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SQUIRREL
A FORTRAN IV ONE-DIMENSIONAL FEW-GROUP DIFFUSION-DEPLETION CODE WHICH INCLUDES THE EFFECTS OF LOCAL POWER AND WATER DENSITY

by

E. SALINA (ARS, Milan)

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— Slab, cylindrical and spherical geometry problems can be dealt with.
— The burnup calculations are carried out by mesh interval.

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EW-GROUP
INCLUDES
ATER DENSITY

ABSTRACT

SQUIRREL is a few group one-dimensional lifetime program written in FORTRAN IV for the IBM-360/65.

— The diffusion equations are solved by the three point finite difference method. The mesh interval can be assigned an arbitrary length provided the interfaces between different material regions at the beginning of the lifetime lie on mesh points.
— Slab, cylindrical and spherical geometry problems can be dealt with.
— The burnup calculations are carried out by mesh interval.
— Six types of criticality searches can be carried out.
— At each time-step a fuel shuffling may be carried out.
— The effect of the water density on the same cross-section is accounted for.
— Finally the program calculates the water number density at each mesh-interval as a function of the local power through the enthalpy.

KEYWORDS

RODENTS
LIFETIME
PROGRAMMING
DIFFUSION
BURNUP
CROSS SECTION
DENSITY

I N D E X

INTRODUCTION AND SUMMARY *)

SQUIRREL is a few group one-dimensional lifetime program written in FORTRAN IV for the IBM-360/65.

Let us begin with a brief account of the main physical features of the program:

- the diffusion equations are solved by the three point finite difference method, that is the point fluxes are calculated numerically only in a finite number of mesh points properly arranged on the segment that represents the reactor. The space included between any two consecutive points, that we shall call a "mesh interval", can be assigned an arbitrary length provided the interfaces between different material regions at the beginning of the lifetime lie on mesh points.
- Slab, cylindrical and spherical geometry problems can be dealt with
- the burnup calculations are carried out by mesh interval, that is the number densities of the burnable isotopes are calculated by means of average group fluxes at each mesh interval;
- six types of criticality searches can be carried out, namely straight k-eff calculation, diluted poison search, rodded poison absorption cross-section search, rodded poison boundary search, water dependent poison search, buckling search;
- a few input data, namely the bucklings, the control data, the microscopic data, the self-shielding data can be read at each time-step;
- at each time-step a fuel shuffling may be carried out. Also fresh fuel can be fed into the reactor;
- the effect of the local power on the U238 absorption cross-section in the resonance group is accounted for. This effect will be referred to as "Doppler effect";
- also the effect of the water density on the same cross-section is accounted for. This effect will be named briefly "water effect";
- moreover the effect of the water density on its own removal cross-section in the resonance group is included;
- finally the program calculates the water number density at each mesh-interval as a function of the local power through the enthalpy. This interaction power-water density will be named "enthalpy effect".

It is easy to realize that, after the first time-step has elapsed, each mesh interval has a different composition. Nevertheless more mesh-intervals may be arranged into the same region. A region is defined as a collection of one or more mesh-intervals, even disjoint, which have the same initial composition, the same self-shielding data and the same data for calculating the

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*) Manuscript received on 8 April 1970

Doppler and water effects. The idea of region is introduced especially for input purposes in order to make easier the specification of the input data but it may be even physically meaningful, with reference to the initial regions, since the program calculates and prints integrated quantities and flux weighted macroscopic cross-sections showing up in this way the total effect of the burn-up at each region.

Moreover it is useful to define what is meant exactly as "time step". A time step begins with the calculation of the new number densities (burnup calculation) and ends with the calculation and the normalization of the group fluxes (diffusion calculation). Exception is made for the time-step 0, where the burn-up calculation is replaced by the mere specification of the input number densities.

If required, the reading of new input data and the shuffling at any time-step are carried out after the relevant burn-up calculation and before the diffusion calculation (see fig. 1).

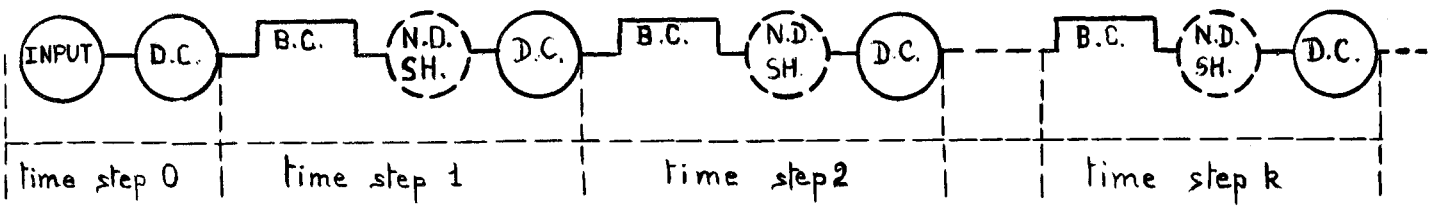


Fig. 1

B.C. = burnup calculation
N.D. = new (input) data
SH. = shuffling
D.C. = diffusion calculation

I - THE DIFFUSION EQUATIONS

I.1 - Statement of the problem

At any time-step, the group diffusion differential equations, solved by the program, are (the time step index having been dropped):

$$-\operatorname{div}\left[D^i(x)\operatorname{grad}\varphi^i(x)\right] + \left[\Sigma_T(x) + \Sigma_p(x)\right]\varphi^i(x) = \psi^i(x)$$

$$\psi^i(x) = \frac{\chi^i}{\lambda}\sum_{j=1}^{G}\nu\Sigma_f^j(x)\varphi^j(x) + \Sigma_R^{i-1}(x)\varphi^{i-1}(x) \qquad (1.1)$$

$i = 1, 2 \ldots G$

The physical meaning of these symbols is:

x represents the spatial variable, either x (in slab geometry) or r (in cylindrical or spherical geometry)

i = group index G = number of groups

$\Sigma_R^0(x) = 0$

$\Sigma_T^i = \Sigma_a^i + \Sigma_R^i + D^i B^i$

$\Sigma_p^i = \vartheta t_d^i \Sigma_{dp} + t_r^i \Sigma_{rp} + Ct_w^i \Sigma_{wp}$

Σ_a^i = the macroscopic absorption cross-section

Σ_R^i = the macroscopic removal cross-section

$B^i = B_f^i + B_c$ = the transverse square buckling

D^i = the diffusion coefficient

Σ_{dp} = the macroscopic absorption cross section of a diluted poison (dp)

t_d^i = fraction of Σ_{dp} acting in the group i

ϑ = dilution factor. It may be either an eigenvalue of the problem or an input datum

Σ_{rp} = the macroscopic cross-section of a rodded poison (rp). It may be a problem eigenvalue or a given datum

t_r^i = fraction of Σ_{rp} in the group i

Σ_{wp} = the macroscopic cross-section of a water-dependent poison (wp)

t_w^i = fraction of Σ_{wp} in group i

C = "dilution factor" (broadly speaking) of the water dependent poison. Also C may be either an eigenvalue or an input datum

B_f^i = the fixed square buckling (group and space dependent)

B_c = the control square buckling (only space dependent). It may be either an eigenvalue or an input datum

$\nu\Sigma_f^i$ = the macroscopic cross-section for fission neutron production

φ^i = the neutron flux

χ^i = the fission spectrum integral over the group i

λ = multiplication factor. It is the eigenvalue of the problem when a straight diffusion calculation is carried out. Otherwise λ is a given parameter and the eigenvalue of the problem is either ϑ or C or B_c or Σ_{rp} or the rodded poison boundary (this last does not appear algebraically in eqs.(1.1), but it is contained in the functional form of $\Sigma_{rp}(x)$).

Any equation of the system (1.1) must be solved in each point interior to the segment $[0,L]$ which represents the reactor.

The functions $\varphi^i(x)$ fulfill boundary conditions of the type:

$$\begin{cases} \eta^i(0)\varphi^i(0) - \xi^i(0)\dot{\varphi}^i(0) = 0 \\ \eta^i(L)\varphi^i(L) + \xi^i(L)\dot{\varphi}^i(L) = 0 \end{cases} \qquad (1.2)$$

Moreover the functions $\varphi^i(x)$ and $D^i(x)\,\dot{\varphi}^i(x)$ are to be continuous in any point of the segment $[0,L]$.

I.2 - Finite difference equations

Let us divide the segment $[0,L]$ into a finite number of mesh intervals the lengths of which are not necessarily the same.

Fig. 2

Let us suppose the coefficients in Eqs.(1.1) be constant in each mesh-interval. (It is understood they can vary from an interval to another).

If we integrate the Eqs.(1.1) from $x_n - \Delta x_L/2$ to $x_n + \Delta x_R/2$ (except for the boundary where the integration is carried out over only one half interval and the conditions (1.2) are used), we obtain:

$$-a_L^i \varphi_{n-1}^i + a_c^i \varphi_n^i - a_R^i \varphi_{n+1}^i = \frac{\lambda^i}{\lambda} \sum_{j=1}^{G} a_F^j \varphi_n^j + a_S^{i-1} \varphi_n^{i-1} \qquad (1.3)$$

$$i = 1, 2 \ldots . G$$

where:

n = mesh point index (dropped in writing the coefficients)

$$a_L^i = \frac{D_L^i}{\Delta x_L} (x_n - \Delta x_L/2)^p$$

$$a_R^i = \frac{D_R^i}{\Delta x_R} (x_n + \Delta x_R/2)^p \qquad (1.4)$$

$$a_c^i = a_L^i + a_R^i + \left(\Sigma_T^i + \Sigma_p^i \right)_L \frac{x_n^{p+1} - (x_n - \Delta x_L/2)^{p+1}}{p+1} + \left(\Sigma_T^i + \Sigma_p^i \right)_R \frac{(x_n + \Delta x_R/2)^{p+1} - x_n^{p+1}}{p+1}$$

$$; \quad a_F^i = \left(\nu \Sigma_f^i \right)_L \frac{x_n^{p+1} - (x_n - \Delta x_L/2)^{p+1}}{p+1} + \left(\nu \Sigma_f^i \right)_R \frac{(x_n + \Delta x_R/2)^{p+1} - x_n^{p+1}}{p+1}$$

$$; \quad a_s^i = \left(\Sigma_R^i \right)_L \frac{x_n^{p+1} - \left(x_n - \Delta x_L/2 \right)^{p+1}}{p+1} + \left(\Sigma_R^i \right)_R \frac{(x_n + \Delta x_R/2)^{p+1} - x_n^{p+1}}{p+1}$$

p { = 0 in slab geometry
= 1 in cylindrical geometry
= 2 in spherical geometry

Δx_L = width of the mesh-interval to the left of the point n

Δx_R = width of the mesh-interval to the right of the point n

The subscript L refers to the left side of the mesh point n, whereas the subscript R refers to the right side.

If in (1.2) $\xi^i(0) = 0$, a zero flux condition is applied at the boundary point 1 (the mesh points are numbered from 1 to N). In this case no difference equation is required for the mesh point 1.

If $\xi^i(0) \neq 0$, the coefficients in the equation (1.3), as applied to the mesh point 1, are as follows:

$$a_L^i = 0$$

$$a_R^i = \frac{D_R^i}{\Delta x_R} (\Delta x_R/2)^p$$

$$a_c^i = a_R^i + \left(\Sigma_T^i + \Sigma_p^i\right)_R \frac{(\Delta x_R/2)^{p+1}}{p+1} + \frac{\eta^i(0)}{\xi^i(0)} x_1^p \qquad (1.6)$$

$$a_F^i = \left(\nu\Sigma_f^i\right)_R \frac{(\Delta x_R/2)^{p+1}}{p+1}$$

$$a_s^i = \left(\Sigma_R^i\right)_R \frac{(\Delta x_R/2)^{p+1}}{p+1}$$

If $\xi^i(L) = 0$, no equation is required at the mesh point N (last mesh point).

If $\xi^i(L) \neq 0$, the equation (1.3) is still holding for the mesh point N provided the coefficients be calculated as follows:

$$a_L^i = \frac{D_L^i}{\Delta x_R}\left(x_N - \Delta x_L/2\right)^p$$

$$a_R^i = 0$$

$$a_c^i = a_L^i + \left(\Sigma_T^i + \Sigma_p^i\right)_L \frac{x_N^{p+1} - (x_N - \Delta x_L/2)^{p+1}}{p+1} + \frac{\eta^i(L)}{\xi^i(L)} x_N^p \qquad (1.7)$$

$$a_F^i = \left(\nu\Sigma_f^i\right)_L \frac{x_N^{p+1} - (x_N - \Delta x_L/2)^{p+1}}{p+1}$$

$$a_s^i = \left(\Sigma_R^i\right)_L \frac{x_N^{p+1} - (x_N - \Delta x_L/2)^{p+1}}{p+1}$$

I.3 - Solution of the system (1.3) with a known source term

Let us suppose that the source term in Eqs. (1.3):

$$\psi_n^i = \frac{\chi^i}{\lambda} \sum_{j=1}^{G} a_F^j \varphi_n^i + a_s^{i-1} \varphi_n^{i-1}$$

is a known vector. The Eqs. (1.3) can be written in the form:

$$-a_L^i \varphi_{n-1}^i + a_c^i \varphi_n^i - a_R^i \varphi_{n+1}^i = \psi_n^i \qquad (1.8)$$

For each value of the group index i, (1.8) is a system of N linear equations in the N unknowns φ_n^i, with a tridiagonal and symmetric coefficient matrix.

It can be shown (e.g. by mathematical induction) that the recursive formulae:

$$\alpha_n^i = \frac{\psi_n^i + a_L^i \alpha_{n-1}^i}{a_c^i - a_L^i \beta_{n-1}^i}$$

$$\beta_n^i = \frac{a_R^i}{a_c^i - a_L^i \beta_{n-1}^i} \qquad (1.9)$$

reduce the tridiagonal matrix system (1.8) to a bidiagonal matrix system of the form:

$$\varphi_n^i - \beta_n^i \varphi_{n+1}^i = \alpha_n^i$$

The backward process for calculating the unknown fluxes is therefore:

$$\varphi_n^i = \alpha_n^i + \beta_n^i \varphi_{n+1}^i \qquad (1.10)$$

As for the starting values of the forward calculation (1.9) and of the backward substitution (1.10), the following rules are applied:

a) If $\xi^i(0) = 0$ (zero flux condition), it is:

$$\alpha_1^i + \beta_1^i \varphi_2^i = \varphi_1^i = 0$$

whence:

$$\alpha_1^i = \beta_1^i = 0 \qquad (1.10)$$

b) If $\xi^i(0) \neq 0$, the difference equation in the mesh point 1 is:

$$a_c^i \varphi_1^i - a_R^i \varphi_2^i = \psi_1^i$$

$$\varphi_1^i = \frac{\psi_1^i}{a_c^i} + \frac{a_R^i}{a_c^i}\varphi_2^i \qquad \text{whence:}$$

$$\alpha_1^i = \frac{\psi_1^i}{a_c^i} \qquad \beta_1^i = \frac{a_R^i}{a_c^i} \qquad (1.11)$$

The starting values (1.11) can be obtained from the general recursive formulae (1.9) by setting:

$$\alpha_o^i = \beta_o^i = 0$$

c) If $\xi^i(L) = 0$ (zero flux condition), the starting value for the backward substitution (1.10) is:

$$\varphi_N^i = 0$$

d) If $\xi^i(L) \neq 0$, the difference equation in the mesh point N is:

$$a_c^i \varphi_N^i - a_L^i \varphi_{N-1}^i = \psi_N^i$$

$$a_c^i \varphi_N^i - a_L^i(\alpha_{N-1}^i + \beta_{N-1}^i \varphi_N^i) = \psi_N^i$$

$$\varphi_N^i = \frac{\psi_N^i + a_L^i \alpha_{N-1}^i}{a_c^i - a_L^i \beta_{N-1}^i} \qquad \text{whence}$$

$$\alpha_N^i = \frac{\psi_N^i + a_L^i \alpha_{N-1}^i}{a_c^i - a_L^i \beta_{N-1}^i} \qquad \beta_N^i = 0$$

that is α_N^i and β_N^i are calculated by the general formula (1.9) if one bears in mind that $a_R^i\big|_N = 0$. In the backward substitution:

$$\varphi_N^i = \alpha_N^i$$

and again the general formula (1.9) can be used by setting:

$$\varphi_{N+1}^i = 0$$

Briefly, the procedure for solving the one-dimensional equation (1.1) with a known neutron source, can be divided into three steps:

i) Calculation of the coefficients a^i_L, a^i_R, a^i_C, a^i_F, a^i_S, by the formulae (1.4), (1.6),(1.7).

ii) Forward calculation by the general recursion formulae (1.9) after setting:

$$\alpha^i_\rho = \beta^i_\rho = 0 \quad \text{and}$$
$$\alpha^i_1 = \beta^i_1 = 0 \quad \text{if} \quad \xi^i(0) = 0$$

iii) Backward substitution by the general formula (1.10) after setting:

$$\varphi^i_{N+1} = 0 \quad \text{and}$$

$$\varphi^i_N = 0 \quad \text{if} \quad \xi^i(L) = 0$$

II - CRITICALITY SEARCHES

The diffusion equations (1.1) can be solved in six different ways depending on what parameter is considered as the eigenvalue of the system (1.1).

a) Straight K_{eff} calculation

This is the calculation of the λ greatest in modulus in Eqs. (1.3) by an extrapolated power method. The system (1.3) can be written in matrix form:

$$A^i \underline{\varphi}^i = \frac{\chi^i}{\lambda} \underline{\psi} + R^{i-1} \underline{\varphi}^{i-1} \qquad i = 1, 2 \ldots G \qquad (2.1)$$

$$\psi = \sum_{j=1}^{G} F^j \underline{\varphi}^j$$

where A^i is a NxN tridiagonal symmetric matrix and R^i, F^i are NxN diagonal matrices whose entries are respectively the coefficients a_S^i and a_F^i.

The iterative procedure for solving the eigenvalue problem (2.1) can be written in the form:

$$\left.\begin{aligned}
A^i \underline{\varphi}^i(t) &= \frac{\chi^i}{\lambda^{(t-1)}_G} \underline{\psi} + R^{i-1} \underline{\varphi}^{i-1}(t) \\
\underline{\psi}^*(t) &= \sum_{j=1}^{} F^j \underline{\varphi}^j(t) \\
\underline{\psi}(t) &= \omega^{(t)} \psi^*(t) + \left[1 - \omega^{(t)}\right] \underline{\psi}(t-1) \\
\lambda^{(t)} &= \lambda^{(t-1)} \frac{\sum_n \left[\psi^{(n)}(t)\right]^2}{\sum_n \psi^{(n)}(t)\, \psi^{(n)}(t-1)} \\
\bar{\lambda}(t) &= \lambda^{(t-1)} \max_n \frac{\psi^{(n)}(t)}{\psi^{(n)}(t-1)} \\
\underline{\lambda}(t) &= \lambda^{(t-1)} \min_n \frac{\psi^{(n)}(t)}{\psi^{(n)}(t-1)}
\end{aligned}\right\} \qquad \begin{matrix} i=1,2,\ldots G \\ t=1,2\ldots \end{matrix} \qquad (2.2)$$

n = mesh point index

t = iteration index

Of course initial approximations $\lambda^{(o)}$ and $\varphi_{(o)}$ for the eigenvalue and for the fission source term must be supplied. The iterations (2.2) are interrupted when the following pointwise convergence criterion is fulfilled for two consecutive times:

$$\frac{\bar{\lambda}_{(t)} - \lambda_{(t)}}{2\lambda_{(t)}} \leq \delta \qquad (2.3)$$

At each iteration t the fluxes $\varphi^{i}_{(t)}$ in the first of (2.2) are calculated by the method described in I.3.

The coefficients $\omega^{(t)}$ for linear extrapolation in (2.2) are calculated by a well-known method, based on the Chebysher polinomials, which requires an estimate of the dominance ratio σ, i.d. the ratio between the second and the first eigenvalue of the system (2.1), if the eigenvalues are ordered by decreasing modulus [1,7]. If the flux residues are defined as:

$$R^{i}_{(t)} = \sum_{n} \left| \varphi^{i,(n)}_{(t)} - \varphi^{i,(n)}_{(t-1)} \right| \qquad (2.4)$$

a rough estimate of δ is given by [2]:

$$\sigma = \frac{1}{G} \sum_{i=1}^{G} \frac{R^{i}_{(t)}}{R^{i}_{(t-1)}} \qquad (2.5)$$

b) Diluted poison search

This is the search of a prefixed multiplication factor λ_c by means of a uniform variation of a control poison absorption cross-sections. The absorption cross-section of the control poison is specified in input by mesh interval, except for a multiplicative factor ϑ, called dilution factor, unique for the whole reactor, which is calculated by the program.

Besides minimum and maximum values of ϑ (ϑ_{max} and ϑ_{min}), a first approximation $\vartheta^{(1)}$ is available, which is either an input datum or the critical value in the last search carried out.

The program first determines the eigenvalue $\lambda^{(1)}$ correspondent to $\vartheta^{(1)}$. The second estimate $\vartheta^{(2)}$ is either ϑ_{min} or ϑ_{max} depending on $\lambda^{(1)} - \lambda_c$ is negative or positive. If $\lambda^{(1)} - \lambda_c$ and $\lambda^{(2)} - \lambda_c$ have different signs, the successive approximations are calculated by linear interpolation:

$$\vartheta^{(i)} = \vartheta^{(i-1)} + (\vartheta^{(i-1)} - \vartheta^{(i-2)}) \frac{\lambda_c - \lambda^{(i-1)}}{\lambda^{(i-1)} - \lambda^{(i-2)}} \qquad (2.6)$$

until a factor $\vartheta^{(\tau)}$ is found such as:

$$\left| \lambda^{(\tau)} - \lambda_c \right| < \varepsilon \qquad (2.7)$$

Then ϑ_c is set equal to $\vartheta^{(\tau)}$ and the search is accomplished.

The eigenvalue $\lambda^{(i)}$, correspondent to each dilution factor estimate $\vartheta^{(i)}$ is calculated by the power method described in a). The only difference is that also an eigenvalue convergence criterion must be satisfied two consecutive times for stopping the iterations (2.2):

$$\left| \frac{\lambda^{(t)} - \lambda^{(t-1)}}{\lambda^{(t)}} \right| < 10^{-1} \varepsilon \qquad (2.8)$$

If the reactivity $\delta\lambda = \lambda - \lambda_c$ does not change sign going from $\vartheta^{(1)}$ to $\vartheta^{(2)}$, the critical search is interrupted and the problem ends with the final edits of a normal problem (average and point fluxes, region integrals ecc.), correspondent to $\vartheta^{(2)}$ (which is either ϑ_{min} or ϑ_{max}) in the current time-step.

c) Rodded poison absorption cross-section search

A rodded poison region is defined with left boundary N_1 and right boundary N_2. Maximum and minimum values Σ^{max}_{rp}, Σ^{min}_{rp} and a first approximation $\Sigma^{(1)}_{rp}$ of the poison cross section, which are constant in all points interior to the region, are available at the beginning of the search. Then for determining the critical value $\Sigma^{(c)}_{rp}$ of the poison cross-section, the same method, based on linear interpolations, is used as for the critical dilution factor ϑ_c in b).

d) Rodded poison boundary search

In this case the poison cross-section Σ_{rp} is fixed. Instead the critical position N_c of a boundary between the poisoned and unpoisoned side of the control region (N_1, N_2), is searched for

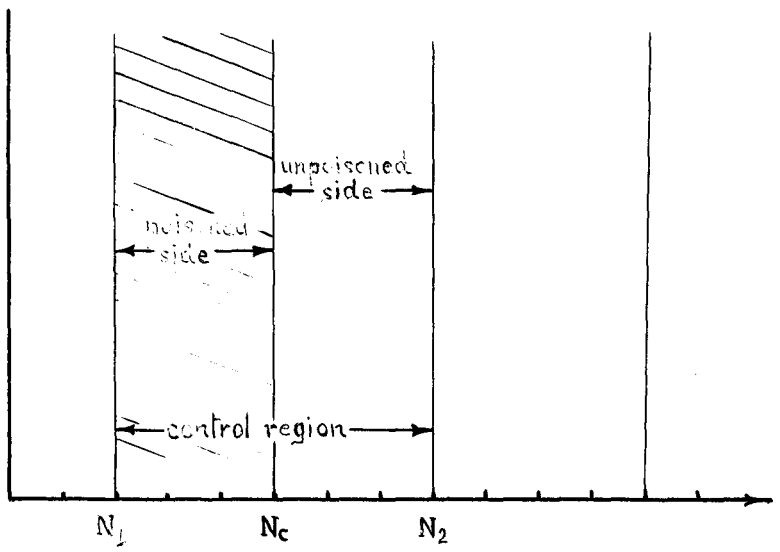


Fig. 3

First the program calculates the eigenvalue $\lambda^{(1)}$ correspondent to a first guess $N_c^{(1)} (N_1 \leq N_c \leq N_2)$, which is either an input datum or the critical boundary achieved in the last search carried out. The second guess $N_c^{(2)}$ is either N_2 or N_1 depending on $\lambda^{(1)} - \lambda_c$ is positive or negative.

If $\lambda^{(1)} - \lambda_c$ and $\lambda^{(2)} - \lambda_c$ have different signs, the successive positions $N_c^{(i)}$ of the parting boundary are chosen by a dichotomy method rather than by linear interpolations.

It is to be pointed out that not always the convergence criterion (2.7) con be satisfied, due to the discontinuous displacements of the parting boundary.

In this last case the critical boundary is set at the mesh point for which $|\lambda - \lambda_c|$ is a minimum.

