATION
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 12

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.8035364E-05
U-236	5.7050587E-07
U-237	3.7503168E-09
NP-237	9.9934224E-03
U-238	2.3022524E-22
NP-239	7.0938615E-03
PU-239	5.7412050E-07
PU-240	4.9519886E-09
PU-241	-4.9314623E-14
PU-242	

AM-243	-1.8368966E-10
AM-241	-1.0814289E-11
FPA-1	0.
FPA-2	1.3903792E-06
FPA-3	5.0614088E-06
FPA-4	7.9194483E-10
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

2

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.6199388E-05
U-236	1.0956935E-06
U-237	1.4541218E-08
U-238	9.9174272E-03
NP-239	2.2847448E-22
PU-239	1.3759389E-04
PU-240	2.2369017E-06
PU-241	1.9393409E-08
PU-242	4.8936921E-13

AM-243	-5.8502802E-10
AM-241	4.9948024E-10
FPA-1	0.
FPA-2	2.6903867E-06
FPA-3	1.2712445E-05
FPA-4	6.4733805E-09
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

3

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.4483646E-05
U-236	1.5736125E-06
U-237	3.1717284E-08
U-238	9.8420099E-03
NP-239	2.2673704E-22
PU-239	2.0019397E-04
PU-240	4.9028220E-06
PU-241	6.2250451E-08
PU-242	5.0795305E-10

AM-243	-1.5871414E-10
AM-241	2.4388142E-09
FPA-1	0.
FPA-2	3.9090231E-06
FPA-3	2.2803531E-05
FPA-4	2.2599929E-08
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 13

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.

AM-243	-1.0409763E-11
AM-241	7.0342526E-10
FPA-1	0.
FPA-2	5.3295133E-06

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FUEL TYPE 13

STEP	ISOTOPE	CONCENTRATION	ISOTOPE	CONCENTRATION
1	U-235	3.2854474E-05	FPA-3	4.7514663E-05
	U-236	1.7839198E-06	FPA-4	3.7315210E-08
	NP-237	3.2092804E-08	XE	0.
	U-238	1.1964838E-02	SM	0.
	NP-239	8.2665045E-22	BP-1	0.
	PU-239	2.4292554E-04	BP-2	0.
	PU-240	4.6322027E-06	BP-3	0.
	PU-241	5.0792301E-08	BP-4	0.
	PU-242	4.0964762E-10	BP-5	0.
2	TH-232	0.	AM-243	1.1407262E-10
	PA-233	0.	AM-241	9.7610271E-09
	U-235	0.	FPA-1	0.
	U-236	0.	FPA-2	9.7216426E-06
	U-238	2.6982411E-05	FPA-3	1.2287389E-04
	U-236	3.1754066E-06	FPA-4	2.9810223E-07
	NP-237	1.1753894E-07	XE	0.
	U-238	1.1676783E-02	SM	0.
	NP-239	8.0674870E-22	BP-1	0.
	PU-239	4.4259048E-04	BP-2	0.
	PU-240	1.7081261E-08	BP-3	0.
	PU-241	3.9767646E-07	BP-4	0.
	PU-242	5.8591799E-09	BP-5	0.
3	TH-232	0.	AM-243	7.2693238E-10
	PA-233	0.	AM-241	4.4381121E-08
	U-235	0.	FPA-1	0.
	U-236	0.	FPA-2	1.3345123E-05
	U-238	2.2154787E-05	FPA-3	2.2094290E-04
	U-236	4.2476134E-06	FPA-4	9.9795983E-07
	NP-237	2.4847970E-07	XE	0.
	U-238	1.1395662E-02	SM	0.
	NP-239	7.8732608E-22	BP-1	0.
	PU-239	6.0579805E-04	BP-2	0.
	PU-240	3.5462494E-08	BP-3	0.
	PU-241	1.0645847E-08	BP-4	0.
	PU-242	2.6559208E-08	BP-5	0.
4	TH-232	0.	AM-243	2.7257955E-09
	PA-233	0.	AM-241	1.2626373E-07
	U-235	0.	FPA-1	0.
	U-236	0.	FPA-2	1.6338435E-05
	U-238	1.8205311E-05	FPA-3	3.3739809E-04
	U-236	5.0604991E-06	FPA-4	2.3341666E-06
	NP-237	3.9575920E-07	XE	0.
	U-238	1.1121310E-02	SM	0.
	NP-239	7.6837108E-22	BP-1	0.
	PU-239	7.3830032E-04	BP-2	0.
	PU-240	5.8223961E-05	BP-3	0.

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FUEL TYPE 13

STEP	ISOTOPE	CONCENTRATION
4	PU-241	2.225370E-06
	PU-242	7.5170385E-08

ISOTOPE	CONCENTRATION
BP-4	0.
BP-5	0.

FUEL TYPE 14

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.9876148E-09
U-236	1.0952115E-06
NP-237	1.0850292E-08
U-238	1.2079663E-02
FP-239	4.8946993E-22
PU-239	1.4255977E-04
PU-240	1.6098981E-06
PU-241	1.0308984E-08
PU-242	5.8840628E-11

AM-243	2.1400568E-12
AM-241	1.1960892E-10
FPA-1	0.
FPA-2	3.0177899E-06
FPA-3	1.6191253E-05
FPA-4	5.0998388E-09
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

2

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.2177450E-05
U-236	2.0239902E-06
NP-237	4.1121654E-08
U-238	1.1941424E-02
NP-239	4.8333020E-22
PU-239	2.7108271E-04
PU-240	6.1665162E-06
PU-241	7.6512272E-08
PU-242	7.4943332E-10

AM-243	2.0383719E-11
AM-241	2.0542053E-09
FPA-1	0.
FPA-2	5.7276746E-06
FPA-3	4.1206106E-05
FPA-4	4.1464866E-08
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

3

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.8860074E-05
U-236	2.8896513E-06
NP-237	8.8569498E-08
U-238	1.1789254E-02
NP-239	4.9727078E-22
PU-239	3.8679172E-04
PU-240	1.3290014E-05
PU-241	2.3977974E-07
PU-242	3.4533762E-09

AM-243	2.1782015E-10
AM-241	9.7733001E-09
FPA-1	0.
FPA-2	8.1617045E-06
FPA-3	7.4269852E-05
FPA-4	1.4163149E-07
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

4

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	2.5884708E-05

AM-243	3.6260316E-10
AM-241	2.9002776E-08
FPA-1	0.
FPA-2	1.0348612E-05
FPA-3	1.1452593E-04

FUEL TYPE 14

STEP	ISOTOPE	CONCENTRATION
4	U-236	3.6166298E-06
	NP-237	1.5005024E-07
	U-238	1.1631128E-02
	NP-239	4.5129056E-22
	PU-239	4.9080500E-04
	PU-240	2.2637045E-05
	PU-241	5.2816327E-07
	PU-242	1.0155730E-08

