MOL.19971218.1070

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Design Analysis Cover Sheet

Complete only applicable items.

(1.) QA: L

Page: 1 Of: 126

2. DESIGN ANALYSIS TITLE CRC Depletion Calculations for the Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3			
3. DOCUMENT IDENTIFIER (Including Rev. No.) BBA000000-01717-0200-00041 REV 00			4. TOTAL PAGES 126
5. TOTAL ATTACHMENTS 26	6. ATTACHMENT NUMBERS - NO. OF PAGES IN EACH See Section 9 for this information.		
	Printed Name	Signature	Date
7. Originator	Kenneth D. Wright	Kenneth D. Wright	9/3/97
8. Checker	D.A. THOMAS FOR LARRY B. WIMMER	D.A. Thomas FOR LARRY B. Wimmer	09/03/97
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11. REMARKS

Attachments XIII through XXVI identified as REV 00 have been moved to independent references.

CRWMS/M&O

Design Analysis Revision Record

Complete only applicable items.

1.

2. DESIGN ANALYSIS TITLE

CRC Depletion Calculations for the Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3

3. DOCUMENT IDENTIFIER (Including Rev. No.)

BBA000000-01717-0200-00041 REV 00

4. Revision No.	5. Description of Revision
00	Initial Issuance Copy

Table of Contents

Item ... Page

1. Purpose ... 5

2. Quality Assurance ... 5

3. Method ... 5

4. Design Inputs ... 6
    - 4.1 Design Parameters ... 6
        - 4.1.1 Fuel Assembly Descriptions ... 6
        - 4.1.2 Burnable Poison Rod Assembly (BPRA) Description ... 7
        - 4.1.3 Control Rod Assembly (CRA) Description ... 8
        - 4.1.4 Axial Power Shaping Rod Assembly (APSRA) Description ... 8
        - 4.1.5 System Pressure ... 9
        - 4.1.6 Fuel Assembly Insertion, Burnable Poison Loading, and Control Bank Insertion Histories ... 9
        - 4.1.7 Fuel Assembly Insertion Position Histories ... 10
        - 4.1.8 Reactor Cycle History Data ... 11
        - 4.1.9 Boron Letdown Data ... 14
        - 4.1.10 Burnup, Fuel Temperature, and Moderator Specific Volume Data ... 21
        - 4.1.11 Insertion History Data for CRA's and APSRA's ... 42
    - 4.2 Criteria ... 51
    - 4.3 Assumptions ... 51
    - 4.4 Codes and Standards ... 52

5. References ... 52

6. Use of Computer Software ... 53
    - 6.1 Software Approved for QA Work ... 53
    - 6.2 Software Routines ... 53

7. Design Analysis ... 55
    - 7.1 Assembly Depletion Calculation Procedure ... 55
    - 7.2 Path B Unit Cell Model Development ... 56
    - 7.3 Cycle Irradiation History Layouts for the Depletion of the Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3 ... 72
    - 7.4 The Commercial Reactor Assembly Follow Taskmaster (CRAFT) Code & Usage ... 97
    - 7.5 Input & Output Filename Descriptions for CRAFT and SAS2H ... 100
    - 7.6 Rodded Assembly Depletion Calculations for Fuel Batches 4 and 5 of Crystal River Unit 3 ... 101
    - 7.7 Isotopic Results ... 123

8. Conclusions 124

9. Attachments 124

1. Purpose

The purpose of this design analysis is to document the SAS2H depletion calculations of certain rodded fuel assemblies from batches 4 and 5 of the Crystal River Unit 3 pressurized water reactor (PWR) that are required for Commercial Reactor Critical (CRC) evaluations to support development of the disposal criticality methodology. A rodded assembly is one that contains a control rod assembly (CRA) or an axial power shaping rod assembly (APSRA) for some period of time during its irradiation history. The objective of this analysis is to provide SAS2H calculated isotopic compositions of depleted fuel and depleted burnable poison for each fuel assembly to be used in subsequent CRC reactivity calculations containing the fuel assemblies.

2. Quality Assurance

The Quality Assurance (QA) program applies to this analysis. The work reported in this document is part of the criticality disposal methodology development 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, Ref. 5.6). The waste package is on the Q-List by direct inclusion by the Department of Energy (DOE), without conducting a QAP-2-3 evaluation. As determined by an evaluation performed in accordance with QAP-2-0, *Conduct of Activities*, the work performed for this analysis is subject to *Quality Assurance Requirements and Description* (QARD; Ref. 5.2) requirements. As specified in NLP-3-18, "Documentation of QA Controls on Drawings, Specifications, Design Analyses, and Technical Documents", the development of this analysis is subject to QA controls. The Waste Package Development Department (WPDD) responsible manager has selected the applicable procedural controls for this activity commensurate with the work control activity evaluation entitled "Perform Criticality, Thermal, Structural, and Shielding Analyses" (Ref. 5.1).

The work reported in this document is part of the CRC neutronic analyses to support the development of the disposal criticality methodology. All design parameters utilized in this analysis are from a qualified source (Ref. 5.3) which was developed under a U. S. Nuclear Regulatory Commission approved QA program. Therefore, all design parameters utilized in this analysis are qualified.

3. Method

The method for obtaining fuel and burnable poison isotopic compositions at specific points during each assembly's irradiation history is based upon the use of the SAS2H control module of the SCALE 4.3 modular code system (Ref. 5.4). The effective full-power day (EFPD) times during reactor operation that correspond to a CRC evaluation are called "statepoints". An assembly depletion calculation between two CRC statepoints is called a "statepoint calculation". The depleted fuel and depleted burnable poison compositions may be used in subsequent CRC reactivity calculations. The SAS2H input decks are automatically developed by the CRAFT program which is a software routine documented in Sections 7.4 and 7.5 and Attachment I of reference 5.11. The SAS2H input decks and depletion models are developed using actual assembly specifications, actual assembly irradiation histories, and actual CRA and APSRA insertion histories. The isotopic results obtained from the SAS2H depletion calculations are reviewed and analyzed to identify any anomalous results which may propagate to subsequent CRC reactivity calculations and ultimately impact the development of the disposal criticality methodology.

4. Design Inputs

The design inputs documented in this analysis describe the design specifications and irradiation histories for certain rodded fuel assemblies in fuel batches 4 and 5 of the Crystal River Unit 3 PWR. All of the design inputs listed in this analysis are obtained from reference 5.3, which is a reference summarizing the necessary input parameters.

4.1 Design Parameters

4.1.1 Fuel Assembly Descriptions

Table 4.1.1-1 contains a description of the rodded fuel assemblies corresponding to fuel batches 4 and 5 of Crystal River Unit 3. All fuel assemblies within a given fuel batch have the same characteristics as identified in Table 4.1.1-1.

Table 4.1.1-1 Fuel Assembly Descriptions for Batches 4 and 5 of Crystal River Unit 3

	Fuel Batch Identifier	
Parameter	4	5
Assembly Type	Mark-B4	Mark-B4
Weight Percent U-235	2.64	2.62
kg of U per Assembly	468.62	463.63
Fuel Height (cm)	360.172	360.172
Fuel Pellet OD[1] (cm)	0.939038	0.936244
Fuel Rod Clad OD (cm)	1.0922	1.0922
Fuel Rod Clad ID[2] (cm)	0.95758	0.95758
Spacer Grid Material	Inconel	Inconel
Volume Fraction of Spacer Grid in Moderator	0.005757609	0.005757609
Guide Tube Material	Zircaloy	Zircaloy
Guide Tube OD (cm)	1.3462	1.3462

	Fuel Batch Identifier	
Parameter	4	5
Guide Tube ID (cm)	1.26492	1.26492
Instrument Tube Material	Zircaloy	Zircaloy
Instrument Tube OD (cm)	1.38193	1.38193
Instrument Tube ID (cm)	1.12014	1.12014
Array Size	15x15	15x15
Number of Fuel Rods	208	208
Number of Guide Tubes	16	16
Number of Instr. Tubes	1	1
Pin Pitch (cm)	1.44272	1.44272
Assembly Pitch (cm)	21.81098	21.81098

[1] OD = Outer Diameter
[2] ID = Inner Diameter

4.1.2 Burnable Poison Rod Assembly (BPRA) Description

Table 4.1.2-1 contains a description of the burnable poison rod assembly utilized in the various fuel assemblies from fuel batches 4 and 5 of Crystal River Unit 3. The rods of the BPRA are inserted into the guide tubes of the fuel assembly during irradiation to produce a lower thermal flux which ultimately allows for longer fuel assembly burnup and better core power distributions.

Table 4.1.2-1 BPRA Descriptions for Use in Batches 4 and 5 of Crystal River Unit 3

Parameter	Value
Burnable Poison (BP) Material	Al_2O_3-B_4C
BP Density (g/cc)	3.7
BP Pellet OD (cm)	0.8636
Burnable Poison Rod (BPR) Cladding Material	Zircaloy
BPR Cladding OD (cm)	1.0922
BPR Cladding ID (cm)	0.9144
Number of BPR's in a BPRA	16

4.1.3 Control Rod Assembly (CRA) Description

Table 4.1.3-1 contains a description of the control rod assembly utilized in the various fuel assemblies from fuel batches 4 and 5 of Crystal River Unit 3. The rods of the CRA are inserted into the guide tubes of the fuel assembly during irradiation to produce a local thermal flux depression which provides a mechanism for controlling the core power distribution (both radially and axially). Operating with CRAs inserted may also allow for extended fuel assembly burnup.

Table 4.1.3-1 CRA Descriptions for Use in Batches 4 and 5 of Crystal River Unit 3

Parameter	Value
Control Rod Neutron Absorbing Material	Ag-In-Cd with a 79.8, 15.0, and 5.0 weight percent by mass composition, respectively
Ag-In-Cd Density (g/cc)	10.17
Absorber Pellet OD (cm)	0.99568
Control Rod (CR) Cladding Material	Stainless Steel 304 (SS304)
CR Cladding OD (cm)	1.11760
CR Cladding ID (cm)	1.01092
Number of CR's in a CRA	16

4.1.4 Axial Power Shaping Rod Assembly (APSRA) Description

Table 4.1.4-1 contains a description of the axial power shaping rod assembly utilized in the various fuel assemblies from fuel batches 4 and 5 of Crystal River Unit 3. The rods of the APSRA are inserted into the guide tubes of the fuel assembly during irradiation to produce a local thermal flux depression which provides a mechanism for controlling the core power distribution (both radially and axially). Operating with APSRAs inserted allows for a more uniform axial burnup which results in longer average fuel assembly burnups. There are two types of APSRAs (black and grey) utilized in Crystal River Unit 3. The black APSRAs utilize Ag-In-Cd as the neutron absorbing material. The grey APSRAs utilize Inconel as the neutron absorbing material. As the names indicate, the black APSRAs have a larger macroscopic neutron absorption cross-section than the grey APSRAs. The grey APSRAs were not inserted in any of the assemblies documented in this analysis.

Table 4.1.4-1 Black APSRA Descriptions for Use in Batches 4 and 5 of Crystal River Unit 3

Parameter	Value
APSRA Neutron Absorbing Material	Ag-In-Cd with a 79.8, 15.0, and 5.0 weight percent by mass composition, respectively

Parameter	Value
Ag-In-Cd Density (g/cc)	10.17
Absorber Pellet OD (cm)	0.99568
Axial Power Shaping Rod (APSR) Cladding Material	Stainless Steel 304 (SS304)
APSR Cladding OD (cm)	1.11760
APSR Cladding ID (cm)	1.01092
Number of APSR's in an APSRA	16

4.1.5 System Pressure

Crystal River Unit 3 is a pressurized water reactor that operates at a constant pressure of 2200 psia (pounds per square inch absolute).

4.1.6 Fuel Assembly Insertion, Burnable Poison Loading, and Control Bank Insertion Histories

The actual irradiation histories of the fuel assemblies in batches 4 and 5 must be used to perform the various assembly depletion calculations relevant to the CRC analyses. Table 4.1.6-1 contains the assembly insertion, burnable poison (BP) loading, and control bank insertion histories for the rodded assemblies in fuel batches 4 and 5 which are required for the CRC analyses of Crystal River Unit 3. For fuel management purposes, some fuel assemblies were removed from the reactor and re-inserted in a later cycle as shown in Table 4.1.6-1.

Table 4.1.6-1 Crystal River Unit 3, Batches 4 and 5, Rodded Fuel Assembly Insertion, BP Loading, and Control Bank Insertion Histories

Assembly Number/Batch	Assembly Location in Cycle 2	3	4	5	8	Comments
B08 / 4	X	X	CR6			The "B" and "C" designations in the assembly number indicates that either Cycle 2 or 3 is the assembly's initial insertion cycle, respectively.
B20 / 4	X	CR6	X			
B21 / 4	X	X	CR7			
B25 / 4	X	CR8	X			
B27 / 4	X	X	CR8			
B28 / 4	X	X	CR6			
B29 / 4	X	X	CR7			
C15 / 5		X	X	CR7		
C15a / 5		X	X	CR7		

Assembly Number/Batch	Assembly Location in Cycle 2	3	4	5	8	Comments
C20 / 5		X	X		CR7	CR6=Control Bank 6
C20a / 5		X	X		CR6	CR7=Control Bank 7
C21 / 5		X	X	CR7		CR8=Control Bank 8
The "X" indicates that the assembly is present in the cycle indicated.						CR8=Black APSR

4.1.7 Fuel Assembly Insertion Position Histories

The positions of the various assemblies in the core must be known to correlate the burnup, fuel temperature, and moderator specific volume data with the appropriate assembly. The assembly position data is also used to document the depletion cases so that the isotopic results may be identified at a later time for a specific assembly in a particular position of the core. Table 4.1.7-1 contains the assembly position histories for the rodded assemblies in batches 4 and 5 of Crystal River Unit 3 which are relevant to the CRC analyses. The assembly position identifiers refer to locations in a one-eighth core symmetrical arrangement for Crystal River Unit 3 as shown in Figure 4.1.7-1. The integer values (1-29) shown in Figure 4.1.7-1 are used in the SAS2H depletion calculations to identify the various assembly locations.

Table 4.1.7-1 Assembly Position Histories for the Rodded Assemblies from Batches 4 and 5 of Crystal River Unit 3

Assembly Number	Assembly Location in Cycle 2	3	4	5	8
B08	H15	H12	H10		
B20	L14	H10	H12		
B21	L15	K13	H14		
B25	M14	L12	K11		
B27	N13	L13	L12		
B28	N14	M12	N12		
B29	O13	M12	L10		
C15		K15	L15	H14	
C15a		K15	L15	N12	
C20		L14	M13		H12
C20a		L14	M13		L10
C21		L15	L14	H10	

	8	9	10	11	12	13	14	15
H	1	2	3	4	5	6	7	8
K		9	10	11	12	13	14	15
L			16	17	18	19	20	21
M				22	23	24	25	
N					26	27	28	
O						29		

Figure 4.1.7-1 One-Eighth Symmetry Core Layout for Crystal River Unit 3

4.1.8 Reactor Cycle History Data

Table 4.1.8-1 contains a listing of the Crystal River Unit 3 reactor cycle history data that is relevant to the SAS2H depletion calculations documented in this analysis. The time durations other than the days of downtime and the total cycle effective full power days presented in Table 4.1.8-1 are calculated using the appropriate dates from Table 4.1.8-1 and the Lotus 1-2-3 "DATEDIF" function.

Table 4.1.8-1 Crystal River Unit 3 Reactor Cycle History Data Relevant to the Depletion Calculations for the Rodded Assemblies in Batches 4 and 5

Crystal River, Unit-3, Cycle-2 Summary

07/29/79 : Cycle Start Date
02/26/80 : Cycle End Date
212 : Cycle Length (Calendar Days)
166.5 : Cycle Effective Full Power Days

164 : Calendar Days of Downtime Between Cycle 2 and 3

Crystal River, Unit-3, Cycle-3 Summary

08/08/80 : Cycle Start Date
02/17/81 : 168.5 EFPD Shutdown Date
03/06/81 : Restart Date After the 168.5 EFPD Shutdown
06/30/81 : 250.0 EFPD Shutdown Date
07/13/81 : Restart Date After the 250.0 EFPD Shutdown
09/28/81 : Cycle End Date
193 : Cycle Length in Calendar Days to 168.5 EFPD Date

Table 4.1.8-1 Crystal River Unit 3 Reactor Cycle History Data Relevant to the Depletion Calculations for the Rodded Assemblies in Batches 4 and 5

116 : Cycle Length in Calendar Days from
168.5 EFPD Restart to 250.0 EFPD Date
77 : Cycle Length in Calendar Days from 250.0 EFPD Restart to EOC Date
416 : Total Cycle Length (Calendar Days)
16.792 : Days of Downtime During Shutdown at 168.5 EFPD
12.333 : Days of Downtime During Shutdown at 250.0 EFPD
323 : Total Cycle Effective Full Power Days

73 : Calendar Days of Downtime Between Cycle 3 and 4

<u>Crystal River, Unit-3, Cycle-4 Summary</u>

12/10/81 : Cycle Start Date
10/14/82 : 228.1 EFPD Shutdown Date
10/31/82 : Restart Date After the 228.1 EFPD Shutdown (10/29/82: Ref. 5.3)
11/25/82 : 253.0 EFPD Shutdown Date (11/26/82: Ref. 5.3)
12/20/82 : Restart Date After the 253.0 EFPD Shutdown
03/19/83 : Cycle End Date
308 : Cycle Length in Calendar Days to 228.1 EFPD Date
25 : Cycle Length in Calendar Days from
228.1 EFPD Restart to 253.0 EFPD Date
89 : Cycle Length in Calendar Days from 253.0 EFPD Restart to EOC Date
464 : Total Cycle Length (Calendar Days)
15.167 : Days of Downtime During Shutdown at 228.1 EFPD
24 : Days of Downtime During Shutdown at 253.0 EFPD
336.6 : Total Cycle Effective Full Power Days

127 : Calendar Days of Downtime Between Cycle 4 and 5

<u>Crystal River, Unit-3, Cycle-5 Summary</u>

07/24/83 : Cycle Start Date
11/05/84 : 388.5 EFPD Shutdown Date
11/10/84 : Restart Date After the 388.5 EFPD Shutdown
03/08/85 : Cycle End Date

Table 4.1.8-1 Crystal River Unit 3 Reactor Cycle History Data Relevant to the Depletion Calculations for the Rodded Assemblies in Batches 4 and 5

470 : Cycle Length in Calendar Days to 388.5 EFPD Date
118 : Cycle Length in Calendar Days from 388.5 EFPD Restart to EOC Date
593 : Total Cycle Length (Calendar Days)
4.958 : Days of Downtime During Shutdown at 388.5 EFPD
484.4 : Total Cycle Effective Full Power Days

163 : Calendar Days of Downtime Between Cycle 5 and 6

Crystal River, Unit-3, Cycle-8 Summary

06/21/90 : Cycle Start Date
10/09/90 : 97.6 EFPD Shutdown Date (10/10/90: Ref. 5.3)
10/25/90 : Restart Date After the 97.6 EFPD Shutdown
12/12/90 : 139.8 EFPD Shutdown Date
12/18/90 : Restart Date After the 139.8 EFPD Shutdown
10/14/91 : 404.0 EFPD Shutdown Date (10/11/91: Ref. 5.3)
11/27/91 : Restart Date After the 404.0 EFPD Shutdown (11/24/91: Ref. 5.3)
12/02/91 : 409.6 EFPD Shutdown Date (12/03/91: Ref. 5.3)
12/07/91 : Restart Date After the 409.6 EFPD Shutdown (12/08/91: Ref. 5.3)
03/27/92 : 515.5 EFPD Shutdown Date
04/04/92 : Restart Date After the 515.5 EFPD Shutdown
04/30/92 : Cycle End Date
110 : Cycle Length in Calendar Days to 97.6 EFPD Date
48 : Cycle Length in Calendar Days from 97.6 EFPD Restart to 139.8 EFPD Date
300 : Cycle Length in Calendar Days from 139.8 EFPD Restart to 404.0 EFPD Date
5 : Cycle Length in Calendar Days from 404.0 EFPD Restart to 409.6 EFPD Date
111 : Cycle Length in Calendar Days from 409.6 EFPD Restart to 515.5 EFPD Date
26 : Cycle Length in Calendar Days from 515.5 EFPD Restart to EOC
679 : Total Cycle Length (Calendar Days)
15.5 : Days of Downtime During Shutdown at 97.6 EFPD
6.2 : Days of Downtime During Shutdown at 139.8 EFPD
44.4 : Days of Downtime During Shutdown at 404.0 EFPD

Table 4.1.8-1 Crystal River Unit 3 Reactor Cycle History Data Relevant to the Depletion Calculations for the Rodded Assemblies in Batches 4 and 5

4.9 : Days of Downtime During Shutdown at 409.6 EFPD
7.6 : Days of Downtime During Shutdown at 515.5 EFPD
535.9 : Total Cycle Effective Full Power Days

75 : Calendar Days of Downtime Between Cycle 8 and 9

A number of the dates presented in Table 4.1.8-1 do not correspond directly with the dates presented in reference 5.3. The date contained in reference 5.3, is presented in parentheses next to each inconsistency. Inconsistencies in the restart and shutdown date values do not affect the calculations due to the fact that the depletions are based upon EFPD durations rather than calendar day durations. The various calendar day time periods between statepoints as presented in Table 4.1.8-1 are used for documentation purposes only. The cycle starting and ending dates are the only dates presented in Table 4.1.8-1 which are involved in calculations that are documented in this analysis. A cycle's starting and ending dates are used to calculate calendar day decay durations for fuel assemblies which skip that particular cycle. The days of downtime between cycles are not calculated from the dates presented in Table 4.1.8-1. The days of downtime between cycles are obtained directly from reference 5.3 in units of hours that are converted to days for presentation in Table 4.1.8-1 and use in this analysis. Therefore, no calculations documented in this analysis are affected by the date inconsistencies between Table 4.1.8-1 and reference 5.3.

4.1.9 Boron Letdown Data

The boron letdown data provided in the Core Operations Reports for Cycles 2, 3, 4, 5, and 8 of Crystal River Unit 3 is used to determine the soluble boron concentration in the moderator at the mid-point of each irradiation step in the various SAS2H depletion calculations performed to deplete the rodded fuel assemblies of batches 4 and 5. The boron concentrations at the irradiation step mid-point effective full-power day (EFPD) times are determined by linear interpolation between the measured values listed in Tables 4.1.9-1 through 4.1.9-5. The boron letdown data tables presented in this section are obtained from reference 5.3, which is a summary compilation of data pertinent to CRC analyses for Crystal River Unit 3.

Table 4.1.9-1 Boron Letdown Data for Cycle 2 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm[1])
0.6	930
0.8	930
0.9	930

Table 4.1.9-1 Boron Letdown Data for Cycle 2 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm[1])
2.1	826
3.0	809
4.4	778
11.4	809
15.8	735
22.5	709
29.3	683
35.3	666
42.3	644
50.0	623
55.8	614
60.8	592
69.1	571
75.2	558
83.1	528
89.8	506
97.8	480
104.7	463
116.4	441
122.5	406
129.1	385
135.9	372
139.9	346
148.6	333
156.4	320

Table 4.1.9-1 Boron Letdown Data for Cycle 2 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm[1])
161.4	316

[1] The acronym "ppm" means parts per million by mass of moderator.

Table 4.1.9-2 Boron Letdown Data for Cycle 3 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
0.7	1090
2.0	1020
4.0	947
6.7	951
12.6	908
26.8	891
32.6	843
50.7	822
66.0	757
69.9	746
85.0	692
100.2	666
111.2	636
130.5	562
143.8	528
163.9	467
174.0	432
184.2	394
212.9	324
227.5	272

Table 4.1.9-2 Boron Letdown Data for Cycle 3 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
246.4	229
262.9	250
283.8	190
304.0	130
322.0	86

Table 4.1.9-3 Boron Letdown Data for Cycle 4 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
0.39	1038
0.42	1038
0.49	1038
2.7	916
3.9	916
20.8	796
27.1	809
33.7	817
40.7	770
46.3	804
52.3	761
60.1	728
68.9	759
75.1	729
81.4	726
87.7	698
94	678

Table 4.1.9-3 Boron Letdown Data for Cycle 4 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
100.3	662
108.7	636
116.3	622
122.6	588
128.9	575
133.4	606
136.9	601
142.2	601
146.6	528
153	493
159.4	484
165.8	471
171.1	439
177.6	415
184.3	394
202	337
221.9	277
228.1	255
233.1	251
238.3	225
246.1	203
252	186
269.4	246
275	221
282	199

Table 4.1.9-3 Boron Letdown Data for Cycle 4 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
289	201
295.7	162
302.5	143
308.3	125
321.5	91
328	72
334.5	56

Table 4.1.9-4 Boron Letdown Data for Cycle 5 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
13.7	1077
23.7	1064
32.1	1056
42.2	1048
57.2	951
82.9	908
105.1	865
131.1	799
156.5	744
180.6	677
210	601
235.9	528
262.4	458
282.4	394
302.1	355

Table 4.1.9-4 Boron Letdown Data for Cycle 5 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
328.3	272
354.2	216
379.9	148
412.1	93
431.9	45
455.3	3
471	1
483.3	3

Table 4.1.9-5 Boron Letdown Data for Cycle 8 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
11.2	1537
52.4	1455
78	1411
111.4	1332
154.4	1176
194.8	1103
234.6	999
271.5	887
338	701
390.7	522
445.7	394
474	311
513.1	216

4.1.10 Burnup, Fuel Temperature, and Moderator Specific Volume Data

Burnup, fuel temperature, and moderator specific volume data are required for each node of each assembly in each SAS2H depletion calculation. A set of nodal burnup data at the beginning and end of each SAS2H depletion calculation is required. A set of nodal fuel temperature and moderator specific volume data representative of full-power operation during each depletion calculation of interest is required. Tables 4.1.10-1 through 4.1.10-12 contain the burnup, fuel temperature, and moderator specific volume data necessary to perform all depletion calculations for each of the rodded fuel assemblies from batches 4 and 5 of Crystal River Unit 3. The assembly heights corresponding to the axial nodes presented in Tables 4.1.10-1 through 4.1.10-12 are as follow: the top node (node 1) is 17.78 cm, the bottom node (node 18) is 22.352 cm, all other nodes are 20.0025 cm. The top of node 1 begins at the top of the active fuel region. The burnup data is presented in units of gigawatt-days per metric ton of uranium (GWd/MTU). The fuel temperature data is presented in units of degrees Fahrenheit. The moderator specific volume data is presented in units of cubic feet per pound. The statepoint numbers shown in the tables identify the relative reactivity statepoint calculations that fuel and burnable poison isotopic data will be generated to support for the evaluation of that particular assembly. The EFPD statepoint and cycle number corresponding to each set of fuel temperature and moderator specific volume data are presented above their respective columns in the tables. Each set of fuel temperature and moderator specific volume data listed in the tables is applicable to the depletion calculation performed between the statepoint number identified above the particular data and the previous statepoint number.

Table 4.1.10-1 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly B08 of Crystal River Unit 3

	Assembly Number B8								
	Statepoint 4 (BOC Cycle 2)			Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy2			BOC Cy3	89.8 Cy2	89.8 Cy2	168.5 Cy3	85.0 Cy3	85.0 Cy3
1	0.0			1.434	819.9	0.0226	4.817	1129.5	0.0237
2	0.0			2.453	982.8	0.0225	7.896	1370.7	0.0236
3	0.0			3.071	1079.7	0.0225	9.601	1475.6	0.0235
4	0.0	Data not required.		3.349	1121.1	0.0224	10.304	1502.5	0.0233
5	0.0			3.457	1138.9	0.0224	10.551	1498.1	0.0232
6	0.0			3.491	1147.1	0.0223	10.596	1480.8	0.0231
7	0.0			3.494	1151.5	0.0222	10.533	1457.2	0.0229
8	0.0			3.484	1153.6	0.0222	10.392	1433.6	0.0228
9	0.0			3.467	1152.6	0.0221	10.223	1422.0	0.0227
10	0.0			3.449	1147.4	0.0220	10.124	1431.4	0.0226
11	0.0			3.436	1138.2	0.0220	10.158	1460.9	0.0224
12	0.0			3.432	1126.1	0.0219	10.316	1504.1	0.0223
13	0.0			3.435	1113.0	0.0218	10.552	1546.0	0.0222
14	0.0			3.453	1101.0	0.0218	10.767	1566.5	0.0220
15	0.0			3.490	1093.4	0.0217	10.800	1559.6	0.0219
16	0.0			3.465	1087.4	0.0217	10.426	1519.8	0.0218
17	0.0			3.092	1041.7	0.0216	9.150	1416.8	0.0217

18	0.0			1.891	858.9	0.0216	5.726	1154.2	0.0216
	Statepoint 7 (250.0 Cycle 3)			Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	250.0 Cy3	246.4 Cy3	246.4 Cy3	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4
1	6.615	1143.8	0.0236	8.213	1143.8	0.0236	10.501	791.8	0.0235
2	10.601	1305.8	0.0235	12.949	1305.8	0.0235	16.759	876.9	0.0235
3	12.681	1360.2	0.0234	15.343	1360.2	0.0234	21.501	984.4	0.0234
4	13.465	1360.4	0.0232	16.229	1360.4	0.0232	24.035	1188.7	0.0233
5	13.702	1349.1	0.0231	16.497	1349.1	0.0231	24.935	1271.4	0.0232
6	13.722	1338.4	0.0230	16.519	1338.4	0.0230	25.271	1317.9	0.0231
7	13.634	1329.7	0.0228	16.419	1329.7	0.0228	25.394	1353.5	0.0229
8	13.465	1321.3	0.0227	16.238	1321.3	0.0227	25.412	1382.1	0.0228
9	13.266	1314.1	0.0226	16.054	1314.1	0.0226	25.382	1399.6	0.0226
10	13.157	1312.5	0.0225	15.993	1312.5	0.0225	25.361	1398.5	0.0225
11	13.219	1317.1	0.0224	16.116	1317.1	0.0224	25.392	1376.5	0.0223
12	13.443	1326.2	0.0223	16.389	1326.2	0.0223	25.484	1338.5	0.0222
13	13.779	1338.9	0.0221	16.726	1338.9	0.0221	25.614	1293.3	0.0221
14	14.106	1351.7	0.0220	16.977	1351.7	0.0220	25.721	1254.6	0.0220
15	14.197	1356.7	0.0219	16.928	1356.7	0.0219	25.639	1231.1	0.0219
16	13.758	1346.4	0.0218	16.311	1346.4	0.0218	24.915	1214.8	0.0218
17	12.181	1302.2	0.0217	14.462	1302.2	0.0217	22.375	1175.9	0.0217
18	7.777	1130.5	0.0216	9.341	1130.5	0.0216	14.780	1022.6	0.0216
	Statepoint 10 (253.0 Cycle 4)								
Node	Burnup	Fuel	Moderator						
No.	(GWd/MTU)	Temp.	Spec. Vol.						
	253.0 Cy4	253.0 Cy4	253.0 Cy4						
1	10.800	878.5	0.0234						
2	17.229	1013.4	0.0233	No additional statepoints.			No additional statepoints.		
3	22.252	1167.5	0.0232						
4	24.904	1175.6	0.0231						
5	25.826	1163.1	0.0230						
6	26.163	1150.9	0.0229						
7	26.285	1142.9	0.0227						
8	26.307	1140.3	0.0226						
9	26.285	1140.9	0.0225						
10	26.270	1139.7	0.0224						
11	26.303	1134.2	0.0223						
12	26.396	1125.6	0.0222						
13	26.525	1116.6	0.0221						
14	26.637	1112.4	0.0220						
15	26.568	1117.7	0.0219						
16	25.851	1126.4	0.0218						

17	23.259	1115.1	0.0217						
18	15.417	1024.3	0.0216						

Table 4.1.10-2 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly B20 of Crystal River Unit 3

	Assembly Number B20								
	Statepoint 4 (BOC Cycle 2)			Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy2			BOC Cy3	89.8 Cy2	89.8 Cy2	168.5 Cy3	85.0 Cy3	85.0 Cy3
1	0.0			2.697	1037.1	0.0235	4.724	929.2	0.0236
2	0.0			4.534	1298.0	0.0234	8.441	1238.4	0.0236
3	0.0			5.624	1437.7	0.0233	11.277	1382.3	0.0234
4	0.0	Data not required.		6.123	1502.4	0.0232	12.407	1408.2	0.0233
5	0.0			6.332	1533.1	0.0231	12.897	1396.7	0.0232
6	0.0			6.412	1550.2	0.0229	13.039	1380.7	0.0230
7	0.0			6.431	1562.2	0.0228	13.052	1366.1	0.0229
8	0.0			6.412	1570.6	0.0226	13.021	1358.1	0.0228
9	0.0			6.359	1571.8	0.0225	12.992	1362.3	0.0227
10	0.0			6.281	1559.9	0.0224	13.011	1381.7	0.0225
11	0.0			6.206	1534.2	0.0223	13.093	1411.7	0.0224
12	0.0			6.164	1502.9	0.0222	13.217	1442.8	0.0223
13	0.0			6.161	1473.8	0.0220	13.344	1466.1	0.0222
14	0.0			6.172	1450.2	0.0219	13.411	1476.2	0.0220
15	0.0			6.126	1430.3	0.0218	13.296	1471.6	0.0219
16	0.0			5.857	1396.6	0.0217	12.742	1447.6	0.0218
17	0.0			5.044	1300.5	0.0216	11.140	1375.0	0.0217
18	0.0			3.054	1033.6	0.0216	6.991	1145.8	0.0216
	Statepoint 7 (250.0 Cycle 3)			Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	250.0 Cy3	246.4 Cy3	246.4 Cy3	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4
1	5.934	965.5	0.0235	7.566	965.5	0.0235	11.757	969.1	0.0236
2	10.846	1243.8	0.0234	13.218	1243.8	0.0234	19.602	1101.8	0.0235
3	14.212	1310.4	0.0233	16.885	1310.4	0.0233	24.423	1164.2	0.0234
4	15.430	1303.5	0.0232	18.199	1303.5	0.0232	26.397	1216.0	0.0233
5	15.894	1286.0	0.0231	18.692	1286.0	0.0231	27.270	1258.9	0.0231
6	16.001	1272.9	0.0229	18.810	1272.9	0.0229	27.629	1293.8	0.0230
7	15.992	1264.7	0.0228	18.810	1264.7	0.0228	27.795	1320.4	0.0229
8	15.956	1260.4	0.0227	18.791	1260.4	0.0227	27.887	1337.6	0.0227
9	15.940	1259.8	0.0226	18.813	1259.8	0.0226	27.920	1339.7	0.0226
10	15.995	1263.3	0.0225	18.922	1263.3	0.0225	27.899	1320.5	0.0224
11	16.132	1269.1	0.0223	19.107	1269.1	0.0223	27.875	1284.6	0.0223
12	16.320	1275.0	0.0222	19.308	1275.0	0.0222	27.878	1244.6	0.0222

13	16.519	1281.0	0.0221	19.462	1281.0	0.0221	27.898	1209.0	0.0221
14	16.665	1288.5	0.0220	19.499	1288.5	0.0220	27.921	1185.0	0.0220
15	16.603	1295.2	0.0219	19.284	1295.2	0.0219	27.787	1174.6	0.0219
16	16.006	1293.8	0.0218	18.516	1293.8	0.0218	26.947	1163.9	0.0218
17	14.141	1264.7	0.0217	16.400	1264.7	0.0217	24.140	1131.4	0.0217
18	9.050	1108.6	0.0216	10.617	1108.6	0.0216	15.957	997.0	0.0216
	Statepoint 10 (253.0 Cycle 4)								
Node	Burnup	Fuel	Moderator						
No.	(GWd/MTU)	Temp.	Spec. Vol.						
	253.0 Cy4	253.0 Cy4	253.0 Cy4						
1	12.290	1054.4	0.0234						
2	20.371	1147.3	0.0233	No additional statepoints.			No additional statepoints.		
3	25.289	1163.9	0.0232						
4	27.295	1158.9	0.0231						
5	28.174	1146.2	0.0230						
6	28.530	1135.0	0.0229						
7	28.695	1127.9	0.0227						
8	28.786	1124.9	0.0226						
9	28.819	1123.4	0.0225						
10	28.794	1118.0	0.0224						
11	28.766	1107.8	0.0223						
12	28.769	1096.8	0.0222						
13	28.796	1088.8	0.0221						
14	28.833	1087.4	0.0220						
15	28.722	1095.9	0.0219						
16	27.890	1107.4	0.0218						
17	25.029	1099.8	0.0217						
18	16.599	1014.7	0.0216						

Table 4.1.10-3 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly B21 of Crystal River Unit 3

	Assembly Number B21								
	Statepoint 4 (BOC Cycle 2)			Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	BOC Cy2			BOC Cy3	89.8 Cy2	89.8 Cy2	168.5 Cy3	85.0 Cy3	85.0 Cy3
1	0.0			1.363	806.9	0.0226	4.478	1085.1	0.0236
2	0.0			2.375	967.6	0.0225	7.444	1321.1	0.0235
3	0.0			3.017	1065.0	0.0225	9.154	1426.5	0.0234
4	0.0	Data not required.		3.329	1111.2	0.0224	9.914	1458.9	0.0233
5	0.0			3.465	1132.9	0.0223	10.215	1459.9	0.0231
6	0.0			3.518	1144.0	0.0223	10.297	1446.2	0.0230
7	0.0			3.532	1150.4	0.0222	10.248	1422.2	0.0229

8	0.0			3.525	1153.8	0.0221	10.080	1393.1	0.0227
9	0.0			3.504	1153.2	0.0221	9.838	1375.0	0.0226
10	0.0			3.475	1146.8	0.0220	9.662	1380.5	0.0225
11	0.0			3.447	1135.0	0.0219	9.640	1407.8	0.0224
12	0.0			3.428	1120.0	0.0219	9.772	1453.0	0.0223
13	0.0			3.419	1104.8	0.0218	10.034	1505.0	0.0222
14	0.0			3.408	1090.8	0.0218	10.323	1536.7	0.0220
15	0.0			3.354	1075.5	0.0217	10.398	1541.5	0.0219
16	0.0			3.166	1046.6	0.0217	9.983	1515.9	0.0218
17	0.0			2.665	974.8	0.0216	8.622	1419.7	0.0217
18	0.0			1.557	804.3	0.0216	5.285	1147.7	0.0216
	Statepoint 7 (250.0 Cycle 3)			Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	250.0 Cy3	246.4 Cy3	246.4 Cy3	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4
1	6.158	1118.8	0.0236	7.640	1118.8	0.0236	9.564	748.9	0.0225
2	9.999	1278.8	0.0235	12.212	1278.8	0.0235	15.231	821.5	0.0224
3	12.092	1336.0	0.0233	14.652	1336.0	0.0233	18.349	870.2	0.0224
4	12.952	1340.6	0.0232	15.658	1340.6	0.0232	19.710	901.4	0.0224
5	13.260	1332.3	0.0231	16.025	1332.3	0.0231	20.270	923.9	0.0223
6	13.329	1323.5	0.0229	16.105	1323.5	0.0229	20.461	940.4	0.0222
7	13.261	1315.7	0.0228	16.020	1315.7	0.0228	20.443	952.1	0.0222
8	13.060	1305.9	0.0227	15.791	1305.9	0.0227	20.247	959.3	0.0221
9	12.767	1294.6	0.0226	15.500	1294.6	0.0226	19.952	960.2	0.0221
10	12.561	1290.9	0.0225	15.338	1290.9	0.0225	19.743	952.3	0.0220
11	12.557	1295.7	0.0224	15.400	1295.7	0.0224	19.730	936.9	0.0219
12	12.754	1306.3	0.0222	15.662	1306.3	0.0222	19.921	918.2	0.0219
13	13.134	1324.0	0.0221	16.071	1324.0	0.0221	20.288	900.3	0.0218
14	13.587	1347.2	0.0220	16.466	1347.2	0.0220	20.714	886.9	0.0218
15	13.786	1364.5	0.0219	16.536	1364.5	0.0219	21.105	883.4	0.0217
16	13.344	1362.6	0.0218	15.927	1362.6	0.0218	21.915	919.3	0.0217
17	11.682	1319.4	0.0217	13.991	1319.4	0.0217	20.213	1013.1	0.0216
18	7.334	1140.1	0.0216	8.904	1140.1	0.0216	13.191	908.9	0.0216
	Statepoint 10 (253.0 Cycle 4)								
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.						
	253.0 Cy4	253.0 Cy4	253.0 Cy4						
1	9.824	815.7	0.0226						
2	15.619	890.2	0.0226	No additional statepoints.			No additional statepoints.		
3	18.804	916.4	0.0225						
4	20.188	919.4	0.0225						
5	20.753	915.9	0.0224						
6	20.945	911.8	0.0223						

7	20.926	909.4	0.0223						
8	20.732	909.7	0.0222						
9	20.438	911.2	0.0222						
10	20.230	910.9	0.0221						
11	20.218	907.4	0.0221						
12	20.409	901.8	0.0220						
13	20.781	896.7	0.0219						
14	21.215	897.1	0.0219						
15	21.642	926.5	0.0218						
16	22.649	1070.2	0.0218						
17	20.979	1070.8	0.0217						
18	13.740	979.4	0.0216						

Table 4.1.10-4 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly B25 of Crystal River Unit 3

	Assembly Number B25								
	Statepoint 4 (BOC Cycle 2)			Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy2			BOC Cy3	89.8 Cy2	89.8 Cy2	168.5 Cy3	85.0 Cy3	85.0 Cy3
1	0.0			2.130	939.3	0.0232	5.446	1109.1	0.0235
2	0.0			3.655	1167.1	0.0231	9.029	1338.0	0.0234
3	0.0			4.623	1299.6	0.0230	11.128	1439.0	0.0233
4	0.0	Data not required.		5.110	1366.0	0.0229	12.095	1466.0	0.0231
5	0.0			5.338	1400.1	0.0228	12.499	1461.7	0.0230
6	0.0			5.436	1418.9	0.0227	12.614	1440.9	0.0228
7	0.0			5.468	1430.8	0.0226	12.514	1391.3	0.0227
8	0.0			5.459	1438.2	0.0225	11.989	1237.4	0.0226
9	0.0			5.417	1438.6	0.0224	10.413	1099.9	0.0225
10	0.0			5.351	1427.9	0.0223	9.433	1094.6	0.0224
11	0.0			5.285	1406.1	0.0221	9.260	1115.6	0.0224
12	0.0			5.242	1379.3	0.0220	9.399	1175.5	0.0223
13	0.0			5.227	1353.9	0.0220	10.144	1438.3	0.0222
14	0.0			5.216	1332.5	0.0219	12.028	1553.3	0.0221
15	0.0			5.140	1311.7	0.0218	12.639	1558.1	0.0219
16	0.0			4.859	1274.7	0.0217	12.189	1533.2	0.0218
17	0.0			4.119	1180.3	0.0216	10.560	1446.0	0.0217
18	0.0			2.445	940.9	0.0216	6.520	1178.8	0.0216

	Statepoint 7 (250.0 Cycle 3)			Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	250.0 Cy3	246.4 Cy3	246.4 Cy3	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4
1	7.219	1123.0	0.0234	8.787	1123.0	0.0234	12.547	915.6	0.0236
2	11.708	1280.5	0.0233	14.011	1280.5	0.0233	19.877	1049.4	0.0235
3	14.196	1330.4	0.0232	16.806	1330.4	0.0232	23.988	1132.2	0.0235
4	15.256	1328.7	0.0230	17.958	1328.7	0.0230	25.906	1197.4	0.0233
5	15.657	1316.4	0.0229	18.377	1316.4	0.0229	26.764	1249.0	0.0232
6	15.749	1304.8	0.0228	18.445	1304.8	0.0228	27.103	1288.5	0.0231
7	15.615	1293.9	0.0226	18.184	1293.9	0.0226	27.067	1324.3	0.0229
8	14.953	1259.9	0.0225	17.031	1259.9	0.0225	26.251	1377.2	0.0228
9	12.748	1105.4	0.0224	14.492	1105.4	0.0224	24.202	1460.4	0.0226
10	11.370	1063.1	0.0224	13.114	1063.1	0.0224	22.923	1483.9	0.0225
11	11.158	1063.0	0.0223	12.971	1063.0	0.0223	22.578	1451.5	0.0223
12	11.350	1077.5	0.0222	13.411	1077.5	0.0222	22.744	1397.7	0.0222
13	12.345	1149.8	0.0221	15.081	1149.8	0.0221	23.985	1307.5	0.0221
14	15.152	1322.5	0.0220	18.039	1322.5	0.0220	26.445	1201.4	0.0220
15	16.089	1346.3	0.0219	18.853	1346.3	0.0219	27.281	1173.6	0.0219
16	15.638	1344.4	0.0218	18.247	1344.4	0.0218	26.722	1169.7	0.0218
17	13.726	1310.9	0.0217	16.079	1310.9	0.0217	23.953	1147.0	0.0217
18	8.667	1139.7	0.0216	10.287	1139.7	0.0216	15.742	1012.4	0.0216
	Statepoint 10 (253.0 Cycle 4)								
Node	Burnup	Fuel	Moderator						
No.	(GWd/MTU)	Temp.	Spec. Vol.						
	253.0 Cy4	253.0 Cy4	253.0 Cy4						
1	13.029	1012.9	0.0234						
2	20.590	1114.8	0.0234	No additional statepoints.			No additional statepoints.		
3	24.816	1150.6	0.0232						
4	26.778	1150.9	0.0231						
5	27.647	1139.2	0.0230						
6	27.985	1128.2	0.0229						
7	27.950	1124.3	0.0228						
8	27.151	1138.5	0.0226						
9	25.138	1177.6	0.0225						
10	23.872	1194.1	0.0224						
11	23.525	1185.1	0.0223						
12	23.687	1168.1	0.0222						
13	24.910	1135.2	0.0221						
14	27.343	1088.8	0.0220						
15	28.196	1087.3	0.0219						
16	27.656	1104.8	0.0218						
17	24.842	1101.9	0.0217						
18	16.387	1018.5	0.0216						