If the reactivity $\delta\lambda = \lambda - \lambda_c$ does not change sign going from $N_c^{(1)}$ to $N_c^{(2)}$, the boundary search is interrupted and the problem ends with the final edits of a normal problem, correspondent to $N_c^{(2)}$ (which is either N_1 or N_2) in the current time-step.

e) Water density dependent poison search

The program considers a poison whose absorption cross-section is dependent on the water number density at each mesh-interval in the following manner:

$$\Sigma_{wp} = C \left(\alpha_1 w_n + \alpha_0 + \alpha_{-1} w_n^{-1} + \alpha_{-2} w_n^{-2} \right) \qquad (2.9)$$

where the α's are coefficients given in input, W_n is the water number density in Szilard = 10^{24} nuclei.cm^3 and C will be called, broadly speaking, "dilution factor".

The factor C can be adjusted in order to achieve criticality with the K_{eff} settled to an input value λ_c. If this option is selected, maximum and minimum values C_{max} and C_{min} are to be input.

First the program calculates the eigenvalue $\lambda^{(1)}$ correspondent to a first approximation $C^{(1)}$ ($C_{min} \leqslant C^{(1)} \leqslant C_{max}$), which is an input datum or the previous critical value. Then the control is passed to C_{min} or C_{max} and the iterative procedure is continued by successive linear interpolations as in b). It is to be pointed out that the water number density can be calculated by the program as a function of the local enthalpy. (See Section VI). Moreover the element "water" should occupy the first place after the burnable isotopes in the isotope list and its number density can be mesh-interval dependent.(See Sections VI-VII).

f) Buckling search

Also the control square buckling can be adjusted in order to bring the K_{eff} to an input value λ_c. The whole reactor or only some specified regions are involved in this search. As for the procedure, given a maximum and a minimum value of the control buckling, the search is accomplished by successive linear interpolations as in b).

It is to be pointed out that each of the aforementioned parameters ϑ, Σ_{rp}, C and B_c, when it is not involved in the correspondent criticality search, can be given a fixed value (input datum). Moreover, although physically the water dependent cross-section is still a diluted or a rodded poison, the widest freedom is left as to what poison type is to be adjusted in the criticality searches and what poison type is to be held fixed even when the water dependence is accounted for (See Sections VI).

Of course the poison data can be specified in such a way that one or more of the cross-sections Σ_{dp}, Σ_{rp}, Σ_{wp} or B_c be zero. (See Section XII - CONTROL DATA).

III - XENON ITERATIONS

At each time-step, if required, the program will solve the mutual dependence Xenon-reactivity by iterating between the K_{eff} (or the relevant control parameter in the criticality searches) and the Xe-135 number density. Input values (in time-step 0) or the number densities calculated by means of the previous time-step fluxes will be taken as initial approximations to start the iteration gear. Then the I-135 and Xe-135 number densities are calculated at each mesh interval by the asimptotic (or saturation) formulae:

$$N^I = \frac{\sum_f \gamma^{f \rightarrow I} N^f F^f}{A^I}$$

$$N^{Xe} = \frac{\sum_f \gamma^{f \rightarrow Xe} N^f F^f + \lambda^I N^I}{A^{Xe}} \qquad (3.1)$$

f= fuel isotope index

The symbols used in formulae (3.1) are explained in Section VII-DEPLETION EQUATIONS to which explicit reference is made. The coefficiente F^f and A^i in (7.3) are calculated by the fluxes of the current Xenon iteration (the iteration index, as well as the mesh interval index, are omitted in (3.1)).

The Xenon iterations are continued until the following pointwise convergence criterion is fulfilled.

$$\max_n \left| \frac{N_n^{Xe,t+1} - N_n^{Xe,t}}{N_n^{Xe,t}} \right| < \varepsilon_x \qquad (3.2)$$

where

t = Xenon iteration index

n = mesh interval index

ε_x = input convergence criterion

IV - DOPPLER AND WATER EFFECTS

At each Keff iteration the program takes into account the effect of the local power on the U-238 absorption cross-section in the resonance group (Doppler effect), that is, using the fluxes calculated in the current iteration (2.2) and normalized to the actual reactor power (see Section X.5), the program calculates the average power density p_n (watt.cm^{-3}) at each mesh interval n and then improves the aforementioned cross-section according to the formula.

$$\sigma_a^{r,U28} = \sigma_o(W_n)\left[\beta_o + \beta_1\left(\frac{p_n}{p^*}\right)^{\frac{1}{2}} + \beta_2\frac{p_n}{p^*} + \beta_3\left(\frac{p_n}{p^*}\right)^{\frac{3}{2}}\right] \qquad (4.1)$$

Where p* is the full (or reference) power density, given in input, and the function $\sigma_o(W_n)$ accounts for the dependence of the U238 absorption cross-section from the water number density (10^{24} nuclei.cm^{-3}). This "water effect" can be represented by another polynomial formula:

$$\sigma_o(W_n) \quad \gamma_o + \gamma_1 W_n^{1/2} + \gamma_2 W_n + \gamma_3 W_n^{3/2} \qquad (4.2)$$

It is to be pointed out that the water number densities can be calculated at each time-step. Moreover the program looks at the dependence of the removal cross-section of the water in the resonance group from its own number density according to the formula:

$$\sigma_r^{r,H_2O} = \rho_o + \rho_1 W_n^{-1} + \rho_2 W_n^{-2} + \rho_3 W_n^{-3} \qquad (4.3)$$

The input coefficients $\beta_i, \gamma_i, \rho_i$ either are the same for the whole reactor or are region dependent.

V - SELF-SHIELDING FACTORS

The isotopes can be assigned either constant self-shielding factors or self-shielding factors dependent on their own concentration with a polynomial law:

$$\xi^{i,j,n} = \sum_{h=0}^{gp} a_h^{i,j,l} \, (N_n^j)^h \qquad (5.1)$$

i = group index

j = isotope index

l = region index

n = mesh interval index

N_n^j = number density in mesh-interval n (10^{24} nuclei.cm^{-3})

The constant self-shielding factors and (or) the polynomial coefficients $a_h^{i,j,l}$ may be specified by isotope, group and region

VI - POWER EFFECT ON WATER DENSITY

The water number density may be held constant throughout the reactor life time or may be calculated at each time-step as a function of local enthalpy. In this latter case the program automatically assumes as "water" the first non burnable isotope, which has the special facture that its number density may be different at each mesh interval, like the other burnable isotopes.

In order to calculate the average enthalpy h_n in each mesh interval two options are available [5]:

a) - the radial enthalpy formulation should be followed when actually the coolant flows normally to the axis of the problem:

$$h_n = h_o + k \frac{p_n}{p^*} \tag{6.1}$$

b) - the axial enthalpy formulation should be chosen when the coulant flows in a direction parallel with the axis of the problem:

$$h(x_n) = h_o + k' \int_o^{x_n} \frac{p(x)}{p^*} dx = h_o + k' \sum_{i=1}^{n-1} V_i \frac{p_i}{p^*} \tag{6.2}$$

and the point values $h(X_n)$ are used to yield, by numerical integration, an average enthalpy h_n in each mesh interval n (See Section X.5).

The meaning of the symbols in (6.1) and (6.2) is as follows:

h_o = inlet enthalpy

p^* = full power density (input quantity)

p_n = average power density at each mesh interval n, calculated by the power normalized fluxes corresponding to the critical control parameter found in the set up criticality search.

V_n = volume of the mesh interval n

K(or K') = conversion factor from power to enthalpy (this quantity can be input per mesh-interval)

h_{sat} = saturation enthalpy

X_n = spatial coordinate of the mesh point n

The average number density of the water at each mesh-interval n, where the input value is not zero, is then calculated as a function of enthalpy by the following formulae:

$$W_n = b_o + b_1(h_{sat} - h_n) + b_2(h_{sat} - h_n)^2 \qquad \text{for } h_n \leq h_{sat}$$

$$W_n = a_o(1 + a_1 h_n + a_2 h_n^2)^{-1} \qquad \text{for } h_n \geq h_{sat} \qquad (6.3)$$

The program does not provide for an automatic iterative procedure to converge the water number density, but it can be brought to a practical convergence simply by specifying a few successive time-steps of length $\Delta t = 0$.

Of course, if the option here described is not chosen but the water number density is held constant throughout the reactor lifetime, it does not matter what isotope is actually representing water but the first non burnable isotope may still be used freely to input number densities per mesh interval rather than per region, if necessary.

VII - DEPLETION EQUATIONS

The program can treat only a standard chain of burnable isotope. More exactly there are:

a) - six fuel isotopes, namely:

1 - U235	4 - Pu239
2 - U236	5 - Pu240
3 - U238	6 - Pu241

The equation governing the time behavior of anyone of these isotopes is of the form:

$$\frac{dN^f}{dt} = -N^f(\lambda^f + A^f) + \delta N^{f-1} C^{f-1} \qquad f = 1,2...6 \tag{7.1}$$

where:

G = number of groups

δ = o if f=1,3 that is the last term in (7.1) is missing for f = 1,3; otherwise δ = 1

λ^j = decay constant of isotope j

$A^j = \sum_{i=1}^{G} \sigma_a^{i,j} \xi^{i,j} \varphi^i$

$C^j = \sum_{i=1}^{G} \sigma_c^{i,j} \xi^{i,j} \varphi^i$

φ^i = group i average flux at the relevant mesh interval (the mesh-interval index is omitted in equation (7.1))

$\xi^{i,j}$ = self-shielding factor of isotope j, group i

$\sigma_a^{i,j}$ = microscopic absorption cross-section of isotope j

$\sigma_f^{i,j}$ = microscopic fission cross-section

$\sigma_i^{i,j} = \sigma_a^{i,j} - \sigma_f^{i,j}$ = microscopic capture cross-section.

The equation (7.1) is solved by a second order finite difference method:

$$N^f(t+\Delta t) = \frac{N^f(t)\,[2-(\lambda^f+A^f)\,\Delta t]+\delta[N^{f-1}(t+\Delta t)+N^{f-1}(t)]\,C^{f-1}\Delta t}{2-(\lambda^f+A^f)\Delta t} \qquad (7.2)$$

b) - Two pairs of single fission products, namely:

7 - P_r 149 9 - I 135
8 - Sm 149 10 - Xe 135

whose number densities are governed by the following equations:

$$\frac{dN^{p1}}{dt} = -N^{p1}(\lambda^{p1}+A^{p1})+\sum_{f=1}^{6}\gamma^{f\to p1}N^fF^f \qquad p1 = 7,9 \qquad (7.3)$$

$$\frac{dN^{p2}}{dt} = -N^{p2}(\lambda^{p2}+A^{p2})+\sum_{f=1}^{6}\gamma^{f\to p2}N^fF^f+\lambda^{p1}N^{p1} \qquad p2 = 8,10$$

where:

$$F^j = A^j - C^j = \sum_{i=1}^{G}\sigma_f^{i,j}\,\xi^{i,j}\varphi^i$$

$\gamma^{i\to p}$ = yield of the fission product p produced by fission of isotope i.

The equations (7.3) are solved by a semianalytic method of the form:

$$N^{p1}(t+\Delta t) = N^{p1}(t)e^{-(\lambda^{p1}+A^{p1})\Delta t}+\frac{\sum_{f=1}^{6}\gamma^{f\to p1}\bar{N}^fF^f}{A^{p1}+\lambda^{p1}}\left[1-e^{-(\lambda^{p1}+A^{p1})\Delta t}\right]$$

$$N^{p2}(t+\Delta t) = N^{p2}(t)e^{-(\lambda^{p2}+A^{p2})\Delta t}+\left[\sum_{f=1}^{6}\gamma^{f\to p2}\bar{N}^fF^f+\lambda^{p1}\frac{\sum_{f=1}^{6}\gamma^{f\to p1}\bar{N}^fF^f}{\lambda^{p2}+A^{p2}}\right]$$

$$\frac{1-e^{-(\lambda^{p2}+A^{p2})}}{\lambda^{p2}+A^{p2}}+\lambda^{p1}\left[N^{p1}(t)-\frac{\sum_{f=1}^{6}\gamma^{f\to p1}\bar{N}^fF^f}{\lambda^{p1}+A^{p1}}\right]\cdot\frac{e^{-(\lambda^{p1}+A^{p1})\Delta t}-e^{-(\lambda^{p2}+A^{p2})\Delta t}}{\lambda^{p2}+A^{p2}-\lambda^{p1}-A^{p1}} \qquad (7.4)$$

$$\bar{N}^f = \frac{1}{2}\left[N^f(t+\Delta t)+N^f(t)\right]$$

c) - A lumped fission product, whose number density is governed by the equation:

$$\frac{dN^{LFP}}{dt} = \sum_{f=1}^{6} \gamma^{f\to LFP} N^f F^f \qquad (7.5)$$

with solution:

$$N^{LFP}(t+\Delta t) = N^{LFP}(t) + \Delta t \sum_{f=1}^{6} \gamma^{f\to LFP} N^f F^f \qquad (7.6)$$

d) - Two burnable poisons which have to satisfy an equation of the form:

$$\frac{dN^b}{dt} = -N^b A^b \qquad b=12,13 \qquad (7.7)$$

The analytic solution of (7.7) is simply:

$$N^b(t+\Delta t) = N^b(t) e^{-A^b \Delta t} \qquad (7.8)$$

As already mentioned, the depletion equations (7.1), (7.3), (7.5), (7.7) are solved in each mesh-interval. Moreover each time-step can be subdivided at will in a number of equal substeps, in each of which the time-dependent number densities, as well as the concentration dependent self-shielding factors, are recalculated but no flux renormalization takes place. If the option described in Col.13-15 of XII.23 is checked, the number densities of the isotope 14 (first non burnable isotope), which should be water in this case, are calculated by the method explained in Section VI.

It should be possible to make the program SQUIRREL accept any isotopic chain specified in input as it happens in (3, 4, 6).

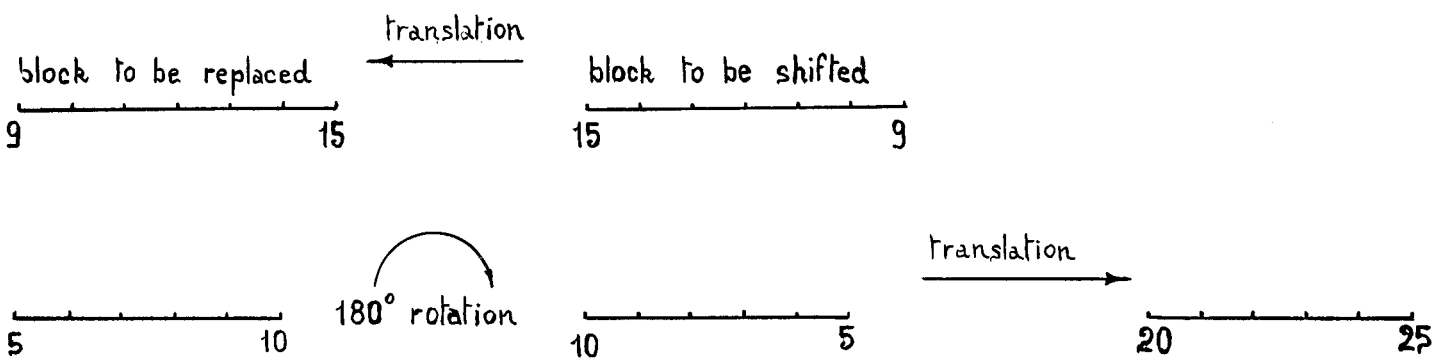
In order to make the uptodating of the report as easiest as possible in view of this possible future extension, from now forth we shall denote parametrically the number of burnable isotope by NUCL, the number of fuel isotopes by NIF, the number of single fission products by NIP and the number of lumped fission products by NAG, understanding that the remaining isotopes, if any is included between NIF + NIP + NAG + 1 and NUCL, are burnable poison.

Of course in the present version of the program SQUIRREL it is:

NUCL = 13, NIF = 6, NIP = 4, NAG = 1

VIII - FUEL SHUFFLING

At any prefixed time-step, the number densities of the burnable isotopes in a block of consecutive mesh-intervals may be shifted into another block with the same number of mesh-intervals. These displacements, which are not necessarily biunivocal, may be accomplished either by a straight translation or by a 180° rotation followed by a translation, as it can be seen in fig. 4.



Also fresh fuel (that is a mixture made up of isotopes present at the beginning of life) can be fed into any mesh interval.

IX - GROUP CONSTANT

The macroscopic cross-sections are calculated at each mesh-interval by the usual formulae:

$$D^{i,n} = \left[3 \sum_{j=1}^{NI} N_n^j \, \sigma_{tr}^{i,j}\right]^{-1}$$

diffusion coefficient (cm)

$$\Sigma_a^{i,n} = \sum_{j=1}^{NI} N_n^j \xi^{i,j,n} \sigma_a^{i,j}$$

macroscopic absorption cross section (cm^{-1})

$$\Sigma_r^{i,n} = \sum_{j=1}^{NI} N_n^j \, \sigma_r^{i,j} \qquad (9.1)$$

macroscopic removal cross-section (cm^{-1})

$$\nu \Sigma_f^{i,n} = \sum_{j=1}^{NIF} N_n^j \xi^{i,j,n} \nu\sigma_f^{i,j}$$

macroscopic cross-section for fission neutron production (cm^{-1})

$$\Sigma_f^{i,n} = \sum_{j=1}^{NIF} N_n^j \xi^{i,j,n} \sigma_f^{i,j}$$

macroscopic fission cross-section (cm^{-1})

$$E^{i,n} = \sum_{j=1}^{NIF} N_n^j \xi^{i,j,n} \sigma_f^{i,j} \, e^{i,j}$$

macroscopic cross-section for energy production (joule.cm^{-1})

where:

NI = total number of isotopes

j = isotope index

i = group index

n = mesh interval index

$\sigma_{tr}^{i,j}$ = microscopic transport cross-section

σ_r = microscopic removal cross-section

ν = average number of neutrons produced per fission

$e^{i,j}$ = energy produced per fission

If the total macroscopic cross-section $\left(\Sigma_a^{i,n} + \Sigma_r^{i,n} + D^{i,n} B^{i,n} + \Sigma_p^{i,n} \right)$ happens to be negative in some group and mesh-interval, the program stops.

X - OTHER FEATURES OF THE PROGRAM

X.2 Unit system

- The microscopic cross-sections are to be specified in (barn).
- The number densities in (Szilard) (1 Szilard = 10^{24} nuclei.cm^{-3}).
- The macroscopic cross-section are in (cm^{-1}).
- The time in (hour).
- The energy in (joule).
- The power in (watt).
- The power density in (watt.cm^{-3}).
- The volume in (cm^{3}).
- The length in (cm).
- The flux in (neutrons.cm^{-2}.sec^{-1}).
- The weight in (gram)

X.2 Time step data

Each time-step can be assigned an arbitrary length and an arbitrary power. Moreover it can be subdivided in a number of smaller substeps in each of which, as already noted, the time-dependent number densities as well as the concentration dependent self-shielding factors are recalculated but no flux renormalization occurs. On the contrary only one diffusion calculation with final flux normalization is carried out at each time-step.

X.3 Cross-section library

The cross-section library is divided into 3 main blocks:

block A : library of macroscopic cross-sections σ_{tr} (transport), σ_a (absorption), σ_r (removal to next group) for any isotope;

block B : library of microscopic cross-section σ_f (fission), $\nu\sigma_f$ (nu-fission), e (energy per fission) for any fissionable isotope;

block C : fission yields for any fissionable isotope.

At any time-step the program can read in any or all of the blocks A,B,C. A block may be read only partially for a restricted number of elements.

The possibility of reading the library at any time-step permits to take into account changes of the spectrum during the lifetime.

X.4 Tape writing and card punching

At each time-step (including the time-step 0) the program writes on the logical unit 2 a record containing the intervalwise number densities of all burnable isotopes. These records are assigned progressive identification numbers starting from a specified value. This unit (normally a tape should be mounted) can be used to specify intervalwise number densities in other SQUIREL problems provided the same isotopic chains and the same number of mesh points are dealt with (See XII.18 PARAMETERS FOR NUMBER DENSITY SPECIFICATION).

Moreover, if desired, the same number densities are punched on cards. These cards (except for the first) are available to input intervalwise number densities in other problems.

Also the group point fluxes may be punched on cards at each time-step. Nevertheless these cards cannot be used for input purposes but only for off-line calculations.

X.5 Output of the program

The output of the program is self-explaining as far as it is possible. Nevertheless some general remarks are suitable. When a function $f(x)$ (e.g. the group fluxes $\varphi^i(x)$, the power, the enthalpy) has to be integrated or averaged over a mesh interval of length Δx, the integration is carried out by a numerical formula which requires only the values f_1 and f_2 of the function at the boundary points of the interval:

$$\int_{x1}^{x_2=x_1+\Delta x} f(x)x^p dx = F\left[\frac{\Delta x}{2} x_1^p(f_1+f_2)+\frac{\Delta x^2}{6}px_1^{p-1}(f_1+3f_2)+\frac{\Delta x^3}{48}p(p-1)(f_1+7f_2)\right] \qquad (10.1)$$

$$F=\begin{cases}1\\2\pi\\4\pi\end{cases} \qquad p=\begin{cases}0 & \text{slab geometry}\\1 & \text{cylindrical geometry}\\2 & \text{spherical geometry}\end{cases}$$

At each time-step K the group fluxes are normalized in such a way that:

$$\sum_{i=1}^{G} F\int_0^L \varphi^i(x)\, E^i(x)\, x^p dx = W(k) \qquad (10.2)$$

where E^i (x) is the macroscopic cross-section for energy production (See (9.1)) and W (K) is the total power produced by the reactor part under investigation.

Briefly we shall list the main items which are printed by the program at each time-step after the input data specified only once in the whole lifetime:

- the new input data which are to be specified in the current time-step (buckl ings, control data, cross-section library, self-shielding factors)
- the atomic densities per mesh-interval of the burnable isotopes
- the K_{eff} iterations for each value of the control parameter
- the macroscopic cross-section per mesh-interval
- the point fluxes and power densities
- the average fluxes and power densities per mesh interval
- the flux weighted macroscopic cross-section both in each reactor region and in the poisoned and unpoisoned side of the rod poison region, if any
- the region integrals and the neutron balance.

XI - DESCRIPTION OF THE PROGRAM

We shall list the FORTRAN decks which constitute the program SQUIRREL:

MAIN	
ALOAD, MAPPIO, DELTAX	The data which cannot be specified for each time-step are read and printed.
BLOAD, DOPCOF	The control data (including the data for the Doppler and water effects) are read and printed.
CLOAD	The cross-section library and the self-shielding data are read and printed.
DLOAD	The atomic number densities of the burnable isotopes are printed, punched on cards and written on the logical unit 2. Moreover the fuel shuffling, if any, is carried out.
MACRAL, SELFAC, INTERP	The macroscopic cross-section are calculated and the flow of the criticality search iterations is controlled.
BEAM	At each criticality search iteration the K_{eff} and the point fluxes are calculated also accounting for the Doppler effect.
AVFLU	The point fluxes are normalized and printed. Moreover the average fluxes per mesh interval (used in the depletion calculations) are calculated and printed.
ADINT	The flux weighted macroscopic cross-section per region are calculated and printed. A detailed neutron balance is drawn.
BURCAL, DBURN	The new number densities per mesh-interval of the burnable isotopes are calculated (burnup calculation).
WATCOR	The water number densities are calculated taking into account the effect of the power through the enthalpy

If the available core storage requires it, the program SQUIRREL can be arranged as an "overlay program" whose links can be shaped in many different ways.

XII - INPUT DATA PREPARATION

It is to be said first that the limitations of SQUIRREL (i.d. the maximum number of compositions, of mesh-points and so on) are not specified in this section, where they are indicated only parametrically.

The numerical values of these parameters, for the present version of SQUIRREL now running at Ispra, are given in Appendix A, so that future changes of the program restrictions will only imply the up-to-dating of Appendix A.

1: TITLE CARD (18A4)

Col. 1-72 Title of the problem (any alphanumeric character)

2: GENERAL PARAMETERS (24I3)

Col. 1-3 NGEØM = 0 slab geometry
= 1 cylindrical geometry
= 2 spherical geometry

Col. 4-6 NG ($\leq$ KNG) = number of groups. It must be NG $\geq$ 2

Col. 7-9 NR ($\leq$ KNR) = number of regions

Col.10-12 NPX ($\leq$ KPX) = last mesh-point (the mesh-points are numbered rightwards starting from 1)

Col.13-15 NGRINT ($\leq$ KRINT) = last time-step
The time-steps are numbered starting from 0

Col.16-18 NIS ($\leq$ KIS) = highest isotope index.

3: OPTIONS (24I3)

Col. 1-3 ICØND = 0 the boundary conditions are the same for all groups
= 1 the boundary conditions are group dependent

Col. 4-6 IGBCK = 0 group independent buckling
= 1 group dependent buckling

Col. 7-9 ISBCK = 0 spatially independent buckling
= 1 the buckling is to be specified per mesh-interval in self-expanding form

Col. 10-12 IC = 1 straight burnup (only a K-effective calculation at each time-step). See Section II.a

= 2 search of the critical dilution factor ϑ of a diluted poison. See Section II.b

= 3 search of the critical absorption cross-section Σ_{rp} of a rodded poison. See Section II.c

= 4 search of the critical boundary of a rodded poison. See Section II.d

= 5 search of the critical "dilution factor" of a water dependent poison. See Section II.e

= 6 search of the critical transverse buckling. See Section II.f

Col. 13-15 IENTH = 0 enthalpy axial formulation (See Section VI)

= 1 enthalpy radial formulation

Col. 16-18 IMACR = 1 isotopic self-shielding factors and macroscopic cross-sections are printed for each mesh-interval

= 0 only macroscopic cross-sections are printed

= -1 neither self-shielding factors nor cross-sections are printed

4. MISCELLANEA (7E10.5)

Col. 1-10 AUTCRI = minimum allowable eigenvalue λ_{min} if IC=1 (straight burnup). If at any time-step the K-effective becomes lower than λ_{min}, the program stops before the burnup calculation

= eigenvalue λ_c to be searched for in criticality searches (IC > 1)

Col.11-20 DEL = pointwise convergence criterion for an eigenvalue calculation: $\frac{\lambda_{max} - \lambda_{min}}{2\lambda} \leq DEL$

A value between 10^{-3} and 10^{-4} is advised. (See 2.3).