ISOTOPE	CONCENTRATION
FPA-4	3.3893249E-07
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 15

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	8.7572441E-05
U-236	6.6902041E-07
NP-237	3.8133231E-09
U-238	1.2168612E-02
NP-239	2.7433854E-22
PU-239	8.4691027E-09
PU-240	5.7529335E-07
PU-241	2.1912819E-09
PU-242	-2.8993895E-11

AM-243	3.8480732E-13
AM-241	7.9762460E-11
FPA-1	0.
FPA-2	1.7547258E-06
FPA-3	6.1181638E-06
FPA-4	8.1046680E-10
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

2

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.5292267E-05
U-236	1.8692298E-06
NP-237	1.4828363E-08
U-238	1.2077906E-02
NP-239	2.7229359E-22
PU-239	1.6459937E-04
PU-240	2.2457014E-06
PU-241	1.6719882E-08
PU-242	7.0905558E-11

AM-243	-7.5624497E-11
AM-241	4.8901889E-10
FPA-1	0.
FPA-2	3.4037368E-06
FPA-3	1.5224858E-05
FPA-4	6.6088030E-09
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

3

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.5150360E-05
U-236	1.8638909E-06
NP-237	3.2432178E-08
U-238	1.1987876E-02
NP-239	2.7026388E-22
PU-239	2.3996417E-04
PU-240	4.9319030E-06
PU-241	5.3796727E-08

AM-243	9.1029232E-11
AM-241	2.2830966E-09
FPA-1	0.
FPA-2	4.9535183E-06
FPA-3	2.7149079E-05
FPA-4	2.2674810E-08
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.

FUEL TYPE 15

STEP	ISOTOPE	CONCENTRATION
3	PU-242	4.3567692E-10
4	TH-232	0.
	PA-233	0.
	U-233	0.
	U-234	0.
	U-235	3.1138498E-05
	U-236	2.3952798E-06
	NP-237	5.6062329E-08
	U-238	1.4896517E-02
	NP-239	2.6824930E-22
	PU-239	3.1101281E-04
	PU-240	8.9576779E-06
	PU-241	1.2162722E-07
	PU-242	1.3932188E-09

ISOTOPE	CONCENTRATION
BP-5	0.
AM-243	5.6256469E-11
AM-241	6.7842720E-09
FPA-1	0.
FPA-2	6.4101606E-06
FPA-3	4.1728387E-05
FPA-4	5.4531796E-08
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 16

STEP	ISOTOPE	CONCENTRATION
1	TH-232	0.
	PA-233	0.
	U-233	0.
	U-234	0.
	U-235	3.8693811E-05
	U-236	3.7007513E-07
	NP-237	1.1209573E-09
	U-238	1.2211593E-02
	NP-239	1.4705366E-22
	PU-239	4.3860815E-05
	PU-240	1.7146255E-07
	PU-241	3.9778893E-10
	PU-242	1.8896676E-11

ISOTOPE	CONCENTRATION
AM-243	1.2423410E-11
AM-241	1.0034276E-10
FPA-1	0.
FPA-2	9.3499383E-07
FPA-3	2.2745866E-06
FPA-4	1.0632116E-10
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

STEP	ISOTOPE	CONCENTRATION
2	TH-232	0.
	PA-233	0.
	U-233	0.
	U-234	0.
	U-235	3.7430275E-05
	U-236	7.8368607E-07
	NP-237	4.4156698E-09
	U-238	1.2163576E-02
	NP-239	1.4647424E-22
	PU-239	9.0351350E-05
	PU-240	6.7711800E-07
	PU-241	2.7601194E-09
	PU-242	3.8469104E-11

ISOTOPE	CONCENTRATION
AM-243	6.3614828E-11
AM-241	2.8434469E-11
FPA-1	0.
FPA-2	1.0396242E-06
FPA-3	5.3924299E-06
FPA-4	8.6130921E-10
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

STEP	ISOTOPE	CONCENTRATION
3	TH-232	0.
	PA-233	0.
	U-233	0.
	U-234	0.
	U-235	3.6206000E-05
	U-236	1.0573206E-06

ISOTOPE	CONCENTRATION
AM-243	3.9002396E-11
AM-241	1.3377204E-10
FPA-1	0.
FPA-2	2.7148953E-06
FPA-3	9.3272115E-06
FPA-4	2.9505376E-09

FUEL TYPE 16

STEP	ISOTOPE	CONCENTRATION
3	NP-237	9.7855432E-09
	U-238	1.2115648E-02
	NP-239	1.4589709E-22
	PU-239	1.3350785E-04
	PU-240	1.9042257E-06
	PU-241	9.0272257E-09
	PU-242	6.6399221E-11

4

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.5029637E-09
U-236	1.3954300E-06
NP-237	1.7136875E-08
U-238	1.2067910E-02
NP-239	1.4532222E-22
PU-239	1.7536564E-04
PU-240	2.6404252E-06
PU-241	2.0746248E-08
PU-242	1.5241832E-10

FUEL TYPE 17

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.5725548E-09
U-236	1.1588985E-06
NP-237	1.2281194E-08
U-238	1.2097644E-02
NP-239	4.7267459E-22
PU-239	1.4328133E-04
PU-240	1.7548753E-06
PU-241	1.2059718E-08
PU-242	8.9622235E-11

2

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.1907869E-09
U-236	2.1668139E-06
NP-237	4.6662796E-08
U-238	1.1937437E-02
NP-239	4.6641507E-22
PU-239	2.7194442E-04
PU-240	6.7091506E-06
PU-241	8.9311165E-08
PU-242	9.6042542E-10

ISOTOPE	CONCENTRATION
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

AM-243	1.4335968E-10
AM-241	8.1315876E-10
FPA-1	0.
FPA-2	3.5617769E-06
FPA-3	1.4055085E-05
FPA-4	7.0845572E-09
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

AM-243	-2.1620839E-11
AM-241	1.2875062E-10
FPA-1	0.
FPA-2	1.1032723E-06
FPA-3	1.7301929E-05
FPA-4	9.8516515E-09
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

AM-243	-6.5619450E-13
AM-241	2.3174916E-09
FPA-1	0.
FPA-2	9.8786537E-06
FPA-3	4.3768683E-05
FPA-4	4.7603152E-08
XE	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 17