Table 4.1.10-5 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly B27 of Crystal River Unit 3

	Assembly Number B27								
	Statepoint 4 (BOC Cycle 2)			Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy2			BOC Cy3	89.8 Cy2	89.8 Cy2	168.5 Cy3	85.0 Cy3	85.0 Cy3
1	0.0			2.365	975.8	0.0236	5.549	1089.0	0.0237
2	0.0			4.134	1227.7	0.0235	9.346	1311.5	0.0236
3	0.0			5.436	1396.2	0.0234	11.784	1407.5	0.0234
4	0.0	Data not required.		6.178	1505.2	0.0233	13.023	1433.3	0.0233
5	0.0			6.545	1562.0	0.0231	13.586	1432.2	0.0232
6	0.0			6.715	1588.9	0.0230	13.797	1416.7	0.0230
7	0.0			6.780	1604.6	0.0228	13.787	1386.9	0.0229
8	0.0			6.782	1614.2	0.0227	13.558	1343.7	0.0228
9	0.0			6.736	1616.0	0.0226	13.140	1312.0	0.0226
10	0.0			6.659	1605.0	0.0224	12.799	1313.8	0.0225
11	0.0			6.577	1580.5	0.0223	12.684	1341.0	0.0224
12	0.0			6.523	1547.8	0.0222	12.791	1392.5	0.0223
13	0.0			6.504	1515.9	0.0221	13.128	1464.9	0.0222
14	0.0			6.487	1489.1	0.0219	13.572	1505.0	0.0221
15	0.0			6.388	1463.4	0.0218	13.669	1507.9	0.0219
16	0.0			6.042	1419.8	0.0217	13.076	1480.4	0.0218
17	0.0			5.147	1312.7	0.0217	11.272	1390.3	0.0217
18	0.0			3.092	1038.4	0.0216	6.919	1138.7	0.0216
	Statepoint 7 (250.0 Cycle 3)			Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	250.0 Cy3	246.4 Cy3	246.4 Cy3	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4
1	7.275	1115.2	0.0236	8.795	1115.2	0.0236	12.749	929.6	0.0233
2	11.976	1271.8	0.0235	14.229	1271.8	0.0235	20.373	1069.6	0.0232
3	14.813	1319.6	0.0234	17.377	1319.6	0.0234	24.801	1147.5	0.0231
4	16.160	1316.8	0.0232	18.816	1316.8	0.0232	26.933	1203.4	0.0230
5	16.732	1304.7	0.0231	19.410	1304.7	0.0231	27.914	1249.4	0.0229
6	16.929	1294.1	0.0229	19.596	1294.1	0.0229	28.331	1284.6	0.0227
7	16.898	1285.1	0.0228	19.517	1285.1	0.0228	28.397	1311.0	0.0226
8	16.613	1270.9	0.0227	19.149	1270.9	0.0227	28.091	1329.0	0.0225
9	16.086	1249.1	0.0226	18.581	1249.1	0.0226	27.173	1317.8	0.0223
10	15.669	1240.7	0.0225	18.196	1240.7	0.0225	24.903	1190.3	0.0222
11	15.556	1244.7	0.0224	18.153	1244.7	0.0224	23.778	1038.1	0.0221
12	15.724	1255.8	0.0222	18.420	1255.8	0.0222	23.793	993.3	0.0221
13	16.198	1277.7	0.0221	18.993	1277.7	0.0221	24.321	966.3	0.0220
14	16.850	1306.5	0.0220	19.635	1306.5	0.0220	25.519	963.2	0.0219
15	17.073	1319.9	0.0219	19.760	1319.9	0.0219	27.721	1096.7	0.0218

16	16.451	1319.0	0.0218	19.002	1319.0	0.0218	27.423	1156.0	0.0218
17	14.353	1286.5	0.0217	16.653	1286.5	0.0217	24.436	1135.0	0.0217
18	8.990	1118.0	0.0216	10.563	1118.0	0.0216	15.921	1001.2	0.0216
	Statepoint 10 (253.0 Cycle 4)								
Node	Burnup	Fuel	Moderator						
No.	(GWd/MTU)	Temp.	Spec. Vol.						
	253.0 Cy4	253.0 Cy4	253.0 Cy4						
1	13.253	1019.3	0.0232						
2	21.112	1116.8	0.0231	No additional statepoints.			No additional statepoints.		
3	25.647	1144.0	0.0230						
4	27.814	1138.6	0.0229						
5	28.800	1125.2	0.0228						
6	29.215	1113.4	0.0227						
7	29.278	1107.5	0.0225						
8	28.971	1109.2	0.0224						
9	28.023	1111.0	0.0223						
10	25.565	1072.2	0.0222						
11	24.364	959.3	0.0221						
12	24.370	934.4	0.0221						
13	24.905	922.0	0.0220						
14	26.172	920.2	0.0219						
15	28.617	1002.5	0.0219						
16	28.364	1084.8	0.0218						
17	25.326	1092.3	0.0217						
18	16.564	1012.9	0.0216						

Table 4.1.10-6 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly B28 of Crystal River Unit 3

	Assembly Number B28								
	Statepoint 4 (BOC Cycle 2)			Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	BOC Cy2			BOC Cy3	89.8 Cy2	89.8 Cy2	168.5 Cy3	85.0 Cy3	85.0 Cy3
1	0.0			1.408	812.3	0.0227	4.466	1090.6	0.0237
2	0.0			2.488	980.2	0.0226	7.597	1347.6	0.0236
3	0.0			3.231	1091.6	0.0226	9.616	1472.2	0.0235
4	0.0	Data not required.		3.641	1154.4	0.0225	10.617	1509.7	0.0233
5	0.0			3.847	1188.2	0.0224	11.062	1508.6	0.0232
6	0.0			3.942	1206.1	0.0224	11.210	1489.7	0.0231
7	0.0			3.977	1215.9	0.0223	11.158	1454.5	0.0229
8	0.0			3.977	1221.2	0.0222	10.892	1404.2	0.0228
9	0.0			3.952	1221.0	0.0221	10.448	1367.5	0.0227
10	0.0			3.912	1213.4	0.0221	10.111	1368.7	0.0226

11	0.0			3.869	1198.5	0.0220	10.033	1400.3	0.0224
12	0.0			3.838	1179.4	0.0219	10.190	1460.9	0.0223
13	0.0			3.818	1160.4	0.0218	10.576	1542.9	0.0222
14	0.0			3.792	1142.9	0.0218	11.060	1585.2	0.0221
15	0.0			3.708	1123.1	0.0217	11.195	1587.4	0.0219
16	0.0			3.466	1087.7	0.0217	10.695	1556.8	0.0218
17	0.0			2.892	1006.1	0.0216	9.184	1455.2	0.0217
18	0.0			1.680	822.6	0.0216	5.612	1172.4	0.0216
	Statepoint 7 (250.0 Cycle 3)			Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	250.0 Cy3	246.4 Cy3	246.4 Cy3	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4
1	6.165	1123.0	0.0236	7.743	1123.0	0.0236	9.934	785.9	0.0234
2	10.251	1301.5	0.0235	12.574	1301.5	0.0235	16.299	873.1	0.0234
3	12.712	1364.5	0.0234	15.330	1364.5	0.0234	21.432	983.8	0.0233
4	13.827	1365.6	0.0232	16.514	1365.6	0.0232	24.305	1190.3	0.0232
5	14.275	1353.2	0.0231	16.961	1353.2	0.0231	25.397	1272.4	0.0231
6	14.403	1341.5	0.0230	17.059	1341.5	0.0230	25.792	1316.2	0.0230
7	14.322	1330.8	0.0228	16.911	1330.8	0.0228	25.815	1346.0	0.0228
8	13.989	1313.5	0.0227	16.476	1313.5	0.0227	25.473	1366.4	0.0227
9	13.419	1287.2	0.0226	15.853	1287.2	0.0226	24.840	1374.8	0.0225
10	12.992	1276.2	0.0225	15.460	1276.2	0.0225	24.299	1359.1	0.0224
11	12.912	1280.4	0.0224	15.464	1280.4	0.0224	24.089	1321.5	0.0223
12	13.136	1293.9	0.0223	15.810	1293.9	0.0223	24.251	1277.6	0.0222
13	13.672	1319.9	0.0221	16.468	1319.9	0.0221	24.792	1236.7	0.0220
14	14.378	1352.6	0.0220	17.177	1352.6	0.0220	25.480	1206.5	0.0219
15	14.642	1366.4	0.0219	17.346	1366.4	0.0219	25.674	1191.9	0.0218
16	14.112	1362.6	0.0218	16.678	1362.6	0.0218	24.822	1174.9	0.0217
17	12.303	1322.3	0.0217	14.617	1322.3	0.0217	21.954	1128.2	0.0217
18	7.707	1144.1	0.0216	9.289	1144.1	0.0216	14.219	976.3	0.0216
	Statepoint 10 (253.0 Cycle 4)								
Node	Burnup	Fuel	Moderator						
No.	(GWd/MTU)	Temp.	Spec. Vol.						
	253.0 Cy4	253.0 Cy4	253.0 Cy4						
1	10.221	867.3	0.0233						
2	16.757	1003.2	0.0233	No additional statepoints.			No additional statepoints.		
3	22.171	1154.8	0.0232						
4	25.163	1162.0	0.0231						
5	26.278	1149.8	0.0229						
6	26.675	1139.1	0.0228						
7	26.697	1134.1	0.0227						
8	26.358	1136.8	0.0226						
9	25.729	1143.7	0.0225						

10	25.187	1145.0	0.0224						
11	24.976	1137.0	0.0223						
12	25.138	1123.9	0.0222						
13	25.685	1109.2	0.0221						
14	26.384	1098.2	0.0220						
15	26.593	1098.5	0.0219						
16	25.740	1103.9	0.0218						
17	22.810	1091.6	0.0217						
18	14.825	1001.7	0.0216						

Table 4.1.10-7 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly B29 of Crystal River Unit 3

	Assembly Number B29								
	Statepoint 4 (BOC Cycle 2)			Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy2			BOC Cy3	89.8 Cy2	89.8 Cy2	168.5 Cy3	85.0 Cy3	85.0 Cy3
1	0.0			1.408	828.1	0.0228	4.466	1090.6	0.0237
2	0.0			2.488	1010.4	0.0228	7.597	1347.6	0.0236
3	0.0			3.231	1143.3	0.0227	9.616	1472.2	0.0235
4	0.0	Data not required.		3.641	1224.1	0.0227	10.617	1509.7	0.0233
5	0.0			3.847	1268.6	0.0226	11.062	1508.6	0.0232
6	0.0			3.942	1290.7	0.0225	11.210	1489.7	0.0231
7	0.0			3.977	1302.9	0.0224	11.158	1454.5	0.0229
8	0.0			3.977	1309.6	0.0223	10.892	1404.2	0.0228
9	0.0			3.952	1310.1	0.0222	10.448	1367.5	0.0227
10	0.0			3.912	1302.1	0.0221	10.111	1368.7	0.0226
11	0.0			3.869	1285.9	0.0220	10.033	1400.3	0.0224
12	0.0			3.838	1265.0	0.0220	10.190	1460.9	0.0223
13	0.0			3.818	1243.9	0.0219	10.576	1542.9	0.0222
14	0.0			3.792	1224.3	0.0218	11.060	1585.2	0.0221
15	0.0			3.708	1202.1	0.0217	11.195	1587.4	0.0219
16	0.0			3.466	1162.8	0.0217	10.695	1556.8	0.0218
17	0.0			2.892	1072.7	0.0216	9.184	1455.2	0.0217
18	0.0			1.680	865.0	0.0216	5.612	1172.4	0.0216
	Statepoint 7 (250.0 Cycle 3)			Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	250.0 Cy3	246.4 Cy3	246.4 Cy3	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4
1	6.165	1123.0	0.0236	7.805	1123.0	0.0236	10.208	792.7	0.0228
2	10.251	1301.5	0.0235	12.713	1301.5	0.0235	16.472	878.7	0.0228
3	12.712	1364.5	0.0234	15.574	1364.5	0.0234	20.228	939.7	0.0227
4	13.827	1365.6	0.0232	16.843	1365.6	0.0232	22.012	985.2	0.0227
5	14.275	1353.2	0.0231	17.337	1353.2	0.0231	22.805	1019.5	0.0226

6	14.403	1341.5	0.0230	17.457	1341.5	0.0230	23.105	1045.6	0.0225
7	14.322	1330.8	0.0228	17.320	1330.8	0.0228	23.098	1067.2	0.0224
8	13.989	1313.5	0.0227	16.890	1313.5	0.0227	22.784	1087.3	0.0223
9	13.419	1287.2	0.0226	16.271	1287.2	0.0226	22.233	1101.2	0.0223
10	12.992	1276.2	0.0225	15.878	1276.2	0.0225	21.795	1096.7	0.0222
11	12.912	1280.4	0.0224	15.881	1280.4	0.0224	21.665	1073.7	0.0221
12	13.136	1293.9	0.0223	16.225	1293.9	0.0223	21.851	1041.8	0.0220
13	13.672	1319.9	0.0221	16.876	1319.9	0.0221	22.361	1007.8	0.0219
14	14.378	1352.6	0.0220	17.572	1352.6	0.0220	23.027	981.5	0.0219
15	14.642	1366.4	0.0219	17.723	1366.4	0.0219	23.574	977.1	0.0218
16	14.112	1362.6	0.0218	17.025	1362.6	0.0218	24.671	1026.8	0.0217
17	12.303	1322.3	0.0217	14.911	1322.3	0.0217	22.924	1154.9	0.0217
18	7.707	1144.1	0.0216	9.475	1144.1	0.0216	15.105	1033.2	0.0216
	Statepoint 10 (253.0 Cycle 4)								
Node	Burnup	Fuel	Moderator						
No.	(GWd/MTU)	Temp.	Spec. Vol.						
	253.0 Cy4	253.0 Cy4	253.0 Cy4						
1	10.522	872.2	0.0229						
2	16.941	957.9	0.0228	No additional statepoints.			No additional statepoints.		
3	20.780	984.4	0.0227						
4	22.597	985.1	0.0227						
5	23.399	977.5	0.0226						
6	23.699	969.8	0.0225						
7	23.692	966.1	0.0224						
8	23.382	968.3	0.0224						
9	22.834	973.9	0.0223						
10	22.396	974.6	0.0222						
11	22.263	967.7	0.0221						
12	22.446	956.8	0.0221						
13	22.955	945.0	0.0220						
14	23.626	939.4	0.0219						
15	24.216	969.3	0.0219						
16	25.539	1125.9	0.0218						
17	23.828	1127.2	0.0217						
18	15.765	1036.0	0.0216						

Table 4.1.10-8 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly C15 of Crystal River Unit 3

	Assembly Number C15								
	Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)			Statepoint 7 (250.0 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy3			168.5 Cy3	85.0 Cy3	85.0 Cy3	250.0 Cy3	246.4 Cy3	246.4 Cy3
1	0.0			1.357	800.1	0.0225	2.179	874.4	0.0227
2	0.0			2.350	953.9	0.0225	3.704	1034.1	0.0227
3	0.0			2.976	1046.4	0.0225	4.614	1103.1	0.0226
4	0.0	Data not required.		3.283	1085.6	0.0224	5.029	1123.9	0.0225
5	0.0			3.416	1098.1	0.0223	5.196	1126.8	0.0225
6	0.0			3.461	1097.9	0.0223	5.247	1124.9	0.0224
7	0.0			3.458	1092.4	0.0222	5.245	1122.7	0.0223
8	0.0			3.429	1086.6	0.0222	5.217	1121.4	0.0222
9	0.0			3.396	1084.6	0.0221	5.187	1121.5	0.0222
10	0.0			3.377	1089.2	0.0220	5.179	1123.2	0.0221
11	0.0			3.390	1100.5	0.0220	5.211	1126.7	0.0220
12	0.0			3.436	1116.0	0.0219	5.291	1132.2	0.0220
13	0.0			3.506	1131.7	0.0219	5.418	1141.3	0.0219
14	0.0			3.586	1144.2	0.0218	5.586	1157.5	0.0218
15	0.0			3.634	1150.6	0.0217	5.718	1175.0	0.0218
16	0.0			3.522	1135.3	0.0217	5.579	1170.4	0.0217
17	0.0			3.016	1059.3	0.0216	4.827	1115.8	0.0216
18	0.0			1.788	857.6	0.0216	2.914	932.4	0.0216
	Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)			Statepoint 10 (253.0 Cycle 4)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4	253.0 Cy4	253.0 Cy4	253.0 Cy4
1	2.948	874.4	0.0227	4.449	724.1	0.0223	4.657	796.9	0.0224
2	4.963	1034.1	0.0227	7.481	818.6	0.0223	7.811	889.8	0.0223
3	6.181	1103.1	0.0226	9.315	877.4	0.0222	9.707	921.4	0.0223
4	6.775	1123.9	0.0225	10.228	913.4	0.0222	10.641	927.4	0.0222
5	7.035	1126.8	0.0225	10.657	937.2	0.0221	11.075	924.8	0.0222
6	7.128	1124.9	0.0224	10.841	953.5	0.0221	11.259	920.5	0.0221
7	7.147	1122.7	0.0223	10.908	963.9	0.0220	11.325	917.1	0.0221
8	7.138	1121.4	0.0222	10.913	968.0	0.0220	11.330	915.4	0.0220
9	7.132	1121.5	0.0222	10.888	965.2	0.0219	11.305	914.3	0.0220
10	7.152	1123.2	0.0221	10.863	955.5	0.0219	11.280	912.8	0.0220
11	7.207	1126.7	0.0220	10.864	941.2	0.0218	11.282	910.1	0.0219
12	7.292	1132.2	0.0220	10.906	926.0	0.0218	11.327	906.9	0.0219
13	7.394	1141.3	0.0219	10.990	912.7	0.0217	11.416	904.8	0.0218
14	7.498	1157.5	0.0218	11.103	902.1	0.0217	11.535	905.0	0.0218
15	7.533	1175.0	0.0218	11.140	892.3	0.0217	11.578	907.7	0.0217

16	7.258	1170.4	0.0217	10.764	877.2	0.0216	11.199	907.1	0.0217
17	6.275	1115.8	0.0216	9.364	840.9	0.0216	9.761	886.8	0.0216
18	3.826	932.4	0.0216	5.763	742.3	0.0216	6.023	801.2	0.0216
	Statepoint 11 (BOC Cycle 5)			Statepoint 12 (388.5 Cycle 5)					
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.			
	BOC Cy5	253.0 Cy4	253.0 Cy4	388.5 Cy5	262.1 Cy5	262.1 Cy5			
1	5.389	796.9	0.0224	11.243	1005.5	0.0232			
2	8.961	889.8	0.0223	18.304	1126.9	0.0231	No additional statepoints.		
3	11.064	921.4	0.0223	22.723	1140.4	0.0230			
4	12.068	927.4	0.0222	24.595	1131.5	0.0229			
5	12.510	924.8	0.0222	25.301	1120.7	0.0228			
6	12.680	920.5	0.0221	25.521	1110.7	0.0227			
7	12.728	917.1	0.0221	25.531	1103.6	0.0226			
8	12.725	915.4	0.0220	25.465	1100.7	0.0225			
9	12.709	914.3	0.0220	25.413	1102.8	0.0224			
10	12.708	912.8	0.0220	25.442	1109.4	0.0223			
11	12.742	910.1	0.0219	25.572	1118.5	0.0222			
12	12.815	906.9	0.0219	25.775	1127.4	0.0221			
13	12.916	904.8	0.0218	25.983	1133.6	0.0220			
14	13.020	905.0	0.0218	26.091	1134.7	0.0219			
15	13.022	907.7	0.0217	25.896	1130.4	0.0218			
16	12.566	907.1	0.0217	24.895	1119.1	0.0217			
17	10.969	886.8	0.0216	21.967	1092.1	0.0217			
18	6.812	801.2	0.0216	14.181	975.7	0.0216			

Table 4.1.10-9 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly C15a of Crystal River Unit 3

	Assembly Number C15a								
	Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)			Statepoint 7 (250.0 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy3			168.5 Cy3	85.0 Cy3	85.0 Cy3	250.0 Cy3	246.4 Cy3	246.4 Cy3
1	0.0			1.357	800.1	0.0225	2.179	874.4	0.0227
2	0.0			2.350	953.9	0.0225	3.704	1034.1	0.0227
3	0.0			2.976	1046.4	0.0225	4.614	1103.1	0.0226
4	0.0	Data not required.		3.283	1085.6	0.0224	5.029	1123.9	0.0225
5	0.0			3.416	1098.1	0.0223	5.196	1126.8	0.0225
6	0.0			3.461	1097.9	0.0223	5.247	1124.9	0.0224
7	0.0			3.458	1092.4	0.0222	5.245	1122.7	0.0223
8	0.0			3.429	1086.6	0.0222	5.217	1121.4	0.0222
9	0.0			3.396	1084.6	0.0221	5.187	1121.5	0.0222
10	0.0			3.377	1089.2	0.0220	5.179	1123.2	0.0221
11	0.0			3.390	1100.5	0.0220	5.211	1126.7	0.0220

12	0.0			3.436	1116.0	0.0219	5.291	1132.2	0.0220
13	0.0			3.506	1131.7	0.0219	5.418	1141.3	0.0219
14	0.0			3.586	1144.2	0.0218	5.586	1157.5	0.0218
15	0.0			3.634	1150.6	0.0217	5.718	1175.0	0.0218
16	0.0			3.522	1135.3	0.0217	5.579	1170.4	0.0217
17	0.0			3.016	1059.3	0.0216	4.827	1115.8	0.0216
18	0.0			1.788	857.6	0.0216	2.914	932.4	0.0216
	Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)			Statepoint 10 (253.0 Cycle 4)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4	253.0 Cy4	253.0 Cy4	253.0 Cy4
1	2.948	874.4	0.0227	4.449	724.1	0.0223	4.657	796.9	0.0224
2	4.963	1034.1	0.0227	7.481	818.6	0.0223	7.811	889.8	0.0223
3	6.181	1103.1	0.0226	9.315	877.4	0.0222	9.707	921.4	0.0223
4	6.775	1123.9	0.0225	10.228	913.4	0.0222	10.641	927.4	0.0222
5	7.035	1126.8	0.0225	10.657	937.2	0.0221	11.075	924.8	0.0222
6	7.128	1124.9	0.0224	10.841	953.5	0.0221	11.259	920.5	0.0221
7	7.147	1122.7	0.0223	10.908	963.9	0.0220	11.325	917.1	0.0221
8	7.138	1121.4	0.0222	10.913	968.0	0.0220	11.330	915.4	0.0220
9	7.132	1121.5	0.0222	10.888	965.2	0.0219	11.305	914.3	0.0220
10	7.152	1123.2	0.0221	10.863	955.5	0.0219	11.280	912.8	0.0220
11	7.207	1126.7	0.0220	10.864	941.2	0.0218	11.282	910.1	0.0219
12	7.292	1132.2	0.0220	10.906	926.0	0.0218	11.327	906.9	0.0219
13	7.394	1141.3	0.0219	10.990	912.7	0.0217	11.416	904.8	0.0218
14	7.498	1157.5	0.0218	11.103	902.1	0.0217	11.535	905.0	0.0218
15	7.533	1175.0	0.0218	11.140	892.3	0.0217	11.578	907.7	0.0217
16	7.258	1170.4	0.0217	10.764	877.2	0.0216	11.199	907.1	0.0217
17	6.275	1115.8	0.0216	9.364	840.9	0.0216	9.761	886.8	0.0216
18	3.826	932.4	0.0216	5.763	742.3	0.0216	6.023	801.2	0.0216
	Statepoint 11 (BOC Cycle 5)			Statepoint 12 (388.5 Cycle 5)					
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.			
	BOC Cy5	253.0 Cy4	253.0 Cy4	388.5 Cy5	262.1 Cy5	262.1 Cy5			
1	5.385	796.9	0.0224	11.641	1030.6	0.0233			
2	8.956	889.8	0.0223	18.872	1155.2	0.0232	No additional statepoints.		
3	11.058	921.4	0.0223	23.409	1167.6	0.0231			
4	12.061	927.4	0.0222	25.334	1159.5	0.0230			
5	12.503	924.8	0.0222	26.050	1147.6	0.0229			
6	12.673	920.5	0.0221	26.230	1135.2	0.0228			
7	12.721	917.1	0.0221	26.130	1123.2	0.0227			
8	12.718	915.4	0.0220	25.876	1114.1	0.0226			
9	12.702	914.3	0.0220	25.618	1112.5	0.0225			
10	12.701	912.8	0.0220	25.513	1119.8	0.0224			

11	12.736	910.1	0.0219	25.637	1133.5	0.0223			
12	12.809	906.9	0.0219	25.966	1150.8	0.0222			
13	12.909	904.8	0.0218	26.394	1166.2	0.0221			
14	13.014	905.0	0.0218	26.717	1171.7	0.0220			
15	13.015	907.7	0.0217	26.649	1166.9	0.0219			
16	12.560	907.1	0.0217	25.685	1153.6	0.0218			
17	10.963	886.8	0.0216	22.723	1123.1	0.0217			
18	6.808	801.2	0.0216	14.744	1003.8	0.0216			

Table 4.1.10-10 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly C20 of Crystal River Unit 3

	Assembly Number C20								
	Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)			Statepoint 7 (250.0 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy3			168.5 Cy3	85.0 Cy3	85.0 Cy3	250.0 Cy3	246.4 Cy3	246.4 Cy3
1	0.0			2.493	999.5	0.0234	3.905	1067.3	0.0234
2	0.0			4.263	1254.4	0.0233	6.518	1263.2	0.0234
3	0.0			5.362	1388.8	0.0232	8.043	1338.2	0.0232
4	0.0	Data not required.		5.898	1445.0	0.0231	8.728	1355.2	0.0231
5	0.0			6.135	1461.2	0.0230	9.006	1353.8	0.0230
6	0.0			6.215	1457.5	0.0229	9.093	1348.9	0.0229
7	0.0			6.201	1443.6	0.0228	9.076	1344.6	0.0228
8	0.0			6.117	1427.5	0.0226	8.985	1341.0	0.0226
9	0.0			6.004	1419.4	0.0225	8.863	1338.5	0.0225
10	0.0			5.931	1426.6	0.0224	8.790	1339.5	0.0224
11	0.0			5.944	1449.6	0.0223	8.828	1343.9	0.0223
12	0.0			6.048	1483.9	0.0222	8.984	1350.8	0.0222
13	0.0			6.218	1519.8	0.0221	9.232	1360.3	0.0221
14	0.0			6.377	1542.3	0.0220	9.484	1371.6	0.0220
15	0.0			6.393	1539.3	0.0219	9.558	1379.0	0.0219
16	0.0			6.085	1494.6	0.0218	9.187	1369.4	0.0218
17	0.0			5.168	1369.1	0.0217	7.934	1313.5	0.0217
18	0.0			3.077	1068.0	0.0216	4.845	1106.1	0.0216
	Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)			Statepoint 10 (253.0 Cycle 4)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4	253.0 Cy4	253.0 Cy4	253.0 Cy4
1	5.167	1067.3	0.0234	8.757	935.2	0.0236	9.221	1028.5	0.0234
2	8.483	1263.2	0.0234	14.343	1101.5	0.0235	15.055	1169.9	0.0233
3	10.360	1338.2	0.0232	17.726	1220.1	0.0234	18.569	1215.6	0.0232
4	11.188	1355.2	0.0231	19.445	1313.6	0.0233	20.340	1218.6	0.0231
5	11.523	1353.8	0.0230	20.279	1381.4	0.0231	21.188	1207.7	0.0230
6	11.630	1348.9	0.0229	20.661	1426.3	0.0230	21.569	1196.9	0.0229

7	11.616	1344.6	0.0228	20.797	1453.1	0.0229	21.703	1190.2	0.0227
8	11.528	1341.0	0.0226	20.753	1465.3	0.0227	21.658	1188.2	0.0226
9	11.426	1338.5	0.0225	20.546	1458.3	0.0226	21.446	1187.7	0.0225
10	11.393	1339.5	0.0224	20.258	1427.3	0.0224	21.147	1182.2	0.0224
11	11.475	1343.9	0.0223	20.076	1380.6	0.0223	20.960	1169.9	0.0223
12	11.663	1350.8	0.0222	20.095	1336.6	0.0222	20.982	1157.7	0.0222
13	11.908	1360.3	0.0221	20.294	1304.2	0.0221	21.192	1148.9	0.0221
14	12.107	1371.6	0.0220	20.584	1287.1	0.0220	21.504	1146.3	0.0220
15	12.083	1379.0	0.0219	20.686	1281.7	0.0218	21.632	1152.6	0.0219
16	11.569	1369.4	0.0218	20.005	1262.8	0.0217	20.952	1159.7	0.0218
17	10.038	1313.5	0.0217	17.581	1195.7	0.0217	18.459	1146.3	0.0217
18	6.217	1106.1	0.0216	11.160	1016.2	0.0216	11.769	1030.5	0.0216
	Statepoint 22 (BOC Cycle 8)			Statepoint 23 (97.6 Cycle 8)			Statepoint 24 (139.8 Cycle 8)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	BOC Cy8	253.0 Cy4+	253.0 Cy4+	97.6 Cy8	111.4 Cy8	111.4 Cy8	139.8 Cy8	111.4 Cy8	111.4 Cy8
1	10.929	1028.5	0.0234	12.277	933.9	0.0231	12.945	933.9	0.0231
2	17.568	1169.9	0.0233	19.743	1016.6	0.0230	20.752	1016.6	0.0230
3	21.398	1215.6	0.0232	23.947	1043.0	0.0229	25.111	1043.0	0.0229
4	23.207	1218.6	0.0231	25.930	1051.1	0.0228	27.161	1051.1	0.0228
5	24.000	1207.7	0.0230	26.817	1053.2	0.0227	28.078	1053.2	0.0227
6	24.301	1196.9	0.0229	27.175	1053.5	0.0226	28.450	1053.5	0.0226
7	24.348	1190.2	0.0227	27.261	1053.7	0.0225	28.545	1053.7	0.0225
8	24.233	1188.2	0.0226	27.175	1054.5	0.0224	28.465	1054.5	0.0224
9	24.012	1187.7	0.0225	26.976	1055.8	0.0223	28.273	1055.8	0.0223
10	23.770	1182.2	0.0224	26.750	1056.9	0.0222	28.051	1056.9	0.0222
11	23.676	1169.9	0.0223	26.658	1055.4	0.0221	27.961	1055.4	0.0221
12	23.814	1157.7	0.0222	26.776	1050.2	0.0221	28.074	1050.2	0.0221
13	24.120	1148.9	0.0221	27.034	1040.9	0.0220	28.320	1040.9	0.0220
14	24.441	1146.3	0.0220	27.275	1027.8	0.0219	28.537	1027.8	0.0219
15	24.500	1152.6	0.0219	27.219	1011.7	0.0218	28.445	1011.7	0.0218
16	23.702	1159.7	0.0218	26.264	994.5	0.0217	27.432	994.5	0.0217
17	20.956	1146.3	0.0217	23.270	973.0	0.0216	24.332	973.0	0.0216
18	13.507	1030.5	0.0216	15.149	901.6	0.0216	15.905	901.6	0.0216
	Statepoint 25 (404.0 Cycle 8)			Statepoint 26 (409.6 Cycle 8)			Statepoint 27 (515.5 Cycle 8)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	404.0 Cy8	234.6 Cy8	234.6 Cy8	409.6 Cy8	234.6 Cy8	234.6 Cy8	515.5 Cy8	470.7 Cy8	470.7 Cy8
1	17.658	956.0	0.0231	17.754	956.0	0.0231	19.798	928.1	0.0232
2	27.633	1026.5	0.0231	27.783	1026.5	0.0231	30.768	1015.8	0.0231
3	32.887	1045.0	0.0230	33.057	1045.0	0.0230	36.353	1046.8	0.0230
4	35.225	1045.6	0.0229	35.398	1045.6	0.0229	38.732	1043.9	0.0229
5	36.209	1045.5	0.0228	36.383	1045.5	0.0228	39.686	1034.2	0.0228

6	36.584	1043.1	0.0227	36.756	1043.1	0.0227	40.022	1025.3	0.0227
7	36.672	1040.6	0.0226	36.844	1040.6	0.0226	40.084	1018.8	0.0226
8	36.597	1038.9	0.0225	36.768	1038.9	0.0225	39.996	1014.7	0.0225
9	36.424	1038.2	0.0224	36.595	1038.2	0.0224	39.821	1012.3	0.0224
10	36.232	1038.1	0.0223	36.404	1038.1	0.0223	39.636	1010.9	0.0223
11	36.168	1037.4	0.0222	36.341	1037.4	0.0222	39.580	1009.6	0.0222
12	36.297	1035.2	0.0221	36.471	1035.2	0.0221	39.720	1008.1	0.0221
13	36.542	1031.4	0.0220	36.717	1031.4	0.0220	39.979	1007.1	0.0220
14	36.729	1025.3	0.0219	36.905	1025.3	0.0219	40.188	1007.5	0.0219
15	36.549	1016.1	0.0218	36.726	1016.1	0.0218	40.033	1009.5	0.0218
16	35.320	1001.2	0.0217	35.495	1001.2	0.0217	38.796	1010.2	0.0217
17	31.620	984.4	0.0217	31.785	984.4	0.0217	34.918	993.7	0.0217
18	21.177	918.2	0.0216	21.299	918.2	0.0216	23.638	931.9	0.0216

Table 4.1.10-11 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly C20a of Crystal River Unit 3

	Assembly Number C20a								
	Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)			Statepoint 7 (250.0 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy3			168.5 Cy3	85.0 Cy3	85.0 Cy3	250.0 Cy3	246.4 Cy3	246.4 Cy3
1	0.0			2.493	999.5	0.0234	3.905	1067.3	0.0234
2	0.0			4.263	1254.4	0.0233	6.518	1263.2	0.0234
3	0.0			5.362	1388.8	0.0232	8.043	1338.2	0.0232
4	0.0	Data not required.		5.898	1445.0	0.0231	8.728	1355.2	0.0231
5	0.0			6.135	1461.2	0.0230	9.006	1353.8	0.0230
6	0.0			6.215	1457.5	0.0229	9.093	1348.9	0.0229
7	0.0			6.201	1443.6	0.0228	9.076	1344.6	0.0228
8	0.0			6.117	1427.5	0.0226	8.985	1341.0	0.0226
9	0.0			6.004	1419.4	0.0225	8.863	1338.5	0.0225
10	0.0			5.931	1426.6	0.0224	8.790	1339.5	0.0224
11	0.0			5.944	1449.6	0.0223	8.828	1343.9	0.0223
12	0.0			6.048	1483.9	0.0222	8.984	1350.8	0.0222
13	0.0			6.218	1519.8	0.0221	9.232	1360.3	0.0221
14	0.0			6.377	1542.3	0.0220	9.484	1371.6	0.0220
15	0.0			6.393	1539.3	0.0219	9.558	1379.0	0.0219
16	0.0			6.085	1494.6	0.0218	9.187	1369.4	0.0218
17	0.0			5.168	1369.1	0.0217	7.934	1313.5	0.0217
18	0.0			3.077	1068.0	0.0216	4.845	1106.1	0.0216

	Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)			Statepoint 10 (253.0 Cycle 4)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4	253.0 Cy4	253.0 Cy4	253.0 Cy4
1	5.167	1067.3	0.0234	8.757	935.2	0.0236	9.221	1028.5	0.0234
2	8.483	1263.2	0.0234	14.343	1101.5	0.0235	15.055	1169.9	0.0233
3	10.360	1338.2	0.0232	17.726	1220.1	0.0234	18.569	1215.6	0.0232
4	11.188	1355.2	0.0231	19.445	1313.6	0.0233	20.340	1218.6	0.0231
5	11.523	1353.8	0.0230	20.279	1381.4	0.0231	21.188	1207.7	0.0230
6	11.630	1348.9	0.0229	20.661	1426.3	0.0230	21.569	1196.9	0.0229
7	11.616	1344.6	0.0228	20.797	1453.1	0.0229	21.703	1190.2	0.0227
8	11.528	1341.0	0.0226	20.753	1465.3	0.0227	21.658	1188.2	0.0226
9	11.426	1338.5	0.0225	20.546	1458.3	0.0226	21.446	1187.7	0.0225
10	11.393	1339.5	0.0224	20.258	1427.3	0.0224	21.147	1182.2	0.0224
11	11.475	1343.9	0.0223	20.076	1380.6	0.0223	20.960	1169.9	0.0223
12	11.663	1350.8	0.0222	20.095	1336.6	0.0222	20.982	1157.7	0.0222
13	11.908	1360.3	0.0221	20.294	1304.2	0.0221	21.192	1148.9	0.0221
14	12.107	1371.6	0.0220	20.584	1287.1	0.0220	21.504	1146.3	0.0220
15	12.083	1379.0	0.0219	20.686	1281.7	0.0218	21.632	1152.6	0.0219
16	11.569	1369.4	0.0218	20.005	1262.8	0.0217	20.952	1159.7	0.0218
17	10.038	1313.5	0.0217	17.581	1195.7	0.0217	18.459	1146.3	0.0217
18	6.217	1106.1	0.0216	11.160	1016.2	0.0216	11.769	1030.5	0.0216
	Statepoint 22 (BOC Cycle 8)			Statepoint 23 (97.6 Cycle 8)			Statepoint 24 (139.8 Cycle 8)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	BOC Cy8	253.0 Cy4+	253.0 Cy4+	97.6 Cy8	111.4 Cy8	111.4 Cy8	139.8 Cy8	111.4 Cy8	111.4 Cy8
1	10.907	1028.5	0.0234	12.472	944.1	0.0231	13.193	944.1	0.0231
2	17.532	1169.9	0.0233	19.836	1033.2	0.0231	20.890	1033.2	0.0231
3	21.349	1215.6	0.0232	24.005	1059.7	0.0230	25.212	1059.7	0.0230
4	23.149	1218.6	0.0231	25.973	1067.6	0.0229	27.246	1067.6	0.0229
5	23.937	1207.7	0.0230	26.849	1069.3	0.0228	28.150	1069.3	0.0228
6	24.235	1196.9	0.0229	27.200	1069.3	0.0227	28.515	1069.3	0.0227
7	24.281	1190.2	0.0227	27.284	1069.3	0.0226	28.607	1069.3	0.0226
8	24.166	1188.2	0.0226	27.197	1069.9	0.0225	28.527	1069.9	0.0225
9	23.947	1187.7	0.0225	27.001	1071.2	0.0224	28.337	1071.2	0.0224
10	23.708	1182.2	0.0224	26.778	1072.3	0.0223	28.119	1072.3	0.0223
11	23.616	1169.9	0.0223	26.688	1070.8	0.0222	28.031	1070.8	0.0222
12	23.754	1157.7	0.0222	26.806	1065.4	0.0221	28.144	1065.4	0.0221
13	24.058	1148.9	0.0221	27.061	1055.8	0.0220	28.386	1055.8	0.0220
14	24.376	1146.3	0.0220	27.297	1042.2	0.0219	28.597	1042.2	0.0219
15	24.433	1152.6	0.0219	27.238	1025.7	0.0218	28.501	1025.7	0.0218
16	23.637	1159.7	0.0218	26.285	1008.4	0.0217	27.489	1008.4	0.0217
17	20.899	1146.3	0.0217	23.296	986.3	0.0216	24.392	986.3	0.0216
18	13.470	1030.5	0.0216	15.173	912.8	0.0216	15.953	912.8	0.0216

	Statepoint 25 (404.0 Cycle 8)			Statepoint 26 (409.6 Cycle 8)			Statepoint 27 (515.5 Cycle 8)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	404.0 Cy8	234.6 Cy8	234.6 Cy8	409.6 Cy8	234.6 Cy8	234.6 Cy8	515.5 Cy8	470.7 Cy8	470.7 Cy8
1	18.170	960.3	0.0232	18.282	960.3	0.0232	20.506	974.8	0.0232
2	27.982	1038.1	0.0231	28.138	1038.1	0.0231	31.186	1028.3	0.0231
3	33.187	1057.4	0.0230	33.360	1057.4	0.0230	36.687	1050.6	0.0230
4	35.501	1060.4	0.0229	35.677	1060.4	0.0229	39.034	1045.9	0.0229
5	36.467	1058.7	0.0228	36.643	1058.7	0.0228	39.963	1035.4	0.0228
6	36.830	1055.9	0.0227	37.004	1055.9	0.0227	40.285	1026.1	0.0227
7	36.912	1053.2	0.0226	37.085	1053.2	0.0226	40.338	1019.4	0.0226
8	36.835	1051.4	0.0225	37.008	1051.4	0.0225	40.247	1015.0	0.0225
9	36.663	1050.7	0.0224	36.836	1050.7	0.0224	40.071	1012.3	0.0224
10	36.473	1050.5	0.0223	36.647	1050.5	0.0223	39.886	1010.6	0.0223
11	36.410	1049.6	0.0222	36.585	1049.6	0.0222	39.829	1008.9	0.0222
12	36.537	1047.2	0.0221	36.712	1047.2	0.0221	39.964	1007.2	0.0221
13	36.775	1043.2	0.0220	36.951	1043.2	0.0220	40.215	1006.1	0.0220
14	36.952	1036.8	0.0219	37.130	1036.8	0.0219	40.414	1006.3	0.0219
15	36.768	1027.5	0.0218	36.946	1027.5	0.0218	40.255	1008.4	0.0218
16	35.540	1014.1	0.0217	35.717	1014.1	0.0217	39.021	1009.3	0.0217
17	31.835	994.4	0.0217	32.002	994.4	0.0217	35.140	993.3	0.0217
18	21.337	926.4	0.0216	21.460	926.4	0.0216	23.805	931.3	0.0216

Table 4.1.10-12 Burnup, Fuel Temperature, and Moderator Specific Volume Data for Assembly C21 of Crystal River Unit 3

	Assembly Number C21								
	Statepoint 5 (BOC Cycle 3)			Statepoint 6 (168.5 Cycle 3)			Statepoint 7 (250.0 Cycle 3)		
Node No.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.	Burnup (GWd/MTU)	Fuel Temp.	Moderator Spec. Vol.
	BOC Cy3			168.5 Cy3	85.0 Cy3	85.0 Cy3	250.0 Cy3	246.4 Cy3	246.4 Cy3
1	0.0			1.191	771.6	0.0224	1.909	834.5	0.0225
2	0.0			2.096	912.5	0.0224	3.293	979.9	0.0225
3	0.0			2.686	1000.0	0.0224	4.146	1045.9	0.0225
4	0.0	Data not required.		2.985	1038.6	0.0223	4.547	1066.0	0.0224
5	0.0			3.119	1051.8	0.0222	4.713	1069.1	0.0223
6	0.0			3.166	1052.1	0.0222	4.767	1067.6	0.0223
7	0.0			3.164	1046.6	0.0221	4.765	1065.4	0.0222
8	0.0			3.134	1040.3	0.0221	4.735	1063.8	0.0221
9	0.0			3.097	1037.7	0.0220	4.699	1063.3	0.0221
10	0.0			3.074	1041.6	0.0220	4.682	1064.3	0.0220
11	0.0			3.081	1052.4	0.0219	4.704	1066.9	0.0220
12	0.0			3.121	1067.6	0.0219	4.770	1071.2	0.0219
13	0.0			3.181	1082.2	0.0218	4.869	1077.2	0.0219
14	0.0			3.231	1091.0	0.0218	4.963	1084.3	0.0218

15	0.0			3.215	1087.5	0.0217	4.971	1088.2	0.0217
16	0.0			3.034	1059.2	0.0217	4.739	1077.0	0.0217
17	0.0			2.534	980.0	0.0216	4.020	1025.7	0.0216
18	0.0			1.465	803.1	0.0216	2.374	862.6	0.0216
	Statepoint 8 (BOC Cycle 4)			Statepoint 9 (228.1 Cycle 4)			Statepoint 10 (253.0 Cycle 4)		
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.
	BOC Cy4	246.4 Cy3	246.4 Cy3	228.1 Cy4	40.7 Cy4	40.7 Cy4	253.0 Cy4	253.0 Cy4	253.0 Cy4
1	2.572	834.5	0.0225	5.802	921.9	0.0233	6.227	1020.3	0.0233
2	4.380	979.9	0.0225	9.730	1121.6	0.0233	10.390	1165.0	0.0232
3	5.469	1045.9	0.0225	12.125	1241.1	0.0232	12.900	1221.9	0.0231
4	5.980	1066.0	0.0224	13.334	1317.6	0.0231	14.148	1229.4	0.0230
5	6.197	1069.1	0.0223	13.933	1371.5	0.0229	14.757	1221.6	0.0229
6	6.272	1067.6	0.0223	14.226	1409.7	0.0228	15.050	1212.2	0.0228
7	6.281	1065.4	0.0222	14.357	1434.3	0.0227	15.179	1205.8	0.0226
8	6.261	1063.8	0.0221	14.377	1444.7	0.0226	15.200	1203.4	0.0225
9	6.240	1063.3	0.0221	14.306	1439.2	0.0224	15.128	1202.9	0.0224
10	6.243	1064.3	0.0220	14.180	1416.8	0.0223	15.001	1200.7	0.0223
11	6.283	1066.9	0.0220	14.075	1382.9	0.0222	14.898	1195.4	0.0222
12	6.355	1071.2	0.0219	14.049	1349.0	0.0221	14.878	1189.3	0.0221
13	6.439	1077.2	0.0219	14.114	1322.6	0.0220	14.955	1185.2	0.0220
14	6.494	1084.3	0.0218	14.231	1305.9	0.0219	15.089	1185.9	0.0220
15	6.437	1088.2	0.0217	14.238	1294.1	0.0218	15.114	1192.9	0.0219
16	6.107	1077.0	0.0217	13.731	1268.9	0.0217	14.607	1198.0	0.0218
17	5.198	1025.7	0.0216	11.962	1196.0	0.0216	12.768	1171.3	0.0217
18	3.106	862.6	0.0216	7.403	984.7	0.0216	7.947	1028.6	0.0216
	Statepoint 11 (BOC Cycle 5)			Statepoint 12 (388.5 Cycle 5)					
Node	Burnup	Fuel	Moderator	Burnup	Fuel	Moderator			
No.	(GWd/MTU)	Temp.	Spec. Vol.	(GWd/MTU)	Temp.	Spec. Vol.			
	BOC Cy5	253.0 Cy4	253.0 Cy4	388.5 Cy5	262.1 Cy5	262.1 Cy5			
1	7.696	1020.3	0.0233	14.311	1023.3	0.0232			
2	12.626	1165.0	0.0232	22.795	1120.2	0.0232	No additional statepoints.		
3	15.493	1221.9	0.0231	27.865	1123.5	0.0231			
4	16.843	1229.4	0.0230	29.933	1109.6	0.0229			
5	17.449	1221.6	0.0229	30.688	1094.0	0.0228			
6	17.701	1212.2	0.0228	30.908	1081.3	0.0227			
7	17.782	1205.8	0.0226	30.892	1072.8	0.0226			
8	17.773	1203.4	0.0225	30.773	1069.0	0.0225			
9	17.713	1202.9	0.0224	30.638	1070.8	0.0224			
10	17.641	1200.7	0.0223	30.562	1077.3	0.0223			
11	17.618	1195.4	0.0222	30.601	1085.9	0.0222			
12	17.680	1189.3	0.0221	30.758	1093.7	0.0221			
13	17.808	1185.2	0.0220	30.961	1098.3	0.0220			

14	17.932	1185.9	0.0220	31.076	1098.5	0.0219			
15	17.886	1192.9	0.0219	30.854	1094.8	0.0218			
16	17.247	1198.0	0.0218	29.747	1087.2	0.0218			
17	15.132	1171.3	0.0217	26.456	1064.6	0.0217			
18	9.538	1028.6	0.0216	17.391	974.5	0.0216			

4.1.11 Insertion History Data for CRA's and APSRA's

The CRA and APSRA time of insertion in a particular axial position in a fuel assembly is required data for performing appropriate depletion calculations for a rodded assembly. Hardening (locally increasing the average energy of the neutron population due to less local thermalization and increased local capture of neutrons at thermal energies) the neutron spectrum in a particular axial region of an assembly at a time during its irradiation history effects the isotopic composition of the depleted fuel. The CRC depletion calculations of rodded assemblies as performed in this analysis requires rod insertion time input in terms of EFPD's inserted for either a CRA or APSRA in each axial node of each fuel assembly for each statepoint depletion calculation of interest. Tables 4.1.11-1 through 4.1.11-11 present the CRA and APSRA insertion time data relevant to each assembly depletion calculation documented in this analysis. Assembly C20a was located in a control bank 6 location during Cycle-8. During Cycle-8 operation, control bank 6 was 100% withdrawn from the core. Therefore, no control rod insertion data is needed or presented for assembly C20a in this analysis. The assembly heights corresponding to the axial nodes presented in Tables 4.1.11-1 through 4.1.11-11 are as follow: the top node (node 1) is 17.78 cm, the bottom node (node 18) is 22.352 cm, all other nodes are 20.0025 cm. The top of node 1 begins at the top of the active fuel region.