Col.21-30 ETA = convergence criterion for a criticality search (IC > 1). The search is interrupted when:

$$|\lambda - \lambda_c| < ETA$$

If IC=1, leave blank or zero. See (2.7).

Col.31-40 XENCØN = convergence criterion for the Xenon iterations, which are interrupted when:

$$\max_p \left| \frac{N_p^{xe,t} - N_p^{xe,t-1}}{N_p^{xe,t}} \right| \leq XENCON \qquad \text{See (3.2)}$$

t = iteration index
p = mesh-point index

Col.41-50 FULPD = reference full power density (in Watt/cm^3). See Sections IV and VI.

5: BOUNDARY CONDITIONS

SQUIRREL applies on each external side of the reactor conditions of the type:

$$\eta^i \varphi^i + \xi^i \frac{d\varphi}{dn} = 0 \qquad (i = 1, 2.. NG) \qquad (12.1)$$

where $\frac{d}{dn}$ is the derivative along the outward normal and $\eta^i \geq 0, \xi^i \geq 0,$ $\eta^i + \xi^i > 0$. The zero flux condition is obtained by $\eta^i \neq 0$ and $\xi^i = 0$, the zero current (symmetry) condition by $\eta^i = 0$ and $\xi^i \neq 0$.

If $\alpha^i = 0.5$ and $\beta^i = 1$, condition (12.1) represents a vanishing in ward current J_{in} (in the diffusion theory).

This last condition should be employed, instead of the usual one of vanishing flux.

The set for the boundary condition specification consist of one card (7E10.3) if ICØND = 0 or NG cards if ICØND = 1 (See Col.1-3 of CARD No.3):

Col. 1-10, 11-20 η^i, ξ^i — for the left boundary (mesh point 1)

Col. 21-30, 31-40 η^i, ξ^i — for the right boundary (mesh point NPX)

If ICOND = 0, only one card is necessary and the specified values apply to all groups.

If ICOND = 1, NG cards must be supplied, one for each group.

If $\eta^i + \xi^i = 0$, the program will stop, except if this condition happens on the left side of a cylindrical or spherical reactor. In this case the program sets automatically $\eta^1 = 0$, $\xi^1 = 1$ (symmetry condition).

6: TIME-STEPS FOR XENON ITERATION

This set of one or more cards (24I3) is to specify the vector NXE (K), K = 0, NGRINT.

The first card contains:

Col. 1-3 NXE (0) $\neq$ 0 at the time-step 0, the iterations Xenon-reactivity (or Xenon-control parameter in the criticality searches) are carried out until convergence of the Xenon number densities. (See Section III).

= 0 Throughout the time-step 0 diffusion calculation, the Xenon number densities are unchanged, that is they are left as given in input.

Col. 4-6 NXE (1) $\neq$ 0 in the time-step 1 diffusion calculation, the Xenon iterations are carried out.

= 0 Throughout the time-step 1 diffusion calculation, the Xenon number densities are as calculated in the burn-up calculation.

.....

And so forth until NXE (NGRINT), using as many cards as necessary.

7: POWER SPECIFICATION

This set contains one or more cards (7E10.5). The first card is:

Col. 1-10 W(0) = power for the flux normalization at the time-step 0

Col. 11-20 W(1) = power for the time-step 1

and so forth, up to W (NGRINT).

It is understood that the power for unit transverse height (Watt/cm) in cylindrical geometry or the power for unit cross-sectional area (Watt/cm ^{2}) in slab geometry is to be given.

Moreover, if a slab reactor is symmetric about one axis (except for a cell problem), only $\frac{1}{2}$ of the actual power must be supplied.

At any time-step K, the fluxes are normalized in such a way that:

$$\sum_{i=1}^{G} F \int_{o}^{L} E^{i} \varphi^{i}(x) x^{p} dx = W(x) \qquad \text{See (10.2)}$$

8: LIST OF TIME-STEPS WITH NEW BUCKLINGS

One or more cards (24I3), present only if NGRINT > 0, for the specification of the vector NBK(L), L = 1, NGRINT, where:

NBK (I) = 1 the program reads new square bucklings after the depletion calculation and before the next diffusion calculation of the time-step I (See card set no.22: BUCKLINGS).

= 0 new bucklings are not required at time-step I.

9: LIST OF TIME-STEPS WITH NEW CONTROL DATA

One or more cards (24I3), present only if NGRINT > 0, for the specification of the vector NCT (I), I = 1, NGRINT, where:

NCT (I) = 1 the program reads new control data, new Doppler and water effect data ...etc.....(see card sets no.23: CONTROL DATA PARAMETERS) immediately after the depletion calculation of the time step I.

= 0 new values of the just mentioned data are not read.

10: LIST OF TIME-STEPS WITH A NEW LIBRARY

One or more cards (24I3), present only if NGRINT > 0, for the specification of the vector NTL (K), K = 1, NGRINT, where:

NTL (I) = 1 the program reads new library data before the time-step I diffusion calculation.

= 0 no library data are read. All the library data are the last ones read by the program.

11: LIST OF TIME-STEPS WITH NEW SELF-SHIELDING DATA

One or more cards (24I3), present only if NGRINT > 0, for the specification of the vector NTS (K), K = 1, NGRINT, where:

NTS(I) = 1 the program reads new self-shielding data before the time-step I diffusion calculation.

= 0 no self-shielding data are read.

N.B. - The data mentioned about the card sets 8, 9, 10, 11 are automatically requested by the program at the time-step 0, that is at the beginning of the problem.

12: LIST OF TIME STEPS WITH SHUFFLING

One or more cards (24I3), present only if NGRINT > 0, for the specification of the vector NFU (K), K =1, NGRINT.

NFU (I) = 1 the program carries out a fuel shuffling before the time-step I diffusion calculation.

= 0 no shuffling is carried out.

13: SUBSTEP DIVISION

This set of one or more cards (24I3), present only if NGRINT > 0, specifies the subdivision of each time-step I into NSA(I) small time-steps.

The first card contains:

Col. 1-3 NSA (1) = number of small time-steps into which the time-step 1 is divided.

Col. 4-6 NSA (2) = ...

and so on up to NSA (NGRINT).

14: TIME-STEP LENGTHS

This set, present only if NGRINT > 0, contains one or more cards (7E10.3). On the first card.

Col. 1-10 DELTAT (1) = length (hours) of the time-step 1

Col.11-20 DELTAT (2) = same, for time-step 2

and so forth, up to DELTAT (NGRINT), using as many cards as necessary.

15: χ^i SPECIFICATION

One card (7E10.5) containing the fission spectrum integrals χ^i (i = 1,2...NG) for all groups.

It must be $\chi^i \geq 0$ and $\sum_{i=1}^{NG} \chi^i > 0$

16: MESH INTERVAL SPECIFICATION

Each card is divided in 6 parts[(6 (E9.3), I3)] of 12 columns each.

Each part is constituted by a 9 column field (E9.3) and a 3 column field (I3) and specifies a couple (Δx ,p) where Δx is a mesh interval length (in cm) and p is the mesh-point up to which this value is extended. All the p must be given in an increasing order and the last one must be NPX.

17: REGION DESCRIPTION

The lay-out of the regions is specified in a self-expanding form by couples of two integers:

Col. 1-3 i_r = region index ($1 \leq i_r \leq NR$)

Col. 4-6 p = mesh point up to which this region index extends

Col. 7-9 these columns are ignored by the program.

The specification is continued by triplets of 3 Column fields, the last of which is always ignored by the program.

The integers p must be input in an increasing order and the last one must equal NPX.

A region (e.g.a reflector) can be constituted by disjoint segments of the reactor domain, that is the integers i_r need not be different even if they do not belong to consecutive couples (i_r, p)

18: PARAMETERS FOR NUMBER DENSITY SPECIFICATION

There must be one card (24I3) containing:

Col. 1-3 NEC = number of isotopes whose number densities are given per region ($0 \leq$ NEC $\leq$ NIS)

Col. 4-6 IREC = identification number, on the logical unit 2, of the record containing the intervalwise number densities to be read by the program. If this field is blank or zero, no number density is read from unit 2

Col. 7-9 NREC = identification number of the last number density record to be saved on the logical unit 2. Next to record NREC, the program will write the number density records relating to the time-steps of the present problem, starting with time-step 0 and identification number NREC+1

Col. 10-12 NEMIR = number of isotopes, whose number densities are given per mesh interval ($0 \leq$ NEMIR $\leq$ NUCL+1)

Col. 13-15 IPUN = 0 no punched cards

= 1 the number densities of the first NUCL+1 isotopes are punched on cards (1P7E10.4) at each time-step, before the shuffling.
These punched cards can be used to input number densities per mesh-interval in other problem (See col.10-12). Anyway we remind the same number densities are <u>always</u> written on the logical unit 2.

= 2 only the power normalized point fluxes are punched on cards (1P7E10.4)

= 3 both the aforementioned number densities and the point fluxes are punched on cards.

The number densities of the first NUCL+1 isotopes (that is the time-dependent isotopes plus the immediately next one) can be specified either per region or per mesh interval or both.

The number densities of the time-independent isotopes, except for the first (of index NUCL+1) can be specified only per region.

Also we recall that, if the option described in Section VI is checked (see col.13-15 of <u>23: CONTROL DATA PARAMETERS</u>), the isotope NUCL+1 is automatically assumed to represent "water" and its number densities are calculated only in those mesh intervals <u>where the input values are different from zero</u>.

All number densities (per region and per mesh-interval) are initialized to zero. The number densities per region, if any, are then read from cards and expanded per mesh-interval.(See sets No.19,20).

Next, if required (see col.4-6), the program reads the number densities of the first NUCL+1 isotopes recorded on logical unit 2. Finally number densities per mesh-interval, if any, are read from cards (see set No.21).

<u>In each of the aforementioned reading steps, the last specified number densities, if overlapping occurs, override the preceding ones.</u>

<u>19: LIST OF ISOTOPES WITH NUMBER DENSITIES GIVEN PER REGION</u>

One or more cards (24I3), present only if NEC $>$ 0, specifying the identification numbers of the NEC isotopes with number densities given per region.

20: NUMBER DENSITIES PER REGION

This set is present only if NEC > 0.

For each of the NEC isotopes specified in 19, one or more cards (7E10.5), containing NR number densities, one for each region. Start a new card for a new isotope.

21: NUMBER DENSITIES PER MESH-INTERVAL

This set is present only if NEMIR > 0. For each isotope, whose number densities are to be given per mesh-interval, there must be the following cards :

a) One card (24I3) with:

Col. 1-3 IN = identification number of the isotope ($1 \leq IN \leq NUCL+1$)

Col. 4-6 IS(IN)= number of segments, each constituted by consecutive mesh-intervals, on which the number densities of the isotope IN are to be specified.

b) One or more cards (8 (2I3,3X)) describing the aforementioned IS segments. On the first card :

Col. 1-3 l_1 = mesh point representing the left boundary of the first segment

Col. 4-6 r_1 = mesh point representing the right boundary ($1 \leq l_1 < r_1 \leq NPX$)

Col. 7-9 These columns are ignored by the program

..... and so on, using the other 7 triplets of 3 column fields and as many cards as necessary.

c) For each segment, described in b , one or more cards (7E10.5) containing $r_i - l_i$ number densities ($r_i - l_i$ = number of mesh intervals belonging to the segment). Start a new card when passing to a new segment. Where two or more segment overlap, the last specified number densities override the preceding ones.

The card sets a), b), c) must be repeated NEMIR times (See col. 10-12 of 18).

22: BUCKLING

The axial (in cylindrical geometry) or the cross-sectional (in slab geometry) square bucklings are read by the program at the beginning of a problem (time-step no.0) and at any time I such as NBK(I) = 1.

(See 8: LIST OF TIME STEPS WITH NEW BUCKLINGS)

a) If ISBCK = 0 (Col.7-9 of card no.3), supply one card (7E10.5) with a spatially independent buckling in the first field.

b) If ISBK = 1, there must be one or more cards (6 (E9.3,I3)) with each 9 column field (E9.3) devoted to a buckling value and the following 3 column field (I3) specifying the mesh point up to which this value extends.

If IGBCK=1 (group dependent buckling. See col.4-6 of card no.3), the card a or the card set b must be repented NG times.

In spherical geometry, although not compulsory, the best policy is to put IGBCK = ISBCK = 0 and supply one blank card as card set 22.

We point out that the buckling referred to here is the fixed buckling not to be confused with the control buckling we shall consider later. (See Section I.1 and card set no.27).

CONTROL DATA

The data, included in the card sets no.23, 24, 25, 26, 27, 28, 29, 30, 31 are read by the program at the beginning of a problem (time-step no.0) and at any time-step I such as NCT(I)=1, unless otherwise specified on card 23 (See 9: LIST OF TIME STEPS WITH NEW CONTROL DATA).

23: CONTROL DATA PARAMETERS (24I3)

Col. 1-3 NCON = 1 The control poison and control buckling data, namely the card sets no.23, 24, 25, 26, 27 are read

= 0 are not read but they hold the last specified values. In time-step no.0 this option is possible only in straight burnup calculations (no search): in this case all control poison absorption cross-sections and the control buckling are automatically set to 0.

Col. 4-6 NDOP number of sets of coefficients for calculating the power effect on U-238 absorption cross section in resonance group (NG-1). If NDOP=0, the Doppler coefficients hold the last specified values. Of course, this option is not possible in time-step 0. See (4.1).

Col. 7-9 NWE number of sets of coefficients for calculating the water effect on the just mentioned U-238 cross-section. The option NWE=0 has the same meaning as for NDOP. See (4.2).

Col. 10-12 NWR — number of sets of coefficients for representing the removal cross-section, from the resonance group, of the isotope no.NUCL+1 (generally, but not necessarily, water) as a function of its own number density.
The option NWR=0 has the same meaning as for NDOP and NWE. See (4.3).

Col. 13-15 IWTR = 1 the data for fitting the number density of the isotope NUCL+1 (which should be water) versus enthalpy are read. See Section VI.

= 0 are not read but they hold the last specified values. IWTR=0 in time-step 0 means that the isotope NUCL+1 number densities are held fixed, as given in input, throughout the lifetime, unless otherwise specified in a following time-step.
This option is usefull when the power effect on the water number density does not matter.

24: DILUTED POISON DATA

In this set, present only if NCON=1, there must be the following cards:

a) One card (7E10.5) containing:

Col. 1-10 ϑ = dilution factor first approximation if IC=2 (diluted poison search. See Col.10-12 of card no.3)

= actual dilution factor in all other cases (IC≠2).

The following two parameters are to be given only if IC=2.

Col.11-20 ϑ_{min} = dilution factor minimum value

Col.21-30 ϑ_{max} = dilution factor maximum value. ($\vartheta_{min} \leq \vartheta \leq \vartheta_{max}$)

b) One card (7E10.5) for the diluted poison fractions :

Col. 1-10 t_d^1 = diluted poison fraction acting in group 1

Col.11-20 t_d^2 = diluted poison fraction acting in group 2.

c) One or more cards (6 (E9.3,I3)) where the diluted poison absorption cross-sections Σ_{dp} are specified in a self-expanding form with each 3 column field occupied by a mesh point number.

25: RODDED POISON DATA

In this set, present only if NCON=1, there must be the following cards:

a) One card (24I3) containing:

Col. 1-3 p_{1r} = left boundary of the rodded poison region

Col. 4-6 p_{2r} = right boundary of the rodded poison region. It must be $p_{1r} < p_{2r}$ unless $P_{1r} = P_{2r} = 0$ (no rodded poison region)

Col. 7-9 p_{vr} = first approximation of the boundary between the poisoned and unpoisoned side if a boundary search is dealt with (IC = 4. See Section II.d). It must be $p_{1r} \leq p_{vr} \leq p_{2r}$ In all other cases (IC≠4) leave blank.

b) One card (7E10.5) with:

Col. 1-10 Σ_{rp} = first approximation of the rodded poison absorption cross-section if IC=3 (rodded poison cross-section search. See Section II.C)

= actual rodded poison cross-section in all other cases (IC≠3).

The following two parameters are to be given only if IC=3.

Col.11-20 Σ_{rp}^{min} = minimum value of the rodded poison cross-section.

Col.21-30 Σ_{rp}^{max} = maximum value of the rodded poison cross-section

$(\Sigma_{rp}^{min} < \Sigma_{rp}^{max}, \Sigma_{rp}^{min} \leq \Sigma_{rp} \leq \Sigma_{rp}^{max})$

c) One card (7E10.5) for the rodded poison fractions:

Col. 1-10 t_r^1 = rodded poison fraction acting in group 1

Col.11-20 t_r^2 = rodded poison fraction in group 2.

.....

26: WATER DEPENDENT POISON DATA

In this set, present only if NCON=1, there must be the following cards:

a) One card (7E10.5) containing:

Col. 1-10 C_{wp} = first approximation of the water dependent poison "dilution factor" if IC= 5 (water dependent poison search. See section II.e)

= actual water dependent poison "dilution factor" in all other cases (IC≠5).

The following two parameters are to be given only if IC=5.

Col.11-20 C_{wp}^{min} = minimum value of the "dilution factor"

Col.21-30 C_{wp}^{max} = maximum value of the "dilution factor"
($C_{wp}^{min} < C_{wp}^{max}$; $C_{wp}^{min} \leq Cwp \leq C_{wp}^{max}$)

b) One card (7E10.5) for the water dependent poison fractions:

Col. 1-10 t_w^1 = water dependent poison fraction acting in group 1

.....

c) One card (7E10.5) with the coefficients for representing the poison cross-section as a function of the water number density:

Col. 1-10 α_1

Col.11-20 α_0 } See (2.9)

Col.21-30 α_{-1}

Col.31-40 α_{-2}

27: CONTROL BUCKLING DATA

In this set, present only if NCON=1, there must be the following cards:

a) One card (3E10.5, 2A4) containing:

Col. 1-10 B_c^2 = first approximation of the control buckling, if a buckling search is dealt with (IC=6. See Section II.f)

= actual value of the control buckling in all other cases (IC≠6).

The following <u>two</u> parameters are to be given only if IC=6:

Col.11-20 $B_c^{2(min)}$ = minimum value of the control buckling

Col.21-30 $B_c^{2(max)}$ = maximum value of the control buckling
($B_c^{2(min)} < B_c^{2(max)}$; $B_c^{2(min)} \leq B_c^2 \leq B_c^{2(max)}$)

Col.31-38 If this field in blank, the aforementioned buckling value (or the buckling search) extends over the whole reactor.
If this field is not blank, the control buckling concerns only the reactor regions that will be specified in <u>b</u>.

b) One or more cards (24I3), present only if the above field 31-38 is not blank, for specifying the vector IB(L), L = 1, NR, where:

IB(L) = 1 the control buckling or the buckling search include the region L

= 0 the control buckling is set automatically to zero in the region L, which is not concerned with the buckling search, if any.

28: DOPPLER EFFECT DATA (*)

In this set, present only if NDOP > 0, there must be the following cards:

a) NDOP cards (7E10.5), one for each of the NDOP coefficient sets:

Col. 1-10 β_0

Col.11-20 β_1 } See (4.1)

Col.21-30 β_2

Col.31-40 β_3

b) One or more cards (24I3), present only if NDOP> 1, for assigning to each region one of the above defined coefficient sets, which are numbered in the same order they are input in a .

On the first card:

Col. 1-3 ID(1) = coefficient set assigned to the region 1

.....

and so on up to ID(NR). It must be $1 \leq ID(L) \leq NDOP$ for any region L.

If NDOP = 1, the card(s) b is not present but the single set is automatically extended over all regions.

29: WATER EFFECT DATA (*)

This set, present only if NWE > 0, has the same structure as the set 28:

a) NWE cards (7E10.5), each containing:

Col. 1-10 γ_0

Col.11-20 γ_1 } See (4.2)

Col.21-30 γ_2

Col.31-40 γ_3

(*) See footnote of the following page.

b) One or more cards (24I3), present only if NWE > 1, specifying the vector IW(L) (L = 1,NR), which assigns to each region L one of the coefficient sets defined in a .
It must be $1 \leq IW(L) \leq NWE$.

30: DATA FOR THE RESONANCE GROUP WATER REMOVAL (*)

This set, present only if NWR > 0, is built as the sets 28, 29.

a) NWR cards (7E10.5), each containing:

Col. 1-10 ρ_0

Col.11-20 ρ_1 } See (4.3)
Col.21-30 ρ_2 }

Col.31-40 ρ_3

b) One or more cards (24I3), present only if NWR > 1, specifying the vector IR(L) (L=1,NR) with the same meaning as in 28b. It must be $1 \leq IR(L) \leq NWR$.

31: POWER EFFECT DATA

In this set, present only if IWTR≠0, there must be the following cards:

a) One card (7E10.5):

Col. 1-10 h_0 = inlet coolant enthalpy

Col.11-20 h_{sat} = saturation enthalpy

b) One card (7E10.5) containing:

Col. 1-10 a_0
Col.11-20 a_1 } water number density versus enthalpy coefficients ($h \geq h_{sat}$). See (6.3).
Col.21-30 a_2 }

c) One card (7E10.5) containing:

Col. 1-10 b_0
Col.11-20 b_1 } water number density versus enthalpy coefficients ($h \leq h_{sat}$). See (6.3).
Col.21-30 b_2 }

It must be $b_0 = a_0 (1+a_1 h_{sat} + a_2 h_{sat}^2)^{-1}$, owing to continuity.

(*) We warn that the values of both the U-238 absorption cross-section and of the water removal cross-section in the resonance group, specified among the library data (see card set 34), are ignored by the program. As a consequence, the aforementioned values should always be specified by a proper use of the card sets 28,29,30, even if the isotope NUCL+1 is not really representing the water.

d) One or more cards (6 (E9.3,I3)) specifying the conversion factor K (or K') in a self-expanding form with each 3 column field devoted to a mesh-point number. See (6.1) and (6.2).

LIBRARY DATA

The data concerning the library, included in the card sets no. 32, 33, 34, 35, 36, 37, 38 are read by the program at the beginning of a problem (time-step no.0) and at any time-step K such as NTL(K) = 1. (See 10: LIST OF TIME-STEPS WITH A NEW LIBRARY).

At the time-step 0, all the library data are initialized to zero,whereas at the successive time-steps, they are initialized to the values of the previous time-step.

Thus the reading of new library data provides a modification, partial or total, of the library data of the preceding time-step.

32: LIBRARY PARAMETERS (24I3)

Col. 1-3 NLL = number of isotopes for which the cross-sections σ_{tr} , σ_a , σ_r are given.

Col. 4-6 NFL = number of isotopes for which the cross-sections σ_f , $\nu\sigma_f$, e are given.

Col. 7-9 NYL = number of isotopes for which the fission yields are given.

33: LIST OF ISOTOPES WITH σ_{tr}, σ_a, σ_R

This set, present only if NLL > 0, is made of one or more cards (24I3) containing the indexes of the NLL isotopes for which σ_{tr}, σ_a, σ_r must be specified.

34: VALUES OF σ_{tr}, σ_a, σ_r

For each isotope declared in the list 33, there must be the following three cards:

a) card for the transport cross sections σ_{tr}

Col. 1-8 Isotope name (it is suggested to start from column 1). This name is used for the printout of the non-burnable isotopes.

Col. 9-10 Are ignored by the program

Col.11-20 σ_{tr}^{1} = group 1 microscopic transport cross-section

Col.21-30 σ_{tr}^{2} = group 2 microscopic transport cross-section

.....

b) card for the absorption cross sections σ_a

Col. 1-10 Any alphameric characters

Col.11-20 σ_{a}^{1} = group 1 microscopic absorption cross-section

Col.21-30 σ_{a}^{2} = group 2 microscopic absorption cross-section

.....

c) card for the removal cross sections σ_r

Col. 1-10 Any alphameric characters

Col.11-20 σ_{r}^{1} = group 1 microscopic removal cross-section

Col.21-30 σ_{r}^{2} = group 2 microscopic removal cross-section

.....

35: LIST OF ISOTOPES WITH σ_f, $\nu\sigma_f$, e

This set, present only if NFL > 0, is made of one or more cards (24I3) containing the indexes of the NFL isotopes for which $\sigma_f, \nu\sigma_f$, e must be specified.

36: VALUES OF $\sigma_f, \nu\sigma_f$, e

For each isotope declared in the list 35, there must be the following three cards:

a) card for the fission cross section σ_f

Col. 1-10 Any alphameric characters

Col.11-20 σ_{f}^{1} = group 1 microscopic fission cross-section

Col.21-30 σ_{f}^{2} = group 2 microscopic fission cross-section

.....

b) card for the nu-fission cross-section $\nu\sigma_f$

Col. 1-10 Any alphameric characters

Col.11-20 $\nu\,\sigma_f^1$ = group 1 microscopic fission cross-section times average number of neutrons per fission

Col.21-30 $\nu\,\sigma_f^2$ = group 2 " " " "

.....

c) card for the energies per fission e

Col. 1-10 Any alphameric characters

Col.11-20 e^1 = energy (Joule) released by one fission in group 1

Col.21-30 e^2 = energy (Joule) released by one fission in group 2

.....