STEP	ISOTOPE	CONCENTRATION	ISOTOPE	CONCENTRATION
3	TH-232	0.	AM-243	-6.8515246E-11
	PA-233	0.	AM-241	1.1321487E-08
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	8.3615560E-06
	U-235	2.8498153E-05	FPA-3	7.8444890E-05
	U-236	3.0405161E-06	FPA-4	1.6270418E-07
	NP-237	9.9774532E-08	XE	0.
	U-238	1.1779353E-02	SM	0.
	NP-239	4.8023843E-22	BP-1	0.
	PU-239	3.8731224E-04	BP-2	0.
	PU-240	1.4432442E-05	BP-3	0.
	PU-241	2.7923138E-07	BP-4	0.
	PU-242	4.2609432E-09	BP-5	0.
4	TH-232	0.	AM-243	1.7586889E-10
	PA-233	0.	AM-241	3.3627356E-08
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	1.0583589E-05
	U-235	2.3452803E-05	FPA-3	1.2046186E-04
	U-236	3.7949681E-06	FPA-4	3.8903856E-07
	NP-237	1.6863919E-07	XE	0.
	U-238	1.1623362E-02	SM	0.
	NP-239	4.5414362E-22	BP-1	0.
	PU-239	4.9058996E-04	BP-2	0.
	PU-240	2.4537907E-05	BP-3	0.
	PU-241	6.1364114E-07	BP-4	0.
	PU-242	1.2328350E-08	BP-5	0.

FUEL TYPE 18

1	TH-232	0.	AM-243	-1.8763678E-10
	PA-233	0.	AM-241	1.1981844E-11
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	1.7835779E-06
	U-235	3.7502347E-05	FPA-3	6.0064976E-06
	U-236	7.8976639E-07	FPA-4	6.5289964E-10
	NP-237	4.3077572E-09	XE	0.
	U-238	1.2168909E-02	SM	0.
	NP-239	2.7376468E-22	BP-1	0.
	PU-239	8.4456125E-05	BP-2	0.
	PU-240	6.2523802E-07	BP-3	0.
	PU-241	2.5583378E-09	BP-4	0.
	PU-242	1.2020705E-11	BP-5	0.
2	TH-232	0.	AM-243	-1.4310986E-13
	PA-233	0.	AM-241	5.1831230E-10
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	3.4566060E-06
	U-235	3.5160652E-05	FPA-3	1.5003313E-05
	U-236	1.3660100E-06	FPA-4	6.9804769E-09
	NP-237	1.6731675E-08	XE	0.

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FUEL TYPE 18

STEP	ISOTOPE	CONCENTRATION
2	U-238	1.2078494E-02
	NP-239	2.7173062E-22
	PU-239	1.6403633E-04
	PU-240	2.4390462E-06
	PU-241	1.9497643E-08
	PU-242	1.1804843E-10

3

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.2965175E-05
U-236	1.9721922E-06
NP-237	3.6599072E-08
U-238	1.1988791E-02
NP-239	2.6971167E-22
PU-239	2.3899094E-04
PU-240	5.3926232E-06
PU-241	6.2689973E-08
PU-242	5.2714922E-10

ISOTOPE	CONCENTRATION
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

AM-243	-4.9747688E-11
AM-241	2.5058776E-09
FPA-1	0.
FPA-2	5.0260734E-06
FPA-3	2.6819560E-05
FPA-4	2.4038276E-08
XB	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.0906786E-05
U-236	2.9319567E-06
NP-237	6.3129820E-08
U-238	1.1899675E-02
NP-239	2.6770772E-22
PU-239	3.0955609E-04
PU-240	9.2821273E-06
PU-241	1.4161218E-07
PU-242	1.5800841E-09

AM-243	-9.8645937E-11
AM-241	7.6089058E-09
FPA-1	0.
FPA-2	6.4989305E-06
FPA-3	4.1277332E-05
FPA-4	5.7996412E-08
XB	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

FUEL TYPE 19

1

TH-232	0.
PA-233	0.
U-233	0.
U-234	0.
U-235	3.8513669E-05
U-236	4.3450193E-07
NP-237	1.9541783E-09
U-238	1.2206969E-02
NP-239	1.6219838E-22
PU-239	5.0491867E-05
PU-240	2.2767559E-07
PU-241	5.6006703E-10
PU-242	1.1099858E-10

AM-243	7.5090533E-11
AM-241	9.3469891E-11
FPA-1	0.
FPA-2	1.0502779E-06
FPA-3	2.3103347E-06
FPA-4	1.3853907E-10
XB	0.
SM	0.
BP-1	0.
BP-2	0.
BP-3	0.
BP-4	0.
BP-5	0.

2

TH-232	0.
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AM-243	2.3096157E-10
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FUEL TYPE 19

STEP ISOTOPE CONCENTRATION

2 PA-233 0.
 U-233 0.
 U-234 0.
 U-235 3.7082961E-05
 U-236 8.4959984E-07
 NP-237 6.1108900E-09
 U-238 1.2184168E-02
 NP-239 1.6145697E-22
 PU-239 9.9281376E-05
 PU-240 8.9764917E-07
 PU-241 4.3503610E-09
 PU-242 1.0875659E-10

3 TH-232 0.
 PA-233 0.
 U-233 0.
 U-234 0.
 U-235 3.5794634E-05
 U-236 1.2460392E-06
 NP-237 1.353831E-08
 U-238 1.2101995E-02
 NP-239 1.6075899E-22
 PU-239 1.4641951E-04
 PU-240 1.9907648E-06
 PU-241 1.4194586E-08
 PU-242 2.7170639E-10

4 TH-232 0.
 PA-233 0.
 U-233 0.
 U-234 0.
 U-235 3.4377908E-05
 U-236 1.6249376E-06
 NP-237 2.3612710E-08
 U-238 1.2049250E-02
 NP-239 1.6006323E-22
 PU-239 1.9195974E-04
 PU-240 3.4885605E-06
 PU-241 3.2580233E-08
 PU-242 4.2590617E-10

FUEL TYPE 20

1 TH-232 0.
 PA-233 0.
 U-233 0.
 U-234 0.
 U-235 3.9191467E-05
 U-236 2.4158536E-07
 NP-237 4.6891416E-10
 U-238 1.2231510E-02

ISOTOPE CONCENTRATION

AM-241 2.1998759E-10
 FPA-1 0.
 FPA-2 2.0617261E-06
 FPA-3 5.6471370E-06
 FPA-4 1.1836556E-09
 XB 0.
 SM 0.
 BP-1 0.
 BP-2 0.
 BP-3 0.
 BP-4 0.
 BP-5 0.

AM-243 2.0018140E-10
 AM-241 8.9109943E-10
 FPA-1 0.
 FPA-2 3.0358129E-06
 FPA-3 9.9755053E-06
 FPA-4 4.0168970E-09
 XB 0.
 SM 0.
 BP-1 0.
 BP-2 0.
 BP-3 0.
 BP-4 0.
 BP-5 0.