Table 4.1.11-1 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number B08

Axial Node (1=Top)	Cycle-4, 0.0 EFPD to Cycle-4, 228.1 EFPD	Cycle-4, 228.1 EFPD to Cycle-4, 253.0 EFPD
1	228.10	24.90
2	214.93	24.90
3	59.60	3.71
4	0.96	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00

11	0.00	0.00
12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00

Table 4.1.11-2 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number B20

Axial Node (1=Top)	Cycle-3, 0.0 EFPD to Cycle-3, 168.5 EFPD	Cycle-3, 168.5 EFPD to Cycle-3, 250.0 EFPD	Cycle-3, 250.0 EFPD to Cycle-4, 0.0 EFPD
1	156.20	71.87	4.16
2	76.25	8.91	2.59
3	9.87	0.00	0.00
4	6.68	0.00	0.00
5	0.15	0.00	0.00
6	0.00	0.00	0.00
7	0.00	0.00	0.00
8	0.00	0.00	0.00
9	0.00	0.00	0.00
10	0.00	0.00	0.00
11	0.00	0.00	0.00
12	0.00	0.00	0.00
13	0.00	0.00	0.00
14	0.00	0.00	0.00
15	0.00	0.00	0.00
16	0.00	0.00	0.00

17	0.00	0.00	0.00
18	0.00	0.00	0.00

Table 4.1.11-3 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number B21

Axial Node (1=Top)	Cycle-4, 0.0 EFPD to Cycle-4, 228.1 EFPD	Cycle-4, 228.1 EFPD to Cycle-4, 253.0 EFPD
1	228.22	24.80
2	228.10	24.90
3	228.10	24.90
4	228.04	24.90
5	228.10	24.95
6	228.10	24.90
7	228.10	24.90
8	228.10	24.90
9	228.10	24.90
10	228.10	24.90
11	228.10	24.90
12	228.05	24.95
13	228.15	24.85
14	228.10	24.90
15	214.72	24.90
16	52.72	3.90
17	1.17	0.00
18	0.11	0.00

Table 4.1.11-4 APSRA Insertion Time Data (EFPDs Inserted) for Assembly Number B25

Axial Node (1=Top)	Cycle-3, 0.0 EFPD to Cycle-3, 168.5 EFPD	Cycle-3, 168.5 EFPD to Cycle-3, 250.0 EFPD	Cycle-3, 250.0 EFPD to Cycle-4, 0.0 EFPD
1	0.00	0.00	0.00

2	0.00	0.00	0.00
3	0.00	0.00	0.00
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	0.00	0.00	0.00
7	0.67	0.00	0.74
8	6.32	0.00	32.04
9	98.82	46.00	69.99
10	167.14	81.54	73.00
11	168.50	81.50	73.00
12	164.85	81.50	61.42
13	127.51	73.13	14.01
14	14.05	5.95	0.00
15	0.00	0.00	0.00
16	0.00	0.00	0.00
17	0.00	0.00	0.00
18	0.00	0.00	0.00

Table 4.1.11-5 APSRA Insertion Time Data (EFPDs Inserted) for Assembly Number B27

Axial Node (1=Top)	Cycle-4, 0.0 EFPD to Cycle-4, 228.1 EFPD	Cycle-4, 228.1 EFPD to Cycle-4, 253.0 EFPD
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.37	0.00
5	0.99	0.00
6	1.20	0.00
7	1.44	0.00

8	1.68	0.00
9	4.81	0.00
10	143.86	18.17
11	222.46	24.90
12	221.94	24.90
13	222.15	24.90
14	183.67	20.97
15	10.89	0.00
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00

Table 4.1.11-6 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number B28

Axial Node (1=Top)	Cycle-4, 0.0 EFPD to Cycle-4, 228.1 EFPD	Cycle-4, 228.1 EFPD to Cycle-4, 253.0 EFPD
1	228.10	24.81
2	215.00	24.90
3	59.96	3.71
4	0.91	0.00
5	0.00	0.00
6	0.00	0.00
7	0.00	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00
12	0.00	0.00
13	0.00	0.00

14	0.00	0.00
15	0.00	0.00
16	0.00	0.00
17	0.00	0.00
18	0.00	0.00

Table 4.1.11-7 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number B29

Axial Node (1=Top)	Cycle-4, 0.0 EFPD to Cycle-4, 228.1 EFPD	Cycle-4, 228.1 EFPD to Cycle-4, 253.0 EFPD
1	228.01	24.90
2	228.10	24.90
3	228.05	24.95
4	228.10	24.90
5	228.10	24.90
6	228.06	24.94
7	228.10	24.94
8	228.10	24.90
9	228.10	24.90
10	228.10	24.90
11	228.10	24.90
12	228.10	24.90
13	228.14	24.86
14	228.06	24.94
15	215.12	24.90
16	54.83	3.93
17	1.28	0.00
18	0.12	0.00

Table 4.1.11-8 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number C15

Axial Node (1=Top)	Cycle-5, 0.0 EFPD to Cycle-5, 388.5 EFPD
1	89.33
2	60.71
3	4.47
4	0.00
5	0.00
6	0.00
7	0.00
8	0.00
9	0.00
10	0.00
11	0.00
12	0.00
13	0.00
14	0.00
15	0.00
16	0.00
17	0.00
18	0.00

Table 4.1.11-9 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number C15a

Axial Node (1=Top)	Cycle-5, 0.0 EFPD to Cycle-5, 388.5 EFPD
1	90.17
2	61.24
3	4.50
4	0.00

5	0.00
6	0.00
7	0.00
8	0.00
9	0.00
10	0.00
11	0.00
12	0.00
13	0.00
14	0.00
15	0.00
16	0.00
17	0.00
18	0.00

Table 4.1.11-10 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number C20

Axial Node (1=Top)	Cycle-8, 0.0 EFPD to Cycle-8, 97.6 EFPD	Cycle-8, 97.6 EFPD to Cycle-8, 139.8 EFPD	Cycle-8, 139.8 EFPD to Cycle-8, 404.0 EFPD	Cycle-8, 404.0 EFPD to Cycle-8, 409.6 EFPD	Cycle-8, 409.6 EFPD to Cycle-8, 515.5 EFPD
1	24.83	4.04	20.57	1.81	19.48
2	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00

10	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00

Table 4.1.11-11 CRA Insertion Time Data (EFPDs Inserted) for Assembly Number C21

Axial Node (1=Top)	Cycle-5, 0.0 EFPD to Cycle-5, 388.5 EFPD
1	93.20
2	63.00
3	4.58
4	0.00
5	0.00
6	0.00
7	0.00
8	0.00
9	0.00
10	0.00
11	0.00
12	0.00
13	0.00
14	0.00
15	0.00

16	0.00
17	0.00
18	0.00

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, Ref. 5.8) provides requirements for engineered barrier segment design. The Repository Design Requirements Document (RDRD, Ref. 5.9) provides requirements for repository design. The Controlled Design Assumptions Document (Ref. 5.10) 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 and burnable poison 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 The inherent approximation of uniformly distributed non-fuel lattice cells in the Path B unit cell models of the SAS2H calculations as described in Section 7.2 is considered acceptable within the fidelity of these calculations as documented in Section S2.2.3.1 of Volume 1, Rev. 5 in reference 5.4. The basis for this assumption is provided in the previously identified section of reference 5.4. This assumption is used throughout all depletion calculations documented in Section 7.

4.3.2 With the utilization of one cross-section update per irradiation time step, the maximum duration of any time step in any reactor cycle irradiation layout of this analysis should not exceed 80 days. The basis for this assumption is that the 80 day irradiation time step limit assures that the isotopic concentrations of the system (primarily fuel and borated moderator) will not alter the neutron spectrum radically enough to cause a time step of the depletion calculation to be performed without the availability of cross-sections which have been properly weighted with an updated neutron spectrum and spatial flux. This assumption is used throughout all depletion calculations documented in Section 7.

4.3.3 Distributing the spacer grid material uniformly in the moderator composition of the Path A and B models is acceptable. The basis for this assumption is that the limited reactivity worth of the spacer grid materials will have negligible impact on the neutron spectrum when placed homogeneously in axial regions of the assembly. This assumption is used throughout all depletion calculations documented in Section 7.

4.4 Codes and Standards

Not applicable.

5. References

5.1 Activity Evaluation: *Perform Criticality, Thermal, Structural, and Shielding Analyses.* Document Identifier Number (DI#): BB0000000-01717-2200-00025 REV 02, Civilian Radioactive Waste Management System (CRWMS) Management and Operating Contractor (M&O).

5.2 Quality Assurance Requirements and Description. DOE/RW-0333P REV 07, DOE (U.S. Department of Energy).

5.3 *Summary Report of Commercial Reactor Criticality Data for Crystal River Unit 3.* DI#: B00000000-01717-5705-00060 REV 00, CRWMS M&O.

5.4 *SCALE 4.3: Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluation.* User's Manual Volumes 0 through 3, Oak Ridge National Laboratory, Document Number: CCC-545.

5.5 *Software Qualification Report for the SCALE Modular Code System Version 4.3.* SCALE Version 4.3 Configuration Software Configuration Identifier (CSCI): 30011 V4.3, DI#: 30011-2002 REV 00, CRWMS M&O.

5.6 *Q-List.* YMP/90-55Q, REV 04, YMP (Yucca Mountain Site Characterization Project).

5.7 *This reference is intentionally left blank.*

5.8 *Engineered Barrier Design Requirements Document.* YMP/CM-0024, REV 0, ICN 1, DOE OCRWM.

5.9 *Repository Design Requirements Document.* YMP/CM-0023, REV 0, ICN 1, DOE OCRWM.

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

5.11 *CRC Depletion Calculations for the Rodded Assemblies in Batches 1, 2, 3, and 1X of Crystal River Unit 3*. DI#: BBA000000-01717-0200-00040 REV 00, CRWMS M&O.

5.12 *CRC Depletion Calculations for the Non-Rodded Assemblies in Batches 1, 2, and 3 of Crystal River Unit 3*. DI#: BBA000000-01717-0200-00032 REV 00, CRWMS M&O.

5.13 *Interoffice Correspondence (IOC) from Hugh Benton to Greg Carlisle, Subject: Software Routines*. July 29, 1997, IOC Number: LV.WP.DAT.07/97-164, CRWMS M&O.

5.14 Attachments for BBA000000-01717-0200-00041 REV 00 - CRC Depletion Calculations for the Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3. Batch Number: MOY-970902-03.

5.15 CRC Depletion Calculations for the Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3 (DI#: BBA000000-01717-0200-00041 REV 00) - Attachments XXV and XXVI - 2 Data Cartridges. Batch Number: MOY-970902-02.

6. Use of Computer Software

6.1 Software Approved for QA Work

The SAS2H control module of the SCALE 4.3 modular code system (Ref. 5.4) was used in this analysis to perform fuel assembly depletion calculations required for CRC evaluations. The SCALE 4.3 code system is subject to the requirements of the QARD (Ref. 5.2). The SCALE 4.3 code system was obtained from the Software Configuration Management in accordance with appropriate procedures. The CSCI number for SCALE 4.3 is 30011 V4.3. The SAS2H calculations documented in this analysis were performed on Hewlett Packard (HP) 9000 series workstations. The SAS2H control module utilizes the BONAMI, NITAWL, XSDRNPM, COUPLE, and ORIGEN-S calculational modules to perform isotopic depletion calculations. A detailed description of the SAS2H control module is provided in Volume 1, Section S2 of reference 5.4. The SAS2H control module of the SCALE 4.3 code system is applicable to the engineering application within this analysis and is used within the range of verification and validation as documented in reference 5.5.

The Excel, Version 5.0, and Lotus 1-2-3, Version 4.0, spreadsheet packages are two of the computational support software packages utilized in this analysis. The user-defined formulas, inputs, and results for all calculations performed with these spreadsheet packages are documented, where applicable, throughout this analysis. The "sed" line editor (Revision: 70.12) available in the "/bin" directory on the HP 9000 series workstations is utilized in the "sedexecute" script file which is called and executed by the CRAFT code. The usage of the "sed" line editor is described in Section 6 of Attachment I of reference 5.11.

6.2 Software Routines

A software routine entitled "Commercial Reactor Assembly Follow Taskmaster" (CRAFT) was written to automate the production of SAS2H input decks as required to support fuel assembly depletion calculations relevant to CRC evaluations. The CRAFT code does not generate data. All calculations performed by the CRAFT code are verified by visual inspection and/or hand calculations. The CRAFT code, Version 3.0, compiled on February 25, 1997, was utilized in this analysis to orchestrate the depletion calculations for the fuel assemblies. The CRAFT 3.0 source code ("CRAFT.f.V-3.compiled_on_02_25_97") and executable file ("CRAFT3.0") exist in the directory "/users/wright/CRAFT_V3" on the Waste Package Development Department (WPDD) HP 9000 series workstation designated "Opus". The CRAFT code is subject to the requirements of the QARD as defined by Section I.2.1 Part C of Supplement I Rev. 1 of the QARD. Complete documentation of the CRAFT code, Version 3.0, including code description, user information, and documentation that the software provides correct results for a specified range of input parameters is included in Attachment I of reference 5.11. The CRAFT Version 3.0 software routine will ultimately be documented as an addendum to the existing SCALE V4.3 baseline and assume the SCALE V4.3 baseline CSCI identifier number of 30011 V4.3 (Ref. 5.13).

A software routine entitled "CRC_DATA_TABULIZER" was written to automate the production of tables containing the isotopic results and other pertinent data for a set of 29 principal isotopes at each CRC statepoint for each assembly. The CRC_DATA_TABULIZER code does not generate data. All calculations performed by the CRC_DATA_TABULIZER code are verified by visual inspection and/or hand calculations. The CRC_DATA_TABULIZER code, Version 2.0, compiled on March 20, 1997, was utilized to tabulate the principal isotope results for each fuel assembly at each CRC statepoint. The CRC_DATA_TABULIZER, Version 2.0, source code (CRC_DATA_TABULIZER_V2.f) and executable file (CRC_DATA_TABULIZER_V2.exe) exist in the directory "/users/wright/CRC_DATA_TABULIZER" on the WPDD HP 9000 series workstation designated "Opus". The CRC_DATA_TABULIZER code is subject to the requirements of the QARD as defined by Section I.2.1 Part C of Supplement I Rev. 1 of the QARD. Complete documentation of the CRC_DATA_TABULIZER code including code description, user information, and documentation that the software provides correct results for a specified range of input parameters is presented in Attachment V of reference 5.12. The CRC_DATA_TABULIZER Version 2.0 software routine will ultimately be documented as an addendum to the existing SCALE V4.3 baseline and assume the SCALE V4.3 baseline CSCI identifier number of 30011 V4.3 (Ref. 5.13).

A software routine entitled "RLAYOUT" was written to automate the development of appropriate irradiation time step layouts for depletion calculations involving rod insertion histories in which rod movements must be followed. The RLAYOUT code does not generate data. All calculations performed by the RLAYOUT code are verified by visual inspection and/or hand calculations. The RLAYOUT code, compiled on February 4, 1997, was utilized to develop appropriate irradiation time step layouts for the statepoint depletion calculations having associated rod insertion histories. The RLAYOUT source code (RLAYOUT.f) and executable file (RLAYOUT.exe) exist in the directory "/users/wright/RLAYOUT" on the WPDD HP 9000 series workstation designated "Opus". The RLAYOUT code is subject to the requirements of the QARD as defined by Section I.2.1 Part C of Supplement I Rev. 1 of the QARD. Complete documentation of the RLAYOUT code including code description, user information, and documentation that the software provides correct results for a specified range of input parameters is presented in Attachment III of reference 5.11. The RLAYOUT software routine will ultimately be documented as an addendum to the existing SCALE V4.3 baseline and assume the SCALE V4.3 baseline CSCI identifier number of 30011 V4.3 (Ref. 5.13).

7. Design Analysis

This design analysis documents the fuel assembly SAS2H depletion calculations for the rodded assemblies of fuel batches 4 and 5 which are required for the CRC evaluations of Crystal River Unit 3. Sections 7.1 through 7.5 describe how the parameters listed in Section 4.1 are utilized to perform the appropriate SAS2H depletion calculations relevant to CRC evaluations. The CRAFT description and user information provided in Attachment I of reference 5.11 is essential for understanding the SAS2H modeling techniques employed in this analysis. The information in Attachment I (Ref. 5.11), the input parameters in Section 4.1, and the CRAFT input decks in Attachments I through XII work together to provide a complete description of how all of the SAS2H depletion calculations in this analysis were performed.

7.1 Assembly Depletion Calculation Procedure

The calculational procedure for the fuel assembly SAS2H depletion calculations performed in this analysis is based on the utilization of the CRAFT Version 3.0 code. The CRAFT code is described generally in Sections 7.4 and 7.5. The complete detailed description of the CRAFT Version 3.0 code is provided in Attachment I of reference 5.11. The procedure for performing a fuel assembly depletion calculation with CRAFT Version 3.0 consists of the following four steps:

1) Create a CRAFT input deck for the assembly depletion calculation.
2) Assure that the CRAFT executable file and the CRAFT input deck entitled "datain" and the "sedexecute" executable file are in the same directory. The "sedexecute" executable file is a script file which is used in conjunction with the CRAFT code to create the consolidated output files described in Section 7.5.
3) Execute CRAFT.
4) Check and analyze the CRAFT generated SAS2H input decks and the SAS2H isotopic results.

The various CRAFT generated and consolidated SAS2H output files contain unique filenames which specify the following information:

1) reactor identifier,
2) one-eighth core symmetry assembly number in current reactor cycle,
3) axial node number,
4) reactor cycle number in which the SAS2H calculation begins,
5) EFPD statepoint at which the SAS2H calculation begins,
6) reactor cycle number in which the SAS2H calculation ends,
7) EFPD statepoint at which the SAS2H calculation ends.

A complete detailed description of the filename content and format is provided in Attachment I of reference 5.11. Specific isotopic results contained in the various consolidated output files generated by CRAFT may be retrieved using the output filename information.

7.2 Path B Unit Cell Model Development

The SAS2H control module uses ORIGEN-S to perform a point depletion calculation for the fuel assembly or section of the fuel assembly described in the SAS2H input deck. The ORIGEN-S calculational module uses cell-weighted cross-sections based on one-dimensional (1-D) transport calculations performed by XSDRNPM. One-dimensional transport calculations are performed on two unit cell models, Path A and Path B, to calculate energy dependent spatial neutron flux distributions necessary to perform cross-section cell-weighting calculations.

The Path A unit cell model is simply a unit cell of the fuel assembly lattice containing a fuel rod. In the Path A model, the fuel pellet, gap, and clad are modeled explicitly. The only modification required to develop the Path A model is the conversion of the fuel assembly's square lattice unit cell perimeter to a radial perimeter conserving moderator volume within the unit cell, exterior to the fuel rod cladding. This modification is performed automatically by the SAS2H control module. A 1-D transport calculation is performed on the Path A unit cell model for each energy group, and the unit cell spatial flux distributions for each energy group are used to calculate cell-weighted cross-sections for the fuel.

The Path B unit cell model is a larger unit cell representation than the Path A model; hence, it is sometimes referred to as the larger unit cell model. The Path B unit cell model represents all or part of the fuel assembly. The Path B unit cell model attempts to account for spectral effects due to heterogeneities within the fuel assembly such as water gaps, burnable poison rods, control rods, or axial power shaping rods. Typically, fuel assemblies contain a number of similar non-fuel lattice cells dispersed somewhat uniformly throughout the assembly lattice. The structure of the Path B unit cell model is based on a uniform distribution of these non-fuel lattice cells. In reality, most fuel assemblies do not have uniformly distributed non-fuel lattice cells, but the approximation of uniformly distributed non-fuel lattice cells is considered acceptable within the fidelity of these calculations as documented in Section S2.2.3.1 of Volume 1, Rev. 5 in reference 5.4.

The basic structure of the Path B unit cell model for the fuel assembly depletion calculations performed in this analysis includes an inner region composed of an explicit representation of the non-fuel lattice cell. This inner region has essentially the same format as the Path A model with the fuel rod replaced by the non-fuel rod. A region representing the homogenization of the remainder of the fuel assembly surrounds the inner region in the Path B unit cell model. A final region representing the moderator in the assembly-to-assembly spacing surrounds the homogenized region in the Path B unit cell model. The size of each radial region surrounding the inner region in the Path B unit cell model is determined by conserving the fuel-to-moderator volume ratio in the system. The cell-weighted cross-sections from the Path A model are used with the fuel of the homogenized region during the Path B model transport calculations. New cell-weighted cross-sections for each energy group are then developed using the unit cell spatial flux distribution results from the Path B model transport calculations. These cell-weighted cross-sections are used in point depletion calculations performed by ORIGEN-S to calculate depleted fuel and depleted burnable poison, if present, isotopics in the fuel assembly. A detailed description of the calculations used to produce time-dependent cross-sections by SAS2H is documented in Section S2.2.4 of Volume 1, Rev. 5 in reference 5.4.

The Path B unit cell models for the various fuel assembly configurations must be developed manually and input to the SAS2H control module. The primary concern in the development of the Path B model for PWR assemblies is the conservation of the fuel-to-moderator volume ratio in the system. For the fuel assemblies in batches 4 and 5 of Crystal River Unit 3 a combination of the following sets of Path B models must be utilized:

Set 1) This set is composed of one Path B model representing the base fuel assembly configuration with sixteen water-filled guide tubes and one water-filled instrument tube. This Path B model may only be employed in a statepoint depletion calculation which does not have any BPRA, CRA, or APSRA insertion history.

Set 2) This set is composed of three Path B models that are utilized in statepoint depletion calculations that have a BPRA insertion history. One of the Path B models in this set represents a fuel assembly axial region containing sixteen BPRs inserted into the guide tubes with one water-filled instrument tube. Another Path B model in this set represents a fuel assembly axial region containing sixteen non-absorbing BPRs inserted into the guide tubes with one water-filled instrument tube. The last Path B model in this set represents a fuel assembly axial region with the BPRA removed. Since a constant number of Path B model radial zones must be maintained during a given SAS2H calculation (i.e., a statepoint depletion calculation), it is necessary to define a Path B model equivalent to that previously described in Set 1, but with the same number of radial zones as those previously described in this set.

Set 3) This set is composed of two Path B models that are utilized in statepoint depletion calculations that have a CRA insertion history. One of the Path B models in this set represents a fuel assembly axial region containing sixteen CRs inserted into the guide tubes with one water-filled instrument tube. The other Path B model in this set represents a fuel assembly axial region with the CRA removed. Since a constant number of Path B model radial zones must be maintained during a given SAS2H calculation (i.e., a statepoint depletion calculation), it is necessary to define a Path B model equivalent to that previously described in Set 1, but with the same number of radial zones as the first Path B model described in this set.

Set 4) This set is composed of three Path B models that are utilized in statepoint depletion calculations that have a APSRA insertion history. One of the Path B models in this set represents a fuel assembly axial region containing sixteen APSRs (absorbing region present in the guide tubes) with one water-filled instrument tube. Another Path B model in this set represents a fuel assembly axial region containing sixteen APSRs (only the follow rod region present in the guide tubes) with one water-filled instrument tube. The last Path B model in this set represents a fuel assembly axial region with the APSRA removed. Since a constant number of Path B model radial zones must be maintained during a given SAS2H calculation (i.e., a statepoint depletion calculation), it is necessary to define a Path B model equivalent to that previously described in Set 1, but with the same number of radial zones as those previously described in this set.

The Path B model development spreadsheets in Tables 7.2-1 through 7.2-6, present the input parameters required, the parameters calculated, references to equations used to calculate the parameters, and the final Path B unit cell model dimensions available for direct implementation into SAS2H input decks for the rodded assembly depletion analyses of batches 4 and 5. The assembly specifications required to develop the Path B models are the same for batches 4 and 5 with the exception of the fuel pellet diameter. The spreadsheet presented in Table 7.2-1, calculates the dimensions of the Path B unit cell model for Set 1, as previously described, of fuel batch 4. The spreadsheet presented in Table 7.2-2, calculates the dimensions of the Path B unit cell models for Set 2, as previously described, of fuel batch 4. The spreadsheet presented in Table 7.2-3, calculates the dimensions of the Path B unit cell models for Set 3, as previously described, of fuel batch 4. The spreadsheet presented in Table 7.2-4, calculates the dimensions of the Path B unit cell models for Set 4, as previously described, of fuel batch 4. The spreadsheet presented in Table 7.2-5, calculates the dimensions of the Path B unit cell model for Set 1, as previously described, of fuel batch 5. The spreadsheet presented in Table 7.2-6, calculates the dimensions of the Path B unit cell models for Set 3, as previously described, of fuel batch 5. None of the fuel assemblies from fuel batch 5 which are depleted in this analysis contain either a BPRA or an APSRA. Table 7.2-7, contains a listing of the equations referenced and utilized in each of the spreadsheets presented in Tables 7.2-1 and 7.2-6.

Table 7.2-1 Set 1 Path B Unit Cell Model Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

<u>SAS2H Path B Unit Cell Model Dimension Calculations for the Rodded Assembly Axial Regions in Fuel Batch 4 of Crystal River Unit 3 that Contain 16 Water-Filled Guide Tubes and 1 Water-Filled Instrument Tube</u>

Input Parameters

Number of unit cells in assembly:	225
Number of fuel rods in assembly:	208
Number of guide tubes in assembly:	16
Rod pitch in assembly (cm):	1.44272
Fuel pellet diameter (cm):	0.939038
Fuel cladding outer diameter (cm):	1.0922
Guide tube outer diameter (cm):	1.3462
Guide tube inner diameter (cm):	1.26492
Instrument tube outer diameter (cm):	1.38193

Table 7.2-1 Set 1 Path B Unit Cell Model Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

Instrument tube inner diameter (cm): 1.12014
Assembly pitch (cm): 21.81098

Fuel-to-Moderator Volume Ratio Calculation:

Identifier of Equation(s) Utilized: 1 (Table 7.2-7)

Fuel-to-Moderator Volume Ratio = 0.532999

Moderator Unit Volume in Central Unit Cell of Path B Model:

Identifier of Equation(s) Utilized: 2 (Table 7.2-7)

Moderator Unit Volume in Central Unit Cell of Path B Model = 1.914755

Fuel Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 3 (Table 7.2-7)

Fuel Unit Volume in Fuel Rod Unit Cell = 0.692558

Moderator Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 4 (Table 7.2-7)

Moderator Unit Volume in Fuel Rod Unit Cell = 1.144539

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model:

Identifier of Equation(s) Utilized: 5 (Table 7.2-7)

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model = 12.36742

Path B Unit Cell Model Dimensions:

Zone #	Outer Radius (cm)	Zone Description

Table 7.2-1 Set 1 Path B Unit Cell Model Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

Inner	1	0.63246	Water filled gap
	2	0.67310	Guide tube
	3	0.81397	Guide tube unit cell moderator
	4	2.97599	Homogenized region
Outer	5	2.99939	Moderator in the assembly-to-assembly gap

Notes: The Zone 4 outer radius is calculated using Equation 6.
The Zone 5 outer radius is calculated using Equation 7.

Table 7.2-2 Set 2 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

<u>SAS2H Path B Unit Cell Model Dimension Calculations for the Rodded Path B Models for Use in Assembly Axial Regions of Fuel Batch 4 of Crystal River Unit 3 that have a BPRA Insertion History</u>

Input Parameters

Number of unit cells in assembly:	225
Number of fuel rods in assembly:	208
Number of guide tubes in assembly:	16
Number of BPR's in assembly:	16
Rod pitch in assembly (cm):	1.44272
Fuel pellet diameter (cm):	0.939038
Fuel cladding outer diameter (cm):	1.0922
Guide tube outer diameter (cm):	1.3462
Guide tube inner diameter (cm):	1.26492
BPR cladding outer diameter (cm):	1.0922
BPR cladding inner diameter (cm):	0.9144
BP pellet diameter (cm):	0.8636
Instrument tube outer diameter (cm):	1.38193
Instrument tube inner diameter (cm):	1.12014
Assembly pitch (cm):	21.81098

Fuel-to-Moderator Volume Ratio Calculation:

Identifier of Equation(s) Utilized: 1 (Table 7.2-7)

Fuel-to-Moderator Volume Ratio = 0.564298

Moderator Unit Volume in Central Unit Cell of Path B Model:

Identifier of Equation(s) Utilized: 2 (Table 7.2-7)

Moderator Unit Volume in Central Unit Cell of Path B Model = 0.977852

Fuel Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 3 (Table 7.2-7)

Fuel Unit Volume in Fuel Rod Unit Cell = 0.692558

Table 7.2-2 Set 2 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

Moderator Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 4 (Table 7.2-7)

Moderator Unit Volume in Fuel Rod Unit Cell = 1.144539

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model:

Identifier of Equation(s) Utilized: 5 (Table 7.2-7)

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model = 11.81651

Path B Unit Cell Model Dimensions:

	Zone #	Outer Radius (cm)	Zone Descriptions With Absorbing BPRA Inserted	Zone Descriptions With Non-Absorbing BPRA Inserted
Inner	1	0.43180	Absorbing BP Material	Non-Absorbing BP Material
	2	0.45720	Helium Gap	Helium Gap
	3	0.54610	BPR cladding	BPR cladding
	4	0.63246	Water Filled Gap	Water Filled Gap
	5	0.67310	Guide tube	Guide tube
	6	0.81397	Unit cell moderator	Unit cell moderator
	7	2.91402	Homogenized region	Homogenized region
Outer	8	2.93693	Moderator Outside Assembly	Moderator Outside Assembly

Notes: The Zone 7 outer radius is calculated using Equation 6.
The Zone 8 outer radius is calculated using Equation 7.

The Path B model that is used after the removal of the BPRA during a statepoint depletion calculation must use the same number of radial zones as the Path B model with the BPRA inserted. One difference between the Path B model with the BPRA removed and the Path B model with the BPRA inserted is that the materials in zones 1 through 3 are changed to water. Another difference is that the outer radius of zones 7 and 8 are adjusted to match the homogenized region and outer water region dimensions of the base Path B model (the Path B model with all empty guide tubes). Typically, a BPRA is not moved or removed during a reactor cycle. In this analysis there is no instance when a BPRA would need to be removed from an assembly axial node during a statepoint calculation. For this reason, the Path B model for the assembly node after removal of a BPRA during a statepoint calculation is not used in any of the assembly depletion calculations documented in this analysis.

Table 7.2-3 Set 3 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

Path B Models for Use in Assembly Axial Regions of Fuel Batch 4 of Crystal River Unit 3 that have a CRA Insertion History

Input Parameters

Number of unit cells in assembly:	225
Number of fuel rods in assembly:	208
Number of guide tubes in assembly:	16
Number of CR's in assembly:	16
Rod pitch in assembly (cm):	1.44272
Fuel pellet diameter (cm):	0.939038
Fuel cladding outer diameter (cm):	1.0922
Guide tube outer diameter (cm):	1.3462
Guide tube inner diameter (cm):	1.26492
CR cladding outer diameter (cm):	1.1176
CR cladding inner diameter (cm):	1.01092
CR absorber material diameter (cm):	0.99568
Instrument tube outer diameter (cm):	1.38193
Instrument tube inner diameter (cm):	1.12014
Assembly pitch (cm):	21.81098

Fuel-to-Moderator Volume Ratio Calculation:

Identifier of Equation(s) Utilized: 1 (Table 7.2-7)

Fuel-to-Moderator Volume Ratio = 0.565861

Moderator Unit Volume in Central Unit Cell of Path B Model:

Identifier of Equation(s) Utilized: 2 (Table 7.2-7)

Moderator Unit Volume in Central Unit Cell of Path B Model = 0.933769

Fuel Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 3 (Table 7.2-7)

Table 7.2-3 Set 3 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

Fuel Unit Volume in Fuel Rod Unit Cell = 0.692558

Moderator Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 4 (Table 7.2-7)

Moderator Unit Volume in Fuel Rod Unit Cell = 1.144539

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model:

Identifier of Equation(s) Utilized: 5 (Table 7.2-7)

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model = 11.76595

Path B Unit Cell Model Dimensions:

	Zone #	Outer Radius (cm)	With CRA Inserted in Axial Region	With CRA Removed from Axial Region
Inner	1	0.49784	CR Absorber Material	Water
	2	0.50546	Helium Gap	Water
	3	0.55880	CR cladding	Water
	4	0.63246	Water	Water
	5	0.67310	Guide tube	Guide tube
	6	0.81397	Unit cell moderator	Unit cell moderator
	7	2.90826	Homogenized region	—
Outer	8	2.93113	Moderator Outside Assembly	—
	7	2.97599	—	Homogenized region
Outer	8	2.99939	—	Moderator Outside Assembly

Notes: The Zone 7 outer radius is calculated using Equation 6.
The Zone 8 outer radius is calculated using Equation 7.
The outer radius values for zones 7 and 8 with the control rod removed are calculated as shown in Table 7.2-1.

Table 7.2-4 Set 4 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

<u>Path B Models for Use in Assembly Axial Regions of Fuel Batch 4 of Crystal River Unit 3 that have a Black APSRA Insertion History</u>

Input Parameters

Number of unit cells in assembly:	225
Number of fuel rods in assembly:	208
Number of guide tubes in assembly:	16
Number of APSR's in assembly:	16
Rod pitch in assembly (cm):	1.44272
Fuel pellet diameter (cm):	0.939038
Fuel cladding outer diameter (cm):	1.0922
Guide tube outer diameter (cm):	1.3462
Guide tube inner diameter (cm):	1.26492
APSR cladding outer diameter (cm):	1.1176
APSR cladding inner diameter (cm):	1.01092
APSR absorber material diameter (cm):	0.99568
Instrument tube outer diameter (cm):	1.38193
Instrument tube inner diameter (cm):	1.12014
Assembly pitch (cm):	21.81098

The APSR follow rod has the same dimensions as the APSR cladding and is filled with water.

Fuel-to-Moderator Volume Ratio Calculation:

Identifier of Equation(s) Utilized: 1 (Table 7.2-7)

Fuel-to-Moderator Volume Ratio for the cross-section of the assembly containing the absorbing region of the APSRA = 0.565861

Fuel-to-Moderator Volume Ratio for the cross-section of the assembly containing the follow rod region of the APSRA = 0.538686

Moderator Unit Volume in Central Unit Cell of Path B Model:

Identifier of Equation(s) Utilized: 2 (Table 7.2-7)

Moderator Unit Volume in the Central Unit Cell of the Path B Model for the Inserted APSR Absorber Region = 0.933769

Moderator Unit Volume in the Central Unit Cell of the Path B Model for the Inserted APSR Follow Rod = 1.736414

Table 7.2-4 Set 4 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

Fuel Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 3 (Table 7.2-7)

Fuel Unit Volume in Fuel Rod Unit Cell = 0.692558

Moderator Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 4 (Table 7.2-7)

Moderator Unit Volume in Fuel Rod Unit Cell = 1.144539

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model:

Identifier of Equation(s) Utilized: 5 (Table 7.2-7)

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model with the APSR Absorber Region Inserted = 11.76595

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model with the APSR Follow Rod Region Inserted = 12.30592

Path B Unit Cell Model Dimensions:

	Zone #	Outer Radius (cm)	With APSRA Inserted in Axial Region	With APSRA Removed from Axial Region	With APSRA Follow Rod Axial Region Inserted
Inner	1	0.49784	APSR Absorber Material	Water	Water
	2	0.50546	Helium Gap	Water	Water
	3	0.55880	APSR cladding	Water	APSR cladding
	4	0.63246	Water	Water	Water
	5	0.67310	Guide tube	Guide tube	Guide tube
	6	0.81397	Unit cell moderator	Unit cell moderator	Unit cell moderator
	7	2.90826	Homogenized region	—	—
Outer	8	2.93113	Moderator Outside Assembly	—	—
	7	2.97599	—	Homogenized region	—
Outer	8	2.99939	—	Moderator Outside Assembly	—

Table 7.2-4 Set 4 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 4 of Crystal River Unit 3

	7	2.96913	—	—	Homogenized region
Outer	8	2.99248	—	—	Moderator Outside Assembly

Notes: The Zone 7 outer radius is calculated using Equation 6.
The Zone 8 outer radius is calculated using Equation 7.
The outer radius values for zones 7 and 8 with the APSR removed are calculated as shown in Table 7.2-1.

Table 7.2-5 Set 1 Path B Unit Cell Model Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 5 of Crystal River Unit 3

<u>SAS2H Path B Unit Cell Model Dimension Calculations for the Rodded Assembly Axial Regions in Fuel Batch 5 of Crystal River Unit 3 that Contain 16 Water-Filled Guide Tubes and 1 Water-Filled Instrument Tube</u>

Input Parameters

Number of unit cells in assembly:	225
Number of fuel rods in assembly:	208
Number of guide tubes in assembly:	16
Rod pitch in assembly (cm):	1.44272
Fuel pellet diameter (cm):	0.936244
Fuel cladding outer diameter (cm):	1.0922
Guide tube outer diameter (cm):	1.3462
Guide tube inner diameter (cm):	1.26492
Instrument tube outer diameter (cm):	1.38193
Instrument tube inner diameter (cm):	1.12014
Assembly pitch (cm):	21.81098

Fuel-to-Moderator Volume Ratio Calculation:

Identifier of Equation(s) Utilized: 1 (Table 7.2-7)

Fuel-to-Moderator Volume Ratio = 0.529832

Moderator Unit Volume in Central Unit Cell of Path B Model:

Table 7.2-5 Set 1 Path B Unit Cell Model Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 5 of Crystal River Unit 3

Identifier of Equation(s) Utilized: 2 (Table 7.2-7)

Moderator Unit Volume in Central Unit Cell of Path B Model = 1.914755

Fuel Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 3 (Table 7.2-7)

Fuel Unit Volume in Fuel Rod Unit Cell = 0.688443

Moderator Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 4 (Table 7.2-7)

Moderator Unit Volume in Fuel Rod Unit Cell = 1.144539

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model:

Identifier of Equation(s) Utilized: 5 (Table 7.2-7)

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model = 12.36742

Path B Unit Cell Model Dimensions:

	Zone #	Outer Radius (cm)	Zone Description
Inner	1	0.63246	Water filled gap
	2	0.67310	Guide tube
	3	0.81397	Guide tube unit cell moderator
	4	2.97599	Homogenized region
Outer	5	2.99939	Moderator in the assembly-to-assembly gap

Notes: The Zone 4 outer radius is calculated using Equation 6.
The Zone 5 outer radius is calculated using Equation 7.

Table 7.2-6 Set 3 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 5 of Crystal River Unit 3

Path B Models for Use in Assembly Axial Regions of Fuel Batch 5 of Crystal River Unit 3 that have a CRA Insertion History

Input Parameters

Number of unit cells in assembly:	225
Number of fuel rods in assembly:	208
Number of guide tubes in assembly:	16
Number of CR's in assembly:	16
Rod pitch in assembly (cm):	1.44272
Fuel pellet diameter (cm):	0.936244
Fuel cladding outer diameter (cm):	1.0922
Guide tube outer diameter (cm):	1.3462
Guide tube inner diameter (cm):	1.26492
CR cladding outer diameter (cm):	1.1176
CR cladding inner diameter (cm):	1.01092
CR absorber material diameter (cm):	0.99568
Instrument tube outer diameter (cm):	1.38193
Instrument tube inner diameter (cm):	1.12014
Assembly pitch (cm):	21.81098

Fuel-to-Moderator Volume Ratio Calculation:

Identifier of Equation(s) Utilized: 1 (Table 7.2-7)

Fuel-to-Moderator Volume Ratio = 0.562499

Moderator Unit Volume in Central Unit Cell of Path B Model:

Identifier of Equation(s) Utilized: 2 (Table 7.2-7)

Moderator Unit Volume in Central Unit Cell of Path B Model = 0.933769

Fuel Unit Volume in Fuel Rod Unit Cell:

Identifier of Equation(s) Utilized: 3 (Table 7.2-7)

Fuel Unit Volume in Fuel Rod Unit Cell = 0.688443

Moderator Unit Volume in Fuel Rod Unit Cell:

Table 7.2-6 Set 3 Path B Unit Cell Model's Dimension Calculation Spreadsheet for the Rodded Assembly Axial Regions from Fuel Batch 5 of Crystal River Unit 3

Identifier of Equation(s) Utilized: 4 (Table 7.2-7)

Moderator Unit Volume in Fuel Rod Unit Cell = 1.144539

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model:

Identifier of Equation(s) Utilized: 5 (Table 7.2-7)

Number of Fuel Rod Unit Cells that must be Represented in the Homogenized Zone of the Path B Model = 11.76595

Path B Unit Cell Model Dimensions:

	Zone #	Outer Radius (cm)	With CRA Inserted in Axial Region	With CRA Removed from Axial Region
Inner	1	0.49784	CR Absorber Material	Water
	2	0.50546	Helium Gap	Water
	3	0.55880	CR cladding	Water
	4	0.63246	Water	Water
	5	0.67310	Guide tube	Guide tube
	6	0.81397	Unit cell moderator	Unit cell moderator
	7	2.90826	Homogenized region	—
Outer	8	2.93113	Moderator Outside Assembly	—
	7	2.97599	—	Homogenized region
Outer	8	2.99939	—	Moderator Outside Assembly

Notes: The Zone 7 outer radius is calculated using Equation 6.
The Zone 8 outer radius is calculated using Equation 7.
The outer radius values for zones 7 and 8 with the control rod removed are calculated as shown in Table 7.2-5.

