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Design Analysis Cover Sheet

Complete only applicable items.

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9. Lead Design Engineer	Dan Thomas	D.A. Thomas	09/02/97
10. Department Manager	Hugh Benton	Hugh A. Benton	9/2/97

11. REMARKS

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Table of Contents:

1. Purpose

The purpose of this design analysis is to determine the accuracy of the SAS2H module of SCALE 4.3 in predicting isotopic concentrations of spent fuel assemblies. The objective is to develop a methodology for modeling assemblies similar to those evaluated within this analysis and to establish the consistency of SAS2H predictions. The results of this analysis may then be applied to future depletion calculations using SAS2H in which no measurements are available.

2. Quality Assurance

The Quality Assurance (QA) program applies to this analysis. The work reported in this document is part of the Waste Package Design analysis that will eventually support the License Application Design phase. This activity, when appropriately confirmed, can impact the proper functioning of the Mined Geologic Disposal System (MGDS) waste package; the waste package has been identified as an MGDS Q-List item important to safety and waste isolation (pp. 4, 15, Reference 5.1). The waste package is on the Q-List by direct inclusion by the Department of Energy (DOE), without conducting a QAP-2-3 evaluation. The Waste Package Development Department (WPDD) responsible manager has evaluated this activity in accordance with QAP-2-0, *Conduct of Activities*. The *Perform Criticality, Thermal, Structural, and Shielding Analyses* (Reference 5.2) evaluation has determined the preparation and review of this design analysis is subject to *Quality Assurance Requirements and Description* (Reference 5.3) requirements. As specified in NLP-3-18, this activity is subject to QA controls.

The analysis described in this document supports development of the disposal criticality analysis methodology. No designs were analyzed in this document. This document will not directly support any construction, fabrication, or procurement activity and therefore is not required to be procedurally controlled as TBV (to be verified). The calculation design inputs or information used in this document come from data accepted by the Nuclear Regulatory Commission and by the scientific and engineering community as established fact. The specific references are listed in Section 5 and identified in Section 7. The information is therefore not treated as unqualified data.

3. Method

The analytical model employed for this analysis was the SAS2H module of the SCALE sequence. Based upon fuel design, power history, and operating data for specific assemblies in the Trino Vercelles pressurized water reactor (PWR), a computational model was developed for use with the SAS2H module of SCALE. The SAS2H module is used to perform a fuel depletion analysis to predict the isotopic concentrations in localized areas of assembly pins (pellet samples) subsequent to irradiation and cooling time. The isotopic concentrations predicted by the SAS2H module are then compared with measured concentrations of the same localized areas (axial locations) of the assembly pins to determine the accuracy of the developed model. The measured isotopic concentrations used for comparisons in the analysis are obtained from a separate report (Reference 5.5).

4. Design Inputs

The sources for the design parameters are References 5.4 through 5.7. Reference 5.4 provides information on the molar masses; the assembly design, power history and operating parameters are obtained from Reference 5.5; and a list of trace elements in the fuel is derived from Reference 5.6; and light elements from Reference 5.7.

4.1 Design Parameters

The molar masses of selected elements are obtained from Reference 5.4 and are provided below within three significant figures. Precision beyond three significant figures is not necessary since the calculated isotopic concentrations from SCALE are only to three significant figures. Also, the weight per mole of enriched uranium is approximated by the weight per mole of natural uranium since the weight percent of enrichment is small.

Mole of natural uranium = 238 g,
6.02×10^{23} atoms per mole (Reference 5.6)

General spent fuel characteristics for each sample are presented in Table 4-1 and include the initial ^{235}U enrichment, final burnup and the cooling time (Table 1, Reference 5.5). The initial enrichment ranges from 3.13 to 3.87 wt% ^{235}U and the burnup ranges from 11.529 to 24.548 GWd/MTU. The cooling time reflects that the measured isotopic concentrations were back-calculated to a "zero time". However, it is unknown whether the "zero time" is the time of shutdown or the time of discharge. Therefore, cooling time for the final cycle is specified as 10 days, since a shorter decay period would effect isotopes that come in part from the decay of short lived parent isotopes (pp. 7 and 10, Reference 5.5). Most notable is the decay of ^{239}U ($T_{1/2}$ = 23.5 m) and ^{239}Np ($T_{1/2}$ = 2.35 d) to form ^{239}Pu, which increases by roughly 1% during the first 10 days (pp. 7 and 10, Reference 5.5). The predicted concentration of ^{239}Pu relative to that which is measured, is used as an indication as to whether the zero day cooling time is appropriate.

Assembly design parameters are presented in Table 4-2 (Tables 2 and 3, Reference 5.5). Trino Vercelles utilizes two assembly types, the first is a Westinghouse 15 x 15 which has 16 outer cell positions removed so that the cruciform assemblies may fit between the square assemblies. A cross section of the square and cruciform assemblies as they fit together is presented in Figure 4-1, while the rod locations for the samples from each of the three square assemblies are included in Figures 4-2 through 4-4 (Figure 1, Reference 5.5). The cruciform assembly contains either Ag-In-Cd absorber rods, with moderator in the absorber cell positions when the absorber rods are withdrawn, or fuel rods with an enrichment of 2.72 wt % ^{235}U. The initial enrichment of the fuel rods in the cruciform assembly and the square assembly are given in Table 4-3 for each of the three assemblies (Table 4, Reference 5.5). The absorber rod composition was not known and therefore is approximated by the composition of an absorber rod from a similar design (Yankee Rowe) and is presented in Table 4-4 (Table 3 and p. 14, Reference 5.5). The fuel stack density was calculated for

the square assembly using the pellet diameter, active fuel length, number of fuel rods and weight of uranium per assembly.

General operating data is given in Table 4-5 and power histories for each assembly during the two cycles of irradiation are presented in Table 4-6 (Tables 5 and 8, Reference 5.5). The assemblies 509-104 and 509-032 were irradiated for 1 cycle while assembly 509-069 was irradiated for two cycles. The first cycle contained two intervals of downtime and therefore is divided into three periods. The boron concentration for cycle 2 was taken as the average for cycle 1, which ranged from 1300 ppm to 0 ppm. The cumulative burnup was only available for assembly 509-069, Table 4-5, and then applied to each sample's final burnup and length of cycles to determine the specific powers.

The operating temperatures are included in Tables 4-5 and 4-7 for the moderator and fuel (Tables 5 and 7, Reference 5.5). The moderator temperatures were calculated by a sinusoidal function of axial height, and inlet and outlet temperatures. The densities for the moderator were derived from correlations using the temperature and pressure data. Cladding and fuel temperatures were approximated using data from Yankee Rowe which is of a similar design (p. 13, Reference 5.5).

A list of trace elements in the fuel used in updating cross sections during the depletion analysis is presented in Table 4-8 and developed with consideration of elements used in (Table 1, Reference 5.6). A generic set of light element weights for PWRs that is typically used in depletion analyses is included in Table 4-9 (Table 17, Reference 5.7). Variations in light element masses per unit fuel in different PWRs are small when compared to this generic set (p. 2-2, Reference 5.9). This data is provided in units of kg/MTUO_2 or kg/MTU depending on the units required in the analysis.

Measured isotopic concentrations are presented in Table 4-10 and are given in mg/gU (Appendix D, Reference 5.5). The radiochemical analyses were performed for 14 samples coming from three different assemblies, and five different axial heights.

Table 4-1. Spent Fuel Characteristic Parameters for Trino Vercelles PWR

Test Assembly (Rod Number)	Axial Level Number	Axial Location from Bottom, cm	Enrichment, wt % ^{235}U	Burnup, GWd/MTU	Cooling Time, days
509-104 (M11)	7	79.2	3.87	12.042	0
509-032 (E11)	4	158.5	3.13	15.377	0
	7	79.2		15.898	0
	9	26.4		11.529	0
509-069 (E11)	1	237.7	3.13	12.859	0
	2	211.3		20.602	0
	4	158.5		23.718	0
	7	79.2		24.304	0
509-069 (E05)	4	158.5		23.867	0
	7	79.2		24.548	0
509-069 (L11)	4	158.5		23.928	0
	7	79.2		24.362	0
509-069 (L5)	4	158.5		24.330	0
	7	79.2		24.313	0

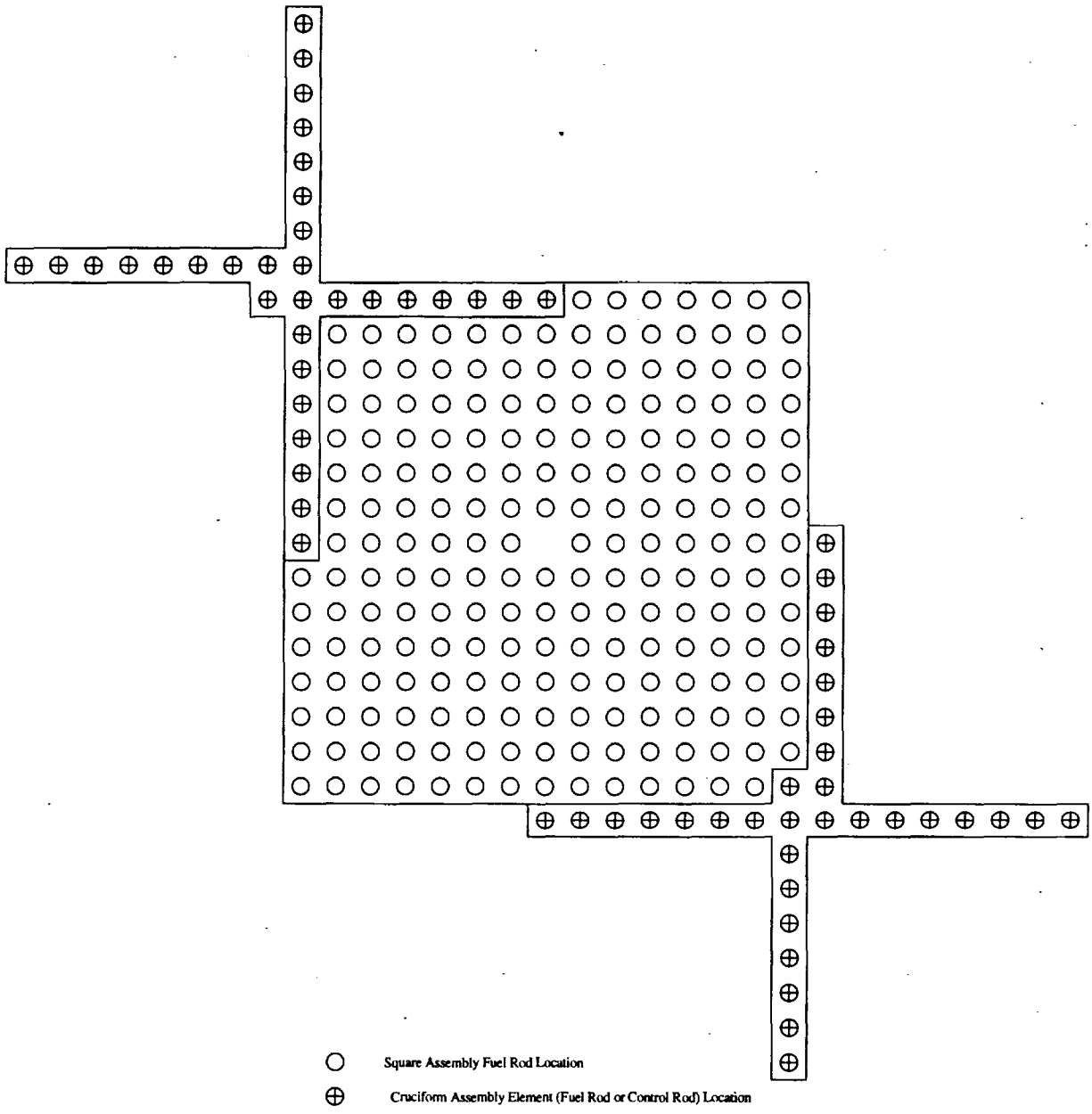
Reference 5.5

Table 4-2. Assembly Design Parameters for Trino Vercelles PWR

Parameter	Data
Square Fuel Assembly Data:	
Designer	Westinghouse
Lattice	15 x 15
Square Assemblies/Core, Cycle 1 (Cycle 2)	120 (112)
Number of Fuel Rods	208
Number of Inner Holes	1
Assembly Fuel, kg UO_2	353.81
Assembly Tube Outer Side, cm	20.1
Channel Tube Thickness, cm	0.06
Channel Tube Material	SS-304
Fuel Rod Data:	
Type of Fuel Pellet	UO_2
Pellet Stack Density, g/cm^3	10.079
Rod Pitch, cm	1.303
Rod Outside Diameter (OD), cm	0.9786
Rod Inside Diameter (ID), cm	0.9020
Active Fuel Length, cm	264.1
Clad Material	SS-304
Cruciform Fuel Assembly Data:	
Number of Cruciform Assemblies/Core	24
Fuel Weight/Assembly, kg UO_2	44
Cruciform Control Rod Data:	
Number of Control Assemblies/Core	28
Number of Absorber Rods/Control Rod	32
Absorber Rod OD, cm	1.001
Absorber Rod Clad Thickness, cm	0.0432

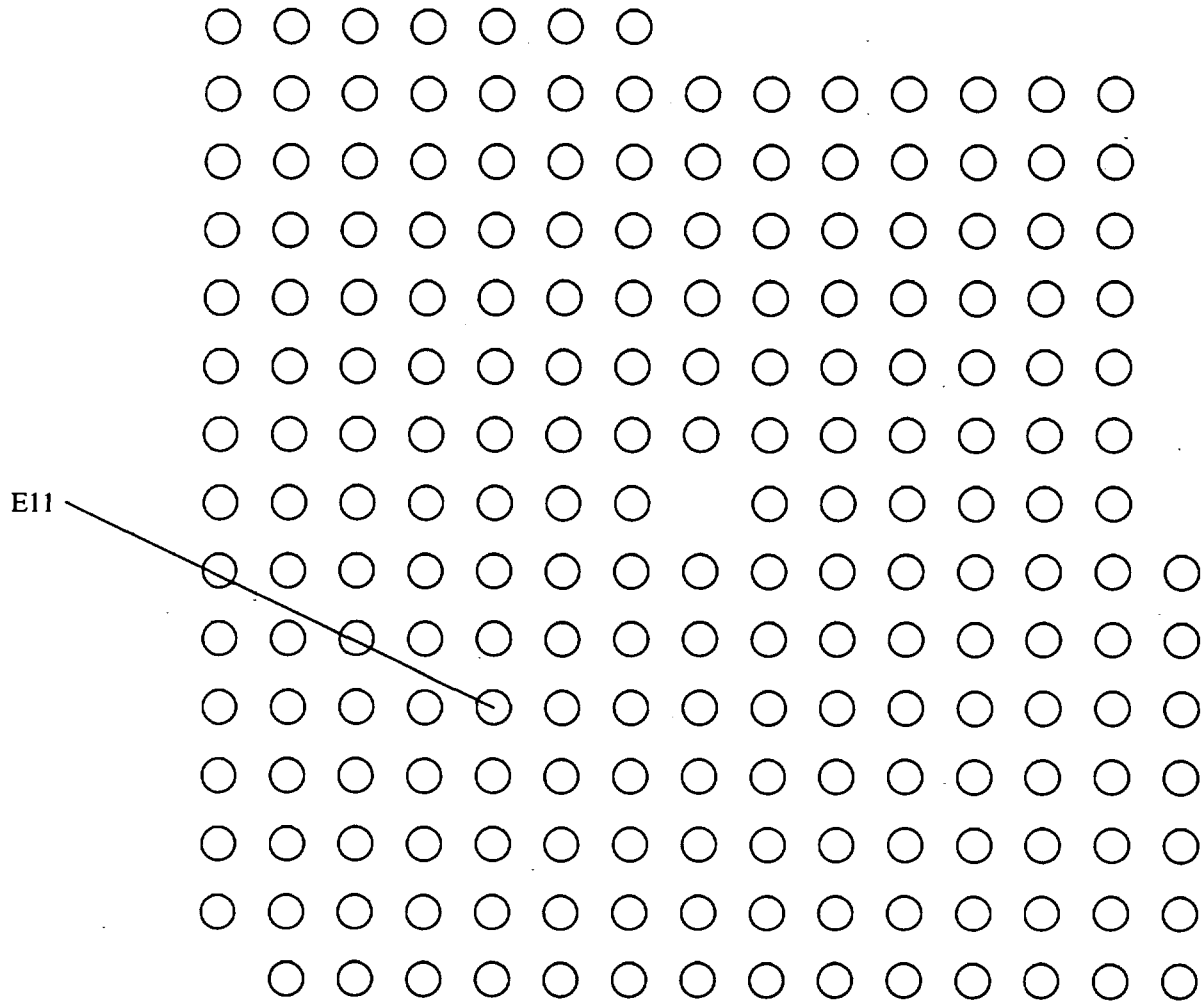
Reference 5.5

Figure 4-1. Cross Section of the Square and Cruciform Assemblies for Trino Vercelles



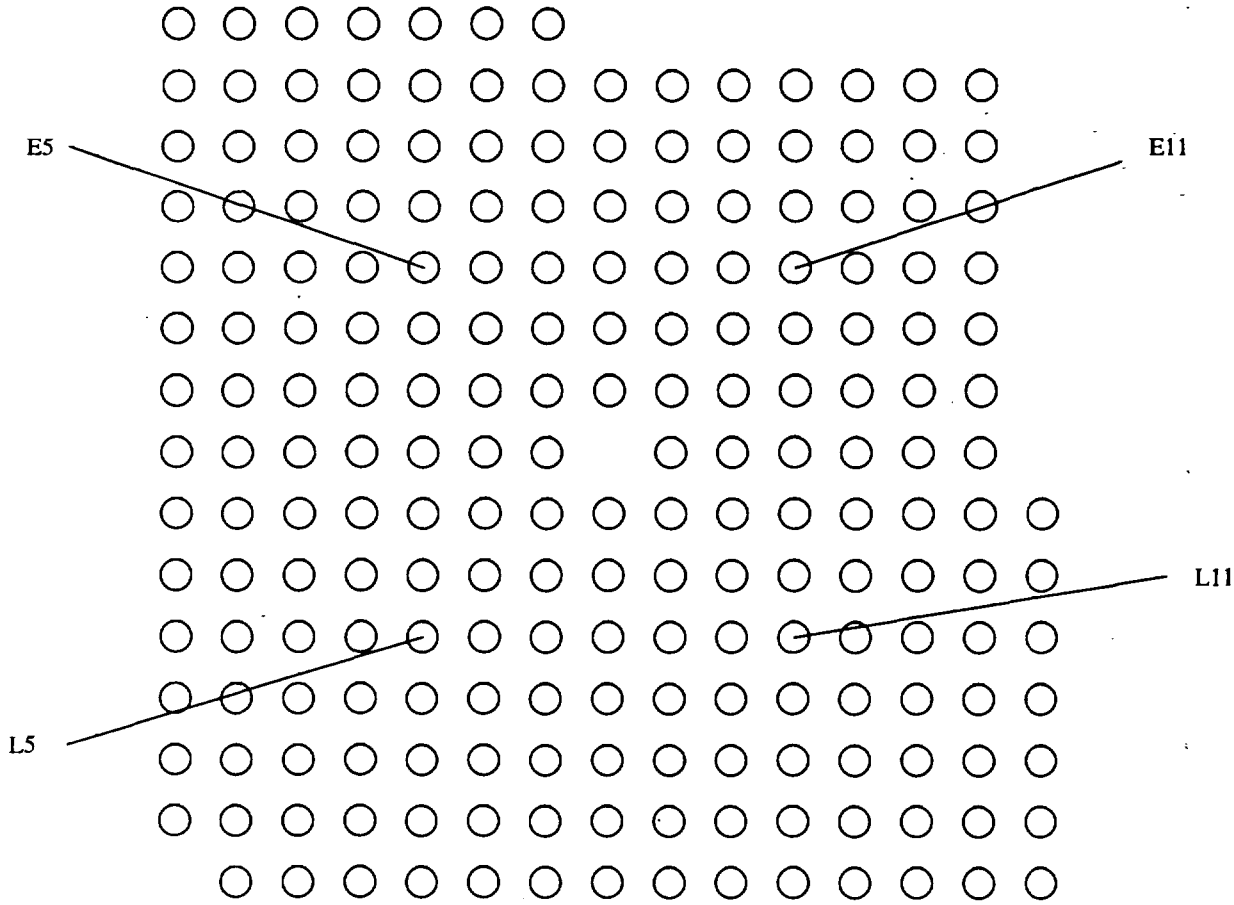
Reference 5.5

Figure 4-2. Fuel Rod Locations for Assembly 509-032



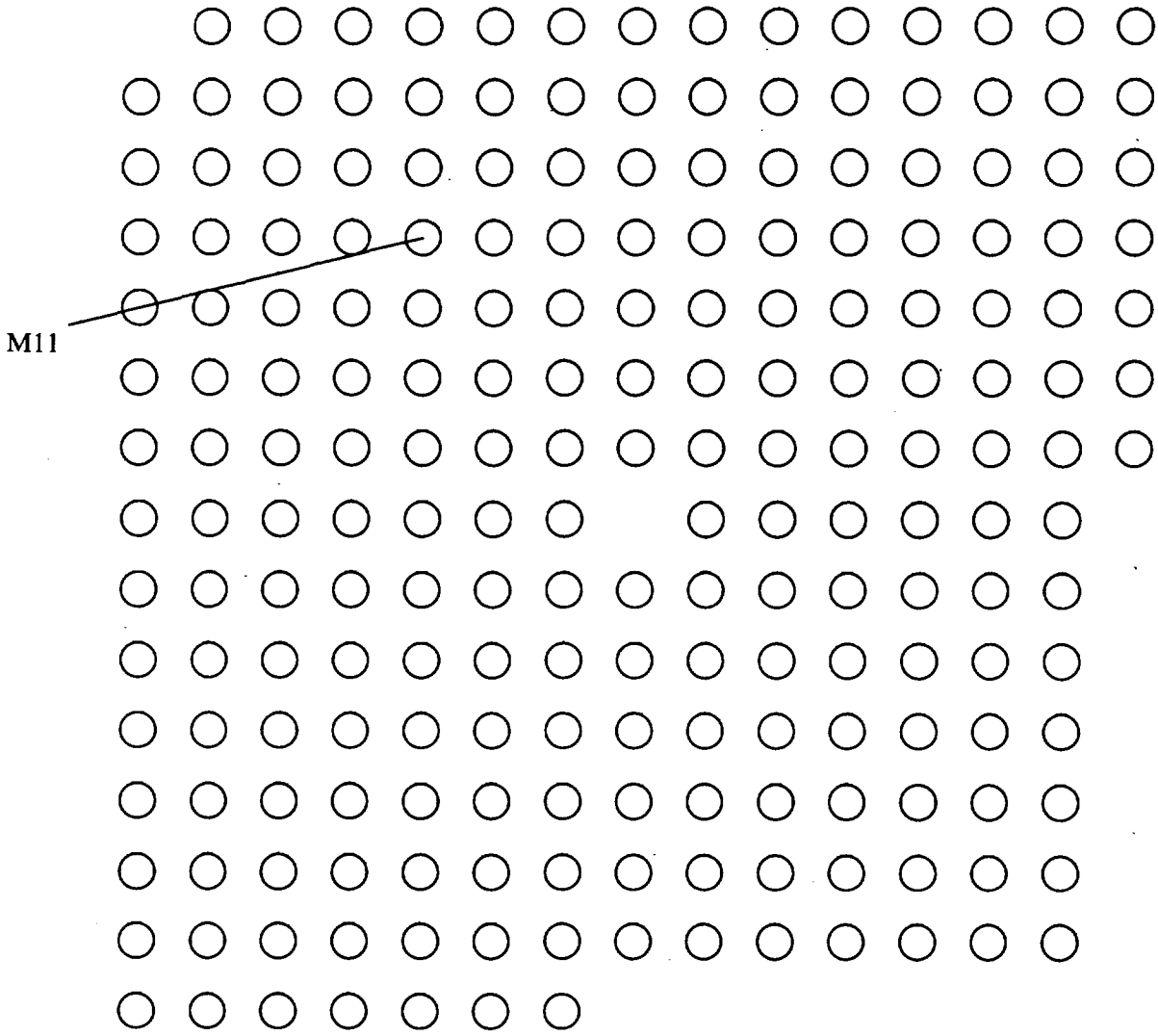
Reference 5.5

Figure 4-3. Fuel Rod Locations for Assembly 509-069



Reference 5.5

Figure 4-4. Fuel Rod Locations for Assembly 509-104



509-104

Reference 5.5

Table 4-3. Initial Fuel Composition for Trino Vercelles PWR

Uranium Isotope	**Assembly Identification Number**		
	509-104	**509-32**	**509-069**
wt % ^{235}U	3.897	3.13	3.13
wt % ^{234}U	0.035	0.028	0.028
wt % ^{236}U	0.018	0.014	0.014
wt % ^{238}U	96.050	96.828	96.828

Reference 5.5

Table 4-4. Absorber Rod Composition

Material	**Weight Percent**
Ag	80
In	15
Cd	5
Density, g/cm^3	10.159

Reference 5.5

Table 4-5. Core Operating Data for Trino Vercelles PWR

Parameter	**Cycle/Period Data**			
Cycle	1	1	1	2
Period	I	II	III	I
Starting Date	10/23/64	8/31/65	7/11/66	5/20/70
Uptime, days	226	263	292	416
Downtime, days	86	51	1117	See Table 4-1
Cladding Temperature, K	570	570	570	570
Coolant Average Temperature, K	282	278	278	269
Control Rod Insertion, %	30	4	4	0
Average Boron, ppm	1175	850	325	650
509-069 Burnup, GWd/MTU	2.726	4.927	6.327	7.720
Core Burnup, GWd/MTU	2.260	4.085	5.245	NA

Reference 5.5

Table 4-6. Operating Data for Trino Vercelles PWR

Assembly Identification Number	**509-104**	**509-032**	**509-032**	**509-032**	**509-069**	**509-069**	**509-069**
Fuel Rod Location	M11	E11	E11	E11	E11	E11	E11
Axial Level No.	7	4	7	9	1	2	4
Burnup, GWd/MTU	12.042	15.377	15.898	11.529	12.859	20.602	23.718
Specific Power, MW/MTU							
Cycle 1, I	10.390	13.268	13.717	9.947	7.148	11.452	13.184
Cycle 1, II	16.138	20.607	21.309	15.451	11.101	17.786	20.476
Cycle 1, III	18.663	23.831	24.639	17.868	12.840	20.571	23.683
Cycle 2	-	-	-	-	10.997	17.619	20.283
Assembly Identification Number	**509-069**	**509-069**	**509-069**	**509-069**	**509-069**	**509-069**	**509-069**
Fuel Rod Location	E11	E5	R5	L11	L11	L5	L5
Axial Level No.	7	4	7	4	7	4	7
Burnup, GWd/MTU	24.304	23.867	24.548	23.928	24.362	24.330	24.313
Specific Power, MW/MTU							
Cycle 1, I	13.509	13.266	13.645	13.300	13.542	13.524	13.514
Cycle 1, II	20.982	20.605	21.193	20.657	21.032	21.004	20,990
Cycle 1, III	24.268	23.832	24.512	23.893	24.326	24.294	24.277
Cycle 2	20.785	20.411	20.993	20.463	20.834	20.807	20.792

Reference 5.5

Table 4-7. Operating Temperatures for Trino Vercelles PWR

Level No.	Effective Fuel Temperature, K		Effective Water Temperature, K		Water Density, g/cm^3	
	Cycle 1	Cycles 1 and 2	Cycle 1	Cycles 1 and 2	Cycle 1	Cycle 2
1	915	915	567	563	0.7365	0.7555
2	968	968	565	561	0.7407	0.7595
4	1015	1015	557	553	0.7554	0.7730
7	1001	1001	543	540	0.7795	0.7953
9	927	927	537	534	0.7885	0.8032

Reference 5.5

Table 4-8. Nuclides Updated in SAS2H

^{83}Kr	^{85}Kr	^{89}Y	^{90}Sr	^{95}Mo	^{93}Zr
^{94}Zr	^{94}Nb	^{95}Zr	^{99}Tc	^{101}Ru	^{103}Rh
^{105}Rh	^{106}Ru	^{105}Pd	^{108}Pd	^{109}Ag	^{124}Sb
^{131}Xe	^{132}Xe	^{134}Cs	^{135}Xe	^{135}Cs	^{136}Xe
^{136}Ba	^{137}Cs	^{139}La	^{141}Pr	^{143}Pr	^{143}Nd
^{144}Ce	^{145}Nd	^{147}Nd	^{147}Pm	^{147}Sm	^{148}Pm
^{149}Sm	^{150}Sm	^{151}Sm	^{152}Sm	^{153}Eu	^{154}Eu
^{155}Gd	^{155}Eu				

Reference 5.6

Table 4-9. Light Element Mass per Unit of Fuel for a Typical PWR

Element	kg/MTU
O	135.0
Cr	5.9
Mn	0.33
Fe	13.0
Co	0.075
Ni	9.9
Zr	221.0
Nb	0.71
Sn	3.6

Reference 5.7

Table 4-10. Measured Isotopic Concentrations (mg/gU)

Assembly	509-104 M11	509-032 E11	509-032 E11	509-032 E11	509-069 E11	509-069 E11	509-069 E11
Location	7	4	7	9	1	2	4
Burnup, GWd/MTU	12.042	15.377	15.898	11.529	12.859	20.602	23.718
^{235}U	2.662E01	1.728E01	1.661E01	2.017E01	1.946E01	1.436E01	1.248E01
^{236}U	2.736E00	2.834E00	2.739E00	2.502E00	2.453E00	3.317E00	3.610E00
^{238}U	9.513E02	9.558E02	9.558E02	9.595E02	9.587E02	9.518E02	9.493E02
^{239}Pu	4.586E00	5.266E00	5.234E00	4.418E00	4.580E00	5.755E00	5.895E00
^{240}Pu	7.165E-01	1.118E00	1.137E00	7.750E-01	8.400E-01	1.520E00	1.755E00
^{241}Pu	3.475E-01	6.140E-01	6.180E-01	3.690E-01	4.000E-01	8.850E-01	1.030E00
^{242}Pu	3.135E-02	8.638E-02	9.487E-02	3.803E-02	4.600E-02	1.720E-01	2.435E-01
^{243}Am	-	-	-	-	-	2.394E-02	4.533E-02
Assembly	509-069 E11	509-069 E5	509-069 E5	509-069 L11	509-069 L11	509-069 L5	509-069 L5
Location	7	4	7	4	7	4	7
Burnup, GWd/MTU	24.304	23.867	24.548	23.928	24.362	24.330	24.313
^{235}U	1.235E01	1.291E01	1.221E01	1.282E01	1.225E01	1.297E01	1.231E01
^{236}U	3.638E00	3.520E00	3.540E00	3.753E00	3.465E00	3.471E00	3.569E00
^{238}U	9.492E02	9.492E02	9.483E02	9.485E02	9.482E02	9.486E02	9.472E02
^{239}Pu	6.070E00	5.950E00	5.980E00	6.060E00	5.995E00	6.060E00	5.970E00
^{240}Pu	1.825E00	1.760E00	1.785E00	1.790E00	1.810E00	1.770E00	1.790E00
^{241}Pu	1.060E00	1.050E00	1.055E00	1.050E00	1.055E00	1.060E00	1.060E00
^{242}Pu	2.575E-01	2.400E-01	2.540E-01	2.470E-01	2.590E-01	2.440E-01	2.500E-01
^{243}Am	4.584E-02	-	4.615E-02	4.452E-02	4.247E-02	-	-

Reference 5.5

4.2 Criteria

The design of the waste package will depend on waste package configuration criticality analyses performed using an acceptable disposal criticality analysis methodology. Criteria that relate to the development and design of repository and engineered barrier components are derived from the applicable requirements and planning documents. The Engineered Barrier Design Requirements Document (EBDRD, Reference 5.10) provides requirements for engineered barrier segment design. The Repository Design Requirements Document (RDRD, Reference 5.11) provides requirements for repository design. The Controlled Design Assumptions Document (Reference 5.12) provides guidance for requirements listed in the EBDRD and RDRD which have unqualified or unconfirmed data associated with the requirement.

This analysis supports the disposal criticality analysis methodology by providing input, in the form of fuel depletion results, to benchmark calculations which address the prediction of both spent fuel isotopic compositions and their associated reactivity. These benchmark calculations will contribute to the determination of bias values in the method of critical multiplication factor calculation that is implemented by the analytic tools to be used in the disposal criticality methodology. The requirements for utilizing the bias in the method of calculation of the critical multiplication factor for disposal configurations containing spent nuclear fuel are located in Section 3.2.2.5 of the RDRD and Section 3.2.2.6 of the EBDRD. This analysis does not satisfy these requirements, but the results from this analysis will be used as input to subsequent analyses which will satisfy these requirements.

4.3 Assumptions

4.3.1 Measured isotopic concentrations from Reference 5.5 are calculated and corrected to either the time of shutdown or the time of discharge. Since it is unclear which time the concentrations are back-calculated to, a cooling time of 10 days is assumed. The basis for this assumption is that a decay period longer than 10 days does not significantly effect isotopic concentrations, but a shorter decay period effects concentrations of those isotopes with short lived parents, specifically ^{239}Pu which increases by approximately 1% in the first ten days. This assumption is used in Section 7.5.

4.4 Codes and Standards

There are no applicable codes or standards for this design analysis.

5. References

5.1 *Yucca Mountain Site Characterization Project Q-List*, YMP/90-55Q REV 4, Yucca Mountain Site Characterization Project.

5.2 *QAP-2-0 Activity Evaluations: ID #WP-20, Perform Criticality, Thermal, Structural, and Shielding Analyses*, Civilian Radioactive Waste Management System (CRWMS) Management and Operating Contractor (M&O), August 3, 1997.

5.3 *Quality Assurance Requirements and Description*, DOE/RW-0333P REV 7, U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management (OCRWM).

5.4 *Nuclides and Isotopes*, General Electric Company, 14ed., 1989.

5.5 *An Extension of the Validation of SCALE (SAS2H) Isotopic Prediction for PWR Spent Fuel*, ORNL/TM-13317, Oak Ridge National Laboratory, September 1996.

5.6 *SCALE-4 Analysis of Pressurized Water Reactor Critical Configurations: Volume 2-Sequoyah Unit 2 Cycle 3*, ORNL/TM-12294/V2, March 1995.

5.7 *Validation of the Scale System for PWR Spent Fuel Isotopic Composition Analyses*, ORNL/TM-12667, Oak Ridge National Laboratory, March 1995.

5.8 *SCALE 4.3, A Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluation for Workstations and Personal Computers*, NUREG/CR-0200 REV 5, ORNL/NUREG/CSD-2/R5, Volumes 1-3, Oak Ridge National Laboratory.