AM-243 5.7233297E-11
 AM-241 1.8248479E-09
 FPA-1 0.
 FPA-2 3.9739402E-06
 FPA-3 1.5261585E-06
 FPA-4 9.7004063E-09
 XB 0.
 SM 0.
 BP-1 0.
 BP-2 0.
 BP-3 0.
 BP-4 0.
 BP-5 0.

AM-243 -1.2408302E-11
 AM-241 8.3530134E-11
 FPA-1 0.
 FPA-2 5.6648003E-07
 FPA-3 8.7126969E-07
 FPA-4 2.0681701E-11
 XB 0.
 SM 0.

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FUEL TYPE 20

STEP	ISOTOPE	CONCENTRATION	ISOTOPE	CONCENTRATION
1	NP-239	8.7953909E-23	BP-1	0.
	PU-239	2.7549468E-05	BP-2	0.
	PU-240	6.9111822E-08	BP-3	0.
	PU-241	9.4076984E-11	BP-4	0.
	PU-242	6.3004288E-11	BP-5	0.
2	TH-232	0.	AM-243	-4.1391215E-10
	PA-233	0.	AM-241	1.9311969E-10
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	1.1215531E-06
	U-235	3.8399276E-05	FPA-3	2.0387320E-06
	U-236	4.7731583E-07	FPA-4	1.6139627E-10
	NP-237	1.4555028E-09	XB	0.
	U-238	1.2203086E-02	SM	0.
	NP-239	8.7749521E-23	BP-1	0.
	PU-239	5.4599796E-05	BP-2	0.
	PU-240	2.7424820E-07	BP-3	0.
	PU-241	7.3416100E-10	BP-4	0.
	PU-242	1.3504239E-10	BP-5	0.
3	TH-232	0.	AM-243	-2.7899022E-10
	PA-233	0.	AM-241	3.1362751E-10
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	1.6654831E-06
	U-235	3.7623099E-05	FPA-3	3.4969881E-06
	U-236	7.0731360E-07	FPA-4	5.4476972E-10
	NP-237	4.1388498E-09	XB	0.
	U-238	1.2174729E-02	SM	0.
	NP-239	8.7549607E-23	BP-1	0.
	PU-239	8.1199023E-05	BP-2	0.
	PU-240	6.1228198E-07	BP-3	0.
	PU-241	2.4188110E-09	BP-4	0.
	PU-242	1.9379860E-10	BP-5	0.
4	TH-232	0.	AM-243	-3.4150954E-10
	PA-233	0.	AM-241	5.2544073E-10
	U-233	0.	FPA-1	0.
	U-234	0.	FPA-2	2.1984092E-06
	U-235	3.9862611E-05	FPA-3	5.2407270E-06
	U-236	9.8169852E-07	FPA-4	1.3096718E-09
	NP-237	7.8830814E-09	XB	0.
	U-238	1.2146437E-02	SM	0.
	NP-239	8.7342167E-23	BP-1	0.
	PU-239	1.0723509E-04	BP-2	0.
	PU-240	1.0801379E-08	BP-3	0.
	PU-241	5.6015788E-09	BP-4	0.
	PU-242	1.7224797E-10	BP-5	0.

GEAR136721

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES,

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES,

RECIPIENT FUEL TYPE 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.2910	0.2910	0.2910	0.2910	0.	0.

RECIPIENT FUEL TYPE 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1380	0.1380	0.1380	0.1380	0.	0.

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES,

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES,

RECIPIENT FUEL TYPE 3

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.1840	0.1840	0.1840	0.1840	0.	0.

RECIPIENT FUEL TYPE 4

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

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RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES.

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES.

RECIPIENT FUEL TYPE 5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 6

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES.

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES.

RECIPIENT FUEL TYPE 7

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 8

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

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RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES,

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES,

RECIPIENT FUEL TYPE 9

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

GEAP18672

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES,

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES.

RECIPIENT FUEL TYPE 11

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 12

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES,

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES.

RECIPIENT FUEL TYPE 13

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 14

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES.

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES.

RECIPIENT FUEL TYPE 15

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 16

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

GEAP.13672

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES.

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES.

RECIPIENT FUEL TYPE 17

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 18

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECYCLE FRACTIONS

HORIZONTAL INTEGERS REPRESENT ISOTOPES,

VERTICAL INTEGERS REPRESENT CONTRIBUTING FUEL TYPES.

RECIPIENT FUEL TYPE 19

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RECIPIENT FUEL TYPE 20

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
1	TX-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-235	0.	0.	0.	0.
	U-235	0.	0.	0.	0.
	U-236	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.
	U-238	6.683235E-03	6.222051E-03	7.838937E 01	7.298003E 01
	NP-239	1.297184E-21	1.207670E-21	1.521500E-17	1.416507E-17
	PU-239	9.460656E-04	9.084219E-04	1.109685E 01	1.065511E 01
	PU-240	3.373086E-04	3.689684E-04	3.956378E 00	4.327725E 00
	PU-241	5.340745E-05	4.975886E-05	6.284297E-01	5.836102E-01
	PU-242	2.333530E-05	2.357704E-05	2.737057E-01	2.765412E-01
	AM-243	2.556922E-06	5.001955E-06	2.999080E-02	5.866922E-02
	AM-241	2.741461E-06	5.144711E-06	3.215530E-02	6.034364E-02
	FPA-1	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.
	FPA-3	4.214540E-04	8.315278E-04	4.943342E 00	9.753203E 00
	FPA-4	5.558580E-05	1.112906E-04	6.519800E-01	1.304769E 00
	XE	0.	0.	0.	0.
	SH	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
	TX-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-235	0.	0.	0.	0.
	U-235	0.	0.	0.	0.
	U-236	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.
	U-238	6.294058E-03	5.920798E-03	7.354847E 01	6.938670E 01
	NP-239	1.028381E-21	9.673934E-22	1.201703E-17	1.130436E-17
	PU-239	1.182951E-03	1.047152E-03	1.382323E 01	1.223637E 01
	PU-240	4.453319E-04	4.670562E-04	5.203874E 00	5.497731E 00
	PU-241	7.283031E-05	6.961243E-05	8.514006E-01	7.667064E-01
	PU-242	3.177124E-05	3.175872E-05	3.912591E-01	3.711128E-01
	AM-243	2.944820E-06	5.766583E-06	3.441135E-02	6.738473E-02
	AM-241	3.809411E-06	7.119980E-06	4.446769E-02	8.319970E-02
	FPA-1	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.
	FPA-3	4.568219E-04	8.794030E-04	5.338139E 00	1.027616E 01
	FPA-4	6.713618E-05	1.330409E-04	7.847457E-01	1.554634E 00
	XE	0.	0.	0.	0.
	SH	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