37: LIST OF ISOTOPES WITH FISSION YIELDS

This set of one or more cards (24I3), present only if NYL > 0, specifies the isotopes for which the fission yields must be input.

38: FISSION YIELDS

For each isotope i declared in the list 37 there must be one or more cards (7E10.5) containing the fission yields $\gamma^{i \rightarrow j}$ of the isotope i under consideration to all fission products j, j going from NIF + 1 to NIF + NIP + NAG. See Section VII.

SELF SHIELDING FACTORS

The data concerning the self-shielding factors, included in the card sets no. 39, 40, 41, 42, 43, 44, 45, 46, 47 are read by the program at the beginning of a problem (time-step 0) and at any time-step K such as NTS(K) = 1 (Cf.11: LIST OF TIME STEPS WITH NEW SELF-SHIELDING DATA).

The self-shielding factors can be directly input or calculated by the formula.

$$g^{i,j} = \sum_{k=0}^{gp} a_k^{ij} N_j^k \qquad (12.2)$$

i = group index

j = isotope index

g_p = polynomial degree

N_j = number density of the isotope j in a given mesh-interval.

It is understood that the self-shielding factors of the isotopes and the groups for which no data are supplied, are all equal to 1.

39: SELF-SHIELDING PARAMETERS

One card (3I3, 11X, 4I3)

Col. 1-3 NBS = number of self-shielding blocks.
If NBS = 0 at the time-step 0, all self-shielding factors are initialized to 1.
If NBS = 0 at any other time-step, the self-shielding factors are initialized to the values of the previous time-step.

Col. 4-6 NGS = number of groups for which the self-shielding factors are specified.

Col. 7-9 NSS = number of isotopes for which the self-shielding factors are specified.

It must be NBS · NGS · NSS (total number of self-shielding factors) $\leq$ KSELF.

Col.10-20 any alphameric characters.

Col.21-23 NBL = number of blocks of polynomial coefficients a_k^{ij}

If NBL = 0 at the time-step 0, the polynomial formula (12.2) is not used. On the contrary, if NBL = 0 at any other time step, the polynomial coefficients are initialized to the values of the previous time-step.

Col.24-26 NGL = number of groups for which the polynomial coefficients are specified (NGL $\leq$ NG).

Col.27-29 NLP = number of isotopes for which the polynomial coefficients are specified (NLP $\leq$ NIS).

Col.30-32 NGP = g_p + 1 = polynomial degree plus one (NGP $\leq$ 7).

It must be: NBL · NGL · NLP · NGP (total number of polynomial coefficients) $\leq$ KPØL.

40: ASSIGNMENT OF THE S.S.BLOCKS

One or more cards (24I3), present only if NBS $\neq$ 0, for the assignment of the self-shielding blocks to the regions.

Col. 1-3 M (1) = block assigned to the region 1
Col. 4-6 M (2) = block assigned to the region 2

.....

and so on up to M (NR).

The block of index 0 is an implicitly defined block having all the self-shielding factors = 1.

41: LIST OF GROUPS WITH SELF-SHIELDING FACTORS

One card (24I3), present only if NBS ≠ 0, specifying the NGS groups for which the self-shielding factors are input.

42: LIST OF ISOTOPES WITH SELF-SHIELDING FACTORS

One or more cards (24I3), present only if NBS ≠ 0, specifying the indexes of the NSS isotopes for which the s.s. factors are given.

43: SELF-SHIELDING FACTORS

This set of cards (7E10.5), present only if NBS ≠ 0, must be repeated as many times as the number of blocks NBS.

For each block, NGS sets of cards must be supplied, following the order given in 41.

Each of the NGS sets contains NSS self-shielding factors, following the order given in 42. Start with a new card when changing group.

44: ASSIGNMENT OF THE BLOCKS OF POLYNOMIAL COEFFICIENTS

One or more cards (24I3), present only if NBL ≠ 0, for the assignment of the self-shielding polynomial coefficients to the regions.

Col. 1-3 N (1) = block assigned to the region 1

Col. 4-6 N (2) = block assigned to the region 2

.....

and so on, up to N (NR).

If a region is given the block 0, its self-shielding factors are not calculated by the formula (12.2), but keep the explicitly input values.

45: LIST OF GROUPS WITH POLYNOMIAL COEFFICIENTS

One card (24I3), present only if NBL ≠ 0, specifying the NGL groups for which the polynomial coefficients are input.

46: LIST OF ISOTOPES WITH POLYNOMIAL COEFFICIENTS

One or more cards (24I3), present only if NBL $\neq$ 0, specifying the indexes of the NLP isotopes for which the polynomial coefficients are given.

47: POLYNOMIAL COEFFICIENTS

This set of cards (7E10.5), present only if NBL $\neq$ 0, must be repeated as many times as the number of blocks NBL.

For each block, NGL sets of cards must be supplied, following the order given in 45.

Each set is made up of NLP cards, one per each isotope, containing the polynomial coefficients of the isotope.

N.B. - The specification of the polynomial coefficients for a given group and a given isotope, overrides the specification of the self-shielding factors previously made with the sets 40 through 43.

48: SHUFFLING LIST

The program reads this set of cards (4 (4I4,2X)) at any time step K such that NFU(K) = 1.(See card set no.12: LIST OF TIME STEPS WITH SHUFFLING). On the first card:

Col. 1-4 p_{R1} = left boundary of the segment whose number densities are to be replaced.

Col. 5-8 p_{R2} = right boundary of the same segment ($p_{R1} < p_{R2}$).

Col.9-12 p_{T1} = index of the region whose initial number densities are to be transferred in the above specified segment, if the field 13-16 is blank ($1 \leq p_{T1} \leq NR$).

= left boundary of the segment whose number densities are to be translated mesh-interval by mesh-interval in the above specified region. If this integer has a minus sign, the segment undergoes a 180° rotation before being translated.

Col.13-16 p_{T2} = blank if the first option in Col.9-12 is checked.

= right boundary of the segment to be translated. In this case it must be $|p_{T1}| < p_{T2}$

$$p_{T2} - |p_{T1}| = p_{R2} - p_{R1}$$

$$\left.\begin{array}{l} p_{T2} \leq p_{R1} \\ \text{or} \\ p_{T1} \geq p_{R2} \end{array}\right\} \quad \text{no overlapping}$$

Col. 17-18 These columns are ignored.

.....

and so on, using as many fields and as many cards as necessary and each specification being divided from the successive one by a 2 column alphameric field as in Col. 17-18.

We remind that only the number densities of the burnable isotopes are involved in a shuffling.

A blank card indicates the end of the shuffling list.

N.B. - It is to be pointed out that the minimum required by the program for each of the card sets "CONTROL DATA", "LIBRARY DATA", "SELF-SHIELDING FACTORS", "SHUFFLING LIST" is a single blank card. In this last case the above data are not changed or shuffling does not take place although these possibilities were foreseen in the card sets from 9 to 12.

We resume here, for control's purpose, the format of an input deck for a lifetime problem:

1: TITLE CARD

2: GENERAL PARAMETERS

3: OPTIONS

4: MISCELLANEA

5: BOUNDARY CONDITIONS

6: TIME STEPS FOR XENON ITERATION

7: POWER SPECIFICATION

(*) 8: LIST OF TIME STEPS WITH NEW BUCKLINGS (ONLY IF NGRINT > 0)

(*) 9: LIST OF TIME STEPS WITH NEW CONTROL DATA (ONLY IF NGRINT > 0)

(*) 10: LIST OF TIME STEPS WITH A NEW LIBRARY (ONLY IF NGRINT > 0)

(*) 11: LIST OF TIME STEPS WITH NEW S.S.DATA (ONLY IF NGRINT > 0)

(*) 12: LIST OF TIME STEPS WITH SHUFFLING (ONLY IF NGRINT > 0)

(*) 13: SUBSTEP DIVISION (ONLY IF NGRINT > 0)

(*) 14: TIME STEP LENGTHS (ONLY IF NGRINT > 0)

15: χ^{i} SPECIFICATION

16: MESH INTERVAL SPECIFICATION

17: REGION DESCRIPTION

18: PARAMETERS FOR NUMBER DENSITY SPECIFICATION

(*) 19: LIST OF ISOTOPES WITH NUMBER DENSITIES GIVEN PER REGION (only if NEC >0)

(*) 20: NUMBER DENSITIES PER REGION (only if NEC > 0)

(*) 21: NUMBER DENSITIES PER MESH INTERVAL (only if NEMIR > 0)

22: BUCKLINGS

23: CONTROL DATA PARAMETERS

(*) 24: DILUTED POISON DATA (only if NCON = 1)

(*) 25: RODDED POISON DATA (only if NCON = 1)

(*) 26: WATER DEPENDENT POISON DATA (only if NCON = 1)

(*) 27: CONTROL BUCKLING DATA (only if NCON = 1)

(*) 28: DOPPLER EFFECT DATA (only if NDOP >0)

(*) 29: WATER EFFECT DATA (only if NWE > 0)

(*) 30: DATA FOR THE RESONANCE GROUP WATER REMOVAL (only if NWR > 0)

(*) 31: POWER EFFECT DATA (only if IWTR $\neq$ 0)

32: LIBRARY PARAMETERS

(*) 33: LIST OF ISOTOPES WITH σ_{tr}, σ_a, σ_r (only if NLL >0)

(*) 34: VALUES OF σ_{tr}, σ_a, σ_r (only if NLL> 0)

(*) 35: LIST OF ISOTOPES WITH σ_f, $\nu\sigma_f$, e (only if NFL > 0)

(*) 36: VALUES OF σ_f, $\nu\sigma_f$, e (only if NFL > 0)

(*) 37: LIST OF ISOTOPES WITH FISSION YIELDS (only if NYL> 0)

(*) 38: FISSION YIELDS (only if NYL > 0)

39: SELF SHIELDING PARAMETERS

(*) 40: ASSIGNMENT OF THE S.S.BLOCKS (only if NBS > 0)

(*) 41: LIST OF GROUPS WITH SELF-SHIELDING FACTORS (only if NBS >0)

(*) 42: LIST OF ISOTOPES WITH SELF-SHIELDING FACTORS (only if NBS >0)

(*) 43: SELF-SHIELDING FACTORS (only if NBS > 0)

(*) 44: ASSIGNMENT OF THE BLOCKS OF POLYNOMIAL COEFFICIENTS (only if NBL > 0)

(*) 45: LIST OF GROUPS WITH POLYNOMIAL COEFFICIENTS (only if NBL > 0)

(*) 46: LIST OF ISOTOPES WITH POLYNOMIAL COEFFICIENTS
(only if NBL > 0)

(*) 47: POLYNOMIAL COEFFICIENTS (only if NBL > 0)

48: SHUFFLING LIST

(*) - The sets with * may be omitted according to the correspondent option.

(**) - The card sets below 21 must be present at the beginning of the problem and moreover can be given at each successive time-step according to the correspondent option on card sets 9 through 12.

APPENDIX A - PROGRAM RESTRICTIONS

The present version of SQUIRREL (October 1968) has the following restrictions:

Maximum number of fuel isotope	KIF = 6
" " " fission products	KIP = 5
" " " isotopes	KIS = 30
" " " burnable isotopes	KIV = 13
" " " groups	KNG = 4
" " " mesh points	KNP = 500
" " " regions	KNR = 100
" " " polynomial coefficients	KPOL = 1000
" " " time - steps	KRINT = 100
" " " self-shielding factors	KSELF = 1000

APPENDIX B - PERIPHERAL UNIT CONFIGURATION

Logical unit	Physical unit	Function
2	tape or disk	to store the atomic densities per mesh interval
5		input
6		output
7		card punching

REFERENCES

1 BILODEAU, CADWELL, DORSEY, FAIREY, VARGA "PDQ-An IBM-704 Code to solve the two-dimensional few-group neutron diffusion equations" WAPD-TM-70 .

2 BOHL, VARGA "On estimating rates of convergence in multigroup diffusion problems" WAPD-TM-41 .

3 CONSOLE, DANERI, SALINA "EREBUS, a multigroup diffusion-depletion program in two dimensions for the IBM-360" FN-E-88.

4 DANERI, MAGGIONI, SALINA "TRITON , A Multigroup Diffusion-Depletion Program in Three Dimensions for IBM-360" FN-E-97.

5 HENDLEY, MANGAN "CNCR-2-A - A one dimensional few group depletion Code for the IBM-7090, which includes the effects of water density variations on neutron moderation" WCAP-6058 .

6 SALINA "CONDOR-2, a few group two dimensional program for the evaluation of water reactor long term reactivity changes" FN-E-95.

7 SALINA, DANERI, GABUTTI "Risoluzione delle equazioni di diffusione a moltigruppi" NTI-FN-95.

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CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

CYLINDRICAL GEOMETRY

NUMBER OF GROUPS= 4	LAST TIME STEP= 6
NUMBER OF REGIONS= 3	LAST MESH POINT= 39
NUMBER OF ISOTOPES= 20	NUMBER OF BURNABLE ISOTOPES= 13
NUMBER OF FISSILE ISOTOPE= 6	NUMBER OF SINGLE FISSION PRODUCTS= 4
NUMBER OF LUMPED FISSION PRODUCTS= 1	
U-238 IDENTIFICATION NO.= 3	I-135 IDENTIFICATION NO.= 9
XE-135 IDENTIFICATION NO.= 10	MAX. NUMBER OF CRIT. SEARCH IT.=300
MAX. NUMBER OF EIGENVALUE IT.= 20	
MIN. OR CONV. EIGENVALUE= 1.00000E 00	POINTWISE CONV. CRITERION= 1.00000E-04
SEARCH CONV. CRITERION= 1.00000E-04	XENON CONV. CRITERION= 1.00000E-02

REFERENCE FULL POWER DENSITY= 7.38195E 01

BUCKLING GIVEN BY GROUP

ENTHALPY AXIAL FORMULATION

INTERVALWISE MACROSCOPIC CROSS-SECTIONS ARE PRINTED

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

BOUNDARY CONDITIONS

GROUP	LEFT BOUNDARY ALPHA	LEFT BOUNDARY BETA	RIGHT BOUNDARY ALPHA	RIGHT BOUNDARY BETA
1	0.0	1.00000E 00	1.00000E 00	0.0
2	0.0	1.00000E 00	1.00000E 00	0.0
3	0.0	1.00000E 00	1.00000E 00	0.0
4	0.0	1.00000E 00	1.00000E 00	0.0

T.STEP	POWER(W)	LENGTH(H)	NO.SUBSTEP	NEW BUCK.	NEW CON. DATA	NEW LIBRARY	NEW S.S. FACTORS	FUEL SHUF.
0	7.31275E 05	-	-	-	-	-	-	-
1	7.31275E 05	1.00000E 02	1	NO	YES	NO	NO	NO
2	7.31275E 05	1.90000E 03	1	YES	NO	NO	NO	NO
3	7.31275E 05	2.00000E 03	1	NO	NO	YES	NO	NO
4	7.31275E 05	2.00000E 03	1	NO	NO	NO	YES	YES
5	7.31275E 05	2.00000E 03	1	NO	NO	NO	NO	NO
6	7.31275E 05	2.00000E 03	1	NO	NO	NO	NO	NO

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

MESH	PNT	MESH	PNT	MESH	PNT
2.8077	21	0.8467	24	2.2465	39

DISTANCE	PNT	DISTANCE	PNT	DISTANCE	PNT	DISTANCE	PNT	DISTANCE	PNT	DISTANCE	PNT
2.8077	2	5.6154	3	8.4231	4	11.2308	5	14.0385	6	16.8462	7
19.6539	8	22.4616	9	25.2693	10	28.0770	11	30.8847	12	33.6924	13
36.5000	14	39.3077	15	42.1154	16	44.9231	17	47.7308	18	50.5385	19
53.3462	20	56.1539	21	57.0806	22	57.8473	23	58.6940	24	60.9405	25
63.1870	26	65.4335	27	67.6799	28	69.9264	29	72.1729	30	74.4194	31
76.6659	32	78.9124	33	81.1589	34	83.4054	35	85.6519	36	87.8984	37
90.1449	38	92.3913	39								

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

REGION	VOLUME		
1- 3	9.90625E 03	9.16475E 02	1.59944E 04

MESH INTERVAL	VOLUME						
1- 7	2.47657E 01	7.42971E 01	1.23829E 02	1.73360E 02	2.22891E 02	2.72422E 02	3.21953E 02
8- 14	3.71485E 02	4.21016E 02	4.70547E 02	5.20078E 02	5.69610E 02	6.19141E 02	6.68672E 02
15- 21	7.18203E 02	7.67735E 02	8.17266E 02	8.66797E 02	9.16328E 02	9.65860E 02	3.00987E 02
22- 28	3.05492E 02	3.09996E 02	8.44327E 02	8.76036E 02	9.07746E 02	9.39455E 02	9.71165E 02
29- 35	1.00287E 03	1.03458E 03	1.06629E 03	1.09800E 03	1.12971E 03	1.16142E 03	1.19313E 03
36- 38	1.22484E 03	1.25655E 03	1.28826E 03				

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

ISOTOPE NAME	ISOTOPE NUMBER	CAPTURE PARENT 1	CAPTURE PARENT 2	DECAY PARENT	FISSILE ISOTOPE	FISSION PRODUCT	DECAY CONSTANT	ATOMIC WEIGHT
U-235	1	0	0	0	YES	NO	0.0	235.117
U-236	2	1	0	0	YES	NO	0.0	236.120
U-238	3	0	0	0	YES	NO	0.0	238.125
PU-239	4	3	0	0	YES	NO	0.0	239.127
PU-240	5	4	0	0	YES	NO	0.0	240.129
PU-241	6	5	0	0	YES	NO	1.664E-09	241.131
PM-149	7	0	0	0	NO	YES	3.630E-06	149.000
SM-149	8	0	0	7	NO	YES	0.0	148.964
I-135	9	0	0	0	NO	YES	2.870E-05	135.000
XE-135	10	0	0	9	NO	YES	2.100E-05	135.000
F.P.-1	11	0	0	0	NO	YES*	0.0	0.0
B.P.-1	12	0	0	0	NO	NO	0.0	0.0
B.P.-2	13	0	0	0	NO	NO	0.0	0.0

*LUMPED FISSION PRODUCT

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

REGION ATOMIC DENSITIES

ISOTOPE REGION	1	2	3	4	5	6	7	8
1	3.14361E-04	0.0	7.08008E-03	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	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

REGION ATOMIC DENSITIES

ISOTOPE REGION	9	10	11	12	13	14	15	16
1	0.0	0.0	0.0	0.0	0.0	3.01512E-02	2.98645E-02	5.06103E-03
2	0.0	0.0	0.0	0.0	0.0	0.0	1.29700E-02	2.96390E-02
3	0.0	0.0	0.0	0.0	0.0	0.0	1.82950E-02	1.74704E-02

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

REGION ATOMIC DENSITIES

ISOTOPE REGION	17	18	19	20
1	7.00769E-04	1.40154E-03	1.47530E-04	0.0
2	4.83505E-03	8.13170E-03	8.79100E-04	2.59401E-02
3	2.85000E-03	4.79320E-03	0.0	3.65900E-02

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

GROUP	MESH INTERVAL	BUCKLING						
1	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				
2	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				
3	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				
4	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

***WATER DEPENDENT SEARCH

DILUTION FACTOR= 1.00000E 00

MESH INTERVAL	POISON THERMAL X-SECTION (EXCEPT FOR DIL. FACTOR)						
1- 7	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02
8- 14	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02
15- 21	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	0.0
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

RODDED POISON REGION LEFT BOUNDARY= 1
RODDED POISON REGION RIGHT BOUNDARY= 21
RODDED POISON X-SECTION= 1.00000E-02

MIN. VALUE OF THE WATER DEPENDENT POISON CONTROL PARAMETER C= 0.0
FIRST APPROX. OF THE WATER DEPENDENT POISON CONTROL PARAMETER C= 5.00000E-01
MAX. VALUE OF THE WATER DEPENDENT POISON CONTROL PARAMETER C= 1.00000E 00

COEFFICIENTS FOR CALCULATING WATER DEP. POISON X-SECTION
1.00000E 00 -2.01512E-02 0.0 0.0

GROUP	D.P. FRACTION	R.P. FRACTION	W.D.P. FRACTION	FISSION FRACTION
1	0.0	0.0	0.0	7.51600E-01
2	0.0	0.0	0.0	2.48400E-01
3	2.52801E-01	2.52801E-01	2.52801E-01	0.0
4	1.00000E 00	1.00000E 00	1.00000E 00	0.0

REGION	REGIONWISE EXPANDED CONTROL BUCKLING		
1- 3	2.00000E-04	2.00000E-04	2.00000E-04

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 0 TIME= 0.0

REGION	COEFFICIENTS FOR CALCULATING DOPPLER EFFECT			
1	2.28344E 00	0.0	0.0	0.0
2	2.28344E 00	0.0	0.0	0.0
3	2.28344E 00	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

REGION	COEFFICIENTS FOR CALCULATING WATER DENSITY EFFECT			
1	1.00000E 00	0.0	0.0	0.0
2	1.00000E 00	0.0	0.0	0.0
3	1.00000E 00	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

REGION	COEFFICIENTS FOR CALCULATING WATER REMOVAL X.SECTION			
1	2.06871E 00	0.0	0.0	0.0
2	2.06871E 00	0.0	0.0	0.0
3	2.06871E 00	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

INLET ENTHALPY= 1.00000E 00 SATURATION ENTHALPY(HSAT)= 2.00000E 00

WATER DENSITY VERSUS ENTHALPY FIT COEFFICIENTS

3.01512E-02	0.0	0.0	ABOVE HSAT
3.01512E-02	0.0	0.0	BELOW HSAT

MESH INTERVAL	CONVERSION FACTOR FROM POWER TO ENTHALPY						
1- 7	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00
8- 14	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00
15- 21	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	2.00000E 00	2.00000E 00	1.00000E 01
22- 28	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01
29- 35	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01
36- 38	1.00000E 01	1.00000E 01	1.00000E 01				

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP. 0 TIME= 0.0

GROUP 1 MICROSCOPIC NUCLEAR DATA

IS. NAME	IS NO	TRANSPORT	ABSORPTION	REMOVAL	FISSION	NUFISSION	ENERGY/FISS
U-235	1	5.39539E 00	1.24599E 00	1.38603E 00	1.12783E 00	3.09369E 00	3.20560E-11
U-236	2	4.91534E 00	8.17762E-01	1.74107E 00	0.0	0.0	0.0
U-238	3	4.54747E 00	4.40383E-01	1.68976E 00	3.77553E-01	1.07611E 00	3.17200E-11
PU-239	4	4.87028E 00	1.93010E 00	1.48661E 00	1.90430E 00	6.13712E 00	3.31130E-11
PU-240	5	6.18542E 00	2.04540E 00	1.38204E 00	0.0	0.0	0.0
PU-241	6	6.27978E 00	2.09896E 00	1.55526E 00	1.72046E 00	5.77216E 00	3.31130E-11
PM-149	7	0.0	0.0	0.0			
SM-149	8	3.88289E 00	0.0	2.81948E 00			
I-135	9	0.0	0.0	0.0			
XE-135	10	3.88289E 00	0.0	6.71204E 00			
F.P.-1	11	0.0	0.0	5.57531E-04			
B.P.-1	12	0.0	0.0	0.0			
B.P.-2	13	0.0	0.0	0.0			
WATER	14	2.00527E 00	3.83856E-05	1.50293E 00			
OXYGEN	15	1.30441E 00	3.43082E-02	2.56198E-01			
IRON	16	2.17108E 00	2.27758E-03	4.56529E-01			
CHROMIUM	17	2.48260E 00	6.88100E-03	9.91301E-01			
COPPER	18	2.78243E 00	5.59900E-03	8.39895E-01			
ALUMIN	19	2.55678E 00	2.39878E-02	4.35264E-01			
HYDROGEN	20	2.00527E 00	3.83856E-05	1.50293E 00			

GROUP 2 MICROSCOPIC NUCLEAR DATA

IS. NAME	IS NO	TRANSPORT	ABSORPTION	REMOVAL	FISSION	NUFISSION	ENERGY/FISS
U-235	1	9.60675E 00	2.08924E 00	-8.03240E-01	1.63588E 00	4.02070E 00	3.20560E-11
U-236	2	8.35676E 00	2.99514E-01	4.74118E-02	0.0	0.0	0.0
U-238	3	8.33218E 00	2.69433E-01	-8.27630E-02	3.69589E-04	8.93288E-04	3.17200E-11
PU-239	4	7.66433E 00	2.30383E 00	-3.62070E-01	1.86853E 00	5.46143E 00	3.31130E-11
PU-240	5	1.04440E 01	2.18842E 00	-3.89020E-01	0.0	0.0	0.0
PU-241	6	1.13698E 01	3.36516E 00	-8.06430E-01	2.75832E 00	8.39894E 00	3.31130E-11
PM-149	7	0.0	0.0	0.0			
SM-149	8	7.52298E 00	2.91810E-01	2.11461E 00			
I-135	9	0.0	0.0	0.0			
XE-135	10	7.86563E 00	0.0	1.00681E 01			
F.P.-1	11	0.0	0.0	2.78765E-04			
B.P.-1	12	0.0	0.0	0.0			
B.P.-2	13	0.0	0.0	0.0			
WATER	14	3.35166E 00	1.88325E-04	2.16876E 00			
OXYGEN	15	3.61344E 00	0.0	9.16756E-02			

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

GROUP 2 MICROSCOPIC NUCLEAR DATA

IS. NAME	IS NO	TRANSPORT	ABSORPTION	REMOVAL	FISSION	NUFISSION	ENERGY/FISS
IRON	16	3.27874E 00	0.0	2.85394E-02			
CHROMIUM	17	5.42060E 00	0.0	1.42123E-01			
COPPER	18	5.21099E 00	0.0	1.13816E-01			
ALUMIN	19	3.81944E 00	0.0	7.17760E-02			
HYDROGEN	20	3.35166E 00	1.88325E-04	2.16876E 00			