5.9 *Software Qualification Report for the SCALE Modular Code System*, Document Identifier Number: 30011-2002 REV 01, CRWMS M&O.

5.10 *Engineered Barrier Design Requirements Document*, YMP/CM-0024, REV 00, ICN 01, DOE OCRWM.

5.11 *Repository Design Requirements Document*, YMP/CM-0023, REV 00, ICN 01, DOE OCRWM.

5.12 *Controlled Design Assumptions Document*, DI#: B00000000-01717-4600-00032 REV 04, ICN 01, CRWMS M&O.

6. Use of Computer Software

A. Reference 5.8 describes the SAS2H module of SCALE 4.3 that is used with the 44GROUPNDF5 cross section library to calculate the isotopic concentrations for the specified burnup and cooling time. The computer code's spatially independent point depletion model is appropriate for comparison with pellet sample measurements, and is used within the range of validation, as described in Reference 5.9, in accordance with the QAP-SI series procedures. SCALE is obtained from the Software Configuration Management in accordance with appropriate procedures. SCALE's CSCI number is 30011 V4.3 and is installed on the WPDD HP 9000, 700 Workstation with CRWMS M&O tag number 110433.

B. *Lotus 1-2-3* Release 5 for Windows 95 is an Acquired Software spreadsheet program as defined in QAP-SI-0. User defined formulas and/or algorithms, inputs and results, are documented in the appropriate sections.

7. Design Analysis

The SAS2H module of SCALE 4.3 is used to perform one-dimensional (1-D) neutron transport and point depletion analyses on the Trino Vercelles samples using the preferred 44GROUPNDF5 cross-section library. To properly model the neutron flux spectrum and the nuclide composition changes, it is necessary to define the materials, temperatures, and geometry of the fuel assembly. This is accomplished with the use of data blocks in which similar parameters are grouped together.

7.1 SCALE Input Data Blocks 1, 2, and 3

Data blocks 1 through 3 define the SCALE module to be used, the title of the input file, the cross section library to be used, and the lattice type to be modeled. The module used is SAS2H and the cross sectional library is 44GROUPNDF5, abbreviated as 44GROUP. The 44GROUP cross section library is recommended by Oak Ridge National Laboratory. Since SAS2H is only to be used for isotopic depletion/generation, the 'parm=skipshipdata' option is used so that a shipping cask shielding analysis is not performed. The title is arbitrary and should contain information that is sample specific, while the lattice type is "latticecell" to reflect the array characteristic of the assembly.

7.2 SCALE Input Data Block 4

Data block 4 defines the material compositions present in the assembly. A unique mixture number is assigned to each composition, and follows the form of mixture 1 for fuel, mixture 2 for cladding and mixture 3 for moderator.

The fuel mixture is specified as UO_2 using the density and isotopic weight percentages from Tables 4-2 and 4-3 and the fuel temperature is obtained from Table 4-7. Isotopes which are selected as needing their cross sections updated during the depletion analysis are included in the fuel mixture. A standard list of trace fuel elements is given in Table 4-8 and defined in the fuel mixture to have a concentration of 10^{-20} atoms/barn·cm. The cladding material of stainless steel 304 is defined by 'ss304' with the temperature given in Table 4-7. Finally, the absorber material is defined as mixture 4 with the density and composition given in Table 4-4.

It was discovered that the temperature is incorrectly specified for the trace elements in the input file for the sample at axial height 4 of rod L11 from assembly 509-069. A temperature of 1001 K is specified when a temperature of 1015 K should have been specified. However, the correct temperature was specified for the fuel component of the same mixture. When different temperatures are specified for the same mixture, the SAS2H code uses the higher temperature of the two, in this case 1015 K. Therefore, the correct temperature was used during the calculation.

The moderator temperature, density and boron concentration are given in Tables 4-5 and 4-7 and is composed of H_2O and boron. The boron is defined as an arbitrary material with the moderator

density and temperature, with a volume fraction equal to the average boron concentration of Cycle 1 Period I, and a standard boron composition of from the Standard Composition Library designated as 5000.

7.3 SCALE Input Data Blocks 5 Through 7

The unit fuel rod cell geometry is defined in data block 5. The 'squarepitch' designation for the type of lattice is appropriate since the fuel assembly consists of a square array of fuel rods. Fuel rod, cladding and pitch dimensions are given in Table 4-2 with the mixture number for each composition defined in Section 7.2. The gap mixture is defined as 0.

Data block 6 allows the user to specify such parameters as the spatial mesh, angular quadrature and the convergence criteria. It is determined that the default values are sufficient and such options are not used in this design model.

In data block 7 the user defines general assembly data and determines the level of detail in which the assembly is to be modeled. The number of fuel rods per assembly is given in Table 4-2 and the length is calculated so that an assembly contains 1 MTU, using the following equation:

$$Length = \frac{1}{\frac{\pi}{4}(POD)^2(PDen)(NFR)} * \frac{270 gUO_2}{238 gU} * \frac{10^6 gU}{1 MTU} \qquad \text{Equation 7-1}$$

Where:

Length = Length Required for an Assembly to Contain 1 MTU (cm)
POD = Fuel Pellet Diameter (cm)
PDen = Fuel Pellet Stack Density (gUO_2/cm^3)
NFR = Number of Fuel Rods

Since, measured isotopic concentrations are presented in milligrams of isotope per grams of uranium and SCALE presents concentrations in grams of isotope per assembly, it is possible to alter the length so that the assembly contains 1 MTU. This is possible since the 1-D transport calculation is axially independent, consequently the length of the assembly does not impact the neutron flux spectrum nor the nuclide cross sections. The resulting length for Trino Vercelles assemblies is 823.10 cm.

Each assembly was irradiated for one or two cycles. It is determined that approximately 80 days per cross section library is sufficient to accurately model the change in nuclide cross sections with increasing burnup, without over-burdening the SAS2H code. Therefore, the number of libraries per cycle are specified as five. To obtain the concentrations of all interested nuclides, a print level of 5 is chosen, while an input level of 2 is defined so that a Path B model may be utilized. The number of light elements is nine and is determined from Table 4-9, while the number of zones is three or

five, depending on the presence of the absorber rod, which is determined by the Path B model described in Section 7.4.

SAS2H calculates a linear boron concentration let down over each cycle when the number of libraries per cycle are specified as greater than one. The methodology calculates an initial boron concentration equal to 1.9 times the average boron concentration and a final boron concentration calculated as 0.1 times the average boron concentration. These two end points are used to determine a linear fit for the boron concentration let down, which is used to calculate the boron concentrations for each library in the cycle. However, a problem arises when the cycle specified is not a full cycle but rather an interval of a cycle. (It is sometimes necessary to specify an interval as a cycle in SAS2H so that either a period of downtime during the actual cycle or a power change during the actual cycle may be modeled.) In this case SAS2H would let down the boron concentration to 0.1 times the average boron concentration for the first interval and jump up to 1.9 times the average boron concentration for the beginning of the second cycle. In reality, this jump does not exist and, therefore, the modeling of the boron concentration let down is inexact. A solution to this problem would be to split all cycles into approximately 80 day intervals and change the number of libraries per cycle to one. However, experience with the SAS2H code indicates that the error due to an inexact boron concentration let down function, such as described here, is usually less than 0.5%. Therefore, allowing the SAS2H code to perform a boron concentration over an interval of a cycle is an acceptable approximation to the actual boron concentration let down.

7.4 SCALE Input Data Block 8

Unfortunately, the exact locations of control rod cruciform assemblies and fuel rod cruciform assemblies are not known. However, it is known that there are 32 fuel rods per fuel cruciform assembly and 24 fuel cruciform assemblies in a core containing 120 square assemblies. Thus, it is possible to find an average number of fuel rods from the fuel cruciform assembly to be added to a square assembly. The result is an average of 6 fuel rods from a fuel cruciform assembly and 10 absorber rods from the absorber cruciform assembly to be added to the square assembly. Furthermore, the fuel rods from the fuel cruciform assemblies are approximated as having the same properties, including initial enrichments, as the fuel rods from the square assembly. This creates an effective square assembly in which there are 214 fuel rods, one centrally located empty fuel cell, and 10 absorber rod cells on the outside of the assembly, that contain moderator when the absorber rods are withdrawn.

The Path B model for Trino Vercelles is dependent upon whether the control rods are inserted to the axial height of the sample, since the effects of the absorber rods are determined to be negligible if the absorber rods are not inserted to the axial height of the sample. The control rods were inserted 30% for period I of cycle 1, 4% for the rest of the first cycle, and were not inserted for cycle 2. Therefore, the effects of the absorber rods are only modeled at an axial height of 185 cm or greater, from the bottom of the assembly during period I of cycle 1. For the remainder of cycle 1 and cycle 2 the effects of the abosorber rods are not experienced by any of the samples.

If it is determined that the sample does not experience the effects of the absorber rods, then the model centralizes an empty unit cell surrounded by an homogenized fuel and moderator mixture, that conserves the fuel to moderator volume ratio, and further surrounded by the assembly casing. The equation below is used to determine the number of fuel unit cells that surround the empty unit cell. All of the following equations used to calculate the Path B model dimensions are derived. The results of the fuel-unit-cell calculations are presented in Table 7-1, and the resulting Path B model dimensions are presented in Table 7-2.

$$x = \frac{(\frac{F}{M})(CUCMV)}{(FV)-(\frac{F}{M})(MV)} \qquad \text{Equation 7-2}$$

$$\frac{F}{M} = \frac{(NFR)(\frac{\pi}{4})(POD)^2}{(NFR)[RP^2-(\frac{\pi}{4})(COD)^2]+(NHole)[RP^2]} \qquad \text{Equation 7-3}$$

$$CUCMV = RP^2 \qquad \text{Equation 7-4}$$

$$FV = (\frac{\pi}{4})(POD)^2 \qquad \text{Equation 7-5}$$

$$MV = RP^2-(\frac{\pi}{4})(COD)^2 \qquad \text{Equation 7-6}$$

Where:

x = Number of Unit Fuel Cells per Empty Unit Cell
F/M = Fuel to Moderator Volume Ratio
NFR = Number of Fuel Rods
POD = Fuel Pellet Outer Diameter
RP = Rod Pitch
COD = Cladding Outer Diameter
NHole = Number of Empty Unit Cells
CUCMV = Central Unit Cell Moderator Volume
FV = Fuel Volume of One Fuel Unit Cell
MV = Moderator Volume of One Fuel Unit Cell

Once the number of fuel cells per empty unit cell is determined the geometry of the Path B model is determined. Since the empty unit cell is centralized, the radius for the moderator is calculated with the following equation:

$$R_1 = \sqrt{(\frac{1}{\pi})RP^2} \qquad \text{Equation 7-7}$$

Where:

R_1 = Radius of Moderator Surrounding Empty Unit Cell

The area of an annular region is calculated by the difference between the outer circular area and the inner circular area. Equation 7-8 is the basis for the Equations 7-9 and 7-10 which determine the radii of the homogenized fuel zone and the outer moderator zone.

$$ARA = \pi(ORAR^2 - IRAR^2) \qquad \text{Equation 7-8}$$

Where:

ARA = Annular Region Area
ORAR = Outer Radius of Annular Region
IRAR = Inner Radius of Annular Region

The area of the homogenized fuel zone surrounding the empty unit cell is equal to the number of fuel unit cells surrounding the empty unit cell multiplied by the area of a fuel unit cell. Consequently, the radius of the homogenized fuel zone is computed with the following equation:

$$R_2 = \sqrt{(\frac{x}{\pi})RP^2 + R_1^2} \qquad \text{Equation 7-9}$$

Where:

R_2 = Radius of Homogenized Fuel and Moderator Zone

The mixture number of the homogenized fuel and moderator mixture must be specified as 500. The code then determines the composition of the region using cell averages or homogenized densities of the fuel rod cell.

The Trino Vercelles reactor assembly is surrounded by a stainless steel channel casing. The total casing volume is determined by the thickness and the outer width. The radius of the stainless steel casing is calculated from the following equation:

$$R_3=\sqrt{\frac{(x+1)}{\pi*NCell}[AW^2-(AW-thick)^2]+R_2^2} \qquad \text{Equation 7-10}$$

Where:

R_3 = Radius of Assembly Casing Zone
AW = Assembly Outside Width
thick = Thickness of Casing

If the sample is located at an axial height in which the control rod is inserted, then the model includes the absorber rods. In this model, the absorber rod unit cell is centralized with a surrounding homogenized fuel and moderator zone and surrounding assembly casing. The radii for the first two zones are the radii for the absorber rod, with corresponding absorber and cladding material. The third zone is the moderator surrounding the absorber rod and the radius is calculated with Equation 7-7.

The radii for the surrounding homogenized fuel and moderator, and the surrounding assembly casing are determined using the same Equations 7-9 and 7-10, respectively. However, the calculation of 'x' is different in that the equations for the fuel to moderator ratio and the central unit cell moderator volume are slightly altered, as shown below in equations 7-11 and 7-12.

$$\frac{F}{M}=\frac{(NFR)(\frac{\pi}{4})(POD)^2}{(NFR)[RP^2-(\frac{\pi}{4})(COD)^2]+(NA)[RP^2-(\frac{\pi}{4})(AOD^2)]+[RP^2]} \qquad \text{Equation 7-11}$$

Where:

NA = Number of Absorber Rods
AOD = Absorber Rod Outer Diameter

$$CUCMV=RP^2-(\frac{\pi}{4})(AOD)^2 \qquad \text{Equation 7-12}$$

Table 7-1. Calculation of Fuel Unit Cell per Guide Tube Unit Cell

Centralized Region	F/M	CUCMV, cm²	FV, cm²	MV, cm²	x
Empty Unit Cell	0.6186	1.6978	0.6390	0.9457	19.4545
Absorber Rod	0.6415	0.9108	0.6390	0.9457	18.0337

Table 7-2. Path B Model Dimensions

	Empty Unit Cell		Absorber Rod	
	Radius, cm	**Composition**	**Radius, cm**	**Composition**
R_1	0.7351	Moderator	0.4573	Absorber
R_2	3.3248	Fuel/Mod.	0.5005	SS-304
R_3	3.3353	SS-304	0.7351	Moderator
R_4	NA	NA	3.2076	Fuel/Mod.
R_5	NA	NA	3.2177	SS-304

7.5 SCALE Input Data Blocks 9 Through 16

Data block 9 is used to describe the power history of the reactor. The specific power, fuel irradiation period, the length of downtime, the fraction of boron and moderator density, and the temperature during the cycle may all be defined. The specific power is in units of MW/MTU while the irradiation period and length of downtime are both defined in days and are found in Tables 4-5 and 4-6. The boron and moderator density fractions are determined by dividing the cycle, or period, value by the value specified in data block 4, using the following command options: 'bfrac=' for boron fraction, and 'h2ofrac=' for the moderator density fraction. The fuel temperatures were provided as an average over both cycles and therefore the option to specify the cycle specific temperature is not used.

Light elements and their effective weight, in kg per assembly, are entered in data block 10. Table 4-9 provides a generic set of light elements and their weights, in kg per MTU. Since the fuel length is altered so that there is 1 MTU per assembly the use of light elements with weights of kg per MTU is appropriate.

Data blocks 11 through 15 describe parameters used in the radial shielding analysis of a shipping cask and are not necessary in performing the depletion analysis. Data block 16 denotes the end of the SCALE input.

7.6 Comparison of Calculated and Measured Concentrations

Comparisons of corresponding calculated and measured concentrations are performed on a percent difference basis. The difference between the measured and the calculated value is divided by the measured value to determine the accuracy of the SAS2H calculation. A positive percent difference represents an over-prediction by the code, while a negative percent difference represents an under-prediction by the code.

Measured concentrations presented in Table 4-10 have units of mg of isotope per g of U, while calculated concentrations presented in Table 7-3 have units of g of isotope per Metric Ton of U. Therefore, the measured concentrations must be multiplied by 10^3 to obtain similar units. Percent differences are presented in Table 7-4.

7.7 Results

SAS2H predicted isotopic concentrations are presented in Table 7-3. The calculated concentrations are obtained through the methodology described in Sections 7.1 through 7.5, and with the input parameters defined in Section 4.1. Calculated concentrations are compared with measured concentrations as described in Section 7.6 to determine the accuracy of the SAS2H module. Results of the comparison, in the form of percent differences, are presented in Table 7-4.

Table 7-3. Calculated concentrations (g/MTU)

Assembly	509-104 M11	509-032 E11	509-032 E11	509-032 E11	509-069 E11	509-069 E11	509-069 E11
Location	7	4	7	9	1	2	4
Burnup, GWd/MTU	12.042	15.377	15.898	11.529	12.859	20.602	23.718
^{235}U	2.69E4	1.77E4	1.73E4	2.03E4	1.99E4	1.51E4	1.29E4
^{236}U	2.46E3	2.62E3	2.68E3	2.15E3	2.27E3	3.09E3	3.41E3
^{238}U	9.52E5	9.56E5	9.56E5	9.59E5	9.58E5	9.52E5	9.49E5
^{239}Pu	4.45E3	5.25E3	5.24E3	4.37E3	4.71E3	5.93E3	6.22E3
^{240}Pu	6.77E2	1.11E3	1.14E3	7.53E2	8.68E2	1.51E3	1.78E3
^{241}Pu	3.06E2	5.82E2	5.98E2	3.38E2	3.94E2	8.39E2	1.03E3
^{242}Pu	2.72E1	8.26E1	8.86E1	3.52E1	4.55E1	1.62E2	2.40E2
^{243}Am	-	-	-	-	-	2.32E1	4.04E1
Assembly	509-069 E11	509-069 E5	509-069 E5	509-069 L11	509-069 L11	509-069 L5	509-069 L5
Location	7	4	7	4	7	4	7
Burnup, GWd/MTU	24.304	23.867	24.548	23.928	24.362	24.330	24.313
^{235}U	1.25E4	1.28E4	1.24E4	1.28E4	1.25E4	1.26E4	1.25E4
^{236}U	3.46E3	3.42E3	3.47E3	3.42E3	3.46E3	3.45E3	3.46E3
^{238}U	9.49E5	9.49E5	9.48E5	9.49E5	9.49E5	9.48E5	9.49E5
^{239}Pu	6.16E3	6.23E3	6.18E3	6.24E3	6.16E3	6.27E3	6.16E3
^{240}Pu	1.80E3	1.79E3	1.82E3	1.79E3	1.81E3	1.82E3	1.80E3
^{241}Pu	1.04E3	1.04E3	1.05E3	1.04E3	1.04E3	1.06E3	1.04E3
^{242}Pu	2.52E2	2.43E2	2.58E2	2.45E2	2.53E2	2.55E2	2.52E2
^{243}Am	4.26E1	-	4.41E1	4.16E1	4.30E1	-	-

Table 7-4. Percent Difference Between Measured and Calculated [(C/M-1)*100]

Assembly	509-104 M11	509-032 E11	509-032 E11	509-032 E11	509-069 E11	509-069 E11	509-069 E11
Location	7	4	7	9	1	2	4
Burnup, GWd/MTU	12.042	15.377	15.898	11.529	12.859	20.602	23.718
^{235}U	1.05	2.43	4.15	0.64	2.26	5.15	3.37
^{236}U	-10.09	-7.55	-2.15	-14.07	-7.46	-6.84	-5.54
^{238}U	0.07	0.02	0.02	-0.05	-0.07	0.02	-0.03
^{239}Pu	-2.97	-0.30	0.11	-1.09	2.84	3.04	5.51
^{240}Pu	-5.51	-0.72	0.26	-2.84	3.33	-0.66	1.42
^{241}Pu	-11.94	-5.21	-3.24	-8.40	-1.50	-5.20	0.00
^{242}Pu	-13.24	-4.38	-6.61	-7.44	-1.09	-5.81	-1.44
^{243}Am	-	-	-	-	-	-3.09	-10.88
Assembly	509-069 E11	509-069 E5	509-069 E5	509-069 L11	509-069 L11	509-069 L5	509-069 L5
Location	7	4	7	4	7	4	7
Burnup, GWd/MTU	24.304	23.867	24.548	23.928	24.362	24.330	24.313
^{235}U	1.21	-0.85	1.56	-0.16	2.04	-2.85	1.54
^{236}U	-4.89	-2.84	-1.98	-8.87	-0.14	-0.61	-3.05
^{238}U	-0.02	-0.02	-0.03	0.05	0.08	-0.06	0.19
^{239}Pu	1.48	4.71	3.34	2.97	2.75	3.47	3.18
^{240}Pu	-1.37	1.70	1.96	0.00	0.00	2.82	0.56
^{241}Pu	-1.89	-0.95	-0.47	-0.95	-1.42	0.00	-1.89
^{242}Pu	-2.14	1.25	1.57	-0.81	-2.32	4.51	0.80
^{243}Am	-7.07	-	-4.44	-6.56	1.25	-	-

8. Conclusions

The accuracy in which the SAS2H module is able to predict isotopic concentrations is indicated by the percent differences presented in Table 7-4. Inspection of such results reveals that the code has a tendency to under-predict ^{236}U. Percent differences from this analysis are compared with results from Reference 5.6, in which similar calculations were performed with a previous version of SCALE and the 27burnuplib cross section library. The concentrations calculated in Reference 5.5 for the most part agree with the concentrations calculated in this analysis; however, significant differences are seen for the plutonium isotopes. However, since there is a significant difference in the Path B model from Reference 5.5 and the model contained within, it cannot be determined what is responsible for the differences between calculated concentrations.

The assumption of a 10 day cooling time does not significantly effect isotopic concentrations. Since the concentration of ^{239}Pu is over-predicted for only some samples, it cannot be conclusively determined whether the assumed cooling time is inappropriate. However, the effects of such a short cooling time are minimal in comparison to the approximations of operating parameters.

The SAS2H code normally predicts isotopic concentrations as a radial assembly average; however, measurements are performed on individual pellet samples. Therefore, local pellet conditions are modeled as closely as possible in this analysis so that a more realistic pellet composition can be determined. However, approximations made to obtain local pellet conditions will influence the calculated isotopic concentrations.

In general, the SAS2H module of SCALE does well in predicting isotopic concentrations for samples from Trino Vercelles, using the methodology presented. The majority of calculated concentrations are close to the measured concentrations; however, more detailed operating data are expected to improve the accuracy of the calculated concentrations in relation to the corresponding measurements. It is recommended that future analyses use more detailed data if possible.

9. Attachments

Attachment I includes 14 pages and contains the input files used in the modeling of the Trino Vercelles samples. A description of the parameters contained within the input files is found in Sections 7.1 through 7.5.

Included in Attachment II is an extraction from each of the output files, containing the following information:

- echo of the SAS2H input deck,
- time/date stamp for when the SAS2H depletion calculation was performed,
- the output extraction of information pertinent to the Radiochemical Assay evaluations from the final ORIGEN calculation of the SAS2H depletion calculation.

t04m11h7.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-104, rod m11 7, 12.042 gwd/mtu, June 97
'
'  mixtures of fuel-pin-unit-cell:
'
44group      latticecell
'
'
uo2  1 den=10.079  1 1001
  92234 0.035 92235 3.897 92236 0.018 92238 96.050   end
kr-83  1 0 1-20 1001  end
kr-85  1 0 1-20 1001  end
y-89   1 0 1-20 1001  end
sr-90  1 0 1-20 1001  end
zr-93  1 0 1-20 1001  end
zr-94  1 0 1-20 1001  end
zr-95  1 0 1-20 1001  end
nb-94  1 0 1-20 1001  end
mo-95  1 0 1-20 1001  end
tc-99  1 0 1-20 1001  end
ru-101 1 0 1-20 1001  end
ru-106 1 0 1-20 1001  end
rh-103 1 0 1-20 1001  end
rh-105 1 0 1-20 1001  end
pd-105 1 0 1-20 1001  end
pd-108 1 0 1-20 1001  end
ag-109 1 0 1-20 1001  end
sb-124 1 0 1-20 1001  end
xe-131 1 0 1-20 1001  end
xe-132 1 0 1-20 1001  end
xe-135 1 0 1-20 1001  end
xe-136 1 0 1-20 1001  end
cs-134 1 0 1-20 1001  end
cs-135 1 0 1-20 1001  end
cs-137 1 0 1-20 1001  end
ba-136 1 0 1-20 1001  end
la-139 1 0 1-20 1001  end
pr-141 1 0 1-20 1001  end
pr-143 1 0 1-20 1001  end
ce-144 1 0 1-20 1001  end
nd-143 1 0 1-20 1001  end
nd-145 1 0 1-20 1001  end
nd-147 1 0 1-20 1001  end
pm-147 1 0 1-20 1001  end
pm-148 1 0 1-20 1001  end
sm-147 1 0 1-20 1001  end
sm-149 1 0 1-20 1001  end
sm-150 1 0 1-20 1001  end
sm-151 1 0 1-20 1001  end
sm-152 1 0 1-20 1001  end
eu-153 1 0 1-20 1001  end
eu-154 1 0 1-20 1001  end
eu-155 1 0 1-20 1001  end
gd-155 1 0 1-20 1001  end
'
ss304  2 1 570  end
'
h2o  3 den=0.7795  1  543   end
arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  543  end
'
' 1175 ppm boron (wt) in moderator
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3    end
3 0.7351 500 3.3248 2 3.3353
power=10.390 burn=226  down=86    end
power=16.138 burn=263  down=51    bfrac=0.7234  end
power=18.663 burn=292  down=10    bfrac=0.2766  end
 o 135    cr 5.9    mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t32e11h4.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-032, rod e11, level 4, 15.377 gwd/mtu, June 97
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
'
uo2  1 den=10.079  1 1015
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1015  end
kr-85  1 0 1-20 1015  end
y-89   1 0 1-20 1015  end
sr-90  1 0 1-20 1015  end
zr-93  1 0 1-20 1015  end
zr-94  1 0 1-20 1015  end
zr-95  1 0 1-20 1015  end
nb-94  1 0 1-20 1015  end
mo-95  1 0 1-20 1015  end
tc-99  1 0 1-20 1015  end
ru-101 1 0 1-20 1015  end
ru-106 1 0 1-20 1015  end
rh-103 1 0 1-20 1015  end
rh-105 1 0 1-20 1015  end
pd-105 1 0 1-20 1015  end
pd-108 1 0 1-20 1015  end
ag-109 1 0 1-20 1015  end
sb-124 1 0 1-20 1015  end
xe-131 1 0 1-20 1015  end
xe-132 1 0 1-20 1015  end
xe-135 1 0 1-20 1015  end
xe-136 1 0 1-20 1015  end
cs-134 1 0 1-20 1015  end
cs-135 1 0 1-20 1015  end
cs-137 1 0 1-20 1015  end
ba-136 1 0 1-20 1015  end
la-139 1 0 1-20 1015  end
pr-141 1 0 1-20 1015  end
pr-143 1 0 1-20 1015  end
ce-144 1 0 1-20 1015  end
nd-143 1 0 1-20 1015  end
nd-145 1 0 1-20 1015  end
nd-147 1 0 1-20 1015  end
pm-147 1 0 1-20 1015  end
pm-148 1 0 1-20 1015  end
sm-147 1 0 1-20 1015  end
sm-149 1 0 1-20 1015  end
sm-150 1 0 1-20 1015  end
sm-151 1 0 1-20 1015  end
sm-152 1 0 1-20 1015  end
eu-153 1 0 1-20 1015  end
eu-154 1 0 1-20 1015  end
eu-155 1 0 1-20 1015  end
gd-155 1 0 1-20 1015  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7554  1  557   end
arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  557  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3    end
3 0.7351 500 3.3248 2 3.3353
power=13.268 burn=226  down=86    end
power=20.607 burn=263  down=51    bfrac=0.7234  end
power=23.831 burn=292  down=10    bfrac=0.2766  end
 o 135    cr 5.9    mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t32e11h7.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-032, rod e11 7, 15.898 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
'
uo2  1 den=10.079  1 1001
   92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1001  end
kr-85  1 0 1-20 1001  end
y-89   1 0 1-20 1001  end
sr-90  1 0 1-20 1001  end
zr-93  1 0 1-20 1001  end
zr-94  1 0 1-20 1001  end
zr-95  1 0 1-20 1001  end
nb-94  1 0 1-20 1001  end
mo-95  1 0 1-20 1001  end
tc-99  1 0 1-20 1001  end
ru-101 1 0 1-20 1001  end
ru-106 1 0 1-20 1001  end
rh-103 1 0 1-20 1001  end
rh-105 1 0 1-20 1001  end
pd-105 1 0 1-20 1001  end
pd-108 1 0 1-20 1001  end
ag-109 1 0 1-20 1001  end
sb-124 1 0 1-20 1001  end
xe-131 1 0 1-20 1001  end
xe-132 1 0 1-20 1001  end
xe-135 1 0 1-20 1001  end
xe-136 1 0 1-20 1001  end
cs-134 1 0 1-20 1001  end
cs-135 1 0 1-20 1001  end
cs-137 1 0 1-20 1001  end
ba-136 1 0 1-20 1001  end
la-139 1 0 1-20 1001  end
pr-141 1 0 1-20 1001  end
pr-143 1 0 1-20 1001  end
ce-144 1 0 1-20 1001  end
nd-143 1 0 1-20 1001  end
nd-145 1 0 1-20 1001  end
nd-147 1 0 1-20 1001  end
pm-147 1 0 1-20 1001  end
pm-148 1 0 1-20 1001  end
sm-147 1 0 1-20 1001  end
sm-149 1 0 1-20 1001  end
sm-150 1 0 1-20 1001  end
sm-151 1 0 1-20 1001  end
sm-152 1 0 1-20 1001  end
eu-153 1 0 1-20 1001  end
eu-154 1 0 1-20 1001  end
eu-155 1 0 1-20 1001  end
gd-155 1 0 1-20 1001  end
'
ss304  2 1 570  end
'
h2o  3 den=0.7795  1  543   end
arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  543  end
'
' 1175 ppm boron (wt) in moderator
'------------------------------
'
end comp
'
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.717 burn=226  down=86    end
power=21.309 burn=263  down=51   bfrac=0.7234  end
power=24.639 burn=292  down=10   bfrac=0.2766  end
 o 135   cr 5.9    mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
'
```

t32e11h9.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-032, rod e11 9, 11.529 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1  927
   92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 927  end
kr-85  1 0 1-20 927  end
y-89   1 0 1-20 927  end
sr-90  1 0 1-20 927  end
zr-93  1 0 1-20 927  end
zr-94  1 0 1-20 927  end
zr-95  1 0 1-20 927  end
nb-94  1 0 1-20 927  end
mo-95  1 0 1-20 927  end
tc-99  1 0 1-20 927  end
ru-101 1 0 1-20 927  end
ru-106 1 0 1-20 927  end
rh-103 1 0 1-20 927  end
rh-105 1 0 1-20 927  end
pd-105 1 0 1-20 927  end
pd-108 1 0 1-20 927  end
ag-109 1 0 1-20 927  end
sb-124 1 0 1-20 927  end
xe-131 1 0 1-20 927  end
xe-132 1 0 1-20 927  end
xe-135 1 0 1-20 927  end
xe-136 1 0 1-20 927  end
cs-134 1 0 1-20 927  end
cs-135 1 0 1-20 927  end
cs-137 1 0 1-20 927  end
ba-136 1 0 1-20 927  end
la-139 1 0 1-20 927  end
pr-141 1 0 1-20 927  end
pr-143 1 0 1-20 927  end
ce-144 1 0 1-20 927  end
nd-143 1 0 1-20 927  end
nd-145 1 0 1-20 927  end
nd-147 1 0 1-20 927  end
pm-147 1 0 1-20 927  end
pm-148 1 0 1-20 927  end
sm-147 1 0 1-20 927  end
sm-149 1 0 1-20 927  end
sm-150 1 0 1-20 927  end
sm-151 1 0 1-20 927  end
sm-152 1 0 1-20 927  end
eu-153 1 0 1-20 927  end
eu-154 1 0 1-20 927  end
eu-155 1 0 1-20 927  end
gd-155 1 0 1-20 927  end
'
ss304 2 1 570  end
'
h2o  3 den=0.7885  1  537  end
arbm-bormod  0.7885 1 1 0 0 5000 100 3 1175.0e-6  537  end
'
' 1175 ppm boron (wt) in moderator
'------------------------------
'
end comp
'
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3    end
3 0.7351 500 3.3248 2 3.3353
power=9.947  burn=226  down=86    end
power=15.451 burn=263  down=51    bfrac=0.7234  end
power=17.868 burn=292  down=10    bfrac=0.2766  end
 o 135    cr 5.9    mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t69e11h1.input

```
=sas2h     parm=skipshipdata
trino vercellese pwr, 509-069, rod e11, level 1, 12.859 gwd/mtu, June 97
'
'
'-----------------------------
' mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 915
  92234 0.028 92235 3.13  92236 0.014 92238 96.828  end
kr-83  1 0 1-20 915  end
kr-85  1 0 1-20 915  end
y-89  1 0 1-20 915  end
sr-90  1 0 1-20 915  end
zr-93  1 0 1-20 915  end
zr-94  1 0 1-20 915  end
zr-95  1 0 1-20 915  end
nb-94  1 0 1-20 915  end
mo-95  1 0 1-20 915  end
tc-99  1 0 1-20 915  end
ru-101 1 0 1-20 915  end
ru-106 1 0 1-20 915  end
rh-103 1 0 1-20 915  end
rh-105 1 0 1-20 915  end
pd-105 1 0 1-20 915  end
pd-108 1 0 1-20 915  end
ag-109 1 0 1-20 915  end
sb-124 1 0 1-20 915  end
xe-131 1 0 1-20 915  end
xe-132 1 0 1-20 915  end
xe-135 1 0 1-20 915  end
xe-136 1 0 1-20 915  end
cs-134 1 0 1-20 915  end
cs-135 1 0 1-20 915  end
cs-137 1 0 1-20 915  end
ba-136 1 0 1-20 915  end
pr-141 1 0 1-20 915  end
pr-143 1 0 1-20 915  end
la-139 1 0 1-20 915  end
ce-144 1 0 1-20 915  end
nd-143 1 0 1-20 915  end
nd-145 1 0 1-20 915  end
nd-147 1 0 1-20 915  end
pm-147 1 0 1-20 915  end
pm-148 1 0 1-20 915  end
sm-147 1 0 1-20 915  end
sm-149 1 0 1-20 915  end
sm-150 1 0 1-20 915  end
sm-151 1 0 1-20 915  end
sm-152 1 0 1-20 915  end
eu-153 1 0 1-20 915  end
eu-154 1 0 1-20 915  end
eu-155 1 0 1-20 915  end
gd-155 1 0 1-20 915  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7365  1  563   end
arbm-bormod  0.7365 1 1 0 0 5000 100 3 1175.0e-6  563  end
'
arbm-ag  10.159 1 1 0 1 47000 100 4 0.80  563  end
arbm-in  10.159 1 1 0 1 49000 100 4 0.15  563  end
arbm-cd  10.159 8 0 0 1
48108  0.85 48110 12.21 48111 12.63 48112 24.02
48113 12.27 48114 29.11 48601  1-20 48116  7.72
4 0.05  563  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'
'-----------------------------
'
end comp
'
'-----------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'-----------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=5 mxrepeats=0
 end
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
'
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
'
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
'
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
power=7.148  burn=226  down=86     end
power=11.101 burn=263  down=51    bfrac=0.7234  end
power=12.840 burn=292  down=1117  bfrac=0.2766  end
power=10.997  burn=416     down=10          bfrac=0.5532
h2ofrac=1.026  end
 o 135     cr 5.9    mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'-----------------------------
'
end
```

t69e11h2.input