7-831

GEAP13672

784

CEAP-13672

FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
3					
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	0.	0.	0.	0.
	U-236	0.	0.	0.	0.
	NP-237	0.	0.	0.	0.
	U-238	6.258901E-03	5.853229E-03	7.313765E-01	6.839722E-01
	NP-239	7.488309E-22	7.002954E-22	8.750376E-18	8.183219E-18
	PU-239	1.171742E-03	1.028608E-03	1.369226E-01	1.201968E-01
	PU-240	4.480482E-04	4.708745E-04	5.235615E-00	5.502349E-00
	PU-241	7.118948E-05	6.339453E-05	8.318761E-01	7.407893E-01
	PU-242	3.175063E-05	3.163336E-05	3.710182E-01	3.696479E-01
	AM-243	3.217492E-06	6.201691E-06	3.759763E-02	7.340396E-02
	AM-241	5.981367E-06	1.036020E-05	6.522041E-02	1.210629E-01
	FPA-1	0.	0.	0.	0.
	FPA-2	0.	0.	0.	0.
	FPA-3	4.946383E-04	9.496039E-04	5.780038E-00	1.109649E-01
	FPA-4	7.263140E-05	1.437148E-04	8.487297E-01	1.679363E-00
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.203882E-05	1.562860E-05	2.182061E-01	1.547386E-01
	U-236	1.975719E-06	3.468046E-06	1.956157E-02	3.433709E-02
	NP-237	7.990970E-08	2.22749E-07	7.911852E-04	2.205494E-03
	U-238	9.677333E-03	9.295009E-03	9.581518E-01	9.202979E-01
	NP-239	1.110054E-21	1.056208E-21	1.099073E-17	1.055652E-17
	PU-239	2.974827E-04	5.367955E-04	2.949374E-00	9.314807E-00
	PU-240	1.283113E-05	3.599435E-05	1.270408E-01	3.563797E-01
	PU-241	3.310311E-07	1.220410E-06	3.277536E-03	1.208327E-02
	PU-242	7.224639E-09	3.416498E-08	7.102811E-05	3.382671E-04
	AM-243	7.540430E-11	1.310169E-09	7.465772E-07	1.000168E-05
	AM-241	7.206361E-09	3.397463E-08	7.139011E-05	3.363825E-04
	FPA-1	0.	0.	0.	0.
	FPA-2	5.905552E-06	1.068060E-05	5.847081E-02	1.057485E-01
	FPA-3	8.173838E-05	1.998383E-04	8.092909E-01	1.978597E-00
	FPA-4	2.689565E-07	1.073107E-06	2.662935E-03	1.062482E-02
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