Table 7.2-7 Equations Utilized in the Path B Model Dimension Calculation Spreadsheets Presented in Tables 7.2-1 and 7.2-6 (The equations listed in this table are derived.)

Equation 1 (Fuel-to-Moderator Volume Ratio in Actual Assembly):

$$\frac{F}{M}\ Ratio = \frac{(Number\ of\ Fuel\ Rods)(\frac{\pi}{4})(Fuel\ Pellet\ Diameter)^2}{\begin{gathered}\{(Number\ of\ Fuel\ Rods)[Rod\ Pitch^2-(Clad\ OD)^2(\frac{\pi}{4})]+\\ (Number\ of\ Empty\ GT's)[Rod\ Pitch^2-(GT\ OD)^2(\frac{\pi}{4})+(GT\ ID)^2(\frac{\pi}{4})]+\\ (Number\ of\ Rodded\ GT's)[Rod\ Pitch^2-(GT\ OD)^2(\frac{\pi}{4})+(GT\ ID)^2(\frac{\pi}{4})-(Inserted\ Rod\ OD)^2(\frac{\pi}{4})+\\ (APSR\ Follow\ Rod\ ID)^2(\frac{\pi}{4})]+[Rod\ Pitch^2-(IT\ OD)^2(\frac{\pi}{4})+(IT\ ID)^2(\frac{\pi}{4})]\}\end{gathered}}$$

where GT means guide tube, IT means instrument tube, and ID means inner diameter, OD means outer diameter. This equation assumes that there is no instrument inserted in the instrument tube, and the instrument tube is filled with moderator. The APSR Follow Rod ID is only specified if the follow rod region of an APSRA is being represented in the Path B model.

Equation 2 (Central Unit Cell Moderator Volume):

$$CUCMV = Rod\ Pitch^2-(GT\ OD)^2(\frac{\pi}{4})+(GT\ ID)^2(\frac{\pi}{4})-(Inserted\ Rod\ OD)^2(\frac{\pi}{4})$$

Equation 3 (Fuel Volume in an Assembly Lattice Cell Containing a Fuel Rod):

$$FV = (Fuel\ Pellet\ OD)^2(\frac{\pi}{4})$$

Equation 4 (Moderator Volume in an Assembly Lattice Cell Containing a Fuel Rod):

$$MV = Rod\ Pitch^2-(Fuel\ Clad\ OD)^2(\frac{\pi}{4})$$

Base equation from which Equation 5 is derived:

$$\frac{F}{M}\ Ratio = \frac{x\ (FV)}{CUCMV+\ x\ (MV)}$$

where x is the number of assembly lattice cells containing fuel rods that must be represented in the Path B homogenized region.

Equation 5:

$$x = \frac{(\frac{F}{M}\ Ratio)(CUCMV)}{FV - (\frac{F}{M}\ Ratio)(MV)}$$

Base equations from which Equations 6 and 7 are derived:

$$Area\ of\ Any\ Annular\ Region\ in\ the\ Path\ B\ Model = \pi\ (Outer\ Radius\ of\ Annular\ Region^2 - Inner\ Radius\ of\ Annular\ Region^2)$$

$$\updownarrow$$

$$Outer\ Radius\ of\ Annular\ Region = \sqrt{\frac{Area\ of\ Annular\ Region}{\pi} + IR^2}$$

where IR means the inner radius of the annular region.

Equation 6:

$$Path\ B\ Model\ Homogenized\ Region\ Outer\ Radius = \sqrt{\frac{x\ (Rod\ Pitch)^2}{\pi} + IR^2}$$

Equation 7:

$$Assembly\text{-}to\text{-}Assembly\ Spacing\ Moderator\ Zone\ Outer\ Radius = \{ \frac{(x+1)}{Number\ of\ Lattice\ Cells\ in\ Assembly} * [Assembly\ Pitch^2 - (Rod\ Pitch)^2(Number\ of\ Lattice\ Cells\ in\ Assembly)](\frac{1}{\pi}) + IR^2\ \}^{0.5}$$

7.3 Cycle Irradiation History Layouts for the Depletion of the Rodded Assemblies in Batches 4 and 5 of Crystal River Unit 3

The irradiation time step layouts for the statepoint depletion calculations performed with the SAS2H control module, as documented in this analysis, will vary depending on whether or not the analyzed assembly has a CRA or APSRA insertion history in the statepoint calculation of interest. This variation in irradiation time step layouts between statepoint calculations containing rod insertion histories occurs because the rod insertion histories vary between statepoint calculations for different assemblies. The rod insertion histories for an assembly must be modeled such that the appropriate axial nodes of the fuel assembly are depleted using the appropriate neutron flux and spectrum over the correct exposure duration. The presence of a CRA or APSRA will effect the isotopic inventory in a fuel assembly local axial region as a result of the hardened neutron spectrum. In general, a hardened neutron spectrum (a higher average energy for the neutron population) will be produced as a result of decreased neutron moderation and increased parasitic capture of thermal neutrons. A locally hardened neutron spectrum in a thermal reactor for a short period of time will result in a local decrease in reactivity due to the following:

1) a decrease in the thermal utilization factor (the ratio of thermal neutron absorptions in the fuel to total thermal neutron absorptions);
2) a decrease in the resonance escape probability (the fraction of fission neutrons that manage to slow down from fission to thermal energies without being absorbed).

The presence of a locally hardened neutron spectrum for longer periods of time will result in the build-up of Pu-239 through the parasitic capture of fast neutrons by U-238 with subsequent beta decay through Np-239. Due to the lower depletion of U-235 through fission and the increase production of Pu-239 through parasitic capture by U-238, the fissile content and hence reactivity of the fuel will be greater upon transition back to a thermal neutron spectrum rather than if the fuel had experienced a continuous thermal neutron spectrum. Therefore, the use of BPRAs, CRAs and APSRAs in reactor operation is not only for power regulation, but also for fuel assembly burnup extension. The isotopic inventory may be quite different between fuel with and without an absorbing rod assembly insertion history. These isotopic inventory differences must be accounted for in the CRC depletion calculations to allow for correct prediction of core k_{eff} values in subsequent CRC reactivity evaluations.

In SAS2H, the duration of an irradiation interval may be separated into a number of time steps of variable length. Typically, an irradiation interval is a CRC statepoint depletion calculation interval, or the continuous irradiation time required to go from one CRC statepoint to another. To follow the CRA or APSRA insertion histories, detailed intra-cycle variable irradiation time steps are required. This is due to the fact that the CRs and APSRs are only present in a given axial node of an assembly for a given period of exposure during a statepoint depletion calculation. A user specified number of cross-section library updates are performed during each time step of an irradiation interval. The boron letdown curve of the reactor cycle may also be followed by specifying, at each irradiation step, a fraction of the soluble boron concentration defined in the base moderator material specification. This boron concentration is applied uniformly over the irradiation time step. The boron concentration fraction at the mid-point of each irradiation time step is specified in the SAS2H depletion calculations of this analysis to appropriately follow boron letdown curves. Considering the cross-section update frequency, the boron letdown data, and the absorber rod assembly insertion histories, the following three primary requirements apply to determining an appropriate reactor cycle irradiation layout for a rodded assembly.

1) The duration of each time step should be specified such that a maximum of 80 days of irradiation is not exceeded between cross-section updates. The SAS2H calculations in this analysis utilize one cross-section update per irradiation step. Therefore, the

maximum duration of any time step in any reactor cycle irradiation layout of this analysis should not exceed 80 days. The 80 day limit is an arbitrary limit based on engineering judgement. The 80 day irradiation time step limit should assure that the isotopic concentrations of the system (primarily fuel and borated moderator) will not alter the neutron spectrum radically enough to cause a time step of the depletion calculation to be performed without the availability of cross-sections which have been properly weighted with an appropriate neutron spectrum and spatial flux.

2) Any radical perturbations in the boron letdown curve should be followed by defining irradiation time step durations such that the average boron concentration over each time step is representative of the actual boron letdown. Usually, the 80 day time step limit imposed for cross-section update frequency is adequate to properly follow a reactor cycle's boron letdown curve.

3) The duration of each time step should be specified such that the insertion of a CRA or APSRA in a given assembly axial node may be modeled for the correct exposure time in terms of EFPD. A more detailed description of the meaning of this statement is warranted. In SAS2H, there is an option to vary the Path B unit cell model between irradiation steps as long as the number of radial zones in the Path B models of a given SAS2H calculation (i.e., statepoint depletion calculation) remain the same. Therefore, an assembly axial node represented in a given SAS2H statepoint depletion calculation that has a CRA or APSRA insertion history for a specified period of exposure (that is a fraction of the exposure covered by the statepoint depletion calculation) may be modeled appropriately by changing the Path B model from one representing the insertion of a CRA or APSRA to one representing the removal of a CRA or APSRA at the appropriate time step (corresponding to the CRA or APSRA removal time).

All three of the requirements previously described must be correctly addressed in the SAS2H input decks developed for each axial node of an assembly in each statepoint depletion calculation. Assuring that the cross-section update frequency and the boron letdown curves are properly modeled is usually a by-product of developing the irradiation layouts for the statepoint depletion calculations containing either CRA or APSRA insertion history. The irradiation time step layout for a given statepoint depletion calculation must be developed such that breakpoints exist between irradiation time steps that allow for the appropriate removal or insertion of a CRA or APSRA to obtain the correct integrated neutron spectrum exposure for each axial node of the assembly. It becomes obvious then that the complexity of the irradiation time step layout for a given statepoint calculation is proportional to the number of CRC axial nodes being modeled and the frequency of CRA or APSRA movement during the assembly depletion. The time steps developed to model CRA or APSRA insertion histories are also designed to encompass the cross-section update and boron letdown requirements. A program entitled "RLAYOUT" was written to automate the development of appropriate irradiation time step layouts for the statepoint depletion calculations of an assembly containing either a CRA or APSRA insertion history. The RLAYOUT program is described in Attachment III of reference 5.11.

The RLAYOUT program is only utilized to determine the irradiation time step layouts for the CRC statepoint depletion calculations that contain either a CRA or APSRA insertion history. A single assembly may have a combination of CRC statepoint calculations that either require or do not require the RLAYOUT developed irradiation time step layouts. For the CRC statepoint depletion calculations that do not require the consideration of CRA or APSRA insertion histories, the irradiation time step layouts are developed by considering the cross-section update frequency and the boron letdown data. Tables 7.3-1 through 7.3-5 contain the CRC statepoint depletion calculation time step layouts for each reactor cycle that is relevant to statepoint calculations documented in this analysis which do not have either a CRA or APSRA insertion history. The mid-step boron concentrations presented in Tables 7.3-1 through 7.3-5 are obtained by using linear interpolation within the data presented in Tables 4.1.9-1 through 4.1.9-5. A description of the linear interpolation procedures employed are presented in the "UNITS_CONVERSION" subroutine description section of the CRAFT code description in Attachment I of reference 5.11.

The irradiation time step layouts developed with the RLAYOUT program for the assemblies documented in this analysis are presented in Tables 7.3-6 through 7.3-16. Tables 7.3-6 through 7.3-16 contain information required to prepare the irradiation layout portion and the CRA or APSRA insertion history portion of the CRAFT input decks for assemblies containing either a CRA or APSRA insertion history. The boron letdown data utilized by RLAYOUT in developing the irradiation layouts that are presented in Tables 7.3-6 through 7.3-16 is not exactly the same as that utilized in developing the irradiation history layouts for the non-rodded statepoint depletion calculations as presented in Tables 7.3-1 through 7.3-5. The boron letdown data provided to the RLAYOUT program is taken from the data presented in 4.1.9-1 through 4.1.9-5. However, some of the measured boron concentrations shown in Tables 4.1.9-1 through 4.1.9-5 were eliminated due to the fact that the particular boron concentration measurements in question were not made at nominal full-power core operation conditions. The use of the entire set of boron letdown data from Tables 4.1.9-1 through 4.1.9-5 in the non-rodded statepoint depletion calculation layouts has no adverse effect on the depletion calculation results. The modified boron letdown data from Tables 4.1.9-1 through 4.1.9-5 is presented in Tables 7.3-17 through 7.3-21. The acronym "ppmb" in the following tables means part per million of natural boron by mass of moderator.

Table 7.3-1 Crystal River Unit 3 Cycle-2
Irradiation History Layout for Non-Rodded Assemblies

Cycle-2

Beginning-of-Cycle (BOC) to End-of-Cycle (EOC)

3 : Number of Irradiation Steps
55.5 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	688.93	27.75
2	527.51	83.25
3	353.48	138.75

Table 7.3-2 Crystal River Unit 3 Cycle-3
Irradiation History Layout for Non-Rodded Assemblies

Cycle-3

BOC to Statepoint 2 (Stpt2) (168.5 EFPD)

3 : Number of Irradiation Steps
56.167 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	880.38	28.08
2	694.68	84.25
3	536.65	140.42

Stpt2 (168.5 EFPD) to Stpt3 (250.0 EFPD)

2 : Number of Irradiation Steps
40.75 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	382.60	188.88
2	267.17	229.63

Stpt3 (250.0 EFPD) to EOC (323.0 EFPD)

2 : Number of Irradiation Steps
36.5 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	234.64	268.25
2	128.17	304.75

Table 7.3-3 Crystal River Unit 3 Cycle-4
Irradiation History Layout for Non-Rodded Assemblies

Cycle-4

BOC to Stpt2 (228.1 EFPD)

3 : Number of Irradiation Steps

76.233 : Length of Each Irradiation Step (EFPD)
(This value should be 76.033. See statement flollowing this table.)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	787.34	38.12
2	625.59	114.35
3	373.77	190.58

The values listed for the three steps above are slightly off due to the use of a 76.233 EFPD step length rather than a 76.033 EFPD step length. The values corresponding to the 76.033 EFPD step lenght are presented below. See statement following this table.

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	787.34	38.12
2	625.59	114.35
-3	373.77	190.58

Stpt2 (228.1 EFPD) to Stpt3 (253.0 EFPD)

1 : Number of Irradiation Steps
24.9 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	218.65	240.55

Stpt3 (253.0 EFPD) to EOC (336.6 EFPD)

2 : Number of Irradiation Steps
41.8 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	225.91	273.90
2	105.94	315.70

The difference between the 76.233 EFPD and 76.033 EFPD step length value in the BOC to statepoint 2 (228.1 EFPD) statepoint calculation results in slight differences in the mid-step ppmb concentrations and the mid-step EFPD values. The differences between the mid-step ppmb concentrations and the mid-step EFPD values have no impact on the isotopic results because the effects of differences of this magnitude are beyond the accuracy of the calculational techniques utilized.

Table 7.3-4 Crystal River Unit 3 Cycle-5
Irradiation History Layout for Non-Rodded Assemblies

Cycle-5

BOC to Stpt2 (388.5 EFPD)

5 : Number of Irradiation Steps
77.7 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	1050.61	38.85
2	835.81	116.55
3	641.59	194.25
4	427.28	271.95
5	225.73	349.65

Stpt2 (388.5 EFPD) to EOC (484.4 EFPD)

2 : Number of Irradiation Steps
47.95 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	92.03	412.48
2	2.35	460.43

Table 7.3-5 Crystal River Unit 3 Cycle-8
Irradiation History Layout for Non-Rodded Assemblies

Cycle-8

BOC to Stpt2 (97.6 EFPD)

2 : Number of Irradiation Steps
48.8 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	1510.73	24.40
2	1419.25	73.20

Stpt2 (97.6 EFPD) to Stpt3 (139.8 EFPD)

1 : Number of Irradiation Steps

42.2 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	1305.52	118.70

Stpt3 (139.8 EFPD) to Stpt4 (404.0 EFPD)

4 : Number of Irradiation Steps
66.05 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	1142.75	172.83
2	985.95	238.88
3	793.58	304.93
4	588.91	370.98

Stpt4 (404.0 EFPD) to Stpt5 (409.6 EFPD)

1 : Number of Irradiation Steps
5.6 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	484.53	406.80

Stpt5 (409.6 EFPD) to Stpt6 (515.5 EFPD)

2 : Number of Irradiation Steps
52.95 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	416.34	436.08
2	274.55	489.03

Stpt6 (515.5 EFPD) to EOC (535.9 EFPD)

1 : Number of Irradiation Steps
20.4 : Length of Each Irradiation Step (EFPD)

Step Number	Mid-Step ppmb	Mid-Step EFPD
1	185.39	525.70

Table 7.3-6 Rodded Irradiation Time Step Layout for Assembly B08

IRRADIATION LAYOUT FOR ASSEMBLY: B08
Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	.96	.96	940.3
2	58.64	59.60	812.9
3	51.78	111.38	707.8
4	51.78	163.15	591.4
5	51.78	214.93	378.7
6	13.17	228.10	278.2

Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	3.71	3.71	253.5
2	21.29	25.00	213.3

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: B08

COLUMN A: Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation
COLUMN B: Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

	A						B	
NODE #	1	2	3	4	5	6	1	2
1	X	X	X	X	X	X	X	X
2	X	X	X	X	X		X	X
3	X	X					X	
4	X							
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

Table 7.3-7 Rodded Irradiation Time Step Layout for Assembly B20

IRRADIATION LAYOUT FOR ASSEMBLY: B20

Cycle-03, .0 EFPD to Cycle-03, 168.5 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	6.68	6.68	946.0
2	3.19	9.87	946.3
3	66.38	76.25	830.9
4	39.97	116.22	672.8
5	39.97	156.20	547.4
6	12.30	168.50	471.7

Cycle-03, 168.5 EFPD to Cycle-03, 250.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	8.91	8.91	435.6
2	62.96	71.87	333.8
3	9.63	81.50	231.8

Cycle-03, 250.0 EFPD to Cycle-03, 323.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	2.59	2.59	235.2
2	1.57	4.16	237.9
3	68.84	73.00	175.8

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: B20

COLUMN A: Cycle-03, .0 EFPD to Cycle-03, 168.5 EFPD Statepoint Calculation
COLUMN B: Cycle-03, 168.5 EFPD to Cycle-03, 250.0 EFPD Statepoint Calculation
COLUMN C: Cycle-03, 250.0 EFPD to Cycle-03, 323.0 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

	A						B			C		
NODE #	1	2	3	4	5	6	1	2	3	1	2	3
1	X	X	X	X	X		X	X		X	X	
2	X	X	X				X			X		
3	X	X										
4	X											
5												
6												
7												
8												
9												
10												
11												

12												
13												
14												
15												
16												
17												
18												

Table 7.3-8 Rodded Irradiation Time Step Layout for Assembly B21

IRRADIATION LAYOUT FOR ASSEMBLY: B21
Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	.11	.11	943.3
2	1.06	1.17	939.1
3	51.55	52.72	808.7
4	54.00	106.72	726.8
5	54.00	160.72	584.4
6	54.00	214.72	383.0
7	13.28	228.00	278.6
8	.10	228.10	255.2

Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	3.90	3.90	253.4
2	21.10	25.00	213.0

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: B21

COLUMN A: Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation
COLUMN B: Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

	A								B	
NODE #	1	2	3	4	5	6	7	8	1	2
1	X	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X	X
3	X	X	X	X	X	X	X	X	X	X
4	X	X	X	X	X	X	X		X	X
5	X	X	X	X	X	X	X	X	X	X
6	X	X	X	X	X	X	X	X	X	X
7	X	X	X	X	X	X	X	X	X	X
8	X	X	X	X	X	X	X	X	X	X
9	X	X	X	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X		X	X

```
 13    | |X|X|X|X|X|X|X|X| |X|X
 14    | |X|X|X|X|X|X|X|X| |X|X
 15    | |X|X|X|X|X|X|  |  | |X|X
 16    | |X|X|X|  |  |  |  |  | |X|
 17    | |X|X|  |  |  |  |  |  | |  |
 18    | |X|  |  |  |  |  |  |  | |  |
-------------------------------
```

Table 7.3-9 Rodded Irradiation Time Step Layout for Assembly B25

IRRADIATION LAYOUT FOR ASSEMBLY: B25
Cycle-03, .0 EFPD to Cycle-03, 168.5 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	.67	.67	941.6
2	5.65	6.32	946.3
3	7.73	14.05	940.6
4	42.38	56.43	839.9
5	42.38	98.82	718.4
6	28.69	127.51	628.5
7	37.34	164.85	520.8
8	2.29	167.14	459.7
9	1.36	168.50	453.4

Cycle-03, 168.5 EFPD to Cycle-03, 250.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	5.95	5.95	440.8
2	40.05	46.00	368.9
3	27.13	73.13	270.7
4	8.87	82.00	229.8

Cycle-03, 250.0 EFPD to Cycle-03, 323.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	.74	.74	234.7
2	13.27	14.01	243.6
3	18.03	32.04	219.5
4	29.38	61.42	150.1
5	8.57	69.99	100.2
6	3.01	73.00	86.0

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: B25

COLUMN A: Cycle-03, .0 EFPD to Cycle-03, 168.5 EFPD Statepoint Calculation
COLUMN B: Cycle-03, 168.5 EFPD to Cycle-03, 250.0 EFPD Statepoint Calculation
COLUMN C: Cycle-03, 250.0 EFPD to Cycle-03, 323.0 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

	A									B				C					
NODE #	1	2	3	4	5	6	7	8	9	1	2	3	4	1	2	3	4	5	6
1																			
2																			
3																			
4																			
5																			
6																			
7	X													X					
8	X	X												X	X	X			
9	X	X	X	X	X					X	X			X	X	X	X	X	
10	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X		
13	X	X	X	X	X	X				X	X	X		X	X				
14	X	X	X							X									
15																			
16																			
17																			
18																			

Table 7.3-10 Rodded Irradiation Time Step Layout for Assembly B27

IRRADIATION LAYOUT FOR ASSEMBLY: B27
Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	1.00	1.00	940.1
2	.68	1.68	934.2
3	3.13	4.81	920.7
4	6.08	10.89	888.0
5	66.49	77.38	790.8
6	66.49	143.86	632.5
7	39.81	183.67	474.5
8	38.33	222.00	334.5
9	6.10	228.10	265.8

Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	18.17	18.17	230.6
2	2.80	20.97	198.5
3	4.03	25.00	188.6

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: B27

COLUMN A: Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation
COLUMN B: Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

NODE #	A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	B 1	B 2	B 3
1												
2												
3												
4												
5	X											
6	X											
7	X											
8	X	X										
9	X	X	X									
10	X	X	X	X	X	X				X		
11	X	X	X	X	X	X	X	X		X	X	X
12	X	X	X	X	X	X	X	X		X	X	X
13	X	X	X	X	X	X	X	X		X	X	X
14	X	X	X	X	X	X	X			X	X	
15	X	X	X	X								
16												
17												
18												

Table 7.3-11 Rodded Irradiation Time Step Layout for Assembly B28

IRRADIATION LAYOUT FOR ASSEMBLY: B28
Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	.91	.91	940.5
2	59.05	59.96	813.0
3	51.68	111.64	706.4
4	51.68	163.32	591.8
5	51.68	215.00	378.3
6	13.10	228.10	278.1

Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	3.71	3.71	253.5
2	21.29	25.00	213.3

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: B28

COLUMN A: Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation
COLUMN B: Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

|| A || B

```
 NODE # ||1|2|3|4|5|6||1|2
---------------------------
    1   ||X|X|X|X|X|X||X|X
    2   ||X|X|X|X|X| ||X|X
    3   ||X|X| | | | ||X|
    4   ||X| | | | | || |
    5   || | | | | | || |
    6   || | | | | | || |
    7   || | | | | | || |
    8   || | | | | | || |
    9   || | | | | | || |
   10   || | | | | | || |
   11   || | | | | | || |
   12   || | | | | | || |
   13   || | | | | | || |
   14   || | | | | | || |
   15   || | | | | | || |
   16   || | | | | | || |
   17   || | | | | | || |
   18   || | | | | | || |
---------------------------
```

Table 7.3-12 Rodded Irradiation Time Step Layout for Assembly B29

IRRADIATION LAYOUT FOR ASSEMBLY: B29
Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	.12	.12	943.3
2	1.16	1.28	938.7
3	53.55	54.83	810.2
4	53.43	108.26	725.4
5	53.43	161.69	586.9
6	53.43	215.12	380.8
7	12.88	228.00	278.0
8	.10	228.10	255.2

Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation.

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	3.93	3.93	253.4
2	21.07	25.00	213.0

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: B29

COLUMN A: Cycle-04, .0 EFPD to Cycle-04, 228.1 EFPD Statepoint Calculation
COLUMN B: Cycle-04, 228.1 EFPD to Cycle-04, 253.0 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

```
---------------------------
        ||       A       || B
 NODE # ||1|2|3|4|5|6|7|8||1|2
```

```
------------------------------
     1    ||X|X|X|X|X|X|X| ||X|X
     2    ||X|X|X|X|X|X|X|X||X|X
     3    ||X|X|X|X|X|X|X| ||X|X
     4    ||X|X|X|X|X|X|X|X||X|X
     5    ||X|X|X|X|X|X|X|X||X|X
     6    ||X|X|X|X|X|X|X| ||X|X
     7    ||X|X|X|X|X|X|X|X||X|X
     8    ||X|X|X|X|X|X|X|X||X|X
     9    ||X|X|X|X|X|X|X|X||X|X
    10    ||X|X|X|X|X|X|X|X||X|X
    11    ||X|X|X|X|X|X|X|X||X|X
    12    ||X|X|X|X|X|X|X|X||X|X
    13    ||X|X|X|X|X|X|X|X||X|X
    14    ||X|X|X|X|X|X|X| ||X|X
    15    ||X|X|X|X|X|X| | ||X|X
    16    ||X|X|X| | | | | ||X|
    17    ||X|X| | | | | | || |
    18    ||X| | | | | | | || |
------------------------------
```

Table 7.3-13 Rodded Irradiation Time Step Layout for Assembly C15

IRRADIATION LAYOUT FOR ASSEMBLY: C15
Cycle-05, .0 EFPD to Cycle-05, 388.5 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	4.47	4.47	1043.0
2	56.24	60.71	992.2
3	28.62	89.33	921.2
4	59.83	149.16	829.1
5	59.83	209.00	681.2
6	59.83	268.83	520.0
7	59.83	328.67	361.6
8	59.83	388.50	204.4

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: C15

COLUMN A: Cycle-05, .0 EFPD to Cycle-05, 388.5 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

```
-------------------------
          ||       A
 NODE #   ||1|2|3|4|5|6|7|8
-------------------------
     1    ||X|X|X| | | | |
     2    ||X|X| | | | | |
     3    ||X| | | | | | |
     4    || | | | | | | |
     5    || | | | | | | |
     6    || | | | | | | |
     7    || | | | | | | |
     8    || | | | | | | |
     9    || | | | | | | |
    10    || | | | | | | |
```

```
    11    || | | | | | | |
    12    || | | | | | | |
    13    || | | | | | | |
    14    || | | | | | | |
    15    || | | | | | | |
    16    || | | | | | | |
    17    || | | | | | | |
    18    || | | | | | | |
-------------------------
```

Table 7.3-14 Rodded Irradiation Time Step Layout for Assembly C15a

IRRADIATION LAYOUT FOR ASSEMBLY: C15a
Cycle-05, .0 EFPD to Cycle-05, 388.5 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	4.50	4.50	1042.9
2	56.74	61.24	991.7
3	28.93	90.17	920.0
4	59.67	149.84	827.2
5	59.67	209.50	679.6
6	59.67	269.17	518.9
7	59.67	328.83	361.1
8	59.67	388.50	204.2

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: C15a

COLUMN A: Cycle-05, .0 EFPD to Cycle-05, 388.5 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

```
-------------------------
          ||       A
  NODE #  ||1|2|3|4|5|6|7|8
-------------------------
     1    ||X|X|X| | | | |
     2    ||X|X| | | | | |
     3    ||X| | | | | | |
     4    || | | | | | | |
     5    || | | | | | | |
     6    || | | | | | | |
     7    || | | | | | | |
     8    || | | | | | | |
     9    || | | | | | | |
    10    || | | | | | | |
    11    || | | | | | | |
    12    || | | | | | | |
    13    || | | | | | | |
    14    || | | | | | | |
    15    || | | | | | | |
    16    || | | | | | | |
    17    || | | | | | | |
    18    || | | | | | | |
-------------------------
```

Table 7.3-15 Rodded Irradiation Time Step Layout for Assembly C20

IRRADIATION LAYOUT FOR ASSEMBLY: C20
Cycle-08, .0 EFPD to Cycle-08, 97.6 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	24.83	24.83	1534.6
2	36.38	61.21	1473.7
3	36.38	97.60	1407.7

Cycle-08, 97.6 EFPD to Cycle-08, 139.8 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	4.04	4.04	1359.9
2	38.16	42.20	1298.2

Cycle-08, 139.8 EFPD to Cycle-08, 404.0 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	20.57	20.57	1191.7
2	60.91	81.48	1110.2
3	60.91	142.39	947.0
4	60.91	203.29	771.9
5	60.91	264.20	580.3

Cycle-08, 404.0 EFPD to Cycle-08, 409.6 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	1.81	1.81	488.9
2	3.79	5.60	482.4

Cycle-08, 409.6 EFPD to Cycle-08, 515.5 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	19.48	19.48	455.3
2	43.21	62.69	379.4
3	43.21	105.90	262.7

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: C20

COLUMN A: Cycle-08, .0 EFPD to Cycle-08, 97.6 EFPD Statepoint Calculation
COLUMN B: Cycle-08, 97.6 EFPD to Cycle-08, 139.8 EFPD Statepoint Calculation
COLUMN C: Cycle-08, 139.8 EFPD to Cycle-08, 404.0 EFPD Statepoint Calculation

COLUMN D: Cycle-08, 404.0 EFPD to Cycle-08, 409.6 EFPD Statepoint Calculation
COLUMN E: Cycle-08, 409.6 EFPD to Cycle-08, 515.5 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

	A			B		C					D		E		
NODE #	1	2	3	1	2	1	2	3	4	5	1	2	1	2	3
1	X			X		X					X		X		
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															

Table 7.3-16 Rodded Irradiation Time Step Layout for Assembly C21

IRRADIATION LAYOUT FOR ASSEMBLY: C21
Cycle-05, .0 EFPD to Cycle-05, 388.5 EFPD Statepoint Calculation

Irradiation Step Number	Step Duration (EFPD)	Exposure at End of Step (EFPD)	Mid-Step Boron Concentration (ppm)
1	4.58	4.58	1042.9
2	58.42	63.00	990.2
3	30.20	93.20	916.0
4	59.06	152.26	820.2
5	59.06	211.32	673.9
6	59.06	270.38	514.9
7	59.06	329.44	359.3
8	59.06	388.50	203.4

NODAL ROD ASSEMBLY INSERTION LAYOUT FOR FUEL ASSEMBLY: C21

COLUMN A: Cycle-05, .0 EFPD to Cycle-05, 388.5 EFPD Statepoint Calculation

X = Rod assembly inserted in corresponding node during the irradiation step

	A							
NODE #	1	2	3	4	5	6	7	8
1	X	X	X					
2	X	X						
3	X							

```
 4   || | | | | | | |
 5   || | | | | | | |
 6   || | | | | | | |
 7   || | | | | | | |
 8   || | | | | | | |
 9   || | | | | | | |
10   || | | | | | | |
11   || | | | | | | |
12   || | | | | | | |
13   || | | | | | | |
14   || | | | | | | |
15   || | | | | | | |
16   || | | | | | | |
17   || | | | | | | |
18   || | | | | | | |
------------------------
```

Table 7.3-17 Boron Letdown Data Provided to RLAYOUT for Cycle 2 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm[1])
3.0	809
4.4	778
11.4	809
15.8	735
22.5	709
29.3	683
35.3	666
42.3	644
55.8	614
60.8	592
75.2	558
83.1	528
89.8	506
97.8	480
104.7	463
116.4	441
122.5	406

Table 7.3-17 Boron Letdown Data Provided to RLAYOUT for Cycle 2 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm[1])
129.1	385
135.9	372
139.9	346
148.6	333
156.4	320
161.4	316

[1] The acronym "ppm" means parts per million by mass of moderator.

Table 7.3-18 Boron Letdown Data Provided to RLAYOUT for Cycle 3 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
4.0	947
6.7	951
26.8	891
32.6	843
50.7	822
66.0	757
69.9	746
85.0	692
100.2	666
111.2	636
130.5	562
143.8	528
163.9	467
174.0	432
184.2	394

Table 7.3-18 Boron Letdown Data Provided to RLAYOUT for Cycle 3 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
212.9	324
227.5	272
246.4	229
262.9	250
283.8	190
304.0	130
322.0	86

Table 7.3-19 Boron Letdown Data Provided to RLAYOUT for Cycle 4 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
3.9	916
20.8	796
27.1	809
33.7	817
40.7	770
46.3	804
52.3	761
60.1	728
68.9	759
75.1	729
81.4	726
87.7	698
94.0	678
100.3	662
108.7	636
116.3	622

Table 7.3-19 Boron Letdown Data Provided to RLAYOUT for Cycle 4 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
122.6	588
128.9	575
142.2	601
146.6	528
153.0	493
165.8	471
171.1	439
177.6	415
184.3	394
202.0	337
221.9	277
228.1	255
233.1	251
238.3	225
246.1	203
252.0	186
269.4	246
275.0	221
282.0	199
295.7	162
302.5	143
308.3	125
321.5	91
328.0	72
334.5	56

Table 7.3-20 Boron Letdown Data Provided to RLAYOUT for Cycle 5 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
57.2	951
82.9	908
105.1	865
131.1	799
156.5	744
180.6	677
210.0	601
235.9	528
262.4	458
282.4	394
302.1	355
328.3	272
354.2	216
379.9	148
412.1	93
431.9	45

Table 7.3-21 Boron Letdown Data Provided to RLAYOUT for Cycle 8 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
11.2	1537
52.4	1455
78.0	1411
111.4	1332
154.4	1176
194.8	1103
234.6	999

Table 7.3-21 Boron Letdown Data Provided to RLAYOUT for Cycle 8 of Crystal River Unit 3

Exposure (EFPD)	Boron Concentration (ppm)
271.5	887
338.0	701
390.7	522
445.7	394
474.0	311
513.1	216

Some interesting behavior appears in the CRA nodal insertion history layouts presented in Tables 7.3-6 through 7.3-16. This interesting behavior refers to the axially staggered nodal CRA insertion locations in some of the irradiation steps that are defined. At first glance, the axial staggering of CRA nodal insertion locations in a given irradiation time step does not make any sense. This is true from a physical perspective based on knowledge of actual CRA design and reactor operation. However, certain approximations are utilized in performing the CRC depletion calculations as documented in this analysis which result in this strange presentation of CRA insertion histories. The following discussion describes the modeling techniques utilized in the CRC depletion calculations of this analysis which contribute to this staggered CRA nodal insertion phenomena.

In the SAS2H CRC depletion calculations, the time dependency of the CRA and APSRA insertion histories are treated on an integral exposure basis rather than on a real-time irradiation history basis. This does not mean that the CRA and APSRA insertion history data utilized in the CRC depletion calculations of this analysis is not the actual insertion history data from the reactor. In fact, the CRA and APSRA insertion history data for each axial node in each statepoint depletion calculation is based on the true CRA and APSRA movement data obtained during the actual reactor operation. The implementation of this true measured data in the SAS2H CRC depletion calculations is based on modeling CRA and APSRA insertion durations (measured in EFPD) in each axial node of the assembly at the beginning of each CRC statepoint calculation. An average nodal power is utilized in each SAS2H CRC statepoint depletion calculation for a given axial node. This average nodal power is calculated based on the average nodal burnup at the beginning and end of the statepoint depletion calculation. Therefore, EFPD durations in a SAS2H CRC statepoint depletion calculation are calculated based on this average nodal power that is being utilized in the statepoint depletion calculation. The CRA nodal insertion durations (measured in EFPDs of exposure) will need to be modeled in SAS2H based on the assembly average nodal power. Due to the fact that the assembly average nodal power may be less than the actual assembly nodal power during a given period of core operation, the SAS2H insertion time of a CRA in a given axial node may vary, relative to the other assembly axial nodes, depending on the average power that is being utilized in the SAS2H calculation and the nodal exposure (EFPD) required with CRA inserted. This results in the staggered CRA insertion phenomena that is present in some of the data presented in Tables 7.3-6 through 7.3-16.

7.4 The Commercial Reactor Assembly Follow Taskmaster (CRAFT) Code & Usage

The Commercial Reactor Assembly Follow Taskmaster (CRAFT) code directs the performance of assembly depletion and decay calculations relevant to CRC evaluations. The CRAFT code generates input decks for the SAS2H control module of the SCALE modular code system based on user-defined input which describes the fuel assembly's specifications and irradiation history. Appropriate isotopic concentrations relevant to both the CRC evaluations containing the fuel assembly and subsequent depletion and decay calculations of the fuel assembly are extracted and stored by CRAFT as it generates and executes SAS2H cases required to simulate the complete fuel assembly irradiation history.

The CRAFT code is developed with a high degree of flexibility that provides for the depletion and decay of fuel assemblies with widely varying features under either standard or non-standard core operating procedures. The following listing describes some of the capabilities and usage of the CRAFT code.

- The CRAFT code generates and executes appropriate SAS2H cases required to perform a prescribed depletion and decay sequence for a fuel assembly. The depletion and decay sequence is orchestrated from the BOC statepoint calculation of the initial prescribed insertion cycle through the final statepoint calculation of the last prescribed insertion cycle. The CRAFT code extracts and saves fuel and burnable poison isotopics at each statepoint, including BOC statepoints, during the fuel assembly's depletion and decay sequence. A certain number of the generated isotopics in the depleted fuel composition obtained from a SAS2H calculation are not used in the initial charge composition to the next SAS2H calculation due to a lack of cross-section data in the specified cross-section library. The CRAFT code provides a listing of the fuel isotopics from the output of a SAS2H calculation which are not used in the initial charge to the next SAS2H calculation. The isotopics left out of the initial charge are fission products whose reactivity worth is small relative to the isotopics retained in the initial charge composition. The listing of excluded initial charge isotopics allows for a determination of the impact upon the reactivity worth of the initial fuel composition in the subsequent depletion calculation.

- Any assembly design may be analyzed within the bounds of the SAS2H control module through the use of the CRAFT code. This includes both PWR and BWR fuel assemblies.

- An axial blanket fuel modeling option is available in the CRAFT code. Any UO_2 enrichment may be specified for the axial blanket fuel. The axial blanket fuel may be defined to exist in any of the CRC axial nodes which are defined for the CRAFT calculation.

- A spacer grid modeling technique is available with the CRAFT code. The modeling technique homogenizes the spacer grid material throughout the moderator of the fuel assembly by utilizing a user-defined spacer material and spacer material volume fraction in the moderator. The available spacer grid materials include the following-- ZIRC-4, INCONEL, SS316, SS316S, SS304, SS304S. Any volume fraction of spacer material in the moderator may be specified (including zero).

- The fuel cladding, BPR cladding, axial power shaping rod (APSR) cladding, or control rod (CR) cladding in the CRAFT calculation may be designated as any of the following materials-- ZIRC-4, INCONEL, SS316, SS316S, SS304, SS304S.

- The insertion of a BPR assembly during the irradiation of the fuel assembly may be modeled in the CRAFT calculation. Up to 10 unique BPR assembly designs may be specified for use during the depletion of a fuel assembly. Any type of BPR assembly design may be specified. The default BP material for use in CRAFT calculation is Al_2O_3-B_4C. Any arbitrary BP material may be specified for use in a BPR assembly design. A maximum of 10 unique BP materials may be specified. A maximum of 20 unique elements or isotopes may be specified in any given BP material. A BPR assembly may be inserted in any reactor cycle specified in the CRAFT calculation. Only one BPR assembly design may be specified per cycle. The position of the BPR assembly in the fuel assembly is specified by identifying the top and bottom axial nodes of the BP material. The BPR assembly remains fixed during a given reactor cycle. The depletion of the BP material is tracked during the CRAFT calculation. The appropriate depleted BP material is utilized in statepoint calculations following the BOC to statepoint 2 calculation for a given reactor cycle. Depleted BP material isotopic concentrations are also retained for use in subsequent mid-cycle statepoint reactivity calculations which may be performed as part of the CRC evaluation process.

- The insertion of a CR assembly during the irradiation of the fuel assembly may be modeled in the CRAFT calculation. Up to 10 unique CR assembly designs may be specified for use during the depletion of a fuel assembly. Any type of CR assembly design may be specified. Any arbitrary CR absorber material may be specified for use in a CR assembly design. A maximum of 10 unique CR absorber materials may be specified. A maximum of 10 unique elements or isotopes may be specified in any given CR absorber material. A CR assembly may be inserted in any reactor cycle specified in the CRAFT calculation. Multiple CR assembly designs may be specified per cycle. The position of the CR assembly in the fuel assembly is specified by identifying the top and bottom axial nodes of sections of the fuel assembly which contain the CR absorber material. The CR assembly position may be changed between each irradiation step of a SAS2H calculation generated by CRAFT. The CR assembly design may also be changed between any two CRC statepoint depletion calculations in a given reactor cycle.

- The insertion of an APSR assembly during the irradiation of the fuel assembly may be modeled in the CRAFT calculation. Up to 10 unique APSR assembly designs may be specified for use during the depletion of a fuel assembly. Any type of APSR assembly design may be specified. Any arbitrary APSR absorber material may be specified for use in an APSR assembly design. A maximum of 10 unique APSR absorber materials may be specified. A maximum of 10 unique elements or isotopes may be specified in any given APSR absorber material. An APSR assembly may be inserted in any reactor cycle specified in the CRAFT calculation. Multiple APSR assembly designs may be specified per cycle. The position of the APSR assembly in the fuel assembly is specified by identifying the top and bottom axial nodes of the APSR absorber material. The APSR assembly position may be changed between each irradiation step of a SAS2H calculation generated by CRAFT. The APSR assembly design may also be changed between any statepoint calculations in a given reactor cycle. For any APSRA modeled, the APSR follow rods are modeled in the axial region above the absorbing region of the APSR. The APSR follow rod material may be specified as a cladding material in the CRAFT input deck.

- A fuel assembly may be inserted in a maximum of 10 reactor cycles during a CRAFT calculation.

- A maximum of 20 statepoints (BOC is always considered a statepoint) may be specified in any given reactor cycle in a CRAFT calculation.

- A maximum of 23 irradiation steps of variable duration may be specified in any given SAS2H statepoint calculation to be generated during a CRAFT calculation.

- A maximum of 50 axial nodes may be specified in the CRC nodal format for use in a CRAFT calculation. Each axial node may have a unique height.

- The CRAFT code utilizes a user-defined input format for fuel temperature, moderator specific volume, and burnup data. The input data must be specified for each axial node in a user-defined nodal format of up to 50 nodes of arbitrary height. The total assembly active fuel height for the input data descriptions may be different than that specified in the CRC nodal format. Depending on the users needs, the fuel temperature, moderator specific volume and burnup input data may be specified in a different nodal format each time an assembly set of this input data is provided. Nominal fuel temperature input data representing full-power reactor operation must be provided in units of degrees Fahrenheit for each node in each statepoint calculation to be generated by the CRAFT calculation. Nominal moderator specific volume input data representing full-power reactor operation must be provided in units of cubic feet per pound for each node in each statepoint calculation to be generated by the CRAFT calculation. The nodal average burnup input data must be provided in units of GWd/MTU for each node at each statepoint including the BOC statepoint. All burnup input data that is specified must be cumulative from the initial insertion of the fuel assembly in the reactor.

- A continuation CRAFT calculation for an assembly may be initiated from any statepoint in any reactor cycle if all of the nodal consolidated output files ("*.cut" files) from the statepoint calculation immediately preceding the continuation calculation exist in the CRAFT execution directory.

Additional information on the CRAFT code is provided in the CRAFT user information in Attachment I of reference 5.11. Instructions on how to develop CRAFT input decks and execute CRAFT calculations are also provided in Attachment I (Ref. 5.11). This attachment also discusses specific modeling procedures and details relevant to the SAS2H fuel assembly depletion calculations which are generated by CRAFT.

7.5 Input & Output Filename Descriptions for CRAFT and SAS2H

The CRAFT code generates five types of files identified as either "*.input", "*.output", "*.cut", "*.msgs", or "*.notes", where the "*" is the base file set identifier for the statepoint calculation of interest. The "*.cut" and "*.notes" files are the only files that must be retained for CRC evaluation and documentation purposes. All files are generated in the working directory in which the CRAFT calculation is performed.

All CRAFT generated filenames utilize the following format-- "{Base File Set Identifier}.{suffix}". Where the suffix corresponds to one of the five file types previously mentioned, and the base file set identifier is a 25 character name containing essential information necessary to delineate one CRAFT generated SAS2H calculation from another.