```
=sas2h     parm=skipshipdata
trino vercellese pwr, 509-069, rod e11, level 2, 20.602 gwd/mtu, June 97
'
'
'-----------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
uo2  1 den=10.079  1 968
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 968  end
kr-85  1 0 1-20 968  end
y-89   1 0 1-20 968  end
sr-90  1 0 1-20 968  end
zr-93  1 0 1-20 968  end
zr-94  1 0 1-20 968  end
zr-95  1 0 1-20 968  end
nb-94  1 0 1-20 968  end
mo-95  1 0 1-20 968  end
tc-99  1 0 1-20 968  end
ru-101 1 0 1-20 968  end
ru-106 1 0 1-20 968  end
rh-103 1 0 1-20 968  end
rh-105 1 0 1-20 968  end
pd-105 1 0 1-20 968  end
pd-108 1 0 1-20 968  end
ag-109 1 0 1-20 968  end
sb-124 1 0 1-20 968  end
xe-131 1 0 1-20 968  end
xe-132 1 0 1-20 968  end
xe-135 1 0 1-20 968  end
xe-136 1 0 1-20 968  end
cs-134 1 0 1-20 968  end
cs-135 1 0 1-20 968  end
cs-137 1 0 1-20 968  end
ba-136 1 0 1-20 968  end
la-139 1 0 1-20 968  end
pr-141 1 0 1-20 968  end
pr-143 1 0 1-20 968  end
ce-144 1 0 1-20 968  end
nd-143 1 0 1-20 968  end
nd-145 1 0 1-20 968  end
nd-147 1 0 1-20 968  end
pm-147 1 0 1-20 968  end
pm-148 1 0 1-20 968  end
sm-147 1 0 1-20 968  end
sm-149 1 0 1-20 968  end
sm-150 1 0 1-20 968  end
sm-151 1 0 1-20 968  end
sm-152 1 0 1-20 968  end
eu-153 1 0 1-20 968  end
eu-154 1 0 1-20 968  end
eu-155 1 0 1-20 968  end
gd-155 1 0 1-20 968  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7407  1  561   end
arbm-bormod  0.7407 1 1 0 0 5000 100 3 1175.0e-6  561  end
'
arbm-ag  10.159 1 1 0 1 47000 100 4 0.80  561  end
arbm-in  10.159 1 1 0 1 49000 100 4 0.15  561  end
arbm-cd  10.159 8 0 0 1
48108  0.85 48110 12.21 48111 12.63 48112 24.02
48113 12.27 48114 29.11 48601  1-20 48116  7.72
4 0.05  561  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'-----------------------------
'
end comp
'
'-----------------------------
'
'   fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'-----------------------------
'
'  assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=5 mxrepeats=0
 end
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
'
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
'
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
'
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
power=11.452 burn=226  down=86     end
power=17.786 burn=263  down=51    bfrac=0.7234  end
power=20.571 burn=292  down=1117  bfrac=0.2766  end
power=17.619  burn=416     down=10         bfrac=0.5532
h2ofrac=1.025  end
 o 135    cr 5.9    mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'-----------------------------
'
end
```

t69e11h4.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod e11, level 4, 23.718 gwd/mtu, June
97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1015
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1015  end
kr-85  1 0 1-20 1015  end
y-89   1 0 1-20 1015  end
sr-90  1 0 1-20 1015  end
zr-93  1 0 1-20 1015  end
zr-94  1 0 1-20 1015  end
zr-95  1 0 1-20 1015  end
nb-94  1 0 1-20 1015  end
mo-95  1 0 1-20 1015  end
tc-99  1 0 1-20 1015  end
ru-101 1 0 1-20 1015  end
ru-106 1 0 1-20 1015  end
rh-103 1 0 1-20 1015  end
rh-105 1 0 1-20 1015  end
pd-105 1 0 1-20 1015  end
pd-108 1 0 1-20 1015  end
ag-109 1 0 1-20 1015  end
sb-124 1 0 1-20 1015  end
xe-131 1 0 1-20 1015  end
xe-132 1 0 1-20 1015  end
xe-135 1 0 1-20 1015  end
xe-136 1 0 1-20 1015  end
cs-134 1 0 1-20 1015  end
cs-135 1 0 1-20 1015  end
cs-137 1 0 1-20 1015  end
ba-136 1 0 1-20 1015  end
la-139 1 0 1-20 1015  end
pr-141 1 0 1-20 1015  end
pr-143 1 0 1-20 1015  end
ce-144 1 0 1-20 1015  end
nd-143 1 0 1-20 1015  end
nd-145 1 0 1-20 1015  end
nd-147 1 0 1-20 1015  end
pm-147 1 0 1-20 1015  end
pm-148 1 0 1-20 1015  end
sm-147 1 0 1-20 1015  end
sm-149 1 0 1-20 1015  end
sm-150 1 0 1-20 1015  end
sm-151 1 0 1-20 1015  end
sm-152 1 0 1-20 1015  end
eu-153 1 0 1-20 1015  end
eu-154 1 0 1-20 1015  end
eu-155 1 0 1-20 1015  end
gd-155 1 0 1-20 1015  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7554  1  553   end
arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'   fuel-pin-cell geometry:
'
squarepitch  1.303  0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214      fuelnght=823.10      ncycles=4
nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.184 burn=226  down=86    end
power=20.476 burn=263  down=51    bfrac=0.7234
end
power=23.683 burn=292  down=1117  bfrac=0.2766
end
power=20.283 burn=416  down=10    bfrac=0.5532
h2ofrac=1.023  end
 o 135   cr 5.9   mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t69e11h7.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod e11, level 7, 24.304 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1001
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1001  end
kr-85  1 0 1-20 1001  end
y-89   1 0 1-20 1001  end
sr-90  1 0 1-20 1001  end
zr-93  1 0 1-20 1001  end
zr-94  1 0 1-20 1001  end
zr-95  1 0 1-20 1001  end
nb-94  1 0 1-20 1001  end
mo-95  1 0 1-20 1001  end
tc-99  1 0 1-20 1001  end
ru-101 1 0 1-20 1001  end
ru-106 1 0 1-20 1001  end
rh-103 1 0 1-20 1001  end
rh-105 1 0 1-20 1001  end
pd-105 1 0 1-20 1001  end
pd-108 1 0 1-20 1001  end
ag-109 1 0 1-20 1001  end
sb-124 1 0 1-20 1001  end
xe-131 1 0 1-20 1001  end
xe-132 1 0 1-20 1001  end
xe-135 1 0 1-20 1001  end
xe-136 1 0 1-20 1001  end
cs-134 1 0 1-20 1001  end
cs-135 1 0 1-20 1001  end
cs-137 1 0 1-20 1001  end
ba-136 1 0 1-20 1001  end
la-139 1 0 1-20 1001  end
pr-141 1 0 1-20 1001  end
pr-143 1 0 1-20 1001  end
ce-144 1 0 1-20 1001  end
nd-143 1 0 1-20 1001  end
nd-145 1 0 1-20 1001  end
nd-147 1 0 1-20 1001  end
pm-147 1 0 1-20 1001  end
pm-148 1 0 1-20 1001  end
sm-147 1 0 1-20 1001  end
sm-149 1 0 1-20 1001  end
sm-150 1 0 1-20 1001  end
sm-151 1 0 1-20 1001  end
sm-152 1 0 1-20 1001  end
eu-153 1 0 1-20 1001  end
eu-154 1 0 1-20 1001  end
eu-155 1 0 1-20 1001  end
gd-155 1 0 1-20 1001  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7795  1  540   end
arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.509 burn=226  down=86    end
power=20.982 burn=263  down=51    bfrac=0.7234  end
power=24.268 burn=292  down=1117  bfrac=0.2766  end
power=20.785  burn=416    down=10         bfrac=0.5532
h2ofrac=1.020  end
 o 135   cr 5.9    mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t69e5h4.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod e5, level 4, 23.867 gwd/mtu,  June 97
'
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1015
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1015  end
kr-85  1 0 1-20 1015  end
y-89   1 0 1-20 1015  end
sr-90  1 0 1-20 1015  end
zr-93  1 0 1-20 1015  end
zr-94  1 0 1-20 1015  end
zr-95  1 0 1-20 1015  end
nb-94  1 0 1-20 1015  end
mo-95  1 0 1-20 1015  end
tc-99  1 0 1-20 1015  end
ru-101 1 0 1-20 1015  end
ru-106 1 0 1-20 1015  end
rh-103 1 0 1-20 1015  end
rh-105 1 0 1-20 1015  end
pd-105 1 0 1-20 1015  end
pd-108 1 0 1-20 1015  end
ag-109 1 0 1-20 1015  end
sb-124 1 0 1-20 1015  end
xe-131 1 0 1-20 1015  end
xe-132 1 0 1-20 1015  end
xe-135 1 0 1-20 1015  end
xe-136 1 0 1-20 1015  end
cs-134 1 0 1-20 1015  end
cs-135 1 0 1-20 1015  end
cs-137 1 0 1-20 1015  end
ba-136 1 0 1-20 1015  end
la-139 1 0 1-20 1015  end
pr-141 1 0 1-20 1015  end
pr-143 1 0 1-20 1015  end
ce-144 1 0 1-20 1015  end
nd-143 1 0 1-20 1015  end
nd-145 1 0 1-20 1015  end
nd-147 1 0 1-20 1015  end
pm-147 1 0 1-20 1015  end
pm-148 1 0 1-20 1015  end
sm-147 1 0 1-20 1015  end
sm-149 1 0 1-20 1015  end
sm-150 1 0 1-20 1015  end
sm-151 1 0 1-20 1015  end
sm-152 1 0 1-20 1015  end
eu-153 1 0 1-20 1015  end
eu-154 1 0 1-20 1015  end
eu-155 1 0 1-20 1015  end
gd-155 1 0 1-20 1015  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7554  1  553   end
arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'  assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.266 burn=226  down=86    end
power=20.605 burn=263  down=51    bfrac=0.7234  end
power=23.832 burn=292  down=1117  bfrac=0.2766  end
power=20.411  burn=416    down=10         bfrac=0.5532
h2ofrac=1.023  end
 o 135   cr 5.9   mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t69e5h7.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod e5, level 7, 24.548 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1001
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1001  end
kr-85  1 0 1-20 1001  end
y-89   1 0 1-20 1001  end
sr-90  1 0 1-20 1001  end
zr-93  1 0 1-20 1001  end
zr-94  1 0 1-20 1001  end
zr-95  1 0 1-20 1001  end
nb-94  1 0 1-20 1001  end
mo-95  1 0 1-20 1001  end
tc-99  1 0 1-20 1001  end
ru-101 1 0 1-20 1001  end
ru-106 1 0 1-20 1001  end
rh-103 1 0 1-20 1001  end
rh-105 1 0 1-20 1001  end
pd-105 1 0 1-20 1001  end
pd-108 1 0 1-20 1001  end
ag-109 1 0 1-20 1001  end
sb-124 1 0 1-20 1001  end
xe-131 1 0 1-20 1001  end
xe-132 1 0 1-20 1001  end
xe-135 1 0 1-20 1001  end
xe-136 1 0 1-20 1001  end
cs-134 1 0 1-20 1001  end
cs-135 1 0 1-20 1001  end
cs-137 1 0 1-20 1001  end
ba-136 1 0 1-20 1001  end
la-139 1 0 1-20 1001  end
pr-141 1 0 1-20 1001  end
pr-143 1 0 1-20 1001  end
ce-144 1 0 1-20 1001  end
nd-143 1 0 1-20 1001  end
nd-145 1 0 1-20 1001  end
nd-147 1 0 1-20 1001  end
pm-147 1 0 1-20 1001  end
pm-148 1 0 1-20 1001  end
sm-147 1 0 1-20 1001  end
sm-149 1 0 1-20 1001  end
sm-150 1 0 1-20 1001  end
sm-151 1 0 1-20 1001  end
sm-152 1 0 1-20 1001  end
eu-153 1 0 1-20 1001  end
eu-154 1 0 1-20 1001  end
eu-155 1 0 1-20 1001  end
gd-155 1 0 1-20 1001  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7795  1  540  end
arbm-boremod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.645 burn=226  down=86    end
power=21.193 burn=263  down=51    bfrac=0.7234  end
power=24.512 burn=292  down=1117  bfrac=0.2766  end
power=20.993  burn=416    down=10        bfrac=0.5532
h2ofrac=1.020  end
 o 135   cr 5.9   mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t69111h4.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod 111, level 4, 23.928 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1015
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1001  end
kr-85  1 0 1-20 1001  end
y-89   1 0 1-20 1001  end
sr-90  1 0 1-20 1001  end
zr-93  1 0 1-20 1001  end
zr-94  1 0 1-20 1001  end
zr-95  1 0 1-20 1001  end
nb-94  1 0 1-20 1001  end
mo-95  1 0 1-20 1001  end
tc-99  1 0 1-20 1001  end
ru-101 1 0 1-20 1001  end
ru-106 1 0 1-20 1001  end
rh-103 1 0 1-20 1001  end
rh-105 1 0 1-20 1001  end
pd-105 1 0 1-20 1001  end
pd-108 1 0 1-20 1001  end
ag-109 1 0 1-20 1001  end
sb-124 1 0 1-20 1001  end
xe-131 1 0 1-20 1001  end
xe-132 1 0 1-20 1001  end
xe-135 1 0 1-20 1001  end
xe-136 1 0 1-20 1001  end
cs-134 1 0 1-20 1001  end
cs-135 1 0 1-20 1001  end
cs-137 1 0 1-20 1001  end
ba-136 1 0 1-20 1001  end
la-139 1 0 1-20 1001  end
pr-141 1 0 1-20 1001  end
pr-143 1 0 1-20 1001  end
ce-144 1 0 1-20 1001  end
nd-143 1 0 1-20 1001  end
nd-145 1 0 1-20 1001  end
nd-147 1 0 1-20 1001  end
pm-147 1 0 1-20 1001  end
pm-148 1 0 1-20 1001  end
sm-147 1 0 1-20 1001  end
sm-149 1 0 1-20 1001  end
sm-150 1 0 1-20 1001  end
sm-151 1 0 1-20 1001  end
sm-152 1 0 1-20 1001  end
eu-153 1 0 1-20 1001  end
eu-154 1 0 1-20 1001  end
eu-155 1 0 1-20 1001  end
gd-155 1 0 1-20 1001  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7554  1  553   end
arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.300 burn=226  down=86    end
power=20.657 burn=263  down=51   bfrac=0.7234  end
power=23.893 burn=292  down=1117  bfrac=0.2766  end
power=20.463  burn=416    down=10        bfrac=0.5532
h2ofrac=1.023  end
 o 135   cr 5.9   mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t69l11h7.input

```
sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod 111, level 7, 24.362 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1001
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1001  end
kr-85  1 0 1-20 1001  end
y-89   1 0 1-20 1001  end
sr-90  1 0 1-20 1001  end
zr-93  1 0 1-20 1001  end
zr-94  1 0 1-20 1001  end
zr-95  1 0 1-20 1001  end
nb-94  1 0 1-20 1001  end
mo-95  1 0 1-20 1001  end
tc-99  1 0 1-20 1001  end
ru-101 1 0 1-20 1001  end
ru-106 1 0 1-20 1001  end
rh-103 1 0 1-20 1001  end
rh-105 1 0 1-20 1001  end
pd-105 1 0 1-20 1001  end
pd-108 1 0 1-20 1001  end
ag-109 1 0 1-20 1001  end
sb-124 1 0 1-20 1001  end
xe-131 1 0 1-20 1001  end
xe-132 1 0 1-20 1001  end
xe-135 1 0 1-20 1001  end
xe-136 1 0 1-20 1001  end
cs-134 1 0 1-20 1001  end
cs-135 1 0 1-20 1001  end
cs-137 1 0 1-20 1001  end
ba-136 1 0 1-20 1001  end
la-139 1 0 1-20 1001  end
pr-141 1 0 1-20 1001  end
pr-143 1 0 1-20 1001  end
ce-144 1 0 1-20 1001  end
nd-143 1 0 1-20 1001  end
nd-145 1 0 1-20 1001  end
nd-147 1 0 1-20 1001  end
pm-147 1 0 1-20 1001  end
pm-148 1 0 1-20 1001  end
sm-147 1 0 1-20 1001  end
sm-149 1 0 1-20 1001  end
sm-150 1 0 1-20 1001  end
sm-151 1 0 1-20 1001  end
sm-152 1 0 1-20 1001  end
eu-153 1 0 1-20 1001  end
eu-154 1 0 1-20 1001  end
eu-155 1 0 1-20 1001  end
gd-155 1 0 1-20 1001  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7795  1  540  end
arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch  1.303  0.9020 1  3  0.9786  2  end
'
'------------------------------
'
'  assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3  end
3 0.7351 500 3.3248 2 3.3353
power=13.542 burn=226  down=86    end
power=21.032 burn=263  down=51   bfrac=0.7234  end
power=24.326 burn=292  down=1117  bfrac=0.2766  end
power=20.834  burn=416    down=10        bfrac=0.5532
h2ofrac=1.020  end
 o 135   cr 5.9   mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t6915h4.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod 15, level 4, 24.330 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1015
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1015  end
kr-85  1 0 1-20 1015  end
y-89   1 0 1-20 1015  end
sr-90  1 0 1-20 1015  end
zr-93  1 0 1-20 1015  end
zr-94  1 0 1-20 1015  end
zr-95  1 0 1-20 1015  end
nb-94  1 0 1-20 1015  end
mo-95  1 0 1-20 1015  end
tc-99  1 0 1-20 1015  end
ru-101 1 0 1-20 1015  end
ru-106 1 0 1-20 1015  end
rh-103 1 0 1-20 1015  end
rh-105 1 0 1-20 1015  end
pd-105 1 0 1-20 1015  end
pd-108 1 0 1-20 1015  end
ag-109 1 0 1-20 1015  end
sb-124 1 0 1-20 1015  end
xe-131 1 0 1-20 1015  end
xe-132 1 0 1-20 1015  end
xe-135 1 0 1-20 1015  end
xe-136 1 0 1-20 1015  end
cs-134 1 0 1-20 1015  end
cs-135 1 0 1-20 1015  end
cs-137 1 0 1-20 1015  end
ba-136 1 0 1-20 1015  end
la-139 1 0 1-20 1015  end
pr-141 1 0 1-20 1015  end
pr-143 1 0 1-20 1015  end
ce-144 1 0 1-20 1015  end
nd-143 1 0 1-20 1015  end
nd-145 1 0 1-20 1015  end
nd-147 1 0 1-20 1015  end
pm-147 1 0 1-20 1015  end
pm-148 1 0 1-20 1015  end
sm-147 1 0 1-20 1015  end
sm-149 1 0 1-20 1015  end
sm-150 1 0 1-20 1015  end
sm-151 1 0 1-20 1015  end
sm-152 1 0 1-20 1015  end
eu-153 1 0 1-20 1015  end
eu-154 1 0 1-20 1015  end
eu-155 1 0 1-20 1015  end
gd-155 1 0 1-20 1015  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7554  1  553   end
arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.524 burn=226  down=86    end
power=21.004 burn=263  down=51    bfrac=0.7234  end
power=24.294 burn=292  down=1117  bfrac=0.2766  end
power=20.807  burn=416    down=10        bfrac=0.5532
h2ofrac=1.023  end
 o 135   cr 5.9   mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t6915h7.input

```
=sas2h    parm=skipshipdata
trino vercellese pwr, 509-069, rod l5, level 7, 24.313 gwd/mtu, June 97
'
'
'------------------------------
'  mixtures of fuel-pin-unit-cell:
'
44group   latticecell
'
'
uo2  1 den=10.079  1 1001
  92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
kr-83  1 0 1-20 1001  end
kr-85  1 0 1-20 1001  end
y-89   1 0 1-20 1001  end
sr-90  1 0 1-20 1001  end
zr-93  1 0 1-20 1001  end
zr-94  1 0 1-20 1001  end
zr-95  1 0 1-20 1001  end
nb-94  1 0 1-20 1001  end
mo-95  1 0 1-20 1001  end
tc-99  1 0 1-20 1001  end
ru-101 1 0 1-20 1001  end
ru-106 1 0 1-20 1001  end
rh-103 1 0 1-20 1001  end
rh-105 1 0 1-20 1001  end
pd-105 1 0 1-20 1001  end
pd-108 1 0 1-20 1001  end
ag-109 1 0 1-20 1001  end
sb-124 1 0 1-20 1001  end
xe-131 1 0 1-20 1001  end
xe-132 1 0 1-20 1001  end
xe-135 1 0 1-20 1001  end
xe-136 1 0 1-20 1001  end
cs-134 1 0 1-20 1001  end
cs-135 1 0 1-20 1001  end
cs-137 1 0 1-20 1001  end
ba-136 1 0 1-20 1001  end
la-139 1 0 1-20 1001  end
pr-141 1 0 1-20 1001  end
pr-143 1 0 1-20 1001  end
ce-144 1 0 1-20 1001  end
nd-143 1 0 1-20 1001  end
nd-145 1 0 1-20 1001  end
nd-147 1 0 1-20 1001  end
pm-147 1 0 1-20 1001  end
pm-148 1 0 1-20 1001  end
sm-147 1 0 1-20 1001  end
sm-149 1 0 1-20 1001  end
sm-150 1 0 1-20 1001  end
sm-151 1 0 1-20 1001  end
sm-152 1 0 1-20 1001  end
eu-153 1 0 1-20 1001  end
eu-154 1 0 1-20 1001  end
eu-155 1 0 1-20 1001  end
gd-155 1 0 1-20 1001  end
'
ss304  2 1   570  end
'
h2o  3 den=0.7795  1  540   end
arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
'
' 1175 ppm boron (wt) in moderator at start (1st segment)
'------------------------------
'
end comp
'
'------------------------------
'
'    fuel-pin-cell geometry:
'
squarepitch   1.303   0.9020 1  3  0.9786  2   end
'
'------------------------------
'
'   assembly and cycle parameters:
'
npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
printlevel=5 lightel=9  inplevel=2 numztotal=3   end
3 0.7351 500 3.3248 2 3.3353
power=13.514 burn=226  down=86    end
power=20.990 burn=263  down=51    bfrac=0.7234  end
power=24.277 burn=292  down=1117  bfrac=0.2766  end
power=20.792  burn=416    down=10         bfrac=0.5532
h2ofrac=1.020  end
 o 135   cr 5.9   mn  0.33
 fe 13.0  co 0.075  ni  9.9
 zr 221.0 nb 0.71   sn  3.6
'
'------------------------------
'
end
```

t04m11h7.sum

```
0*****************************************************************************
 *                                                                           *
 *                    SCALE4.3  Bulletin  Board                              *
 *                    --------  --------  -----                              *
 *                                                                           *
 *                      Welcome to SCALE-4.3.                                *
 *                                                                           *
 *                                                                           *
 *****************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-104, rod m11 7, 12.042 gwd/mtu, June 97
      '
      '   mixtures of fuel-pin-unit-cell:
      '
      44group        latticecell
      '
      '
      uo2  1 den=10.079  1 1001
         92234 0.035 92235 3.897 92236 0.018 92238 96.050   end
      kr-83   1 0 1-20 1001  end
      kr-85   1 0 1-20 1001  end
      y-89    1 0 1-20 1001  end
      sr-90   1 0 1-20 1001  end
      zr-93   1 0 1-20 1001  end
      zr-94   1 0 1-20 1001  end
      zr-95   1 0 1-20 1001  end
      nb-94   1 0 1-20 1001  end
      mo-95   1 0 1-20 1001  end
      tc-99   1 0 1-20 1001  end
      ru-101  1 0 1-20 1001  end
      ru-106  1 0 1-20 1001  end
      rh-103  1 0 1-20 1001  end
      rh-105  1 0 1-20 1001  end
      pd-105  1 0 1-20 1001  end
      pd-108  1 0 1-20 1001  end
      ag-109  1 0 1-20 1001  end
      sb-124  1 0 1-20 1001  end
      xe-131  1 0 1-20 1001  end
      xe-132  1 0 1-20 1001  end
      xe-135  1 0 1-20 1001  end
      xe-136  1 0 1-20 1001  end
      cs-134  1 0 1-20 1001  end
      cs-135  1 0 1-20 1001  end
      cs-137  1 0 1-20 1001  end
      ba-136  1 0 1-20 1001  end
      la-139  1 0 1-20 1001  end
      pr-141  1 0 1-20 1001  end
      pr-143  1 0 1-20 1001  end
      ce-144  1 0 1-20 1001  end
      nd-143  1 0 1-20 1001  end
      nd-145  1 0 1-20 1001  end
      nd-147  1 0 1-20 1001  end
      pm-147  1 0 1-20 1001  end
      pm-148  1 0 1-20 1001  end
      sm-147  1 0 1-20 1001  end
      sm-149  1 0 1-20 1001  end
      sm-150  1 0 1-20 1001  end
      sm-151  1 0 1-20 1001  end
      sm-152  1 0 1-20 1001  end
      eu-153  1 0 1-20 1001  end
      eu-154  1 0 1-20 1001  end
      eu-155  1 0 1-20 1001  end
      gd-155  1 0 1-20 1001  end
      '
      ss304   2 1 570  end
      '
      h2o   3 den=0.7795  1  543   end
      arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  543  end
      '
      ' 1175 ppm boron (wt) in moderator
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch    1.303    0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3    end
      3 0.7351 500 3.3248 2 3.3353
      power=10.390 burn=226  down=86     end
      power=16.138 burn=263  down=51    bfrac=0.7234  end
      power=18.663 burn=292  down=10    bfrac=0.2766  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss       aaaaaaaaa       sssssssssss     22222222222    hh          hh
   ssssssssssssss    aaaaaaaaaaa    ssssssssssssss   2222222222222   hh          hh
   ss          ss   aa         aa   ss          ss  22          22   hh          hh
   ss               aa         aa   ss                          22   hh          hh
   ss               aa         aa   ss                          22   hh          hh
   sssssssssss      aaaaaaaaaaaaa   sssssssssss               22     hhhhhhhhhhhhh
    sssssssssss     aaaaaaaaaaaaa    sssssssssss           22       hhhhhhhhhhhhh
             ss     aa         aa               ss        22        hh          hh
             ss     aa         aa               ss     22           hh          hh
   ss        ss     aa         aa   ss          ss    22            hh          hh
   ssssssssssssss   aa         aa   ssssssssssssss   2222222222222   hh          hh
    ssssssssssss    aa         aa    ssssssssssss    2222222222222   hh          hh
```

```
0
   nn          nn  iiiiiiiiiiii    cccccccccccc   hh          hh   oooooooooooo    ll
   nnn         nn  iiiiiiiiiiii   ccccccccccccc   hh          hh  oooooooooooooo   ll
   nnnn        nn       ii        cc         cc   hh          hh  oo          oo   ll
   nn nn       nn       ii        cc              hh          hh  oo          oo   ll
   nn  nn      nn       ii        cc              hh          hh  oo          oo   ll
   nn   nn     nn       ii        cc              hhhhhhhhhhhhhh  oo          oo   ll
   nn    nn    nn       ii        cc              hhhhhhhhhhhhhh  oo          oo   ll
   nn     nn   nn       ii        cc              hh          hh  oo          oo   ll
   nn      nn  nn       ii        cc              hh          hh  oo          oo   ll
   nn       nnnn        ii        cc         cc   hh          hh  oo          oo   ll
   nn        nnn   iiiiiiiiiiii   ccccccccccccc   hh          hh  oooooooooooooo   llllllllllllll
   nn         nn   iiiiiiiiiiii    cccccccccccc   hh          hh   oooooooooooo    llllllllllllll
0
     0000000     777777777777          //  33333333333       11            //  99999999999   777777777777
    000000000    777777777777         //  3333333333333     111           //  9999999999999  777777777777
   00      00   77          77       //   33          33   1111          //   99        99   77        77
  00        00             77       //               33     11          //    99        99            77
  00        00            77       //                33     11         //     99        99           77
  00        00           77       //               333      11        //      9999999999999          77
  00        00           77      //                333      11       //        999999999999         77
  00        00          77      //                   33     11      //                   99         77
  00        00          77     //                    33     11     //                    99        77
   00      00          77     //      33            33      11    //                     99        77
    000000000          77    //       3333333333333      11111111 //        9999999999999         77
     0000000           77   //         33333333333       11111111//         999999999999          77
0
        11        0000000                         44   666666666666                33333333333     0000000
       111       000000000                       444  6666666666666               3333333333333   000000000
      1111      00       00      :::            4444  66                 :::      33         33  00      00
        11      00       00      :::          44 44   66                 :::                 33  00      00
        11      00       00      :::         44  44   66                 :::                 33  00      00
        11      00       00                 44   44   666666666666                         333   00      00
        11      00       00                44    44   6666666666666                        333   00      00
        11      00       00      :::      444444444444 66         66     :::                 33  00      00
        11      00       00      :::      444444444444 66         66     :::                 33  00      00
        11      00       00      :::                44 66         66     :::      33         33   00    00
     11111111   000000000                           44 6666666666666              3333333333333   000000000
     11111111    0000000                            44  66666666666                33333333333     0000000
1
0
                                 sssssssssss   ccccccccccc     aaaaaaaaa    ll            eeeeeeeeeeee
                                ssssssssssss  ccccccccccccc   aaaaaaaaaaa   ll            eeeeeeeeeeee
                                ss        ss  cc         cc  aa         aa  ll            ee
                                ss            cc             aa         aa  ll            ee
                                ss            cc             aa         aa  ll            ee
                                sssssssssss   cc             aaaaaaaaaaaaa  ll            eeeeeeeee
                                 sssssssssss  cc             aaaaaaaaaaaaa  ll            eeeeeeeee
                                          ss  cc             aa         aa  ll            ee
                                          ss  cc             aa         aa  ll            ee
                                ss        ss  cc         cc  aa         aa  ll            ee
                                ssssssssssss  ccccccccccccc  aa         aa  llllllllllllll eeeeeeeeeeee
                                 sssssssssss   ccccccccccc   aa         aa  llllllllllllll eeeeeeeeeeee


          ***********************************************************************
          ***********************************************************************
          ***********************************************************************
          *****                                                             *****
          *****             program verification information                *****
          *****                                                             *****
          *****           code system:    scale  version:    4.3            *****
          *****                                                             *****
          ***********************************************************************
          ***********************************************************************
          *****                                                             *****
          *****                                                             *****
          *****              program:  sas2                                 *****
          *****                                                             *****
          *****        creation date:  03/07/97                             *****
          *****                                                             *****
          *****              library:  /opt/neut/Scale4.3/bin               *****
          *****                                                             *****
          *****                                                             *****
          *****    this is not a   scale  configuration controlled code     *****
          *****                                                             *****
          *****              jobname:  nichol                               *****
          *****                                                             *****
          *****    date of execution:  07/31/97                             *****
          *****                                                             *****
          *****    time of execution:  10:46:30                             *****
          *****                                                             *****
          *****                                                             *****
          ***********************************************************************
          ***********************************************************************
          ***********************************************************************
1
0'
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
               initial  1E-18 d
        o 16  1.35E+05  1.35E+05
     total    3.90E+05  3.90E+05
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
               initial  1E-18 d
        u234  3.50E+02  3.50E+02
        u235  3.90E+04  3.90E+04
        u236  1.80E+02  1.80E+02
        u238  9.60E+05  9.60E+05
     total    1.00E+06  1.00E+06
0                                            basis =
0                    initial          11.3 d           22.6 d          33.9 d          45.2 d          45.2 d
0                    initial          11.3 d           22.6 d          33.9 d          45.2 d          45.2 d
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
               initial     1.7 d      3.3 d      5.0 d      6.7 d      8.3 d     10.0 d
```

o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	4.96E+00	4.98E+00	4.99E+00	5.01E+00	5.03E+00	5.04E+00	5.06E+00
tc 99	2.65E-06	2.67E-06	2.68E-06	2.69E-06	2.69E-06	2.70E-06	2.70E-06

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	1.55E-03	1.55E-03	1.55E-03	1.55E-03	1.55E-03	1.55E-03	1.55E-03
u234	2.94E+02	2.94E+02	2.94E+02	2.94E+02	2.94E+02	2.94E+02	2.94E+02
u235	2.69E+04	2.69E+04	2.69E+04	2.69E+04	2.69E+04	2.69E+04	2.69E+04
u236	2.46E+03	2.46E+03	2.46E+03	2.46E+03	2.46E+03	2.46E+03	2.46E+03
u238	9.52E+05	9.52E+05	9.52E+05	9.52E+05	9.52E+05	9.52E+05	9.52E+05
np237	1.20E+02	1.21E+02	1.21E+02	1.22E+02	1.22E+02	1.22E+02	1.22E+02
pu236	6.30E-05	6.32E-05	6.32E-05	6.31E-05	6.31E-05	6.30E-05	6.29E-05
pu238	1.35E+01	1.35E+01	1.36E+01	1.36E+01	1.36E+01	1.36E+01	1.36E+01
pu238	1.35E+01	1.35E+01	1.36E+01	1.36E+01	1.36E+01	1.36E+01	1.36E+01
pu239	4.41E+03	4.43E+03	4.43E+03	4.44E+03	4.44E+03	4.45E+03	4.45E+03
pu240	6.77E+02	6.77E+02	6.77E+02	6.77E+02	6.77E+02	6.77E+02	6.77E+02
pu241	3.07E+02	3.07E+02	3.07E+02	3.06E+02	3.06E+02	3.06E+02	3.06E+02
pu242	2.72E+01	2.72E+01	2.72E+01	2.72E+01	2.72E+01	2.72E+01	2.72E+01
am241	7.63E+00	7.70E+00	7.77E+00	7.83E+00	7.90E+00	7.97E+00	8.04E+00
am242m	1.22E-01	1.22E-01	1.22E-01	1.22E-01	1.22E-01	1.22E-01	1.22E-01
am243	1.89E+00	1.90E+00	1.90E+00	1.90E+00	1.90E+00	1.90E+00	1.90E+00
total	9.87E+05	9.87E+05	9.87E+05	9.87E+05	9.87E+05	9.87E+05	9.87E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	2.44E+02	2.45E+02	2.45E+02	2.46E+02	2.47E+02	2.48E+02	2.48E+02