FUE TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
5	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.459496E-05	1.988174E-05	2.435144E-01	1.968489E-01
	U-236	1.431043E-06	2.635946E-06	1.416874E-02	2.609848E-02
	NP-237	3.684990E-08	1.054995E-07	3.648505E-04	1.044550E-03
	U-238	9.827432E-03	9.588790E-03	9.730130E-01	9.493852E-01
	NP-239	7.066238E-22	6.894647E-22	6.996279E-18	6.826383E-18
	PU-239	2.012309E-04	3.775737E-04	1.992381E-00	3.738353E-00
	PU-240	5.880764E-06	1.692929E-05	5.822539E-02	1.676168E-01
	PU-241	1.038407E-07	3.941455E-07	1.028126E-03	3.902430E-03
	PU-242	1.457939E-09	7.118653E-09	1.443504E-05	7.048369E-05
	AM-243	5.931488E-11	2.030280E-10	5.872761E-07	2.010178E-06
	AM-241	2.227221E-09	1.072675E-08	2.205169E-05	1.062059E-04
	FPA-1	0.	0.	0.	0.
	FPA-2	3.937149E-04	7.376818E-06	3.898167E-02	7.303780E-02
	FPA-3	3.529025E-05	6.605966E-05	3.494084E-01	6.520362E-01
	FPA-4	5.928849E-08	2.389644E-07	5.866187E-04	2.365984E-03
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
6	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.644199E-05	2.317707E-05	2.618019E-01	2.294760E-01
	U-236	1.006566E-06	1.911491E-06	9.966000E-03	1.892566E-02
	NP-237	1.677173E-09	4.884025E-08	1.660567E-04	4.835669E-04
	U-238	9.923607E-03	9.778639E-03	9.825393E-01	9.681821E-01
	NP-239	4.355494E-22	4.291868E-22	4.312371E-18	4.249374E-18
	PU-239	1.288976E-04	2.478507E-04	1.276214E-00	2.453967E-00
	PU-240	2.586367E-06	7.564714E-06	2.560768E-02	7.489816E-02
	PU-241	3.122908E-08	1.207061E-07	3.091988E-04	1.195110E-03
	PU-242	3.474961E-10	1.378812E-09	3.440556E-06	1.365161E-05
	AM-243	1.098639E-10	2.461592E-10	1.087762E-06	2.437220E-06
	AM-241	6.603109E-10	3.231825E-09	6.537728E-06	3.199827E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	2.534676E-06	4.862596E-06	2.509580E-02	4.814452E-02
	FPA-3	1.486478E-05	3.576985E-05	1.471760E-01	3.541570E-01
	FPA-4	1.246202E-08	5.052520E-08	1.233864E-04	5.002495E-04
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
7					
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.334738E-05	1.775947E-05	2.311622E-01	1.758364E-01
	U-236	1.660460E-06	2.989276E-06	1.644019E-02	2.959679E-02
	NP-237	5.358371E-08	1.514994E-07	5.305318E-04	1.499994E-03
	U-238	9.751970E-03	9.440708E-03	9.655416E-01	9.347235E-01
	NP-239	8.990859E-22	8.703890E-22	9.901841E-18	8.617713E-18
	PU-239	2.484162E-04	4.571530E-04	2.459567E-00	4.526267E-00
	PU-240	8.561886E-06	2.432976E-05	8.477115E-02	2.408887E-01
	PU-241	1.864910E-07	6.753204E-07	1.787039E-03	6.686341E-03
	PU-242	3.171012E-09	1.506298E-08	3.139615E-05	1.491384E-04
	AM-243	3.281497E-11	2.466543E-10	3.249007E-07	2.442121E-06
	AM-241	3.911133E-09	1.864132E-08	3.872409E-05	1.845675E-04
	FPA-1	0.	0.	0.	0.
	FPA-2	4.938572E-06	9.099750E-06	4.889676E-02	9.009654E-02
	FPA-3	6.072287E-05	1.465354E-04	6.012165E-01	1.450846E-00
	FPA-4	1.413611E-07	5.648786E-07	1.399619E-03	5.592857E-03
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
8					
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.572937E-05	2.188465E-05	2.547462E-01	2.166797E-01
	U-236	1.149146E-06	2.157634E-06	1.137769E-02	2.136271E-02
	NP-237	2.266877E-08	6.560325E-08	2.244433E-04	6.495372E-04
	U-238	9.884438E-03	9.701170E-03	9.786572E-01	9.605119E-01
	NP-239	5.443945E-22	5.343008E-22	5.390045E-18	5.290107E-18
	PU-239	1.587485E-04	3.023648E-04	1.571767E-00	2.993711E-00
	PU-240	3.605143E-06	1.048027E-05	3.569449E-02	1.037651E-01
	PU-241	4.996938E-08	1.917965E-07	4.947464E-04	1.898975E-03
	PU-242	5.703767E-10	2.727295E-09	5.647294E-06	2.700292E-05
	AM-243	1.038937E-11	7.625191E-11	1.028651E-07	7.549695E-07
	AM-241	1.051473E-09	5.159826E-09	1.041062E-05	5.108739E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	3.098815E-06	5.892115E-06	3.068133E-02	5.833777E-02
	FPA-3	2.313118E-05	5.568216E-05	2.290216E-01	5.513085E-01
	FPA-4	2.558952E-08	1.033124E-07	2.533616E-04	1.022895E-03
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
9	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.737423E-05	2.498634E-05	2.710320E-01	2.465975E-01
	U-236	7.564926E-07	1.457497E-06	7.490026E-03	1.443066E-02
	NP-237	9.115021E-09	2.676328E-08	9.024774E-05	2.649830E-04
	U-238	9.965151E-03	9.861033E-03	9.866486E-01	9.763399E-01
	NP-239	3.147534E-22	3.114648E-22	3.116370E-18	3.083810E-18
	PU-239	9.482441E-05	1.843717E-04	9.388555E-01	1.825463E-00
	PU-240	1.398408E-06	4.119750E-06	1.384563E-02	4.078960E-02
	PU-241	1.246857E-06	4.859130E-06	1.234512E-04	4.811020E-04
	PU-242	5.249352E-11	5.010267E-10	5.197378E-07	4.960661E-06
	AM-243	3.299782E-11	3.849521E-11	3.267111E-07	3.811407E-07
	AM-241	2.401320E-10	1.388792E-09	2.377549E-06	1.375042E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	1.860158E-06	3.609395E-06	1.841740E-02	3.573699E-02
	FPA-3	8.608620E-06	2.040764E-05	8.523386E-02	2.020558E-01
	FPA-4	4.284161E-09	1.732182E-08	4.241744E-05	1.718002E-04
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
10	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.283454E-05	1.691247E-05	2.260846E-01	1.674502E-01
	U-236	1.785911E-06	3.184376E-06	1.768228E-02	3.152847E-02
	NP-237	6.310847E-09	1.774716E-07	6.248363E-04	1.757144E-03
	U-238	9.723013E-03	9.384091E-03	9.626746E-01	9.291179E-01
	NP-239	8.589166E-22	6.320877E-22	6.484323E-18	6.298294E-18
	PU-239	2.683103E-04	4.900938E-04	2.656538E-00	4.852414E-00
	PU-240	1.013785E-05	2.868857E-05	1.003747E-01	2.838482E-01
	PU-241	2.298403E-07	8.531101E-07	2.275646E-03	8.446635E-03
	PU-242	4.439422E-09	2.096065E-08	4.391909E-05	2.075312E-04
	AM-243	1.325407E-10	6.109326E-10	1.312284E-06	6.048838E-06
	AM-241	7.472569E-09	3.550594E-08	7.398583E-05	3.515440E-04
	FPA-1	0.	0.	0.	0.
	FPA-2	5.316441E-06	9.725685E-06	5.263803E-02	9.629392E-02
	FPA-3	6.811360E-05	1.655063E-04	6.743921E-01	1.638678E-00
	FPA-4	1.828297E-07	7.301102E-07	1.810195E-03	7.228814E-03
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
11					
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-235	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.53796E-05	2.125986E-05	2.512832E-01	2.104937E-01
	U-236	1.243236E-06	2.320988E-06	1.230927E-02	2.298008E-02
	NP-237	2.679965E-08	7.730774E-08	2.653431E-04	7.654232E-04
	U-238	9.867591E-03	9.667913E-03	9.769892E-01	9.572191E-01
	NP-239	3.964739E-22	3.884510E-22	3.925484E-18	3.846049E-18
	PU-239	1.722349E-04	3.266271E-04	1.705296E-00	3.233931E-00
	PU-240	4.282670E-06	1.241512E-05	4.240268E-02	1.229220E-01
	PU-241	6.394859E-06	2.440492E-07	6.331544E-04	2.416329E-03
	PU-242	7.625802E-10	3.663980E-09	7.550299E-06	3.627703E-05
	AM-243	-2.293626E-11	-7.456413E-11	-2.272897E-07	-7.382587E-07
	AM-241	2.077777E-09	9.949214E-09	2.057205E-05	9.890707E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	3.350362E-06	6.341840E-06	3.317191E-02	6.279050E-02
	FPA-3	2.579140E-05	6.265368E-05	2.553634E-01	6.203335E-01
	FPA-4	3.301082E-08	1.333338E-07	3.268398E-04	1.320137E-03
	XE	0.	0.	0.	0.
	SH	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
12					
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-235	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.714848E-05	2.448365E-05	2.687968E-01	2.424123E-01
	U-236	8.221502E-07	1.578612E-06	8.140101E-03	1.562983E-02
	NP-237	1.082318E-08	3.171728E-08	1.071600E-04	3.140325E-04
	U-238	9.959570E-03	9.842010E-03	9.857000E-01	9.744564E-01
	NP-239	2.293532E-22	2.267370E-22	2.270824E-18	2.244921E-18
	PU-239	1.032243E-04	2.001960E-04	1.022023E-00	1.982138E-00
	PU-240	1.666969E-06	4.902822E-06	1.650465E-02	4.854279E-02
	PU-241	1.604426E-08	6.225049E-08	1.588540E-04	6.163411E-04
	PU-242	8.450729E-11	5.079530E-10	8.386861E-07	5.029238E-06
	AM-243	-3.201533E-10	-1.587141E-10	-3.169834E-06	-1.571427E-06
	AM-241	4.611014E-10	2.458814E-09	4.565361E-06	2.434470E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	2.018545E-06	3.906023E-06	1.998560E-02	3.867350E-02
	FPA-3	9.516652E-06	2.280353E-05	9.422428E-02	2.257775E-01
	FPA-4	5.512231E-09	2.235993E-08	5.457654E-05	2.213854E-04
	XE	0.	0.	0.	0.
	SH	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
13	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	2.768753E-05	1.820531E-05	2.251019E-01	1.480107E-01
	U-236	2.961528E-06	5.060499E-06	2.407746E-02	4.114227E-02
	NP-237	1.440769E-07	3.957552E-07	1.171357E-03	3.217522E-03
	U-238	1.168141E-02	1.112131E-02	9.497078E-01	9.041715E-01
	NP-239	8.070681E-22	7.683711E-22	6.561530E-18	6.246919E-18
	PU-239	4.182039E-04	7.383003E-04	3.400031E-00	8.002442E-00
	PU-240	2.106190E-05	5.822396E-05	1.712350E-01	4.733655E-01
	PU-241	6.177026E-07	2.229537E-06	5.021973E-03	1.812632E-02
	PU-242	1.621616E-08	7.517039E-08	1.318387E-04	6.111413E-04
	AM-243	4.832131E-10	2.725795E-09	3.928562E-06	2.216094E-05
	AM-241	2.714206E-08	1.262637E-07	2.206672E-04	1.026534E-03
	FPA-1	0.	0.	0.	0.
	FPA-2	9.206859E-06	1.633843E-05	7.485251E-02	1.328328E-01
	FPA-3	1.380768E-04	3.373981E-04	1.122578E-00	2.743074E-00
	FPA-4	5.893956E-07	2.334167E-06	4.791835E-03	1.897696E-02
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
14	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	3.243202E-05	2.585471E-05	2.636749E-01	2.104448E-01
	U-236	1.971940E-06	3.616830E-06	1.603203E-02	2.940349E-02
	NP-237	3.252994E-08	1.500802E-07	4.270727E-04	1.219921E-03
	U-238	1.194280E-02	1.163213E-02	9.709596E-01	9.456200E-01
	NP-239	4.633837E-22	4.512706E-22	3.767347E-18	3.689029E-18
	PU-239	2.629319E-04	4.908050E-04	2.134406E-00	3.990285E-00
	PU-240	7.880614E-06	2.263705E-05	6.407003E-02	1.040410E-01
	PU-241	1.402045E-07	5.281633E-07	1.139874E-03	4.294010E-03
	PU-242	2.117020E-09	1.015573E-08	1.721155E-05	8.256391E-05
	AM-243	8.911717E-11	3.626032E-10	7.245299E-07	2.947993E-06
	AM-241	6.050062E-09	2.900278E-08	4.918750E-05	2.357949E-04
	FPA-1	0.	0.	0.	0.
	FPA-2	5.543513E-06	1.034861E-05	4.506921E-02	8.413506E-02
	FPA-3	4.655144E-05	1.145259E-04	3.784670E-01	9.311052E-01
	FPA-4	8.402944E-08	3.385325E-07	6.831662E-04	2.752297E-03
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
15					
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	J-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	3.538451E-05	3.113850E-05	2.876789E-01	2.531585E-01
	U-236	1.258716E-06	2.395286E-06	1.023347E-02	1.947382E-02
	NP-237	1.922454E-08	5.606233E-08	1.562971E-04	4.557913E-04
	U-238	1.207836E-02	1.189892E-02	9.819802E-01	9.673591E-01
	NP-239	2.723037E-22	2.682493E-22	2.213852E-18	2.180889E-18
	PU-239	1.619694E-04	3.110128E-04	1.313573E-00	2.528559E-00
	PU-240	2.923031E-06	8.557678E-06	2.376448E-02	6.957462E-02
	PU-241	3.159547E-08	1.216272E-07	2.568738E-04	9.888392E-04
	PU-242	2.685962E-10	1.396219E-09	2.183709E-06	1.135137E-05
	AM-243	2.271129E-11	5.625647E-11	1.846447E-07	4.573697E-07
	AM-241	1.405975E-09	6.784272E-09	1.143069E-05	5.515668E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	3.337553E-06	6.410161E-06	2.713458E-02	5.211913E-02
	FPA-3	1.710387E-05	4.172839E-05	1.390559E-01	3.392552E-01
	FPA-4	1.347311E-08	5.453180E-08	1.095375E-04	4.433479E-04
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
16					
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	3.745779E-05	3.502554E-05	3.045348E-01	2.847613E-01
	U-236	7.163672E-07	1.395450E-06	5.824123E-03	1.134912E-02
	NP-237	5.799076E-09	1.716688E-08	4.714695E-05	1.393242E-04
	U-238	1.216370E-02	1.206791E-02	9.889189E-01	9.811309E-01
	NP-239	1.464758E-22	1.493222E-22	1.190863E-18	1.181481E-18
	PU-239	8.946193E-05	1.753656E-04	7.273327E-01	1.425737E-00
	PU-240	8.914561E-07	2.640429E-06	7.247611E-03	2.146687E-02
	PU-241	5.317977E-09	2.074625E-08	4.323559E-05	1.686687E-04
	PU-242	3.621376E-11	1.524183E-10	2.944208E-07	1.239173E-06
	AM-243	3.643241E-12	1.483597E-10	2.961985E-08	1.165226E-06
	AM-241	1.250483E-10	8.131588E-10	1.016653E-06	6.611047E-06
	FPA-1	0.	0.	0.	0.
	FPA-2	1.820049E-06	3.561777E-06	1.479714E-02	2.895754E-02
	FPA-3	5.937208E-06	1.405508E-05	4.826998E-02	1.142690E-01
	FPA-4	1.752768E-09	7.084557E-09	1.425008E-05	5.759803E-05
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