GROUP 3 MICROSCOPIC NUCLEAR DATA

IS. NAME	IS NO	TRANSPORT	ABSORPTION	REMOVAL	FISSION	NUFISSION	ENERGY/FISS
U-235	1	3.46097E 01	3.61059E 01	-1.51630E 01	2.38060E 01	5.80104E 01	3.20560E-11
U-236	2	1.71277E 01	2.27764E 01	-1.17960E 01	0.0	0.0	0.0
U-238	3	1.29622E 01	0.0	-5.40640E-01	0.0	0.0	0.0
PU-239	4	4.97690E 01	5.00038E 01	-2.07310E 01	2.95463E 01	8.54007E 01	3.31130E-11
PU-240	5	5.75494E 02	5.79251E 02	-4.22830E 02	0.0	0.0	0.0
PU-241	6	5.85711E 01	6.69255E 01	-3.32650E 01	5.33247E 01	1.61096E 02	3.31130E-11
PM-149	7	0.0	0.0	0.0			
SM-149	8	3.09299E 01	2.61097E 02	-1.82210E 02			
I-135	9	0.0	0.0	0.0			
XE-135	10	2.11015E 01	2.97220E 02	-2.26530E 02			
F.P.-1	11	2.71607E 01	2.71375E 01	-8.42190E 00			
B.P.-1	12	0.0	0.0	0.0			
B.P.-2	13	0.0	0.0	0.0			
WATER	14	5.97765E 00	1.17496E-02	0.0			
OXYGEN	15	3.80324E 00	0.0	3.62070E-02			
IRON	16	9.92776E 00	9.19794E-02	-5.38230E-02			
CHROMIUM	17	1.74459E 01	1.75199E-01	-9.14820E-02			
COPPER	18	4.88777E 00	8.32050E-02	-4.48700E-02			
ALUMIN	19	5.93333E 00	9.30898E-01	-4.78280E-01			
HYDROGEN	20	5.97765E 00	1.17496E-02	2.06871E 00			

GROUP 4 MICROSCOPIC NUCLEAR DATA

IS. NAME	IS NO	TRANSPORT	ABSORPTION	REMOVAL	FISSION	NUFISSION	ENERGY/FISS
U-235	1	3.11580E 02	6.27979E 02	0.0	5.32720E 02	1.29919E 03	3.20560E-11

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP. 0 TIME= 0.0

GROUP 4 MICROSCOPIC NUCLEAR DATA

IS. NAME	IS NO	TRANSPORT	ABSORPTION	REMOVAL	FISSION	NUFISSION	ENERGY/FISS
U-236	2	1.21493E 01	6.00000E 00	0.0	0.0	0.0	0.0
U-238	3	1.03953E 01	2.72973E 00	0.0	0.0	0.0	0.0
PU-239	4	7.70166E 02	2.27302E 03	0.0	1.47623E 03	4.26689E 03	3.31130E-11
PU-240	5	1.61786E 02	3.48217E 02	0.0	0.0	0.0	0.0
PU-241	6	8.80190E 02	1.93287E 03	0.0	1.36478E 03	4.12284E 03	3.31130E-11
PM-149	7	0.0	0.0	0.0			
SM-149	8	2.31190E 04	1.04865E 05	0.0			
I-135	9	0.0	0.0	0.0			
XE-135	10	1.28256E 06	3.22521E 06	0.0			
F.P.-1	11	5.49764E 01	1.11855E 02	0.0			
B.P.-1	12	0.0	0.0	0.0			
B.P.-2	13	0.0	0.0	0.0			
WATER	14	1.31943E 01	3.31992E-01	0.0			
OXYGEN	15	3.57901E 00	2.00000E-04	0.0			
IRON	16	1.10865E 01	2.52986E 00	0.0			
CHROMIUM	17	1.79608E 01	4.60025E 00	0.0			
COPPER	18	4.19272E 00	2.90006E 00	0.0			
ALUMIN	19	8.71270E 00	1.31992E 01	0.0			
HYDROGEN	20	1.31943E 01	3.31992E-01	0.0			

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

LIBRARY FISSION YIELDS

FISSION PRODUCT FISSILE ISOTOPE NAME	NO	7 PM-149	8 SM-149	9 I-135	10 XE-135	11 F.P.-1
U-235	1	1.13000E-02	0.0	6.20000E-02	2.00000E-03	1.00000E 00
U-236	2	0.0	0.0	0.0	0.0	0.0
U-238	3	2.00000E-02	0.0	6.20000E-02	2.00000E-03	1.00000E 00
PU-239	4	1.89000E-02	0.0	7.00000E-02	2.00000E-03	1.00000E 00
PU-240	5	0.0	0.0	0.0	0.0	0.0
PU-241	6	2.00000E-02	0.0	6.30000E-02	2.00000E-03	1.00000E 00

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

SELF-SHIELDING FACTORS SPECIFIED FOR THE FOLLOWING ISOTOPES

14 WATER 15 OXYGEN 16 IRON 17 CHROMIUM 18 COPPER 19 ALUMIN 1 U-235 2 U-236 3 U-238
4 PU-239 5 PU-240 6 PU-241 8 SM-149 10 XE-135 11 F.P.-1

BLOCK	GROUP	SELF-SHIELDING FACTORS						
1	4	1.06930E 00	9.76610E-01	9.80940E-01	9.80940E-01	9.80940E-01	9.80940E-01	8.77480E-01
		8.82110E-01	8.82110E-01	8.98960E-01	8.94710E-01	8.90770E-01	8.97030E-01	8.85870E-01
		8.82110E-01						

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 0 TIME= 0.0

BLOCK	GROUP	IS. NAME	IS NO	POLYNOMIAL COEFFICIENTS
1	1	U-235	1	1.00000E 00

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

REGION	SELF-SH. BLOCK	POL. COEFF. BLOCK
1	1	0
2	0	0
3	0	0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE MESH INTERVAL	1 U-235	2 U-236	3 U-238	4 PU-239	5 PU-240	6 PU-241	7 PM-149	8 SM-149
1	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
2	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
3	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
4	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
5	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
6	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
7	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
8	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
9	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
10	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
11	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
12	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
13	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
14	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
15	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
16	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
17	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
18	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
19	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
20	3.14361E-04	0.0	7.08008E-03	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE MESH INTERVAL	9 I-135	10 XE-135	11 F.P.-1	12 B.P.-1	13 B.P.-2	14 WATER
1	0.0	0.0	0.0	0.0	0.0	3.01512E-02
2	0.0	0.0	0.0	0.0	0.0	3.01512E-02
3	0.0	0.0	0.0	0.0	0.0	3.01512E-02
4	0.0	0.0	0.0	0.0	0.0	3.01512E-02
5	0.0	0.0	0.0	0.0	0.0	3.01512E-02
6	0.0	0.0	0.0	0.0	0.0	3.01512E-02
7	0.0	0.0	0.0	0.0	0.0	3.01512E-02
8	0.0	0.0	0.0	0.0	0.0	3.01512E-02
9	0.0	0.0	0.0	0.0	0.0	3.01512E-02
10	0.0	0.0	0.0	0.0	0.0	3.01512E-02
11	0.0	0.0	0.0	0.0	0.0	3.01512E-02
12	0.0	0.0	0.0	0.0	0.0	3.01512E-02
13	0.0	0.0	0.0	0.0	0.0	3.01512E-02
14	0.0	0.0	0.0	0.0	0.0	3.01512E-02
15	0.0	0.0	0.0	0.0	0.0	3.01512E-02
16	0.0	0.0	0.0	0.0	0.0	3.01512E-02
17	0.0	0.0	0.0	0.0	0.0	3.01512E-02
18	0.0	0.0	0.0	0.0	0.0	3.01512E-02
19	0.0	0.0	0.0	0.0	0.0	3.01512E-02
20	0.0	0.0	0.0	0.0	0.0	3.01512E-02
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0

ATOMIC DENSITIES OF BJRNABLE ISOTOPES

ISOTOPE REGION	1 U-235	2 U-236	3 U-238	4 PU-239	5 PU-240	6 PU-241	7 PM-149	8 SM-149
1	3.14360E-04	0.0	7.08007E-03	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	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE REGION	9 I-135	10 XE-135	11 F.P.-1	12 B.P.-1	13 B.P.-2	14 WATER
1	0.0	0.0	0.0	0.0	0.0	3.01512E-02
2	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

TIME STEP 0 TIME= 0.0

WEIGHTS OF BURNABLE ISOTOPES (IN G)

ISOTOPE REGION	1 U-235	2 U-236	3 U-238	4 PU-239	5 PU-240	6 PU-241	7 PM-149	8 SM-149
1	1.21531E 03	0.0	2.77215E 04	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	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 0. TIME= 0.0

WEIGHTS OF BURNABLE ISOTOPES (IN G)

ISOTOPE REGION	9 I-135	10 XE-135
1	0.0	0.0
2	0.0	0.0
3	0.0	0.0

FUEL ENRICHEMENTS

REGION	ENR. BY ATOMS	ENR. BY WEIGHT
1	4.25132E-02	4.19987E-02
2	0.0	0.0
3	0.0	0.0

***ATOMIC DENSITIES OF TIME STEP 0
HAVE BEEN WRITTEN ON LOGICAL UNIT 2 WITH RECORD IDENTIFICATION NO.= 1

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

***WATER DEPENDENT SEARCH ITERATION 1
POISON CONSTANT C= 5.00000E-01

MESH INTERVAL	POISON THERMAL CROSS-SECTION						
1- 7	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03
8- 14	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03
15- 21	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03	0.0
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

K-EFFECTIVE CALCULATION

ERATION	MIN. EIGENV.	EIGENVALUE	MAX. EIGENV.	POINT. CONV.	EIGEN. CONV.	EXTR. FACTOR	FLUX RESIDUE	DOMIN.
1	6.963611E-01	9.387994E-01	1.067275E 00	1.975469E-01	6.518936E-02	0.0	2.424836E 02	
2	8.120691E-01	9.617202E-01	1.065339E 00	1.316754E-01	2.383316E-02	0.0	3.230409E 01	
3	8.772519E-01	9.738609E-01	1.060681E 00	9.417635E-02	1.246655E-02	0.0	2.315530E 01	
4	9.142702E-01	9.815595E-01	1.053694E 00	7.102144E-02	7.843316E-03	2.900197E 00	1.777531E 01	7.6225E
5	9.873847E-01	9.989620E-01	1.030193E 00	2.142654E-02	1.742059E-02	1.532602E 00	5.449945E 01	
6	9.803485E-01	1.000996E 00	1.008291E 00	1.395746E-02	2.031684E-03	6.158438E-01	9.933402E 00	
7	9.982434E-01	1.001586E 00	1.004995E 00	3.370631E-03	5.894303E-04	1.863898E-01	2.384533E 00	
8	9.989767E-01	1.001834E 00	1.004536E 00	2.774396E-03	2.475381E-04	1.900838E-02	9.626872E-01	
9	9.998254E-01	1.001991E 00	1.004189E 00	2.177224E-03	1.570582E-04	0.0	6.163506E-01	
10	1.000463E 00	1.002111E 00	1.003876E 00	1.702528E-03	1.199245E-04	0.0	4.707851E-01	
11	1.000946E 00	1.002204E 00	1.003607E 00	1.327450E-03	9.232759E-05	3.013818E 00	3.677580E-01	7.8057E
12	1.002422E 00	1.002496E 00	1.002713E 00	1.450733E-04	2.911091E-04	1.172215E 00	1.152441E 00	
13	1.002443E 00	1.002515E 00	1.002601E 00	7.848076E-05	1.907349E-05	3.174007E-01	7.356036E-02	
14	1.002470E 00	1.002520E 00	1.002580E 00	5.469845E-05	4.768372E-06	3.061827E-02	2.246770E-02	
15	1.002484E 00	1.002522E 00	1.002570E 00	4.280735E-05	2.861023E-06	0.0	1.247177E-02	
16	1.002494E 00	1.002525E 00	1.002563E 00	3.424579E-05	2.861023E-06	0.0	9.720858E-03	

NVERGENCE ATTAINED IN K-EFF ITERATIONS

***WATER DEPENDENT SEARCH ITERATION 2
POISON CONSTANT C= 1.00000E 00

MESH INTERVAL	POISON THERMAL CROSS-SECTION						
1- 7	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02
8- 14	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02
15- 21	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	0.0
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

K-EFFECTIVE CALCULATION

ERATION	MIN. EIGENV.	EIGENVALUE	MAX. EIGENV.	POINT. CONV.	EIGEN. CONV.	EXTR. FACTOR	FLUX RESIDUE	DOMIN.
1	9.758281E-01	9.759355E-01	9.833242E-01	3.840448E-03	2.724457E-02	0.0	2.451284E 00	
2	9.758602E-01	9.759444E-01	9.769502E-01	5.584587E-04	9.119511E-06	0.0	6.099705E-02	
3	9.758664E-01	9.759374E-01	9.762914E-01	2.177297E-04	6.675720E-06	0.0	3.744655E-02	
4	9.758677E-01	9.759315E-01	9.761119E-01	1.251114E-04	5.722046E-06	5.388541E-01	2.668891E-02	7.00331
5	9.758717E-01	9.759240E-01	9.759939E-01	6.260196E-05	7.629395E-06	0.0	3.111890E-02	
6	9.758772E-01	9.759212E-01	9.759731E-01	4.913505E-05	2.861023E-06	0.0	1.296043E-02	

ONVERGENCE ATTAINED IN K-EFF ITERATIONS

***WATER DEPENDENT SEARCH ITERATION 3
POISON CONSTANT C= 5.47461E-01

MESH INTERVAL	POISON THERMAL CROSS-SECTION						
1- 7	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03
8- 14	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03
15- 21	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	0.0
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

K-EFFECTIVE CALCULATION

ERATION	MIN. EIGENV.	EIGENVALUE	MAX. EIGENV.	POINT. CONV.	EIGEN. CONV.	EXTR. FACTOR	FLUX RESIDUE	DOMIN.
1	9.931474E-01	9.999291E-01	1.000037E 00	3.445154E-03	2.400964E-02	0.0	7.418723E 00	
2	9.990034E-01	9.999210E-01	9.999957E-01	4.962180E-04	7.629395E-06	0.0	5.180156E-02	
3	9.996089E-01	9.999271E-01	9.999878E-01	1.894970E-04	6.139278E-06	0.0	3.111975E-02	
4	9.997718E-01	9.999322E-01	9.999850E-01	1.065803E-04	5.125999E-06	5.296145E-01	2.195538E-02	6.92481
5	9.998778E-01	9.999383E-01	9.999815E-01	5.185923E-05	6.198883E-06	0.0	2.491349E-02	
6	9.998968E-01	9.999411E-01	9.999775E-01	4.032491E-05	2.801418E-06	0.0	1.060432E-02	

ONVERGENCE ATTAINED IN K-EFF ITERATIONS

***THE REQUIRED CRITICALITY SEARCH HAS BEEN CARRIED OUT SUCCESSFULLY

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

SHT.	GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PROD. X-SECTION
1	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
1	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
1	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
1	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
2	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
2	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
2	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
3	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
3	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
3	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
4	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
4	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
4	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
5	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
5	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
5	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
5	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
6	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
6	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
6	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
6	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
7	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
7	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
7	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
7	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
8	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
8	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
8	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
8	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
9	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
9	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
9	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
9	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
0	1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
0	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
0	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA — TIME STEP 0 TIME= 0.0

GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PROD. X-SECTION
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14
2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	2.21758E 00	4.56312E-03	0.0	0.0	0.0	6.96121E-02	8.59147E-03	9.61561E-14

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

SHT.	GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PROD. X-SECTION
0	2	1.11393E 00	2.57006E-03	0.0	0.0	0.0	6.77040E-02	1.27028E-03	1.65680E-14
0	3	7.14290E-01	2.87137E-02	2.52801E-03	2.52801E-03	1.38399E-03	5.43910E-02	1.82362E-02	2.39897E-13
0	4	4.43195E-01	2.22602E-01	1.00000E-02	1.00000E-02	5.47461E-03	0.0	3.58376E-01	4.71057E-12
1	1	1.95893E 00	6.13364E-04	0.0	0.0	0.0	6.78455E-02	0.0	0.0
1	2	1.10037E 00	4.88517E-06	0.0	0.0	0.0	5.99685E-02	0.0	0.0
1	3	5.30827E-01	5.37300E-03	0.0	0.0	0.0	5.13092E-02	0.0	0.0
1	4	3.94072E-01	1.41025E-01	0.0	0.0	0.0	0.0	0.0	0.0
2	1	1.95893E 00	6.13364E-04	0.0	0.0	0.0	6.78455E-02	0.0	0.0
2	2	1.10037E 00	4.88517E-06	0.0	0.0	0.0	5.99685E-02	0.0	0.0
2	3	5.30827E-01	5.37300E-03	0.0	0.0	0.0	5.13092E-02	0.0	0.0
2	4	3.94072E-01	1.41025E-01	0.0	0.0	0.0	0.0	0.0	0.0
3	1	1.95893E 00	6.13364E-04	0.0	0.0	0.0	6.78455E-02	0.0	0.0
3	2	1.10037E 00	4.88517E-06	0.0	0.0	0.0	5.99685E-02	0.0	0.0
3	3	5.30827E-01	5.37300E-03	0.0	0.0	0.0	5.13092E-02	0.0	0.0
3	4	3.94072E-01	1.41025E-01	0.0	0.0	0.0	0.0	0.0	0.0
4	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
4	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
4	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
4	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
5	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
5	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
5	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
5	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
6	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
6	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
6	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
6	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
7	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
7	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
7	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
7	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
8	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
8	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
8	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
8	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
9	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
9	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
9	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
9	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

SH	GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PROD. X-SECTION
)	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
)	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
)	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
)	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
L	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
L	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
L	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
L	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
2	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
2	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
2	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
2	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
3	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
3	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
3	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
3	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
4	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
4	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
4	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
4	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
5	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
5	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
5	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
5	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
6	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
6	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
6	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
6	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
7	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
7	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
7	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
7	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
8	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
8	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
8	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
8	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

DINT	DISTANCE	POWER DENS. LEFT VALUE	POWER DENS. RIGHT VALUE	P.D.AVERAGE POINT VALUE	POWER DENS. PEAK VALUE	GROUP1 FLUX	GROUP2 FLUX	GROUP3 FLUX	GROUP4 FLUX
1	0.0	0.0	1.36589E 02	1.36589E 02	1.85031E 00	1.00333E 14	1.32198E 14	9.83175E 13	2.14761E 13
2	2.80770E 00	1.36207E 02	1.36207E 02	1.36207E 02	1.84514E 00	1.00052E 14	1.31829E 14	9.80429E 13	2.14161E 13
3	5.61540E 00	1.35065E 02	1.35065E 02	1.35065E 02	1.82967E 00	9.92138E 13	1.30724E 14	9.72210E 13	2.12366E 13
4	8.42310E 00	1.33173E 02	1.33173E 02	1.33173E 02	1.80403E 00	9.78239E 13	1.28893E 14	9.58589E 13	2.09391E 13
5	1.12308E 01	1.30546E 02	1.30546E 02	1.30546E 02	1.76845E 00	9.58943E 13	1.26350E 14	9.39679E 13	2.05260E 13
6	1.40385E 01	1.27206E 02	1.27206E 02	1.27206E 02	1.72320E 00	9.34411E 13	1.23118E 14	9.15639E 13	2.00009E 13
7	1.68462E 01	1.23181E 02	1.23181E 02	1.23181E 02	1.66868E 00	9.04847E 13	1.19222E 14	8.86669E 13	1.93680E 13
8	1.96539E 01	1.18505E 02	1.18505E 02	1.18505E 02	1.60534E 00	8.70498E 13	1.14697E 14	8.53010E 13	1.86328E 13
9	2.24616E 01	1.13217E 02	1.13217E 02	1.13217E 02	1.53370E 00	8.31651E 13	1.09578E 14	8.14943E 13	1.78013E 13
10	2.52693E 01	1.07359E 02	1.07359E 02	1.07359E 02	1.45435E 00	7.88626E 13	1.03909E 14	7.72781E 13	1.68803E 13
11	2.80770E 01	1.00982E 02	1.00982E 02	1.00982E 02	1.36796E 00	7.41780E 13	9.77364E 13	7.26874E 13	1.58776E 13
12	3.08847E 01	9.41366E 01	9.41366E 01	9.41366E 01	1.27523E 00	6.91499E 13	9.11110E 13	6.77601E 13	1.48013E 13
13	3.36924E 01	8.68804E 01	8.68804E 01	8.68804E 01	1.17693E 00	6.38198E 13	8.40873E 13	6.25369E 13	1.36604E 13
14	3.65000E 01	7.92730E 01	7.92730E 01	7.92730E 01	1.07388E 00	5.82311E 13	7.67225E 13	5.70608E 13	1.24643E 13
15	3.93077E 01	7.13787E 01	7.13787E 01	7.13787E 01	9.66935E-01	5.24293E 13	6.90759E 13	5.13777E 13	1.12232E 13
16	4.21154E 01	6.32677E 01	6.32677E 01	6.32677E 01	8.57059E-01	4.64606E 13	6.12081E 13	4.55372E 13	9.94823E 12
17	4.49231E 01	5.50241E 01	5.50241E 01	5.50241E 01	7.45387E-01	4.03704E 13	5.31791E 13	3.95967E 13	8.65331E 12
18	4.77308E 01	4.67730E 01	4.67730E 01	4.67730E 01	6.33613E-01	3.41983E 13	4.50451E 13	3.36329E 13	7.36001E 12
19	5.05385E 01	3.87827E 01	3.87827E 01	3.87827E 01	5.25372E-01	2.79644E 13	3.68511E 13	2.77739E 13	6.11822E 12
20	5.33462E 01	3.19168E 01	3.19168E 01	3.19168E 01	4.32363E-01	2.16218E 13	2.86088E 13	2.22887E 13	5.09848E 12
21	5.61539E 01	2.99130E 01	0.0	2.99130E 01	4.05219E-01	1.48771E 13	2.02141E 13	1.78330E 13	5.06722E 12
22	5.70006E 01	0.0	0.0	0.0	0.0	1.24818E 13	1.76248E 13	1.64718E 13	5.72979E 12
23	5.78473E 01	0.0	0.0	0.0	0.0	1.04382E 13	1.52180E 13	1.49733E 13	6.31829E 12
24	5.86940E 01	0.0	0.0	0.0	0.0	8.68886E 12	1.29856E 13	1.34180E 13	7.12297E 12
25	6.09405E 01	0.0	0.0	0.0	0.0	5.59501E 12	8.62066E 12	9.89159E 12	7.34446E 12
26	6.31870E 01	0.0	0.0	0.0	0.0	3.60512E 12	5.69530E 12	6.99691E 12	6.02220E 12
27	6.54335E 01	0.0	0.0	0.0	0.0	2.32432E 12	3.74836E 12	4.82437E 12	4.49586E 12
28	6.76799E 01	0.0	0.0	0.0	0.0	1.49936E 12	2.45954E 12	3.27090E 12	3.19618E 12
29	6.99264E 01	0.0	0.0	0.0	0.0	9.67644E 11	1.60993E 12	2.19212E 12	2.20768E 12
30	7.21729E 01	0.0	0.0	0.0	0.0	6.24697E 11	1.05165E 12	1.45700E 12	1.49715E 12
31	7.44194E 01	0.0	0.0	0.0	0.0	4.03330E 11	6.85673E 11	9.62350E 11	1.00268E 12
32	7.66659E 01	0.0	0.0	0.0	0.0	2.60289E 11	4.46125E 11	6.32317E 11	6.65328E 11
33	7.89124E 01	0.0	0.0	0.0	0.0	1.67699E 11	2.89384E 11	4.13249E 11	4.37927E 11
34	8.11589E 01	0.0	0.0	0.0	0.0	1.07563E 11	1.86652E 11	2.68086E 11	2.85578E 11
35	8.34054E 01	0.0	0.0	0.0	0.0	6.82260E 10	1.18928E 11	1.71567E 11	1.83463E 11
36	8.56519E 01	0.0	0.0	0.0	0.0	4.20897E 10	7.36282E 10	1.06565E 11	1.14269E 11
37	8.78984E 01	0.0	0.0	0.0	0.0	2.41315E 10	4.23217E 10	6.13941E 10	6.59563E 10
38	9.01449E 01	0.0	0.0	0.0	0.0	1.09287E 10	1.91967E 10	2.78856E 10	2.99908E 10
39	9.23913E 01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 0 TIME= 0.0