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
tc 99	3.17E+02	3.17E+02	3.18E+02	3.18E+02	3.18E+02	3.18E+02	3.19E+02
tc 99m	1.60E-01	1.15E-01	7.55E-02	4.96E-02	3.25E-02	2.14E-02	1.40E-02
ru101	2.82E+02	2.82E+02	2.82E+02	2.82E+02	2.82E+02	2.82E+02	2.82E+02
rh103	1.68E+02	1.69E+02	1.69E+02	1.70E+02	1.71E+02	1.71E+02	1.72E+02
rh103m	2.02E-02	1.96E-02	1.90E-02	1.85E-02	1.79E-02	1.74E-02	1.69E-02
ag109	1.80E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	3.86E+02	3.87E+02	3.88E+02	3.89E+02	3.90E+02	3.90E+02	3.91E+02
nd145	2.82E+02	2.82E+02	2.82E+02	2.82E+02	2.82E+02	2.82E+02	2.82E+02
sm147	3.19E+01	3.21E+01	3.22E+01	3.23E+01	3.24E+01	3.26E+01	3.27E+01
sm149	2.78E+00	3.02E+00	3.16E+00	3.24E+00	3.29E+00	3.32E+00	3.33E+00
sm150	9.43E+01	9.43E+01	9.43E+01	9.43E+01	9.43E+01	9.43E+01	9.43E+01
sm151	1.22E+01	1.23E+01	1.23E+01	1.23E+01	1.23E+01	1.23E+01	1.23E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
eu151	3.29E-02	3.33E-02	3.37E-02	3.42E-02	3.46E-02	3.50E-02	3.55E-02
sm152	4.74E+01	4.74E+01	4.74E+01	4.74E+01	4.74E+01	4.74E+01	4.74E+01
eu153	2.59E+01	2.60E+01	2.61E+01	2.61E+01	2.61E+01	2.61E+01	2.61E+01
gd155	2.04E-02	2.11E-02	2.19E-02	2.27E-02	2.35E-02	2.42E-02	2.50E-02
total	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04

t32e11h4.sum

```
0*************************************************************************
*                                                                       *
*                   SCALE4.3  Bulletin  Board                           *
*                   --------  --------  -----                           *
*                                                                       *
*                     Welcome to SCALE-4.3.                             *
*                                                                       *
*                                                                       *
*************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h     will be called
      trino vercellese pwr, 509-032, rod ell, level 4, 15.377 gwd/mtu, June 97
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      '
      uo2  1 den=10.079  1 1015
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1015  end
      kr-85  1 0 1-20 1015  end
      y-89   1 0 1-20 1015  end
      sr-90  1 0 1-20 1015  end
      zr-93  1 0 1-20 1015  end
      zr-94  1 0 1-20 1015  end
      zr-95  1 0 1-20 1015  end
      nb-94  1 0 1-20 1015  end
      mo-95  1 0 1-20 1015  end
      tc-99  1 0 1-20 1015  end
      ru-101 1 0 1-20 1015  end
      ru-106 1 0 1-20 1015  end
      rh-103 1 0 1-20 1015  end
      rh-105 1 0 1-20 1015  end
      pd-105 1 0 1-20 1015  end
      pd-108 1 0 1-20 1015  end
      ag-109 1 0 1-20 1015  end
      sb-124 1 0 1-20 1015  end
      xe-131 1 0 1-20 1015  end
      xe-132 1 0 1-20 1015  end
      xe-135 1 0 1-20 1015  end
      xe-136 1 0 1-20 1015  end
      cs-134 1 0 1-20 1015  end
      cs-135 1 0 1-20 1015  end
      cs-137 1 0 1-20 1015  end
      ba-136 1 0 1-20 1015  end
      la-139 1 0 1-20 1015  end
      pr-141 1 0 1-20 1015  end
      pr-143 1 0 1-20 1015  end
      ce-144 1 0 1-20 1015  end
      nd-143 1 0 1-20 1015  end
      nd-145 1 0 1-20 1015  end
      nd-147 1 0 1-20 1015  end
      pm-147 1 0 1-20 1015  end
      pm-148 1 0 1-20 1015  end
      sm-147 1 0 1-20 1015  end
      sm-149 1 0 1-20 1015  end
      sm-150 1 0 1-20 1015  end
      sm-151 1 0 1-20 1015  end
      sm-152 1 0 1-20 1015  end
      eu-153 1 0 1-20 1015  end
      eu-154 1 0 1-20 1015  end
      eu-155 1 0 1-20 1015  end
      gd-155 1 0 1-20 1015  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7554  1  557   end
      arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  557  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3    end
      3 0.7351 500 3.3248 2 3.3353
      power=13.268 burn=226  down=86     end
      power=20.607 burn=263  down=51    bfrac=0.7234  end
      power=23.831 burn=292  down=10    bfrac=0.2766  end
        o 135     cr 5.9     mn  0.33
        fe 13.0   co 0.075   ni  9.9
        zr 221.0 nb 0.71    sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss      aaaaaaaaa      sssssssssss     22222222222    hh          hh
   ssssssssssssss    aaaaaaaaaaa    ssssssssssssss  2222222222222  hh          hh
   ss          ss   aa          aa  ss          ss  22          22  hh          hh
   ss               aa          aa  ss                      22  hh          hh
   ss               aa          aa  ss                      22  hh          hh
   sssssssssss      aaaaaaaaaaaaa   sssssssssss            22    hhhhhhhhhhhhh
    sssssssssss     aaaaaaaaaaaaa    sssssssssss          22     hhhhhhhhhhhhh
            ss      aa          aa          ss        22        hh          hh
            ss      aa          aa          ss      22          hh          hh
   ss       ss      aa          aa  ss      ss     22           hh          hh
   ssssssssssss     aa          aa  ssssssssssss   2222222222222  hh          hh
```

```
    sssssssssss    aa          aa    sssssssssss    2222222222222    hh          hh
0
   nn          nn  iiiiiiiiiii    cccccccccc    hh          hh   ooooooooooo    ll
   nnn         nn  iiiiiiiiiii   cccccccccccc   hh          hh  oooooooooooo    ll
   nnnn        nn      ii        cc         cc  hh          hh  oo        oo    ll
   nn nn       nn      ii        cc             hh          hh  oo        oo    ll
   nn  nn      nn      ii        cc             hh          hh  oo        oo    ll
   nn   nn     nn      ii        cc             hhhhhhhhhhhhhh  oo        oo    ll
   nn    nn    nn      ii        cc             hhhhhhhhhhhhhh  oo        oo    ll
   nn     nn   nn      ii        cc             hh          hh  oo        oo    ll
   nn      nn  nn      ii        cc             hh          hh  oo        oo    ll
   nn       nnnn       ii        cc         cc  hh          hh  oo        oo    ll
   nn        nnn   iiiiiiiiiii   cccccccccccc   hh          hh  oooooooooooo    llllllllllll
   nn         nn   iiiiiiiiiii    cccccccccc    hh          hh   ooooooooooo    llllllllllll
0
     0000000     777777777777            //  33333333333        11              //  99999999999    777777777777
    000000000    777777777777           //  3333333333333      111             //  9999999999999   777777777777
   00       00   77         77         //   33         33     1111            //   99         99   77         77
  00         00            77         //               33       11           //    99         99             77
  00         00           77         //                33       11          //     99         99            77
  00         00          77         //               333        11         //      9999999999999           77
  00         00          77        //                333        11        //        999999999999           77
  00         00         77        //                   33       11       //                   99          77
  00         00         77       //                    33       11      //                    99          77
   00       00         77       //      33         33       11     //                     99          77
    000000000          77      //       3333333333333    11111111  //           9999999999999          77
     0000000           77     //         33333333333     11111111 //            999999999999           77
0
       11          11                 0000000        11                 0000000     33333333333
      111         111                000000000      111                000000000   3333333333333
     1111        1111       :::     00       00    1111      :::     00       00   33         33
       11          11       :::    00         00     11      :::    00         00             33
       11          11       :::    00         00     11      :::    00         00             33
       11          11              00         00     11             00         00           333
       11          11              00         00     11             00         00           333
       11          11       :::    00         00     11      :::    00         00             33
       11          11       :::    00         00     11      :::    00         00             33
       11          11       :::     00       00      11      :::     00       00   33         33
    11111111    11111111             000000000    11111111           000000000    3333333333333
    11111111    11111111              0000000     11111111            0000000      33333333333
1
0                                  sssssssssss    cccccccccc     aaaaaaaaa     ll             eeeeeeeeeeee
                                  ssssssssssss   cccccccccccc   aaaaaaaaaaa    ll             eeeeeeeeeeee
                                  ss        ss   cc         cc  aa         aa  ll             ee
                                  ss             cc             aa         aa  ll             ee
                                  ss             cc             aa         aa  ll             ee
                                  sssssssssss    cc             aaaaaaaaaaaaa  ll             eeeeeeeee
                                   sssssssssss   cc             aaaaaaaaaaaaa  ll             eeeeeeeee
                                            ss   cc             aa         aa  ll             ee
                                            ss   cc             aa         aa  ll             ee
                                  ss        ss   cc         cc  aa         aa  ll             ee
                                  ssssssssssss   cccccccccccc   aa         aa  llllllllllll   eeeeeeeeeeee
                                   sssssssssss    cccccccccc    aa         aa  llllllllllll   eeeeeeeeeeee


                        ************************************************************************
                        ************************************************************************
                        ************************************************************************
                        *****                                                              *****
                        *****                 program verification information             *****
                        *****                                                              *****
                        *****                code system:    scale  version:    4.3        *****
                        *****                                                              *****
                        ************************************************************************
                        ************************************************************************
                        *****                                                              *****
                        *****                                                              *****
                        *****              program:  sas2                                  *****
                        *****                                                              *****
                        *****        creation date:  03/07/97                              *****
                        *****                                                              *****
                        *****              library:  /opt/neut/Scale4.3/bin                *****
                        *****                                                              *****
                        *****                                                              *****
                        *****    this is not a   scale  configuration controlled code      *****
                        *****                                                              *****
                        *****              jobname:  nichol                                *****
                        *****                                                              *****
                        *****    date of execution:  07/31/97                              *****
                        *****                                                              *****
                        *****    time of execution:  11:01:03                              *****
                        *****                                                              *****
                        *****                                                              *****
                        ************************************************************************
                        ************************************************************************
                        ************************************************************************
1
0'
0' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                          nuclide concentrations, grams
                                           basis =single reactor assembly
              initial   1E-18 d
     o 16    1.35E+05  1.35E+05
   total     3.90E+05  3.90E+05
0                                          nuclide concentrations, grams
                                           basis =single reactor assembly
              initial   1E-18 d
      u234   2.80E+02  2.80E+02
      u235   3.13E+04  3.13E+04
      u236   1.40E+02  1.40E+02
      u238   9.68E+05  9.68E+05
   total     1.00E+06  1.00E+06
0                                         basis =
0                  initial         11.3 d          22.6 d          33.9 d          45.2 d          45.2 d
0                  initial         11.3 d          22.6 d          33.9 d          45.2 d          45.2 d
0                                          nuclide concentrations, grams
```

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	7.11E+00	7.13E+00	7.15E+00	7.18E+00	7.20E+00	7.22E+00	7.25E+00
tc 99	7.76E-06	7.81E-06	7.84E-06	7.87E-06	7.88E-06	7.89E-06	7.90E-06

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03
u234	2.17E+02	2.17E+02	2.17E+02	2.17E+02	2.17E+02	2.17E+02	2.17E+02
u235	1.77E+04	1.77E+04	1.77E+04	1.77E+04	1.77E+04	1.77E+04	1.77E+04
u236	2.62E+03	2.62E+03	2.62E+03	2.62E+03	2.62E+03	2.62E+03	2.62E+03
u238	9.56E+05	9.56E+05	9.56E+05	9.56E+05	9.56E+05	9.56E+05	9.56E+05
np237	1.74E+02	1.75E+02	1.75E+02	1.76E+02	1.76E+02	1.77E+02	1.77E+02
pu236	1.31E-04	1.32E-04	1.32E-04	1.32E-04	1.31E-04	1.31E-04	1.31E-04
pu238	2.80E+01	2.81E+01	2.82E+01	2.83E+01	2.83E+01	2.84E+01	2.84E+01
pu238	2.80E+01	2.81E+01	2.82E+01	2.83E+01	2.83E+01	2.84E+01	2.84E+01
pu239	5.19E+03	5.21E+03	5.23E+03	5.24E+03	5.24E+03	5.24E+03	5.25E+03
pu240	1.11E+03	1.11E+03	1.11E+03	1.11E+03	1.11E+03	1.11E+03	1.11E+03
pu241	5.83E+02	5.83E+02	5.83E+02	5.83E+02	5.82E+02	5.82E+02	5.82E+02
pu242	8.26E+01	8.26E+01	8.26E+01	8.26E+01	8.26E+01	8.26E+01	8.26E+01
am241	1.45E+01	1.46E+01	1.48E+01	1.49E+01	1.50E+01	1.52E+01	1.53E+01
am242m	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01
am243	8.53E+00	8.55E+00	8.55E+00	8.55E+00	8.55E+00	8.55E+00	8.55E+00
total	9.84E+05	9.84E+05	9.84E+05	9.84E+05	9.84E+05	9.84E+05	9.84E+05

0 element concentrations, grams

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	3.00E+02	3.01E+02	3.02E+02	3.03E+02	3.04E+02	3.05E+02	3.06E+02
tc 99	3.95E+02	3.96E+02	3.96E+02	3.97E+02	3.97E+02	3.97E+02	3.97E+02
tc 99m	2.02E-01	1.45E-01	9.55E-02	6.27E-02	4.12E-02	2.71E-02	1.78E-02
ru101	3.61E+02	3.61E+02	3.61E+02	3.61E+02	3.61E+02	3.61E+02	3.61E+02
rh103	2.19E+02	2.20E+02	2.21E+02	2.21E+02	2.22E+02	2.23E+02	2.24E+02
rh103m	2.84E-02	2.76E-02	2.68E-02	2.60E-02	2.52E-02	2.45E-02	2.38E-02
ag109	3.19E+01	3.20E+01	3.20E+01	3.20E+01	3.20E+01	3.20E+01	3.20E+01

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	4.57E+02	4.59E+02	4.60E+02	4.61E+02	4.62E+02	4.63E+02	4.64E+02
nd145	3.45E+02	3.45E+02	3.45E+02	3.45E+02	3.45E+02	3.45E+02	3.45E+02
sm147	3.66E+01	3.68E+01	3.69E+01	3.71E+01	3.72E+01	3.74E+01	3.75E+01
sm149	2.56E+00	2.89E+00	3.09E+00	3.20E+00	3.27E+00	3.31E+00	3.34E+00
sm150	1.27E+02	1.27E+02	1.27E+02	1.27E+02	1.27E+02	1.27E+02	1.27E+02

0 nuclide concentrations, grams

basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm151	1.23E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01	1.24E+01
eu151	2.22E-02	2.26E-02	2.30E-02	2.35E-02	2.39E-02	2.44E-02	2.48E-02
sm152	6.36E+01	6.36E+01	6.36E+01	6.36E+01	6.36E+01	6.36E+01	6.36E+01
eu153	4.03E+01	4.05E+01	4.06E+01	4.06E+01	4.06E+01	4.07E+01	4.07E+01
gd155	2.09E-02	2.21E-02	2.33E-02	2.45E-02	2.56E-02	2.68E-02	2.80E-02
total	1.58E+04	1.58E+04	1.58E+04	1.58E+04	1.58E+04	1.58E+04	1.58E+04

t32e11h7.sum

```
0*************************************************************************
 *                                                                       *
 *                    SCALE4.3  Bulletin  Board                          *
 *                    --------  --------  -----                          *
 *                                                                       *
 *                      Welcome to SCALE-4.3.                            *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-032, rod e11 7, 15.898 gwd/mtu, June 97
      '
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      '
      uo2  1 den=10.079  1 1001
          92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1001  end
      kr-85  1 0 1-20 1001  end
      y-89   1 0 1-20 1001  end
      sr-90  1 0 1-20 1001  end
      zr-93  1 0 1-20 1001  end
      zr-94  1 0 1-20 1001  end
      zr-95  1 0 1-20 1001  end
      nb-94  1 0 1-20 1001  end
      mo-95  1 0 1-20 1001  end
      tc-99  1 0 1-20 1001  end
      ru-101 1 0 1-20 1001  end
      ru-106 1 0 1-20 1001  end
      rh-103 1 0 1-20 1001  end
      rh-105 1 0 1-20 1001  end
      pd-105 1 0 1-20 1001  end
      pd-108 1 0 1-20 1001  end
      ag-109 1 0 1-20 1001  end
      sb-124 1 0 1-20 1001  end
      xe-131 1 0 1-20 1001  end
      xe-132 1 0 1-20 1001  end
      xe-135 1 0 1-20 1001  end
      xe-136 1 0 1-20 1001  end
      cs-134 1 0 1-20 1001  end
      cs-135 1 0 1-20 1001  end
      cs-137 1 0 1-20 1001  end
      ba-136 1 0 1-20 1001  end
      la-139 1 0 1-20 1001  end
      pr-141 1 0 1-20 1001  end
      pr-143 1 0 1-20 1001  end
      ce-144 1 0 1-20 1001  end
      nd-143 1 0 1-20 1001  end
      nd-145 1 0 1-20 1001  end
      nd-147 1 0 1-20 1001  end
      pm-147 1 0 1-20 1001  end
      pm-148 1 0 1-20 1001  end
      sm-147 1 0 1-20 1001  end
      sm-149 1 0 1-20 1001  end
      sm-150 1 0 1-20 1001  end
      sm-151 1 0 1-20 1001  end
      sm-152 1 0 1-20 1001  end
      eu-153 1 0 1-20 1001  end
      eu-154 1 0 1-20 1001  end
      eu-155 1 0 1-20 1001  end
      gd-155 1 0 1-20 1001  end
      '
      ss304  2 1 570  end
      '
      h2o  3 den=0.7795  1  543   end
      arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  543  end
      '
      ' 1175 ppm boron (wt) in moderator
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3   end
      3 0.7351 500 3.3248 2 3.3353
      power=13.717 burn=226  down=86     end
      power=21.309 burn=263  down=51    bfrac=0.7234  end
      power=24.639 burn=292  down=10    bfrac=0.2766  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss      aaaaaaaaa      sssssssssss     22222222222    hh          hh
   ssssssssssss    aaaaaaaaaaa    ssssssssssss   2222222222222   hh          hh
   ss          ss  aa         aa  ss          ss  22          22  hh          hh
   ss              aa         aa  ss              22          22  hh          hh
   ss              aa         aa  ss              22          22  hh          hh
   sssssssssss     aaaaaaaaaaaaa  sssssssssss              22     hhhhhhhhhhhhh
    ssssssssssss   aaaaaaaaaaaaa   ssssssssssss         22       hhhhhhhhhhhhh
             ss    aa         aa              ss     22          hh          hh
             ss    aa         aa              ss   22            hh          hh
   ss        ss    aa         aa  ss          ss  22            hh          hh
```

```
   ssssssssssss   aa        aa   ssssssssssss   2222222222222   hh        hh
    ssssssssss    aa        aa    ssssssssss    2222222222222   hh        hh
0
   nn          nn  iiiiiiiiiiii   cccccccccc    hh         hh    oooooooooo     11
   nnn         nn  iiiiiiiiiiii  cccccccccccc   hh         hh   oooooooooooo    11
   nnnn        nn       ii       cc        cc   hh         hh   oo        oo    11
   nn nn       nn       ii       cc             hh         hh   oo        oo    11
   nn  nn      nn       ii       cc             hh         hh   oo        oo    11
   nn   nn     nn       ii       cc             hhhhhhhhhhhhh   oo        oo    11
   nn    nn    nn       ii       cc             hhhhhhhhhhhhh   oo        oo    11
   nn     nn   nn       ii       cc             hh         hh   oo        oo    11
   nn      nn nn        ii       cc             hh         hh   oo        oo    11
   nn       nnnn        ii       cc        cc   hh         hh   oo        oo    11
   nn        nnn   iiiiiiiiiiii  cccccccccccc   hh         hh   oooooooooooo    111111111111
   nn         nn   iiiiiiiiiiii   cccccccccc    hh         hh    oooooooooo     111111111111
0
     0000000    777777777777         //  33333333333       11          //  99999999999   777777777777
    000000000   77777777777         //  3333333333333     111         //  9999999999999  77777777777
   00       00  77        77       //   33          33   1111        //   99        99   77        77
   00       00           77       //                33     11       //    99        99            77
   00       00          77       //                 33     11      //     99        99           77
   00       00         77       //                333      11     //      9999999999999         77
   00       00         77      //                 333      11    //        999999999999        77
   00       00        77      //                   33      11   //                   99       77
   00       00        77     //                    33      11  //                    99       77
   00       00       77     //      33             33      11 //                     99      77
    000000000        77    //       3333333333333   11111111 //         9999999999999      77
     0000000         77   //         33333333333    11111111//          999999999999       77
0
        11          11                    11        5555555555555            33333333333   22222222222
       111         111                   111        5555555555555           3333333333333 2222222222222
      1111        1111        :::       1111        55                 :::  33         33 22         22
        11          11        :::         11        55                 :::             33            22
        11          11        :::         11        55                 :::             33            22
        11          11                    11        555555555555                     333            22
        11          11                    11        5555555555555                    333          22
        11          11        :::         11                   55      :::             33        22
        11          11        :::         11                   55      :::             33      22
        11          11        :::         11        55         55      :::  33         33    22
     11111111    11111111              11111111     5555555555555           3333333333333 2222222222222
     11111111    11111111              11111111      55555555555             33333333333  2222222222222
1
0
                              sssssssssss    cccccccccc    aaaaaaaaa    11           eeeeeeeeeeee
                             sssssssssssss  cccccccccccc  aaaaaaaaaaa   11           eeeeeeeeeeee
                             ss         ss  cc        cc  aa        aa  11           ee
                             ss             cc            aa        aa  11           ee
                             ss             cc            aa        aa  11           ee
                             ssssssssssss   cc            aaaaaaaaaaaa  11           eeeeeeeee
                              ssssssssssss  cc            aaaaaaaaaaaa  11           eeeeeeeee
                                        ss  cc            aa        aa  11           ee
                                        ss  cc            aa        aa  11           ee
                             ss         ss  cc        cc  aa        aa  11           ee
                             sssssssssssss  cccccccccccc  aa        aa  111111111111 eeeeeeeeeeee
                              sssssssssss    cccccccccc   aa        aa  111111111111 eeeeeeeeeeee


          ************************************************************************************
          ************************************************************************************
          ************************************************************************************
          *****                                                                          *****
          *****                    program verification information                      *****
          *****                                                                          *****
          *****                 code system:    scale  version:    4.3                   *****
          *****                                                                          *****
          ************************************************************************************
          ************************************************************************************
          *****                                                                          *****
          *****                                                                          *****
          *****                                                                          *****
          *****                   program:  sas2                                         *****
          *****                                                                          *****
          *****             creation date:  03/07/97                                     *****
          *****                                                                          *****
          *****                   library:  /opt/neut/Scale4.3/bin                       *****
          *****                                                                          *****
          *****                                                                          *****
          *****        this is not a   scale  configuration controlled code              *****
          *****                                                                          *****
          *****                   jobname:  nichol                                       *****
          *****                                                                          *****
          *****         date of execution:  07/31/97                                     *****
          *****                                                                          *****
          *****         time of execution:  11:15:32                                     *****
          *****                                                                          *****
          *****                                                                          *****
          ************************************************************************************
          ************************************************************************************
          ************************************************************************************
1
0
0
0 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                        nuclide concentrations, grams
                                         basis =single reactor assembly
            initial   1E-18 d
    o 16   1.35E+05  1.35E+05
  total    3.90E+05  3.90E+05
0                                        nuclide concentrations, grams
                                         basis =single reactor assembly
            initial   1E-18 d
   u234    2.80E+02  2.80E+02
   u235    3.13E+04  3.13E+04
   u236    1.40E+02  1.40E+02
   u238    9.68E+05  9.68E+05
  total    1.00E+06  1.00E+06
0                                       basis =
0                initial        11.3 d         22.6 d         33.9 d         45.2 d         45.2 d
```

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	7.20E+00	7.22E+00	7.25E+00	7.27E+00	7.29E+00	7.32E+00	7.34E+00
tc 99	8.01E-06	8.06E-06	8.10E-06	8.12E-06	8.14E-06	8.15E-06	8.15E-06

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03	1.52E-03
u234	2.15E+02	2.15E+02	2.15E+02	2.15E+02	2.15E+02	2.15E+02	2.15E+02
u235	1.73E+04	1.73E+04	1.73E+04	1.73E+04	1.73E+04	1.73E+04	1.73E+04
u236	2.68E+03	2.68E+03	2.68E+03	2.68E+03	2.68E+03	2.68E+03	2.68E+03
u238	9.56E+05	9.56E+05	9.56E+05	9.56E+05	9.56E+05	9.56E+05	9.56E+05
np237	1.79E+02	1.80E+02	1.80E+02	1.81E+02	1.81E+02	1.82E+02	1.82E+02
pu236	1.38E-04	1.38E-04	1.38E-04	1.38E-04	1.38E-04	1.38E-04	1.38E-04
pu238	2.94E+01	2.96E+01	2.97E+01	2.98E+01	2.98E+01	2.98E+01	2.98E+01
pu238	2.94E+01	2.96E+01	2.97E+01	2.98E+01	2.98E+01	2.98E+01	2.98E+01
pu239	5.19E+03	5.21E+03	5.22E+03	5.23E+03	5.24E+03	5.24E+03	5.24E+03
pu240	1.14E+03	1.14E+03	1.14E+03	1.14E+03	1.14E+03	1.14E+03	1.14E+03
pu241	5.99E+02	5.99E+02	5.99E+02	5.99E+02	5.98E+02	5.98E+02	5.98E+02
pu242	8.86E+01	8.86E+01	8.86E+01	8.86E+01	8.86E+01	8.86E+01	8.86E+01
am241	1.49E+01	1.50E+01	1.51E+01	1.53E+01	1.54E+01	1.55E+01	1.57E+01
am242m	2.72E-01	2.72E-01	2.72E-01	2.72E-01	2.72E-01	2.72E-01	2.72E-01
am243	9.29E+00	9.31E+00	9.31E+00	9.31E+00	9.31E+00	9.31E+00	9.31E+00
total	9.83E+05	9.83E+05	9.83E+05	9.83E+05	9.83E+05	9.83E+05	9.83E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	3.10E+02	3.11E+02	3.12E+02	3.13E+02	3.14E+02	3.15E+02	3.16E+02
tc 99	4.08E+02	4.09E+02	4.09E+02	4.10E+02	4.10E+02	4.10E+02	4.10E+02
tc 99m	2.09E-01	1.50E-01	9.87E-02	6.49E-02	4.26E-02	2.80E-02	1.84E-02
ru101	3.73E+02	3.73E+02	3.73E+02	3.73E+02	3.73E+02	3.73E+02	3.73E+02
rh103	2.26E+02	2.27E+02	2.27E+02	2.28E+02	2.29E+02	2.30E+02	2.30E+02
rh103m	2.94E-02	2.85E-02	2.77E-02	2.69E-02	2.61E-02	2.54E-02	2.46E-02
ag109	3.32E+01	3.32E+01	3.32E+01	3.32E+01	3.32E+01	3.32E+01	3.32E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	4.70E+02	4.71E+02	4.73E+02	4.74E+02	4.75E+02	4.76E+02	4.77E+02
nd145	3.56E+02	3.57E+02	3.57E+02	3.57E+02	3.57E+02	3.57E+02	3.57E+02
sm147	3.76E+01	3.78E+01	3.79E+01	3.81E+01	3.82E+01	3.84E+01	3.85E+01
sm149	2.51E+00	2.85E+00	3.06E+00	3.18E+00	3.25E+00	3.29E+00	3.32E+00
sm150	1.32E+02	1.32E+02	1.32E+02	1.32E+02	1.32E+02	1.32E+02	1.32E+02

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm151	1.20E+01	1.21E+01	1.22E+01	1.22E+01	1.22E+01	1.22E+01	1.22E+01
eu151	2.10E-02	2.14E-02	2.18E-02	2.22E-02	2.27E-02	2.31E-02	2.35E-02
sm152	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01	6.60E+01
eu153	4.21E+01	4.23E+01	4.24E+01	4.24E+01	4.25E+01	4.25E+01	4.25E+01
gd155	2.04E-02	2.17E-02	2.29E-02	2.41E-02	2.53E-02	2.65E-02	2.78E-02
total	1.64E+04	1.64E+04	1.64E+04	1.64E+04	1.64E+04	1.64E+04	1.64E+04

t32e11h9.sum

```
0*****************************************************************************
 *                                                                           *
 *                   SCALE4.3  Bulletin  Board                               *
 *                   --------  --------  -----                               *
 *                                                                           *
 *                     Welcome to SCALE-4.3.                                 *
 *                                                                           *
 *                                                                           *
 *****************************************************************************
1           primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
¬  module sas2h     will be called
     trino vercellese pwr, 509-032, rod e11 9, 11.529 gwd/mtu, June 97
     '
     ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
     '   mixtures of fuel-pin-unit-cell:
     '
     44group    latticecell
     '
     '
     uo2  1 den=10.079  1  927
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
     kr-83   1 0 1-20 927  end
     kr-85   1 0 1-20 927  end
     y-89    1 0 1-20 927  end
     sr-90   1 0 1-20 927  end
     zr-93   1 0 1-20 927  end
     zr-94   1 0 1-20 927  end
     zr-95   1 0 1-20 927  end
     nb-94   1 0 1-20 927  end
     mo-95   1 0 1-20 927  end
     tc-99   1 0 1-20 927  end
     ru-101 1 0 1-20 927  end
     ru-106 1 0 1-20 927  end
     rh-103 1 0 1-20 927  end
     rh-105 1 0 1-20 927  end
     pd-105 1 0 1-20 927  end
     pd-108 1 0 1-20 927  end
     ag-109 1 0 1-20 927  end
     sb-124 1 0 1-20 927  end
     xe-131 1 0 1-20 927  end
     xe-132 1 0 1-20 927  end
     xe-135 1 0 1-20 927  end
     xe-136 1 0 1-20 927  end
     cs-134 1 0 1-20 927  end
     cs-135 1 0 1-20 927  end
     cs-137 1 0 1-20 927  end
     ba-136 1 0 1-20 927  end
     la-139 1 0 1-20 927  end
     pr-141 1 0 1-20 927  end
     pr-143 1 0 1-20 927  end
     ce-144 1 0 1-20 927  end
     nd-143 1 0 1-20 927  end
     nd-145 1 0 1-20 927  end
     nd-147 1 0 1-20 927  end
     pm-147 1 0 1-20 927  end
     pm-148 1 0 1-20 927  end
     sm-147 1 0 1-20 927  end
     sm-149 1 0 1-20 927  end
     sm-150 1 0 1-20 927  end
     sm-151 1 0 1-20 927  end
     sm-152 1 0 1-20 927  end
     eu-153 1 0 1-20 927  end
     eu-154 1 0 1-20 927  end
     eu-155 1 0 1-20 927  end
     gd-155 1 0 1-20 927  end
     '
     ss304 2 1 570  end
     '
     h2o  3 den=0.7885  1  537   end
     arbm-bormod  0.7885 1 1 0 0 5000 100 3 1175.0e-6  537  end
     '
     ' 1175 ppm boron (wt) in moderator
     ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
     '
     end comp
     '
     '
     '      fuel-pin-cell geometry:
     '
     squarepitch   1.303   0.9020 1  3  0.9786  2   end
     '
     ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
     '
     '    assembly and cycle parameters:
     '
     npin/assm=214 fuelnght=823.10 ncycles=3  nlib/cyc=5
     printlevel=5 lightel=9  inplevel=2 numztotal=3    end
     3 0.7351 500 3.3248 2 3.3353
     power=9.947  burn=226  down=86        end
     power=15.451 burn=263  down=51     bfrac=0.7234  end
     power=17.868 burn=292  down=10     bfrac=0.2766  end
       o 135     cr 5.9    mn  0.33
       fe 13.0   co 0.075  ni  9.9
       zr 221.0 nb 0.71    sn  3.6
     '
     ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
     '
1    sssssssssss       aaaaaaaaa       sssssssssss      22222222222     hh          hh
    sssssssssssss     aaaaaaaaaaa     sssssssssssss    2222222222222    hh          hh
    ss         ss    aa         aa    ss         ss    22          22   hh          hh
    ss               aa         aa    ss                         22   hh          hh
    ss               aa         aa    ss                         22   hh          hh
    ssssssssssss     aaaaaaaaaaaaa    ssssssssssss              22     hhhhhhhhhhhhhh
     ssssssssssss    aaaaaaaaaaaaa     ssssssssssss           22       hhhhhhhhhhhhhh
               ss    aa         aa               ss         22        hh          hh
               ss    aa         aa               ss       22          hh          hh
    ss         ss    aa         aa    ss         ss     22            hh          hh
    sssssssssssss    aa         aa    sssssssssssss    2222222222222    hh          hh
```

```
    sssssssssss     aa          aa    sssssssssss     2222222222222   hh          hh
0

  nn         nn  iiiiiiiiiiii    ccccccccccc    hh          hh   ooooooooooo    ll
  nnn        nn  iiiiiiiiiiii   ccccccccccccc   hh          hh  ooooooooooooo   ll
  nnnn       nn       ii        cc         cc   hh          hh  oo         oo   ll
  nn nn      nn       ii        cc              hh          hh  oo         oo   ll
  nn  nn     nn       ii        cc              hh          hh  oo         oo   ll
  nn   nn    nn       ii        cc              hhhhhhhhhhhhhh  oo         oo   ll
  nn    nn   nn       ii        cc              hhhhhhhhhhhhhh  oo         oo   ll
  nn     nn  nn       ii        cc              hh          hh  oo         oo   ll
  nn      nn nn       ii        cc              hh          hh  oo         oo   ll
  nn       nnnn       ii        cc         cc   hh          hh  oo         oo   ll
  nn        nnn  iiiiiiiiiiii   ccccccccccccc   hh          hh  ooooooooooooo   llllllllllll
  nn         nn  iiiiiiiiiiii    ccccccccccc    hh          hh   ooooooooooo    llllllllllll
0

    0000000     7777777777777          //   33333333333        11            //  99999999999    7777777777777
   000000000    777777777777          //   3333333333333      111           //  9999999999999   777777777777
  00       00   77        77         //    33          33    1111          //   99         99   77        77
 00         00           77         //                 33      11         //    99         99            77
 00         00          77         //                  33      11        //     99         99           77
 00         00         77         //                  333      11       //      9999999999999          77
 00         00         77        //                   333      11      //        999999999999          77
 00         00        77        //                     33      11     //                   99         77
 00         00        77       //                      33      11    //                    99         77
  00       00        77       //       33              33      11   //                     99        77
   000000000         77      //        3333333333333        11111111  //        9999999999999        77
    0000000          77     //          33333333333         11111111 //         999999999999         77
0

      11              11                     2222222222     99999999999                   44    33333333333
     111             111                   2222222222222  9999999999999                  444   3333333333333
    1111            1111        :::        22          22  99          99      :::        4444   33          33
      11              11        :::                    22  99          99      :::       44 44               33
      11              11        :::                    22  99          99      :::      44  44               33
      11              11                              22   9999999999999               44   44              333
      11              11                            22      999999999999              44    44              333
      11              11        :::               22                   99      :::    44444444444            33
      11              11        :::             22                     99      :::   4444444444444           33
      11              11        :::           22                       99      :::          44    33          33
   11111111        11111111                  2222222222222  9999999999999                   44    3333333333333
   11111111        11111111                  2222222222222  999999999999                    44     33333333333
1
0                                  sssssssssss    ccccccccccc      aaaaaaaaa     ll            eeeeeeeeeeeee
                                  sssssssssssss  ccccccccccccc    aaaaaaaaaaa    ll            eeeeeeeeeeeee
                                  ss         ss  cc         cc   aa         aa   ll            ee
                                  ss             cc              aa         aa   ll            ee
                                  ss             cc              aa         aa   ll            ee
                                  ssssssssssss   cc              aaaaaaaaaaaaa   ll            eeeeeeeee
                                   ssssssssssss  cc              aaaaaaaaaaaaa   ll            eeeeeeeee
                                             ss  cc              aa         aa   ll            ee
                                             ss  cc              aa         aa   ll            ee
                                  ss         ss  cc         cc   aa         aa   ll            ee
                                  sssssssssssss  ccccccccccccc   aa         aa   llllllllllll  eeeeeeeeeeeee
                                   sssssssssss    ccccccccccc    aa         aa   llllllllllll  eeeeeeeeeeeee
```

```
************************************************************************
************************************************************************
************************************************************************
*****                                                             *****
*****                program verification information             *****
*****                                                             *****
*****               code system:    scale  version:    4.3        *****
*****                                                             *****
************************************************************************
************************************************************************
*****                                                             *****
*****                                                             *****
*****                                                             *****
*****                   program:  sas2                            *****
*****                                                             *****
*****             creation date:  03/07/97                        *****
*****                                                             *****
*****                   library:  /opt/neut/Scale4.3/bin          *****
*****                                                             *****
*****                                                             *****
*****     this is not a   scale  configuration controlled code    *****
*****                                                             *****
*****                   jobname:  nichol                          *****
*****                                                             *****
*****         date of execution:  07/31/97                        *****
*****                                                             *****
*****         time of execution:  11:29:43                        *****
*****                                                             *****
*****                                                             *****
************************************************************************
************************************************************************
************************************************************************
```

```
1
0'
0'
0' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                          nuclide concentrations, grams
                                           basis =single reactor assembly
              initial   1E-18 d
     o 16    1.35E+05  1.35E+05
  total      3.90E+05  3.90E+05
0                                          nuclide concentrations, grams
                                           basis =single reactor assembly
              initial   1E-18 d
     u234    2.80E+02  2.80E+02
     u235    3.13E+04  3.13E+04
     u236    1.40E+02  1.40E+02
     u238    9.68E+05  9.68E+05
  total      1.00E+06  1.00E+06
0                                         basis =
0                    initial        11.3 d         22.6 d         33.9 d         45.2 d         45.2 d
0                    initial        11.3 d         22.6 d         33.9 d         45.2 d         45.2 d
```