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FUEL TYPE 17	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	3.218025E-05	2.545280E-05	2.616280E-01	2.069334E-01
	U-236	2.077198E-06	3.794968E-06	1.688779E-02	3.085340E-02
	NP-237	5.918013E-08	1.686392E-07	4.811393E-04	1.371050E-03
	U-238	1.193885E-02	1.162336E-02	9.706384E-01	9.449888E-01
	NP-239	4.664703E-22	4.541436E-22	3.792442E-18	3.692225E-18
	PU-239	2.630717E-04	4.905900E-04	2.138795E-00	3.988536E-00
	PU-240	8.558510E-06	2.453751E-05	6.958138E-02	1.994919E-01
	PU-241	1.632079E-07	6.136411E-07	1.326893E-03	4.988952E-03
	PU-242	2.622433E-09	1.232535E-08	2.132060E-05	1.002061E-04
	AM-243	1.405501E-11	1.758887E-10	1.142684E-07	1.429827E-06
	AM-241	6.986530E-09	3.362736E-08	5.680105E-05	2.733931E-04
	FPA-1	0.	0.	0.	0.
	FPA-2	5.683372E-06	1.058399E-05	4.620628E-02	8.604544E-02
	FPA-3	4.924839E-02	1.204619E-04	4.003934E-01	9.793647E-01
	FPA-4	9.653601E-08	3.890386E-07	7.848496E-04	3.162919E-03
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	3.529818E-05	3.090679E-05	2.866519E-01	2.512747E-01
	U-236	1.332619E-06	2.551557E-06	1.083430E-02	2.058176E-02
	NP-237	2.157124E-04	6.312502E-08	1.761869E-04	9.132181E-04
	U-238	1.217894E-02	1.159968E-02	9.820278E-01	9.674533E-01
	NP-239	2.717407E-22	2.677077E-22	2.289274E-18	2.176486E-18
	PU-239	1.669514E-04	3.095561E-04	1.308548E-00	2.516716E-00
	PU-240	3.172601E-06	9.282127E-06	2.579351E-02	7.548445E-02
	PU-241	3.681222E-08	1.416122E-07	2.992663E-04	1.191319E-03
	PU-242	3.692190E-10	1.580084E-09	2.969260E-06	1.284621E-05
	AM-243	1.104794E-10	9.864594E-11	8.982062E-07	8.019995E-07
	AM-241	1.561196E-09	7.608906E-09	1.269265E-05	6.186102E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	3.387531E-06	6.498530E-06	2.754091E-02	5.283358E-02
	FPA-3	1.688097E-05	4.127733E-05	1.372436E-01	3.355881E-01
	FPA-4	1.429243E-08	5.799841E-08	1.161986E-04	4.719318E-04
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