MESH TERVAL	VOLUME	GRP 3 U238 ABS. X-SECT	INTEGRATED POWER	AVERAGE POWER DENS.	POWER DENS. PEAK VALUE	AVERAGE NEU TRON SOURCE	GROUP1 FLUX	GROUP2 FLUX	GROUP3 FLUX
1	2.47657E 01	2.28344E 00	3.37563E 03	1.36303E 02	1.84643E 00	1.04980E 13	1.00122E 14	1.31921E 14	9.81114E 13
2	7.42971E 01	2.28344E 00	1.00703E 04	1.35541E 02	1.83611E 00	1.04393E 13	9.95632E 13	1.31184E 14	9.75634E 13
3	1.23829E 02	2.28344E 00	1.65961E 04	1.34025E 02	1.81557E 00	1.03225E 13	9.84493E 13	1.29717E 14	9.64718E 13
4	1.73360E 02	2.28344E 00	2.28429E 04	1.31766E 02	1.78497E 00	1.01485E 13	9.67902E 13	1.27531E 14	9.48459E 13
5	2.22891E 02	2.28344E 00	2.87047E 04	1.28783E 02	1.74457E 00	9.91883E 12	9.45995E 13	1.24644E 14	9.26991E 13
6	2.72422E 02	2.28344E 00	3.40807E 04	1.25102E 02	1.69470E 00	9.63532E 12	9.18957E 13	1.21081E 14	9.00495E 13
7	3.21953E 02	2.28344E 00	3.88770E 04	1.20753E 02	1.63579E 00	9.30038E 12	8.87012E 13	1.16872E 14	8.69191E 13
8	3.71485E 02	2.28344E 00	4.30079E 04	1.15773E 02	1.56832E 00	8.91678E 12	8.50427E 13	1.12052E 14	8.33341E 13
9	4.21016E 02	2.28344E 00	4.63968E 04	1.10202E 02	1.49286E 00	8.48771E 12	8.09506E 13	1.06660E 14	7.93241E 13
10	4.70547E 02	2.28344E 00	4.89777E 04	1.04087E 02	1.41002E 00	8.01672E 12	7.64586E 13	1.00741E 14	7.49223E 13
11	5.20078E 02	2.28344E 00	5.06961E 04	9.74778E 01	1.32049E 00	7.50770E 12	7.16041E 13	9.43448E 13	7.01651E 13
12	5.69610E 02	2.28344E 00	5.15095E 04	9.04296E 01	1.22501E 00	6.96485E 12	6.64269E 13	8.75228E 13	6.50917E 13
13	6.19141E 02	2.28344E 00	5.13891E 04	8.30006E 01	1.12437E 00	6.39267E 12	6.09695E 13	8.03313E 13	5.97441E 13
14	6.68672E 02	2.28344E 00	5.03194E 04	7.52527E 01	1.01941E 00	5.79593E 12	5.52764E 13	7.28284E 13	5.41666E 13
15	7.18203E 02	2.28344E 00	4.83015E 04	6.72532E 01	9.11049E-01	5.17980E 12	4.93934E 13	6.50741E 13	4.84071E 13
16	7.67735E 02	2.28344E 00	4.53573E 04	5.90794E 01	8.00322E-01	4.55023E 12	4.33664E 13	5.71288E 13	4.25191E 13
17	8.17266E 02	2.28344E 00	4.15465E 04	5.08360E 01	6.88652E-01	3.91523E 12	3.72376E 13	4.90504E 13	3.65696E 13
18	8.66797E 02	2.28344E 00	3.70302E 04	4.27207E 01	5.78719E-01	3.28989E 12	3.10368E 13	4.08895E 13	3.06615E 13
19	9.16328E 02	2.28344E 00	3.23495E 04	3.53033E 01	4.78238E-01	2.71753E 12	2.47502E 13	3.26742E 13	2.49942E 13
20	9.65860E 02	2.28344E 00	2.98471E 04	3.09021E 01	4.18616E-01	2.37431E 12	1.82062E 13	2.43576E 13	2.00323E 13
21	3.00987E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.36750E 13	1.89146E 13	1.71499E 13
22	3.05492E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.14563E 13	1.64169E 13	1.57198E 13
23	3.09996E 02	2.28344E 00	0.0	0.0	0.0	0.0	9.56036E 12	1.40977E 13	1.41928E 13
24	8.44327E 02	2.28344E 00	0.0	0.0	0.0	0.0	7.12740E 12	1.07826E 13	1.16383E 13
25	8.76036E 02	2.28344E 00	0.0	0.0	0.0	0.0	4.59106E 12	7.14473E 12	8.43115E 12
26	9.07746E 02	2.28344E 00	0.0	0.0	0.0	0.0	2.95913E 12	4.71333E 12	5.90115E 12
27	9.39455E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.90836E 12	3.09851E 12	4.04108E 12
28	9.71165E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.23133E 12	2.03126E 12	2.72710E 12
29	1.00287E 03	2.28344E 00	0.0	0.0	0.0	0.0	7.94814E 11	1.32858E 12	1.82165E 12
30	1.03458E 03	2.28344E 00	0.0	0.0	0.0	0.0	5.13165E 11	8.67258E 11	1.20778E 12
31	1.06629E 03	2.28344E 00	0.0	0.0	0.0	0.0	3.31277E 11	5.65008E 11	7.96107E 11
32	1.09800E 03	2.28344E 00	0.0	0.0	0.0	0.0	2.13659E 11	3.67189E 11	5.21992E 11
33	1.12971E 03	2.28344E 00	0.0	0.0	0.0	0.0	1.37420E 11	2.37658E 11	3.40158E 11
34	1.16142E 03	2.28344E 00	0.0	0.0	0.0	0.0	8.77602E 10	1.52559E 11	2.19497E 11
35	1.19313E 03	2.28344E 00	0.0	0.0	0.0	0.0	5.50710E 10	9.61276E 10	1.38850E 11
36	1.22484E 03	2.28344E 00	0.0	0.0	0.0	0.0	3.30525E 10	5.78736E 10	8.38334E 10
37	1.25655E 03	2.28344E 00	0.0	0.0	0.0	0.0	1.74884E 10	3.06862E 10	4.45341E 10
38	1.28826E 03	2.28344E 00	0.0	0.0	0.0	0.0	5.43073E 09	9.53926E 09	1.38570E 10

CORE VOLUME= 9.90625E 03 AVERAGE POWER DENSITY= 7.38195E 01

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 0 TIME= 0.0

FLUX WEIGHTED MACROSCOPIC CROSS-SECTIONS

P REG	DIFFUSION COEFFICIENT	TRANSPORT X-SECTION	ABSORPTION X-SECTION	DIL. POIS. X-SECTION	ROD. POIS. X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD X-SECTION	ENERG PROD X-SECTION	TRANSVER BUCKLIN
1	2.2176E 00	1.5031E-01	4.5631E-03	0.0	0.0	0.0	6.9612E-02	8.5915E-03	9.6156E-14	6.6970E-
2	1.9589E 00	1.7016E-01	6.1336E-04	0.0	0.0	0.0	6.7845E-02	0.0	0.0	6.6970E-
3	2.1425E 00	1.5558E-01	7.1531E-04	0.0	0.0	0.0	7.4506E-02	0.0	0.0	6.6970E-
1	1.1139E 00	2.9924E-01	2.5701E-03	0.0	0.0	0.0	6.7704E-02	1.2703E-03	1.6568E-14	6.6970E-
2	1.1004E 00	3.0293E-01	4.8852E-06	0.0	0.0	0.0	5.9968E-02	0.0	0.0	6.6970E-
3	1.1637E 00	2.8645E-01	6.8908E-06	0.0	0.0	0.0	8.2481E-02	0.0	0.0	6.6970E-
1	7.1429E-01	4.6666E-01	2.8714E-02	2.5280E-03	2.5280E-03	1.3840E-03	5.4391E-02	1.8236E-02	2.3990E-13	6.6970E-
2	5.3083E-01	6.2795E-01	5.3730E-03	0.0	0.0	0.0	5.1309E-02	0.0	0.0	6.6970E-
3	6.2318E-01	5.3489E-01	2.9350E-03	0.0	0.0	0.0	7.4940E-02	0.0	0.0	6.6970E-
1	4.4320E-01	7.5211E-01	2.2260E-01	1.0000E-02	1.0000E-02	5.4746E-03	0.0	3.5838E-01	4.7106E-12	6.6970E-
2	3.9407E-01	8.4587E-01	1.4103E-01	0.0	0.0	0.0	0.0	0.0	0.0	6.6970E-
3	4.0989E-01	8.1323E-01	8.3360E-02	0.0	0.0	0.0	0.0	0.0	0.0	6.6970E-

FLUX WEIGHTED MACROSCOPIC CROSS-SECTIONS

P REG	DIFFUSION COEFFICIENT	TRANSPORT X-SECTION	ABSORPTION X-SECTION	DIL. POIS. X-SECTION	ROD. POIS. X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD X-SECTION	ENERG PROD X-SECTION	TRANSVER BUCKLIN
T.R.	2.2176E 00	1.5031E-01	4.5631E-03	0.0	0.0	0.0	6.9612E-02	8.5915E-03	9.6156E-14	6.6970E-
T.R.	1.1139E 00	2.9924E-01	2.5701E-03	0.0	0.0	0.0	6.7704E-02	1.2703E-03	1.6568E-14	6.6970E-
T.R.	7.1429E-01	4.6666E-01	2.8714E-02	2.5280E-03	2.5280E-03	1.3840E-03	5.4391E-02	1.8236E-02	2.3990E-13	6.6970E-
T.R.	4.4320E-01	7.5211E-01	2.2260E-01	1.0000E-02	1.0000E-02	5.4746E-03	0.0	3.5838E-01	4.7106E-12	6.6970E-

REGION INTEGRALS

P REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. POIS. ABS. RATE	ROD. POIS. ABS. RATE	WATER DEP. ABS. RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRON PROD. RA
1	9.9063E 03	5.3133E 17	5.3636E 13	2.4245E 15	0.0	0.0	0.0	7.8909E 14	3.6987E 16	4.2326E
2	9.1648E 02	1.0579E 16	1.1544E 13	6.4891E 12	0.0	0.0	0.0	1.3879E 13	7.1777E 14	0.0
3	1.5994E 04	1.8023E 16	1.1268E 12	1.2892E 13	0.0	0.0	0.0	2.5860E 13	1.3428E 15	0.0

REGION INTEGRALS

REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. ABS.	POIS. RATE	ROD. ABS.	POIS. RATE	WATER DEP. ABS.	RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRON PROD.	RATE
1	9.9063E 03	7.0046E 17	7.0709E 13	1.8002E 15	0.0		0.0		0.0		5.2254E 14	4.7424E 16	1.3989E	1(
2	9.1648E 02	1.5079E 16	1.6453E 13	7.3661E 10	0.0		0.0		0.0		1.1112E 13	9.0424E 14	0.0	
3	1.5994E 04	2.8443E 16	1.7783E 12	1.9599E 11	0.0		0.0		0.0		2.2165E 13	2.3460E 15	0.0	
1	9.9063E 03	5.2376E 17	5.2871E 13	1.5039E 16	1.3241E	15	1.3241E	15	7.2487E	14	2.5054E 14	2.8488E 16	0.0	
2	9.1648E 02	1.4364E 16	1.5673E 13	7.7177E 13	0.0		0.0		0.0		5.1063E 12	7.3700E 14	0.0	
3	1.5994E 04	3.4494E 16	2.1565E 12	1.0124E 14	0.0		0.0		0.0		1.4396E 13	2.5850E 15	0.0	
1	9.9063E 03	1.1526E 17	1.1635E 13	2.5657E 16	1.1526E	15	1.1526E	15	6.3099E	14	3.4209E 13	0.0	0.0	
2	9.1648E 02	5.5497E 15	6.0555E 12	7.8265E 14	0.0		0.0		0.0		1.4646E 12	0.0	0.0	
3	1.5994E 04	2.8640E 16	1.7906E 12	2.3874E 15	0.0		0.0		0.0		7.8617E 12	0.0	0.0	

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 0 TIME= 0.0

FLUX WEIGHTED MACROSCOPIC CROSS-SECTIONS
(POISONED SIDE (1, 21)=REGION 1
UNPOISONED SIDE (21, 21)=REGION 2)

REG	DIFFUSION COEFFICIENT	TRANSPORT X-SECTION	ABSORPTION X-SECTION	DIL. POIS. X-SECTION	ROD. POIS. X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD X-SECTION	ENERG PROD X-SECTION	TRANSVERS BUCKLING
1	2.2176E 00	1.5031E-01	4.5631E-03	0.0	0.0	0.0	6.9612E-02	8.5915E-03	9.6156E-14	6.6970E-0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	1.1139E 00	2.9924E-01	2.5701E-03	0.0	0.0	0.0	6.7704E-02	1.2703E-03	1.6568E-14	6.6970E-0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	7.1429E-01	4.6666E-01	2.8714E-02	2.5280E-03	2.5280E-03	1.3840E-03	5.4391E-02	1.8236E-02	2.3990E-13	6.6970E-0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	4.4320E-01	7.5211E-01	2.2260E-01	1.0000E-02	1.0000E-02	5.4746E-03	0.0	3.5838E-01	4.7106E-12	6.6970E-0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

RODDED POISON REGION INTEGRALS
(POISONED SIDE (1, 21)=REGION 1
UNPOISONED SIDE (21, 21)=REGION 2)

REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. POIS. ABS. RATE	ROD. POIS. ABS. RATE	WATER DEP. ABS. RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRON PROD. RAT
1	9.9063E 03	5.3133E 17	5.3636E 13	2.4245E 15	0.0	0.0	0.0	7.8909E 14	3.6987E 16	4.2326E 1
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	9.9063E 03	7.0046E 17	7.0709E 13	1.8002E 15	0.0	0.0	0.0	5.2254E 14	4.7424E 16	1.3989E 1
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	9.9063E 03	5.2376E 17	5.2871E 13	1.5039E 16	1.3241E 15	1.3241E 15	7.2487E 14	2.5054E 14	2.8488E 16	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	9.9063E 03	1.1526E 17	1.1635E 13	2.5657E 16	1.1526E 15	1.1526E 15	6.3099E 14	3.4209E 13	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 0 TIME= 0.0

REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. ABS.	POIS. RATE	ROD. ABS.	POIS. RATE	WATER DEP. ABS.	RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRON PROD.	RATE
T.R.	2.6817E 04	5.5993E 17	2.0880E 13	2.4439E 15	0.0		0.0		0.0		8.2883E 14	3.9048E 16	4.2326E	16
T.R.	2.6817E 04	7.4398E 17	2.7743E 13	1.8005E 15	0.0		0.0		0.0		5.5582E 14	5.0674E 16	1.3989E	16
T.R.	2.6817E 04	5.7261E 17	2.1353E 13	1.5217E 16	1.3241E	15	1.3241E	15	7.2487E	14	2.7005E 14	3.1810E 16	0.0	
T.R.	2.6817E 04	1.4945E 17	5.5728E 12	2.8827E 16	1.1526E	15	1.1526E	15	6.3099E	14	4.3536E 13	0.0	0.0	

NEUTRON BALANCE GROUP BY GROUP

GROUP	LEFT LEAKAGE	RIGHT LEAKAGE	TOTAL LEAKAGE	TOTAL LOSSES	TOTAL PROD.
1	0.0	5.977126E 12	5.977126E 12	4.232632E 16	4.232632E 16
2	0.0	5.702248E 12	5.702248E 12	5.303630E 16	5.303624E 16
3	0.0	4.435938E 12	4.435938E 12	5.067435E 16	5.067428E 16
4	0.0	3.137969E 12	3.137969E 12	3.180954E 16	3.180954E 16

REACTOR NEUTRON BALANCE

/OLUME	LEFT LEAK.	RIGHT LEAK.	TOTAL LEAK.	ABSOR. RATE	TRANSV LEAK	TOT. LOSSES	TOTAL PROD.	TOTAL POWER	TOTAL FLU)
58171E 04	0.0	1.92533E 13	1.92533E 13	5.62958E 16	1.69823E 15	5.63151E 16	5.63149E 16	7.31275E 05	2.02597E

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

MESH INTERVAL	VOLUME	ENTHALPY LEFT VALUE	ENTHALPY RIGHT VALUE	INTEGRATED ENTHALPY	ENTHALPY AVER. VALUE	ENTHALPY STEP	WATER DENS. AVER. VALUE	WATER PEAK
1	2.47657E 01	1.00000E 00	4.67282E 01	8.74134E 02	3.52961E 01	3.42961E 01	3.01512E-02	1.000(
2	7.42971E 01	4.67282E 01	1.83146E 02	9.38412E 03	1.26305E 02	9.10092E 01	3.01512E-02	1.000(
3	1.23829E 02	1.83146E 02	4.07966E 02	3.79902E 04	3.06797E 02	1.80492E 02	3.01512E-02	1.000(
4	1.73360E 02	4.07966E 02	7.17408E 02	9.94632E 04	5.73738E 02	2.66941E 02	3.01512E-02	1.000(
5	2.22891E 02	7.17408E 02	1.10626E 03	2.05647E 05	9.22635E 02	3.48896E 02	3.01512E-02	1.000(
6	2.72422E 02	1.10626E 03	1.56793E 03	3.67113E 05	1.34759E 03	4.24953E 02	3.01512E-02	1.000(
7	3.21953E 02	1.56793E 03	2.09458E 03	5.92840E 05	1.84138E 03	4.93797E 02	3.01512E-02	1.000(
8	3.71485E 02	2.09458E 03	2.67719E 03	8.89927E 05	2.39560E 03	5.54211E 02	3.01512E-02	1.000(
9	4.21016E 02	2.67719E 03	3.30571E 03	1.26334E 06	3.00069E 03	6.05096E 02	3.01512E-02	1.000(
10	4.70547E 02	3.30571E 03	3.96919E 03	1.71570E 06	3.64618E 03	6.45485E 02	3.01512E-02	1.000(
11	5.20078E 02	3.96919E 03	4.65594E 03	2.24712E 06	4.32073E 03	6.74558E 02	3.01512E-02	1.000(
12	5.69610E 02	4.65594E 03	5.35371E 03	2.85512E 06	5.01241E 03	6.91676E 02	3.01512E-02	1.000(
13	6.19141E 02	5.35371E 03	6.04986E 03	3.53452E 06	5.70875E 03	6.96336E 02	3.01512E-02	1.000(
14	6.68672E 02	6.04986E 03	6.73151E 03	4.27749E 06	6.39700E 03	6.88250E 02	3.01512E-02	1.000(
15	7.18203E 02	6.73151E 03	7.38583E 03	5.07361E 06	7.06431E 03	6.67313E 02	3.01512E-02	1.000(
16	7.67735E 02	7.38583E 03	8.00026E 03	5.91002E 06	7.69803E 03	6.33691E 02	3.01512E-02	1.000(
17	8.17266E 02	8.00026E 03	8.56307E 03	6.77180E 06	8.28592E 03	5.87922E 02	3.01512E-02	1.000(
18	8.66797E 02	8.56307E 03	9.06470E 03	7.64295E 06	8.81746E 03	5.31535E 02	3.01512E-02	1.000(
19	9.16328E 02	1.81284E 04	1.90048E 04	1.70185E 07	1.85725E 04	9.75508E 03	3.01512E-02	1.000(
20	9.65860E 02	1.90048E 04	1.98135E 04	1.87515E 07	1.94143E 04	8.41812E 02	3.01512E-02	1.000(
21	3.00987E 02	0.0	0.0	0.0	0.0	-1.94143E 04	0.0	0.0
22	3.05492E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	3.09996E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	8.44327E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	8.76036E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	9.07746E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	9.39455E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	9.71165E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	1.00287E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	1.03458E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	1.06629E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	1.09800E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	1.12971E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	1.16142E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	1.19313E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	1.22484E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	1.25655E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	1.28826E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXIT ENTHALPY= 1.98135E 04 WATER VOLUME= 9.90625E 03 REACTOR AVERAGE WATER DENSITY= 3.01512E-02

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 1 TIME= 1.00000E 02

***WATER DEPENDENT SEARCH

DILUTION FACTOR= 1.00000E 00

MESH INTERVAL	POISON THERMAL X-SECTION (EXCEPT FOR DIL. FACTOR)						
1- 7	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02
8- 14	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02
15- 21	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02	1.00000E-02
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

RODDED POISON REGION LEFT BOUNDARY= 1
RODDED POISON REGION RIGHT BOUNDARY= 21
RODDED POISON X-SECTION= 1.00000E-02

MIN. VALUE OF THE WATER DEPENDENT POISON CONTROL PARAMETER C= 0.0
FIRST APPROX. OF THE WATER DEPENDENT POISON CONTROL PARAMETER C= 5.47461E-01
MAX. VALUE OF THE WATER DEPENDENT POISON CONTROL PARAMETER C= 1.00000E 00

COEFFICIENTS FOR CALCULATING WATER DEP. POISON X-SECTION
1.00000E 00 -2.01512E-02 0.0 0.0

GROUP	D.P. FRACTION	R.P. FRACTION	W.D.P. FRACTION	FISSION FRACTION
1	0.0	0.0	0.0	7.51600E-01
2	0.0	0.0	0.0	2.48400E-01
3	2.52801E-01	2.52801E-01	2.52801E-01	0.0
4	1.00000E 00	1.00000E 00	1.00000E 00	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 1 TIME= 1.000000E 02

REGION	REGIONWISE	EXPANDED	CONTROL	BUCKLING
1- 3	2.000000E-04	2.000000E-04	2.000000E-04	

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

REGION	COEFFICIENTS FOR CALCULATING DOPPLER EFFECT			
1	2.28344E 00	0.0	0.0	0.0
2	2.28344E 00	0.0	0.0	0.0
3	2.28344E 00	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

REGION	COEFFICIENTS FOR CALCULATING WATER DENSITY EFFECT			
1	1.00000E 00	0.0	0.0	0.0
2	1.00000E 00	0.0	0.0	0.0
3	1.00000E 00	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 1 TIME= 1.00000E 02

REGION	COEFFICIENTS FOR CALCULATING WATER REMOVAL X.SECTION			
1	2.06871E 00	0.0	0.0	0.0
2	2.06871E 00	0.0	0.0	0.0
3	2.06871E 00	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

INLET ENTHALPY= 1.00000E 00 SATURATION ENTHALPY(HSAT)= 2.00000E 00

WATER DENSITY VERSUS ENTHALPY FIT COEFFICIENTS

3.01512E-02	0.0	0.0	ABOVE HSAT
3.01512E-02	0.0	0.0	BELOW HSAT

MESH INTERVAL	CONVERSION FACTOR FROM POWER TO ENTHALPY						
1- 7	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00
8- 14	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00
15- 21	1.00000E 00	1.00000E 00	1.00000E 00	1.00000E 00	2.00000E 00	2.00000E 00	1.00000E 01
22- 28	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01
29- 35	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01	1.00000E 01
36- 38	1.00000E 01	1.00000E 01	1.00000E 01				

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE MESH INTERVAL	1 U-235	2 U-236	3 U-238	4 PU-239	5 PU-240	6 PU-241	7 PM-149	8 SM-149
1	3.12583E-04	3.46270E-07	7.07917E-03	8.01900E-07	2.48549E-09	2.83995E-11	1.01509E-08	6.23796E-09
2	3.12593E-04	3.44342E-07	7.07917E-03	7.97460E-07	2.45808E-09	2.79306E-11	1.00941E-08	6.21131E-09
3	3.12613E-04	3.40502E-07	7.07919E-03	7.88616E-07	2.40392E-09	2.70120E-11	9.98092E-09	6.15798E-09
4	3.12642E-04	3.34781E-07	7.07920E-03	7.75438E-07	2.32436E-09	2.56811E-11	9.81235E-09	6.07800E-09
5	3.12681E-04	3.27227E-07	7.07922E-03	7.58033E-07	2.22131E-09	2.39912E-11	9.58979E-09	5.97136E-09
6	3.12729E-04	3.17901E-07	7.07924E-03	7.36542E-07	2.09728E-09	2.20089E-11	9.31512E-09	5.83810E-09
7	3.12785E-04	3.06883E-07	7.07928E-03	7.11139E-07	1.95527E-09	1.98103E-11	8.99068E-09	5.67829E-09
8	3.12850E-04	2.94261E-07	7.07931E-03	6.82029E-07	1.79864E-09	1.74768E-11	8.61916E-09	5.49204E-09
9	3.12923E-04	2.80138E-07	7.07934E-03	6.49444E-07	1.63105E-09	1.50906E-11	8.20366E-09	5.27954E-09
10	3.13002E-04	2.64632E-07	7.07939E-03	6.13650E-07	1.45638E-09	1.27313E-11	7.74766E-09	5.04110E-09
11	3.13089E-04	2.47869E-07	7.07943E-03	5.74933E-07	1.27856E-09	1.04712E-11	7.25495E-09	4.77717E-09
12	3.13180E-04	2.29985E-07	7.07948E-03	5.33606E-07	1.10151E-09	8.37229E-12	6.72960E-09	4.48833E-09
13	3.13277E-04	2.11129E-07	7.07953E-03	4.90004E-07	9.28984E-10	6.48369E-12	6.17599E-09	4.17543E-09
14	3.13378E-04	1.91456E-07	7.07958E-03	4.44482E-07	7.64520E-10	4.83988E-12	5.59876E-09	3.83954E-09
15	3.13482E-04	1.71136E-07	7.07963E-03	3.97423E-07	6.11333E-10	3.46023E-12	5.00291E-09	3.48216E-09
16	3.13589E-04	1.50366E-07	7.07968E-03	3.49256E-07	4.72301E-10	2.34928E-12	4.39416E-09	3.10546E-09
17	3.13697E-04	1.29407E-07	7.07974E-03	3.00520E-07	3.50021E-10	1.49825E-12	3.78015E-09	2.71319E-09
18	3.13802E-04	1.08746E-07	7.07980E-03	2.52065E-07	2.47139E-10	8.87690E-13	3.17506E-09	2.31394E-09
19	3.13899E-04	8.97101E-08	7.07984E-03	2.05740E-07	1.67579E-10	4.91876E-13	2.61918E-09	1.93517E-09
20	3.13954E-04	7.74004E-08	7.07989E-03	1.67056E-07	1.21838E-10	2.90573E-13	2.27594E-09	1.69239E-09
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE MESH INTERVAL	9 I-135	10 XE-135	11 F.P.-1	12 B.P.-1	13 B.P.-2	14 WATER
1	9.19798E-09	3.31253E-09	1.53226E-06	0.0	0.0	3.01512E-02
2	9.14657E-09	3.30777E-09	1.52369E-06	0.0	0.0	3.01512E-02
3	9.04415E-09	3.29818E-09	1.50664E-06	0.0	0.0	3.01512E-02
4	8.89162E-09	3.28359E-09	1.48124E-06	0.0	0.0	3.01512E-02
5	8.69023E-09	3.26376E-09	1.44770E-06	0.0	0.0	3.01512E-02
6	8.44167E-09	3.23832E-09	1.40631E-06	0.0	0.0	3.01512E-02
7	8.14804E-09	3.20684E-09	1.35741E-06	0.0	0.0	3.01512E-02
8	7.81177E-09	3.16873E-09	1.30141E-06	0.0	0.0	3.01512E-02
9	7.43565E-09	3.12323E-09	1.23877E-06	0.0	0.0	3.01512E-02
10	7.02282E-09	3.06944E-09	1.17001E-06	0.0	0.0	3.01512E-02
11	6.57667E-09	3.00618E-09	1.09570E-06	0.0	0.0	3.01512E-02
12	6.10092E-09	2.93201E-09	1.01646E-06	0.0	0.0	3.01512E-02
13	5.59949E-09	2.84514E-09	9.32939E-07	0.0	0.0	3.01512E-02
14	5.07659E-09	2.74327E-09	8.45835E-07	0.0	0.0	3.01512E-02
15	4.53674E-09	2.62356E-09	7.55906E-07	0.0	0.0	3.01512E-02
16	3.98517E-09	2.48249E-09	6.64020E-07	0.0	0.0	3.01512E-02
17	3.42896E-09	2.31605E-09	5.71356E-07	0.0	0.0	3.01512E-02
18	2.88143E-09	2.12131E-09	4.80134E-07	0.0	0.0	3.01512E-02
19	2.38097E-09	1.90564E-09	3.96751E-07	0.0	0.0	3.01512E-02
20	2.08378E-09	1.73740E-09	3.47234E-07	0.0	0.0	3.01512E-02
21	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0