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	5.10E+00	5.12E+00	5.14E+00	5.15E+00	5.17E+00	5.19E+00	5.20E+00
tc 99	2.80E-06	2.81E-06	2.83E-06	2.83E-06	2.84E-06	2.84E-06	2.84E-06

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	1.21E-03	1.21E-03	1.21E-03	1.21E-03	1.21E-03	1.21E-03	1.21E-03
u234	2.32E+02	2.32E+02	2.32E+02	2.32E+02	2.32E+02	2.32E+02	2.32E+02
u235	2.03E+04	2.03E+04	2.03E+04	2.03E+04	2.03E+04	2.03E+04	2.03E+04
u236	2.15E+03	2.15E+03	2.15E+03	2.15E+03	2.15E+03	2.15E+03	2.15E+03
u238	9.59E+05	9.59E+05	9.59E+05	9.59E+05	9.59E+05	9.59E+05	9.59E+05
np237	1.13E+02	1.13E+02	1.13E+02	1.14E+02	1.14E+02	1.14E+02	1.14E+02
pu236	5.97E-05	5.99E-05	5.99E-05	5.99E-05	5.98E-05	5.97E-05	5.97E-05
pu238	1.36E+01	1.37E+01	1.37E+01	1.38E+01	1.38E+01	1.38E+01	1.38E+01
pu238	1.36E+01	1.37E+01	1.37E+01	1.38E+01	1.38E+01	1.38E+01	1.38E+01
pu239	4.33E+03	4.35E+03	4.36E+03	4.37E+03	4.37E+03	4.37E+03	4.37E+03
pu240	7.53E+02	7.53E+02	7.53E+02	7.53E+02	7.53E+02	7.53E+02	7.53E+02
pu241	3.38E+02	3.38E+02	3.38E+02	3.38E+02	3.38E+02	3.38E+02	3.38E+02
pu242	3.52E+01	3.52E+01	3.52E+01	3.52E+01	3.52E+01	3.52E+01	3.52E+01
am241	8.47E+00	8.54E+00	8.62E+00	8.69E+00	8.77E+00	8.84E+00	8.92E+00
am242m	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01	1.36E-01
am243	2.55E+00	2.56E+00	2.56E+00	2.56E+00	2.56E+00	2.56E+00	2.56E+00
total	9.88E+05	9.88E+05	9.88E+05	9.88E+05	9.88E+05	9.88E+05	9.88E+05

0 element concentrations, grams

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	2.31E+02	2.31E+02	2.32E+02	2.33E+02	2.33E+02	2.34E+02	2.35E+02

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
tc 99	3.02E+02	3.02E+02	3.03E+02	3.03E+02	3.03E+02	3.03E+02	3.04E+02
tc 99m	1.52E-01	1.09E-01	7.20E-02	4.73E-02	3.11E-02	2.04E-02	1.34E-02
ru101	2.71E+02	2.71E+02	2.71E+02	2.71E+02	2.71E+02	2.71E+02	2.71E+02
rh103	1.65E+02	1.65E+02	1.66E+02	1.67E+02	1.67E+02	1.68E+02	1.68E+02
rh103m	2.01E-02	1.95E-02	1.90E-02	1.84E-02	1.79E-02	1.74E-02	1.69E-02
ag109	2.01E+01	2.02E+01	2.02E+01	2.02E+01	2.02E+01	2.02E+01	2.02E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	3.60E+02	3.61E+02	3.62E+02	3.63E+02	3.63E+02	3.64E+02	3.65E+02
nd145	2.67E+02	2.67E+02	2.67E+02	2.67E+02	2.67E+02	2.67E+02	2.67E+02
sm147	3.01E+01	3.02E+01	3.03E+01	3.05E+01	3.06E+01	3.07E+01	3.08E+01
sm149	2.26E+00	2.49E+00	2.63E+00	2.71E+00	2.75E+00	2.78E+00	2.80E+00
sm150	9.14E+01	9.14E+01	9.14E+01	9.14E+01	9.14E+01	9.14E+01	9.14E+01
sm151	1.04E+01	1.04E+01	1.05E+01	1.05E+01	1.05E+01	1.05E+01	1.05E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
eu151	2.50E-02	2.54E-02	2.58E-02	2.61E-02	2.65E-02	2.69E-02	2.72E-02
sm152	4.75E+01	4.75E+01	4.75E+01	4.75E+01	4.75E+01	4.75E+01	4.75E+01
eu153	2.63E+01	2.64E+01	2.64E+01	2.64E+01	2.65E+01	2.65E+01	2.65E+01
gd155	1.71E-02	1.79E-02	1.87E-02	1.95E-02	2.03E-02	2.11E-02	2.19E-02
total	1.19E+04	1.19E+04	1.19E+04	1.19E+04	1.19E+04	1.19E+04	1.19E+04

t69e11h1.sum

```
0*************************************************************************
 *                                                                       *
 *                    SCALE4.3  Bulletin  Board                          *
 *                    --------  --------  -----                          *
 *                                                                       *
 *                      Welcome to SCALE-4.3.                            *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod e11, level 1, 12.859 gwd/mtu, June 97
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '    mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 915
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 915  end
      kr-85  1 0 1-20 915  end
      y-89   1 0 1-20 915  end
      sr-90  1 0 1-20 915  end
      zr-93  1 0 1-20 915  end
      zr-94  1 0 1-20 915  end
      zr-95  1 0 1-20 915  end
      nb-94  1 0 1-20 915  end
      mo-95  1 0 1-20 915  end
      tc-99  1 0 1-20 915  end
      ru-101 1 0 1-20 915  end
      ru-106 1 0 1-20 915  end
      rh-103 1 0 1-20 915  end
      rh-105 1 0 1-20 915  end
      pd-105 1 0 1-20 915  end
      pd-108 1 0 1-20 915  end
      ag-109 1 0 1-20 915  end
      sb-124 1 0 1-20 915  end
      xe-131 1 0 1-20 915  end
      xe-132 1 0 1-20 915  end
      xe-135 1 0 1-20 915  end
      xe-136 1 0 1-20 915  end
      cs-134 1 0 1-20 915  end
      cs-135 1 0 1-20 915  end
      cs-137 1 0 1-20 915  end
      ba-136 1 0 1-20 915  end
      pr-141 1 0 1-20 915  end
      pr-143 1 0 1-20 915  end
      la-139 1 0 1-20 915  end
      ce-144 1 0 1-20 915  end
      nd-143 1 0 1-20 915  end
      nd-145 1 0 1-20 915  end
      nd-147 1 0 1-20 915  end
      pm-147 1 0 1-20 915  end
      pm-148 1 0 1-20 915  end
      sm-147 1 0 1-20 915  end
      sm-149 1 0 1-20 915  end
      sm-150 1 0 1-20 915  end
      sm-151 1 0 1-20 915  end
      sm-152 1 0 1-20 915  end
      eu-153 1 0 1-20 915  end
      eu-154 1 0 1-20 915  end
      eu-155 1 0 1-20 915  end
      gd-155 1 0 1-20 915  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7365  1  563   end
      arbm-bormod  0.7365 1 1 0 0 5000 100 3 1175.0e-6  563  end
      '
      arbm-ag  10.159 1 1 0 1 47000 100 4 0.80  563  end
      arbm-in  10.159 1 1 0 1 49000 100 4 0.15  563  end
      arbm-cd  10.159 8 0 0 1
      48108  0.85 48110 12.21 48111 12.63 48112 24.02
      48113 12.27 48114 29.11 48601  1-20 48116  7.72
      4 0.05  563  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=5 mxrepeats=0   end
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      '
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      '
```

```
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 '
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
 power=7.148  burn=226  down=86      end
 power=11.101 burn=263  down=51     bfrac=0.7234  end
 power=12.840 burn=292  down=1117   bfrac=0.2766  end
 power=10.997 burn=416  down=10     bfrac=0.5532  h2ofrac=1.026  end
   o 135     cr 5.9     mn  0.33
   fe 13.0   co 0.075   ni  9.9
   zr 221.0  nb 0.71    sn  3.6
 '
 '- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 '
1  sssssssssss      aaaaaaaaa      sssssssssss      22222222222    hh          hh
  sssssssssssss   aaaaaaaaaaa    sssssssssssss    2222222222222   hh          hh
  ss         ss  aa         aa  ss         ss    22         22   hh          hh
  ss             aa         aa  ss                          22   hh          hh
  ss             aa         aa  ss                          22   hh          hh
  sssssssssss    aaaaaaaaaaaaa  sssssssssss              22      hhhhhhhhhhhhh
   sssssssssss   aaaaaaaaaaaaa   sssssssssss           22        hhhhhhhhhhhhh
             ss  aa         aa             ss        22          hh          hh
             ss  aa         aa             ss      22            hh          hh
  ss         ss  aa         aa  ss         ss    22              hh          hh
  sssssssssssss  aa         aa  sssssssssssss    2222222222222   hh          hh
   sssssssssss   aa         aa   sssssssssss     2222222222222   hh          hh
0
  nn         nn  iiiiiiiiiii    ccccccccccc    hh          hh    ooooooooooo    ll
  nnn        nn  iiiiiiiiiii   ccccccccccccc   hh          hh   ooooooooooooo   ll
  nnnn       nn      ii        cc         cc   hh          hh   oo         oo   ll
  nn nn      nn      ii        cc              hh          hh   oo         oo   ll
  nn  nn     nn      ii        cc              hh          hh   oo         oo   ll
  nn   nn    nn      ii        cc              hhhhhhhhhhhhh    oo         oo   ll
  nn    nn   nn      ii        cc              hhhhhhhhhhhhh    oo         oo   ll
  nn     nn  nn      ii        cc              hh          hh   oo         oo   ll
  nn      nn nn      ii        cc              hh          hh   oo         oo   ll
  nn       nnnn      ii        cc         cc   hh          hh   oo         oo   ll
  nn        nnn  iiiiiiiiiii   ccccccccccccc   hh          hh   ooooooooooooo   lllllllllllll
  nn         nn  iiiiiiiiiii    ccccccccccc    hh          hh    ooooooooooo    lllllllllllll
0
    0000000      88888888888             //        11        33333333333             //  99999999999    7777777777777
   000000000    8888888888888           //        111       3333333333333           //  9999999999999   777777777777
  00       00   88         88          //        1111       33         33          //   99         99   77         77
  00       00   88         88         //           11                  33         //    99         99             77
  00       00   88         88        //            11                  33        //     99         99            77
  00       00    88888888888        //             11                333        //      9999999999999           77
  00       00    88888888888       //              11                333       //        999999999999          77
  00       00   88         88     //               11                  33     //                   99         77
  00       00   88         88    //                11                  33    //                    99         77
  00       00   88         88   //                 11       33         33   //                     99        77
   000000000    8888888888888  //              11111111     3333333333333  //           9999999999999        77
    0000000      88888888888  //               11111111      33333333333  //            999999999999         77
0
      11         666666666666                    22222222222      33333333333                  11          99999999999
     111        6666666666666                   2222222222222    3333333333333                111         9999999999999
    1111        66                  :::         22         22    33         33     :::       1111         99         99
      11        66                  :::                    22               33     :::         11         99         99
      11        66                  :::                    22               33     :::         11         99         99
      11        666666666666                             22               333                  11         9999999999999
      11        6666666666666                          22                 333.                 11          999999999999
      11        66         66       :::              22                     33     :::         11                    99
      11        66         66       :::            22                       33     :::         11                    99
      11        66         66       :::          22               33         33     :::         11                    99
  11111111      6666666666666                    2222222222222    3333333333333             11111111      9999999999999
  11111111       66666666666                     2222222222222     33333333333              11111111      999999999999
1
0                                    sssssssssss     ccccccccccc      aaaaaaaaa     ll            eeeeeeeeeeeee
                                    sssssssssssss   ccccccccccccc   aaaaaaaaaaa    ll            eeeeeeeeeeeee
                                    ss         ss   cc         cc  aa         aa   ll            ee
                                    ss              cc             aa         aa   ll            ee
                                    ss              cc             aa         aa   ll            ee
                                    sssssssssss     cc             aaaaaaaaaaaaa   ll            eeeeeeeee
                                     sssssssssss    cc             aaaaaaaaaaaaa   ll            eeeeeeeee
                                               ss   cc             aa         aa   ll            ee
                                               ss   cc             aa         aa   ll            ee
                                    ss         ss   cc         cc  aa         aa   ll            ee
                                    sssssssssssss   ccccccccccccc  aa         aa   lllllllllllll eeeeeeeeeeeee
                                     sssssssssss     ccccccccccc   aa         aa   lllllllllllll eeeeeeeeeeeee


            ***********************************************************************
            ***********************************************************************
            ***********************************************************************
            *****                                                             *****
            *****               program verification information              *****
            *****                                                             *****
            *****             code system:    scale  version:    4.3          *****
            *****                                                             *****
            ***********************************************************************
            ***********************************************************************
            *****                                                             *****
            *****                                                             *****
            *****            program:  sas2                                   *****
            *****                                                             *****
            *****      creation date:  03/07/97                               *****
            *****                                                             *****
            *****            library:  /opt/neut/Scale4.3/bin                 *****
            *****                                                             *****
            *****                                                             *****
```

```
                          *****     this is not a   scale  configuration controlled code                 *****
                          *****                                                                          *****
                          *****               jobname:  nichol                                           *****
                          *****                                                                          *****
                          *****     date of execution:  08/13/97                                         *****
                          *****                                                                          *****
                          *****     time of execution:  16:23:19                                         *****
                          *****                                                                          *****
                          *****                                                                          *****
                          ********************************************************************************
                          ********************************************************************************
                          ********************************************************************************
1
0'
0'
0' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
-0                                        nuclide concentrations, grams
                                          basis =single reactor assembly
            initial   1E-18 d
    o 16    1.35E+05  1.35E+05
   ag109    2.54E+04  2.54E+04
  total     4.55E+05  4.55E+05
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial   1E-18 d
    u234    2.80E+02  2.80E+02
    u235    3.13E+04  3.13E+04
    u236    1.40E+02  1.40E+02
    u238    9.68E+05  9.68E+05
  total     1.00E+06  1.00E+06
0                                        basis =
0                  initial          11.3 d         22.6 d         33.9 d         45.2 d         45.2 d
0                  initial          11.3 d         22.6 d         33.9 d         45.2 d         45.2 d
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
    o 16    1.35E+05  1.35E+05  1.35E+05  1.35E+05  1.35E+05  1.35E+05  1.35E+05
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   mo 95    6.59E+00  6.60E+00  6.61E+00  6.62E+00  6.63E+00  6.64E+00  6.65E+00
   tc 99    4.39E-06  4.41E-06  4.42E-06  4.43E-06  4.43E-06  4.43E-06  4.43E-06
   rh103    3.24E-05  3.24E-05  3.24E-05  3.24E-05  3.24E-05  3.24E-05  3.24E-05
   ag109    1.81E+04  1.81E+04  1.81E+04  1.81E+04  1.81E+04  1.81E+04  1.81E+04
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
  total     4.55E+05  4.55E+05  4.55E+05  4.55E+05  4.55E+05  4.55E+05  4.55E+05
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
    u233    1.42E-03  1.42E-03  1.42E-03  1.42E-03  1.42E-03  1.42E-03  1.42E-03
    u234    2.27E+02  2.27E+02  2.27E+02  2.27E+02  2.27E+02  2.27E+02  2.27E+02
    u235    1.99E+04  1.99E+04  1.99E+04  1.99E+04  1.99E+04  1.99E+04  1.99E+04
    u236    2.27E+03  2.27E+03  2.27E+03  2.27E+03  2.27E+03  2.27E+03  2.27E+03
    u238    9.58E+05  9.58E+05  9.58E+05  9.58E+05  9.58E+05  9.58E+05  9.58E+05
   np237    1.32E+02  1.33E+02  1.33E+02  1.33E+02  1.33E+02  1.33E+02  1.33E+02
   pu236    6.35E-05  6.37E-05  6.36E-05  6.36E-05  6.35E-05  6.35E-05  6.34E-05
   pu238    2.10E+01  2.11E+01  2.11E+01  2.12E+01  2.12E+01  2.12E+01  2.12E+01
   pu238    2.10E+01  2.11E+01  2.11E+01  2.12E+01  2.12E+01  2.12E+01  2.12E+01
   pu239    4.69E+03  4.70E+03  4.71E+03  4.71E+03  4.71E+03  4.71E+03  4.71E+03
   pu240    8.68E+02  8.68E+02  8.68E+02  8.68E+02  8.68E+02  8.68E+02  8.68E+02
   pu241    3.95E+02  3.95E+02  3.94E+02  3.94E+02  3.94E+02  3.94E+02  3.94E+02
   pu242    4.55E+01  4.55E+01  4.55E+01  4.55E+01  4.55E+01  4.55E+01  4.55E+01
   am241    3.41E+01  3.42E+01  3.43E+01  3.44E+01  3.45E+01  3.46E+01  3.47E+01
   am242m   7.01E-01  7.01E-01  7.01E-01  7.01E-01  7.01E-01  7.01E-01  7.01E-01
   am243    3.93E+00  3.94E+00  3.94E+00  3.94E+00  3.94E+00  3.94E+00  3.94E+00
  total     9.87E+05  9.87E+05  9.87E+05  9.87E+05  9.87E+05  9.87E+05  9.87E+05
0                                         element concentrations, grams
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   mo 95    2.74E+02  2.75E+02  2.75E+02  2.75E+02  2.76E+02  2.76E+02  2.77E+02
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   tc 99    3.23E+02  3.23E+02  3.24E+02  3.24E+02  3.24E+02  3.24E+02  3.24E+02
   tc 99m   9.05E-02  6.51E-02  4.28E-02  2.81E-02  1.85E-02  1.21E-02  7.97E-03
   ru101    2.92E+02  2.92E+02  2.92E+02  2.92E+02  2.92E+02  2.92E+02  2.92E+02
   rh103    1.87E+02  1.88E+02  1.88E+02  1.88E+02  1.89E+02  1.89E+02  1.89E+02
   rh103m   1.24E-02  1.20E-02  1.17E-02  1.13E-02  1.10E-02  1.07E-02  1.04E-02
   ag109    2.35E+01  2.36E+01  2.36E+01  2.36E+01  2.36E+01  2.36E+01  2.36E+01
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   nd143    3.88E+02  3.89E+02  3.90E+02  3.90E+02  3.90E+02  3.91E+02  3.91E+02
   nd145    2.84E+02  2.84E+02  2.84E+02  2.84E+02  2.84E+02  2.84E+02  2.84E+02
   sm147    7.48E+01  7.49E+01  7.50E+01  7.50E+01  7.51E+01  7.52E+01  7.53E+01
   sm149    2.17E+00  2.30E+00  2.37E+00  2.42E+00  2.44E+00  2.46E+00  2.47E+00
   sm150    9.51E+01  9.51E+01  9.51E+01  9.51E+01  9.51E+01  9.51E+01  9.51E+01
   sm151    1.12E+01  1.13E+01  1.13E+01  1.13E+01  1.13E+01  1.13E+01  1.13E+01
0                                         nuclide concentrations, grams
                                          basis =single reactor assembly
            initial    1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   eu151    7.21E-02  7.25E-02  7.29E-02  7.33E-02  7.37E-02  7.41E-02  7.45E-02
   sm152    5.09E+01  5.09E+01  5.09E+01  5.09E+01  5.09E+01  5.09E+01  5.09E+01
   eu153    2.99E+01  2.99E+01  3.00E+01  3.00E+01  3.00E+01  3.00E+01  3.00E+01
   gd155    3.47E-02  3.56E-02  3.64E-02  3.72E-02  3.80E-02  3.89E-02  3.97E-02
  total     1.28E+04  1.28E+04  1.28E+04  1.28E+04  1.28E+04  1.28E+04  1.28E+04
```

t69e11h2.sum

```
0*************************************************************************
 *                                                                       *
 *                   SCALE4.3  Bulletin  Board                           *
 *                   --------  --------  -----                           *
 *                                                                       *
 *                     Welcome to SCALE-4.3.                             *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod e11, level 2, 20.602 gwd/mtu, June 97
      '
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      uo2  1 den=10.079  1 968
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 968  end
      kr-85  1 0 1-20 968  end
      y-89   1 0 1-20 968  end
      sr-90  1 0 1-20 968  end
      zr-93  1 0 1-20 968  end
      zr-94  1 0 1-20 968  end
      zr-95  1 0 1-20 968  end
      nb-94  1 0 1-20 968  end
      mo-95  1 0 1-20 968  end
      tc-99  1 0 1-20 968  end
      ru-101 1 0 1-20 968  end
      ru-106 1 0 1-20 968  end
      rh-103 1 0 1-20 968  end
      rh-105 1 0 1-20 968  end
      pd-105 1 0 1-20 968  end
      pd-108 1 0 1-20 968  end
      ag-109 1 0 1-20 968  end
      sb-124 1 0 1-20 968  end
      xe-131 1 0 1-20 968  end
      xe-132 1 0 1-20 968  end
      xe-135 1 0 1-20 968  end
      xe-136 1 0 1-20 968  end
      cs-134 1 0 1-20 968  end
      cs-135 1 0 1-20 968  end
      cs-137 1 0 1-20 968  end
      ba-136 1 0 1-20 968  end
      la-139 1 0 1-20 968  end
      pr-141 1 0 1-20 968  end
      pr-143 1 0 1-20 968  end
      ce-144 1 0 1-20 968  end
      nd-143 1 0 1-20 968  end
      nd-145 1 0 1-20 968  end
      nd-147 1 0 1-20 968  end
      pm-147 1 0 1-20 968  end
      pm-148 1 0 1-20 968  end
      sm-147 1 0 1-20 968  end
      sm-149 1 0 1-20 968  end
      sm-150 1 0 1-20 968  end
      sm-151 1 0 1-20 968  end
      sm-152 1 0 1-20 968  end
      eu-153 1 0 1-20 968  end
      eu-154 1 0 1-20 968  end
      eu-155 1 0 1-20 968  end
      gd-155 1 0 1-20 968  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7407  1  561   end
      arbm-bormod  0.7407 1 1 0 0 5000 100 3 1175.0e-6  561  end
      '
      arbm-ag  10.159 1 1 0 1 47000 100 4 0.80  561  end
      arbm-in  10.159 1 1 0 1 49000 100 4 0.15  561  end
      arbm-cd  10.159 8 0 0 1
      48108  0.85 48110 12.21 48111 12.63 48112 24.02
      48113 12.27 48114 29.11 48601  1-20 48116  7.72
      4 0.05  561  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=5 mxrepeats=0   end
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      4 0.4573  2 0.5005  3 0.7351 500 3.2076 2 3.2177
      '
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      '
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
      3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
```

```
     3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
     3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
     '
     3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
     3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
     3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
     3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
     3 0.4573  3 0.5005  3 0.7351 500 3.3248 2 3.3353
     power=11.452 burn=226  down=86       end
     power=17.786 burn=263  down=51     bfrac=0.7234  end
     power=20.571 burn=292  down=1117   bfrac=0.2766  end
     power=17.619 burn=416  down=10     bfrac=0.5532  h2ofrac=1.025  end
       o 135     cr 5.9     mn  0.33
       fe 13.0   co 0.075   ni  9.9
       zr 221.0  nb 0.71    sn  3.6
     '
     '------------------------------
     '
1  sssssssssss      aaaaaaaaa     sssssssssss    22222222222    hh          hh
  sssssssssssss   aaaaaaaaaaa   sssssssssssss  2222222222222  hh          hh
  ss         ss  aa         aa  ss         ss  22         22  hh          hh
  ss              aa         aa  ss                       22  hh          hh
  ss              aa         aa  ss                       22  hh          hh
  ssssssssssss    aaaaaaaaaaaaa  ssssssssssss            22   hhhhhhhhhhhhh
   ssssssssssss   aaaaaaaaaaaaa   ssssssssssss         22     hhhhhhhhhhhhh
             ss   aa         aa             ss       22       hh          hh
             ss   aa         aa             ss     22         hh          hh
  ss         ss   aa         aa  ss         ss   22           hh          hh
  sssssssssssss   aa         aa  sssssssssssss  2222222222222  hh          hh
   sssssssssss    aa         aa   sssssssssss   2222222222222  hh          hh
0
  nn         nn  iiiiiiiiiii    ccccccccccc   hh          hh   ooooooooooo   ll
  nnn        nn  iiiiiiiiiii   ccccccccccccc  hh          hh  ooooooooooooo  ll
  nnnn       nn      ii        cc         cc  hh          hh  oo         oo  ll
  nn nn      nn      ii        cc             hh          hh  oo         oo  ll
  nn  nn     nn      ii        cc             hh          hh  oo         oo  ll
  nn   nn    nn      ii        cc             hhhhhhhhhhhhh  oo         oo  ll
  nn    nn   nn      ii        cc             hhhhhhhhhhhhh  oo         oo  ll
  nn     nn  nn      ii        cc             hh          hh  oo         oo  ll
  nn      nn nn      ii        cc             hh          hh  oo         oo  ll
  nn       nnnn      ii        cc         cc  hh          hh  oo         oo  ll
  nn        nnn  iiiiiiiiiii   ccccccccccccc  hh          hh  ooooooooooooo  lllllllllllll
  nn         nn  iiiiiiiiiii    ccccccccccc   hh          hh   ooooooooooo   lllllllllllll
0
    0000000      88888888888          //      11      33333333333          //   99999999999   7777777777777
   000000000    8888888888888        //      111     3333333333333        //   9999999999999  777777777777
  00       00   88         88       //      1111     33         33       //    99         99  77        77
 00         00  88         88      //         11                33      //     99         99            77
 00         00  88         88     //          11                33     //      99         99           77
 00         00   88888888888     //           11              333     //       9999999999999          77
 00         00   88888888888    //            11              333    //         999999999999         77
 00         00  88         88  //             11                33  //                    99        77
 00         00  88         88 //              11                33 //                     99       77
  00       00   88         88//               11     33         33//                      99      77
   000000000    8888888888888//             11111111  3333333333333//              9999999999999     77
    0000000      88888888888//              11111111   33333333333//               999999999999      77
0
      11        7777777777777                 11      666666666666                 22222222222   5555555555555
     111        777777777777                 111     6666666666666                2222222222222  5555555555555
    1111        77        77       :::      1111     66                  :::      22         22  55
      11                 77        :::        11     66                  :::                 22  55
      11                77         :::        11     66                  :::                 22  55
      11               77                     11     666666666666                           22   555555555555
      11              77                      11     6666666666666                        22     5555555555555
      11             77            :::        11     66         66       :::            22                  55
      11            77             :::        11     66         66       :::          22                    55
      11           77              :::        11     66         66       :::        22           55         55
   11111111        77                     11111111   6666666666666                 2222222222222  5555555555555
   11111111        77                     11111111    66666666666                  2222222222222   55555555555
1
0                                 sssssssssss    ccccccccccc      aaaaaaaaa     ll           eeeeeeeeeeeee
                                 sssssssssssss  ccccccccccccc   aaaaaaaaaaa    ll           eeeeeeeeeeeee
                                 ss         ss  cc         cc  aa         aa   ll           ee
                                 ss             cc             aa         aa   ll           ee
                                 ss             cc             aa         aa   ll           ee
                                 ssssssssssss   cc             aaaaaaaaaaaaa   ll           eeeeeeeee
                                  ssssssssssss  cc             aaaaaaaaaaaaa   ll           eeeeeeeee
                                            ss  cc             aa         aa   ll           ee
                                            ss  cc             aa         aa   ll           ee
                                 ss         ss  cc         cc  aa         aa   ll           ee
                                 sssssssssssss  ccccccccccccc  aa         aa   lllllllllllll eeeeeeeeeeeee
                                  sssssssssss    ccccccccccc   aa         aa   lllllllllllll eeeeeeeeeeeee


                    *******************************************************************************
                    *******************************************************************************
                    *******************************************************************************
                    *****                                                                     *****
                    *****                     program verification information                *****
                    *****                                                                     *****
                    *****                  code system:    scale  version:    4.3            *****
                    *****                                                                     *****
                    *******************************************************************************
                    *******************************************************************************
                    *****                                                                     *****
                    *****                                                                     *****
                    *****                   program:  sas2                                    *****
                    *****                                                                     *****
                    *****             creation date:  03/07/97                                *****
                    *****                                                                     *****
                    *****                   library:  /opt/neut/Scale4.3/bin                  *****
                    *****                                                                     *****
                    *****                                                                     *****
                    *****      this is not a  scale  configuration controlled code            *****
                    *****                                                                     *****
                    *****                   jobname:  nichol                                  *****
```

```
                        *****                                                                            *****
                        *****   date of execution:  08/13/97                                             *****
                        *****                                                                            *****
                        *****   time of execution:  17:16:25                                             *****
                        *****                                                                            *****
                        *****                                                                            *****
                        *****************************************************************************************
                        *****************************************************************************************
                        *****************************************************************************************

1
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0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial   1E-18 d
    o 16   1.35E+05  1.35E+05
   ag109   2.54E+04  2.54E+04
  total    4.55E+05  4.55E+05
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial   1E-18 d
    u234   2.80E+02  2.80E+02
    u235   3.13E+04  3.13E+04
    u236   1.40E+02  1.40E+02
    u238   9.68E+05  9.68E+05
  total    1.00E+06  1.00E+06
0                                            basis =
0                  initial          11.3 d          22.6 d          33.9 d          45.2 d          45.2 d
0                  initial          11.3 d          22.6 d          33.9 d          45.2 d          45.2 d
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
    o 16   1.35E+05  1.35E+05  1.35E+05  1.35E+05  1.35E+05  1.35E+05  1.35E+05
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   mo 95   1.08E+01  1.08E+01  1.08E+01  1.08E+01  1.09E+01  1.09E+01  1.09E+01
   tc 99   1.97E-05  1.98E-05  1.98E-05  1.98E-05  1.99E-05  1.99E-05  1.99E-05
   rh103   4.93E-05  4.93E-05  4.93E-05  4.93E-05  4.93E-05  4.93E-05  4.93E-05
   ag109   1.46E+04  1.46E+04  1.46E+04  1.46E+04  1.46E+04  1.46E+04  1.46E+04
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
  total    4.55E+05  4.55E+05  4.55E+05  4.55E+05  4.55E+05  4.55E+05  4.55E+05
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
    u233   1.93E-03  1.93E-03  1.93E-03  1.93E-03  1.93E-03  1.93E-03  1.93E-03
    u234   2.00E+02  2.00E+02  2.00E+02  2.00E+02  2.00E+02  2.00E+02  2.00E+02
    u235   1.51E+04  1.51E+04  1.51E+04  1.51E+04  1.51E+04  1.51E+04  1.51E+04
    u236   3.09E+03  3.09E+03  3.09E+03  3.09E+03  3.09E+03  3.09E+03  3.09E+03
    u238   9.52E+05  9.52E+05  9.52E+05  9.52E+05  9.52E+05  9.52E+05  9.52E+05
   np237   2.55E+02  2.55E+02  2.56E+02  2.56E+02  2.57E+02  2.57E+02  2.57E+02
   pu236   2.14E-04  2.14E-04  2.14E-04  2.14E-04  2.14E-04  2.14E-04  2.13E-04
   pu238   6.50E+01  6.53E+01  6.54E+01  6.56E+01  6.57E+01  6.58E+01  6.59E+01
   pu238   6.50E+01  6.53E+01  6.54E+01  6.56E+01  6.57E+01  6.58E+01  6.59E+01
   pu239   5.88E+03  5.90E+03  5.91E+03  5.92E+03  5.92E+03  5.92E+03  5.93E+03
   pu240   1.51E+03  1.51E+03  1.51E+03  1.51E+03  1.51E+03  1.51E+03  1.51E+03
   pu241   8.40E+02  8.40E+02  8.40E+02  8.40E+02  8.39E+02  8.39E+02  8.39E+02
   pu242   1.62E+02  1.62E+02  1.62E+02  1.62E+02  1.62E+02  1.62E+02  1.62E+02
   am241   6.91E+01  6.93E+01  6.95E+01  6.97E+01  6.99E+01  7.01E+01  7.03E+01
   am242m  1.62E+00  1.62E+00  1.62E+00  1.62E+00  1.62E+00  1.62E+00  1.62E+00
   am243   2.32E+01  2.32E+01  2.32E+01  2.32E+01  2.32E+01  2.32E+01  2.32E+01
  total    9.79E+05  9.79E+05  9.79E+05  9.79E+05  9.79E+05  9.79E+05  9.79E+05
0                                             element concentrations, grams
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   mo 95   4.23E+02  4.23E+02  4.24E+02  4.25E+02  4.25E+02  4.26E+02  4.26E+02
   tc 99   5.02E+02  5.02E+02  5.03E+02  5.03E+02  5.03E+02  5.03E+02  5.04E+02
   tc 99m  1.45E-01  1.04E-01  6.84E-02  4.49E-02  2.95E-02  1.94E-02  1.27E-02
   ru101   4.67E+02  4.67E+02  4.67E+02  4.67E+02  4.67E+02  4.67E+02  4.67E+02
   rh103   2.95E+02  2.95E+02  2.96E+02  2.97E+02  2.97E+02  2.98E+02  2.98E+02
   rh103m  2.16E-02  2.10E-02  2.04E-02  1.98E-02  1.92E-02  1.87E-02  1.81E-02
   ag109   4.74E+01  4.75E+01  4.75E+01  4.75E+01  4.75E+01  4.75E+01  4.75E+01
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   nd143   5.71E+02  5.72E+02  5.72E+02  5.73E+02  5.74E+02  5.75E+02  5.75E+02
   nd145   4.34E+02  4.34E+02  4.34E+02  4.34E+02  4.34E+02  4.34E+02  4.34E+02
   sm147   1.02E+02  1.02E+02  1.02E+02  1.03E+02  1.03E+02  1.03E+02  1.03E+02
   sm149   2.42E+00  2.64E+00  2.78E+00  2.86E+00  2.90E+00  2.93E+00  2.95E+00
0                                             nuclide concentrations, grams
                                              basis =single reactor assembly
           initial     1.7 d     3.3 d     5.0 d     6.7 d     8.3 d    10.0 d
   sm150   1.60E+02  1.60E+02  1.60E+02  1.60E+02  1.60E+02  1.60E+02  1.60E+02
   sm151   1.38E+01  1.39E+01  1.39E+01  1.39E+01  1.39E+01  1.39E+01  1.39E+01
   eu151   4.35E-02  4.40E-02  4.45E-02  4.49E-02  4.54E-02  4.59E-02  4.64E-02
   sm152   8.12E+01  8.12E+01  8.12E+01  8.12E+01  8.12E+01  8.12E+01  8.12E+01
   eu153   5.95E+01  5.96E+01  5.97E+01  5.97E+01  5.98E+01  5.98E+01  5.98E+01
   gd155   4.89E-02  5.06E-02  5.23E-02  5.39E-02  5.56E-02  5.72E-02  5.89E-02
  total    2.05E+04  2.05E+04  2.05E+04  2.05E+04  2.05E+04  2.05E+04  2.05E+04
```