The base file set identifier for a statepoint calculation contains the following information:

1) reactor identifier (three character);
2) one-eighth core symmetry assembly number in current reactor cycle (two digit);
3) axial node number (node 1 is always the top node) (two digit);
4) reactor cycle number in which the SAS2H calculation starts (two character);
5) EFPD statepoint at which the SAS2H calculation starts (three digit);
6) reactor cycle number in which the SAS2H calculation ends (two character);
7) EFPD statepoint at which the SAS2H calculation ends (three digit).

The format of the base file set identifier is as follows where the numbers identified as #{number} correspond to one of the seven items previously listed-- #1 A #2 N #3 DC #4 T #5 AC #6 T #7. The letters contained in the base file set identifier are presented explicitly as shown in the previous format. The base file set identifier does not contain any spaces.

The "*.input" files contain a CRAFT generated SAS2H input deck. The "*.output" files contain a complete SAS2H calculation output file. The "*.cut" files contain the corresponding SAS2H input deck followed by an output extraction, from the final ORIGEN-S pass of the SAS2H calculation, which contains data relevant to CRC evaluations. The "*.msgs" files contain the standard run-time messages associated with the SAS2H calculation. The "*.notes" files contain a listing of the isotopes and their concentration which were left behind in generating the initial charge fuel composition for a continuation SAS2H calculation. The "*.notes" files are only created for CRAFT generated SAS2H calculations which represent continuation depletion and decay calculations. The "*.cut" and "*.notes" files contain all of the information which is required to perform CRC evaluations or repeat calculations as necessary for quality assurance purposes. The remainder of the CRAFT generated files may be discarded once the "*.cut" and "*.notes" files have been produced correctly.

7.6 Rodded Assembly Depletion Calculations for Fuel Batches 4 and 5 of Crystal River Unit 3

Depletion calculations for 12 rodded fuel assemblies from fuel batches 4 and 5 of Crystal River Unit 3 are documented in this analysis. The depleted fuel and depleted burnable poison isotopics for these fuel assemblies must be calculated at a number of statepoints during several reactor cycles of Crystal River Unit 3 for use in subsequent CRC reactivity calculations. The assembly depletion calculations documented in this analysis are applicable to CRC statepoints in Cycles-2, -3, -4, -5, and -8 of Crystal River Unit 3. Table 7.6-1 identifies the CRC statepoint EFPD values in each of these cycles for which isotopic compositions are required.

Table 7.6-1 CRC Statepoint EFPD Values Relevant to Rodded Assembly Depletion Calculations for Fuel Batches 4 and 5 of Crystal River Unit 3

Crystal River Unit 3 Reactor Cycle	CRC Statepoint EFPD Values
2	0.0 (BOC)
3	0.0 (BOC)
3	168.5
3	250.0
4	0.0 (BOC)
4	228.1
4	253.0
5	0.0 (BOC)
5	388.5
8	0.0 (BOC)
8	97.6
8	139.8
8	404.0
8	409.6
8	515.5

CRAFT input decks for each of the fuel assemblies identified in Tables 4.1.6-1 and 4.1.7-1 were developed and executed such that their depleted fuel and depleted burnable poison (if applicable) isotopic concentrations were retained at each of the CRC statepoints identified in Table 7.6-1 for which a particular assembly is inserted. The CRAFT input decks were developed in accordance with the instructions presented in Sections 5 and 7 of Attachment I of reference 5.11. SAS2H modeling features incorporated in the depletion calculations of this analysis are described in Attachment I (Ref. 5.11). The CRAFT input decks for the assembly depletions documented in this analysis are provided in Attachments I through XII, as documented in Section 9.

The SAS2H input decks generated for the various depletion calculations have similar structures depending on the characteristics of the fuel assembly axial node that is being depleted. The following listing presents the base SAS2H input deck descriptions.

- Fuel assembly axial node containing empty guide tubes
- Fuel assembly axial node containing an absorbing BPRA inserted in the guide tubes
- Fuel assembly axial node (top node) containing a non-absorbing BPRA region inserted in the guide tubes
- Fuel assembly axial node containing a CRA insertion in the guide tubes (with or without CRA removal during the depletion calculation)
- Fuel assembly axial node containing an APSRA insertion in the guide tubes (with or without APSRA removal and/or APSRA follow rod region insertion during the depletion calculation)

All of the SAS2H input decks generated by CRAFT in this analysis will correspond to one of the afore-mentioned base SAS2H input decks depending on the assembly characteristics being modeled in the specific depletion calculation. The material compositions of the fuel, burnable absorber, and moderator are modified for each SAS2H case depending on the depleted material compositions at the beginning of the SAS2H case and the irradiation parameters for the SAS2H case as defined in the CRAFT input deck. The material specifications for the fuel and burnable absorber have different formats in the SAS2H input decks depending on whether the depletion case represents the initial depletion calculation for the assembly axial node or a continuation depletion calculation for the axial node utilizing previously calculated fuel and burnable poison (if applicable) isotopics for the initial charge compositions.

The following ten example SAS2H input decks are presented to demonstrate the modeling techniques employed by CRAFT in generating appropriate SAS2H depletion cases for the fuel assembly depletion calculations relevant to this analysis. These example input decks are actual SAS2H input decks which were generated and executed during the depletion of fuel assemblies relevant to CRC evaluations (the assemblies from which these examples are obtained may not be documented in this analysis). Each section of the SAS2H input decks are modified as necessary to perform each depletion calculation according to the pertinent information provided in the CRAFT input deck.

SAS2H Depletion Input Deck Example 1: BOL Depletion Calculation for a B&W Fuel Assembly Axial Node Containing 208 Fuel Rods, 16 Empty Guide Tubes, and 1 Empty Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-03, Node-05 (Cyc-1A,     .0 to Cyc-1B,     .0 EFPD)
```

```
44group        latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
uo2 1 den=10.121 1 1066.3 92234  .016 92235 1.930 92236  .009 92238 98.045 end
kr-83        1  0  1-21   1066.3   end
kr-85        1  0  1-21   1066.3   end
sr-90        1  0  1-21   1066.3   end
y-89         1  0  1-21   1066.3   end
mo-95        1  0  1-21   1066.3   end
zr-93        1  0  1-21   1066.3   end
zr-94        1  0  1-21   1066.3   end
zr-95        1  0  1-21   1066.3   end
nb-94        1  0  1-21   1066.3   end
tc-99        1  0  1-21   1066.3   end
rh-103       1  0  1-21   1066.3   end
rh-105       1  0  1-21   1066.3   end
ru-101       1  0  1-21   1066.3   end
ru-106       1  0  1-21   1066.3   end
pd-105       1  0  1-21   1066.3   end
pd-108       1  0  1-21   1066.3   end
ag-109       1  0  1-21   1066.3   end
sb-124       1  0  1-21   1066.3   end
xe-131       1  0  1-21   1066.3   end
xe-132       1  0  1-21   1066.3   end
xe-135       1  0  1-21   1066.3   end
xe-136       1  0  1-21   1066.3   end
cs-134       1  0  1-21   1066.3   end
cs-135       1  0  1-21   1066.3   end
cs-137       1  0  1-21   1066.3   end
ba-136       1  0  1-21   1066.3   end
la-139       1  0  1-21   1066.3   end
ce-144       1  0  1-21   1066.3   end
nd-143       1  0  1-21   1066.3   end
nd-145       1  0  1-21   1066.3   end
pm-147       1  0  1-21   1066.3   end
pm-148       1  0  1-21   1066.3   end
nd-147       1  0  1-21   1066.3   end
sm-147       1  0  1-21   1066.3   end
sm-149       1  0  1-21   1066.3   end
sm-150       1  0  1-21   1066.3   end
sm-151       1  0  1-21   1066.3   end
sm-152       1  0  1-21   1066.3   end
gd-155       1  0  1-21   1066.3   end
eu-153       1  0  1-21   1066.3   end
eu-154       1  0  1-21   1066.3   end
eu-155       1  0  1-21   1066.3   end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'    material composition of moderator within unit cell
'    with smeared inconel spacer grids
h2o   3   den=.7343   .99424     588.9    end
arbm-bormod    .7343 1 0 0 0 5000 100 3 .00092   588.9 end
arbm-spacer    .7343 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                26000 7.0 28000 73.0 3 .00576   588.9 end
'
```

```
'
he    5   end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9398   1   3   1.0922   2    .9576   0   end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=04 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=05 mxrepeats=1 mixmod=3 facmesh=.50 end
  3  .63246   2  .67310   3  .81397 500 2.97599   3 2.99939
'
'     assembly depletion/decay parameters
'
'   Cycle-1A, one-eighth core assembly number 03
power=1.0928     burn=67.20     down=.00000E+00 bfrac=1.000     end
power=1.0928     burn=67.20     down=.00000E+00 bfrac=.9470     end
power=1.0928     burn=67.20     down=.00000E+00 bfrac=.8016     end
power=1.0928     burn=67.20     down=195.29     bfrac=.6603     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 2: Continuation Depletion Calculation for a B&W Fuel Assembly Axial Node Containing 208 Fuel Rods, 16 Empty Guide Tubes, and 1 Empty Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-03, Node-05 (Cyc-1B,    .0 to Cyc-1B, 142.2 EFPD)
44group          latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
arbm-fuel   10.1      183 0 0 0 8016    11.8
      2004   .135E-05       90230   .373E-07
     90232   .411E-08       91231   .568E-08       92233   .578E-07
     92234   .112E-01       92235   .887           92236   .147
     92238   85.6           93237   .934E-02       94236   .466E-08
     94238   .126E-02       94239   .356           94240   .907E-01
     94241   .383E-01       94242   .650E-02       95241   .137E-02
     95601   .578E-05       95243   .524E-03       96242   .289E-04
     96243   .640E-06       96244   .507E-04       96245   .760E-06
     96246   .400E-07        1003   .153E-05        3006   .876E-08
     32072   .147E-06       32073   .448E-06       32074   .373E-06
     33075   .363E-05       32076   .111E-04       34076   .397E-07
     34077   .255E-04       34078   .784E-04       34080   .428E-03
     35081   .640E-03       34082   .103E-02       36082   .897E-05
     36083   .151E-02       36084   .353E-02       36085   .763E-03
     37085   .299E-02       36086   .602E-02       38086   .390E-05
     37087   .787E-02       38087   .249E-07       38088   .113E-01
     38089   .249E-03       39089   .149E-01       38090   .180E-01
```

```
      39090   .469E-05      40090   .418E-03      39091   .541E-03
      40091   .189E-01      40092   .205E-01      40093   .151E-01
      40094   .240E-01      41094   .137E-07      40095   .948E-03
      41095   .103E-02      42095   .228E-01      40096   .251E-01
      42096   .221E-03      42097   .235E-01      42098   .252E-01
      43099   .261E-01      44099   .952E-06      42100   .285E-01
      44100   .122E-02      44101   .238E-01      44102   .224E-01
      44103   .145E-03      45103   .176E-01      44104   .150E-01
      46104   .215E-02      46105   .989E-02      44106   .448E-02
      46106   .496E-02      46107   .544E-02      46108   .342E-02
      47109   .248E-02      46110   .101E-02      48110   .380E-03
      48111   .527E-03      48112   .277E-03      48113   .548E-05
      49113   .123E-06      48114   .311E-03      48601   .575E-07
      49115   .664E-04      50115   .493E-05      48116   .142E-03
      50116   .346E-04      50117   .129E-03      50118   .105E-03
      50119   .112E-03      50120   .109E-03      51121   .115E-03
      50122   .142E-03      52122   .282E-05      50123   .212E-05
      51123   .133E-03      52123   .136E-07      50124   .239E-03
      51124   .114E-06      52124   .225E-05      51125   .234E-03
      52125   .534E-04      50126   .531E-03      52126   .774E-05
      52601   .337E-04      53127   .122E-02      52128   .264E-02
      54128   .217E-04      52611   .359E-05      53129   .544E-02
      54129   .424E-07      52130   .110E-01      54130   .907E-04
      54131   .160E-01      54132   .298E-01      55133   .383E-01
      54134   .462E-01      55134   .147E-02      56134   .435E-03
      55135   .654E-02      56135   .366E-06      54136   .736E-01
      55136   .863E-09      56136   .227E-03      55137   .380E-01
      56137   .815E-03      56138   .394E-01      57139   .377E-01
      56140   .620E-07      57140   .938E-08      58140   .380E-01
      58141   .928E-04      59141   .346E-01      58142   .349E-01
      60142   .192E-03      59143   .118E-06      60143   .304E-01
      58144   .142E-01      60144   .217E-01      60145   .224E-01
      60146   .197E-01      60147   .366E-08      61147   .887E-02
      62147   .224E-02      60148   .112E-01      61148   .166E-07
      61601   .241E-05      62148   .153E-02      62149   .273E-03
      60150   .524E-02      62150   .859E-02      62151   .695E-03
      63151   .334E-05      62152   .459E-02      63152   .763E-06
      64152   .555E-06      63153   .266E-02      62154   .989E-03
      63154   .310E-03      64154   .198E-04      63155   .114E-03
      64155   .986E-05      63156   .184E-07      64156   .989E-03
      64157   .507E-05      64158   .373E-03      65159   .531E-04
      64160   .235E-04      65160   .222E-06      66160   .229E-05
      66161   .917E-05      66162   .599E-05      66163   .319E-05
      66164   .753E-06      67165   .804E-06      68166   .110E-06
      1   1.0     974.3    end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'    material composition of moderator within unit cell
'    with smeared inconel spacer grids
h2o    3   den=.7433    .99424      585.2    end
arbm-bormod     .7433 1 0 0 0 5000 100 3 .00052    585.2 end
arbm-spacer     .7433 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                26000 7.0 28000 73.0 3 .00576   585.2 end
'
'
he    5    end
end comp
'
'     base reactor lattice specification
```

```
'
squarepitch   1.44272    .9398   1   3   1.0922   2   .9576   0   end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=02 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=05 mxrepeats=1 mixmod=3 facmesh=.50 end
  3  .63246   2  .67310   3  .81397 500 2.97599   3 2.99939
'
'     assembly depletion/decay parameters
'
'   Cycle-1B, one-eighth core assembly number 03
power=.92563     burn=71.10     down=.00000E+00 bfrac=1.000     end
power=.92563     burn=71.10     down=14.792     bfrac=.4938     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 3: BOL Depletion Calculation for a B&W Fuel Assembly Top Axial Node Containing 208 Fuel Rods, 16 Guide Tubes with BPR's Inserted, and 1 Empty Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-02, Node-01 (Cyc-1A,    .0 to Cyc-1B,    .0 EFPD)
44group          latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
uo2 1 den=10.121 1  820.6 92234  .021 92235 2.540 92236  .012 92238 97.427 end
kr-83         1   0   1-21    820.6   end
kr-85         1   0   1-21    820.6   end
sr-90         1   0   1-21    820.6   end
y-89          1   0   1-21    820.6   end
mo-95         1   0   1-21    820.6   end
zr-93         1   0   1-21    820.6   end
zr-94         1   0   1-21    820.6   end
zr-95         1   0   1-21    820.6   end
nb-94         1   0   1-21    820.6   end
tc-99         1   0   1-21    820.6   end
rh-103        1   0   1-21    820.6   end
rh-105        1   0   1-21    820.6   end
ru-101        1   0   1-21    820.6   end
ru-106        1   0   1-21    820.6   end
pd-105        1   0   1-21    820.6   end
pd-108        1   0   1-21    820.6   end
ag-109        1   0   1-21    820.6   end
sb-124        1   0   1-21    820.6   end
xe-131        1   0   1-21    820.6   end
xe-132        1   0   1-21    820.6   end
xe-135        1   0   1-21    820.6   end
xe-136        1   0   1-21    820.6   end
cs-134        1   0   1-21    820.6   end
cs-135        1   0   1-21    820.6   end
```

```
cs-137       1  0  1-21   820.6   end
ba-136       1  0  1-21   820.6   end
la-139       1  0  1-21   820.6   end
ce-144       1  0  1-21   820.6   end
nd-143       1  0  1-21   820.6   end
nd-145       1  0  1-21   820.6   end
pm-147       1  0  1-21   820.6   end
pm-148       1  0  1-21   820.6   end
nd-147       1  0  1-21   820.6   end
sm-147       1  0  1-21   820.6   end
sm-149       1  0  1-21   820.6   end
sm-150       1  0  1-21   820.6   end
sm-151       1  0  1-21   820.6   end
sm-152       1  0  1-21   820.6   end
gd-155       1  0  1-21   820.6   end
eu-153       1  0  1-21   820.6   end
eu-154       1  0  1-21   820.6   end
eu-155       1  0  1-21   820.6   end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o   3   den=.7198-   .99424     594.5   end
arbm-bormod     .7198 1 0 0 0 5000 100 3 .00092    594.5 end
arbm-spacer     .7198 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                 26000 7.0 28000 73.0 3 .00576   594.5 end
'
'
'     BPR above the BP absorber region
'
al      6   den=3.700   .52924    594.5 end
o      6   den=3.700   .47076    594.5 end
'
he     5.   end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272   .9398   1   3   1.0922   2    .9576   0   end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=17.780 ncycles=04 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=1 mixmod=3 facmesh=.50 end
  6  .43180    5  .45720   2  .54610    3  .63246    2  .67310
  3  .81397 500 2.91402    3 2.93693
'
'     assembly depletion/decay parameters
'
'   Cycle-1A, one-eighth core assembly number 02
power=.35463     burn=67.20     down=.00000E+00 bfrac=1.000     end
power=.35463     burn=67.20     down=.00000E+00 bfrac=.9470     end
power=.35463     burn=67.20     down=.00000E+00 bfrac=.8016     end
power=.35463     burn=67.20     down=195.29     bfrac=.6603     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 4: Continuation Depletion Calculation for a B&W Fuel Assembly Top Axial Node Containing 208 Fuel Rods, 16 Guide Tubes with BPR's Inserted, and 1 Empty Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-04, Node-01 (Cyc-04, 228.1 to Cyc-04, 253.0 EFPD)
44group          latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'    material specification input
'
arbm-fuel    10.2     192 0 0 0 8016    11.9
      2004   .114E-06       90230   .327E-07
     92233   .309E-07       92234   .177E-01       92235   1.84
     92236   .977E-01       92237   .305E-04       92238   85.4
     93237   .311E-02       93238   .302E-07       94238   .184E-03
     94239   .216           94240   .243E-01       94241   .636E-02
     94242   .337E-03       95241   .915E-04       95601   .946E-06
     95243   .103E-04       96242   .563E-05       96243   .334E-07
     96244   .387E-06        1003   .678E-06        3006   .406E-08
     32072   .410E-07       32073   .142E-06       32074   .119E-06
     33075   .174E-05       32076   .555E-05       34076   .747E-08
     34077   .126E-04       34078   .354E-04       34080   .208E-03
     35081   .311E-03       34082   .521E-03       36082   .185E-05
     36083   .827E-03       36084   .177E-02       36085   .398E-03
     37085   .157E-02       36086   .319E-02       37086   .747E-07
     38086   .720E-06       37087   .417E-02       38087   .674E-08
     38088   .597E-02       38089   .140E-02       39089   .670E-02
     38090   .961E-02       39090   .250E-05       40090   .242E-03
     39091   .208E-02       40091   .816E-02       40092   .106E-01
     40093   .766E-02       40094   .119E-01       41094   .363E-08
     40095   .277E-02       41095   .162E-02       42095   .781E-02
     40096   .121E-01       42096   .659E-04       42097   .112E-01
     42098   .118E-01       42099   .346E-05       43099   .125E-01
     44099   .320E-06       42100   .131E-01       44100   .239E-03
     44101   .109E-01       44102   .973E-02       44103   .115E-02
     45103   .628E-02       44104   .540E-02       46104   .440E-03
     45105   .277E-07       46105   .353E-02       44106   .149E-02
     46106   .793E-03       46107   .129E-02       46108   .770E-03
     47109   .563E-03       46110   .236E-03       48110   .339E-04
     47111   .160E-05       48111   .129E-03       48112   .770E-04
     48113   .429E-05       49113   .123E-07       48114   .102E-03
     48601   .275E-06       49115   .299E-04       50115   .180E-05
     48116   .536E-04       50116   .597E-05       50117   .429E-04
     50118   .383E-04       50119   .414E-04       50120   .410E-04
     51121   .440E-04       50122   .525E-04       52122   .394E-06
     50123   .189E-05       51123   .502E-04       50124   .877E-04
     51124   .137E-06       52124   .245E-06       50125   .467E-06
     51125   .854E-04       52125   .169E-04       50126   .170E-03
     51126   .317E-07       52126   .185E-05       52601   .303E-04
     53127   .410E-03       52128   .107E-02       54128   .331E-05
     52611   .506E-04       53129   .221E-02       54129   .296E-08
     52130   .490E-02       54130   .155E-04       53131   .862E-04
     54131   .766E-02       52132   .735E-05       54132   .128E-01
     54133   .709E-04       55133   .183E-01       54134   .217E-01
     55134   .338E-03       56134   .483E-04       55135   .800E-02
```

```
     56135   .682E-07      54136   .287E-01      55136   .350E-05
     56136   .758E-04      55137   .175E-01      56137   .398E-03
     56138   .188E-01      57139   .180E-01      56140   .460E-03
     57140   .693E-04      58140   .182E-01      58141   .178E-02
     59141   .149E-01      58142   .168E-01      60142   .391E-04
     58143   .498E-07      59143   .509E-03      60143   .156E-01
     58144   .869E-02      60144   .770E-02      60145   .112E-01
     60146   .911E-02      60147   .131E-03      61147   .486E-02
     62147   .119E-02      60148   .521E-02      61148   .207E-05
     61601   .211E-04      62148   .421E-03      61149   .359E-06
     62149   .183E-03      60150   .225E-02      62150   .343E-02
     61151   .123E-08      62151   .601E-03      63151   .170E-05
     62152   .179E-02      63152   .229E-05      64152   .124E-05
     62153   .475E-07      63153   .804E-03      62154   .338E-03
     63154   .586E-04      64154   .206E-05      63155   .490E-04
     64155   .900E-06      63156   .119E-04      64156   .222E-03
     64157   .216E-05      64158   .827E-04      65159   .124E-04
     64160   .529E-05      65160   .124E-06      66160   .148E-06
     66161   .214E-05      66162   .108E-05      66163   .460E-06
     66164   .137E-06      67165   .835E-07      68166   .115E-07
     1    1.0     872.8    end
arbm-zirc4  6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
            40000 98.18 2 1.0 640.0 end
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o    3   den=.7198    .99424      594.5    end
arbm-bormod     .7198 1 0 0 0 5000 100 3 .00022    594.5 end
arbm-spacer     .7198 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                 26000 7.0 28000 73.0 3 .00576    594.5 end
'
'
'     BPR above the BP absorber region
'
al      6   den=3.700   .52924    594.5 end
o       6   den=3.700   .47076    594.5 end
'
he      5   end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9390   1   3   1.0922   2    .9576   0   end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=17.780 ncycles=01 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=1 mixmod=3 facmesh=.50 end
  6  .43180    5  .45720    2  .54610    3  .63246    2  .67310
  3  .81397 500 2.91402    3 2.93693
'
'     assembly depletion/decay parameters
'
'   Cycle-04, one-eighth core assembly number 04
power=.45617     burn=24.90     down=24.000     bfrac=1.000     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 5: BOL Depletion Calculation for a B&W Fuel Assembly Axial Node (Other than Top Node) Containing 208 Fuel Rods, 16 Guide Tubes with BPR's Inserted, and 1 Empty Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-02, Node-02 (Cyc-1A,     .0 to Cyc-1B,     .0 EFPD)
44group          latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
uo2 1 den=10.121 1   936.2 92234   .021 92235 2.540 92236   .012 92238 97.427 end
kr-83          1   0   1-21     936.2    end
kr-85          1   0   1-21     936.2    end
sr-90          1   0   1-21     936.2    end
y-89           1   0   1-21     936.2    end
mo-95          1   0   1-21     936.2    end
zr-93          1   0   1-21     936.2    end
zr-94          1   0   1-21     936.2    end
zr-95          1   0   1-21     936.2    end
nb-94          1   0   1-21     936.2    end
tc-99          1   0   1-21     936.2    end
rh-103         1   0   1-21     936.2    end
rh-105         1   0   1-21     936.2    end
ru-101         1   0   1-21     936.2    end
ru-106         1   0   1-21     936.2    end
pd-105         1   0   1-21     936.2    end
pd-108         1   0   1-21     936.2    end
ag-109         1   0   1-21     936.2    end
sb-124         1   0   1-21     936.2    end
xe-131         1   0   1-21     936.2    end
xe-132         1   0   1-21     936.2    end
xe-135         1   0   1-21     936.2    end
xe-136         1   0   1-21     936.2    end
cs-134         1   0   1-21     936.2    end
cs-135         1   0   1-21     936.2    end
cs-137         1   0   1-21     936.2    end
ba-136         1   0   1-21     936.2    end
la-139         1   0   1-21     936.2    end
ce-144         1   0   1-21     936.2    end
nd-143         1   0   1-21     936.2    end
nd-145         1   0   1-21     936.2    end
pm-147         1   0   1-21     936.2    end
pm-148         1   0   1-21     936.2    end
nd-147         1   0   1-21     936.2    end
sm-147         1   0   1-21     936.2    end
sm-149         1   0   1-21     936.2    end
sm-150         1   0   1-21     936.2    end
sm-151         1   0   1-21     936.2    end
sm-152         1   0   1-21     936.2    end
gd-155         1   0   1-21     936.2    end
eu-153         1   0   1-21     936.2    end
eu-154         1   0   1-21     936.2    end
eu-155         1   0   1-21     936.2    end
arbm-zirc4  6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
            40000 98.18 2 1.0 640.0 end
```

```
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o    3    den=.7226    .99424      593.4    end
arbm-bormod     .7226 1 0 0 0 5000 100 3 .00092    593.4 end
arbm-spacer     .7226 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                26000 7.0 28000 73.0 3 .00576    593.4 end
'
'
'     burnable absorber pellet specification
'
b4c    4    den=3.700   .01340    593.4 end
al     4    den=3.700   .52215    593.4 end
o      4    den=3.700   .46445    593.4 end
'
he     5    end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9398   1   3   1.0922   2    .9576   0    end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=04 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=1 mixmod=3 facmesh=.50 end
  4  .43180   5  .45720   2  .54610   3  .63246   2  .67310
  3  .81397 500 2.91402   3 2.93693
'
'     assembly depletion/decay parameters
'
'   Cycle-1A, one-eighth core assembly number 02
power=.63623     burn=67.20     down=.00000E+00 bfrac=1.000     end
power=.63623     burn=67.20     down=.00000E+00 bfrac=.9470     end
power=.63623     burn=67.20     down=.00000E+00 bfrac=.8016     end
power=.63623     burn=67.20     down=195.29     bfrac=.6603     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 6: Continuation Depletion Calculation for a B&W Fuel Assembly Axial Node (Other than Top Node) Containing 208 Fuel Rods, 16 Guide Tubes with BPR's Inserted, and 1 Empty Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-04, Node-05 (Cyc-04, 228.1 to Cyc-04, 253.0 EFPD)
44group         latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
arbm-fuel    10.3     199 0 0 0 8016   11.8
      2004   .129E-05      90230   .284E-07
     90232   .273E-08      91231   .302E-08       92233   .657E-07
```

92234	.154E-01	92235	1.30	92236	.192
92237	.128E-03	92238	85.0	93237	.116E-01
93238	.275E-06	94236	.657E-08	94237	.299E-08
94238	.159E-02	94239	.388	94240	.873E-01
94241	.408E-01	94242	.593E-02	95241	.637E-03
95601	.995E-05	95243	.512E-03	96242	.118E-03
96243	.189E-05	96244	.533E-04	96245	.860E-06
96246	.401E-07	1003	.174E-05	3006	.833E-08
32072	.123E-06	32073	.506E-06	32074	.311E-06
33075	.425E-05	32076	.132E-04	34076	.472E-07
34077	.302E-04	34078	.904E-04	34080	.502E-03
35081	.752E-03	34082	.123E-02	36082	.105E-04
36083	.182E-02	36084	.421E-02	36085	.914E-03
37085	.361E-02	36086	.728E-02	37086	.452E-06
38086	.482E-05	37087	.951E-02	38087	.229E-07
38088	.136E-01	38089	.290E-02	39089	.154E-01
38090	.218E-01	39090	.566E-05	40090	.614E-03
39091	.442E-02	40091	.191E-01	40092	.246E-01
40093	.180E-01	40094	.285E-01	41094	.116E-07
40095	.630E-02	41095	.371E-02	42095	.190E-01
40096	.295E-01	42096	.421E-03	42097	.275E-01
42098	.293E-01	42099	.829E-05	43099	.302E-01
44099	.112E-05	42100	.330E-01	44100	.151E-02
44101	.274E-01	44102	.256E-01	44103	.322E-02
45103	.160E-01	44104	.162E-01	46104	.279E-02
45105	.914E-07	46105	.111E-01	44106	.560E-02
46106	.337E-02	46107	.539E-02	46108	.341E-02
47109	.242E-02	46110	.100E-02	48110	.381E-03
47111	.671E-05	48111	.523E-03	48112	.285E-03
48113	.634E-05	49113	.405E-07	48114	.332E-03
48601	.860E-06	49115	.715E-04	50115	.536E-05
48116	.155E-03	50116	.367E-04	50117	.137E-03
50118	.114E-03	50119	.121E-03	50120	.119E-03
51121	.125E-03	50122	.154E-03	52122	.312E-05
50123	.496E-05	51123	.143E-03	52123	.131E-07
50124	.260E-03	51124	.974E-06	52124	.170E-05
50125	.138E-05	51125	.259E-03	52125	.509E-04
50126	.560E-03	51126	.134E-06	52126	.786E-05
52601	.934E-04	53127	.125E-02	52128	.295E-02
54128	.275E-04	52611	.138E-03	53129	.597E-02
54129	.644E-07	52130	.126E-01	54130	.991E-04
53131	.217E-03	54131	.180E-01	52132	.182E-04
54132	.344E-01	54133	.171E-03	55133	.442E-01
54134	.539E-01	55134	.205E-02	56134	.313E-03
55135	.113E-01	56135	.110E-05	54136	.813E-01
55136	.130E-04	56136	.290E-03	55137	.438E-01
56137	.106E-02	56138	.462E-01	57139	.438E-01
56140	.108E-02	57140	.163E-03	58140	.448E-01
58141	.418E-02	59141	.364E-01	58142	.411E-01
60142	.245E-03	58143	.113E-06	59143	.115E-02
60143	.347E-01	58144	.200E-01	60144	.221E-01
60145	.264E-01	60146	.231E-01	60147	.310E-03
61147	.101E-01	62147	.264E-02	60148	.130E-01
61148	.900E-05	61601	.698E-04	62148	.203E-02
61149	.108E-05	62149	.300E-03	60150	.593E-02
62150	.957E-02	61151	.337E-08	62151	.880E-03
63151	.107E-05	62152	.496E-02	63152	.273E-05
64152	.246E-05	62153	.225E-06	63153	.297E-02
62154	.106E-02	63154	.384E-03	64154	.137E-04
63155	.133E-03	64155	.156E-05	63156	.624E-04

```
     64156    .988E-03       64157    .512E-05       64158    .364E-03
     65159    .526E-04       64160    .233E-04       65160    .126E-05
     66160    .141E-05       66161    .887E-05       66162    .580E-05
     66163    .317E-05       66164    .755E-06       67165    .627E-06
     68166    .860E-07
     1   1.0    1010.8    end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o   3   den=.7343    .99424     588.9    end
arbm-bormod     .7343 1 0 0 0 5000 100 3 .00022    588.9 end
arbm-spacer     .7343 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                26000 7.0 28000 73.0 3 .00576    588.9 end
'
'
'     burnable absorber pellet specification
'
arbm-bp   3.699 5 0 0 0
       5010    .225E-02
       5011    .140
      6012    .435E-01
     13027  52.827 -8016  46.987
     4 1.0  588.9 end
'
he    5   end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9390   1   3   1.0922   2    .9576   0   end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=01 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=1 mixmod=3 facmesh=.50 end
  4  .43180   5  .45720   2  .54610   3  .63246   2  .67310
  3  .81397 500 2.91402   3 2.93693
'
'     assembly depletion/decay parameters
'
'   Cycle-04, one-eighth core assembly number 04
power=1.0347     burn=24.90     down=24.000    bfrac=1.000     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 7: BOL Depletion Calculation for a B&W Fuel Assembly Axial Node Containing 208 Fuel Rods, 16 Guide Tubes with a 16 Rod CRA Inserted for a Portion of the Depletion, and 1 Empty (Water-filled) Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-07, Node-07 (Cyc-1A,    .0 to Cyc-1B,    .0 EFPD)
44group        latticecell
'
```

```
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
uo2 1 den=10.121 1 1061.9 92234  .024 92235 2.830 92236  .013 92238 97.133 end
kr-83          1   0   1-21    1061.9    end
kr-85          1   0   1-21    1061.9    end
sr-90          1   0   1-21    1061.9    end
y-89           1   0   1-21    1061.9    end
mo-95          1   0   1-21    1061.9    end
zr-93          1   0   1-21    1061.9    end
zr-94          1   0   1-21    1061.9    end
zr-95          1   0   1-21    1061.9    end
nb-94          1   0   1-21    1061.9    end
tc-99          1   0   1-21    1061.9    end
rh-103         1   0   1-21    1061.9    end
rh-105         1   0   1-21    1061.9    end
ru-101         1   0   1-21    1061.9    end
ru-106         1   0   1-21    1061.9    end
pd-105         1   0   1-21    1061.9    end
pd-108         1   0   1-21    1061.9    end
ag-109         1   0   1-21    1061.9    end
sb-124         1   0   1-21    1061.9    end
xe-131         1   0   1-21    1061.9    end
xe-132         1   0   1-21    1061.9    end
xe-135         1   0   1-21    1061.9    end
xe-136         1   0   1-21    1061.9    end
cs-134         1   0   1-21    1061.9    end
cs-135         1   0   1-21    1061.9    end
cs-137         1   0   1-21    1061.9    end
ba-136         1   0   1-21    1061.9    end
la-139         1   0   1-21    1061.9    end
ce-144         1   0   1-21    1061.9    end
nd-143         1   0   1-21    1061.9    end
nd-145         1   0   1-21    1061.9    end
pm-147         1   0   1-21    1061.9    end
pm-148         1   0   1-21    1061.9    end
nd-147         1   0   1-21    1061.9    end
sm-147         1   0   1-21    1061.9    end
sm-149         1   0   1-21    1061.9    end
sm-150         1   0   1-21    1061.9    end
sm-151         1   0   1-21    1061.9    end
sm-152         1   0   1-21    1061.9    end
gd-155         1   0   1-21    1061.9    end
eu-153         1   0   1-21    1061.9    end
eu-154         1   0   1-21    1061.9    end
eu-155         1   0   1-21    1061.9    end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o   3   den=.7433    .99424      585.2    end
arbm-bormod     .7433 1 0 0 0 5000 100 3 .00090    585.2 end
arbm-spacer     .7433 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                 26000 7.0 28000 73.0 3 .00576    585.2 end
'
'
'    control rod material specification
```

```
'
arbm-ss304 7.92 4 0 0 0 24304 19.0 25055 2.0 26304 69.5 28304 9.5
             6 1.0 640.0 end
 arbm-cr     10.17    4   0   0   0
           47000      79.80000
           49000      15.00000
           48000       5.00000
           13027        .20000
             7 1.0  585.1721    end
'
he     5   end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9398   1   3   1.0922   2    .9576  0   end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=11 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=0 mixmod=3 facmesh=.50 end
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
'
'     assembly depletion/decay parameters
'
'   Cycle-1A, one-eighth core assembly number 07
power=1.0933     burn=2.500     down=.00000E+00 bfrac=1.000     end
power=1.0933     burn=6.500     down=.00000E+00 bfrac=1.003     end
power=1.0933     burn=1.000     down=.00000E+00 bfrac=1.005     end
power=1.0933     burn=1.000     down=.00000E+00 bfrac=1.006     end
power=1.0933     burn=1.000     down=.00000E+00 bfrac=1.007     end
power=1.0933     burn=.9700     down=.00000E+00 bfrac=1.007     end
power=1.0933     burn=1.040     down=.00000E+00 bfrac=1.008     end
power=1.0933     burn=63.70     down=.00000E+00 bfrac=1.030     end
power=1.0933     burn=63.70     down=.00000E+00 bfrac=.9481     end
power=1.0933     burn=63.70     down=.00000E+00 bfrac=.8072     end
power=1.0933     burn=63.70     down=195.29     bfrac=.6578     end
'
```

```
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 8: Continuation Depletion Calculation for a B&W Fuel Assembly Axial Node Containing 208 Fuel Rods, 16 Guide Tubes with a 16 Rod CRA Inserted for a Portion of the Depletion, and 1 Empty (Water-filled) Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-07, Node-07 (Cyc-1B,     .0 to Cyc-1B, 142.2 EFPD)
44group          latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
arbm-fuel    10.1      183 0 0 0 8016    11.8
      2004    .900E-06      90230    .585E-07
     90232    .500E-08      91231    .825E-08       92233    .859E-07
     92234    .175E-01      92235    1.55           92236    .179
     92238    84.9          93237    .931E-02       94236    .407E-08
     94238    .103E-02      94239    .349           94240    .698E-01
     94241    .290E-01      94242    .356E-02       95241    .104E-02
     95601    .428E-05      95243    .243E-03       96242    .169E-04
     96243    .315E-06      96244    .197E-04       96245    .267E-06
     96246    .102E-07       1003    .151E-05        3006    .982E-08
     32072    .131E-06      32073    .431E-06       32074    .363E-06
     33075    .370E-05      32076    .116E-04       34076    .349E-07
     34077    .266E-04      34078    .784E-04       34080    .438E-03
     35081    .657E-03      34082    .109E-02       36082    .750E-05
     36083    .164E-02      36084    .370E-02       36085    .818E-03
     37085    .321E-02      36086    .647E-02       38086    .356E-05
     37087    .846E-02      38087    .226E-07       38088    .122E-01
     38089    .278E-03      39089    .161E-01       38090    .195E-01
     39090    .507E-05      40090    .448E-03       39091    .592E-03
     40091    .203E-01      40092    .218E-01       40093    .159E-01
     40094    .250E-01      41094    .118E-07       40095    .989E-03
     41095    .107E-02      42095    .236E-01       40096    .257E-01
     42096    .189E-03      42097    .240E-01       42098    .254E-01
     43099    .265E-01      44099    .962E-06       42100    .285E-01
     44100    .104E-02      44101    .237E-01       44102    .218E-01
     44103    .132E-03      45103    .166E-01       44104    .134E-01
     46104    .171E-02      46105    .863E-02       44106    .356E-02
     46106    .373E-02      46107    .411E-02       46108    .254E-02
     47109    .185E-02      46110    .757E-03       48110    .236E-03
     48111    .404E-03      48112    .222E-03       48113    .616E-05
     49113    .105E-06      48114    .267E-03       48601    .496E-07
     49115    .873E-04      50115    .442E-05       48116    .129E-03
     50116    .209E-05      50117    .111E-03       50118    .941E-04
     50119    .100E-03      50120    .989E-04       51121    .104E-03
     50122    .128E-03      52122    .227E-05       50123    .203E-05
     51123    .122E-03      52123    .993E-08       50124    .214E-03
     51124    .917E-07      52124    .182E-05       51125    .208E-03
     52125    .476E-04      50126    .448E-03       52126    .599E-05
     52601    .294E-04      53127    .107E-02       52128    .249E-02
     54128    .169E-04      52611    .335E-05       53129    .517E-02
     54129    .274E-07      52130    .108E-01       54130    .678E-04
```

```
     54131   .161E-01      54132   .291E-01      55133   .390E-01
     54134   .469E-01      55134   .126E-02      56134   .373E-03
     55135   .873E-02      56135   .269E-06      54136   .712E-01
     55136   .794E-09      56136   .204E-03      55137   .380E-01
     56137   .815E-03      56138   .401E-01      57139   .383E-01
     56140   .633E-07      57140   .959E-08      58140   .387E-01
     58141   .948E-04      59141   .353E-01      58142   .359E-01
     60142   .153E-03      59143   .123E-06      60143   .326E-01
     58144   .148E-01      60144   .214E-01      60145   .233E-01
     60146   .199E-01      60147   .373E-08      61147   .938E-02
     62147   .237E-02      60148   .113E-01      61148   .181E-07
     61601   .264E-05      62148   .142E-02      62149   .307E-03
     60150   .507E-02      62150   .832E-02      62151   .839E-03
     63151   .421E-05      62152   .428E-02      63152   .989E-06
     64152   .644E-06      63153   .232E-02      62154   .863E-03
     63154   .255E-03      64154   .163E-04      63155   .979E-04
     64155   .863E-05      63156   .136E-07      64156   .763E-03
     64157   .448E-05      64158   .280E-03      65159   .397E-04
     64160   .174E-04      65160   .149E-06      66160   .155E-05
     66161   .695E-05      66162   .421E-05      66163   .217E-05
     66164   .568E-06      67165   .490E-06      68166   .674E-07
     1   1.0     817.9   end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o   3   den=.7588    .99424      578.4     end
arbm-bormod     .7588 1 0 0 0 5000 100 3 .00054    578.4 end
arbm-spacer     .7588 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                 26000 7.0 28000 73.0 3 .00576   578.4 end
'
'
'    control rod material specification
'
arbm-ss304 7.92 4 0 0 0 24304 19.0 25055 2.0 26304 69.5 28304 9.5
            6 1.0 640.0 end
 arbm-cr      10.17   4   0   0   0
          47000       79.80000
          49000       15.00000
          48000        5.00000
          13027         .20000
            7 1.0  578.3998   end
'
he    5    end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9398   1   3   1.0922   2    .9576   0   end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=10 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=0 mixmod=3 facmesh=.50 end
  7  .49784    5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205    3 2.40078
  7  .49784    5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205    3 2.40078
```

```
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
'
'     assembly depletion/decay parameters
'
'   Cycle-1B, one-eighth core assembly number 07
power=.59608     burn=4.460    down=.00000E+00 bfrac=1.000     end
power=.59608     burn=24.44    down=.00000E+00 bfrac=1.050     end
power=.59608     burn=42.89    down=.00000E+00 bfrac=.8052     end
power=.59608     burn=42.89    down=.00000E+00 bfrac=.5791     end
power=.59608     burn=9.320    down=.00000E+00 bfrac=.5087     end
power=.59608     burn=1.000    down=.00000E+00 bfrac=.5220     end
power=.59608     burn=1.310    down=.00000E+00 bfrac=.5240     end
power=.59608     burn=7.900    down=.00000E+00 bfrac=.5316     end
power=.59608     burn=7.790    down=.00000E+00 bfrac=.5262     end
power=.59608     burn=.2000    down=14.792     bfrac=.5187     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 9: BOL Depletion Calculation for a B&W Fuel Assembly Axial Node Containing 208 Fuel Rods, 16 Guide Tubes with a 16 Rod APSRA Inserted for a Portion of the Depletion with a Subsequent APSRA Follow Rod Region Insertion with a Subsequent APSRA Removal, and 1 Empty (Water-filled) Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-18, Node-12 {Cyc-1A,    .0 to Cyc-1B,    .0 EFPD}
44group          latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
uo2 1 den=10.121 1 1139.7 92234  .016 92235 1.930 92236  .009 92238 98.045 end
kr-83         1   0   1-21   1139.7   end
kr-85         1   0   1-21   1139.7   end
sr-90         1   0   1-21   1139.7   end
y-89          1   0   1-21   1139.7   end
mo-95         1   0   1-21   1139.7   end
zr-93         1   0   1-21   1139.7   end
zr-94         1   0   1-21   1139.7   end
zr-95         1   0   1-21   1139.7   end
```

```
nb-94          1   0   1-21   1139.7   end
tc-99          1   0   1-21   1139.7   end
rh-103         1   0   1-21   1139.7   end
rh-105         1   0   1-21   1139.7   end
ru-101         1   0   1-21   1139.7   end
ru-106         1   0   1-21   1139.7   end
pd-105         1   0   1-21   1139.7   end
pd-108         1   0   1-21   1139.7   end
ag-109         1   0   1-21   1139.7   end
sb-124         1   0   1-21   1139.7   end
xe-131         1   0   1-21   1139.7   end
xe-132         1   0   1-21   1139.7   end
xe-135         1   0   1-21   1139.7   end
xe-136         1   0   1-21   1139.7   end
cs-134         1   0   1-21   1139.7   end
cs-135         1   0   1-21   1139.7   end
cs-137         1   0   1-21   1139.7   end
ba-136         1   0   1-21   1139.7   end
la-139         1   0   1-21   1139.7   end
ce-144         1   0   1-21   1139.7   end
nd-143         1   0   1-21   1139.7   end
nd-145         1   0   1-21   1139.7   end
pm-147         1   0   1-21   1139.7   end
pm-148         1   0   1-21   1139.7   end
nd-147         1   0   1-21   1139.7   end
sm-147         1   0   1-21   1139.7   end
sm-149         1   0   1-21   1139.7   end
sm-150         1   0   1-21   1139.7   end
sm-151         1   0   1-21   1139.7   end
sm-152         1   0   1-21   1139.7   end
gd-155         1   0   1-21   1139.7   end
eu-153         1   0   1-21   1139.7   end
eu-154         1   0   1-21   1139.7   end
eu-155         1   0   1-21   1139.7   end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o   3   den=.7717    .99424      572.3    end
arbm-bormod     .7717 1 0 0 0 5000 100 3 .00090   572.3 end
arbm-spacer     .7717 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                26000 7.0 28000 73.0 3 .00576   572.3 end
'
'
'    APSR follow rod material specification
'
arbm-ss304 7.92 4 0 0 0 24304 19.0 25055 2.0 26304 69.5 28304 9.5
            6 1.0 640.0 end
'
'    axial power shaping rod material specification
'
arbm-ss304 7.92 4 0 0 0 24304 19.0 25055 2.0 26304 69.5 28304 9.5
            6 1.0 640.0 end
 arbm-apsr    10.17    4   0    0    0
           47000       79.80000
           49000       15.00000
           48000        5.00000
           13027         .20000
             7 1.0  572.3109   end
```