TIME STEP 1 TIME= 1.00000E 02

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE / REGION	1 U-235	2 U-236	3 U-238	4 PU-239	5 PU-240	6 PU-241	7 PM-149	8 SM-149
1	3.13396E-04	1.87605E-07	7.07958E-03	4.33704E-07	8.71456E-10	7.22900E-12	5.49044E-09	3.68721E-09
2	0.0	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	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 1 TIME= 1.00000E 02

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE REGION	9 I-135	10 XE-135	11 F.P.-1	12 B.P.-1	13 B.P.-2	14 WATER
1	4.98017E-09	2.59022E-09	8.29742E-07	0.0	0.0	3.01512E-02
2	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

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

WEIGHTS OF BURNABLE ISOTOPES (IN G)

ISOTOPE REGION	1 U-235	2 U-236	3 U-238	4 PU-239	5 PU-240	6 PU-241	7 PM-149	8 SM-149
1	1.21158E 03	7.28370E-01	2.77196E 04	1.70528E 00	3.44084E-03	2.86619E-05	1.34514E-02	9.03135E-03
2	0.0	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	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

WEIGHTS OF BURNABLE ISOTOPES (IN G)

ISOTOPE REGION	9 I-135	10 XE-135
1	1.10548E-02	5.74968E-03
2	0.0	0.0
3	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 1 TIME= 1.00000E 02

FUEL ENRICHEMENTS

REGION	ENR. BY ATOMS	ENR. BY WEIGHT
1	4.23900E-02	4.18770E-02
2	0.0	0.0
3	0.0	0.0

***ATOMIC DENSITIES OF TIME STEP 1
HAVE BEEN WRITTEN ON LOGICAL UNIT 2 WITH RECORD IDENTIFICATION NO.= 2

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

***WATER DEPENDENT SEARCH ITERATION 1
POISON CONSTANT C= 5.47461E-01

MESH INTERVAL	POISON THERMAL CROSS-SECTION						
1- 7	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03
8- 14	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03
15- 21	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	5.47461E-03	0.0
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

K-EFFECTIVE CALCULATION

ITERATION	MIN. EIGENV.	EIGENVALUE	MAX. EIGENV.	POINT. CONV.	EIGEN. CONV.	EXTR. FACTOR	FLUX RESIDUE	DOMIN
1	9.707620E-01	9.755438E-01	9.892066E-01	9.453494E-03	2.500820E-02	0.0	1.234735E 00	
2	9.712836E-01	9.752693E-01	9.815201E-01	5.248006E-03	2.813339E-04	0.0	1.235995E 00	
3	9.717666E-01	9.750428E-01	9.790915E-01	3.756181E-03	2.317429E-04	0.0	9.528203E-01	
4	9.722017E-01	9.748636E-01	9.777132E-01	2.826787E-03	1.831055E-04	2.926030E 00	7.406805E-01	7.747
5	9.737043E-01	9.743065E-01	9.744795E-01	3.978305E-04	5.712509E-04	1.153487E 00	2.267113E 00	
6	9.740279E-01	9.742613E-01	9.744852E-01	2.346533E-04	4.577637E-05	3.143058E-01	1.795358E-01	
7	9.740881E-01	9.742470E-01	9.743743E-01	1.468631E-04	1.430511E-05	3.038421E-02	5.706072E-02	
8	9.741185E-01	9.742391E-01	9.743358E-01	1.115018E-04	7.629395E-06	0.0	3.147698E-02	
9	9.741392E-01	9.742341E-01	9.743080E-01	8.666293E-05	4.768372E-06	0.0	2.345105E-02	
10	9.741557E-01	9.742290E-01	9.742876E-01	6.769715E-05	4.768372E-06	6.512352E-01	1.852409E-02	7.887

CONVERGENCE ATTAINED IN K-EFF ITERATIONS

***WATER DEPENDENT SEARCH ITERATION 2
POISON CONSTANT C= 0.0

MESH INTERVAL	POISON THERMAL CROSS-SECTION						
1- 7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8- 14	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15- 21	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

K-EFFECTIVE CALCULATION

ITERATION	MIN. EIGENV.	EIGENVALUE	MAX. EIGENV.	POINT. CONV.	EIGEN. CONV.	EXTR. FACTOR	FLUX RESIDUE	DOMIN
1	9.951838E-01	1.003199E 00	1.003468E 00	4.128661E-03	2.887732E-02	0.0	7.600567E 00	

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

K-EFFECTIVE CALCULATION

ITERATION	MIN. EIGENV.	EIGENVALUE	MAX. EIGENV.	POINT. CONV.	EIGEN. CONV.	EXTR. FACTOR	FLUX RESIDUE	DOM
2	1.002211E 00	1.003180E 00	1.003273E 00	5.295128E-04	1.811981E-05	0.0	4.960345E-02	
3	1.002894E 00	1.003181E 00	1.003230E 00	1.673145E-04	9.536743E-07	0.0	1.861395E-02	
4	1.003060E 00	1.003182E 00	1.003210E 00	7.462593E-05	1.907349E-06	3.298066E-01	9.352271E-03	4.9(
5	1.003142E 00	1.003184E 00	1.003198E 00	2.756876E-05	1.907349E-06	0.0	7.075109E-03	

CONVERGENCE ATTAINED IN K-EFF ITERATIONS

***WATER DEPENDENT SEARCH ITERATION 3
POISON CONSTANT C= 6.02062E-02

MESH INTERVAL	POISON THERMAL CROSS-SECTION						
1- 7	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04
8- 14	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04
15- 21	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	6.02062E-04	0.0
22- 28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29- 35	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36- 38	0.0	0.0	0.0				

K-EFFECTIVE CALCULATION

ITERATION	MIN. EIGENV.	EIGENVALUE	MAX. EIGENV.	POINT. CONV.	EIGEN. CONV.	EXTR. FACTOR	FLUX RESIDUE	DOM
1	9.998807E-01	9.999230E-01	1.000794E 00	4.569048E-04	3.261566E-03	0.0	9.247191E-01	
2	9.999143E-01	9.999260E-01	1.000021E 00	5.332030E-05	3.099442E-06	0.0	5.557820E-03	
3	9.999208E-01	9.999253E-01	9.999484E-01	1.376970E-05	0.0	0.0	1.822112E-03	
4	9.999229E-01	9.999255E-01	9.999348E-01	5.960908E-06	2.384186E-07	3.732102E-01	1.004601E-03	5.4

CONVERGENCE ATTAINED IN K-EFF ITERATIONS

***THE REQUIRED CRITICALITY SEARCH HAS BEEN CARRIED OUT SUCCESSFULLY

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

MESH INT.	GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PROD X-SECTION
1	1	2.21770E 00	4.56234E-03	0.0	0.0	0.0	6.96099E-02	8.58992E-03	9.61315E-1
1	2	1.11398E 00	2.56806E-03	0.0	0.0	0.0	6.77053E-02	1.26751E-03	1.65244E-1
1	3	7.14265E-01	2.87411E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43819E-02	1.82016E-02	2.39325E-1
1	4	4.40539E-01	2.33463E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59425E-01	4.71917E-1
2	1	2.21770E 00	4.56234E-03	0.0	0.0	0.0	6.96099E-02	8.58992E-03	9.61316E-1
2	2	1.11398E 00	2.56807E-03	0.0	0.0	0.0	6.77053E-02	1.26752E-03	1.65246E-1
2	3	7.14266E-01	2.87409E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43819E-02	1.82017E-02	2.39328E-1
2	4	4.40543E-01	2.33443E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59419E-01	4.71913E-1
3	1	2.21770E 00	4.56235E-03	0.0	0.0	0.0	6.96099E-02	8.58995E-03	9.61320E-1
3	2	1.11398E 00	2.56809E-03	0.0	0.0	0.0	6.77052E-02	1.26755E-03	1.65251E-1
3	3	7.14266E-01	2.87406E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43820E-02	1.82021E-02	2.39334E-1
3	4	4.40552E-01	2.33401E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59408E-01	4.71904E-1
4	1	2.21770E 00	4.56236E-03	0.0	0.0	0.0	6.96100E-02	8.58997E-03	9.61323E-1
4	2	1.11398E 00	2.56813E-03	0.0	0.0	0.0	6.77052E-02	1.26760E-03	1.65258E-1
4	3	7.14266E-01	2.87401E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43822E-02	1.82027E-02	2.39344E-1
4	4	4.40565E-01	2.33339E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59390E-01	4.71890E-1
5	1	2.21770E 00	4.56238E-03	0.0	0.0	0.0	6.96100E-02	8.59000E-03	9.61328E-1
5	2	1.11398E 00	2.56817E-03	0.0	0.0	0.0	6.77052E-02	1.26766E-03	1.65268E-1
5	3	7.14267E-01	2.87395E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43824E-02	1.82035E-02	2.39356E-1
5	4	4.40583E-01	2.33255E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59368E-01	4.71871E-1
6	1	2.21769E 00	4.56240E-03	0.0	0.0	0.0	6.96101E-02	8.59005E-03	9.61335E-1
6	2	1.11398E 00	2.56822E-03	0.0	0.0	0.0	6.77052E-02	1.26773E-03	1.65280E-1
6	3	7.14268E-01	2.87388E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43827E-02	1.82044E-02	2.39372E-1
6	4	4.40606E-01	2.33148E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59340E-01	4.71848E-1
7	1	2.21769E 00	4.56243E-03	0.0	0.0	0.0	6.96102E-02	8.59010E-03	9.61344E-1
7	2	1.11398E 00	2.56829E-03	0.0	0.0	0.0	6.77051E-02	1.26782E-03	1.65294E-1
7	3	7.14269E-01	2.87379E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43829E-02	1.82055E-02	2.39390E-1
7	4	4.40634E-01	2.33017E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59307E-01	4.71821E-1
8	1	2.21769E 00	4.56246E-03	0.0	0.0	0.0	6.96102E-02	8.59016E-03	9.61353E-1
8	2	1.11398E 00	2.56836E-03	0.0	0.0	0.0	6.77051E-02	1.26793E-03	1.65310E-1
8	3	7.14269E-01	2.87369E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43833E-02	1.82068E-02	2.39411E-1
8	4	4.40668E-01	2.32862E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59270E-01	4.71791E-1
9	1	2.21768E 00	4.56249E-03	0.0	0.0	0.0	6.96103E-02	8.59022E-03	9.61362E-1
9	2	1.11397E 00	2.56844E-03	0.0	0.0	0.0	6.77050E-02	1.26804E-03	1.65328E-1
9	3	7.14270E-01	2.87358E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43836E-02	1.82082E-02	2.39434E-1
9	4	4.40708E-01	2.32679E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59227E-01	4.71756E-1
10	1	2.21768E 00	4.56252E-03	0.0	0.0	0.0	6.96104E-02	8.59029E-03	9.61373E-1
10	2	1.11397E 00	2.56853E-03	0.0	0.0	0.0	6.77050E-02	1.26816E-03	1.65347E-1
10	3	7.14272E-01	2.87346E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43840E-02	1.82098E-02	2.39460E-1

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

MESH INT.	GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PRO X-SECTIO
10	4	4.40756E-01	2.32466E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59181E-01	4.71718E-
11	1	2.21767E 00	4.56256E-03	0.0	0.0	0.0	6.96105E-02	8.59037E-03	9.61385E-
11	2	1.11397E 00	2.56863E-03	0.0	0.0	0.0	6.77049E-02	1.26830E-03	1.65368E-
11	3	7.14273E-01	2.87333E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43845E-02	1.82115E-02	2.39488E-
11	4	4.40810E-01	2.32222E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59130E-01	4.71677E-
12	1	2.21766E 00	4.56260E-03	0.0	0.0	0.0	6.96107E-02	8.59045E-03	9.61398E-
12	2	1.11397E 00	2.56873E-03	0.0	0.0	0.0	6.77049E-02	1.26844E-03	1.65391E-
12	3	7.14274E-01	2.87319E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43849E-02	1.82133E-02	2.39518E-
12	4	4.40874E-01	2.31941E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59076E-01	4.71633E-
13	1	2.21766E 00	4.56264E-03	0.0	0.0	0.0	6.96108E-02	8.59053E-03	9.61412E-
13	2	1.11396E 00	2.56884E-03	0.0	0.0	0.0	6.77047E-02	1.26859E-03	1.65415E-
13	3	7.14276E-01	2.87304E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43854E-02	1.82152E-02	2.39549E-
13	4	4.40948E-01	2.31619E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.59019E-01	4.71586E-
14	1	2.21765E 00	4.56269E-03	0.0	0.0	0.0	6.96109E-02	8.59062E-03	9.61425E-
14	2	1.11396E 00	2.56895E-03	0.0	0.0	0.0	6.77047E-02	1.26875E-03	1.65440E-
14	3	7.14277E-01	2.87289E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43859E-02	1.82171E-02	2.39581E-
14	4	4.41033E-01	2.31251E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.58960E-01	4.71538E-
15	1	2.21764E 00	4.56273E-03	0.0	0.0	0.0	6.96110E-02	8.59071E-03	9.61440E-
15	2	1.11396E 00	2.56907E-03	0.0	0.0	0.0	6.77046E-02	1.26891E-03	1.65465E-
15	3	7.14279E-01	2.87273E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43865E-02	1.82192E-02	2.39615E-
15	4	4.41133E-01	2.30828E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.58898E-01	4.71487E-
16	1	2.21764E 00	4.56278E-03	0.0	0.0	0.0	6.96111E-02	8.59080E-03	9.61454E-
16	2	1.11395E 00	2.56919E-03	0.0	0.0	0.0	6.77046E-02	1.26908E-03	1.65491E-
16	3	7.14280E-01	2.87256E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43870E-02	1.82213E-02	2.39649E-
16	4	4.41249E-01	2.30340E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.58835E-01	4.71435E-
17	1	2.21763E 00	4.56283E-03	0.0	0.0	0.0	6.96113E-02	8.59090E-03	9.61469E-
17	2	1.11395E 00	2.56931E-03	0.0	0.0	0.0	6.77044E-02	1.26925E-03	1.65518E-
17	3	7.14281E-01	2.87240E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43875E-02	1.82233E-02	2.39684E-
17	4	4.41384E-01	2.29778E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.58771E-01	4.71382E-
18	1	2.21762E 00	4.56287E-03	0.0	0.0	0.0	6.96114E-02	8.59099E-03	9.61484E-
18	2	1.11395E 00	2.56943E-03	0.0	0.0	0.0	6.77044E-02	1.26941E-03	1.65543E-
18	3	7.14283E-01	2.87224E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43881E-02	1.82253E-02	2.39717E-
18	4	4.41540E-01	2.29135E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.58706E-01	4.71328E-
19	1	2.21762E 00	4.56291E-03	0.0	0.0	0.0	6.96115E-02	8.59105E-03	9.61495E-
19	2	1.11394E 00	2.56953E-03	0.0	0.0	0.0	6.77043E-02	1.26954E-03	1.65565E-
19	3	7.14284E-01	2.87207E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43886E-02	1.82269E-02	2.39745E-
19	4	4.41713E-01	2.28433E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.58637E-01	4.71269E-
20	1	2.21761E 00	4.56291E-03	0.0	0.0	0.0	6.96116E-02	8.59104E-03	9.61497E-

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

MESH INT.	GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PRO X-SECTIO
20	2	1.11394E 00	2.56957E-03	0.0	0.0	0.0	6.77043E-02	1.26955E-03	1.65570E-
20	3	7.14286E-01	2.87191E-02	2.52801E-03	2.52801E-03	1.52202E-04	5.43892E-02	1.82269E-02	2.39749E-
20	4	4.41851E-01	2.27876E-01	1.00000E-02	1.00000E-02	6.02062E-04	0.0	3.58552E-01	4.71182E-
21	1	1.95893E 00	6.13364E-04	0.0	0.0	0.0	6.78455E-02	0.0	0.0
21	2	1.10037E 00	4.88517E-06	0.0	0.0	0.0	5.99685E-02	0.0	0.0
21	3	5.30827E-01	5.37300E-03	0.0	0.0	0.0	5.13092E-02	0.0	0.0
21	4	3.94072E-01	1.41025E-01	0.0	0.0	0.0	0.0	0.0	0.0
22	1	1.95893E 00	6.13364E-04	0.0	0.0	0.0	6.78455E-02	0.0	0.0
22	2	1.10037E 00	4.88517E-06	0.0	0.0	0.0	5.99685E-02	0.0	0.0
22	3	5.30827E-01	5.37300E-03	0.0	0.0	0.0	5.13092E-02	0.0	0.0
22	4	3.94072E-01	1.41025E-01	0.0	0.0	0.0	0.0	0.0	0.0
23	1	1.95893E 00	6.13364E-04	0.0	0.0	0.0	6.78455E-02	0.0	0.0
23	2	1.10037E 00	4.88517E-06	0.0	0.0	0.0	5.99685E-02	0.0	0.0
23	3	5.30827E-01	5.37300E-03	0.0	0.0	0.0	5.13092E-02	0.0	0.0
23	4	3.94072E-01	1.41025E-01	0.0	0.0	0.0	0.0	0.0	0.0
24	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
24	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
24	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
24	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
25	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
25	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
25	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
25	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
26	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
26	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
26	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
26	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
27	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
27	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
27	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
27	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
28	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
28	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
28	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
28	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
29	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
29	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
29	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
29	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

MESH INT.	GROUP	DIFFUSION COEFFICIENT	ABSORPTION X-SECTION	DIL. POISON X-SECTION	ROD. POISON X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD. X-SECTION	ENERG PROD X-SECTION
30	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
30	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
30	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
30	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
31	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
31	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
31	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
31	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
32	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
32	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
32	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
32	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
33	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
33	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
33	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
33	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
34	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
34	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
34	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
34	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
35	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
35	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
35	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
35	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
36	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
36	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
36	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
36	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
37	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
37	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
37	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
37	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0
38	1	2.14254E 00	7.15310E-04	0.0	0.0	0.0	7.45060E-02	0.0	0.0
38	2	1.16366E 00	6.89081E-06	0.0	0.0	0.0	8.24813E-02	0.0	0.0
38	3	6.23178E-01	2.93497E-03	0.0	0.0	0.0	7.49403E-02	0.0	0.0
38	4	4.09889E-01	8.33601E-02	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

POINT	DISTANCE	POWER DENS. LEFT VALUE	POWER DENS. RIGHT VALUE	P.D.AVERAGE POINT VALUE	POWER DENS. PEAK VALUE	GROUP1 FLUX	GROUP2 FLUX	GROUP3 FLUX	GROUP4 FL
1	0.0	0.0	1.33279E 02	1.33279E 02	1.80548E 00	9.82268E 13	1.29497E 14	9.76715E 13	2.08345E
2	2.80770E 00	1.32932E 02	1.32931E 02	1.32932E 02	1.80076E 00	9.79681E 13	1.29156E 14	9.74136E 13	2.07804E
3	5.61540E 00	1.31889E 02	1.31888E 02	1.31888E 02	1.78663E 00	9.71939E 13	1.28133E 14	9.66411E 13	2.06181E
4	8.42310E 00	1.30158E 02	1.30157E 02	1.30157E 02	1.76318E 00	9.59090E 13	1.26436E 14	9.53595E 13	2.03487E
5	1.12308E 01	1.27751E 02	1.27749E 02	1.27750E 02	1.73057E 00	9.41222E 13	1.24077E 14	9.35771E 13	1.99740E
6	1.40385E 01	1.24683E 02	1.24680E 02	1.24682E 02	1.68900E 00	9.18451E 13	1.21070E 14	9.13059E 13	1.94965E
7	1.68462E 01	1.20974E 02	1.20971E 02	1.20972E 02	1.63876E 00	8.90929E 13	1.17436E 14	8.85610E 13	1.89190E
8	1.96539E 01	1.16648E 02	1.16644E 02	1.16646E 02	1.58015E 00	8.58839E 13	1.13199E 14	8.53609E 13	1.82454E
9	2.24616E 01	1.11734E 02	1.11730E 02	1.11732E 02	1.51358E 00	8.22396E 13	1.08388E 14	8.17271E 13	1.74801E
10	2.52693E 01	1.06264E 02	1.06260E 02	1.06262E 02	1.43949E 00	7.81845E 13	1.03035E 14	7.76842E 13	1.66281E
11	2.80770E 01	1.00275E 02	1.00271E 02	1.00273E 02	1.35835E 00	7.37462E 13	9.71758E 13	7.32598E 13	1.56949E
12	3.08847E 01	9.38066E 01	9.38025E 01	9.38046E 01	1.27073E 00	6.89548E 13	9.08514E 13	6.84843E 13	1.46867E
13	3.36924E 01	8.69029E 01	8.68988E 01	8.69008E 01	1.17721E 00	6.38435E 13	8.41052E 13	6.33912E 13	1.36103E
14	3.65000E 01	7.96115E 01	7.96076E 01	7.96096E 01	1.07843E 00	5.84477E 13	7.69840E 13	5.80166E 13	1.24730E
15	3.93077E 01	7.19850E 01	7.19813E 01	7.19832E 01	9.75124E-01	5.28053E 13	6.95377E 13	5.24001E 13	1.12830E
16	4.21154E 01	6.40829E 01	6.40795E 01	6.40812E 01	8.68079E-01	4.69559E 13	6.18187E 13	4.65863E 13	1.00496E
17	4.49231E 01	5.59799E 01	5.59769E 01	5.59784E 01	7.58314E-01	4.09390E 13	5.38800E 13	4.06289E 13	8.78498E
18	4.77308E 01	4.77937E 01	4.77909E 01	4.77923E 01	6.47421E-01	3.47900E 13	4.57735E 13	3.46031E 13	7.50925E
19	5.05385E 01	3.97877E 01	3.97849E 01	3.97863E 01	5.38967E-01	2.85263E 13	3.75424E 13	2.86386E 13	6.27128E
20	5.33462E 01	3.28324E 01	3.28280E 01	3.28302E 01	4.44736E-01	2.21004E 13	2.92008E 13	2.30096E 13	5.24278E
21	5.61539E 01	3.07615E 01	0.0	3.07615E 01	4.16713E-01	1.52183E 13	2.06513E 13	1.83803E 13	5.21025E
22	5.70006E 01	0.0	0.0	0.0	0.0	1.27681E 13	1.80079E 13	1.69479E 13	5.88858E
23	5.78473E 01	0.0	0.0	0.0	0.0	1.06776E 13	1.55503E 13	1.53848E 13	6.48903E
24	5.86940E 01	0.0	0.0	0.0	0.0	8.88813E 12	1.32704E 13	1.37707E 13	7.31091E
25	6.09405E 01	0.0	0.0	0.0	0.0	5.72333E 12	8.81128E 12	1.01358E 13	7.52899E
26	6.31870E 01	0.0	0.0	0.0	0.0	3.68780E 12	5.82207E 12	7.16365E 12	6.16873E
27	6.54335E 01	0.0	0.0	0.0	0.0	2.37763E 12	3.83223E 12	4.93699E 12	4.60283E
28	6.76799E 01	0.0	0.0	0.0	0.0	1.53375E 12	2.51481E 12	3.34634E 12	3.27104E
29	6.99264E 01	0.0	0.0	0.0	0.0	9.89836E 11	1.64623E 12	2.24233E 12	2.25883E
30	7.21729E 01	0.0	0.0	0.0	0.0	6.39024E 11	1.07543E 12	1.49024E 12	1.53159E
31	7.44194E 01	0.0	0.0	0.0	0.0	4.12580E 11	7.01215E 11	9.84270E 11	1.02565E
32	7.66659E 01	0.0	0.0	0.0	0.0	2.66259E 11	4.56257E 11	6.46709E 11	6.80525E
33	7.89124E 01	0.0	0.0	0.0	0.0	1.71545E 11	2.95967E 11	4.22655E 11	4.47914E
34	8.11589E 01	0.0	0.0	0.0	0.0	1.10030E 11	1.90903E 11	2.74189E 11	2.92087E
35	8.34054E 01	0.0	0.0	0.0	0.0	6.97907E 10	1.21639E 11	1.75475E 11	1.87643E
36	8.56519E 01	0.0	0.0	0.0	0.0	4.30550E 10	7.53082E 10	1.08994E 11	1.16873E
37	8.78984E 01	0.0	0.0	0.0	0.0	2.46849E 10	4.32880E 10	6.27939E 10	6.74597E
38	9.01449E 01	0.0	0.0	0.0	0.0	1.11794E 10	1.96351E 10	2.85216E 10	3.06745E
39	9.23913E 01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