t69e11h4.sum

```
0**************************************************************************
*                                                                        *
*                    SCALE4.3  Bulletin  Board                           *
*                    --------  --------  -----                           *
*                                                                        *
*                      Welcome to SCALE-4.3.                             *
*                                                                        *
**************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-    module sas2h    will be called
      trino vercellese pwr, 509-069, rod e11, level 4, 23.718 gwd/mtu, June 97
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '    mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1015
        92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83   1 0 1-20 1015  end
      kr-85   1 0 1-20 1015  end
      y-89    1 0 1-20 1015  end
      sr-90   1 0 1-20 1015  end
      zr-93   1 0 1-20 1015  end
      zr-94   1 0 1-20 1015  end
      zr-95   1 0 1-20 1015  end
      nb-94   1 0 1-20 1015  end
      mo-95   1 0 1-20 1015  end
      tc-99   1 0 1-20 1015  end
      ru-101  1 0 1-20 1015  end
      ru-106  1 0 1-20 1015  end
      rh-103  1 0 1-20 1015  end
      rh-105  1 0 1-20 1015  end
      pd-105  1 0 1-20 1015  end
      pd-108  1 0 1-20 1015  end
      ag-109  1 0 1-20 1015  end
      sb-124  1 0 1-20 1015  end
      xe-131  1 0 1-20 1015  end
      xe-132  1 0 1-20 1015  end
      xe-135  1 0 1-20 1015  end
      xe-136  1 0 1-20 1015  end
      cs-134  1 0 1-20 1015  end
      cs-135  1 0 1-20 1015  end
      cs-137  1 0 1-20 1015  end
      ba-136  1 0 1-20 1015  end
      la-139  1 0 1-20 1015  end
      pr-141  1 0 1-20 1015  end
      pr-143  1 0 1-20 1015  end
      ce-144  1 0 1-20 1015  end
      nd-143  1 0 1-20 1015  end
      nd-145  1 0 1-20 1015  end
      nd-147  1 0 1-20 1015  end
      pm-147  1 0 1-20 1015  end
      pm-148  1 0 1-20 1015  end
      sm-147  1 0 1-20 1015  end
      sm-149  1 0 1-20 1015  end
      sm-150  1 0 1-20 1015  end
      sm-151  1 0 1-20 1015  end
      sm-152  1 0 1-20 1015  end
      eu-153  1 0 1-20 1015  end
      eu-154  1 0 1-20 1015  end
      eu-155  1 0 1-20 1015  end
      gd-155  1 0 1-20 1015  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7554  1  553   end
      arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3    end
      3 0.7351 500 3.3248 2 3.3353
      power=13.184 burn=226  down=86     end
      power=20.476 burn=263  down=51    bfrac=0.7234  end
      power=23.683 burn=292  down=1117  bfrac=0.2766  end
      power=20.283 burn=416  down=10    bfrac=0.5532  h2ofrac=1.023  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   ssssssssss      aaaaaaaaa      ssssssssss     22222222222    hh          hh
   ssssssssssss    aaaaaaaaaa    ssssssssssss   2222222222222   hh          hh
   ss          ss   aa          aa   ss          ss   22          22   hh          hh
   ss               aa          aa   ss                       22   hh          hh
   ss               aa          aa   ss                       22   hh          hh
   ssssssssssss    aaaaaaaaaaaa   ssssssssssss             22     hhhhhhhhhhhh
    ssssssssssss   aaaaaaaaaaaa    ssssssssssss          22       hhhhhhhhhhhh
             ss   aa          aa              ss       22         hh          hh
             ss   aa          aa              ss     22           hh          hh
```

```
   ss          ss   aa          aa   ss          ss    22               hh          hh
  sssssssssssss     aa          aa   sssssssssssss     2222222222222    hh          hh
   sssssssssss      aa          aa    sssssssssss      2222222222222    hh          hh
0
  nn          nn   iiiiiiiiiii     ccccccccccc     hh          hh    ooooooooooo     ll
  nnn         nn   iiiiiiiiiii    ccccccccccccc    hh          hh   ooooooooooooo    ll
  nnnn        nn       ii         cc         cc    hh          hh   oo         oo    ll
  nn nn       nn       ii         cc               hh          hh   oo         oo    ll
  nn  nn      nn       ii         cc               hh          hh   oo         oo    ll
  nn   nn     nn       ii         cc               hhhhhhhhhhhhh    oo         oo    ll
  nn    nn    nn       ii         cc               hhhhhhhhhhhhh    oo         oo    ll
  nn     nn   nn       ii         cc               hh          hh   oo         oo    ll
  nn      nn  nn       ii         cc               hh          hh   oo         oo    ll
  nn       nnnn        ii         cc         cc    hh          hh   oo         oo    ll
  nn        nnn    iiiiiiiiiii    ccccccccccccc    hh          hh   ooooooooooooo    lllllllllllll
  nn         nn    iiiiiiiiiii     ccccccccccc     hh          hh    ooooooooooo     lllllllllllll
0
     0000000       777777777777             //   33333333333        11               //   99999999999    777777777777
    000000000      777777777777            //   3333333333333      111              //   9999999999999   777777777777
   00       00     77         77          //    33         33     1111             //    99         99   77         77
  00         00              77          //                33       11            //     99         99             77
  00         00             77          //                 33       11           //      99         99            77
  00         00            77          //                333        11          //       9999999999999           77
  00         00            77         //                 333        11         //         999999999999          77
  00         00           77         //                    33       11        //                    99         77
  00         00           77        //                     33       11       //                     99         77
   00       00            77       //       33         33           11      //                      99        77
    000000000             77      //        3333333333333       11111111   //        9999999999999            77
     0000000              77     //          33333333333        11111111  //          999999999999            77
0
        11        22222222222                  22222222222     33333333333                 5555555555555   88888888888
       111       2222222222222                2222222222222   3333333333333                5555555555555  8888888888888
      1111       22         22      :::       22         22   33         33      :::       55             88         88
        11                  22      :::                  22              33      :::       55             88         88
        11                  22      :::                  22              33      :::       55             88         88
        11                22                           22              333                 555555555555    88888888888
        11              22                           22                333                 5555555555555   88888888888
        11            22            :::            22                    33      :::                  55  88         88
        11          22              :::          22                      33      :::                  55  88         88
        11         22               :::       22              33         33      :::       55         55  88         88
     11111111    2222222222222                2222222222222   3333333333333                5555555555555  8888888888888
     11111111    2222222222222                2222222222222    33333333333                  55555555555    88888888888
1
0
                                     sssssssssss     ccccccccccc      aaaaaaaaa      ll             eeeeeeeeeeeee
                                    sssssssssssss   ccccccccccccc    aaaaaaaaaaa     ll             eeeeeeeeeeeee
                                    ss         ss   cc         cc   aa         aa    ll             ee
                                    ss              cc              aa         aa    ll             ee
                                    ss              cc              aa         aa    ll             ee
                                    ssssssssssss    cc              aaaaaaaaaaaaa    ll             eeeeeeeee
                                     ssssssssssss   cc              aaaaaaaaaaaaa    ll             eeeeeeeee
                                               ss   cc              aa         aa    ll             ee
                                               ss   cc              aa         aa    ll             ee
                                    ss         ss   cc         cc   aa         aa    ll             ee
                                    sssssssssssss   ccccccccccccc   aa         aa    lllllllllllll  eeeeeeeeeeeee
                                     sssssssssss     ccccccccccc    aa         aa    lllllllllllll  eeeeeeeeeeeee


               ***************************************************************************
               ***************************************************************************
               ***************************************************************************
               *****                                                                 *****
               *****                program verification information                 *****
               *****                                                                 *****
               *****             code system:    scale  version:    4.3              *****
               *****                                                                 *****
               ***************************************************************************
               ***************************************************************************
               *****                                                                 *****
               *****                                                                 *****
               *****             program:  sas2                                      *****
               *****                                                                 *****
               *****       creation date:  03/07/97                                  *****
               *****                                                                 *****
               *****             library:  /opt/neut/Scale4.3/bin                    *****
               *****                                                                 *****
               *****                                                                 *****
               *****  this is not a   scale  configuration controlled code           *****
               *****                                                                 *****
               *****             jobname:  nichol                                    *****
               *****                                                                 *****
               *****   date of execution:  07/31/97                                  *****
               *****                                                                 *****
               *****   time of execution:  12:23:58                                  *****
               *****                                                                 *****
               *****                                                                 *****
               ***************************************************************************
               ***************************************************************************
               ***************************************************************************
1
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0' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                              nuclide concentrations, grams
                                               basis =single reactor assembly
          initial   1E-18 d
    o 16  1.35E+05  1.35E+05
  total   3.90E+05  3.90E+05
0                                              nuclide concentrations, grams
                                               basis =single reactor assembly
          initial   1E-18 d
    u234  2.80E+02  2.80E+02
    u235  3.13E+04  3.13E+04
    u236  1.40E+02  1.40E+02
    u238  9.68E+05  9.68E+05
  total   1.00E+06  1.00E+06
0                                             basis =
```

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.25E+01	1.25E+01	1.25E+01	1.26E+01	1.26E+01	1.26E+01	1.26E+01
tc 99	3.08E-05	3.09E-05	3.10E-05	3.10E-05	3.11E-05	3.11E-05	3.11E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03
u234	1.88E+02	1.88E+02	1.88E+02	1.88E+02	1.88E+02	1.88E+02	1.88E+02
u235	1.29E+04	1.29E+04	1.29E+04	1.29E+04	1.29E+04	1.29E+04	1.29E+04
u236	3.41E+03	3.41E+03	3.41E+03	3.41E+03	3.41E+03	3.41E+03	3.41E+03
u238	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05
np237	3.16E+02	3.16E+02	3.17E+02	3.18E+02	3.18E+02	3.19E+02	3.19E+02
pu236	3.23E-04	3.24E-04	3.24E-04	3.24E-04	3.23E-04	3.23E-04	3.23E-04
pu238	9.35E+01	9.38E+01	9.41E+01	9.42E+01	9.44E+01	9.45E+01	9.47E+01
pu238	9.35E+01	9.38E+01	9.41E+01	9.42E+01	9.44E+01	9.45E+01	9.47E+01
pu239	6.17E+03	6.19E+03	6.20E+03	6.21E+03	6.22E+03	6.22E+03	6.22E+03
pu240	1.78E+03	1.78E+03	1.78E+03	1.78E+03	1.78E+03	1.78E+03	1.78E+03
pu241	1.03E+03	1.03E+03	1.03E+03	1.03E+03	1.03E+03	1.03E+03	1.03E+03
pu242	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02	2.40E+02
am241	8.01E+01	8.03E+01	8.05E+01	8.08E+01	8.10E+01	8.12E+01	8.14E+01
am242m	1.89E+00	1.89E+00	1.89E+00	1.89E+00	1.89E+00	1.89E+00	1.89E+00
am243	4.03E+01	4.04E+01	4.04E+01	4.04E+01	4.04E+01	4.04E+01	4.04E+01
total	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	4.95E+02	4.96E+02	4.96E+02	4.97E+02	4.98E+02	4.99E+02	4.99E+02
tc 99	5.87E+02	5.88E+02	5.88E+02	5.89E+02	5.89E+02	5.89E+02	5.89E+02
tc 99m	1.71E-01	1.23E-01	8.06E-02	5.30E-02	3.48E-02	2.28E-02	1.50E-02
ru101	5.53E+02	5.53E+02	5.53E+02	5.53E+02	5.53E+02	5.53E+02	5.53E+02
rh103	3.42E+02	3.43E+02	3.44E+02	3.44E+02	3.45E+02	3.46E+02	3.46E+02
rh103m	2.64E-02	2.56E-02	2.49E-02	2.42E-02	2.35E-02	2.28E-02	2.21E-02
ag109	5.94E+01	5.94E+01	5.95E+01	5.95E+01	5.95E+01	5.95E+01	5.95E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.49E+02	6.50E+02	6.51E+02	6.52E+02	6.53E+02	6.53E+02	6.54E+02
nd145	5.04E+02	5.05E+02	5.05E+02	5.05E+02	5.05E+02	5.05E+02	5.05E+02
sm147	1.13E+02	1.13E+02	1.13E+02	1.13E+02	1.13E+02	1.13E+02	1.13E+02
sm149	2.45E+00	2.73E+00	2.90E+00	2.99E+00	3.05E+00	3.09E+00	3.11E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	1.94E+02	1.94E+02	1.94E+02	1.94E+02	1.94E+02	1.94E+02	1.94E+02
sm151	1.46E+01	1.47E+01	1.47E+01	1.47E+01	1.47E+01	1.47E+01	1.47E+01
eu151	3.44E-02	3.50E-02	3.55E-02	3.60E-02	3.65E-02	3.70E-02	3.75E-02
sm152	9.50E+01	9.50E+01	9.50E+01	9.50E+01	9.50E+01	9.50E+01	9.50E+01
eu153	7.56E+01	7.58E+01	7.59E+01	7.60E+01	7.60E+01	7.60E+01	7.60E+01
gd155	5.58E-02	5.80E-02	6.02E-02	6.25E-02	6.47E-02	6.69E-02	6.91E-02
total	2.43E+04	2.43E+04	2.43E+04	2.43E+04	2.43E+04	2.43E+04	2.43E+04

t69e11h7.sum

```
0*************************************************************************
 *                                                                       *
 *                   SCALE4.3  Bulletin  Board                           *
 *                   --------  --------  -----                           *
 *                                                                       *
 *                     Welcome to SCALE-4.3.                             *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod e11, level 7, 24.304 gwd/mtu, June 97
      '
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1001
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1001  end
      kr-85  1 0 1-20 1001  end
      y-89   1 0 1-20 1001  end
      sr-90  1 0 1-20 1001  end
      zr-93  1 0 1-20 1001  end
      zr-94  1 0 1-20 1001  end
      zr-95  1 0 1-20 1001  end
      nb-94  1 0 1-20 1001  end
      mo-95  1 0 1-20 1001  end
      tc-99  1 0 1-20 1001  end
      ru-101 1 0 1-20 1001  end
      ru-106 1 0 1-20 1001  end
      rh-103 1 0 1-20 1001  end
      rh-105 1 0 1-20 1001  end
      pd-105 1 0 1-20 1001  end
      pd-108 1 0 1-20 1001  end
      ag-109 1 0 1-20 1001  end
      sb-124 1 0 1-20 1001  end
      xe-131 1 0 1-20 1001  end
      xe-132 1 0 1-20 1001  end
      xe-135 1 0 1-20 1001  end
      xe-136 1 0 1-20 1001  end
      cs-134 1 0 1-20 1001  end
      cs-135 1 0 1-20 1001  end
      cs-137 1 0 1-20 1001  end
      ba-136 1 0 1-20 1001  end
      la-139 1 0 1-20 1001  end
      pr-141 1 0 1-20 1001  end
      pr-143 1 0 1-20 1001  end
      ce-144 1 0 1-20 1001  end
      nd-143 1 0 1-20 1001  end
      nd-145 1 0 1-20 1001  end
      nd-147 1 0 1-20 1001  end
      pm-147 1 0 1-20 1001  end
      pm-148 1 0 1-20 1001  end
      sm-147 1 0 1-20 1001  end
      sm-149 1 0 1-20 1001  end
      sm-150 1 0 1-20 1001  end
      sm-151 1 0 1-20 1001  end
      sm-152 1 0 1-20 1001  end
      eu-153 1 0 1-20 1001  end
      eu-154 1 0 1-20 1001  end
      eu-155 1 0 1-20 1001  end
      gd-155 1 0 1-20 1001  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7795  1  540   end
      arpm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3    end
      3 0.7351 500 3.3248 2 3.3353
      power=13.509 burn=226  down=86     end
      power=20.982 burn=263  down=51    bfrac=0.7234  end
      power=24.268 burn=292  down=1117  bfrac=0.2766  end
      power=20.785 burn=416  down=10    bfrac=0.5532  h2ofrac=1.020  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss       aaaaaaaaa       sssssssssss     22222222222    hh          hh
   ssssssssssss     aaaaaaaaaaa     ssssssssssss   2222222222222    hh          hh
   ss          ss   aa         aa   ss          ss   22          22   hh          hh
   ss               aa         aa   ss                           22   hh          hh
   ss               aa         aa   ss                           22   hh          hh
   ssssssssssss     aaaaaaaaaaaaa    ssssssssssss              22     hhhhhhhhhhhhh
    ssssssssssss    aaaaaaaaaaaaa     sssssssssss          22         hhhhhhhhhhhhh
              ss    aa         aa               ss        22          hh          hh
              ss    aa         aa               ss      22            hh          hh
```

```
     ss          ss   aa           aa   ss          ss    22                 hh            hh
     sssssssssssss    aa           aa   ssssssssssssss    2222222222222      hh            hh
      sssssssssss     aa           aa    sssssssssss      2222222222222      hh            hh
0

     nn          nn  iiiiiiiiiii     ccccccccccc      hh          hh    ooooooooooo     11
     nnn         nn  iiiiiiiiiii    ccccccccccccc     hh          hh   ooooooooooooo    11
     nnnn        nn      ii         cc         cc     hh          hh   oo         oo    11
     nn nn       nn      ii         cc                hh          hh   oo         oo    11
     nn  nn      nn      ii         cc                hh          hh   oo         oo    11
     nn   nn     nn      ii         cc                hhhhhhhhhhhhh    oo         oo    11
     nn    nn    nn      ii         cc                hhhhhhhhhhhhh    oo         oo    11
     nn     nn   nn      ii         cc                hh          hh   oo         oo    11
     nn      nn  nn      ii         cc                hh          hh   oo         oo    11
     nn       nnnn       ii         cc         cc     hh          hh   oo         oo    11
     nn        nnn   iiiiiiiiiii    ccccccccccccc     hh          hh   ooooooooooooo    1111111111111
     nn         nn   iiiiiiiiiii     ccccccccccc      hh          hh    ooooooooooo     1111111111111
0

       0000000      777777777777           //   33333333333        11            //  99999999999    777777777777
      000000000     777777777777          //   3333333333333      111           //  9999999999999   777777777777
     00       00    77         77        //    33          33    1111          //   99         99   77         77
    00         00             77        //                 33      11         //    99         99             77
    00         00            77        //                  33      11        //     99         99            77
    00         00           77        //                333        11       //      9999999999999           77
    00         00          77        //                 333        11      //        999999999999          77
    00         00         77        //                   33        11     //                   99         77
    00         00         77       //                    33        11    //                    99         77
     00       00         77       //       33          33          11   //                     99        77
      000000000          77      //        3333333333333      11111111 //          9999999999999         77
       0000000           77     //          33333333333       11111111 //          999999999999          77
0

          11        22222222222                  44    22222222222                  44    88888888888
         111       2222222222222                444   2222222222222                444   8888888888888
        1111       22         22    :::        4444   22         22    :::        4444   88         88
          11                  22    :::       44 44              22    :::       44 44   88         88
          11                  22    :::      44  44              22    :::      44  44   88         88
          11                22                44   44            22                44   44    88888888888
          11              22                 44    44          22                 44    44    88888888888
          11            22          :::     44444444444      22          :::     44444444444   88         88
          11          22            :::     4444444444444  22            :::     4444444444444 88         88
          11        22              :::              44   22             :::              44   88         88
       11111111     2222222222222                    44   2222222222222                   44   8888888888888
       11111111     2222222222222                    44   2222222222222                   44    88888888888
1
0                                      sssssssssss     ccccccccccc     aaaaaaaaa     11           eeeeeeeeeeeee
                                      sssssssssssss   ccccccccccccc   aaaaaaaaaaa    11           eeeeeeeeeeeee
                                      ss         ss   cc         cc   aa         aa  11           ee
                                      ss              cc              aa         aa  11           ee
                                      ss              cc              aa         aa  11           ee
                                      ssssssssssss    cc              aaaaaaaaaaaaa  11           eeeeeeeee
                                       ssssssssssss   cc              aaaaaaaaaaaaa  11           eeeeeeeee
                                                 ss   cc              aa         aa  11           ee
                                                 ss   cc              aa         aa  11           ee
                                      ss         ss   cc         cc   aa         aa  11           ee
                                      sssssssssssss   ccccccccccccc   aa         aa  1111111111111 eeeeeeeeeeeee
                                       sssssssssss     ccccccccccc    aa         aa  1111111111111 eeeeeeeeeeeee
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                  program verification information                   *****
*****                                                                     *****
*****                code system:    scale  version:    4.3               *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****                  program:  sas2                                     *****
*****                                                                     *****
*****            creation date:  03/07/97                                 *****
*****                                                                     *****
*****                  library:  /opt/neut/Scale4.3/bin                   *****
*****                                                                     *****
*****                                                                     *****
*****     this is not a   scale  configuration controlled code            *****
*****                                                                     *****
*****                  jobname:  nichol                                   *****
*****                                                                     *****
*****        date of execution:  07/31/97                                 *****
*****                                                                     *****
*****        time of execution:  12:42:48                                 *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
1
0'
0'
0'- - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                                    nuclide concentrations, grams
                                                     basis =single reactor assembly
              initial   1E-18 d
      o 16   1.35E+05  1.35E+05
   total     3.90E+05  3.90E+05
0                                                    nuclide concentrations, grams
                                                     basis =single reactor assembly
              initial   1E-18 d
      u234   2.80E+02  2.80E+02
      u235   3.13E+04  3.13E+04
      u236   1.40E+02  1.40E+02
      u238   9.68E+05  9.68E+05
   total     1.00E+06  1.00E+06
0                                                   basis =
```

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.26E+01	1.26E+01	1.26E+01	1.26E+01	1.27E+01	1.27E+01	1.27E+01
tc 99	3.11E-05	3.12E-05	3.13E-05	3.14E-05	3.14E-05	3.14E-05	3.14E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03
u234	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02
u235	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04
u236	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03
u238	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05
np237	3.21E+02	3.22E+02	3.22E+02	3.23E+02	3.23E+02	3.24E+02	3.24E+02
pu236	3.33E-04	3.34E-04	3.34E-04	3.34E-04	3.33E-04	3.33E-04	3.32E-04
pu238	9.63E+01	9.67E+01	9.70E+01	9.72E+01	9.73E+01	9.75E+01	9.76E+01
pu238	9.63E+01	9.67E+01	9.70E+01	9.72E+01	9.73E+01	9.75E+01	9.76E+01
pu239	6.11E+03	6.13E+03	6.14E+03	6.15E+03	6.15E+03	6.16E+03	6.16E+03
pu240	1.80E+03	1.80E+03	1.80E+03	1.80E+03	1.80E+03	1.80E+03	1.80E+03
pu241	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03
pu242	2.51E+02	2.51E+02	2.52E+02	2.52E+02	2.52E+02	2.52E+02	2.52E+02
am241	7.99E+01	8.01E+01	8.04E+01	8.06E+01	8.08E+01	8.11E+01	8.13E+01
am242m	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00
am243	4.26E+01	4.26E+01	4.26E+01	4.26E+01	4.26E+01	4.26E+01	4.26E+01
total	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	5.07E+02	5.08E+02	5.09E+02	5.09E+02	5.10E+02	5.11E+02	5.12E+02
tc 99	6.01E+02	6.02E+02	6.02E+02	6.03E+02	6.03E+02	6.03E+02	6.03E+02
tc 99m	1.75E-01	1.26E-01	8.26E-02	5.43E-02	3.56E-02	2.34E-02	1.54E-02
ru101	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02
rh103	3.49E+02	3.49E+02	3.50E+02	3.51E+02	3.52E+02	3.52E+02	3.53E+02
rh103m	2.71E-02	2.63E-02	2.56E-02	2.48E-02	2.41E-02	2.34E-02	2.27E-02
ag109	6.09E+01	6.10E+01	6.10E+01	6.10E+01	6.10E+01	6.10E+01	6.10E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

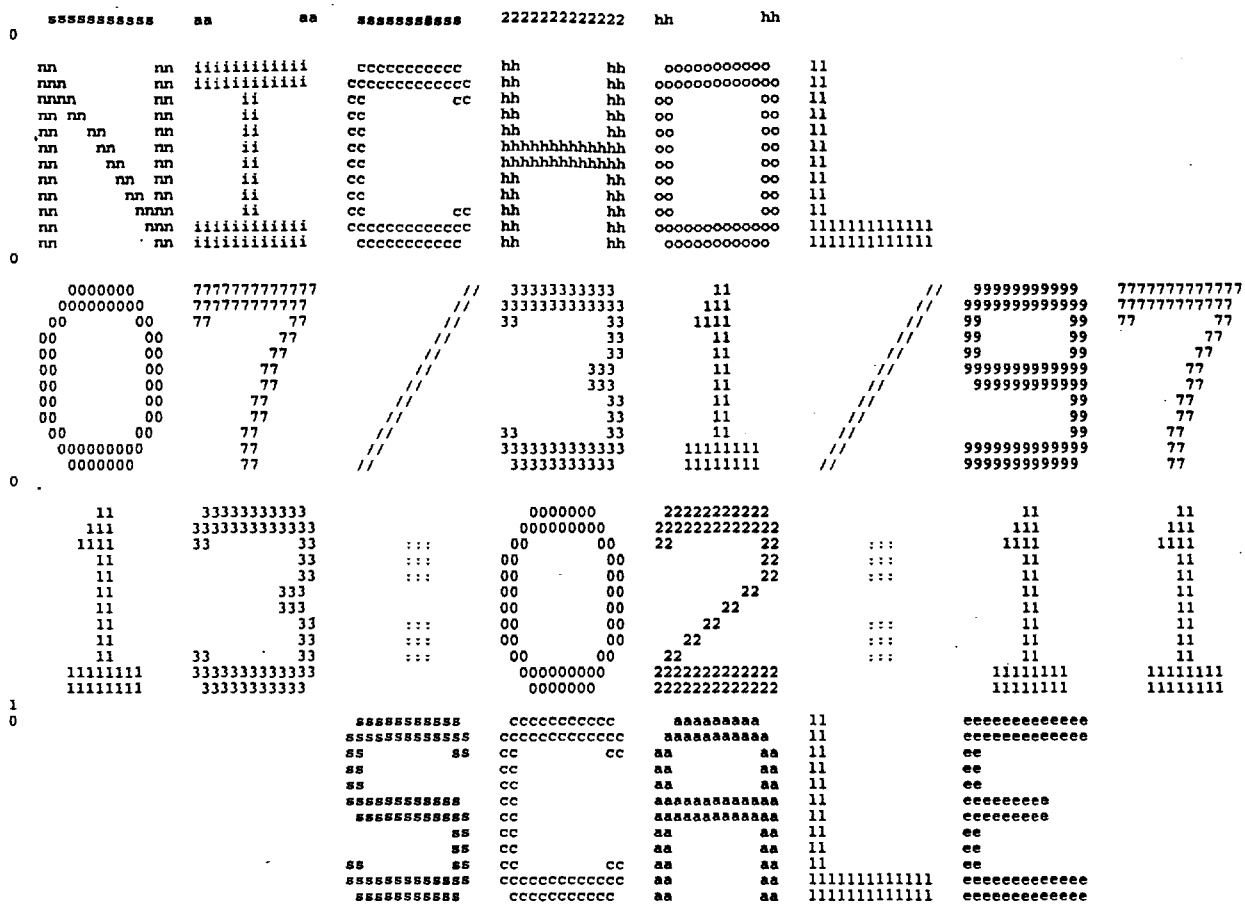
	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.59E+02	6.60E+02	6.61E+02	6.62E+02	6.63E+02	6.64E+02	6.65E+02
nd145	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02
sm147	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.15E+02
sm149	2.38E+00	2.67E+00	2.84E+00	2.94E+00	3.00E+00	3.04E+00	3.06E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	1.99E+02	1.99E+02	1.99E+02	1.99E+02	1.99E+02	1.99E+02	1.99E+02
sm151	1.42E+01	1.43E+01	1.43E+01	1.44E+01	1.44E+01	1.44E+01	1.44E+01
eu151	3.20E-02	3.25E-02	3.30E-02	3.35E-02	3.40E-02	3.45E-02	3.50E-02
sm152	9.75E+01	9.75E+01	9.75E+01	9.75E+01	9.75E+01	9.75E+01	9.75E+01
eu153	7.80E+01	7.82E+01	7.83E+01	7.84E+01	7.84E+01	7.84E+01	7.84E+01
gd155	5.43E-02	5.66E-02	5.89E-02	6.12E-02	6.34E-02	6.57E-02	6.80E-02
total	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04

t69e5h4.sum

```
0*************************************************************************
 *                                                                       *
 *                    SCALE4.3  Bulletin  Board                          *
 *                    --------  --------  -----                          *
 *                                                                       *
 *                      Welcome to SCALE-4.3.                            *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod e5, level 4, 23.867 gwd/mtu,  June 97
      '
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1015
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1015  end
      kr-85  1 0 1-20 1015  end
      y-89   1 0 1-20 1015  end
      sr-90  1 0 1-20 1015  end
      zr-93  1 0 1-20 1015  end
      zr-94  1 0 1-20 1015  end
      zr-95  1 0 1-20 1015  end
      nb-94  1 0 1-20 1015  end
      mo-95  1 0 1-20 1015  end
      tc-99  1 0 1-20 1015  end
      ru-101 1 0 1-20 1015  end
      ru-106 1 0 1-20 1015  end
      rh-103 1 0 1-20 1015  end
      rh-105 1 0 1-20 1015  end
      pd-105 1 0 1-20 1015  end
      pd-108 1 0 1-20 1015  end
      ag-109 1 0 1-20 1015  end
      sb-124 1 0 1-20 1015  end
      xe-131 1 0 1-20 1015  end
      xe-132 1 0 1-20 1015  end
      xe-135 1 0 1-20 1015  end
      xe-136 1 0 1-20 1015  end
      cs-134 1 0 1-20 1015  end
      cs-135 1 0 1-20 1015  end
      cs-137 1 0 1-20 1015  end
      ba-136 1 0 1-20 1015  end
      la-139 1 0 1-20 1015  end
      pr-141 1 0 1-20 1015  end
      pr-143 1 0 1-20 1015  end
      ce-144 1 0 1-20 1015  end
      nd-143 1 0 1-20 1015  end
      nd-145 1 0 1-20 1015  end
      nd-147 1 0 1-20 1015  end
      pm-147 1 0 1-20 1015  end
      pm-148 1 0 1-20 1015  end
      sm-147 1 0 1-20 1015  end
      sm-149 1 0 1-20 1015  end
      sm-150 1 0 1-20 1015  end
      sm-151 1 0 1-20 1015  end
      sm-152 1 0 1-20 1015  end
      eu-153 1 0 1-20 1015  end
      eu-154 1 0 1-20 1015  end
      eu-155 1 0 1-20 1015  end
      gd-155 1 0 1-20 1015  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7554  1  553   end
      arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3   end
      3 0.7351 500 3.3248 2 3.3353
      power=13.266 burn=226  down=86     end
      power=20.605 burn=263  down=51    bfrac=0.7234  end
      power=23.832 burn=292  down=1117  bfrac=0.2766  end
      power=20.411 burn=416  down=10    bfrac=0.5532  h2ofrac=1.023  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss      aaaaaaaaa      sssssssssss     22222222222    hh          hh
   sssssssssssss    aaaaaaaaaaa    sssssssssssss   2222222222222   hh          hh
   ss          ss   aa          aa   ss          ss   22          22   hh          hh
   ss               aa          aa   ss                           22   hh          hh
   ss               aa          aa   ss                           22   hh          hh
   sssssssssss      aaaaaaaaaaaaa    sssssssssss             22      hhhhhhhhhhhhh
    sssssssssss     aaaaaaaaaaaaa     sssssssssss          22        hhhhhhhhhhhhh
              ss   aa          aa              ss       22           hh          hh
              ss   aa          aa              ss     22             hh          hh
   ss         ss   aa          aa   ss         ss    22              hh          hh
   sssssssssssss   aa          aa   sssssssssssss   2222222222222   hh          hh
```