```
'
he     5   end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9398   1   3   1.0922   2    .9576   0    end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=12 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=0 mixmod=3 facmesh=.50 end
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784    5   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784    3   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784    3   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784    3   .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784    3   .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
'
'     assembly depletion/decay parameters
'
'   Cycle-1A, one-eighth core assembly number 18
power=.63853     burn=.7800     down=.00000E+00 bfrac=1.000     end
power=.63853     burn=1.420     down=.00000E+00 bfrac=1.001     end
power=.63853     burn=1.800     down=.00000E+00 bfrac=1.002     end
power=.63853     burn=27.29     down=.00000E+00 bfrac=1.011     end
power=.63853     burn=45.42     down=.00000E+00 bfrac=1.036     end
power=.63853     burn=45.42     down=.00000E+00 bfrac=.9710     end
power=.63853     burn=58.01     down=.00000E+00 bfrac=.8566     end
power=.63853     burn=58.01     down=.00000E+00 bfrac=.7138     end
power=.63853     burn=11.91     down=.00000E+00 bfrac=.6388     end
power=.63853     burn=7.500     down=.00000E+00 bfrac=.6591     end
power=.63853     burn=3.800     down=.00000E+00 bfrac=.6174     end
power=.63853     burn=7.440     down=195.29     bfrac=.5757     end
'
'     end of input
'
end
```

SAS2H Depletion Input Deck Example 10: Continuation Depletion Calculation for a B&W Fuel Assembly Axial Node Containing 208 Fuel Rods, 16 Guide Tubes with a 16 Rod APSRA Inserted for a Portion of the Depletion with a Subsequent APSRA Follow Rod Region Insertion with a Subsequent APSRA Removal, and 1 Empty (Water-filled) Instrument Tube

```
=sas2h    parm=skipshipdata
Crystal River, Unit 3 Assy-18, Node-11 (Cyc-1B,    .0 to Cyc-1B, 142.2 EFPD)
44group         latticecell
'
'   fuel density based on mass of uranium per assembly & total pellet stack
'   volume to account for fuel volume loss to pellet chamfers
'
'     material specification input
'
arbm-fuel   10.1      183 0 0 0 8016    11.9
      2004    .902E-06        90230    .394E-07
     90232    .360E-08        91231    .504E-08        92233    .518E-07
     92234    .117E-01        92235    1.00            92236    .129
     92238    85.7            93237    .710E-02        94236    .285E-08
     94238    .819E-03        94239    .326            94240    .737E-01
     94241    .280E-01        94242    .391E-02        95241    .101E-02
     95601    .404E-05        95243    .249E-03        96242    .175E-04
     96243    .312E-06        96244    .191E-04        96245    .233E-06
     96246    .101E-07         1003    .125E-05         3006    .778E-08
     32072    .118E-06        32073    .367E-06        32074    .304E-06
     33075    .302E-05        32076    .922E-05        34076    .257E-07
     34077    .214E-04        34078    .644E-04        34080    .353E-03
     35081    .531E-03        34082    .864E-03        36082    .614E-05
     36083    .129E-02        36084    .292E-02        36085    .641E-03
     37085    .251E-02        36086    .507E-02        38086    .254E-05
     37087    .662E-02        38087    .191E-07        38088    .950E-02
     38089    .215E-03        39089    .125E-01        38090    .152E-01
     39090    .394E-05        40090    .350E-03        39091    .463E-03
     40091    .159E-01        40092    .172E-01        40093    .126E-01
     40094    .200E-01        41094    .109E-07        40095    .795E-03
     41095    .864E-03        42095    .190E-01        40096    .208E-01
     42096    .144E-03        42097    .195E-01        42098    .208E-01
     43099    .218E-01        44099    .792E-06        42100    .234E-01
     44100    .809E-03        44101    .196E-01        44102    .182E-01
     44103    .116E-03        45103    .145E-01        44104    .119E-01
     46104    .144E-02        46105    .799E-02        44106    .346E-02
     46106    .367E-02        46107    .415E-02        46108    .260E-02
     47109    .191E-02        46110    .764E-03        48110    .236E-03
     48111    .401E-03        48112    .215E-03        48113    .500E-05
     49113    .960E-07        48114    .245E-03        48601    .446E-07
     49115    .785E-04        50115    .394E-05        48116    .114E-03
     50116    .173E-05        50117    .102E-03        50118    .840E-04
     50119    .895E-04        50120    .878E-04        51121    .926E-04
     50122    .114E-03        52122    .179E-05        50123    .172E-05
     51123    .107E-03        52123    .713E-08        50124    .191E-03
     51124    .723E-07        52124    .145E-05        51125    .187E-03
     52125    .428E-04        50126    .418E-03        52126    .583E-05
     52601    .267E-04        53127    .970E-03        52128    .214E-02
     54128    .136E-04        52611    .289E-05        53129    .442E-02
     54129    .217E-07        52130    .898E-02        54130    .610E-04
     54131    .135E-01        54132    .241E-01        55133    .320E-01
     54134    .384E-01        55134    .980E-03        56134    .290E-03
     55135    .638E-02        56135    .199E-06        54136    .596E-01
```

```
     55136   .658E-09      56136   .177E-03      55137   .313E-01
     56137   .668E-03      56138   .326E-01      57139   .311E-01
     56140   .514E-07      57140   .778E-08      58140   .314E-01
     58141   .771E-04      59141   .287E-01      58142   .290E-01
     60142   .127E-03      59143   .101E-06      60143   .257E-01
     58144   .119E-01      60144   .174E-01      60145   .188E-01
     60146   .161E-01      60147   .305E-08      61147   .771E-02
     62147   .195E-02      60148   .926E-02      61148   .138E-07
     61601   .201E-05      62148   .112E-02      62149   .232E-03
     60150   .425E-02      62150   .686E-02      62151   .631E-03
     63151   .312E-05      62152   .377E-02      63152   .751E-06
     64152   .490E-06      63153   .200E-02      62154   .778E-03
     63154   .207E-03      64154   .133E-04      63155   .908E-04
     64155   .792E-05      63156   .125E-07      64156   .713E-03
     64157   .391E-05      64158   .274E-03      65159   .401E-04
     64160   .178E-04      65160   .135E-06      66160   .142E-05
     66161   .706E-05      66162   .449E-05      66163   .225E-05
     66164   .542E-06      67165   .542E-06      68166   .703E-07
     1   1.0     863.7    end
arbm-zirc4 6.56 5 0 0 0 8016 0.12 24000 0.10 26000 0.20 50000 1.40
           40000 98.18 2 1.0 640.0 end
'
'     material composition of moderator within unit cell
'     with smeared inconel spacer grids
h2o    3   den=.7684    .99424     573.9    end
arbm-bormod     .7684 1 0 0 0 5000 100 3 .00054    573.9 end
arbm-spacer     .7684 5 0 0 0 14000 2.5 22000 2.5 24000 15.0
                 26000 7.0 28000 73.0 3 .00576   573.9 end
'
'
'    APSR follow rod material specification
'
arbm-ss304 7.92 4 0 0 0 24304 19.0 25055 2.0 26304 69.5 28304 9.5
            6 1.0 640.0 end
'
'    axial power shaping rod material specification
'
arbm-ss304 7.92 4 0 0 0 24304 19.0 25055 2.0 26304 69.5 28304 9.5
            6 1.0 640.0 end
 arbm-apsr    10.17     4    0     0    0
          47000       79.80000
          49000       15.00000
          48000        5.00000
          13027         .20000
            7 1.0  573.8673    end
'
he     5    end
end comp
'
'     base reactor lattice specification
'
squarepitch   1.44272    .9398   1   3   1.0922   2    .9576   0    end
more data szf=0.50 end
'
'     assembly specification
'
npin/assembly=208 fuelngth=20.003 ncycles=06 nlib/cyc=1 lightel=0
printlevel=05 inplevel=2 numztotal=08 mxrepeats=0 mixmod=3 facmesh=.50 end
  7  .49784    5  .50546    6  .55880    3  .63246    2  .67310
  3  .81397 500 2.38205    3 2.40078
```

```
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  7  .49784   5  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784   3  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784   3  .50546   6  .55880   3  .63246   2  .67310
  3  .81397 500 2.38205   3 2.40078
  3  .49784   3  .50546   3  .55880   3  .63246   2  .67310
  3  .81397 500 2.97599   3 2.99939
'
'     assembly depletion/decay parameters
'
'   Cycle-1B, one-eighth core assembly number 18
power=.64570     burn=6.340     down=.00000E+00 bfrac=1.000     end
power=.64570     burn=10.50     down=.00000E+00 bfrac=1.029     end
power=.64570     burn=54.86     down=.00000E+00 bfrac=.8150     end
power=.64570     burn=37.64     down=.00000E+00 bfrac=.5874     end
power=.64570     burn=30.66     down=.00000E+00 bfrac=.5207     end
power=.64570     burn=2.200     down=14.792     bfrac=.5189     end
'
'     end of input
'
end
```

Attachment XXV (moved to reference 5.15) contains the CRAFT generated consolidated SAS2H output files for the depletion calculations documented in this analysis as identified in the attachment listing of Section 9. The consolidated output files contain the following information:

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

7.7 Isotopic Results

Isotopic results for the set of 29 principal isotopes identified in Table 7.7-1 are tabulated for each axial node of each fuel assembly at each CRC statepoint other than beginning of life (BOC of first reactor cycle of in which the assembly is inserted) statepoints. The program entitled "CRC_DATA_TABULIZER.exe" as described in Section 6.1, and Attachment V of reference 5.12, was used to create the principal isotope result tables included in this analysis. Attachments XIII through XXIV (moved to reference 5.14) contain the principal isotope tabulations for the assemblies documented in this analysis. The consolidated output files for the SAS2H depletion calculations contain isotopic concentrations for all isotopes included in the ORIGEN-S cross-section library. The ORIGEN-S cross-section library contains a considerably larger number of isotopes than the 29 isotopes included in the principal isotope set. Isotopic concentrations may be extracted from the consolidated SAS2H output files for subsequent evaluation and/or use in CRC reactivity analyses.

Table 7.7-1 Principal Isotopes

Mo-95	Tc-99	Ru-101	Rh-103	Ag-109
Nd-143	Nd-145	Sm-147	Sm-149	Sm-150
Sm-151	Sm-152	Eu-151	Eu-153	Gd-155
U-233	U-234	U-235	U-236	U-238
Np-237	Pu-238	Pu-239	Pu-240	Pu-241
Pu-242	Am-241	Am-242m	Am-243	—

Between CRC statepoints in the depletion sequence for a fuel assembly axial region, a new SAS2H input deck must be created using the fuel isotopic results from the previous calculation as the initial charge. Since the 44-group cross-section library utilized in the SAS2H depletion calculations of this analysis has a reduced isotopic inventory relative to the ORIGEN-S cross-section library, a number of isotopes present in the ORIGEN-S output cannot be transferred to the initial fuel charge of the subsequent SAS2H depletion calculation. The isotopic inventory in the ORIGEN-S output which cannot be propagated to the following SAS2H depletion calculation does not significantly affect integral reactivity or the energy dependent neutron spectrum as documented in Section 4.9.1 of Attachment I of reference 5.11. The non-propagated isotopic inventory is written to a file entitled "{depletion case identifier}.notes" to allow for subsequent analysis of the impact of excluding these isotopics in the initial charge to the subsequent SAS2H depletion calculation. The "*.notes" files are contained in Attachment XXVI (moved to reference 5.15) as documented in Section 9.

8. Conclusions

The SAS2H depletion calculations of the rodded fuel assemblies from batches 4 and 5 of the Crystal River Unit 3 PWR that are required for CRC evaluations to support development of the disposal criticality methodology are fully documented in this analysis. The isotopic compositions of depleted fuel and depleted burnable poison for the various assemblies documented in this analysis are available in the consolidated SAS2H output files of Attachment XXV (moved to reference 5.15) for subsequent evaluation and/or use in CRC reactivity evaluations. The inputs for the depletion calculations are obtained from a qualified source (Ref. 5.3). The SAS2H modeling techniques employed in the depletion calculations within this analysis are dictated by the CRAFT Version 3.0 code which is fully documented in Attachment I of reference 5.11.

9. Attachments

The attachments referenced throughout this design analysis are listed in Table 9-1. Attachment XXV (moved to reference 5.15) contains the consolidated SAS2H output files for the assembly depletion calculations documented in this analysis. Attachment XXVI (moved to reference 5.15) contains the "*.notes" files which are generated during the CRAFT calculations for each assembly documented in this analysis. Attachments XXV and XXVI (moved to reference 5.15) are written in an ASCII format to an attachment tape. Detailed listings of the content of Attachments XXV and XXVI (moved to reference 5.15) on the attachment tape are provided in a hard-copy format in their corresponding attachment locations. The listing of the tape content for Attachments XXV and XXVI (moved to reference 5.15) contain the following information for each of the files that are written to the tape:

- the directory and filename as taken from the HP workstation,
- the corresponding filename on the tape attachment,
- the number of text pages in the file on tape after the addition of page headers,
- the date that the file was created on the HP workstation,
- the size of the file on the HP workstation in bytes,
- the file type (ASCII or BINARY).

The tape for Attachments XXV and XXVI (moved to reference 5.15) contain text files only. This tape is written using the HP Colorado Trakker Model T1000e External Parallel Port Backup System for personal computers.

Table 9-1 Attachment Listing

Attachment #	Number of Pages	Generation Date	Description
I	13	07/31/97	CRAFT Input Deck for Fuel Assembly B08
II	13	07/31/97	CRAFT Input Deck for Fuel Assembly B20
III	13	07/31/97	CRAFT Input Deck for Fuel Assembly B21
IV	13	07/31/97	CRAFT Input Deck for Fuel Assembly B25
V	13	07/31/97	CRAFT Input Deck for Fuel Assembly B27
VI	13	07/31/97	CRAFT Input Deck for Fuel Assembly B28
VII	13	07/31/97	CRAFT Input Deck for Fuel Assembly B29
VIII	15	07/31/97	CRAFT Input Deck for Fuel Assembly C15
IX	15	07/31/97	CRAFT Input Deck for Fuel Assembly C15a
X	21	07/31/97	CRAFT Input Deck for Fuel Assembly C20
XI	21	07/31/97	CRAFT Input Deck for Fuel Assembly C20a
XII	15	07/31/97	CRAFT Input Deck for Fuel Assembly C21
XIII	80	07/31/97	Principal Isotope Results for Assembly B08 This attachment was moved to reference 5.14.
XIV	80	07/31/97	Principal Isotope Results for Assembly B20 This attachment was moved to reference 5.14.

<table>
<tr><th>Attachment #</th><th>Number of Pages</th><th>Generation Date</th><th>Description</th></tr>
<tr><td>XV</td><td>80</td><td>07/31/97</td><td>Principal Isotope Results for Assembly B21
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XVI</td><td>80</td><td>07/31/97</td><td>Principal Isotope Results for Assembly B25
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XVII</td><td>80</td><td>07/31/97</td><td>Principal Isotope Results for Assembly B27
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XVIII</td><td>80</td><td>07/31/97</td><td>Principal Isotope Results for Assembly B28
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XIX</td><td>80</td><td>07/31/97</td><td>Principal Isotope Results for Assembly B29
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XX</td><td>93</td><td>07/31/97</td><td>Principal Isotope Results for Assembly C15
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XXI</td><td>27</td><td>07/31/97</td><td>Principal Isotope Results for Assembly C15a
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XXII</td><td>147</td><td>07/31/97</td><td>Principal Isotope Results for Assembly C20
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XXIII</td><td>80</td><td>07/31/97</td><td>Principal Isotope Results for Assembly C20a
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XXIV</td><td>93</td><td>07/31/97</td><td>Principal Isotope Results for Assembly C21
This attachment was moved to reference 5.14.</td></tr>
<tr><td>XXV</td><td>Total Page Count for Hard-Copy Listing of Tape Content = 21</td><td>07/31/97</td><td rowspan="2">Tape Containing CRAFT Generated Consolidated SAS2H Output Decks for Assemblies B08, B20, B21, B25, B27, B28, B29, C15, C15a, C20, C20a, C21

and

CRAFT Generated "*.notes" files for Assemblies B08, B20, B21, B25, B27, B28, B29, C15, C15a, C20, C20a, C21
This attachment was moved to reference 5.15.</td></tr>
<tr><td>XXVI</td><td>Total Page Count for Hard-Copy Listing of Tape Content = 18</td><td>08/01/97</td></tr>
</table>

```
N                          : This is not a pick-up case
Crystal River, Unit 3      : Reactor Identifier
CR3                        : Prefix identifier for reactor
44group                    : Scale cross-section library
2.64                       : U-235 wt% enrichment in U of UO2
468620                     : Grams of U per assembly
208                        : Number of fuel rods in assembly
1.44272                    : Pin-pitch in assembly (cm)
0.939038                   : Fuel pellet diameter (cm)
0.95758                    : Fuel rod cladding ID (cm)
1.0922                     : Fuel rod cladding OD (cm)
360.172                    : Fuel stack height (cm)
N                          : No axial blanket fuel
INCONEL                    : Spacer grid material
0.005757609                : Vol. frac. of mod. displaced by grids
ZIRC-4                     : Fuel rod cladding material
640.0                      : Avg. fuel rod cladding temp. (K)
Y                          : Cladding materials other than ZIRC-4
1                          : Number of cladding materials needed other than ZIRC-4
6                          : SAS2H material mixture number for clad material below
SS304                      : Cladding material for CR's
2200.0                     : System pressure (psi)
N                          : Activate BPRA tracking
5                          : # of radial zones in the standard Path B model
3 0.63246                  : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                          : # of cross-section libraries per irradiation step
5                          : SAS2H output print level
0.5                        : Zone mesh factor for XSDRNPM
NO SPECIAL                 : No special XSDRNPM control parameter specs.
3                          : # of insertion reactor cycles
02                         : Insertion reactor cycle identifier
1                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
164.0                      : Days of downtime at EOC
166.5                      : Total cycle EFPD
212.0                      : Total cycle length in calendar days
08                         : Integer position of assembly in cycle
03                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
168.5                      : Stpt EFPD
193.0                      : Length to stpt in calendar days
16.792                     : Downtime at stpt
250.0                      : Stpt EFPD
325.792                    : Length to stpt in calendar days
12.333                     : Downtime at stpt
73.0                       : Days of downtime at EOC
323.0                      : Total cycle EFPD
416.0                      : Total cycle length in calendar days
05                         : Integer position of assembly in cycle
04                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
228.1                      : Stpt EFPD
308                        : Length to stpt in calendar days
15.167                     : Downtime at stpt
253.0                      : Stpt EFPD
350                        : Length to stpt in calendar days
24.0                       : Downtime at stpt
127                        : Days of downtime at EOC
```

```
336.6                  : Total cycle EFPD
464                    : Total cycle length in calendar days
03                     : Integer position of assembly in cycle
Y                      : Flag for variable or constant irradiation step specs
1                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
55.5     688.93        : Step length (EFPD), Mid-step ppmb
55.5     527.51        : Step length (EFPD), Mid-step ppmb
55.5     353.48        : Step length (EFPD), Mid-step ppmb
2                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
56.167   880.38        : Step length (EFPD), Mid-step ppmb
56.167   694.68        : Step length (EFPD), Mid-step ppmb
56.167   536.65        : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
40.75    382.60        : Step length (EFPD), Mid-step ppmb
40.75    267.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
36.5     234.64        : Step length (EFPD), Mid-step ppmb
36.5     128.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
6                      : Number of steps in statepoint calculation
 .96     940.3         : Step length (EFPD), Mid-step ppmb
58.64    812.9         : Step length (EFPD), Mid-step ppmb
51.78    707.8         : Step length (EFPD), Mid-step ppmb
51.78    591.4         : Step length (EFPD), Mid-step ppmb
51.78    378.7         : Step length (EFPD), Mid-step ppmb
13.17    278.2         : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
 3.71    253.5         : Step length (EFPD), Mid-step ppmb
21.29    213.3         : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
41.8     225.91        : Step length (EFPD), Mid-step ppmb
41.8     105.94        : Step length (EFPD), Mid-step ppmb
18                     : # of axial nodes in CRC format
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
RODDED
8                      : Number of irradiation steps with CRA inserted
1                      : Number of axial section with CRA inserted in step 1
3 1 1 1 4 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 2
3 1 2 1 3 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 3
3 1 3 1 2 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 4
3 1 4 1 2 7 1          : Input card 47B
```

```
1                        : Number of axial section with CRA inserted in step 5
3 1 5 1 2 7 1            : Input card 47B
1                        : Number of axial section with CRA inserted in step 6
3 1 6 1 1 7 1            : Input card 47B
1                        : Number of axial section with CRA inserted in step 7
3 2 1 1 3 7 1            : Input card 47B
1                        : Number of axial section with CRA inserted in step 8
3 2 2 1 2 7 1            : Input card 47B
1                        : Number of different CRA absorber material mixtures
7                        : SAS2H material mixture number for CRA absorber
4                        : Number of isotopes or elements in the CRA absorber
47000   79.8             : SCALE isotope ID, Isotope wt%
49000   15.0             : SCALE isotope ID, Isotope wt%
48000   5.0              : SCALE isotope ID, Isotope wt%
13027   0.2              : SCALE isotope ID, Isotope wt%
1                        : Number of CRA designs
10.17   6                : CR absorber density, CR clad SAS2H mat. mix. number
8                        : Number of radial zones in Path B model with CRA inserted
7   0.49784              : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784              : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                       : # of fuel temp axial nodes (BOC-2 to EOC-2)
1      17.7800           : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 819.9
 982.8
1079.7
1121.1
1138.9
1147.1
1151.5
1153.6
1152.6
1147.4
1138.2
1126.1
1113.0
1101.0
1093.4
1087.4
```

```
1041.7
 858.9
18                              : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1129.5
1370.7
1475.6
1502.5
1498.1
1480.8
1457.2
1433.6
1422.0
1431.4
1460.9
1504.1
1546.0
1566.5
1559.6
1519.8
1416.8
1154.2
18                              : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1143.8
1305.8
1360.2
1360.4
1349.1
1338.4
1329.7
1321.3
1314.1
1312.5
1317.1
1326.2
```

```
1338.9
1351.7
1356.7
1346.4
1302.2
1130.5
18                              : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1    17.7800                    : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1143.8
1305.8
1360.2
1360.4
1349.1
1338.4
1329.7
1321.3
1314.1
1312.5
1317.1
1326.2
1338.9
1351.7
1356.7
1346.4
1302.2
1130.5
18                              : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1    17.7800                    : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 791.8
 876.9
 984.4
1188.7
1271.4
1317.9
1353.5
1382.1
```

```
1399.6
1398.5
1376.5
1338.5
1293.3
1254.6
1231.1
1214.8
1175.9
1022.6
18                          : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 878.5
1013.4
1167.5
1175.6
1163.1
1150.9
1142.9
1140.3
1140.9
1139.7
1134.2
1125.6
1116.6
1112.4
1117.7
1126.4
1115.1
1024.3
18                          : # of mod spec vol axial nodes (BOC-2 to EOC-2)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0226
0.0225
0.0225
0.0224
```

```
0.0224
0.0223
0.0222
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                     : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0237
0.0236
0.0235
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0224
0.0223
0.0222
0.0220
0.0219
0.0218
0.0217
0.0216
18                     : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
```

```
0.0236
0.0235
0.0234
0.0232
0.0231
0.0230
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0235
0.0234
0.0232
0.0231
0.0230
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
```

```
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0235
0.0235
0.0234
0.0233
0.0232
0.0231
0.0229
0.0228
0.0226
0.0225
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0233
0.0232
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of burnup axial nodes (BOC-2)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
```

```
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                      : # of burnup axial nodes (BOC-3)
1      17.7800          : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1.434
2.453
3.071
3.349
3.457
3.491
3.494
3.484
3.467
3.449
3.436
3.432
3.435
3.453
3.490
3.465
3.092
1.891
18                      : # of burnup axial nodes (Stpt2-3)
1      17.7800          : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
```

```
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 4.817
 7.896
 9.601
10.304
10.551
10.596
10.533
10.392
10.223
10.124
10.158
10.316
10.552
10.767
10.800
10.426
 9.150
 5.726
18                          : # of burnup axial nodes (Stpt3-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 6.615
10.601
12.681
13.465
13.702
13.722
13.634
13.465
13.266
13.157
13.219
13.443
13.779
14.106
14.197
13.758
12.181
 7.777
18                          : # of burnup axial nodes (BOC-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
```

```
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 8.213
12.949
15.343
16.229
16.497
16.519
16.419
16.238
16.054
15.993
16.116
16.389
16.726
16.977
16.928
16.311
14.462
 9.341
18                          : # of burnup axial nodes (Stpt2-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
10.501
16.759
21.501
24.035
24.935
25.271
25.394
25.412
25.382
25.361
25.392
25.484
25.614
25.721
25.639
24.915
22.375
```

```
14.780
18                : # of burnup axial nodes (Stpt3-4)
1    17.7800      : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
10.800
17.229
22.252
24.904
25.826
26.163
26.285
26.307
26.285
26.270
26.303
26.396
26.525
26.637
26.568
25.851
23.259
15.417
```

```
N                             : This is not a pick-up case
Crystal River, Unit 3         : Reactor Identifier
CR3                           : Prefix Identifier for reactor
44group                       : Scale cross-section library
2.64                          : U-235 wt% enrichment in U of UO2
468620                        : Grams of U per assembly
208                           : Number of fuel rods in assembly
1.44272                       : Pin-pitch in assembly (cm)
0.939038                      : Fuel pellet diameter (cm)
0.95758                       : Fuel rod cladding ID (cm)
1.0922                        : Fuel rod cladding OD (cm)
360.172                       : Fuel stack height (cm)
N                             : No axial blanket fuel
INCONEL                       : Spacer grid material
0.005757609                   : Vol. frac. of mod. displaced by grids
ZIRC-4                        : Fuel rod cladding material
640.0                         : Avg. fuel rod cladding temp. (K)
Y                             : Cladding materials other than ZIRC-4
1                             : Number of cladding materials needed other than ZIRC-4
6                             : SAS2H material mixture number for clad material below
SS304                         : Cladding material for CR's
2200.0                        : System pressure (psi)
N                             : Activate BPRA tracking
5                             : # of radial zones in the standard Path B model
3 0.63246                     : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                             : # of cross-section libraries per irradiation step
5                             : SAS2H output print level
0.5                           : Zone mesh factor for XSDRNPM
NO SPECIAL                    : No special XSDRNPM control parameter specs.
3                             : # of insertion reactor cycles
02                            : Insertion reactor cycle identifier
1                             : # of stpts in cycle
0                             : Stpt EFPD
0                             : Length to stpt in calendar days
0                             : Downtime at stpt
164.0                         : Days of downtime at EOC
166.5                         : Total cycle EFPD
212.0                         : Total cycle length in calendar days
20                            : Integer position of assembly in cycle
03                            : Insertion reactor cycle identifier
3                             : # of stpts in cycle
0                             : Stpt EFPD
0                             : Length to stpt in calendar days
0                             : Downtime at stpt
168.5                         : Stpt EFPD
193.0                         : Length to stpt in calendar days
16.792                        : Downtime at stpt
250.0                         : Stpt EFPD
325.792                       : Length to stpt in calendar days
12.333                        : Downtime at stpt
73.0                          : Days of downtime at EOC
323.0                         : Total cycle EFPD
416.0                         : Total cycle length in calendar days
03                            : Integer position of assembly in cycle
04                            : Insertion reactor cycle identifier
3                             : # of stpts in cycle
0                             : Stpt EFPD
0                             : Length to stpt in calendar days
0                             : Downtime at stpt
228.1                         : Stpt EFPD
308                           : Length to stpt in calendar days
15.167                        : Downtime at stpt
253.0                         : Stpt EFPD
350                           : Length to stpt in calendar days
24.0                          : Downtime at stpt
127                           : Days of downtime at EOC
```

```
336.6                  : Total cycle EFPD
464                    : Total cycle length in calendar days
05                     : Integer position of assembly in cycle
Y                      : Flag for variable or constant irradiation step specs
1                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
55.5     688.93        : Step length (EFPD), Mid-step ppmb
55.5     527.51        : Step length (EFPD), Mid-step ppmb
55.5     353.48        : Step length (EFPD), Mid-step ppmb
2                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
6                      : Number of steps in statepoint calculation
 6.68    946.0         : Step length (EFPD), Mid-step ppmb
 3.19    946.3         : Step length (EFPD), Mid-step ppmb
66.38    830.9         : Step length (EFPD), Mid-step ppmb
39.97    672.8         : Step length (EFPD), Mid-step ppmb
39.97    547.4         : Step length (EFPD), Mid-step ppmb
12.30    471.7         : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
 8.91    435.6         : Step length (EFPD), Mid-step ppmb
62.96    333.8         : Step length (EFPD), Mid-step ppmb
 9.63    231.8         : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
 2.59    235.2         : Step length (EFPD), Mid-step ppmb
 1.57    237.9         : Step length (EFPD), Mid-step ppmb
68.84    175.8         : Step length (EFPD), Mid-step ppmb
3                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
76.233   787.34        : Step length (EFPD), Mid-step ppmb
76.233   625.59        : Step length (EFPD), Mid-step ppmb
76.233   373.77        : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
1                      : Number of steps in statepoint calculation
24.9     218.65        : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
41.8     225.91        : Step length (EFPD), Mid-step ppmb
41.8     105.94        : Step length (EFPD), Mid-step ppmb
18                     : # of axial nodes in CRC format
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17.   20.0025
18    22.3520
RODDED
9                      : Number of irradiation steps with CRA inserted
1                      : Number of axial section with CRA inserted in step 1
2 1 1 1 4 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 2
2 1 2 1 3 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 3
2 1 3 1 2 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 4
```

```
2 1 4 1 1 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 5
2 1 5 1 1 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 6
2 2 1 1 2 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 7
2 2 2 1 1 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 8
2 3 1 1 2 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 9
2 3 2 1 1 7 1          : Input card 47B
1                      : Number of different CRA absorber material mixtures
7                      : SAS2H material mixture number for CRA absorber
4                      : Number of isotopes or elements in the CRA absorber
47000   79.8           : SCALE isotope ID, Isotope wt%
49000   15.0           : SCALE isotope ID, Isotope wt%
48000   5.0            : SCALE isotope ID, Isotope wt%
13027   0.2            : SCALE isotope ID, Isotope wt%
1                      : Number of CRA designs
10.17   6              : CR absorber density, CR clad SAS2H mat. mix. number
8                      : Number of radial zones in Path B model with CRA inserted
7   0.49784            : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784            : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                     : # of fuel temp axial nodes (BOC-2 to EOC-2)
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1037.1
1298.0
1437.7
1502.4
1533.1
1550.2
1562.2
1570.6
1571.8
1559.9
1534.2
1502.9
1473.8
```

```
1450.2
1430.3
1396.6
1300.5
1033.6
18                                  : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800                       : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 929.2
1238.4
1382.3
1408.2
1396.7
1380.7
1366.1
1358.1
1362.3
1381.7
1411.7
1442.8
1466.1
1476.2
1471.6
1447.6
1375.0
1145.8
18                                  : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800                       : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 965.5
1243.8
1310.4
1303.5
1286.0
1272.9
1264.7
1260.4
1259.8
```

```
1263.3
1269.1
1275.0
1281.0
1288.5
1295.2
1293.8
1264.7
1108.6
18                                  : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1      17.7800                      : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 965.5
1243.8
1310.4
1303.5
1286.0
1272.9
1264.7
1260.4
1259.8
1263.3
1269.1
1275.0
1281.0
1288.5
1295.2
1293.8
1264.7
1108.6
18                                  : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1      17.7800                      : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 969.1
1101.8
1164.2
1216.0
1258.9
```

```
1293.8
1320.4
1337.6
1339.7
1320.5
1284.6
1244.6
1209.0
1185.0
1174.6
1163.9
1131.4
 997.0
18                        : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1       17.7800           : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
1054.4
1147.3
1163.9
1158.9
1146.2
1135.0
1127.9
1124.9
1123.4
1118.0
1107.8
1096.8
1088.8
1087.4
1095.9
1107.4
1099.8
1014.7
18                        : # of mod spec vol axial nodes (BOC-2 to EOC-2)
1       17.7800           : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0235
```

```
0.0234
0.0233
0.0232
0.0231
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0220
0.0219
0.0218
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0236
0.0234
0.0233
0.0232
0.0230
0.0229
0.0228
0.0227
0.0225
0.0224
0.0223
0.0222
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
```

```
16    20.0025
17    20.0025
18    22.3520
0.0235
0.0234
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                      : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0235
0.0234
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                      : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
```

```
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0236
0.0235
0.0234
0.0233
0.0231
0.0230
0.0229
0.0227
0.0226
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                              : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1       17.7800                 : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0234
0.0233
0.0232
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                              : # of burnup axial nodes (BOC-2)
1       17.7800                 : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
```

```
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                        : # of burnup axial nodes (BOC-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
2.697
4.534
5.624
6.123
6.332
6.412
6.431
6.412
6.359
6.281
6.206
6.164
6.161
6.172
6.126
5.857
5.044
3.054
18                        : # of burnup axial nodes (Stpt2-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
```

```
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 4.724
 8.441
11.277
12.407
12.897
13.039
13.052
13.021
12.992
13.011
13.093
13.217
13.344
13.411
13.296
12.742
11.140
 6.991
18                           : # of burnup axial nodes (Stpt3-3)
1      17.7800               : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 5.934
10.846
14.212
15.430
15.894
16.001
15.992
15.956
15.940
15.995
16.132
16.320
16.519
16.665
16.603
16.006
14.141
 9.050
```

```
18                         : # of burnup axial nodes (BOC-4)
1     17.7800              : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 7.566
13.218
16.885
18.199
18.692
18.810
18.810
18.791
18.813
18.922
19.107
19.308
19.462
19.499
19.284
18.516
16.400
10.617
18                         : # of burnup axial nodes (Stpt2-4)
1     17.7800              : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
11.757
19.602
24.423
26.397
27.270
27.629
27.795
27.887
27.920
27.899
27.875
27.878
27.898
27.921
```

```
27.787
26.947
24.140
15.957
18                              : # of burnup axial nodes (Stpt3-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
12.290
20.371
25.289
27.295
28.174
28.530
28.695
28.786
28.819
28.794
28.766
28.769
28.796
28.833
28.722
27.890
25.029
16.599
```

```
N                          : This is a pick-up case from Stpt3, Cyc-3, Assy 821a
Crystal River, Unit 3      : Reactor Identifier
CR3                        : Prefix Identifier for reactor
44group                    : Scale cross-section library
2.64                       : U-235 wt% enrichment in U of UO2
468620                     : Grams of U per assembly
208                        : Number of fuel rods in assembly
1.44272                    : Pin-pitch in assembly (cm)
0.939038                   : Fuel pellet diameter (cm)
0.95758                    : Fuel rod cladding ID (cm)
1.0922                     : Fuel rod cladding OD (cm)
360.172                    : Fuel stack height (cm)
N                          : No axial blanket fuel
INCONEL                    : Spacer grid material
0.005757609                : Vol. frac. of mod. displaced by grids
ZIRC-4                     : Fuel rod cladding material
640.0                      : Avg. fuel rod cladding temp. (K)
Y                          : Cladding materials other than ZIRC-4
1                          : Number of cladding materials needed other than ZIRC-4
6                          : SAS2H material mixture number for clad material below
SS304                      : Cladding material for CR's
2200.0                     : System pressure (psi)
N                          : Activate BPRA tracking
5                          : # of radial zones in the standard Path B model
3 0.63246                  : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                          : # of cross-section libraries per irradiation step
5                          : SAS2H output print level
0.5                        : Zone mesh factor for XSDRNPM
NO SPECIAL                 : No special XSDRNPM control parameter specs.
3                          : # of insertion reactor cycles
02                         : Insertion reactor cycle identifier
1                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
164.0                      : Days of downtime at EOC
166.5                      : Total cycle EFPD
212.0                      : Total cycle length in calendar days
21                         : Integer position of assembly in cycle
03                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
168.5                      : Stpt EFPD
193.0                      : Length to stpt in calendar days
16.792                     : Downtime at stpt
250.0                      : Stpt EFPD
325.792                    : Length to stpt in calendar days
12.333                     : Downtime at stpt
73.0                       : Days of downtime at EOC
323.0                      : Total cycle EFPD
416.0                      : Total cycle length in calendar days
13                         : Integer position of assembly in cycle
04                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
228.1                      : Stpt EFPD
308                        : Length to stpt in calendar days
15.167                     : Downtime at stpt
253.0                      : Stpt EFPD
350                        : Length to stpt in calendar days
24.0                       : Downtime at stpt
127                        : Days of downtime at EOC
```

```
336.6                  : Total cycle EFPD
464                    : Total cycle length in calendar days
07                     : Integer position of assembly in cycle
Y                      : Flag for variable or constant irradiation step specs
1                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
55.5     688.93        : Step length (EFPD), Mid-step ppmb
55.5     527.51        : Step length (EFPD), Mid-step ppmb
55.5     353.48        : Step length (EFPD), Mid-step ppmb
2                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
56.167   880.38        : Step length (EFPD), Mid-step ppmb
56.167   694.68        : Step length (EFPD), Mid-step ppmb
56.167   536.65        : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
40.75    382.60        : Step length (EFPD), Mid-step ppmb
40.75    267.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
36.5     234.64        : Step length (EFPD), Mid-step ppmb
36.5     128.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
8                      : Number of steps in statepoint calculation
  .11    943.3         : Step length (EFPD), Mid-step ppmb
 1.06    939.1         : Step length (EFPD), Mid-step ppmb
51.55    808.7         : Step length (EFPD), Mid-step ppmb
54.00    726.8         : Step length (EFPD), Mid-step ppmb
54.00    584.4         : Step length (EFPD), Mid-step ppmb
54.00    383.0         : Step length (EFPD), Mid-step ppmb
13.28    278.6         : Step length (EFPD), Mid-step ppmb
  .10    255.2         : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
 3.90    253.4         : Step length (EFPD), Mid-step ppmb
21.10    213.0         : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
41.8     225.91        : Step length (EFPD), Mid-step ppmb
41.8     105.94        : Step length (EFPD), Mid-step ppmb
18                     : # of axial nodes in CRC format
1    17.7800           : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
RODDED
10                     : Number of irradiation steps with CRA inserted
1                      : Number of axial section with CRA inserted in step 1
3 1 1 1 18 7 1         : Input card 47B
1                      : Number of axial section with CRA inserted in step 2
3 1 2 1 17 7 1         : Input card 47B
1                      : Number of axial section with CRA inserted in step 3
3 1 3 1 16 7 1         : Input card 47B
```

```
1                          : Number of axial section with CRA inserted in step 4
3 1 4 1 15 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 5
3 1 5 1 15 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 6
3 1 6 1 15 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 7
3 1 7 1 14 7 1             : Input card 47B
3                          : Number of axial section with CRA inserted in step 8
3 1 8 1 3 7 1              : Input card 47B
3 1 8 5 11 7 1             : Input card 47B
3 1 8 13 14 7 1            : Input card 47B
1                          : Number of axial section with CRA inserted in step 9
3 2 1 1 16 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 10
3 2 2 1 15 7 1             : Input card 47B
1                          : Number of different CRA absorber material mixtures
7                          : SAS2H material mixture number for CRA absorber
4                          : Number of isotopes or elements in the CRA absorber
47000   79.8               : SCALE isotope ID, isotope wt%
49000   15.0               : SCALE isotope ID, isotope wt%
48000   5.0                : SCALE isotope ID, isotope wt%
13027   0.2                : SCALE isotope ID, isotope wt%
1                          : Number of CRA designs
10.17   6                  : CR absorber density, CR clad SAS2H mat. mix. number
8                          : Number of radial zones in Path B model with CRA inserted
7   0.49784                : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784                : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                         : # of fuel temp axial nodes (BOC-2 to EOC-2)
1      17.7800             : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 806.9
 967.6
1065.0
1111.2
1132.9
1144.0
1150.4
1153.8
```

```
1153.2
1146.8
1135.0
1120.0
1104.8
1090.8
1075.5
1046.6
 974.8
 804.3
18                           : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800                : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1085.1
1321.1
1426.5
1458.9
1459.9
1446.2
1422.2
1393.1
1375.0
1380.5
1407.8
1453.0
1505.0
1536.7
1541.5
1515.9
1419.7
1147.7
18                           : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800                : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1118.8
1278.8
1336.0
1340.6
```

```
1332.3
1323.5
1315.7
1305.9
1294.6
1290.9
1295.7
1306.3
1324.0
1347.2
1364.5
1362.6
1319.4
1140.1
18                              : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1118.8
1278.8
1336.0
1340.6
1332.3
1323.5
1315.7
1305.9
1294.6
1290.9
1295.7
1306.3
1324.0
1347.2
1364.5
1362.6
1319.4
1140.1
18                              : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
```

```
 748.9
 821.5
 870.2
 901.4
 923.9
 940.4
 952.1
 959.3
 960.2
 952.3
 936.9
 918.2
 900.3
 886.9
 883.4
 919.3
1013.1
 908.9
18                          : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 815.7
 890.2
 916.4
 919.4
 915.9
 911.8
 909.4
 909.7
 911.2
 910.9
 907.4
 901.8
 896.7
 897.1
 926.5
1070.2
1070.8
 979.4
18                          : # of mod spec vol axial nodes (BOC-2 to EOC-2)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
```

```
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0226
0.0225
0.0225
0.0224
0.0223
0.0223
0.0222
0.0221
0.0221
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                     : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1      17.7800         : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0236
0.0235
0.0234
0.0233
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0220
0.0219
0.0218
0.0217
0.0216
18                     : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1      17.7800         : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
```

```
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0235
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                  : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800       : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0235
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                  : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800       : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
```

```
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0225
0.0224
0.0224
0.0224
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                  : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1    17.7800        : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0226
0.0226
0.0225
0.0225
0.0224
0.0223
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0216
18                  : # of burnup axial nodes (BOC-2)
1    17.7800        : Node #, node height (cm)
2    20.0025
```

```
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                          : # of burnup axial nodes (BOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1.363
2.375
3.017
3.329
3.465
3.518
3.532
3.525
3.504
3.475
3.447
3.428
3.419
3.408
3.354
3.166
2.665
```

```
1.557
18                          : # of burnup axial nodes (Stpt2-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 4.478
 7.444
 9.154
 9.914
10.215
10.297
10.248
10.080
 9.838
 9.662
 9.640
 9.772
10.034
10.323
10.398
 9.983
 8.622
 5.285
18                          : # of burnup axial nodes (Stpt3-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 6.158
 9.999
12.092
12.952
13.260
13.329
13.261
13.060
12.767
12.561
12.557
12.754
13.134
```

```
13.587
13.786
13.344
11.682
 7.334
18                          : # of burnup axial nodes (BOC-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 7.640
12.212
14.652
15.658
16.025
16.105
16.020
15.791
15.500
15.338
15.400
15.662
16.071
16.466
16.536
15.927
13.991
 8.904
18                          : # of burnup axial nodes (Stpt2-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 9.564
15.231
18.349
19.710
20.270
20.461
20.443
20.247
19.952
```

```
19.743
19.730
19.921
20.288
20.714
21.105
21.915
20.213
13.191
18                              : # of burnup axial nodes (Stpt3-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 9.824
15.619
18.804
20.188
20.753
20.945
20.926
20.732
20.438
20.230
20.218
20.409
20.781
21.215
21.642
22.649
20.979
13.740
```