MESH INTERVAL	VOLUME	GRP 3 U238 ABS. X-SECT	INTEGRATED POWER	AVERAGE POWER DENS.	POWER DENS. PEAK VALUE	AVERAGE NEUTRON SOURCE	GROUP1 FLUX	GROUP2 FLUX	GROUP3 FLU
1	2.47657E 01	2.28344E 00	3.29430E 03	1.33019E 02	1.80194E 00	1.02548E 13	9.80327E 13	1.29241E 14	9.74780E 1
2	7.42971E 01	2.28344E 00	9.83124E 03	1.32323E 02	1.79252E 00	1.02011E 13	9.75164E 13	1.28559E 14	9.69629E 1
3	1.23829E 02	2.28344E 00	1.62137E 04	1.30937E 02	1.77374E 00	1.00941E 13	9.64872E 13	1.27200E 14	9.59362E 1
4	1.73360E 02	2.28344E 00	2.23406E 04	1.28868E 02	1.74572E 00	9.93446E 12	9.49518E 13	1.25172E 14	9.44047E 1
5	2.22891E 02	2.28344E 00	2.81135E 04	1.26131E 02	1.70864E 00	9.72325E 12	9.29205E 13	1.22490E 14	9.23785E 1
6	2.72422E 02	2.28344E 00	3.34379E 04	1.22743E 02	1.66274E 00	9.46182E 12	9.04064E 13	1.19171E 14	8.98711E 1
7	3.21953E 02	2.28344E 00	3.82243E 04	1.18726E 02	1.60833E 00	9.15191E 12	8.74267E 13	1.15236E 14	8.68994E 1
8	3.71485E 02	2.28344E 00	4.23891E 04	1.14107E 02	1.54576E 00	8.79556E 12	8.40010E 13	1.10713E 14	8.34834E 1
9	4.21016E 02	2.28344E 00	4.58557E 04	1.08917E 02	1.47545E 00	8.39511E 12	8.01524E 13	1.05633E 14	7.96462E 1
10	4.70547E 02	2.28344E 00	4.85552E 04	1.03189E 02	1.39785E 00	7.95326E 12	7.59070E 13	1.00028E 14	7.54138E 1
11	5.20078E 02	2.28344E 00	5.04277E 04	9.69618E 01	1.31350E 00	7.47295E 12	7.12934E 13	9.39384E 13	7.08152E 1
12	5.69610E 02	2.28344E 00	5.14230E 04	9.02776E 01	1.22295E 00	6.95743E 12	6.63436E 13	8.74050E 13	6.58824E 1
13	6.19141E 02	2.28344E 00	5.15015E 04	8.31823E 01	1.12683E 00	6.41025E 12	6.10916E 13	8.04733E 13	6.06501E 1
14	6.68672E 02	2.28344E 00	5.06357E 04	7.57257E 01	1.02582E 00	5.83528E 12	5.55742E 13	7.31918E 13	5.51563E 1
15	7.18203E 02	2.28344E 00	4.88120E 04	6.79640E 01	9.20678E-01	5.23684E 12	4.98302E 13	6.56116E 13	4.94431E 1
16	7.67735E 02	2.28344E 00	4.60367E 04	5.99644E 01	8.12310E-01	4.62011E 12	4.38989E 13	5.77853E 13	4.35596E 1
17	8.17266E 02	2.28344E 00	4.23534E 04	5.18232E 01	7.02026E-01	3.99248E 12	3.78179E 13	4.97653E 13	3.75704E 1
18	8.66797E 02	2.28344E 00	3.79068E 04	4.37321E 01	5.92419E-01	3.36857E 12	3.16134E 13	4.15991E 13	3.15782E 1
19	9.16328E 02	2.28344E 00	3.32276E 04	3.62617E 01	4.91220E-01	2.79179E 12	2.52699E 13	3.33152E 13	2.57860E 1
20	9.65860E 02	2.28344E 00	3.06965E 04	3.17815E 01	4.30529E-01	2.44225E 12	1.86152E 13	2.48712E 13	2.06652E 1
21	3.00987E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.39886E 13	1.93247E 13	1.76614E 1
22	3.05492E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.17190E 13	1.67745E 13	1.61635E 1
23	3.09996E 02	2.28344E 00	0.0	0.0	0.0	0.0	9.77962E 12	1.44062E 13	1.45748E 1
24	8.44327E 02	2.28344E 00	0.0	0.0	0.0	0.0	7.29087E 12	1.10199E 13	1.19362E 1
25	8.76036E 02	2.28344E 00	0.0	0.0	0.0	0.0	4.69636E 12	7.30315E 12	8.63629E 1
26	9.07746E 02	2.28344E 00	0.0	0.0	0.0	0.0	3.02699E 12	4.81846E 12	6.04059E 1
27	9.39455E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.95213E 12	3.16796E 12	4.13496E 1
28	9.71165E 02	2.28344E 00	0.0	0.0	0.0	0.0	1.25957E 12	2.07697E 12	2.78983E 1
29	1.00287E 03	2.28344E 00	0.0	0.0	0.0	0.0	8.13043E 11	1.35857E 12	1.86331E 1
30	1.03458E 03	2.28344E 00	0.0	0.0	0.0	0.0	5.24934E 11	8.86888E 11	1.23532E 1
31	1.06629E 03	2.28344E 00	0.0	0.0	0.0	0.0	3.38875E 11	5.77825E 11	8.14234E 1
32	1.09800E 03	2.28344E 00	0.0	0.0	0.0	0.0	2.18560E 11	3.75533E 11	5.33873E 1
33	1.12971E 03	2.28344E 00	0.0	0.0	0.0	0.0	1.40572E 11	2.43066E 11	3.47901E 1
34	1.16142E 03	2.28344E 00	0.0	0.0	0.0	0.0	8.97730E 10	1.56035E 11	2.24495E 1
35	1.19313E 03	2.28344E 00	0.0	0.0	0.0	0.0	5.63341E 10	9.83199E 10	1.42013E 1
36	1.22484E 03	2.28344E 00	0.0	0.0	0.0	0.0	3.38105E 10	5.91945E 10	8.57443E 1
37	1.25655E 03	2.28344E 00	0.0	0.0	0.0	0.0	1.78896E 10	3.13869E 10	4.55496E 1
38	1.28826E 03	2.28344E 00	0.0	0.0	0.0	0.0	5.55529E 09	9.75713E 09	1.41730E 1

CORE VOLUME= 9.90625E 03 AVERAGE POWER DENSITY= 7.38195E 01

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

FLUX WEIGHTED MACROSCOPIC CROSS-SECTIONS

RP	REG	DIFFUSION COEFFICIENT	TRANSPORT X-SECTION	ABSORPTION X-SECTION	DIL. POIS. X-SECTION	ROD. POIS. X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD X-SECTION	ENERG PROD X-SECTION	TRANSVER BUCKLI
1	1	2.2177E 00	1.5031E-01	4.5626E-03	0.0	0.0	0.0	6.9611E-02	8.5905E-03	9.6140E-14	6.6970E-
1	2	1.9589E 00	1.7016E-01	6.1336E-04	0.0	0.0	0.0	6.7845E-02	0.0	0.0	6.6970E-
1	3	2.1425E 00	1.5558E-01	7.1531E-04	0.0	0.0	0.0	7.4506E-02	0.0	0.0	6.6970E-
2	1	1.1140E 00	2.9923E-01	2.5688E-03	0.0	0.0	0.0	6.7705E-02	1.2685E-03	1.6540E-14	6.6970E-
2	2	1.1004E 00	3.0293E-01	4.8852E-06	0.0	0.0	0.0	5.9969E-02	0.0	0.0	6.6970E-
2	3	1.1637E 00	2.8645E-01	6.8908E-06	0.0	0.0	0.0	8.2481E-02	0.0	0.0	6.6970E-
3	1	7.1427E-01	4.6667E-01	2.8731E-02	2.5280E-03	2.5280E-03	1.5220E-04	5.4385E-02	1.8214E-02	2.3953E-13	6.6970E-
3	2	5.3083E-01	6.2795E-01	5.3730E-03	0.0	0.0	0.0	5.1309E-02	0.0	0.0	6.6970E-
3	3	6.2318E-01	5.3489E-01	2.9350E-03	0.0	0.0	0.0	7.4940E-02	0.0	0.0	6.6970E-
4	1	4.4098E-01	7.5589E-01	2.3150E-01	1.0000E-02	1.0000E-02	6.0206E-04	0.0	3.5905E-01	4.7161E-12	6.6970E-
4	2	3.9407E-01	8.4587E-01	1.4103E-01	0.0	0.0	0.0	0.0	0.0	0.0	6.6970E-
4	3	4.0989E-01	8.1323E-01	8.3360E-02	0.0	0.0	0.0	0.0	0.0	0.0	6.6970E-

FLUX WEIGHTED MACROSCOPIC CROSS-SECTIONS

RP	REG	DIFFUSION COEFFICIENT	TRANSPORT X-SECTION	ABSORPTION X-SECTION	DIL. POIS. X-SECTION	ROD. POIS. X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD X-SECTION	ENERG PROD X-SECTION	TRANSVER BUCKLI
1	T.R.	2.2177E 00	1.5031E-01	4.5626E-03	0.0	0.0	0.0	6.9611E-02	8.5905E-03	9.6140E-14	6.6970E-
2	T.R.	1.1140E 00	2.9923E-01	2.5688E-03	0.0	0.0	0.0	6.7705E-02	1.2685E-03	1.6540E-14	6.6970E-
3	T.R.	7.1427E-01	4.6667E-01	2.8731E-02	2.5280E-03	2.5280E-03	1.5220E-04	5.4385E-02	1.8214E-02	2.3953E-13	6.6970E-
4	T.R.	4.4098E-01	7.5589E-01	2.3150E-01	1.0000E-02	1.0000E-02	6.0206E-04	0.0	3.5905E-01	4.7161E-12	6.6970E-

REGION INTEGRALS

RP	REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. POIS. ABS. RATE	ROD. POIS. ABS. RATE	WATER DEP. ABS. RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRO PROD. R
1	1	9.9063E 03	5.3103E 17	5.3605E 13	2.4229E 15	0.0	0.0	0.0	7.8866E 14	3.6965E 16	4.2351E
1	2	9.1648E 02	1.0822E 16	1.1808E 13	6.6379E 12	0.0	0.0	0.0	1.4197E 13	7.3423E 14	0.0
1	3	1.5994E 04	1.8436E 16	1.1527E 12	1.3188E 13	0.0	0.0	0.0	2.6453E 13	1.3736E 15	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA

TIME STEP 1 TIME= 1.00000E 02

REGION INTEGRALS

RP	REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. ABS.	POIS. RATE	ROD. ABS.	POIS. RATE	WATER DEP. ABS.	RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRON PROD. RA
2	1	9.9063E 03	6.9991E 17	7.0654E 13	1.7979E 15	0.0		0.0		0.0		5.2215E 14	4.7387E 16	1.3997E
2	2	9.1648E 02	1.5407E 16	1.6811E 13	7.5265E 10	0.0		0.0		0.0		1.1354E 13	9.2392E 14	0.0
2	3	1.5994E 04	2.9076E 16	1.8179E 12	2.0035E 11	0.0		0.0		0.0		2.2659E 13	2.3982E 15	0.0
3	1	9.9063E 03	5.3035E 17	5.3537E 13	1.5238E 16	1.3407E	15	1.3407E	15	8.0720E	13	2.5369E 14	2.8843E 16	0.0
3	2	9.1648E 02	1.4772E 16	1.6118E 13	7.9369E 13	0.0		0.0		0.0		5.2513E 12	7.5793E 14	0.0
3	3	1.5994E 04	3.5326E 16	2.2086E 12	1.0368E 14	0.0		0.0		0.0		1.4743E 13	2.6473E 15	0.0
4	1	9.9063E 03	1.1484E 17	1.1593E 13	2.6587E 16	1.1484E	15	1.1484E	15	6.9143E	13	3.3916E 13	0.0	0.0
4	2	9.1648E 02	5.7011E 15	6.2207E 12	8.0399E 14	0.0		0.0		0.0		1.5046E 12	0.0	0.0
4	3	1.5994E 04	2.9334E 16	1.8340E 12	2.4453E 15	0.0		0.0		0.0		8.0522E 12	0.0	0.0

FLUX WEIGHTED MACROSCOPIC CROSS-SECTIONS
(POISONED SIDE (1, 21)=REGION 1
UNPOISONED SIDE (21, 21)=REGION 2)

RP	REG	DIFFUSION COEFFICIENT	TRANSPORT X-SECTION	ABSORPTION X-SECTION	DIL. POIS. X-SECTION	ROD. POIS. X-SECTION	WATER DEP. X-SECTION	REMOVAL X-SECTION	NEUTR PROD X-SECTION	ENERG PROD X-SECTION	TRANSVER BUCKLIN
L	1	2.2177E 00	1.5031E-01	4.5626E-03	0.0	0.0	0.0	6.9611E-02	8.5905E-03	9.6140E-14	6.6970E-
L	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1	1.1140E 00	2.9923E-01	2.5688E-03	0.0	0.0	0.0	6.7705E-02	1.2685E-03	1.6540E-14	6.6970E-
2	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	1	7.1427E-01	4.6667E-01	2.8731E-02	2.5280E-03	2.5280E-03	1.5220E-04	5.4385E-02	1.8214E-02	2.3953E-13	6.6970E-
3	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1	4.4098E-01	7.5589E-01	2.3150E-01	1.0000E-02	1.0000E-02	6.0206E-04	0.0	3.5905E-01	4.7161E-12	6.6970E-
4	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

RODDED POISON REGION INTEGRALS
(POISONED SIDE (1, 21)=REGION 1
UNPOISONED SIDE (21, 21)=REGION 2)

RP	REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. POIS. ABS. RATE	ROD. POIS. ABS. RATE	WATER DEP. ABS. RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRON PROD. RA
L	1	9.9063E 03	5.3103E 17	5.3605E 13	2.4229E 15	0.0	0.0	0.0	7.8866E 14	3.6965E 16	4.2351E
L	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1	9.9063E 03	6.9991E 17	7.0654E 13	1.7979E 15	0.0	0.0	0.0	5.2215E 14	4.7387E 16	1.3997E
2	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	1	9.9063E 03	5.3035E 17	5.3537E 13	1.5238E 16	1.3407E 15	1.3407E 15	8.0720E 13	2.5369E 14	2.8843E 16	0.0
3	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	1	9.9063E 03	1.1484E 17	1.1593E 13	2.6587E 16	1.1484E 15	1.1484E 15	6.9143E 13	3.3916E 13	0.0	0.0
4	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 1 TIME= 1.00000E 02

P REG.	VOLUME	INTEGRATED FLUX	AVERAGE FLUX	ABSORPTION RATE	DIL. ABS.	POIS. RATE	ROD. ABS.	POIS. RATE	WATER DEP. ABS.	RATE	TRANSVERSE LEAKAGE	REMOVAL RATE	NEUTRON PROD. RA
T.R.	2.6817E 04	5.6028E 17	2.0893E 13	2.4427E 15	0.0		0.0		0.0		8.2931E 14	3.9073E 16	4.2351E
T.R.	2.6817E 04	7.4440E 17	2.7758E 13	1.7982E 15	0.0		0.0		0.0		5.5616E 14	5.0710E 16	1.3997E
T.R.	2.6817E 04	5.8045E 17	2.1645E 13	1.5421E 16	1.3407E	15	1.3407E	15	8.0720E	13	2.7369E 14	3.2248E 16	0.0
T.R.	2.6817E 04	1.4988E 17	5.5889E 12	2.9836E 16	1.1484E	15	1.1484E	15	6.9143E	13	4.3473E 13	0.0	0.0

NEUTRON BALANCE GROUP BY GROUP

GROUP	LEFT LEAKAGE	RIGHT LEAKAGE	TOTAL LEAKAGE	TOTAL LOSSES	TOTAL PROD.
1	0.0	6.114211E 12	6.114211E 12	4.235103E 16	4.235103E 16
2	0.0	5.832490E 12	5.832490E 12	5.306975E 16	5.306972E 16
3	0.0	4.537110E 12	4.537110E 12	5.070962E 16	5.070957E 16
4	0.0	3.209508E 12	3.209508E 12	3.224848E 16	3.224850E 16

REACTOR NEUTRON BALANCE

VOLUME	LEFT LEAK.	RIGHT LEAK.	TOTAL LEAK.	ABSOR. RATE	TRANSV LEAK	TOT. LOSSES	TOTAL PROD.	TOTAL POWER	TOTAL FLI
68171E 04	0.0	1.96933E 13	1.96933E 13	5.63282E 16	1.70263E 15	5.63479E 16	5.63478E 16	7.31275E 05	2.03500E

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 2 TIME= 2.00000E 03

MESH INTERVAL	VOLUME	ENTHALPY LEFT VALUE	ENTHALPY RIGHT VALUE	INTEGRATED ENTHALPY	ENTHALPY AVER. VALUE	ENTHALPY STEP	WATER DENS. AVER. VALUE	WATER PEAK
1	2.47657E 01	1.00000E 00	4.56265E 01	8.53671E 02	3.44699E 01	3.34699E 01	3.01512E-02	1.00
2	7.42971E 01	4.56265E 01	1.78806E 02	9.16191E 03	1.23314E 02	8.88446E 01	3.01512E-02	1.00
3	1.23829E 02	1.78806E 02	3.98446E 02	3.71000E 04	2.99607E 02	1.76293E 02	3.01512E-02	1.00
4	1.73360E 02	3.98446E 02	7.01083E 02	9.71808E 04	5.60573E 02	2.60965E 02	3.01512E-02	1.00
5	2.22891E 02	7.01083E 02	1.08192E 03	2.01066E 05	9.02083E 02	3.41510E 02	3.01512E-02	1.00
6	2.72422E 02	1.08192E 03	1.53489E 03	3.59244E 05	1.31870E 03	4.16620E 02	3.01512E-02	1.00
7	3.21953E 02	1.53489E 03	2.05270E 03	5.80724E 05	1.80375E 03	4.85050E 02	3.01512E-02	1.00
8	3.71485E 02	2.05270E 03	2.62693E 03	8.72760E 05	2.34938E 03	5.45631E 02	3.01512E-02	1.00
9	4.21016E 02	2.62693E 03	3.24811E 03	1.24059E 06	2.94665E 03	5.97268E 02	3.01512E-02	1.00
10	4.70547E 02	3.24811E 03	3.90587E 03	1.68721E 06	3.58565E 03	6.38994E 02	3.01512E-02	1.00
11	5.20078E 02	3.90587E 03	4.58899E 03	2.21322E 06	4.25556E 03	6.69914E 02	3.01512E-02	1.00
12	5.69610E 02	4.58899E 03	5.28559E 03	2.81664E 06	4.94486E 03	6.89301E 02	3.01512E-02	1.00
13	6.19141E 02	5.28559E 03	5.98326E 03	3.49282E 06	5.64140E 03	6.96539E 02	3.01512E-02	1.00
14	6.68672E 02	5.98326E 03	6.66920E 03	4.23441E 06	6.33257E 03	6.91176E 02	3.01512E-02	1.00
15	7.18203E 02	6.66920E 03	7.33043E 03	5.03138E 06	7.00551E 03	6.72934E 02	3.01512E-02	1.00
16	7.67735E 02	7.33043E 03	7.95406E 03	5.87108E 06	7.64727E 03	6.41766E 02	3.01512E-02	1.00
17	8.17266E 02	7.95406E 03	8.52780E 03	6.73858E 06	8.24527E 03	5.98000E 02	3.01512E-02	1.00
18	8.66797E 02	8.52780E 03	9.04131E 03	7.61760E 06	8.78821E 03	5.42941E 02	3.01512E-02	1.00
19	9.16328E 02	1.80816E 04	1.89819E 04	1.69867E 07	1.85378E 04	9.74959E 03	3.01512E-02	1.00
20	9.65860E 02	1.89819E 04	1.98135E 04	1.87406E 07	1.94030E 04	8.65191E 02	3.01512E-02	1.00
21	3.00987E 02	0.0	0.0	0.0	0.0	-1.94030E 04	0.0	0.0
22	3.05492E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	3.09996E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	8.44327E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	8.76036E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	9.07746E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	9.39455E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	9.71165E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	1.00287E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	1.03458E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	1.06629E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	1.09800E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	1.12971E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	1.16142E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	1.19313E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	1.22484E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	1.25655E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	1.28826E 03	0.0	0.0	0.0	0.0	0.0	0.0	0.0

EXIT ENTHALPY= 1.98135E 04 WATER VOLUME= 9.90625E 03 REACTOR AVERAGE WATER DENSITY= 3.01512E-02

CASO CANDLE RICERCA VELENO DIPENDENTE DALL'ACQUA TIME STEP 2 TIME= 2.00000E 03

GROUP	MESH INTERVAL	BUCKLING						
1	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
1	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				
2	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
2	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				
3	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
3	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				
4	1- 7	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	8- 14	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	15- 21	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	22- 28	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	29- 35	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04	4.69700E-04
4	36- 38	4.69700E-04	4.69700E-04	4.69700E-04				

CASO CANDLE RICERCA VELENO DIP DENTE DALL'ACQUA TIME STEP 2 TIME= 2.00000E 03

ATOMIC DENSITIES OF BURNABLE ISOTOPES

ISOTOPE MESH INTERVAL	1 U-235	2 U-236	3 U-238	4 PU-239	5 PU-240	6 PU-241	7 PM-149	8 SM-149
1	2.81390E-04	6.39869E-06	7.06221E-03	1.36097E-05	6.87998E-07	1.29964E-07	1.40436E-08	2.57269E-08
2	2.81553E-04	6.36711E-06	7.06230E-03	1.35484E-05	6.81932E-07	1.28223E-07	1.39682E-08	2.57226E-08
3	2.81879E-04	6.30411E-06	7.06249E-03	1.34260E-05	6.69888E-07	1.24790E-07	1.38178E-08	2.57139E-08
4	2.82367E-04	6.20997E-06	7.06278E-03	1.32427E-05	6.52049E-07	1.19766E-07	1.35935E-08	2.57009E-08
5	2.83013E-04	6.08514E-06	7.06315E-03	1.29988E-05	6.28682E-07	1.13293E-07	1.32971E-08	2.56835E-08
6	2.83815E-04	5.93022E-06	7.06360E-03	1.26950E-05	6.00144E-07	1.05560E-07	1.29305E-08	2.56618E-08
7	2.84768E-04	5.74596E-06	7.06415E-03	1.23318E-05	5.66882E-07	9.67884E-08	1.24964E-08	2.56356E-08
8	2.85868E-04	5.53326E-06	7.06478E-03	1.19102E-05	5.29425E-07	8.72314E-08	1.19980E-08	2.56049E-08
9	2.87109E-04	5.29319E-06	7.06547E-03	1.14312E-05	4.88384E-07	7.71619E-08	1.14388E-08	2.55698E-08
10	2.88485E-04	5.02699E-06	7.06625E-03	1.08963E-05	4.44453E-07	6.68659E-08	1.08230E-08	2.55300E-08
11	2.89987E-04	4.73609E-06	7.06709E-03	1.03069E-05	3.98392E-07	5.66305E-08	1.01549E-08	2.54854E-08
12	2.91608E-04	4.42204E-06	7.06800E-03	9.66510E-06	3.51030E-07	4.67339E-08	9.43967E-09	2.54356E-08
13	2.93338E-04	4.08666E-06	7.06896E-03	8.97324E-06	3.03253E-07	3.74339E-08	8.68249E-09	2.53799E-08
14	2.95167E-04	3.73195E-06	7.06995E-03	8.23414E-06	2.55992E-07	2.89567E-08	7.88917E-09	2.53162E-08
15	2.97082E-04	3.36027E-06	7.07100E-03	7.45138E-06	2.10220E-07	2.14870E-08	7.06607E-09	2.52401E-08
16	2.99067E-04	2.97459E-06	7.07208E-03	6.62963E-06	1.66944E-07	1.51590E-08	6.22068E-09	2.51407E-08
17	3.01100E-04	2.57930E-06	7.07318E-03	5.77605E-06	1.27241E-07	1.00516E-08	5.36329E-09	2.49901E-08
18	3.03131E-04	2.18332E-06	7.07428E-03	4.90404E-06	9.23683E-08	6.18800E-09	4.51339E-09	2.47169E-08
19	3.05008E-04	1.81245E-06	7.07535E-03	4.04588E-06	6.42343E-08	3.54902E-09	3.72727E-09	2.41376E-08
20	3.06105E-04	1.56845E-06	7.07627E-03	3.30145E-06	4.74499E-08	2.13876E-09	3.23548E-09	2.28606E-08
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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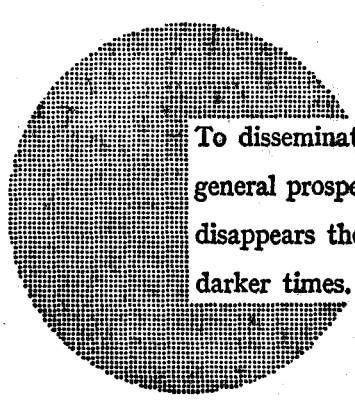

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Alfred Nobel

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