nuclide concentrations, grams
basis =single reactor assembly

	initial	1E-18 d
o 16	1.35E+05	1.35E+05
total	3.90E+05	3.90E+05

nuclide concentrations, grams
basis =single reactor assembly

	initial	1E-18 d
u234	2.80E+02	2.80E+02
u235	3.13E+04	3.13E+04
u236	1.40E+02	1.40E+02
u238	9.68E+05	9.68E+05
total	1.00E+06	1.00E+06

basis =

initial	11.3 d	22.6 d	33.9 d	45.2 d	45.2 d
initial	11.3 d	22.6 d	33.9 d	45.2 d	45.2 d

nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.26E+01	1.26E+01	1.26E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01
tc 99	3.14E-05	3.15E-05	3.16E-05	3.17E-05	3.17E-05	3.17E-05	3.17E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.05E-03	2.05E-03	2.05E-03	2.06E-03	2.06E-03	2.06E-03	2.06E-03
u234	1.88E+02	1.88E+02	1.88E+02	1.88E+02	1.88E+02	1.88E+02	1.88E+02
u235	1.28E+04	1.28E+04	1.28E+04	1.28E+04	1.28E+04	1.28E+04	1.28E+04
u236	3.42E+03	3.42E+03	3.42E+03	3.42E+03	3.42E+03	3.42E+03	3.42E+03
u238	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05
np237	3.18E+02	3.19E+02	3.20E+02	3.20E+02	3.21E+02	3.21E+02	3.22E+02
pu236	3.29E-04	3.29E-04	3.29E-04	3.29E-04	3.28E-04	3.28E-04	3.28E-04
pu238	9.48E+01	9.52E+01	9.54E+01	9.56E+01	9.58E+01	9.59E+01	9.60E+01
pu238	9.48E+01	9.52E+01	9.54E+01	9.56E+01	9.58E+01	9.59E+01	9.60E+01
pu239	6.18E+03	6.20E+03	6.22E+03	6.22E+03	6.23E+03	6.23E+03	6.23E+03
pu240	1.79E+03	1.79E+03	1.79E+03	1.79E+03	1.79E+03	1.79E+03	1.79E+03
pu241	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03
pu242	2.43E+02	2.43E+02	2.43E+02	2.43E+02	2.43E+02	2.43E+02	2.43E+02
am241	8.06E+01	8.08E+01	8.10E+01	8.13E+01	8.15E+01	8.17E+01	8.20E+01
am242m	1.90E+00	1.90E+00	1.90E+00	1.90E+00	1.90E+00	1.90E+00	1.90E+00
am243	4.12E+01	4.12E+01	4.12E+01	4.12E+01	4.12E+01	4.12E+01	4.12E+01
total	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	4.98E+02	4.98E+02	4.99E+02	5.00E+02	5.01E+02	5.02E+02	5.02E+02
tc 99	5.90E+02	5.91E+02	5.92E+02	5.92E+02	5.92E+02	5.92E+02	5.93E+02
tc 99m	1.72E-01	1.23E-01	8.11E-02	5.33E-02	3.50E-02	2.30E-02	1.51E-02
ru101	5.57E+02	5.57E+02	5.57E+02	5.57E+02	5.57E+02	5.57E+02	5.57E+02
rh103	3.44E+02	3.45E+02	3.45E+02	3.46E+02	3.47E+02	3.48E+02	3.48E+02
rh103m	2.66E-02	2.58E-02	2.51E-02	2.43E-02	2.36E-02	2.30E-02	2.23E-02
ag109	5.99E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.52E+02	6.53E+02	6.54E+02	6.55E+02	6.56E+02	6.56E+02	6.57E+02
nd145	5.07E+02	5.07E+02	5.07E+02	5.07E+02	5.07E+02	5.07E+02	5.07E+02
sm147	1.13E+02	1.13E+02	1.13E+02	1.13E+02	1.13E+02	1.14E+02	1.14E+02
sm149	2.45E+00	2.73E+00	2.90E+00	3.00E+00	3.06E+00	3.10E+00	3.12E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	1.96E+02	1.96E+02	1.96E+02	1.96E+02	1.96E+02	1.96E+02	1.96E+02
sm151	1.46E+01	1.47E+01	1.47E+01	1.48E+01	1.48E+01	1.48E+01	1.48E+01
eu151	3.42E-02	3.47E-02	3.53E-02	3.58E-02	3.63E-02	3.68E-02	3.73E-02
sm152	9.55E+01	9.55E+01	9.55E+01	9.55E+01	9.55E+01	9.55E+01	9.55E+01
eu153	7.63E+01	7.65E+01	7.66E+01	7.66E+01	7.67E+01	7.67E+01	7.67E+01
gd155	5.62E-02	5.84E-02	6.06E-02	6.29E-02	6.51E-02	6.73E-02	6.95E-02
total	2.45E+04	2.45E+04	2.45E+04	2.45E+04	2.45E+04	2.45E+04	2.45E+04

t69e5h7.sum

```
0*************************************************************************
*                                                                       *
*                   SCALE4.3  Bulletin  Board                           *
*                   --------  --------  -----                           *
*                                                                       *
*                     Welcome to SCALE-4.3.                             *
*                                                                       *
*                                                                       *
*************************************************************************
1         primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod e5, level 7, 24.548 gwd/mtu, June 97
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1001
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1001  end
      kr-85  1 0 1-20 1001  end
      y-89   1 0 1-20 1001  end
      sr-90  1 0 1-20 1001  end
      zr-93  1 0 1-20 1001  end
      zr-94  1 0 1-20 1001  end
      zr-95  1 0 1-20 1001  end
      nb-94  1 0 1-20 1001  end
      mo-95  1 0 1-20 1001  end
      tc-99  1 0 1-20 1001  end
      ru-101 1 0 1-20 1001  end
      ru-106 1 0 1-20 1001  end
      rh-103 1 0 1-20 1001  end
      rh-105 1 0 1-20 1001  end
      pd-105 1 0 1-20 1001  end
      pd-108 1 0 1-20 1001  end
      ag-109 1 0 1-20 1001  end
      sb-124 1 0 1-20 1001  end
      xe-131 1 0 1-20 1001  end
      xe-132 1 0 1-20 1001  end
      xe-135 1 0 1-20 1001  end
      xe-136 1 0 1-20 1001  end
      cs-134 1 0 1-20 1001  end
      cs-135 1 0 1-20 1001  end
      cs-137 1 0 1-20 1001  end
      ba-136 1 0 1-20 1001  end
      la-139 1 0 1-20 1001  end
      pr-141 1 0 1-20 1001  end
      pr-143 1 0 1-20 1001  end
      ce-144 1 0 1-20 1001  end
      nd-143 1 0 1-20 1001  end
      nd-145 1 0 1-20 1001  end
      nd-147 1 0 1-20 1001  end
      pm-147 1 0 1-20 1001  end
      pm-148 1 0 1-20 1001  end
      sm-147 1 0 1-20 1001  end
      sm-149 1 0 1-20 1001  end
      sm-150 1 0 1-20 1001  end
      sm-151 1 0 1-20 1001  end
      sm-152 1 0 1-20 1001  end
      eu-153 1 0 1-20 1001  end
      eu-154 1 0 1-20 1001  end
      eu-155 1 0 1-20 1001  end
      gd-155 1 0 1-20 1001  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7795  1  540   end
      arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3   end
      3 0.7351 500 3.3248 2 3.3353
      power=13.645 burn=226  down=86     end
      power=21.193 burn=263  down=51    bfrac=0.7234  end
      power=24.512 burn=292  down=1117  bfrac=0.2766  end
      power=20.993 burn=416  down=10    bfrac=0.5532  h2ofrac=1.020  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   ssssssssss      aaaaaaaaa      ssssssssss     22222222222    hh          hh
   ssssssssssss    aaaaaaaaaa    ssssssssssss   2222222222222   hh          hh
   ss          ss  aa          aa  ss          ss  22          22  hh          hh
   ss              aa          aa  ss                          22  hh          hh
   ss              aa          aa  ss                          22  hh          hh
   ssssssssssss    aaaaaaaaaaaaa   ssssssssssss              22     hhhhhhhhhhhhh
    ssssssssssss   aaaaaaaaaaaaa    ssssssssssss          22        hhhhhhhhhhhhh
              ss   aa          aa              ss        22          hh          hh
              ss   aa          aa              ss      22            hh          hh
```

```
   ss         ss   aa         aa   ss         ss     22               hh         hh
   sssssssssssss   aa         aa   sssssssssssss   2222222222222      hh         hh
    ssssssssss     aa         aa    ssssssssss     2222222222222      hh         hh
0
   nn         nn   iiiiiiiiiiii     ccccccccccc    hh         hh    ooooooooooo    ll
   nnn        nn   iiiiiiiiiiii    ccccccccccccc   hh         hh   ooooooooooooo   ll
   nnnn       nn        ii         cc         cc   hh         hh   oo         oo   ll
   nn nn      nn        ii         cc              hh         hh   oo         oo   ll
   nn  nn     nn        ii         cc              hh         hh   oo         oo   ll
   nn   nn    nn        ii         cc              hhhhhhhhhhhhh   oo         oo   ll
   nn    nn   nn        ii         cc              hhhhhhhhhhhhh   oo         oo   ll
   nn     nn  nn        ii         cc              hh         hh   oo         oo   ll
   nn      nn nn        ii         cc              hh         hh   oo         oo   ll
   nn       nnnn        ii         cc         cc   hh         hh   oo         oo   ll
   nn        nnn   iiiiiiiiiiii    ccccccccccccc   hh         hh   ooooooooooooo   lllllllllllll
   nn         nn   iiiiiiiiiiii     ccccccccccc    hh         hh    ooooooooooo    lllllllllllll
0
     0000000       7777777777777             //     33333333333          11                  //    99999999999    7777777777777
    000000000      777777777777             //     3333333333333        111                 //    9999999999999   777777777777
   00       00     77         77           //      33         33       1111                //     99         99   77         77
  00         00              77           //                  33         11               //      99         99             77
  00         00             77           //                   33         11              //       99         99            77
  00         00            77           //                 333           11             //        9999999999999           77
  00         00           77           //                  333           11            //          999999999999          77
  00         00          77           //                      33         11           //                     99         77
  00         00          77          //                       33         11          //                      99         77
   00       00           77         //         33         33             11         //                       99        77
    000000000            77        //          3333333333333       11111111        //             9999999999999        77
     0000000             77       //            33333333333        11111111       //              999999999999         77
0
       11          33333333333                  22222222222              44                       33333333333    7777777777777
      111         3333333333333                2222222222222            444                      3333333333333   777777777777
     1111         33         33        :::     22         22           4444            :::       33         33   77         77
       11                    33        :::                22          44 44            :::                  33             77
       11                    33        :::                22         44  44            :::                  33            77
       11                  333                           22         44   44                               333            77
       11                  333                         22          44    44                               333           77
       11                    33        :::           22           444444444444         :::                  33          77
       11                    33        :::         22             444444444444         :::                  33          77
       11         33         33        :::       22                      44            :::       33         33          77
    11111111      3333333333333                2222222222222             44                      3333333333333          77
    11111111       33333333333                 2222222222222             44                       33333333333           77
1
0                                      ssssssssss     ccccccccccc     aaaaaaaaa     ll               eeeeeeeeeeeee
                                      ssssssssssss   ccccccccccccc   aaaaaaaaaaa    ll               eeeeeeeeeeeee
                                      ss        ss   cc         cc  aa         aa   ll               ee
                                      ss             cc             aa         aa   ll               ee
                                      ss             cc             aa         aa   ll               ee
                                      ssssssssssss   cc             aaaaaaaaaaaaa   ll               eeeeeeeeee
                                       ssssssssssss  cc             aaaaaaaaaaaaa   ll               eeeeeeeeee
                                                ss   cc             aa         aa   ll               ee
                                                ss   cc             aa         aa   ll               ee
                                      ss        ss   cc         cc  aa         aa   ll               ee
                                      sssssssssssss  ccccccccccccc  aa         aa   lllllllllllll    eeeeeeeeeeeee
                                       ssssssssss     ccccccccccc   aa         aa   lllllllllllll    eeeeeeeeeeeee


                     ************************************************************************
                     ************************************************************************
                     ************************************************************************
                     *****                                                              *****
                     *****                 program verification information             *****
                     *****                                                              *****
                     *****           code system:    scale  version:      4.3           *****
                     *****                                                              *****
                     ************************************************************************
                     ************************************************************************
                     *****                                                              *****
                     *****                                                              *****
                     *****               program:  sas2                                 *****
                     *****                                                              *****
                     *****         creation date:  03/07/97                             *****
                     *****                                                              *****
                     *****               library:  /opt/neut/Scale4.3/bin               *****
                     *****                                                              *****
                     *****                                                              *****
                     *****   this is not a   scale  configuration controlled code      *****
                     *****                                                              *****
                     *****              jobname:  nichol                                *****
                     *****                                                              *****
                     *****     date of execution:  07/31/97                             *****
                     *****                                                              *****
                     *****     time of execution:  13:24:38                             *****
                     *****                                                              *****
                     *****                                                              *****
                     ************************************************************************
                     ************************************************************************
                     ************************************************************************
1
0'
0'
0' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                            nuclide concentrations, grams
                                             basis =single reactor assembly
            initial   1E-18 d
    o 16   1.35E+05  1.35E+05
  total    3.90E+05  3.90E+05
0                                            nuclide concentrations, grams
                                             basis =single reactor assembly
            initial   1E-18 d
    u234   2.80E+02  2.80E+02
    u235   3.13E+04  3.13E+04
    u236   1.40E+02  1.40E+02
    u238   9.68E+05  9.68E+05
  total    1.00E+06  1.00E+06
0                                           basis =
```

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.27E+01	1.27E+01	1.28E+01	1.28E+01	1.28E+01	1.28E+01	1.28E+01
tc 99	3.21E-05	3.23E-05	3.23E-05	3.24E-05	3.24E-05	3.25E-05	3.25E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03
u234	1.86E+02	1.86E+02	1.86E+02	1.86E+02	1.86E+02	1.86E+02	1.86E+02
u235	1.24E+04	1.24E+04	1.24E+04	1.24E+04	1.24E+04	1.24E+04	1.24E+04
u236	3.47E+03	3.47E+03	3.47E+03	3.47E+03	3.47E+03	3.47E+03	3.47E+03
u238	9.48E+05	9.48E+05	9.48E+05	9.48E+05	9.48E+05	9.48E+05	9.48E+05
np237	3.25E+02	3.26E+02	3.26E+02	3.27E+02	3.28E+02	3.28E+02	3.28E+02
pu236	3.42E-04	3.43E-04	3.43E-04	3.42E-04	3.42E-04	3.42E-04	3.41E-04
pu238	9.86E+01	9.89E+01	9.92E+01	9.94E+01	9.96E+01	9.97E+01	9.98E+01
pu238	9.86E+01	9.89E+01	9.92E+01	9.94E+01	9.96E+01	9.97E+01	9.98E+01
pu239	6.13E+03	6.15E+03	6.16E+03	6.17E+03	6.17E+03	6.18E+03	6.18E+03
pu240	1.82E+03	1.82E+03	1.82E+03	1.82E+03	1.82E+03	1.82E+03	1.82E+03
pu241	1.05E+03	1.05E+03	1.05E+03	1.05E+03	1.05E+03	1.05E+03	1.05E+03
pu242	2.58E+02	2.58E+02	2.58E+02	2.58E+02	2.58E+02	2.58E+02	2.58E+02
am241	8.07E+01	8.09E+01	8.11E+01	8.14E+01	8.16E+01	8.18E+01	8.21E+01
am242m	1.88E+00	1.88E+00	1.88E+00	1.88E+00	1.88E+00	1.88E+00	1.88E+00
am243	4.40E+01	4.41E+01	4.41E+01	4.41E+01	4.41E+01	4.41E+01	4.41E+01
total	9.74E+05	9.74E+05	9.74E+05	9.74E+05	9.74E+05	9.74E+05	9.74E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	5.11E+02	5.12E+02	5.13E+02	5.14E+02	5.15E+02	5.15E+02	5.16E+02
tc 99	6.06E+02	6.07E+02	6.08E+02	6.08E+02	6.08E+02	6.08E+02	6.09E+02
tc 99m	1.77E-01	1.27E-01	8.34E-02	5.48E-02	3.60E-02	2.36E-02	1.55E-02
ru101	5.73E+02	5.73E+02	5.73E+02	5.73E+02	5.73E+02	5.73E+02	5.73E+02
rh103	3.52E+02	3.53E+02	3.53E+02	3.54E+02	3.55E+02	3.56E+02	3.56E+02
rh103m	2.74E-02	2.66E-02	2.59E-02	2.51E-02	2.44E-02	2.37E-02	2.30E-02
ag109	6.18E+01	6.19E+01	6.19E+01	6.19E+01	6.19E+01	6.19E+01	6.19E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

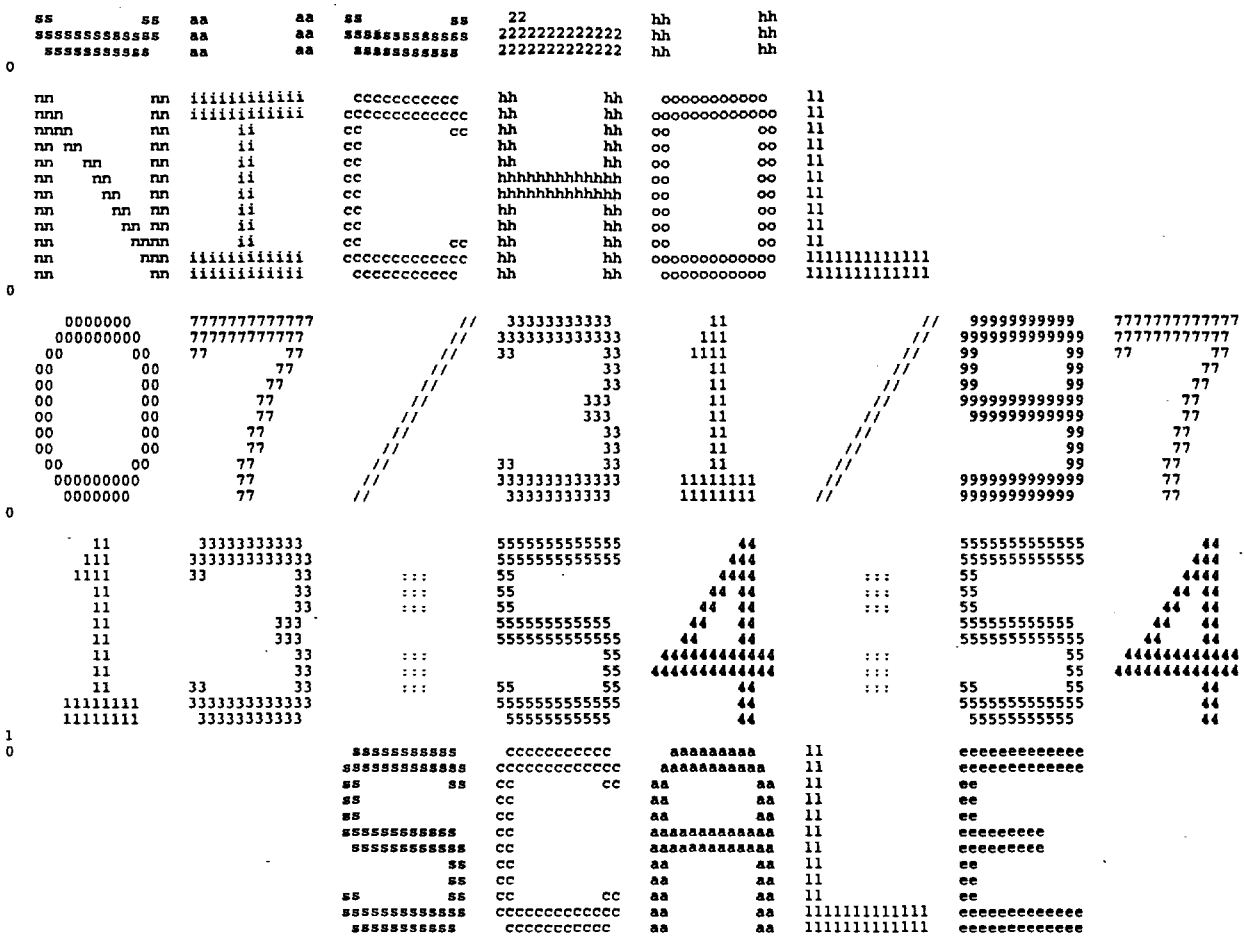
	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.64E+02	6.65E+02	6.66E+02	6.67E+02	6.68E+02	6.69E+02	6.69E+02
nd145	5.20E+02	5.21E+02	5.21E+02	5.21E+02	5.21E+02	5.21E+02	5.21E+02
sm147	1.15E+02	1.15E+02	1.15E+02	1.16E+02	1.16E+02	1.16E+02	1.16E+02
sm149	2.39E+00	2.68E+00	2.85E+00	2.96E+00	3.02E+00	3.05E+00	3.07E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	2.01E+02	2.01E+02	2.01E+02	2.01E+02	2.01E+02	2.01E+02	2.01E+02
sm151	1.43E+01	1.44E+01	1.44E+01	1.44E+01	1.44E+01	1.44E+01	1.44E+01
eu151	3.16E-02	3.21E-02	3.26E-02	3.31E-02	3.36E-02	3.41E-02	3.47E-02
sm152	9.84E+01	9.84E+01	9.84E+01	9.84E+01	9.84E+01	9.84E+01	9.84E+01
eu153	7.91E+01	7.93E+01	7.94E+01	7.95E+01	7.95E+01	7.95E+01	7.95E+01
gd155	5.48E-02	5.72E-02	5.95E-02	6.18E-02	6.41E-02	6.65E-02	6.88E-02
total	2.52E+04	2.52E+04	2.52E+04	2.52E+04	2.52E+04	2.52E+04	2.52E+04

t69l11h4.sum

```
0*************************************************************************
 *                                                                       *
 *                    SCALE4.3  Bulletin  Board                          *
 *                    --------  --------  -----                          *
 *                                                                       *
 *                      Welcome to SCALE-4.3.                            *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1         primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod 111, level 4, 23.928 gwd/mtu, June 97
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1015
        92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1001  end
      kr-85  1 0 1-20 1001  end
      y-89   1 0 1-20 1001  end
      sr-90  1 0 1-20 1001  end
      zr-93  1 0 1-20 1001  end
      zr-94  1 0 1-20 1001  end
      zr-95  1 0 1-20 1001  end
      nb-94  1 0 1-20 1001  end
      mo-95  1 0 1-20 1001  end
      tc-99  1 0 1-20 1001  end
      ru-101 1 0 1-20 1001  end
      ru-106 1 0 1-20 1001  end
      rh-103 1 0 1-20 1001  end
      rh-105 1 0 1-20 1001  end
      pd-105 1 0 1-20 1001  end
      pd-108 1 0 1-20 1001  end
      ag-109 1 0 1-20 1001  end
      sb-124 1 0 1-20 1001  end
      xe-131 1 0 1-20 1001  end
      xe-132 1 0 1-20 1001  end
      xe-135 1 0 1-20 1001  end
      xe-136 1 0 1-20 1001  end
      cs-134 1 0 1-20 1001  end
      cs-135 1 0 1-20 1001  end
      cs-137 1 0 1-20 1001  end
      ba-136 1 0 1-20 1001  end
      la-139 1 0 1-20 1001  end
      pr-141 1 0 1-20 1001  end
      pr-143 1 0 1-20 1001  end
      ce-144 1 0 1-20 1001  end
      nd-143 1 0 1-20 1001  end
      nd-145 1 0 1-20 1001  end
      nd-147 1 0 1-20 1001  end
      pm-147 1 0 1-20 1001  end
      pm-148 1 0 1-20 1001  end
      sm-147 1 0 1-20 1001  end
      sm-149 1 0 1-20 1001  end
      sm-150 1 0 1-20 1001  end
      sm-151 1 0 1-20 1001  end
      sm-152 1 0 1-20 1001  end
      eu-153 1 0 1-20 1001  end
      eu-154 1 0 1-20 1001  end
      eu-155 1 0 1-20 1001  end
      gd-155 1 0 1-20 1001  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7554  1  553   end
      arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3   end
      3 0.7351 500 3.3248 2 3.3353
      power=13.300 burn=226  down=86     end
      power=20.657 burn=263  down=51    bfrac=0.7234  end
      power=23.893 burn=292  down=1117  bfrac=0.2766  end
      power=20.463 burn=416  down=10    bfrac=0.5532  h2ofrac=1.023  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss      aaaaaaaaa      sssssssssss     22222222222     hh          hh
   sssssssssssss    aaaaaaaaaa    sssssssssssss   2222222222222    hh          hh
   ss          ss   aa          aa  ss          ss  22          22   hh          hh
   ss               aa          aa  ss                          22   hh          hh
   ss               aa          aa  ss                          22   hh          hh
   sssssssssss      aaaaaaaaaaaa    sssssssssss                 22   hhhhhhhhhhhhh
    sssssssssss     aaaaaaaaaaaa     sssssssssss            22       hhhhhhhhhhhhh
              ss    aa          aa              ss        22         hh          hh
              ss    aa          aa              ss      22           hh          hh
```



nuclide concentrations, grams
basis =single reactor assembly

	initial	1E-18 d
o 16	1.35E+05	1.35E+05
total	3.90E+05	3.90E+05

nuclide concentrations, grams
basis =single reactor assembly

	initial	1E-18 d
u234	2.80E+02	2.80E+02
u235	3.13E+04	3.13E+04
u236	1.40E+02	1.40E+02
u238	9.68E+05	9.68E+05
total	1.00E+06	1.00E+06

basis =

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.26E+01	1.26E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.28E+01
tc 99	3.17E-05	3.18E-05	3.19E-05	3.19E-05	3.20E-05	3.20E-05	3.20E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.06E-03	2.06E-03	2.06E-03	2.06E-03	2.06E-03	2.06E-03	2.06E-03
u234	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02
u235	1.28E+04	1.28E+04	1.28E+04	1.28E+04	1.28E+04	1.28E+04	1.28E+04
u236	3.42E+03	3.42E+03	3.42E+03	3.42E+03	3.42E+03	3.42E+03	3.42E+03
u238	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05
np237	3.19E+02	3.20E+02	3.21E+02	3.21E+02	3.22E+02	3.22E+02	3.23E+02
pu236	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.30E-04	3.30E-04
pu238	9.54E+01	9.57E+01	9.60E+01	9.62E+01	9.63E+01	9.65E+01	9.66E+01
pu238	9.54E+01	9.57E+01	9.60E+01	9.62E+01	9.63E+01	9.65E+01	9.66E+01
pu239	6.19E+03	6.21E+03	6.22E+03	6.23E+03	6.23E+03	6.24E+03	6.24E+03
pu240	1.79E+03	1.79E+03	1.79E+03	1.79E+03	1.79E+03	1.79E+03	1.79E+03
pu241	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03
pu242	2.45E+02	2.45E+02	2.45E+02	2.45E+02	2.45E+02	2.45E+02	2.45E+02
am241	8.08E+01	8.10E+01	8.12E+01	8.15E+01	8.17E+01	8.19E+01	8.22E+01
am242m	1.91E+00	1.91E+00	1.91E+00	1.91E+00	1.91E+00	1.91E+00	1.91E+00
am243	4.15E+01	4.16E+01	4.16E+01	4.16E+01	4.16E+01	4.16E+01	4.16E+01
total	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	4.99E+02	5.00E+02	5.00E+02	5.01E+02	5.02E+02	5.03E+02	5.03E+02
tc 99	5.92E+02	5.93E+02	5.93E+02	5.93E+02	5.94E+02	5.94E+02	5.94E+02
tc 99m	1.72E-01	1.24E-01	8.13E-02	5.34E-02	3.51E-02	2.30E-02	1.51E-02
ru101	5.58E+02	5.58E+02	5.58E+02	5.58E+02	5.58E+02	5.58E+02	5.58E+02
rh103	3.45E+02	3.45E+02	3.46E+02	3.47E+02	3.48E+02	3.48E+02	3.49E+02
rh103m	2.67E-02	2.59E-02	2.52E-02	2.44E-02	2.37E-02	2.30E-02	2.24E-02
ag109	6.01E+01	6.02E+01	6.02E+01	6.02E+01	6.02E+01	6.02E+01	6.02E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.53E+02	6.54E+02	6.55E+02	6.56E+02	6.57E+02	6.58E+02	6.58E+02
nd145	5.08E+02	5.08E+02	5.08E+02	5.08E+02	5.08E+02	5.08E+02	5.08E+02
sm147	1.13E+02	1.13E+02	1.13E+02	1.13E+02	1.14E+02	1.14E+02	1.14E+02
sm149	2.45E+00	2.74E+00	2.91E+00	3.01E+00	3.06E+00	3.10E+00	3.12E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	1.96E+02	1.96E+02	1.96E+02	1.96E+02	1.96E+02	1.96E+02	1.96E+02
sm151	1.46E+01	1.47E+01	1.48E+01	1.48E+01	1.48E+01	1.48E+01	1.48E+01
eu151	3.41E-02	3.46E-02	3.52E-02	3.57E-02	3.62E-02	3.67E-02	3.72E-02
sm152	9.57E+01	9.57E+01	9.57E+01	9.57E+01	9.57E+01	9.57E+01	9.57E+01
eu153	7.65E+01	7.67E+01	7.69E+01	7.69E+01	7.70E+01	7.70E+01	7.70E+01
gd155	5.63E-02	5.86E-02	6.08E-02	6.30E-02	6.53E-02	6.75E-02	6.97E-02
total	2.45E+04	2.45E+04	2.45E+04	2.45E+04	2.45E+04	2.45E+04	2.45E+04

t69l11h7.sum

```
0*************************************************************************
*                                                                       *
*                    SCALE4.3  Bulletin  Board                          *
*                    --------  --------  -----                          *
*                                                                       *
*                      Welcome to SCALE-4.3.                            *
*                                                                       *
*                                                                       *
*************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod 111, level 7, 24.362 gwd/mtu, June 97
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1001
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1001  end
      kr-85  1 0 1-20 1001  end
      y-89   1 0 1-20 1001  end
      sr-90  1 0 1-20 1001  end
      zr-93  1 0 1-20 1001  end
      zr-94  1 0 1-20 1001  end
      zr-95  1 0 1-20 1001  end
      nb-94  1 0 1-20 1001  end
      mo-95  1 0 1-20 1001  end
      tc-99  1 0 1-20 1001  end
      ru-101 1 0 1-20 1001  end
      ru-106 1 0 1-20 1001  end
      rh-103 1 0 1-20 1001  end
      rh-105 1 0 1-20 1001  end
      pd-105 1 0 1-20 1001  end
      pd-108 1 0 1-20 1001  end
      ag-109 1 0 1-20 1001  end
      sb-124 1 0 1-20 1001  end
      xe-131 1 0 1-20 1001  end
      xe-132 1 0 1-20 1001  end
      xe-135 1 0 1-20 1001  end
      xe-136 1 0 1-20 1001  end
      cs-134 1 0 1-20 1001  end
      cs-135 1 0 1-20 1001  end
      cs-137 1 0 1-20 1001  end
      ba-136 1 0 1-20 1001  end
      la-139 1 0 1-20 1001  end
      pr-141 1 0 1-20 1001  end
      pr-143 1 0 1-20 1001  end
      ce-144 1 0 1-20 1001  end
      nd-143 1 0 1-20 1001  end
      nd-145 1 0 1-20 1001  end
      nd-147 1 0 1-20 1001  end
      pm-147 1 0 1-20 1001  end
      pm-148 1 0 1-20 1001  end
      sm-147 1 0 1-20 1001  end
      sm-149 1 0 1-20 1001  end
      sm-150 1 0 1-20 1001  end
      sm-151 1 0 1-20 1001  end
      sm-152 1 0 1-20 1001  end
      eu-153 1 0 1-20 1001  end
      eu-154 1 0 1-20 1001  end
      eu-155 1 0 1-20 1001  end
      gd-155 1 0 1-20 1001  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7795  1  540   end
      arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3   end
      3 0.7351 500 3.3248 2 3.3353
      power=13.542 burn=226  down=86     end
      power=21.032 burn=263  down=51    bfrac=0.7234  end
      power=24.326 burn=292  down=1117  bfrac=0.2766  end
      power=20.834 burn=416  down=10    bfrac=0.5532  h2ofrac=1.020  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss      aaaaaaaaa      sssssssssss     22222222222    hh          hh
   ssssssssssss    aaaaaaaaaaa    ssssssssssss   2222222222222   hh          hh
   ss          ss   aa         aa   ss          ss   22         22   hh          hh
   ss               aa         aa   ss                      22   hh          hh
   ss               aa         aa   ss                      22   hh          hh
   ssssssssssss    aaaaaaaaaaaaa   ssssssssssss           22     hhhhhhhhhhhhh
    ssssssssssss   aaaaaaaaaaaaa    ssssssssssss         22       hhhhhhhhhhhhh
              ss   aa         aa              ss       22         hh          hh
              ss   aa         aa              ss     22           hh          hh
```

```
   ss          ss  aa          aa  ss          ss   22                 hh          hh
   sssssssssssss   aa          aa  sssssssssssss   2222222222222      hh          hh
    sssssssssss    aa          aa   sssssssssss    2222222222222      hh          hh
0
   nn          nn  iiiiiiiiiiii    cccccccccc      hh          hh     ooooooooooo      11
   nnn         nn  iiiiiiiiiiii   cccccccccccc     hh          hh    ooooooooooooo     11
   nnnn        nn       ii        cc          cc   hh          hh    oo          oo    11
   nn nn       nn       ii        cc               hh          hh    oo          oo    11
   nn  nn      nn       ii        cc               hh          hh    oo          oo    11
   nn   nn     nn       ii        cc               hhhhhhhhhhhhh     oo          oo    11
   nn    nn    nn       ii        cc               hhhhhhhhhhhhh     oo          oo    11
   nn     nn   nn       ii        cc               hh          hh    oo          oo    11
   nn      nn  nn       ii        cc               hh          hh    oo          oo    11
   nn       nnnn        ii        cc          cc   hh          hh    oo          oo    11
   nn        nnn   iiiiiiiiiiii   cccccccccccc     hh          hh    ooooooooooooo     1111111111111
   nn         nn   iiiiiiiiiiii    cccccccccc      hh          hh     ooooooooooo      1111111111111
0
     0000000     7777777777777          //   33333333333        11             //   99999999999    7777777777777
    000000000    777777777777          //   3333333333333      111            //   9999999999999   777777777777
   00       00   77         77        //    33          33    1111           //    99          99  77         77
  00         00             77       //                 33      11          //     99          99            77
  00         00            77       //                  33      11         //      99          99           77
  00         00           77       //                 333       11        //       9999999999999           77
  00         00           77      //                  333       11       //         999999999999          77
  00         00          77      //                     33      11      //                     99         77
  00         00          77     //                      33      11     //                      99         77
   00       00          77     //       33              33      11    //                       99        77
    000000000           77    //        3333333333333        11111111  //          9999999999999        77
     0000000            77   //          33333333333        11111111  //           999999999999         77
0
        11               44             22222222222     5555555555555           33333333333    99999999999
       111              444            2222222222222    5555555555555          3333333333333  9999999999999
      1111             4444     :::    22         22    55                :::  33         33  99         99
        11            44 44     :::               22    55                :::             33  99         99
        11           44  44     :::               22    55                :::             33  99         99
        11          44   44                      22     555555555555                     333  9999999999999
        11         44    44                     22      5555555555555                    333   999999999999
        11        444444444444  :::            22                  55     :::             33            99
        11        444444444444  :::           22                   55     :::             33            99
        11                44    :::          22         55         55     :::  33         33            99
      11111111            44                2222222222222   5555555555555      3333333333333  9999999999999
      11111111            44                2222222222222    55555555555        33333333333    999999999999
1
0                                sssssssssss    cccccccccc       aaaaaaaaa     11              eeeeeeeeeeeee
                                sssssssssssss  cccccccccccc     aaaaaaaaaaa    11              eeeeeeeeeeeee
                                ss         ss  cc          cc  aa          aa  11              ee
                                ss             cc              aa          aa  11              ee
                                ss             cc              aa          aa  11              ee
                                sssssssssss    cc              aaaaaaaaaaaaa   11              eeeeeeeee
                                 sssssssssss   cc              aaaaaaaaaaaaa   11              eeeeeeeee
                                           ss  cc              aa          aa  11              ee
                                           ss  cc              aa          aa  11              ee
                                ss         ss  cc          cc  aa          aa  11              ee
                                sssssssssssss  cccccccccccc    aa          aa  1111111111111   eeeeeeeeeeeee
                                 sssssssssss    cccccccccc     aa          aa  1111111111111   eeeeeeeeeeeee


                 ************************************************************************
                 ************************************************************************
                 ************************************************************************
                 *****                                                              *****
                 *****                program verification information              *****
                 *****                                                              *****
                 *****                code system:    scale  version:    4.3        *****
                 *****                                                              *****
                 ************************************************************************
                 ************************************************************************
                 *****                                                              *****
                 *****                                                              *****
                 *****                   program:  sas2                             *****
                 *****                                                              *****
                 *****             creation date:  03/07/97                         *****
                 *****                                                              *****
                 *****                   library:  /opt/neut/Scale4.3/bin           *****
                 *****                                                              *****
                 *****                                                              *****
                 *****     this is not a   scale  configuration controlled code     *****
                 *****                                                              *****
                 *****                   jobname:  nichol                           *****
                 *****                                                              *****
                 *****         date of execution:  07/31/97                         *****
                 *****                                                              *****
                 *****         time of execution:  14:25:39                         *****
                 *****                                                              *****
                 *****                                                              *****
                 ************************************************************************
                 ************************************************************************
                 ************************************************************************
1
0
0
0 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                              nuclide concentrations, grams
                                               basis =single reactor assembly
               initial   1E-18 d
     o 16     1.35E+05  1.35E+05
  total       3.90E+05  3.90E+05
0                                              nuclide concentrations, grams
                                               basis =single reactor assembly
               initial   1E-18 d
     u234     2.80E+02  2.80E+02
     u235     3.13E+04  3.13E+04
     u236     1.40E+02  1.40E+02
     u238     9.68E+05  9.68E+05
  total       1.00E+06  1.00E+06
0                                             basis =
```