```
N                          : This is not a pick-up case
Crystal River, Unit 3      : Reactor Identifier
CR3                        : Prefix identifier for reactor
44group                    : Scale cross-section library
2.64                       : U-235 wt% enrichment in U of UO2
468620                     : Grams of U per assembly
208                        : Number of fuel rods in assembly
1.44272                    : Pin-pitch in assembly (cm)
0.939038                   : Fuel pellet diameter (cm)
0.95758                    : Fuel rod cladding ID (cm)
1.0922                     : Fuel rod cladding OD (cm)
360.172                    : Fuel stack height (cm)
N                          : No axial blanket fuel
INCONEL                    : Spacer grid material
0.005757609                : Vol. frac. of mod. displaced by grids
ZIRC-4                     : Fuel rod cladding material
640.0                      : Avg. fuel rod cladding temp. (K)
Y                          : Cladding materials other than ZIRC-4
1                          : Number of cladding materials needed other than ZIRC-4
6                          : SAS2H material mixture number for clad material below
SS304                      : Cladding material for CR's
2200.0                     : System pressure (psi)
N                          : Activate BPRA tracking
5                          : # of radial zones in the standard Path B model
3 0.63246                  : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                          : # of cross-section libraries per irradiation step
5                          : SAS2H output print level
0.5                        : Zone mesh factor for XSDRNPM
NO SPECIAL                 : No special XSDRNPM control parameter specs.
3                          : # of insertion reactor cycles
02                         : Insertion reactor cycle identifier
1                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
164.0                      : Days of downtime at EOC
166.5                      : Total cycle EFPD
212.0                      : Total cycle length in calendar days
25                         : Integer position of assembly in cycle
03                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
168.5                      : Stpt EFPD
193.0                      : Length to stpt in calendar days
16.792                     : Downtime at stpt
250.0                      : Stpt EFPD
325.792                    : Length to stpt in calendar days
12.333                     : Downtime at stpt
73.0                       : Days of downtime at EOC
323.0                      : Total cycle EFPD
416.0                      : Total cycle length in calendar days
18                         : Integer position of assembly in cycle
04                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
228.1                      : Stpt EFPD
308                        : Length to stpt in calendar days
15.167                     : Downtime at stpt
253.0                      : Stpt EFPD
350                        : Length to stpt in calendar days
24.0                       : Downtime at stpt
127                        : Days of downtime at EOC
```

```
336.6                     : Total cycle EFPD
464                       : Total cycle length in calendar days
11                        : Integer position of assembly in cycle
Y                         : Flag for variable or constant irradiation step specs
1                         : Relative insertion cycle
1                         : Relative statepoint in insertion cycle
3                         : Number of steps in statepoint calculation
55.5     688.93           : Step length (EFPD), Mid-step ppmb
55.5     527.51           : Step length (EFPD), Mid-step ppmb
55.5     353.48           : Step length (EFPD), Mid-step ppmb
2                         : Relative insertion cycle
1                         : Relative statepoint in insertion cycle
9                         : Number of steps in statepoint calculation
  .67    941.6            : Step length (EFPD), Mid-step ppmb
 5.65    946.3            : Step length (EFPD), Mid-step ppmb
 7.73    940.6            : Step length (EFPD), Mid-step ppmb
42.38    839.9            : Step length (EFPD), Mid-step ppmb
42.38    718.4            : Step length (EFPD), Mid-step ppmb
28.69    628.5            : Step length (EFPD), Mid-step ppmb
37.34    520.8            : Step length (EFPD), Mid-step ppmb
 2.29    459.7            : Step length (EFPD), Mid-step ppmb
 1.36    453.4            : Step length (EFPD), Mid-step ppmb
2                         : Relative statepoint in insertion cycle
4                         : Number of steps in statepoint calculation
 5.95    440.8            : Step length (EFPD), Mid-step ppmb
40.05    368.9            : Step length (EFPD), Mid-step ppmb
27.13    270.7            : Step length (EFPD), Mid-step ppmb
 8.87    229.8            : Step length (EFPD), Mid-step ppmb
3                         : Relative statepoint in insertion cycle
6                         : Number of steps in statepoint calculation
  .74    234.7            : Step length (EFPD), Mid-step ppmb
13.27    243.6            : Step length (EFPD), Mid-step ppmb
18.03    219.5            : Step length (EFPD), Mid-step ppmb
29.38    150.1            : Step length (EFPD), Mid-step ppmb
 8.57    100.2            : Step length (EFPD), Mid-step ppmb
 3.01     86.0            : Step length (EFPD), Mid-step ppmb
3                         : Relative insertion cycle
1                         : Relative statepoint in insertion cycle
3                         : Number of steps in statepoint calculation
76.233   787.34           : Step length (EFPD), Mid-step ppmb
76.233   625.59           : Step length (EFPD), Mid-step ppmb
76.233   373.77           : Step length (EFPD), Mid-step ppmb
2                         : Relative statepoint in insertion cycle
1                         : Number of steps in statepoint calculation
24.9     218.65           : Step length (EFPD), Mid-step ppmb
3                         : Relative statepoint in insertion cycle
2                         : Number of steps in statepoint calculation
41.8     225.91           : Step length (EFPD), Mid-step ppmb
41.8     105.94           : Step length (EFPD), Mid-step ppmb
18                        : # of axial nodes in CRC format
1    17.7800              : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
NO CRA INSERTION HISTORY
RODDED                    : APSRA Insertion
```

```
19                          : Number of irradiation steps with APSRA inserted
2 1 1 7  14 7 1 6           : Input card 48B
2 1 2 8  14 7 1 6           : Input card 48B
2 1 3 9  14 7 1 6           : Input card 48B
2 1 4 9  13 7 1 6           : Input card 48B
2 1 5 9  13.7 1 6           : Input card 48B
2 1 6 10 13 7 1 6           : Input card 48B
2 1 7 10 12 7 1 6           : Input card 48B
2 1 8 10 11 7 1 6           : Input card 48B
2 1 9 11 11 7 1 6           : Input card 48B
2 2 1 9  14 7 1 6           : Input card 48B
2 2 2 9  13 7 1 6           : Input card 48B
2 2 3 10 13 7 1 6           : Input card 48B
2 2 4 10 12 7 1 6           : Input card 48B
2 3 1 7  13 7 1 6           : Input card 48B
2 3 2 8  13 7 1 6           : Input card 48B
2 3 3 8  12 7 1 6           : Input card 48B
2 3 4 9  12 7 1 6           : Input card 48B
2 3 5 9  11 7 1 6           : Input card 48B
2 3 6 10 11 7 1 6           : Input card 48B
1                           : Number of different APSR absorber material mixtures
7                           : SAS2H material mixture number for APSR absorber
4                           : Number of isotopes or elements in the APSR absorber
47000   79.8                : SCALE isotope ID, Isotope wt%
49000   15.0                : SCALE isotope ID, Isotope wt%
48000   5.0                 : SCALE isotope ID, Isotope wt%
13027   0.2                 : SCALE isotope ID, Isotope wt%
1                           : Number of APSRA designs
10.17   6                   : APSR absorber density, APSR clad SAS2H mat. mix. number
8                           : Number of radial zones in Path B model with APSRA inserted
7   0.49784                 : Path B model APSRA inserted (Input Card 48J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784                 : Path B model APSRA removed (Input Card 48K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
3   0.49784                 : Path B model APSRA follow (Input Card 48L)
3   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.96913
3   2.99248
18                          : # of fuel temp axial nodes (BOC-2 to EOC-2)
1       17.7800             : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
```

```
16    20.0025
17    20.0025
18    22.3520
 939.3
1167.1
1299.6
1366.0
1400.1
1418.9
1430.8
1438.2
1438.6
1427.9
1406.1
1379.3
1353.9
1332.5
1311.7
1274.7
1180.3
 940.9
18                          : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1109.1
1338.0
1439.0
1466.0
1461.7
1440.9
1391.3
1237.4
1099.9
1094.6
1115.6
1175.5
1438.3
1553.3
1558.1
1533.2
1446.0
1178.8
18                          : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
```

```
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1123.0
1280.5
1330.4
1328.7
1316.4
1304.8
1293.9
1259.9
1105.4
1063.1
1063.0
1077.5
1149.8
1322.5
1346.3
1344.4
1310.9
1139.7
18                : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1    17.7800      : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1123.0
1280.5
1330.4
1328.7
1316.4
1304.8
1293.9
1259.9
1105.4
1063.1
1063.0
1077.5
1149.8
1322.5
1346.3
1344.4
1310.9
1139.7
18                : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1    17.7800      : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
```

```
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 915.6
1049.4
1132.2
1197.4
1249.0
1288.5
1324.3
1377.2
1460.4
1483.9
1451.5
1397.7
1307.5
1201.4
1173.6
1169.7
1147.0
1012.4
18                      : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1012.9
1114.8
1150.6
1150.9
1139.2
1128.2
1124.3
1138.5
1177.6
1194.1
1185.1
1168.1
1135.2
1088.8
1087.3
1104.8
1101.9
1018.5
18                      : # of mod spec vol axial nodes (BOC-2 to EOC-2)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
```

```
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0221
0.0220
0.0220
0.0219
0.0218
0.0217
0.0216
0.0216
18                    : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1     17.7800         : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0235
0.0234
0.0233
0.0231
0.0230
0.0228
0.0227
0.0226
0.0225
0.0224
0.0224
0.0223
0.0222
0.0221
0.0219
0.0218
0.0217
0.0216
```

```
18                  : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800       : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0233
0.0232
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                  : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800       : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0233
0.0232
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0224
0.0223
0.0222
0.0221
0.0220
```

```
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0235
0.0235
0.0233
0.0232
0.0231
0.0229
0.0228
0.0226
0.0225
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0234
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
```

```
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of burnup axial nodes (BOC-2)
1       17.7800           : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                        : # of burnup axial nodes (BOC-3)
1       17.7800           : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
2.130
3.655
4.623
5.110
5.338
5.436
```

```
5.468
5.459
5.417
5.351
5.285
5.242
5.227
5.216
5.140
4.859
4.119
2.445
18                        : # of burnup axial nodes (Stpt2-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 5.446
 9.029
11.128
12.095
12.499
12.614
12.514
11.989
10.413
 9.433
 9.260
 9.399
10.144
12.028
12.639
12.189
10.560
 6.520
18                        : # of burnup axial nodes (Stpt3-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 7.219
11.708
```

```
14.196
15.256
15.657
15.749
15.615
14.953
12.748
11.370
11.158
11.350
12.345
15.152
16.089
15.638
13.726
 8.667
18                          : # of burnup axial nodes (BOC-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 8.787
14.011
16.806
17.958
18.377
18.445
18.184
17.031
14.492
13.114
12.971
13.411
15.081
18.039
18.853
18.247
16.079
10.287
18                          : # of burnup axial nodes (Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
```

```
17    20.0025
18    22.3520
12.547
19.877
23.988
25.906
26.764
27.103
27.067
26.251
24.202
22.923
22.578
22.744
23.985
26.445
27.281
26.722
23.953
15.742
18                              : # of burnup axial nodes (Stpt3-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
13.029
20.590
24.816
26.778
27.647
27.985
27.950
27.151
25.138
23.872
23.525
23.687
24.910
27.343
28.196
27.656
24.842
16.387
```

N	: This is not a pick-up case
Crystal River, Unit 3	: Reactor Identifier
CR3	: Prefix identifier for reactor
44group	: Scale cross-section library
2.64	: U-235 wt% enrichment in U of UO2
468620	: Grams of U per assembly
208	: Number of fuel rods in assembly
1.44272	: Pin-pitch in assembly (cm)
0.939038	: Fuel pellet diameter (cm)
0.95758	: Fuel rod cladding ID (cm)
1.0922	: Fuel rod cladding OD (cm)
360.172	: Fuel stack height (cm)
N	: No axial blanket fuel
INCONEL	: Spacer grid material
0.005757609	: Vol. frac. of mod. displaced by grids
ZIRC-4	: Fuel rod cladding material
640.0	: Avg. fuel rod cladding temp. (K)
Y	: Cladding materials other than ZIRC-4
1	: Number of cladding materials needed other than ZIRC-4
6	: SAS2H material mixture number for clad material below
SS304	: Cladding material for CR's
2200.0	: System pressure (psi)
N	: Activate BPRA tracking
5	: # of radial zones in the standard Path B model
3 0.63246	: Standard Path B model (Input Card 20)
2 0.67310	
3 0.81397	
500 2.97599	
3 2.99939	
1	: # of cross-section libraries per irradiation step
5	: SAS2H output print level
0.5	: Zone mesh factor for XSDRNPM
NO SPECIAL	: No special XSDRNPM control parameter specs.
3	: # of insertion reactor cycles
02	: Insertion reactor cycle identifier
1	: # of stpts in cycle
0	: Stpt EFPD
0	: Length to stpt in calendar days
0	: Downtime at stpt
164.0	: Days of downtime at EOC
166.5	: Total cycle EFPD
212.0	: Total cycle length in calendar days
27	: Integer position of assembly in cycle
03	: Insertion reactor cycle identifier
3	: # of stpts in cycle
0	: Stpt EFPD
0	: Length to stpt in calendar days
0	: Downtime at stpt
168.5	: Stpt EFPD
193.0	: Length to stpt in calendar days
16.792	: Downtime at stpt
250.0	: Stpt EFPD
325.792	: Length to stpt in calendar days
12.333	: Downtime at stpt
73.0	: Days of downtime at EOC
323.0	: Total cycle EFPD
416.0	: Total cycle length in calendar days
19	: Integer position of assembly in cycle
04	: Insertion reactor cycle identifier
3	: # of stpts in cycle
0	: Stpt EFPD
0	: Length to stpt in calendar days
0	: Downtime at stpt
228.1	: Stpt EFPD
308	: Length to stpt in calendar days
15.167	: Downtime at stpt
253.0	: Stpt EFPD
350	: Length to stpt in calendar days
24.0	: Downtime at stpt
127	: Days of downtime at EOC

```
336.6                  : Total cycle EFPD
464                    : Total cycle length in calendar days
18                     : Integer position of assembly in cycle
Y                      : Flag for variable or constant irradiation step specs
1                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
55.5     688.93        : Step length (EFPD), Mid-step ppmb
55.5     527.51        : Step length (EFPD), Mid-step ppmb
55.5     353.48        : Step length (EFPD), Mid-step ppmb
2                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
56.167   880.38        : Step length (EFPD), Mid-step ppmb
56.167   694.68        : Step length (EFPD), Mid-step ppmb
56.167   536.65        : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
40.75    382.60        : Step length (EFPD), Mid-step ppmb
40.75    267.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
36.5     234.64        : Step length (EFPD), Mid-step ppmb
36.5     128.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
9                      : Number of steps in statepoint calculation
 1.00    940.1         : Step length (EFPD), Mid-step ppmb
  .68    934.2         : Step length (EFPD), Mid-step ppmb
 3.13    920.7         : Step length (EFPD), Mid-step ppmb
 6.08    888.0         : Step length (EFPD), Mid-step ppmb
66.49    790.8         : Step length (EFPD), Mid-step ppmb
66.49    632.5         : Step length (EFPD), Mid-step ppmb
39.81    474.5         : Step length (EFPD), Mid-step ppmb
38.33    334.5         : Step length (EFPD), Mid-step ppmb
 6.10    265.8         : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
18.17    230.6         : Step length (EFPD), Mid-step ppmb
 2.80    198.5         : Step length (EFPD), Mid-step ppmb
 4.03    188.6         : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
41.8     225.91        : Step length (EFPD), Mid-step ppmb
41.8     105.94        : Step length (EFPD), Mid-step ppmb
18                     : # of axial nodes in CRC format
1    17.7800           : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
NO CRA INSERTION HISTORY
RODDED                 : APSRA Insertion
11                     : Number of irradiation steps with APSRA inserted
3 1 1 5  15 7 1 6      : Input card 488
3 1 2 8  15 7 1 6      : Input card 488
3 1 3 9  15 7 1 6      : Input card 488
```

```
3 1 4 10 15 7 1 6        : Input card 48B
3 1 5 10 14 7 1 6        : Input card 48B
3 1 6 10 14 7 1 6        : Input card 48B
3 1 7 11 14 7 1 6        : Input card 48B
3 1 8 11 13 7 1 6        : Input card 48B
3 2 1 10 14 7 1 6        : Input card 48B
3 2 2 11 14 7 1 6        : Input card 48B
3 2 3 11 13 7 1 6        : Input card 48B
1                        : Number of different APSR absorber material mixtures
7                        : SAS2H material mixture number for APSR absorber
4                        : Number of isotopes or elements in the APSR absorber
47000   79.8             : SCALE isotope ID, Isotope wt%
49000   15.0             : SCALE isotope ID, Isotope wt%
48000   5.0              : SCALE isotope ID, Isotope wt%
13027   0.2              : SCALE isotope ID, Isotope wt%
1                        : Number of APSRA designs
10.17   6                : APSR absorber density, APSR clad SAS2H mat. mix. number
8                        : Number of radial zones in Path B model with APSRA inserted
7   0.49784              : Path B model APSRA inserted (Input Card 48J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784              : Path B model APSRA removed (Input Card 48K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
3   0.49784              : Path B model APSRA follow (Input Card 48L)
3   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.96913
3   2.99248
18                       : # of fuel temp axial nodes (BOC-2 to EOC-2)
1      17.7800           : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 975.8
1227.7
1396.2
1505.2
1562.0
1588.9
1604.6
1614.2
1616.0
```

```
1605.0
1580.5
1547.8
1515.9
1489.1
1463.4
1419.8
1312.7
1038.4
18                      : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1089.0
1311.5
1407.5
1433.3
1432.2
1416.7
1386.9
1343.7
1312.0
1313.8
1341.0
1392.5
1464.9
1505.0
1507.9
1480.4
1390.3
1138.7
18                      : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1115.2
1271.8
1319.6
1316.8
1304.7
```

```
1294.1
1285.1
1270.9
1249.1
1240.7
1244.7
1255.8
1277.7
1306.5
1319.9
1319.0
1286.5
1118.0
18                      : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1115.2
1271.8
1319.6
1316.8
1304.7
1294.1
1285.1
1270.9
1249.1
1240.7
1244.7
1255.8
1277.7
1306.5
1319.9
1319.0
1286.5
1118.0
18                      : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 929.6
```

```
1069.6
1147.5
1203.4
1249.4
1284.6
1311.0
1329.0
1317.8
1190.3
1038.1
 993.3
 966.3
 963.2
1096.7
1156.0
1135.0
1001.2
18                              : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1      17.7800                  : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1019.3
1116.8
1144.0
1138.6
1125.2
1113.4
1107.5
1109.2
1111.0
1072.2
 959.3
 934.4
 922.0
 920.2
1002.5
1084.8
1092.3
1012.9
18                              : # of mod spec vol axial nodes (BOC-2 to EOC-2)
1      17.7800                  : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
```

```
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0235
0.0234
0.0233
0.0231
0.0230
0.0228
0.0227
0.0226
0.0224
0.0223
0.0222
0.0221
0.0219
0.0218
0.0217
0.0217
0.0216
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0237
0.0236
0.0234
0.0233
0.0232
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
```

```
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0236
0.0235
0.0234
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0236
0.0235
0.0234
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
```

```
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0233
0.0232
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0223
0.0222
0.0221
0.0221
0.0220
0.0219
0.0218
0,0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1       17.7800             : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0225
0.0224
0.0223
0.0222
0.0221
0.0221
0.0220
0.0219
0.0219
0.0218
0.0217
0.0216
18                          : # of burnup axial nodes (BOC-2)
1       17.7800             : Node #, node height (cm)
2       20.0025
3       20.0025
```

```
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                          : # of burnup axial nodes (BOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
2.365
4.134
5.436
6.178
6.545
6.715
6.780
6.782
6.736
6.659
6.577
6.523
6.504
6.487
6.388
6.042
5.147
3.092
```

```
18                     : # of burnup axial nodes (Stpt2-3)
1      17.7800         : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 5.549
 9.346
11.784
13.023
13.586
13.797
13.787
13.558
13.140
12.799
12.684
12.791
13.128
13.572
13.669
13.076
11.272
 6.919
18                     : # of burnup axial nodes (Stpt3-3)
1      17.7800         : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 7.275
11.976
14.813
16.160
16.732
16.929
16.898
16.613
16.086
15.669
15.556
15.724
16.198
16.850
```

```
17.073
16.451
14.353
 8.990
18                         : # of burnup axial nodes (BOC-4)
1     17.7800              : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 8.795
14.229
17.377
18.816
19.410
19.596
19.517
19.149
18.581
18.196
18.153
18.420
18.993
19.635
19.760
19.002
16.653
10.563
18                         : # of burnup axial nodes (Stpt2-4)
1     17.7800              : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
12.749
20.373
24.801
26.933
27.914
28.331
28.397
28.091
27.173
24.903
```

```
23.778
23.793
24.321
25.519
27.721
27.423
24.436
15.921
18                            : # of burnup axial nodes (Stpt3-4)
1     17.7800                 : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
13.253
21.112
25.647
27.814
28.800
29.215
29.278
28.971
28.023
25.565
24.364
24.370
24.905
26.172
28.617
28.364
25.326
16.564
```

```
N                          : This is not a pick-up case
Crystal River, Unit 3      : Reactor Identifier
CR3                        : Prefix Identifier for reactor
44group                    : Scale cross-section library
2.64                       : U-235 wt% enrichment in U of UO2
468620                     : Grams of U per assembly
208                        : Number of fuel rods in assembly
1.44272                    : Pin-pitch in assembly (cm)
0.939038                   : Fuel pellet diameter (cm)
0.95758                    : Fuel rod cladding ID (cm)
1.0922                     : Fuel rod cladding OD (cm)
360.172                    : Fuel stack height (cm)
N                          : No axial blanket fuel
INCONEL                    : Spacer grid material
0.005757609                : Vol. frac. of mod. displaced by grids
ZIRC-4                     : Fuel rod cladding material
640.0                      : Avg. fuel rod cladding temp. (K)
Y                          : Cladding materials other than ZIRC-4
1                          : Number of cladding materials needed other than ZIRC-4
6                          : SAS2H material mixture number for clad material below
SS304                      : Cladding material for CR's
2200.0                     : System pressure (psi)
N                          : Activate BPRA tracking
5                          : # of radial zones in the standard Path B model
3 0.63246                  : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                          : # of cross-section libraries per irradiation step
5                          : SAS2H output print level
0.5                        : Zone mesh factor for XSDRNPM
NO SPECIAL                 : No special XSDRNPM control parameter specs.
3                          : # of insertion reactor cycles
02                         : Insertion reactor cycle identifier
1                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
164.0                      : Days of downtime at EOC
166.5                      : Total cycle EFPD
212.0                      : Total cycle length in calendar days
28                         : Integer position of assembly in cycle
03                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
168.5                      : Stpt EFPD
193.0                      : Length to stpt in calendar days
16.792                     : Downtime at stpt
250.0                      : Stpt EFPD
325.792                    : Length to stpt in calendar days
12.333                     : Downtime at stpt
73.0                       : Days of downtime at EOC
323.0                      : Total cycle EFPD
416.0                      : Total cycle length in calendar days
23                         : Integer position of assembly in cycle
04                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
228.1                      : Stpt EFPD
308                        : Length to stpt in calendar days
15.167                     : Downtime at stpt
253.0                      : Stpt EFPD
350                        : Length to stpt in calendar days
24.0                       : Downtime at stpt
127                        : Days of downtime at EOC
```

```
336.6                  : Total cycle EFPD
464                    : Total cycle length in calendar days
26                     : Integer position of assembly in cycle
Y                      : Flag for variable or constant irradiation step specs
1                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
55.5     688.93        : Step length (EFPD), Mid-step ppmb
55.5     527.51        : Step length (EFPD), Mid-step ppmb
55.5     353.48        : Step length (EFPD), Mid-step ppmb
2                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
3                      : Number of steps in statepoint calculation
56.167   880.38        : Step length (EFPD), Mid-step ppmb
56.167   694.68        : Step length (EFPD), Mid-step ppmb
56.167   536.65        : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
40.75    382.60        : Step length (EFPD), Mid-step ppmb
40.75    267.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
36.5     234.64        : Step length (EFPD), Mid-step ppmb
36.5     128.17        : Step length (EFPD), Mid-step ppmb
3                      : Relative insertion cycle
1                      : Relative statepoint in insertion cycle
6                      : Number of steps in statepoint calculation
 .91     940.5         : Step length (EFPD), Mid-step ppmb
59.05    813.0         : Step length (EFPD), Mid-step ppmb
51.68    706.4         : Step length (EFPD), Mid-step ppmb
51.68    591.8         : Step length (EFPD), Mid-step ppmb
51.68    378.3         : Step length (EFPD), Mid-step ppmb
13.10    278.1         : Step length (EFPD), Mid-step ppmb
2                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
 3.71    253.5         : Step length (EFPD), Mid-step ppmb
21.29    213.3         : Step length (EFPD), Mid-step ppmb
3                      : Relative statepoint in insertion cycle
2                      : Number of steps in statepoint calculation
41.8     225.91        : Step length (EFPD), Mid-step ppmb
41.8     105.94        : Step length (EFPD), Mid-step ppmb
18                     : # of axial nodes in CRC format
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
RODDED
8                      : Number of irradiation steps with CRA inserted
1                      : Number of axial section with CRA inserted in step 1
3 1 1 1 4 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 2
3 1 2 1 3 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 3
3 1 3 1 2 7 1          : Input card 47B
1                      : Number of axial section with CRA inserted in step 4
3 1 4 1 2 7 1          : Input card 47B
```

```
1                        : Number of axial section with CRA inserted in step 5
3 1 5 1 2 7 1            : Input card 47B
1                        : Number of axial section with CRA inserted in step 6
3 1 6 1 1 7 1            : Input card 47B
1                        : Number of axial section with CRA inserted in step 7
3 2 1 1 3 7 1            : Input card 47B
1                        : Number of axial section with CRA inserted in step 8
3 2 2 1 2 7 1            : Input card 47B
1                        : Number of different CRA absorber material mixtures
7                        : SAS2H material mixture number for CRA absorber
4                        : Number of isotopes or elements in the CRA absorber
47000   79.8             : SCALE isotope ID, Isotope wt%
49000   15.0             : SCALE isotope ID, Isotope wt%
48000   5.0              : SCALE isotope ID, Isotope wt%
13027   0.2              : SCALE isotope ID, Isotope wt%
1                        : Number of CRA designs
10.17   6                : CR absorber density, CR clad SAS2H mat. mix. number
8                        : Number of radial zones in Path B model with CRA inserted
7   0.49784              : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784              : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                       : # of fuel temp axial nodes (BOC-2 to EOC-2)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 812.3
 980.2
1091.6
1154.4
1188.2
1206.1
1215.9
1221.2
1221.0
1213.4
1198.5
1179.4
1160.4
1142.9
1123.1
1087.7
```

```
1006.1
 822.6
18                              : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1       17.7800                 : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
1090.6
1347.6
1472.2
1509.7
1508.6
1489.7
1454.5
1404.2
1367.5
1368.7
1400.3
1460.9
1542.9
1585.2
1587.4
1556.8
1455.2
1172.4
18                              : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1       17.7800                 : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
1123.0
1301.5
1364.5
1365.6
1353.2
1341.5
1330.8
1313.5
1287.2
1276.2
1280.4
1293.9
```

```
1319.9
1352.6
1366.4
1362.6
1322.3
1144.1
18                          : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1123.0
1301.5
1364.5
1365.6
1353.2
1341.5
1330.8
1313.5
1287.2
1276.2
1280.4
1293.9
1319.9
1352.6
1366.4
1362.6
1322.3
1144.1
18                          : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 785.9
 873.1
 983.8
1190.3
1272.4
1316.2
1346.0
1366.4
```

```
1374.8
1359.1
1321.5
1277.6
1236.7
1206.5
1191.9
1174.9
1128.2
 976.3
18                          : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 867.3
1003.2
1154.8
1162.0
1149.8
1139.1
1134.1
1136.8
1143.7
1145.0
1137.0
1123.9
1109.2
1098.2
1098.5
1103.9
1091.6
1001.7
18                          : # of mod spec vol axial nodes (BOC-2 to EOC-2)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0227
0.0226
0.0226
0.0225
```

```
0.0224
0.0224
0.0223
0.0222
0.0221
0.0221
0.0220
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0237
0.0236
0.0235
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0224
0.0223
0.0222
0.0221
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
```

```
0.0236
0.0235
0.0234
0.0232
0.0231
0.0230
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                              : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1       17.7800                 : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0236
0.0235
0.0234
0.0232
0.0231
0.0230
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                              : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1       17.7800                 : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
```

```
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0234
0.0234
0.0233
0.0232
0.0231
0.0230
0.0228
0.0227
0.0225
0.0224
0.0223
0.0222
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0233
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of burnup axial nodes (BOC-2)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
```

```
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                          : # of burnup axial nodes (BOC-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1.408
2.488
3.231
3.641
3.847
3.942
3.977
3.977
3.952
3.912
3.869
3.838
3.818
3.792
3.708
3.466
2.892
1.680
18                          : # of burnup axial nodes (Stpt2-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
```

```
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 4.466
 7.597
 9.616
10.617
11.062
11.210
11.158
10.892
10.448
10.111
10.033
10.190
10.576
11.060
11.195
10.695
 9.184
 5.612
18                        : # of burnup axial nodes (Stpt3-3)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 6.165
10.251
12.712
13.827
14.275
14.403
14.322
13.989
13.419
12.992
12.912
13.136
13.672
14.378
14.642
14.112
12.303
 7.707
18                        : # of burnup axial nodes (BOC-4)
1      17.7800            : Node #, node height (cm)
2      20.0025
```

```
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
 7.743
12.574
15.330
16.514
16.961
17.059
16.911
16.476
15.853
15.460
15.464
15.810
16.468
17.177
17.346
16.678
14.617
 9.289
18                      : # of burnup axial nodes (Stpt2-4)
1       17.7800         : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
 9.934
16.299
21.432
24.305
25.397
25.792
25.815
25.473
24.840
24.299
24.089
24.251
24.792
25.480
25.674
24.822
21.954
```

```
14.219
18                              : # of burnup axial nodes (Stpt3-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
10.221
16.757
22.171
25.163
26.278
26.675
26.697
26.358
25.729
25.187
24.976
25.138
25.685
26.384
26.593
25.740
22.810
14.825
```

N	: This is not a pick-up case
Crystal River, Unit 3	: Reactor Identifier
CR3	: Prefix Identifier for reactor
44group	: Scale cross-section library
2.64	: U-235 wt% enrichment in U of UO2
468620	: Grams of U per assembly
208	: Number of fuel rods in assembly
1.44272	: Pin-pitch in assembly (cm)
0.939038	: Fuel pellet diameter (cm)
0.95758	: Fuel rod cladding ID (cm)
1.0922	: Fuel rod cladding OD (cm)
360.172	: Fuel stack height (cm)
N	: No axial blanket fuel
INCONEL	: Spacer grid material
0.005757609	: Vol. frac. of mod. displaced by grids
ZIRC-4	: Fuel rod cladding material
640.0	: Avg. fuel rod cladding temp. (K)
Y	: Cladding materials other than ZIRC-4
1	: Number of cladding materials needed other than ZIRC-4
6	: SAS2H material mixture number for clad material below
SS304	: Cladding material for CR's
2200.0	: System pressure (psi)
N	: Activate BPRA tracking
5	: # of radial zones in the standard Path B model
3 0.63246	: Standard Path B model (Input Card 20)
2 0.67310	
3 0.81397	
500 2.97599	
3 2.99939	
1	: # of cross-section libraries per irradiation step
5	: SAS2H output print level
0.5	: Zone mesh factor for XSDRNPM
NO SPECIAL	: No special XSDRNPM control parameter specs.
3	: # of insertion reactor cycles
02	: Insertion reactor cycle identifier
1	: # of stpts in cycle
0	: Stpt EFPD
0	: Length to stpt in calendar days
0	: Downtime at stpt
164.0	: Days of downtime at EOC
166.5	: Total cycle EFPD
212.0	: Total cycle length in calendar days
29	: Integer position of assembly in cycle
03	: Insertion reactor cycle identifier
3	: # of stpts in cycle
0	: Stpt EFPD
0	: Length to stpt in calendar days
0	: Downtime at stpt
168.5	: Stpt EFPD
193.0	: Length to stpt in calendar days
16.792	: Downtime at stpt
250.0	: Stpt EFPD
325.792	: Length to stpt in calendar days
12.333	: Downtime at stpt
73.0	: Days of downtime at EOC
323.0	: Total cycle EFPD
416.0	: Total cycle length in calendar days
23	: Integer position of assembly in cycle
04	: Insertion reactor cycle identifier
3	: # of stpts in cycle
0	: Stpt EFPD
0	: Length to stpt in calendar days
0	: Downtime at stpt
228.1	: Stpt EFPD
308	: Length to stpt in calendar days
15.167	: Downtime at stpt
253.0	: Stpt EFPD
350	: Length to stpt in calendar days
24.0	: Downtime at stpt
127	: Days of downtime at EOC

```
336.6                    : Total cycle EFPD
464                      : Total cycle length in calendar days
16                       : Integer position of assembly in cycle
Y                        : Flag for variable or constant irradiation step specs
1                        : Relative insertion cycle
1                        : Relative statepoint in insertion cycle
3                        : Number of steps in statepoint calculation
55.5     688.93          : Step length (EFPD), Mid-step ppmb
55.5     527.51          : Step length (EFPD), Mid-step ppmb
55.5     353.48          : Step length (EFPD), Mid-step ppmb
2                        : Relative insertion cycle
1                        : Relative statepoint in insertion cycle
3                        : Number of steps in statepoint calculation
56.167   880.38          : Step length (EFPD), Mid-step ppmb
56.167   694.68          : Step length (EFPD), Mid-step ppmb
56.167   536.65          : Step length (EFPD), Mid-step ppmb
2                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
40.75    382.60          : Step length (EFPD), Mid-step ppmb
40.75    267.17          : Step length (EFPD), Mid-step ppmb
3                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
36.5     234.64          : Step length (EFPD), Mid-step ppmb
36.5     128.17          : Step length (EFPD), Mid-step ppmb
3                        : Relative insertion cycle
1                        : Relative statepoint in insertion cycle
8                        : Number of steps in statepoint calculation
  .12    943.3           : Step length (EFPD), Mid-step ppmb
 1.16    938.7           : Step length (EFPD), Mid-step ppmb
53.55    810.2           : Step length (EFPD), Mid-step ppmb
53.43    725.4           : Step length (EFPD), Mid-step ppmb
53.43    586.9           : Step length (EFPD), Mid-step ppmb
53.43    380.8           : Step length (EFPD), Mid-step ppmb
12.88    278.0           : Step length (EFPD), Mid-step ppmb
  .10    255.2           : Step length (EFPD), Mid-step ppmb
2                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
 3.93    253.4           : Step length (EFPD), Mid-step ppmb
21.07    213.0           : Step length (EFPD), Mid-step ppmb
3                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
41.8     225.91          : Step length (EFPD), Mid-step ppmb
41.8     105.94          : Step length (EFPD), Mid-step ppmb
18                       : # of axial nodes in CRC format
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
RODDED
10                       : Number of irradiation steps with CRA inserted
1                        : Number of axial section with CRA inserted in step 1
3 1 1 1 18 7 1           : Input card 47B
1                        : Number of axial section with CRA inserted in step 2
3 1 2 1 17 7 1           : Input card 47B
1                        : Number of axial section with CRA inserted in step 3
3 1 3 1 16 7 1           : Input card 47B
```

```
1                          : Number of axial section with CRA inserted in step 4
3 1 4 1 15 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 5
3 1 5 1 15 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 6
3 1 6 1 15 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 7
3 1 7 1 14 7 1             : Input card 47B
3                          : Number of axial section with CRA inserted in step 8
3 1 8 2 2  7 1             : Input card 47B
3 1 8 4 5  7 1             : Input card 47B
3 1 8 7 13 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 9
3 2 1 1 16 7 1             : Input card 47B
1                          : Number of axial section with CRA inserted in step 10
3 2 2 1 15 7 1             : Input card 47B
1                          : Number of different CRA absorber material mixtures
7                          : SAS2H material mixture number for CRA absorber
4                          : Number of isotopes or elements in the CRA absorber
47000   79.8               : SCALE isotope ID, Isotope wt%
49000   15.0               : SCALE isotope ID, Isotope wt%
48000   5.0                : SCALE isotope ID, Isotope wt%
13027   0.2                : SCALE isotope ID, Isotope wt%
1                          : Number of CRA designs
10.17   6                  : CR absorber density, CR clad SAS2H mat. mix. number
8                          : Number of radial zones in Path B model with CRA inserted
7   0.49784                : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784                : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                         : # of fuel temp axial nodes (BOC-2 to EOC-2)
1     17.7800              : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 828.1
1010.4
1143.3
1224.1
1268.6
1290.7
1302.9
1309.6
```

```
1310.1
1302.1
1285.9
1265.0
1243.9
1224.3
1202.1
1162.8
1072.7
 865.0
18                       : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1090.6
1347.6
1472.2
1509.7
1508.6
1489.7
1454.5
1404.2
1367.5
1368.7
1400.3
1460.9
1542.9
1585.2
1587.4
1556.8
1455.2
1172.4
18                       : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1123.0
1301.5
1364.5
1365.6
```

```
1353.2
1341.5
1330.8
1313.5
1287.2
1276.2
1280.4
1293.9
1319.9
1352.6
1366.4
1362.6
1322.3
1144.1
18                          : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1123.0
1301.5
1364.5
1365.6
1353.2
1341.5
1330.8
1313.5
1287.2
1276.2
1280.4
1293.9
1319.9
1352.6
1366.4
1362.6
1322.3
1144.1
18                          : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
```

```
 792.7
 878.7
 939.7
 985.2
1019.5
1045.6
1067.2
1087.3
1101.2
1096.7
1073.7
1041.8
1007.8
 981.5
 977.1
1026.8
1154.9
1033.2
18                            : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1      17.7800                : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 872.2
 957.9
 984.4
 985.1
 977.5
 969.8
 966.1
 968.3
 973.9
 974.6
 967.7
 956.8
 945.0
 939.4
 969.3
1125.9
1127.2
1036.0
18                            : # of mod spec vol axial nodes (BOC-2 to EOC-2)
1      17.7800                : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
```

```
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0228
0.0228
0.0227
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
0.0216
18                     : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0237
0.0236
0.0235
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0224
0.0223
0.0222
0.0221
0.0219
0.0218
0.0217
0.0216
18                     : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
```

```
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0236
0.0235
0.0234
0.0232
0.0231
0.0230
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0236
0.0235
0.0234
0.0232
0.0231
0.0230
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
```

```
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0228
0.0228
0.0227
0.0227
0.0226
0.0225
0.0224
0.0223
0.0223
0.0222
0.0221
0.0220
0.0219
0.0219
0.0218
0.0217
0.0217
0.0216
18                        : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1       17.7800           : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0229
0.0228
0.0227
0.0227
0.0226
0.0225
0.0224
0.0224
0.0223
0.0222
0.0221
0.0221
0.0220
0.0219
0.0219
0.0218
0.0217
0.0216
18                        : # of burnup axial nodes (BOC-2)
1       17.7800           : Node #, node height (cm)
2       20.0025
```

```
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                       : # of burnup axial nodes (BOC-3)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1.408
2.488
3.231
3.641
3.847
3.942
3.977
3.977
3.952
3.912
3.869
3.838
3.818
3.792
3.708
3.466
2.892
```

```
1.680
18                       : # of burnup axial nodes (Stpt2-3)
1      17.7800           : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 4.466
 7.597
 9.616
10.617
11.062
11.210
11.158
10.892
10.448
10.111
10.033
10.190
10.576
11.060
11.195
10.695
 9.184
 5.612
18                       : # of burnup axial nodes (Stpt3-3)
1      17.7800           : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 6.165
10.251
12.712
13.827
14.275
14.403
14.322
13.989
13.419
12.992
12.912
13.136
13.672
```

```
14.378
14.642
14.112
12.303
 7.707
18                          : # of burnup axial nodes (BOC-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 7.805
12.713
15.574
16.843
17.337
17.457
17.320
16.890
16.271
15.878
15.881
16.225
16.876
17.572
17.723
17.025
14.911
 9.475
18                          : # of burnup axial nodes (Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
10.208
16.472
20.228
22.012
22.805
23.105
23.098
22.784
22.233
```

```
21.795
21.665
21.851
22.361
23.027
23.574
24.671
22.924
15.105
18                         : # of burnup axial nodes ($tpt3-4)
1    17.7800               : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
10.522
16.941
20.780
22.597
23.399
23.699
23.692
23.382
22.834
22.396
22.263
22.446
22.955
23.626
24.216
25.539
23.828
15.765
```

```
N                        : This is not a pick-up case
Crystal River, Unit 3    : Reactor Identifier
CR3                      : Prefix Identifier for reactor
44group                  : Scale cross-section library
2.62                     : U-235 wt% enrichment in U of UO2
463630                   : Grams of U per assembly
208                      : Number of fuel rods in assembly
1.44272                  : Pin-pitch in assembly (cm)
0.936244                 : Fuel pellet diameter (cm)
0.95758                  : Fuel rod cladding ID (cm)
1.0922                   : Fuel rod cladding OD (cm)
360.172                  : Fuel stack height (cm)
N                        : No axial blanket fuel
INCONEL                  : Spacer grid material
0.005757609              : Vol. frac. of mod. displaced by grids
ZIRC-4                   : Fuel rod cladding material
640.0                    : Avg. fuel rod cladding temp. (K)
Y                        : Cladding materials other than ZIRC-4
1                        : Number of cladding materials needed other than ZIRC-4
6                        : SAS2H material mixture number for clad material below
SS304                    : Cladding material for CR's
2200.0                   : System pressure (psi)
N                        : Activate BPRA tracking
5                        : # of radial zones in the standard Path B model
3 0.63246                : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                        : # of cross-section libraries per irradiation step
5                        : SAS2H output print level
0.5                      : Zone mesh factor for XSDRNPM
NO SPECIAL               : No special XSDRNPM control parameter specs.
3                        : # of insertion reactor cycles
03                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
168.5                    : Stpt EFPD
193.0                    : Length to stpt in calendar days
16.792                   : Downtime at stpt
250.0                    : Stpt EFPD
325.792                  : Length to stpt in calendar days
12.333                   : Downtime at stpt
73.0                     : Days of downtime at EOC
323.0                    : Total cycle EFPD
416.0                    : Total cycle length in calendar days
15                       : Integer position of assembly in cycle
04                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
228.1                    : Stpt EFPD
308                      : Length to stpt in calendar days
15.167                   : Downtime at stpt
253.0                    : Stpt EFPD
350                      : Length to stpt in calendar days
24.0                     : Downtime at stpt
127                      : Days of downtime at EOC
336.6                    : Total cycle EFPD
464                      : Total cycle length in calendar days
21                       : Integer position of assembly in cycle
05                       : Insertion reactor cycle identifier
2                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
388.5                    : Stpt EFPD
```

```
470                  : Length to stpt in calendar days
4.958                : Downtime at stpt
163.0                : Days of downtime at EOC
484.4                : Total cycle EFPD
593.0                : Total cycle length in calendar days
07                   : Integer position of assembly in cycle
Y                    : Flag for variable or constant irradiation step specs
1                    : Relative insertion cycle
1                    : Relative statepoint in insertion cycle
3                    : Number of steps in statepoint calculation
56.167  880.38       : Step length (EFPD), Mid-step ppmb
56.167  694.68       : Step length (EFPD), Mid-step ppmb
56.167  536.65       : Step length (EFPD), Mid-step ppmb
2                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
40.75   382.60       : Step length (EFPD), Mid-step ppmb
40.75   267.17       : Step length (EFPD), Mid-step ppmb
3                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
36.5    234.64       : Step length (EFPD), Mid-step ppmb
36.5    128.17       : Step length (EFPD), Mid-step ppmb
2                    : Relative insertion cycle
1                    : Relative statepoint in insertion cycle
3                    : Number of steps in statepoint calculation
76.233  787.34       : Step length (EFPD), Mid-step ppmb
76.233  625.59       : Step length (EFPD), Mid-step ppmb
76.233  373.77       : Step length (EFPD), Mid-step ppmb
2                    : Relative statepoint in insertion cycle
1                    : Number of steps in statepoint calculation
24.9    218.65       : Step length (EFPD), Mid-step ppmb
3                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
41.8    225.91       : Step length (EFPD), Mid-step ppmb
41.8    105.94       : Step length (EFPD), Mid-step ppmb
3                    : Relative insertion cycle
1                    : Relative statepoint in insertion cycle
8                    : Number of steps in statepoint calculation
 4.47   1043.0       : Step length (EFPD), Mid-step ppmb
56.24   992.2        : Step length (EFPD), Mid-step ppmb
28.62   921.2        : Step length (EFPD), Mid-step ppmb
59.83   829.1        : Step length (EFPD), Mid-step ppmb
59.83   681.2        : Step length (EFPD), Mid-step ppmb
59.83   520.0        : Step length (EFPD), Mid-step ppmb
59.83   361.6        : Step length (EFPD), Mid-step ppmb
59.83   204.4        : Step length (EFPD), Mid-step ppmb
2                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
47.95   92.03        : Step length (EFPD), Mid-step ppmb
47.95   2.35         : Step length (EFPD), Mid-step ppmb
18                   : # of axial nodes in CRC format
1    17.7800         : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
RODDED
3                    : Number of irradiation steps with CRA inserted
```

```
1                         : Number of axial section with CRA inserted in step 1
3 1 1 1 3 7 1             : Input card 47B
1                         : Number of axial section with CRA inserted in step 2
3 1 2 1 2 7 1             : Input card 47B
1                         : Number of axial section with CRA inserted in step 3
3 1 3 1 1 7 1             : Input card 47B
1                         : Number of different CRA absorber material mixtures
7                         : SAS2H material mixture number for CRA absorber
4                         : Number of isotopes or elements in the CRA absorber
47000   79.8              : SCALE isotope ID, Isotope wt%
49000   15.0              : SCALE isotope ID, Isotope wt%
48000   5.0               : SCALE isotope ID, Isotope wt%
13027   0.2               : SCALE isotope ID, Isotope wt%
1                         : Number of CRA designs
10.17   6                 : CR absorber density, CR clad SAS2H mat. mix. number
8                         : Number of radial zones in Path B model with CRA inserted
7   0.49784               : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784               : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                        : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 800.1
 953.9
1046.4
1085.6
1098.1
1097.9
1092.4
1086.6
1084.6
1089.2
1100.5
1116.0
1131.7
1144.2
1150.6
1135.3
1059.3
 857.6
```