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FUEL TYPE	ISOTOPE	AVERAGE CONCENTRATION	FINAL CONCENTRATION	AVERAGE ENRICHMENT	FINAL ENRICHMENT
19	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	3.711802E-05	3.437791E-05	3.017725E-01	2.794952E-01
	U-236	8.371587E-07	1.624538E-06	6.806168E-03	1.320762E-02
	NP-237	8.008431E-09	2.361271E-08	6.510919E-09	1.919732E-04
	U-238	1.215432E-02	1.204925E-02	9.881561E-01	9.796138E-01
	NP-239	1.614590E-22	1.600632E-22	1.312675E-18	1.301327E-18
	PU-239	9.818034E-05	1.919557E-04	7.982142E-01	1.560616E-00
	PU-240	1.179798E-06	3.488561E-06	9.591851E-03	2.836228E-02
	PU-241	8.355869E-09	3.254023E-08	6.793390E-05	2.645547E-04
	PU-242	1.322824E-10	4.259062E-10	1.075467E-06	3.462652E-06
	AM-243	6.479319E-11	5.723130E-11	5.267739E-07	4.692951E-07
	AM-241	3.987897E-10	1.824247E-09	3.242193E-06	1.483128E-05
	FPA-1	0.	0.	0.	0.
	FPA-2	2.036814E-06	3.973940E-06	1.655946E-02	3.230846E-02
	FPA-3	6.308262E-06	1.526158E-05	5.128669E-02	1.240779E-01
	FPA-4	2.387441E-09	9.700406E-09	1.941009E-05	7.886509E-05
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.
20	TH-232	0.	0.	0.	0.
	PA-233	0.	0.	0.	0.
	U-233	0.	0.	0.	0.
	U-234	0.	0.	0.	0.
	U-235	3.840995E-09	3.686261E-09	3.122760E-01	2.996950E-01
	U-236	4.734938E-07	9.316985E-07	3.849543E-03	7.574785E-03
	NP-237	2.451098E-09	7.283081E-09	1.992763E-05	5.921204E-05
	U-238	1.220313E-02	1.214644E-02	9.921244E-01	9.875152E-01
	NP-239	8.774984E-23	8.734217E-23	7.134133E-19	7.100989E-19
	PU-239	5.427236E-05	1.072350E-04	4.412389E-01	8.718296E-01
	PU-240	3.628423E-07	1.080138E-06	2.949937E-03	8.781609E-03
	PU-241	1.427402E-09	5.601979E-09	1.160489E-05	4.994129E-05
	PU-242	4.479415E-11	1.722480E-10	3.641801E-07	1.400390E-06
	AM-243	-7.218546E-11	-3.415055E-10	-5.866297E-07	-2.776468E-06
	AM-241	1.887589E-10	5.234497E-10	1.534625E-06	4.255689E-06
	FPA-1	0.	0.	0.	0.
	FPA-2	1.114104E-06	2.198409E-06	9.057756E-03	1.787325E-02
	FPA-3	2.232601E-06	5.240727E-06	1.815123E-02	4.260754E-02
	FPA-4	3.244993E-10	1.309672E-09	2.638206E-06	1.064774E-05
	XE	0.	0.	0.	0.
	SM	0.	0.	0.	0.
	BP-1	0.	0.	0.	0.
	BP-2	0.	0.	0.	0.
	BP-3	0.	0.	0.	0.
	BP-4	0.	0.	0.	0.
	BP-5	0.	0.	0.	0.

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TOTAL INSTANTANEOUS BREEDING RATIO = 1.349367E 00

TOTAL MASS CONVERSION RATIO = 1.342947E 00

FUEL TYPE	INSTANTANEOUS CONVERSION RATIO	INSTANTANEOUS BREEDING RATIO	MASS CONVERSION RATIO
1	9.234404E-01	4.216225E-01	9.174838E-01
2	6.972112E-01	1.177662E-01	6.897656E-01
3	7.046750E-01	1.716667E-01	6.945643E-01
4	3.942740E 00	1.152945E-01	3.947904E 00
5	5.699682E 00	7.330981E-02	5.711919E 00
6	8.157799E 00	4.516278E-02	8.185460E 00
7	4.644604E 00	3.208273E-02	4.652284E 00
8	6.993412E 00	1.941077E-02	7.012708E 00
9	1.031782E 01	1.121871E-02	1.036367E 01
10	4.347909E 00	4.675195E-02	4.354398E 00
11	6.556666E 00	2.827843E-02	6.575312E 00
12	9.728865E 00	1.635043E-02	9.769191E 00
13	3.379493E 00	1.193923E-01	3.383174E 00
14	5.422695E 00	2.262528E-02	5.434337E 00
15	8.309875E 00	1.328666E-02	8.339636E 00
16	1.285082E 01	7.145093E-03	1.292559E 01
17	5.238651E 00	6.628721E-02	5.249731E 00
18	8.101294E 00	1.326006E-02	8.130354E 00
19	1.174876E 01	7.876386E-03	1.181278E 01
20	1.678853E 01	4.280147E-03	1.692326E 01

7.93/7.94

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7. "TROUT - A system of file tape maintenance routines", M. D. Kelley et al. APED - 4738, December - 1964, General Electric Company.

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