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.26E+01	1.26E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01
tc 99	3.13E-05	3.15E-05	3.15E-05	3.16E-05	3.16E-05	3.17E-05	3.17E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03
u234	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02
u235	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04
u236	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03
u238	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05
np237	3.22E+02	3.23E+02	3.23E+02	3.24E+02	3.24E+02	3.25E+02	3.25E+02
pu236	3.35E-04	3.36E-04	3.36E-04	3.36E-04	3.35E-04	3.35E-04	3.35E-04
pu238	9.69E+01	9.72E+01	9.75E+01	9.77E+01	9.78E+01	9.80E+01	9.81E+01
pu238	9.69E+01	9.72E+01	9.75E+01	9.77E+01	9.78E+01	9.80E+01	9.81E+01
pu239	6.11E+03	6.13E+03	6.14E+03	6.15E+03	6.16E+03	6.16E+03	6.16E+03
pu240	1.81E+03	1.81E+03	1.81E+03	1.81E+03	1.81E+03	1.81E+03	1.81E+03
pu241	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03
pu242	2.53E+02	2.53E+02	2.53E+02	2.53E+02	2.53E+02	2.53E+02	2.53E+02
am241	8.01E+01	8.03E+01	8.06E+01	8.08E+01	8.10E+01	8.12E+01	8.15E+01
am242m	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00
am243	4.29E+01	4.30E+01	4.30E+01	4.30E+01	4.30E+01	4.30E+01	4.30E+01
total	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	5.08E+02	5.09E+02	5.10E+02	5.10E+02	5.11E+02	5.12E+02	5.13E+02
tc 99	6.02E+02	6.03E+02	6.04E+02	6.04E+02	6.04E+02	6.04E+02	6.04E+02
tc 99m	1.75E-01	1.26E-01	8.28E-02	5.44E-02	3.57E-02	2.35E-02	1.54E-02
ru101	5.68E+02	5.68E+02	5.68E+02	5.68E+02	5.68E+02	5.68E+02	5.68E+02
rh103	3.49E+02	3.50E+02	3.51E+02	3.52E+02	3.52E+02	3.53E+02	3.54E+02
rh103m	2.72E-02	2.64E-02	2.56E-02	2.49E-02	2.42E-02	2.35E-02	2.28E-02
ag109	6.11E+01	6.12E+01	6.12E+01	6.12E+01	6.12E+01	6.12E+01	6.12E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.60E+02	6.61E+02	6.62E+02	6.63E+02	6.64E+02	6.65E+02	6.66E+02
nd145	5.17E+02	5.17E+02	5.17E+02	5.17E+02	5.17E+02	5.17E+02	5.17E+02
sm147	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.16E+02
sm149	2.38E+00	2.67E+00	2.84E+00	2.95E+00	3.01E+00	3.04E+00	3.06E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	2.00E+02	2.00E+02	2.00E+02	2.00E+02	2.00E+02	2.00E+02	2.00E+02
sm151	1.42E+01	1.43E+01	1.44E+01	1.44E+01	1.44E+01	1.44E+01	1.44E+01
eu151	3.19E-02	3.24E-02	3.29E-02	3.34E-02	3.39E-02	3.44E-02	3.49E-02
sm152	9.77E+01	9.77E+01	9.77E+01	9.77E+01	9.77E+01	9.77E+01	9.77E+01
eu153	7.82E+01	7.84E+01	7.86E+01	7.86E+01	7.87E+01	7.87E+01	7.87E+01
gd155	5.44E-02	5.67E-02	5.90E-02	6.13E-02	6.36E-02	6.59E-02	6.82E-02
total	2.50E+04	2.50E+04	2.50E+04	2.50E+04	2.50E+04	2.50E+04	2.50E+04

t69l5h4.sum

```
0*************************************************************************
 *                                                                       *
 *                    SCALE4.3  Bulletin  Board                          *
 *                    --------  --------  -----                          *
 *                                                                       *
 *                      Welcome to SCALE-4.3.                            *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1         primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod 15, level 4, 24.330 gwd/mtu, June 97
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1015
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1015  end
      kr-85  1 0 1-20 1015  end
      y-89   1 0 1-20 1015  end
      sr-90  1 0 1-20 1015  end
      zr-93  1 0 1-20 1015  end
      zr-94  1 0 1-20 1015  end
      zr-95  1 0 1-20 1015  end
      nb-94  1 0 1-20 1015  end
      mo-95  1 0 1-20 1015  end
      tc-99  1 0 1-20 1015  end
      ru-101 1 0 1-20 1015  end
      ru-106 1 0 1-20 1015  end
      rh-103 1 0 1-20 1015  end
      rh-105 1 0 1-20 1015  end
      pd-105 1 0 1-20 1015  end
      pd-108 1 0 1-20 1015  end
      ag-109 1 0 1-20 1015  end
      sb-124 1 0 1-20 1015  end
      xe-131 1 0 1-20 1015  end
      xe-132 1 0 1-20 1015  end
      xe-135 1 0 1-20 1015  end
      xe-136 1 0 1-20 1015  end
      cs-134 1 0 1-20 1015  end
      cs-135 1 0 1-20 1015  end
      cs-137 1 0 1-20 1015  end
      ba-136 1 0 1-20 1015  end
      la-139 1 0 1-20 1015  end
      pr-141 1 0 1-20 1015  end
      pr-143 1 0 1-20 1015  end
      ce-144 1 0 1-20 1015  end
      nd-143 1 0 1-20 1015  end
      nd-145 1 0 1-20 1015  end
      nd-147 1 0 1-20 1015  end
      pm-147 1 0 1-20 1015  end
      pm-148 1 0 1-20 1015  end
      sm-147 1 0 1-20 1015  end
      sm-149 1 0 1-20 1015  end
      sm-150 1 0 1-20 1015  end
      sm-151 1 0 1-20 1015  end
      sm-152 1 0 1-20 1015  end
      eu-153 1 0 1-20 1015  end
      eu-154 1 0 1-20 1015  end
      eu-155 1 0 1-20 1015  end
      gd-155 1 0 1-20 1015  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7554  1  553   end
      arbm-bormod  0.7554 1 1 0 0 5000 100 3 1175.0e-6  553  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3   end
      3 0.7351 500 3.3248 2 3.3353
      power=13.524 burn=226  down=86     end
      power=21.004 burn=263  down=51    bfrac=0.7234  end
      power=24.294 burn=292  down=1117  bfrac=0.2766  end
      power=20.807 burn=416  down=10    bfrac=0.5532  h2ofrac=1.023  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   ssssssssss      aaaaaaaaa      ssssssssss     22222222222     hh          hh
   ssssssssssss    aaaaaaaaaa    ssssssssssss   2222222222222    hh          hh
   ss          ss  aa          aa  ss          ss  22          22  hh          hh
   ss              aa          aa  ss                          22  hh          hh
   ss              aa          aa  ss                          22  hh          hh
   ssssssssssss    aaaaaaaaaaaaa   ssssssssssss              22    hhhhhhhhhhhhh
    ssssssssssss   aaaaaaaaaaaaa    ssssssssssss          22      hhhhhhhhhhhhh
             ss    aa          aa              ss        22        hh          hh
             ss    aa          aa              ss      22          hh          hh
```

```
   ss          ss  aa          aa  ss          ss  22            hh          hh
   sssssssssssss   aa          aa  sssssssssssss   2222222222222 hh          hh
    sssssssssss    aa          aa   sssssssssss    2222222222222 hh          hh
0
   nn          nn  iiiiiiiiiiii     ccccccccccc    hh          hh  ooooooooooo    11
   nnn         nn  iiiiiiiiiiii    ccccccccccccc   hh          hh ooooooooooooo   11
   nnnn        nn       ii         cc          cc  hh          hh oo          oo  11
   nn nn       nn       ii         cc              hh          hh oo          oo  11
   nn  nn      nn       ii         cc              hh          hh oo          oo  11
   nn   nn     nn       ii         cc              hhhhhhhhhhhhh  oo          oo  11
   nn    nn    nn       ii         cc              hhhhhhhhhhhhh  oo          oo  11
   nn     nn   nn       ii         cc              hh          hh oo          oo  11
   nn      nn  nn       ii         cc              hh          hh oo          oo  11
   nn       nnnn        ii         cc          cc  hh          hh oo          oo  11
   nn        nnn   iiiiiiiiiiii    ccccccccccccc   hh          hh ooooooooooooo   1111111111111
   nn         nn   iiiiiiiiiiii     ccccccccccc    hh          hh  ooooooooooo    1111111111111
0
      0000000      777777777777              //   33333333333        11               //  99999999999   777777777777
     000000000     777777777777             //   3333333333333      111              //  9999999999999  777777777777
    00       00    77        77            //    33          33    1111             //   99          99 77        77
   00         00            77            //                 33      11            //    99          99          77
   00         00           77            //                  33      11           //     99          99         77
   00         00          77            //                 333       11          //      9999999999999         77
   00         00          77           //                  333       11         //        999999999999        77
   00         00         77           //                     33      11        //                    99       77
   00         00         77          //                      33      11       //                     99       77
    00       00          77         //       33          33          11      //                      99      77
     000000000           77        //        3333333333333      11111111    //        9999999999999         77
      0000000            77       //          33333333333       11111111   //          999999999999         77
0
        11                  44                   5555555555555   5555555555555                  22222222222    33333333333
       111                 444                   5555555555555   5555555555555                 2222222222222  3333333333333
      1111                4444         :::       55              55                 :::        22          22 33          33
        11               44 44         :::       55              55                 :::                    22             33
        11              44  44         :::       55              55                 :::                    22             33
        11             44   44                   555555555555    555555555555                            22              333
        11            44    44                   5555555555555   5555555555555                         22                333
        11            4444444444444    :::                  55              55      :::              22                   33
        11            4444444444444    :::                  55              55      :::            22                     33
        11                  44         :::       55         55   55         55      :::         22                33          33
     11111111               44                   5555555555555   5555555555555                  2222222222222  3333333333333
     11111111               44                    55555555555     55555555555                   2222222222222   33333333333
1
0                                    sssssssssss    ccccccccccc     aaaaaaaaa    11               eeeeeeeeeeeee
                                    sssssssssssss  ccccccccccccc   aaaaaaaaaaa   11               eeeeeeeeeeeee
                                    ss          ss cc          cc aa          aa 11               ee
                                    ss             cc             aa          aa 11               ee
                                    ss             cc             aa          aa 11               ee
                                    ssssssssssss   cc             aaaaaaaaaaaaa  11               eeeeeeeee
                                     ssssssssssss  cc             aaaaaaaaaaaaa  11               eeeeeeeee
                                               ss  cc             aa          aa 11               ee
                                               ss  cc             aa          aa 11               ee
                                    ss         ss  cc          cc aa          aa 11               ee
                                    sssssssssssss  ccccccccccccc  aa          aa 1111111111111    eeeeeeeeeeeee
                                     sssssssssss    ccccccccccc   aa          aa 1111111111111    eeeeeeeeeeeee
```

```
                    *********************************************************************************
                    *********************************************************************************
                    *********************************************************************************
                    *****                                                                       *****
                    *****                     program verification information                  *****
                    *****                                                                       *****
                    *****                     code system:    scale  version:    4.3            *****
                    *****                                                                       *****
                    *********************************************************************************
                    *********************************************************************************
                    *****                                                                       *****
                    *****                                                                       *****
                    *****                  program:  sas2                                       *****
                    *****                                                                       *****
                    *****            creation date:  03/07/97                                   *****
                    *****                                                                       *****
                    *****                  library:  /opt/neut/Scale4.3/bin                     *****
                    *****                                                                       *****
                    *****                                                                       *****
                    *****    this is not a   scale  configuration controlled code               *****
                    *****                                                                       *****
                    *****                  jobname:  nichol                                     *****
                    *****                                                                       *****
                    *****        date of execution:  07/31/97                                   *****
                    *****                                                                       *****
                    *****        time of execution:  14:55:23                                   *****
                    *****                                                                       *****
                    *****                                                                       *****
                    *********************************************************************************
                    *********************************************************************************
                    *********************************************************************************
```

```
1
0'
0'
0' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                                nuclide concentrations, grams
                                                 basis =single reactor assembly
            initial   1E-18 d
     o 16   1.35E+05  1.35E+05
   total    3.90E+05  3.90E+05
0                                                nuclide concentrations, grams
                                                 basis =single reactor assembly
            initial   1E-18 d
     u234   2.80E+02  2.80E+02
     u235   3.13E+04  3.13E+04
     u236   1.40E+02  1.40E+02
     u238   9.68E+05  9.68E+05
   total    1.00E+06  1.00E+06
0                                               basis =
```

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.28E+01	1.29E+01	1.29E+01	1.29E+01	1.29E+01	1.30E+01	1.30E+01
tc 99	3.35E-05	3.36E-05	3.37E-05	3.37E-05	3.38E-05	3.38E-05	3.38E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03
u234	1.86E+02	1.86E+02	1.86E+02	1.86E+02	1.86E+02	1.86E+02	1.86E+02
u235	1.26E+04	1.26E+04	1.26E+04	1.26E+04	1.26E+04	1.26E+04	1.26E+04
u236	3.45E+03	3.45E+03	3.45E+03	3.45E+03	3.45E+03	3.45E+03	3.45E+03
u238	9.48E+05	9.48E+05	9.48E+05	9.48E+05	9.48E+05	9.48E+05	9.48E+05
np237	3.26E+02	3.27E+02	3.28E+02	3.28E+02	3.29E+02	3.29E+02	3.30E+02
pu236	3.45E-04	3.46E-04	3.46E-04	3.45E-04	3.45E-04	3.45E-04	3.44E-04
pu238	9.90E+01	9.94E+01	9.97E+01	9.99E+01	1.00E+02	1.00E+02	1.00E+02
pu238	9.90E+01	9.94E+01	9.97E+01	9.99E+01	1.00E+02	1.00E+02	1.00E+02
pu239	6.22E+03	6.24E+03	6.26E+03	6.26E+03	6.27E+03	6.27E+03	6.27E+03
pu240	1.82E+03	1.82E+03	1.82E+03	1.82E+03	1.82E+03	1.82E+03	1.82E+03
pu241	1.07E+03	1.07E+03	1.06E+03	1.06E+03	1.06E+03	1.06E+03	1.06E+03
pu242	2.55E+02	2.55E+02	2.55E+02	2.55E+02	2.55E+02	2.55E+02	2.55E+02
am241	8.21E+01	8.24E+01	8.26E+01	8.28E+01	8.31E+01	8.33E+01	8.35E+01
am242m	1.95E+00	1.95E+00	1.95E+00	1.95E+00	1.95E+00	1.95E+00	1.95E+00
am243	4.39E+01	4.40E+01	4.40E+01	4.40E+01	4.40E+01	4.40E+01	4.40E+01
total	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	5.06E+02	5.07E+02	5.08E+02	5.09E+02	5.09E+02	5.10E+02	5.11E+02
tc 99	6.01E+02	6.01E+02	6.02E+02	6.02E+02	6.03E+02	6.03E+02	6.03E+02
tc 99m	1.75E-01	1.26E-01	8.27E-02	5.43E-02	3.57E-02	2.34E-02	1.54E-02
ru101	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02
rh103	3.50E+02	3.51E+02	3.51E+02	3.52E+02	3.53E+02	3.54E+02	3.54E+02
rh103m	2.72E-02	2.64E-02	2.57E-02	2.49E-02	2.42E-02	2.35E-02	2.28E-02
ag109	6.15E+01	6.16E+01	6.16E+01	6.16E+01	6.16E+01	6.16E+01	6.16E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.61E+02	6.62E+02	6.63E+02	6.64E+02	6.65E+02	6.66E+02	6.66E+02
nd145	5.15E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02
sm147	1.14E+02	1.14E+02	1.14E+02	1.14E+02	1.15E+02	1.15E+02	1.15E+02
sm149	2.46E+00	2.75E+00	2.93E+00	3.03E+00	3.09E+00	3.12E+00	3.14E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	2.00E+02	2.00E+02	2.00E+02	2.00E+02	2.00E+02	2.00E+02	2.00E+02
sm151	1.48E+01	1.48E+01	1.49E+01	1.49E+01	1.49E+01	1.49E+01	1.49E+01
eu151	3.35E-02	3.41E-02	3.46E-02	3.51E-02	3.56E-02	3.62E-02	3.67E-02
sm152	9.72E+01	9.72E+01	9.72E+01	9.72E+01	9.72E+01	9.72E+01	9.72E+01
eu153	7.84E+01	7.86E+01	7.87E+01	7.87E+01	7.88E+01	7.88E+01	7.88E+01
gd155	5.73E-02	5.96E-02	6.19E-02	6.42E-02	6.65E-02	6.88E-02	7.11E-02
total	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04

t69l5h7.sum

```
0*************************************************************************
 *                                                                       *
 *                    SCALE4.3  Bulletin  Board                          *
 *                    --------  --------  -----                          *
 *                                                                       *
 *                      Welcome to SCALE-4.3.                            *
 *                                                                       *
 *                                                                       *
 *************************************************************************
1          primary module access and input record ( scale driver - 95/03/29 - 09:06:37 )
-   module sas2h    will be called
      trino vercellese pwr, 509-069, rod 15, level 7, 24.313 gwd/mtu, June 97
      '
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '   mixtures of fuel-pin-unit-cell:
      '
      44group    latticecell
      '
      '
      uo2  1 den=10.079  1 1001
         92234 0.028 92235 3.13  92236 0.014 92238 96.828   end
      kr-83  1 0 1-20 1001  end
      kr-85  1 0 1-20 1001  end
      y-89   1 0 1-20 1001  end
      sr-90  1 0 1-20 1001  end
      zr-93  1 0 1-20 1001  end
      zr-94  1 0 1-20 1001  end
      zr-95  1 0 1-20 1001  end
      nb-94  1 0 1-20 1001  end
      mo-95  1 0 1-20 1001  end
      tc-99  1 0 1-20 1001  end
      ru-101 1 0 1-20 1001  end
      ru-106 1 0 1-20 1001  end
      rh-103 1 0 1-20 1001  end
      rh-105 1 0 1-20 1001  end
      pd-105 1 0 1-20 1001  end
      pd-108 1 0 1-20 1001  end
      ag-109 1 0 1-20 1001  end
      sb-124 1 0 1-20 1001  end
      xe-131 1 0 1-20 1001  end
      xe-132 1 0 1-20 1001  end
      xe-135 1 0 1-20 1001  end
      xe-136 1 0 1-20 1001  end
      cs-134 1 0 1-20 1001  end
      cs-135 1 0 1-20 1001  end
      cs-137 1 0 1-20 1001  end
      ba-136 1 0 1-20 1001  end
      la-139 1 0 1-20 1001  end
      pr-141 1 0 1-20 1001  end
      pr-143 1 0 1-20 1001  end
      ce-144 1 0 1-20 1001  end
      nd-143 1 0 1-20 1001  end
      nd-145 1 0 1-20 1001  end
      nd-147 1 0 1-20 1001  end
      pm-147 1 0 1-20 1001  end
      pm-148 1 0 1-20 1001  end
      sm-147 1 0 1-20 1001  end
      sm-149 1 0 1-20 1001  end
      sm-150 1 0 1-20 1001  end
      sm-151 1 0 1-20 1001  end
      sm-152 1 0 1-20 1001  end
      eu-153 1 0 1-20 1001  end
      eu-154 1 0 1-20 1001  end
      eu-155 1 0 1-20 1001  end
      gd-155 1 0 1-20 1001  end
      '
      ss304  2 1   570  end
      '
      h2o  3 den=0.7795  1  540   end
      arbm-bormod  0.7795 1 1 0 0 5000 100 3 1175.0e-6  540  end
      '
      ' 1175 ppm boron (wt) in moderator at start (1st segment)
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      end comp
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '      fuel-pin-cell geometry:
      '
      squarepitch   1.303   0.9020 1  3  0.9786  2   end
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
      '    assembly and cycle parameters:
      '
      npin/assm=214 fuelnght=823.10 ncycles=4  nlib/cyc=5
      printlevel=5 lightel=9  inplevel=2 numztotal=3   end
      3 0.7351 500 3.3248 2 3.3353
      power=13.514 burn=226  down=86     end
      power=20.990 burn=263  down=51    bfrac=0.7234  end
      power=24.277 burn=292  down=1117  bfrac=0.2766  end
      power=20.792 burn=416  down=10    bfrac=0.5532  h2ofrac=1.020  end
        o 135    cr 5.9    mn  0.33
        fe 13.0  co 0.075  ni  9.9
        zr 221.0 nb 0.71   sn  3.6
      '
      ' - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      '
1   sssssssssss      aaaaaaaaa      sssssssssss     22222222222    hh          hh
   ssssssssssss    aaaaaaaaaaa    ssssssssssss   2222222222222   hh          hh
   ss          ss   aa         aa   ss          ss   22         22   hh          hh
   ss               aa         aa   ss                      22   hh          hh
   ss               aa         aa   ss                      22   hh          hh
   ssssssssssss    aaaaaaaaaaaaa   ssssssssssss          22     hhhhhhhhhhhhh
    ssssssssssss   aaaaaaaaaaaaa    ssssssssssss        22       hhhhhhhhhhhhh
              ss   aa         aa              ss      22         hh          hh
              ss   aa         aa              ss    22           hh          hh
```

```
   ss          ss  aa          aa  ss          ss   22             hh          hh
   ssssssssssss    aa          aa  ssssssssssss     2222222222222  hh          hh
    ssssssssss     aa          aa   ssssssssss      2222222222222  hh          hh
0
   nn          nn  iiiiiiiiiii    ccccccccccc    hh          hh   ooooooooooo    11
   nnn         nn  iiiiiiiiiii   ccccccccccccc   hh          hh  ooooooooooooo   11
   nnnn        nn      ii        cc         cc   hh          hh  oo         oo   11
   nn nn       nn      ii        cc              hh          hh  oo         oo   11
   nn  nn      nn      ii        cc              hh          hh  oo         oo   11
   nn   nn     nn      ii        cc              hhhhhhhhhhhhh   oo         oo   11
   nn    nn    nn      ii        cc              hhhhhhhhhhhhh   oo         oo   11
   nn     nn   nn      ii        cc              hh          hh  oo         oo   11
   nn      nn  nn      ii        cc              hh          hh  oo         oo   11
   nn       nnnn       ii        cc         cc   hh          hh  oo         oo   11
   nn        nnn   iiiiiiiiiii   ccccccccccccc   hh          hh  ooooooooooooo   1111111111111
   nn         nn   iiiiiiiiiii    ccccccccccc    hh          hh   ooooooooooo    1111111111111
0
     0000000     777777777777          //   33333333333       11            //  99999999999   777777777777
    000000000    777777777777         //   3333333333333     111           //  9999999999999  777777777777
   00     00     77        77        //    33          33   1111          //   99         99  77        77
  00       00             77        //                 33     11         //    99         99           77
  00       00            77        //                  33     11        //     99         99          77
  00       00           77        //                  333     11       //      9999999999999        77
  00       00           77       //                  333      11      //        999999999999       77
  00       00          77       //                     33     11     //                   99      77
  00       00          77      //                      33     11    //                    99      77
   00     00          77      //       33          33      11   //                     99     77
    000000000         77     //        3333333333333    11111111 //             9999999999999   77
     0000000          77    //          33333333333     11111111 //             999999999999    77
0
     11       5555555555555         2222222222222  5555555555555                 44  5555555555555
    111       5555555555555         2222222222222  5555555555555                444  5555555555555
   1111       55             :::    22         22  55             :::          4444  55
     11       55             :::               22  55             :::         44 44  55
     11       55             :::               22  55             :::        44  44  55
     11       555555555555                    22   555555555555             44   44  555555555555
     11       5555555555555                 22     5555555555555           44    44  5555555555555
     11                  55  :::           22                 55  :::     4444444444444         55
     11                  55  :::         22                   55  :::     4444444444444         55
     11       55         55  :::        22         55         55  :::                44  55         55
   11111111   5555555555555            2222222222222  5555555555555                  44  5555555555555
   11111111    55555555555             2222222222222   55555555555                   44   55555555555
1
0                               sssssssssss    ccccccccccc     aaaaaaaaa    11           eeeeeeeeeeeee
                               sssssssssssss  ccccccccccccc   aaaaaaaaaaa   11           eeeeeeeeeeeee
                               ss         ss  cc         cc  aa         aa  11           ee
                               ss             cc             aa         aa  11           ee
                               ss             cc             aa         aa  11           ee
                               ssssssssssss   cc             aaaaaaaaaaaaa  11           eeeeeeeee
                                ssssssssssss  cc             aaaaaaaaaaaaa  11           eeeeeeeee
                                          ss  cc             aa         aa  11           ee
                                          ss  cc             aa         aa  11           ee
                               ss         ss  cc         cc  aa         aa  11           ee
                               sssssssssssss  ccccccccccccc  aa         aa  1111111111111 eeeeeeeeeeeee
                                sssssssssss    ccccccccccc   aa         aa  1111111111111 eeeeeeeeeeeee


                  **********************************************************************
                  **********************************************************************
                  **********************************************************************
                  *****                                                            *****
                  *****                 program verification information           *****
                  *****                                                            *****
                  *****              code system:    scale  version:    4.3        *****
                  *****                                                            *****
                  **********************************************************************
                  **********************************************************************
                  *****                                                            *****
                  *****                                                            *****
                  *****             program:  sas2                                 *****
                  *****                                                            *****
                  *****       creation date:  03/07/97                             *****
                  *****                                                            *****
                  *****             library:  /opt/neut/Scale4.3/bin               *****
                  *****                                                            *****
                  *****                                                            *****
                  *****     this is not a   scale  configuration controlled code   *****
                  *****                                                            *****
                  *****             jobname:  nichol                               *****
                  *****                                                            *****
                  *****   date of execution:  07/31/97                             *****
                  *****                                                            *****
                  *****   time of execution:  15:25:45                             *****
                  *****                                                            *****
                  *****                                                            *****
                  **********************************************************************
                  **********************************************************************
                  **********************************************************************
1
0
0
0 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
0                                          nuclide concentrations, grams
                                           basis =single reactor assembly
             initial   1E-18 d
     o 16   1.35E+05  1.35E+05
   total    3.90E+05  3.90E+05
0                                          nuclide concentrations, grams
                                           basis =single reactor assembly
             initial   1E-18 d
     u234   2.80E+02  2.80E+02
     u235   3.13E+04  3.13E+04
     u236   1.40E+02  1.40E+02
     u238   9.68E+05  9.68E+05
   total    1.00E+06  1.00E+06
0                                         basis =
```

0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 initial 11.3 d 22.6 d 33.9 d 45.2 d 45.2 d
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
o 16	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05	1.35E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	1.26E+01	1.26E+01	1.26E+01	1.26E+01	1.27E+01	1.27E+01	1.27E+01
tc 99	3.11E-05	3.13E-05	3.13E-05	3.14E-05	3.14E-05	3.14E-05	3.15E-05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
total	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05	3.90E+05

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
u233	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03
u234	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02	1.87E+02
u235	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04	1.25E+04
u236	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03	3.46E+03
u238	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05	9.49E+05
np237	3.21E+02	3.22E+02	3.22E+02	3.23E+02	3.23E+02	3.24E+02	3.24E+02
pu236	3.34E-04	3.34E-04	3.34E-04	3.34E-04	3.34E-04	3.33E-04	3.33E-04
pu238	9.64E+01	9.68E+01	9.70E+01	9.72E+01	9.74E+01	9.75E+01	9.77E+01
pu238	9.64E+01	9.68E+01	9.70E+01	9.72E+01	9.74E+01	9.75E+01	9.77E+01
pu239	6.11E+03	6.13E+03	6.14E+03	6.15E+03	6.15E+03	6.16E+03	6.16E+03
pu240	1.80E+03	1.80E+03	1.80E+03	1.80E+03	1.80E+03	1.80E+03	1.80E+03
pu241	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03	1.04E+03
pu242	2.52E+02	2.52E+02	2.52E+02	2.52E+02	2.52E+02	2.52E+02	2.52E+02
am241	7.99E+01	8.02E+01	8.04E+01	8.06E+01	8.09E+01	8.11E+01	8.13E+01
am242m	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00	1.86E+00
am243	4.26E+01	4.27E+01	4.27E+01	4.27E+01	4.27E+01	4.27E+01	4.27E+01
total	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05	9.75E+05

0 element concentrations, grams
0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
mo 95	5.07E+02	5.08E+02	5.09E+02	5.09E+02	5.10E+02	5.11E+02	5.12E+02
tc 99	6.01E+02	6.02E+02	6.03E+02	6.03E+02	6.03E+02	6.03E+02	6.03E+02
tc 99m	1.75E-01	1.26E-01	8.27E-02	5.43E-02	3.57E-02	2.34E-02	1.54E-02
ru101	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02	5.67E+02
rh103	3.49E+02	3.50E+02	3.50E+02	3.51E+02	3.52E+02	3.53E+02	3.53E+02
rh103m	2.71E-02	2.63E-02	2.56E-02	2.48E-02	2.41E-02	2.34E-02	2.27E-02
ag109	6.10E+01	6.10E+01	6.10E+01	6.10E+01	6.10E+01	6.10E+01	6.10E+01

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
nd143	6.60E+02	6.61E+02	6.62E+02	6.62E+02	6.63E+02	6.64E+02	6.65E+02
nd145	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02	5.16E+02
sm147	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.15E+02	1.16E+02
sm149	2.38E+00	2.67E+00	2.84E+00	2.94E+00	3.00E+00	3.04E+00	3.06E+00

0 nuclide concentrations, grams
basis =single reactor assembly

	initial	1.7 d	3.3 d	5.0 d	6.7 d	8.3 d	10.0 d
sm150	1.99E+02	1.99E+02	1.99E+02	1.99E+02	1.99E+02	1.99E+02	1.99E+02
sm151	1.42E+01	1.43E+01	1.43E+01	1.44E+01	1.44E+01	1.44E+01	1.44E+01
eu151	3.19E-02	3.24E-02	3.29E-02	3.34E-02	3.40E-02	3.45E-02	3.50E-02
sm152	9.75E+01	9.75E+01	9.75E+01	9.75E+01	9.75E+01	9.75E+01	9.75E+01
eu153	7.80E+01	7.82E+01	7.83E+01	7.84E+01	7.84E+01	7.85E+01	7.85E+01
gd155	5.43E-02	5.66E-02	5.89E-02	6.12E-02	6.35E-02	6.58E-02	6.80E-02
total	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04	2.49E+04