```
18                        : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1    17.7800              : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 874.4
1034.1
1103.1
1123.9
1126.8
1124.9
1122.7
1121.4
1121.5
1123.2
1126.7
1132.2
1141.3
1157.5
1175.0
1170.4
1115.8
 932.4
18                        : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1    17.7800              : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 874.4
1034.1
1103.1
1123.9
1126.8
1124.9
1122.7
1121.4
1121.5
1123.2
1126.7
1132.2
1141.3
1157.5
```

```
1175.0
1170.4
1115.8
 932.4
18                          : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
724.1
818.6
877.4
913.4
937.2
953.5
963.9
968.0
965.2
955.5
941.2
926.0
912.7
902.1
892.3
877.2
840.9
742.3
18                          : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
796.9
889.8
921.4
927.4
924.8
920.5
917.1
915.4
914.3
912.8
```

```
910.1
906.9
904.8
905.0
907.7
907.1
886.8
801.2
18                          : # of fuel temp axial nodes (Stpt3-4 to EOC-4)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
796.9
889.8
921.4
927.4
924.8
920.5
917.1
915.4
914.3
912.8
910.1
906.9
904.8
905.0
907.7
907.1
886.8
801.2
18                          : # of fuel temp axial nodes (BOC-5 to Stpt2-5)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1005.5
1126.9
1140.4
1131.5
1120.7
1110.7
```

```
1103.6
1100.7
1102.8
1109.4
1118.5
1127.4
1133.6
1134.7
1130.4
1119.1
1092.1
 975.7
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0225
0.0225
0.0225
0.0224
0.0223
0.0223
0.0222
0.0222
0.0221
0.0220
0.0220
0.0219
0.0219
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0227
0.0227
```

```
0.0226
0.0225
0.0225
0.0224
0.0223
0.0222
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0218
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0227
0.0227
0.0226
0.0225
0.0225
0.0224
0.0223
0.0222
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0218
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
```

```
17    20.0025
18    22.3520
0.0223
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0217
0.0216
0.0216
0.0216
18                     : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0224
0.0223
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0220
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                     : # of mod spec vol axial nodes (Stpt3-4 to EOC-4)
1     17.7800          : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
```

```
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0224
0.0223
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0220
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (BOC-5 to Stpt2-5)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
18                          : # of burnup axial nodes (BOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
```

```
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                      : # of burnup axial nodes (Stpt2-3)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1.357
2.350
2.976
3.283
3.416
3.461
3.458
3.429
3.396
3.377
3.390
3.436
3.506
3.586
3.634
3.522
3.016
1.788
18                      : # of burnup axial nodes (Stpt3-3)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
```

```
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
2.179
3.704
4.614
5.029
5.196
5.247
5.245
5.217
5.187
5.179
5.211
5.291
5.418
5.586
5.718
5.579
4.827
2.914
18                          : # of burnup axial nodes (BOC-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
2.948
4.963
6.181
6.775
7.035
7.128
7.147
7.138
7.132
7.152
7.207
7.292
7.394
7.498
7.533
7.258
6.275
3.826
18                          : # of burnup axial nodes (Stpt2-4)
```

```
1      17.7800          : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 4.449
 7.481
 9.315
10.228
10.657
10.841
10.908
10.913
10.888
10.863
10.864
10.906
10.990
11.103
11.140
10.764
 9.364
 5.763
18                      : # of burnup axial nodes (Stpt3-4)
1      17.7800          : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 4.657
 7.811
 9.707
10.641
11.075
11.259
11.325
11.330
11.305
11.280
11.282
11.327
11.416
11.535
11.578
```

```
11.199
 9.761
 6.023
18                              : # of burnup axial nodes (BOC-5)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 5.389
 8.961
11.064
12.068
12.510
12.680
12.728
12.725
12.709
12.708
12.742
12.815
12.916
13.020
13.022
12.566
10.969
 6.812
18                              : # of burnup axial nodes (Stpt2-5)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
11.243
18.304
22.723
24.595
25.301
25.521
25.531
25.465
25.413
25.442
25.572
```

25.775
25.983
26.091
25.896
24.895
21.967
14.181

```
Y                        : This is a pick-up case from Cyc-3, Stpt3, Assy C15
2                        : Relative pick-up cycle
3                        : Relative pick-up statepoint
Crystal River, Unit 3    : Reactor Identifier
CR3                      : Prefix Identifier for reactor
44group                  : Scale cross-section library
2.62                     : U-235 wt% enrichment in U of UO2
463630                   : Grams of U per assembly
208                      : Number of fuel rods in assembly
1.44272                  : Pin-pitch in assembly (cm)
0.936244                 : Fuel pellet diameter (cm)
0.95758                  : Fuel rod cladding ID (cm)
1.0922                   : Fuel rod cladding OD (cm)
360.172                  : Fuel stack height (cm)
N                        : No axial blanket fuel
INCONEL                  : Spacer grid material
0.005757609              : Vol. frac. of mod. displaced by grids
ZIRC-4                   : Fuel rod cladding material
640.0                    : Avg. fuel rod cladding temp. (K)
Y                        : Cladding materials other than ZIRC-4
1                        : Number of cladding materials needed other than ZIRC-4
6                        : SAS2H material mixture number for clad material below
SS304                    : Cladding material for CR's
2200.0                   : System pressure (psi)
N                        : Activate BPRA tracking
5                        : # of radial zones in the standard Path B model
3 0.63246                : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                        : # of cross-section libraries per irradiation step
5                        : SAS2H output print level
0.5                      : Zone mesh factor for XSDRNPM
NO SPECIAL               : No special XSDRNPM control parameter specs.
3                        : # of insertion reactor cycles
03                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
168.5                    : Stpt EFPD
193.0                    : Length to stpt in calendar days
16.792                   : Downtime at stpt
250.0                    : Stpt EFPD
325.792                  : Length to stpt in calendar days
12.333                   : Downtime at stpt
73.0                     : Days of downtime at EOC
323.0                    : Total cycle EFPD
416.0                    : Total cycle length in calendar days
15                       : Integer position of assembly in cycle
04                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
228.1                    : Stpt EFPD
308                      : Length to stpt in calendar days
15.167                   : Downtime at stpt
253.0                    : Stpt EFPD
350                      : Length to stpt in calendar days
24.0                     : Downtime at stpt
127                      : Days of downtime at EOC
336.6                    : Total cycle EFPD
464                      : Total cycle length in calendar days
21                       : Integer position of assembly in cycle
05                       : Insertion reactor cycle identifier
2                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
```

```
0                    : Downtime at stpt
388.5                : Stpt EFPD
470                  : Length to stpt in calendar days
4.958                : Downtime at stpt
163.0                : Days of downtime at EOC
484.4                : Total cycle EFPD
593.0                : Total cycle length in calendar days
26                   : Integer position of assembly in cycle
Y                    : Flag for variable or constant irradiation step specs
1                    : Relative insertion cycle
1                    : Relative statepoint in insertion cycle
3                    : Number of steps in statepoint calculation
56.167   880.38      : Step length (EFPD), Mid-step ppmb
56.167   694.68      : Step length (EFPD), Mid-step ppmb
56.167   536.65      : Step length (EFPD), Mid-step ppmb
2                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
40.75    382.60      : Step length (EFPD), Mid-step ppmb
40.75    267.17      : Step length (EFPD), Mid-step ppmb
3                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
36.5     234.64      : Step length (EFPD), Mid-step ppmb
36.5     128.17      : Step length (EFPD), Mid-step ppmb
2                    : Relative insertion cycle
1                    : Relative statepoint in insertion cycle
3                    : Number of steps in statepoint calculation
76.233   787.34      : Step length (EFPD), Mid-step ppmb
76.233   625.59      : Step length (EFPD), Mid-step ppmb
76.233   373.77      : Step length (EFPD), Mid-step ppmb
2                    : Relative statepoint in insertion cycle
1                    : Number of steps in statepoint calculation
24.9     218.65      : Step length (EFPD), Mid-step ppmb
3                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
41.8     225.91      : Step length (EFPD), Mid-step ppmb
41.8     105.94      : Step length (EFPD), Mid-step ppmb
3                    : Relative insertion cycle
1                    : Relative statepoint in insertion cycle
8                    : Number of steps in statepoint calculation
 4.50    1042.9      : Step length (EFPD), Mid-step ppmb
56.74     991.7      : Step length (EFPD), Mid-step ppmb
28.93     920.0      : Step length (EFPD), Mid-step ppmb
59.67     827.2      : Step length (EFPD), Mid-step ppmb
59.67     679.6      : Step length (EFPD), Mid-step ppmb
59.67     518.9      : Step length (EFPD), Mid-step ppmb
59.67     361.1      : Step length (EFPD), Mid-step ppmb
59.67     204.2      : Step length (EFPD), Mid-step ppmb
2                    : Relative statepoint in insertion cycle
2                    : Number of steps in statepoint calculation
47.95    92.03       : Step length (EFPD), Mid-step ppmb
47.95    2.35        : Step length (EFPD), Mid-step ppmb
18                   : # of axial nodes in CRC format
1     17.7800        : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
```

```
RODDED
3                          : Number of irradiation steps with CRA inserted
1                          : Number of axial section with CRA inserted in step 1
3 1 1 1 3 7 1              : Input card 47B
1                          : Number of axial section with CRA inserted in step 2
3 1 2 1 2 7 1              : Input card 47B
1                          : Number of axial section with CRA inserted in step 3
3 1 3 1 1 7 1              : Input card 47B
1                          : Number of different CRA absorber material mixtures
7                          : SAS2H material mixture number for CRA absorber
4                          : Number of isotopes or elements in the CRA absorber
47000   79.8               : SCALE isotope ID, Isotope wt%
49000   15.0               : SCALE isotope ID, Isotope wt%
48000   5.0                : SCALE isotope ID, Isotope wt%
13027   0.2                : SCALE isotope ID, Isotope wt%
1                          : Number of CRA designs
10.17   6                  : CR absorber density, CR clad SAS2H mat. mix. number
8                          : Number of radial zones in Path B model with CRA inserted
7   0.49784                : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784                : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                         : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800              : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 800.1
 953.9
1046.4
1085.6
1098.1
1097.9
1092.4
1086.6
1084.6
1089.2
1100.5
1116.0
1131.7
1144.2
1150.6
1135.3
```

```
1059.3
 857.6
18                        : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 874.4
1034.1
1103.1
1123.9
1126.8
1124.9
1122.7
1121.4
1121.5
1123.2
1126.7
1132.2
1141.3
1157.5
1175.0
1170.4
1115.8
 932.4
18                        : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 874.4
1034.1
1103.1
1123.9
1126.8
1124.9
1122.7
1121.4
1121.5
1123.2
1126.7
1132.2
```

```
1141.3
1157.5
1175.0
1170.4
1115.8
 932.4
18                              : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
724.1
818.6
877.4
913.4
937.2
953.5
963.9
968.0
965.2
955.5
941.2
926.0
912.7
902.1
892.3
877.2
840.9
742.3
18                              : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
796.9
889.8
921.4
927.4
924.8
920.5
917.1
915.4
```

```
914.3
912.8
910.1
906.9
904.8
905.0
907.7
907.1
886.8
801.2
18                                 : # of fuel temp axial nodes (Stpt3-4 to EOC-4)
1       17.7800                    : Node #, node height (cm).
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
796.9
889.8
921.4
927.4
924.8
920.5
917.1
915.4
914.3
912.8
910.1
906.9
904.8
905.0
907.7
907.1
886.8
801.2
18                                 : # of fuel temp axial nodes (BOC-5 to Stpt2-5)
1       17.7800                    : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
1030.6
1155.2
1167.6
1159.5
```

```
1147.6
1135.2
1123.2
1114.1
1112.5
1119.8
1133.5
1150.8
1166.2
1171.7
1166.9
1153.6
1123.1
1003.8
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0225
0.0225
0.0225
0.0224
0.0223
0.0223
0.0222
0.0222
0.0221
0.0220
0.0220
0.0219
0.0219
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
```

```
0.0227
0.0227
0.0226
0.0225
0.0225
0.0224
0.0223
0.0222
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0218
0.0217
0.0216
0.0216
18                        : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0227
0.0227
0.0226
0.0225
0.0225
0.0224
0.0223
0.0222
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0218
0.0217
0.0216
0.0216
18                        : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
```

```
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0223
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0217
0.0216
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0224
0.0223
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0220
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt3-4 to EOC-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
```

```
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0224
0.0223
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0220
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                              : # of mod spec vol axial nodes (BOC-5 to Stpt2-5)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0233
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                              : # of burnup axial nodes (BOC-3)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
```

```
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                      : # of burnup axial nodes (Stpt2-3)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1.357
2.350
2.976
3.283
3.416
3.461
3.458
3.429
3.396
3.377
3.390
3.436
3.506
3.586
3.634
3.522
3.016
1.788
18                      : # of burnup axial nodes (Stpt3-3)
1     17.7800           : Node #, node height (cm)
2     20.0025
```

```
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
2.179
3.704
4.614
5.029
5.196
5.247
5.245
5.217
5.187
5.179
5.211
5.291
5.418
5.586
5.718
5.579
4.827
2.914
18                              : # of burnup axial nodes (BOC-4)
1     17.7800                   : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
2.948
4.963
6.181
6.775
7.035
7.128
7.147
7.138
7.132
7.152
7.207
7.292
7.394
7.498
7.533
7.258
6.275
```

```
3.826
18                          : # of burnup axial nodes (Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 4.449
 7.481
 9.315
10.228
10.657
10.841
10.908
10.913
10.888
10.863
10.864
10.906
10.990
11.103
11.140
10.764
 9.364
 5.763
18                          : # of burnup axial nodes (Stpt3-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 4.657
 7.811
 9.707
10.641
11.075
11.259
11.325
11.330
11.305
11.280
11.282
11.327
11.416
```

```
11.535
11.578
11.199
 9.761
 6.023
18                              : # of burnup axial nodes (BOC-5)
1      17.7800                  : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 5.385
 8.956
11.058
12.061
12.503
12.673
12.721
12.718
12.702
12.701
12.736
12.809
12.909
13.014
13.015
12.560
10.963
 6.808
18                              : # of burnup axial nodes (Stpt2-5)
1      17.7800                  : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
11.641
18.872
23.409
25.334
26.050
26.230
26.130
25.876
25.618
```

25.513
25.637
25.966
26.394
26.717
26.649
25.685
22.723
14.744

```
N                        : This is not a pick-up case
Crystal River, Unit 3    : Reactor Identifier
CR3                      : Prefix Identifier for reactor
44group                  : Scale cross-section library
2.62                     : U-235 wt% enrichment in U of UO2
463630                   : Grams of U per assembly
208                      : Number of fuel rods in assembly
1.44272                  : Pin-pitch in assembly (cm)
0.936244                 : Fuel pellet diameter (cm)
0.95758                  : Fuel rod cladding ID (cm)
1.0922                   : Fuel rod cladding OD (cm)
360.172                  : Fuel stack height (cm)
N                        : No axial blanket fuel
INCONEL                  : Spacer grid material
0.005757609              : Vol. frac. of mod. displaced by grids
ZIRC-4                   : Fuel rod cladding material
640.0                    : Avg. fuel rod cladding temp. (K)
Y                        : Cladding materials other than ZIRC-4
1                        : Number of cladding materials needed other than ZIRC-4
6                        : SAS2H material mixture number for clad material below
SS304                    : Cladding material for CR's
2200.0                   : System pressure (psi)
N                        : Activate BPRA tracking
5                        : # of radial zones in the standard Path B model
3 0.63246                : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                        : # of cross-section libraries per irradiation step
5                        : SAS2H output print level
0.5                      : Zone mesh factor for XSDRNPM
NO SPECIAL               : No special XSDRNPM control parameter specs.
3                        : # of insertion reactor cycles
03                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
168.5                    : Stpt EFPD
193.0                    : Length to stpt in calendar days
16.792                   : Downtime at stpt
250.0                    : Stpt EFPD
325.792                  : Length to stpt in calendar days
12.333                   : Downtime at stpt
73.0                     : Days of downtime at EOC
323.0                    : Total cycle EFPD
416.0                    : Total cycle length in calendar days
20                       : Integer position of assembly in cycle
04                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
228.1                    : Stpt EFPD
308                      : Length to stpt in calendar days
15.167                   : Downtime at stpt
253.0                    : Stpt EFPD
350                      : Length to stpt in calendar days
24.0                     : Downtime at stpt
2652.0                   : Days of downtime at EOC
336.6                    : Total cycle EFPD
464                      : Total cycle length in calendar days
24                       : Integer position of assembly in cycle
08                       : Insertion reactor cycle identifier
6                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
97.6                     : Stpt EFPD
```

```
110.0               : Length to stpt in calendar days
15.5                : Downtime at stpt
139.8               : Stpt EFPD
173.5               : Length to stpt in calendar days
6.2                 : Downtime at stpt
404.0               : Stpt EFPD
479.7               : Length to stpt in calendar days
44.4                : Downtime at stpt
409.6               : Stpt EFPD
529.1               : Length to stpt in calendar days
4.9                 : Downtime at stpt
515.5               : Stpt EFPD
645.0               : Length to stpt in calendar days
7.6                 : Downtime at stpt
75                  : Days of downtime at EOC
535.9               : Total cycle EFPD
679                 : Total cycle length in calendar days
05                  : Integer position of assembly in cycle
Y                   : Flag for variable or constant irradiation step specs
1                   : Relative insertion cycle
1                   : Relative statepoint in insertion cycle
3                   : Number of steps in statepoint calculation
56.167   880.38     : Step length (EFPD), Mid-step ppmb
56.167   694.68     : Step length (EFPD), Mid-step ppmb
56.167   536.65     : Step length (EFPD), Mid-step ppmb
2                   : Relative statepoint in insertion cycle
2                   : Number of steps in statepoint calculation
40.75    382.60     : Step length (EFPD), Mid-step ppmb
40.75    267.17     : Step length (EFPD), Mid-step ppmb
3                   : Relative statepoint in insertion cycle
2                   : Number of steps in statepoint calculation
36.5     234.64     : Step length (EFPD), Mid-step ppmb
36.5     128.17     : Step length (EFPD), Mid-step ppmb
2                   : Relative insertion cycle
1                   : Relative statepoint in insertion cycle
3                   : Number of steps in statepoint calculation
76.233   787.34     : Step length (EFPD), Mid-step ppmb
76.233   625.59     : Step length (EFPD), Mid-step ppmb
76.233   373.77     : Step length (EFPD), Mid-step ppmb
2                   : Relative statepoint in insertion cycle
1                   : Number of steps in statepoint calculation
24.9     218.65     : Step length (EFPD), Mid-step ppmb
3                   : Relative statepoint in insertion cycle
2                   : Number of steps in statepoint calculation
41.8     225.91     : Step length (EFPD), Mid-step ppmb
41.8     105.94     : Step length (EFPD), Mid-step ppmb
3                   : Relative insertion cycle
1                   : Relative statepoint in insertion cycle
3                   : Number of steps in statepoint calculation
24.83    1534.6     : Step length (EFPD), Mid-step ppmb
36.38    1473.7     : Step length (EFPD), Mid-step ppmb
36.38    1407.7     : Step length (EFPD), Mid-step ppmb
2                   : Relative statepoint in insertion cycle
2                   : Number of steps in statepoint calculation
 4.04    1359.9     : Step length (EFPD), Mid-step ppmb
38.16    1298.2     : Step length (EFPD), Mid-step ppmb
3                   : Relative statepoint in insertion cycle
5                   : Number of steps in statepoint calculation
20.57    1191.7     : Step length (EFPD), Mid-step ppmb
60.91    1110.2     : Step length (EFPD), Mid-step ppmb
60.91     947.0     : Step length (EFPD), Mid-step ppmb
60.91     771.9     : Step length (EFPD), Mid-step ppmb
60.91     580.3     : Step length (EFPD), Mid-step ppmb
4                   : Relative statepoint in insertion cycle
2                   : Number of steps in statepoint calculation
1.81      488.9     : Step length (EFPD), Mid-step ppmb
3.79      482.4     : Step length (EFPD), Mid-step ppmb
5                   : Relative statepoint in insertion cycle
3                   : Number of steps in statepoint calculation
19.48     455.3     : Step length (EFPD), Mid-step ppmb
```

```
43.21     379.4         : Step length (EFPD), Mid-step ppmb
43.21     262.7         : Step length (EFPD), Mid-step ppmb
6                       : Relative statepoint in insertion cycle
1                       : Number of steps in statepoint calculation
20.4      185.39        : Step length (EFPD), Mid-step ppmb
18                      : # of axial nodes in CRC format
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
RODDED
5                       : Number of irradiation steps with CRA inserted
1                       : Number of axial section with CRA inserted in step 1
3 1 1 1 1 7 1           : Input card 47B
1                       : Number of axial section with CRA inserted in step 2
3 2 1 1 1 7 1           : Input card 47B
1                       : Number of axial section with CRA inserted in step 3
3 3 1 1 1 7 1           : Input card 47B
1                       : Number of axial section with CRA inserted in step 4
3 4 1 1 1 7 1           : Input card 47B
1                       : Number of axial section with CRA inserted in step 5
3 5 1 1 1 7 1           : Input card 47B
1                       : Number of different CRA absorber material mixtures
7                       : SAS2H material mixture number for CRA absorber
4                       : Number of isotopes or elements in the CRA absorber
47000   79.8            : SCALE isotope ID, Isotope wt%
49000   15.0            : SCALE isotope ID, Isotope wt%
48000   5.0             : SCALE isotope ID, Isotope wt%
13027   0.2             : SCALE isotope ID, Isotope wt%
1                       : Number of CRA designs
10.17   6               : CR absorber density, CR clad SAS2H mat. mix. number
8                       : Number of radial zones in Path B model with CRA inserted
7   0.49784             : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784             : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                      : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
```

```
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 999.5
1254.4
1388.8
1445.0
1461.2
1457.5
1443.6
1427.5
1419.4
1426.6
1449.6
1483.9
1519.8
1542.3
1539.3
1494.6
1369.1
1068.0
18                          : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1067.3
1263.2
1338.2
1355.2
1353.8
1348.9
1344.6
1341.0
1338.5
1339.5
1343.9
1350.8
1360.3
1371.6
1379.0
1369.4
1313.5
1106.1
18                          : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
```

```
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1067.3
1263.2
1338.2
1355.2
1353.8
1348.9
1344.6
1341.0
1338.5
1339.5
1343.9
1350.8
1360.3
1371.6
1379.0
1369.4
1313.5
1106.1
18                          : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 935.2
1101.5
1220.1
1313.6
1381.4
1426.3
1453.1
1465.3
1458.3
1427.3
1380.6
1336.6
1304.2
1287.1
1281.7
1262.8
1195.7
```

```
1016.2
18                          : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1028.5
1169.9
1215.6
1218.6
1207.7
1196.9
1190.2
1188.2
1187.7
1182.2
1169.9
1157.7
1148.9
1146.3
1152.6
1159.7
1146.3
1030.5
18                          : # of fuel temp axial nodes (Stpt3-4 to EOC-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1028.5
1169.9
1215.6
1218.6
1207.7
1196.9
1190.2
1188.2
1187.7
1182.2
1169.9
1157.7
1148.9
```

```
1146.3
1152.6
1159.7
1146.3
1030.5
18                          : # of fuel temp axial nodes (BOC-8 to Stpt2-8)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 933.9
1016.6
1043.0
1051.1
1053.2
1053.5
1053.7
1054.5
1055.8
1056.9
1055.4
1050.2
1040.9
1027.8
1011.7
 994.5
 973.0
 901.6
18                          : # of fuel temp axial nodes (Stpt2-8 to Stpt3-8)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 933.9
1016.6
1043.0
1051.1
1053.2
1053.5
1053.7
1054.5
1055.8
```

```
1056.9
1055.4
1050.2
1040.9
1027.8
1011.7
 994.5
 973.0
 901.6
18                            : # of fuel temp axial nodes (Stpt3-8 to Stpt4-8)
1     17.7800                 : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 956.0
1026.5
1045.0
1045.6
1045.5
1043.1
1040.6
1038.9
1038.2
1038.1
1037.4
1035.2
1031.4
1025.3
1016.1
1001.2
 984.4
 918.2
18                            : # of fuel temp axial nodes (Stpt4-8 to Stpt5-8)
1     17.7800                 : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 956.0
1026.5
1045.0
1045.6
1045.5
```

```
1043.1
1040.6
1038.9
1038.2
1038.1
1037.4
1035.2
1031.4
1025.3
1016.1
1001.2
 984.4
 918.2
18                          : # of fuel temp axial nodes (Stpt5-8 to Stpt6-8)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 928.1
1015.8
1046.8
1043.9
1034.2
1025.3
1018.8
1014.7
1012.3
1010.9
1009.6
1008.1
1007.1
1007.5
1009.5
1010.2
 993.7
 931.9
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0234
```

```
0.0233
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0234
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
```

```
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0234
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                      : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0235
0.0234
0.0233
0.0231
0.0230
0.0229
0.0227
0.0226
0.0224
0.0223
0.0222
0.0221
0.0220
0.0218
0.0217
0.0217
0.0216
18                      : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
```

```
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0234
0.0233
0.0232
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt3-4 to EOC-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0234
0.0233
0.0232
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (BOC-8 to Stpt2-8)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
```

```
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-8 to Stpt3-8)
1       17.7800             : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt3-8 to Stpt4-8)
1       17.7800             : Node #, node height (cm)
2       20.0025
3       20.0025
```

```
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0231
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
18                    : # of mod spec vol axial nodes (Stpt4-8 to Stpt5-8)
1    17.7800          : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0231
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
```

```
18                          : # of mod spec vol axial nodes (Stpt5-8 to Stpt6-8)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
18                          : # of burnup axial nodes (BOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
```

```
0.0
0.0
0.0
0.0
18                          : # of burnup axial nodes (Stpt2-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
2.493
4.263
5.362
5.898
6.135
6.215
6.201
6.117
6.004
5.931
5.944
6.048
6.218
6.377
6.393
6.085
5.168
3.077
18                          : # of burnup axial nodes (Stpt3-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
3.905
6.518
8.043
8.728
9.006
9.093
9.076
8.985
8.863
8.790
```

```
8.828
8.984
9.232
9.484
9.558
9.187
7.934
4.845
18                                : # of burnup axial nodes (BOC-4)
1       17.7800                   : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
 5.167
 8.483
10.360
11.188
11.523
11.630
11.616
11.528
11.426
11.393
11.475
11.663
11.908
12.107
12.083
11.569
10.038
 6.217
18                                : # of burnup axial nodes (Stpt2-4)
1       17.7800                   : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
 8.757
14.343
17.726
19.445
20.279
20.661
```

```
20.797
20.753
20.546
20.258
20.076
20.095
20.294
20.584
20.686
20.005
17.581
11.160
18                       : # of burnup axial nodes (Stpt3-4)
1    17.7800             : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 9.221
15.055
18.569
20.340
21.188
21.569
21.703
21.658
21.446
21.147
20.960
20.982
21.192
21.504
21.632
20.952
18.459
11.769
18                       : # of burnup axial nodes (BOC-8)
1    17.7800             : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
10.929
17.568
```

```
21.398
23.207
24.000
24.301
24.348
24.233
24.012
23.770
23.676
23.814
24.120
24.441
24.500
23.702
20.956
13.507
18                           : # of burnup axial nodes (Stpt2-8)
1      17.7800               : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
12.277
19.743
23.947
25.930
26.817
27.175
27.261
27.175
26.976
26.750
26.658
26.776
27.034
27.275
27.219
26.264
23.270
15.149
18                           : # of burnup axial nodes (Stpt3-8)
1      17.7800               : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
```

```
17    20.0025
18    22.3520
12.945
20.752
25.111
27.161
28.078
28.450
28.545
28.465
28.273
28.051
27.961
28.074
28.320
28.537
28.445
27.432
24.332
15.905
18                          : # of burnup axial nodes (Stpt4-8)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
17.658
27.633
32.887
35.225
36.209
36.584
36.672
36.597
36.424
36.232
36.168
36.297
36.542
36.729
36.549
35.320
31.620
21.177
18                          : # of burnup axial nodes (Stpt5-8)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
```

```
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
17.754
27.783
33.057
35.398
36.383
36.756
36.844
36.768
36.595
36.404
36.341
36.471
36.717
36.905
36.726
35.495
31.785
21.299
18                          : # of burnup axial nodes (Stpt6-8)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
19.798
30.768
36.353
38.732
39.686
40.022
40.084
39.996
39.821
39.636
39.580
39.720
39.979
40.188
40.033
38.796
34.918
23.638
```

```
Y                          : This is a pick-up case from Cyc-4, Stpt3, Assy C20
2                          : Relative pick-up cycle
3                          : Relative pick-up statepoint
Crystal River, Unit 3      : Reactor Identifier
CR3                        : Prefix identifier for reactor
44group                    : Scale cross-section library
2.62                       : U-235 wt% enrichment in U of UO2
463630                     : Grams of U per assembly
208                        : Number of fuel rods in assembly
1.44272                    : Pin-pitch in assembly (cm)
0.936244                   : Fuel pellet diameter (cm)
0.95758                    : Fuel rod cladding ID (cm)
1.0922                     : Fuel rod cladding OD (cm)
360.172                    : Fuel stack height (cm)
N                          : No axial blanket fuel
INCONEL                    : Spacer grid material
0.005757609                : Vol. frac. of mod. displaced by grids
ZIRC-4                     : Fuel rod cladding material
640.0                      : Avg. fuel rod cladding temp. (K)
N                          : No cladding materials other than ZIRC-4
2200.0                     : System pressure (psi)
N                          : Activate BPRA tracking
5                          : # of radial zones in the standard Path B model
3 0.63246                  : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                          : # of cross-section libraries per irradiation step
5                          : SAS2H output print level
0.5                        : Zone mesh factor for XSDRNPM
NO SPECIAL                 : No special XSDRNPM control parameter specs.
3                          : # of insertion reactor cycles
03                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
168.5                      : Stpt EFPD
193                        : Length to stpt in calendar days
16.792                     : Downtime at stpt
250.0                      : Stpt EFPD
325.8                      : Length to stpt in calendar days
13.333                     : Downtime at stpt
73.0                       : Days of downtime at EOC
323.0                      : Total cycle EFPD
416.0                      : Total cycle length in calendar days
20                         : Integer position of assembly in cycle
04                         : Insertion reactor cycle identifier
3                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
228.1                      : Stpt EFPD
308                        : Length to stpt in calendar days
15.167                     : Downtime at stpt
253.0                      : Stpt EFPD
348.167                    : Length to stpt in calendar days
24.0                       : Downtime at stpt
2652.0                     : Days of downtime at EOC
336.6                      : Total cycle EFPD
464.0                      : Total cycle length in calendar days
24                         : Integer position of assembly in cycle
08                         : Insertion reactor cycle identifier
6                          : # of stpts in cycle
0                          : Stpt EFPD
0                          : Length to stpt in calendar days
0                          : Downtime at stpt
97.6                       : Stpt EFPD
110.0                      : Length to stpt in calendar days
```

```
15.5        : Downtime at stpt
139.8       : Stpt EFPD
173.5       : Length to stpt in calendar days
6.2         : Downtime at stpt
404.0       : Stpt EFPD
479.7       : Length to stpt in calendar days
44.4        : Downtime at stpt
409.6       : Stpt EFPD
529.1       : Length to stpt in calendar days
4.9         : Downtime at stpt
515.5       : Stpt EFPD
645.0       : Length to stpt in calendar days
7.6         : Downtime at stpt
75          : Days of downtime at EOC
535.9       : Total cycle EFPD
679         : Total cycle length in calendar days
16          : Integer position of assembly in cycle
N           : Flag for variable or constant irradiation step specs
1           : Relative insertion cycle #
1           : Relative stpt # in insertion cycle
56.167      : Irradiation step length in EFPD
3           : # of irradiation steps to next stpt
880.38      : ppmb
694.68      : ppmb
536.65      : ppmb
2           : Relative stpt # in insertion cycle
40.75       : Irradiation step length in EFPD
2           : # of irradiation steps to next stpt
382.60      : ppmb
267.17      : ppmb
3           : Relative stpt # in insertion cycle
36.5        : Irradiation step length in EFPD
2           : # of irradiation steps to next stpt
234.64      : ppmb
128.17      : ppmb
2           : Relative insertion cycle #
1           : Relative stpt # in insertion cycle
76.233      : Irradiation step length in EFPD
3           : # of irradiation steps to next stpt
787.34      : ppmb
625.59      : ppmb
373.77      : ppmb
2           : Relative stpt # in insertion cycle
24.90       : Irradiation step length in EFPD
1           : # of irradiation steps to next stpt
218.65      : ppmb
3           : Relative stpt # in insertion cycle
41.8        : Irradiation step length in EFPD
2           : # of irradiation steps to next stpt
225.91      : ppmb
105.94      : ppmb
3           : Relative insertion cycle #
1           : Relative stpt # in insertion cycle
48.8        : Irradiation step length in EFPD
2           : # of irradiation steps to next stpt
1510.73     : ppmb
1419.25     : ppmb
2           : Relative stpt # in insertion cycle
42.2        : Irradiation step length in EFPD
1           : # of irradiation steps to next stpt
1305.52     : ppmb
3           : Relative stpt # in insertion cycle
66.05       : Irradiation step length in EFPD
4           : # of irradiation steps to next stpt
1142.75     : ppmb
985.95      : ppmb
793.58      : ppmb
588.91      : ppmb
4           : Relative stpt # in insertion cycle
5.6         : Irradiation step length in EFPD
```

```
1                       : # of irradiation steps to next stpt
484.53                  : ppmb
5                       : Relative stpt # in insertion cycle
52.95                   : Irradiation step length in EFPD
2                       : # of irradiation steps to next stpt
416.34                  : ppmb
274.55                  : ppmb
6                       : Relative stpt # in insertion cycle
20.4                    : Irradiation step length in EFPD
1                       : # of irradiation steps to next stpt
185.39                  : ppmb
18                      : # of axial nodes in CRC format
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
NO CRA INSERTION HISTORY
NO APSRA INSERTION HISTORY
18                      : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1    17.7800            : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
999.5
1254.4
1388.8
1445.0
1461.2
1457.5
1443.6
1427.5
1419.4
1426.6
1449.6
1483.9
1519.8
1542.3
1539.3
1494.6
1369.1
1068.0
18                      : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
```

```
1      17.7800          : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1067.3
1263.2
1338.2
1355.2
1353.8
1348.9
1344.6
1341.0
1338.5
1339.5
1343.9
1350.8
1360.3
1371.6
1379.0
1369.4
1313.5
1106.1
18                      : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1      17.7800          : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
1067.3
1263.2
1338.2
1355.2
1353.8
1348.9
1344.6
1341.0
1338.5
1339.5
1343.9
1350.8
1360.3
1371.6
1379.0
```

```
1369.4
1313.5
1106.1
18                          : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 935.2
1101.5
1220.1
1313.6
1381.4
1426.3
1453.1
1465.3
1458.3
1427.3
1380.6
1336.6
1304.2
1287.1
1281.7
1262.8
1195.7
1016.2
18                          : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
1028.5
1169.9
1215.6
1218.6
1207.7
1196.9
1190.2
1188.2
1187.7
1182.2
1169.9
```

```
1157.7
1148.9
1146.3
1152.6
1159.7
1146.3
1030.5
18                          : # of fuel temp axial nodes (Stpt3-4 to EOC-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1028.5
1169.9
1215.6
1218.6
1207.7
1196.9
1190.2
1188.2
1187.7
1182.2
1169.9
1157.7
1148.9
1146.3
1152.6
1159.7
1146.3
1030.5
18                          : # of fuel temp axial nodes (BOC-8 to Stpt2-8)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
944.1
1033.2
1059.7
1067.6
1069.3
1069.3
1069.3
```

```
1069.9
1071.2
1072.3
1070.8
1065.4
1055.8
1042.2
1025.7
1008.4
 986.3
 912.8
18                        : # of fuel temp axial nodes (Stpt2-8 to Stpt3-8)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 944.1
1033.2
1059.7
1067.6
1069.3
1069.3
1069.3
1069.9
1071.2
1072.3
1070.8
1065.4
1055.8
1042.2
1025.7
1008.4
 986.3
 912.8
18                        : # of fuel temp axial nodes (Stpt3-8 to Stpt4-8)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 960.3
1038.1
1057.4
```

```
1060.4
1058.7
1055.9
1053.2
1051.4
1050.7
1050.5
1049.6
1047.2
1043.2
1036.8
1027.5
1014.1
 994.4
 926.4
18                          : # of fuel temp axial nodes (Stpt4-8 to Stpt5-8)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 960.3
1038.1
1057.4
1060.4
1058.7
1055.9
1053.2
1051.4
1050.7
1050.5
1049.6
1047.2
1043.2
1036.8
1027.5
1014.1
 994.4
 926.4
18                          : # of fuel temp axial nodes (Stpt5-8 to Stpt6-8)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
```

```
18   22.3520
974.8
1028.3
1050.6
1045.9
1035.4
1026.1
1019.4
1015.0
1012.3
1010.6
1008.9
1007.2
1006.1
1006.3
1008.4
1009.3
993.3
931.3
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
0.0234
0.0233
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
```

```
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0234
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                             : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800                  : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0234
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                             : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800                  : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
```

```
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0236
0.0235
0.0234
0.0233
0.0231
0.0230
0.0229
0.0227
0.0226
0.0224
0.0223
0.0222
0.0221
0.0220
0.0218
0.0217
0.0217
0.0216
18                       : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0234
0.0233
0.0232
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                       : # of mod spec vol axial nodes (Stpt3-4 to EOC-4)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
```

```
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0234
0.0233
0.0232
0.0231
0.0230
0.0229
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
18                        : # of mod spec vol axial nodes (BOC-8 to Stpt2-8)
1       17.7800           : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0231
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
0.0216
18                        : # of mod spec vol axial nodes (Stpt2-8 to Stpt3-8)
1       17.7800           : Node #, node height (cm)
```

```
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0231
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
0.0216
18                  : # of mod spec vol axial nodes (Stpt3-8 to Stpt4-8)
1       17.7800     : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
```

```
0.0217
0.0216
18                                : # of mod spec vol axial nodes (Stpt4-8 to Stpt5-8)
1      17.7800                    : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
18                                : # of mod spec vol axial nodes (Stpt5-8 to Stpt6-8)
1      17.7800                    : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0232
0.0231
0.0230
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
```

```
0.0220
0.0219
0.0218
0.0217
0.0217
0.0216
18                                  : # of burnup axial nodes (BOC-3)
1       17.7800                     : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                                  : # of burnup axial nodes (Stpt2-3)
1       17.7800                     : Node #, node height (cm) .
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
2.493
4.263
5.362
5.898
6.135
6.215
6.201
6.117
```

```
6.004
5.931
5.944
6.048
6.218
6.377
6.393
6.085
5.168
3.077
18                          : # of burnup axial nodes (Stpt3-3)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
3.905
6.518
8.043
8.728
9.006
9.093
9.076
8.985
8.863
8.790
8.828
8.984
9.232
9.484
9.558
9.187
7.934
4.845
18                          : # of burnup axial nodes (EOC-4)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
5.167
8.483
10.360
11.188
```

```
11.523
11.630
11.616
11.528
11.426
11.393
11.475
11.663
11.908
12.107
12.083
11.569
10.038
 6.217
18                             : # of burnup axial nodes (Stpt2-4)
1     17.7800                  : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 8.757
14.343
17.726
19.445
20.279
20.661
20.797
20.753
20.546
20.258
20.076
20.095
20.294
20.584
20.686
20.005
17.581
11.160
18                             : # of burnup axial nodes (Stpt3-4)
1     17.7800                  : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
```

```
9.221
15.055
18.569
20.340
21.188
21.569
21.703
21.658
21.446
21.147
20.960
20.982
21.192
21.504
21.632
20.952
18.459
11.769
18                      : # of burnup axial nodes (BOC-8)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
10.907
17.532
21.349
23.149
23.937
24.235
24.281
24.166
23.947
23.708
23.616
23.754
24.058
24.376
24.433
23.637
20.899
13.470
18                      : # of burnup axial nodes (Stpt2-8)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
```

```
15    20.0025
16    20.0025
17    20.0025
18    22.3520
12.472
19.836
24.005
25.973
26.849
27.200
27.284
27.197
27.001
26.778
26.688
26.806
27.061
27.297
27.238
26.285
23.296
15.173
18                        : # of burnup axial nodes (Stpt3-8)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
13.193
20.890
25.212
27.246
28.150
28.515
28.607
28.527
28.337
28.119
28.031
28.144
28.386
28.597
28.501
27.489
24.392
15.953
18                        : # of burnup axial nodes (Stpt4-8)
1     17.7800             : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
```

```
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
18.170
27.982
33.187
35.501
36.467
36.830
36.912
36.835
36.663
36.473
36.410
36.537
36.775
36.952
36.768
35.540
31.835
21.337
18                          : # of burnup axial nodes (Stpt5-8)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
18.282
28.138
33.360
35.677
36.643
37.004
37.085
37.008
36.836
36.647
36.585
36.712
36.951
37.130
36.946
35.717
32.002
21.460
18                          : # of burnup axial nodes (Stpt6-8)
1      17.7800              : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
```

7	20.0025
8	20.0025
9	20.0025
10	20.0025
11	20.0025
12	20.0025
13	20.0025
14	20.0025
15	20.0025
16	20.0025
17	20.0025
18	22.3520

20.506
31.186
36.687
39.034
39.963
40.285
40.338
40.247
40.071
39.886
39.829
39.964
40.215
40.414
40.255
39.021
35.140
23.805

```
N                        : This is not a pick-up case
Crystal River, Unit 3    : Reactor Identifier
CR3                      : Prefix Identifier for reactor
44group                  : Scale cross-section library
2.62                     : U-235 wt% enrichment in U of UO2
463630                   : Grams of U per assembly
208                      : Number of fuel rods in assembly
1.44272                  : Pin-pitch in assembly (cm)
0.936244                 : Fuel pellet diameter (cm)
0.95758                  : Fuel rod cladding ID (cm)
1.0922                   : Fuel rod cladding OD (cm)
360.172                  : Fuel stack height (cm)
N                        : No axial blanket fuel
INCONEL                  : Spacer grid material
0.005757609              : Vol. frac. of mod. displaced by grids
ZIRC-4                   : Fuel rod cladding material
640.0                    : Avg. fuel rod cladding temp. (K)
Y                        : Cladding materials other than ZIRC-4
1                        : Number of cladding materials needed other than ZIRC-4
6                        : SAS2H material mixture number for clad material below
SS304                    : Cladding material for CR's
2200.0                   : System pressure (psi)
N                        : Activate BPRA tracking
5                        : # of radial zones in the standard Path B model
3 0.63246                : Standard Path B model (Input Card 20)
2 0.67310
3 0.81397
500 2.97599
3 2.99939
1                        : # of cross-section libraries per irradiation step
5                        : SAS2H output print level
0.5                      : Zone mesh factor for XSDRNPM
NO SPECIAL               : No special XSDRNPM control parameter specs.
3                        : # of insertion reactor cycles
03                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
168.5                    : Stpt EFPD
193.0                    : Length to stpt in calendar days
16.792                   : Downtime at stpt
250.0                    : Stpt EFPD
325.792                  : Length to stpt in calendar days
12.333                   : Downtime at stpt
73.0                     : Days of downtime at EOC
323.0                    : Total cycle EFPD
416.0                    : Total cycle length in calendar days
21                       : Integer position of assembly in cycle
04                       : Insertion reactor cycle identifier
3                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
228.1                    : Stpt EFPD
308                      : Length to stpt in calendar days
15.167                   : Downtime at stpt
253.0                    : Stpt EFPD
350                      : Length to stpt in calendar days
24.0                     : Downtime at stpt
127                      : Days of downtime at EOC
336.6                    : Total cycle EFPD
464                      : Total cycle length in calendar days
20                       : Integer position of assembly in cycle
05                       : Insertion reactor cycle identifier
2                        : # of stpts in cycle
0                        : Stpt EFPD
0                        : Length to stpt in calendar days
0                        : Downtime at stpt
388.5                    : Stpt EFPD
```

```
470                      : Length to stpt in calendar days
4.958                    : Downtime at stpt
163.0                    : Days of downtime at EOC
484.4                    : Total cycle EFPD
593.0                    : Total cycle length in calendar days
03                       : Integer position of assembly in cycle
Y                        : Flag for variable or constant irradiation step specs
1                        : Relative insertion cycle
1                        : Relative statepoint in insertion cycle
3                        : Number of steps in statepoint calculation
56.167   880.38          : Step length (EFPD), Mid-step ppmb
56.167   694.68          : Step length (EFPD), Mid-step ppmb
56.167   536.65          : Step length (EFPD), Mid-step ppmb
2                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
40.75    382.60          : Step length (EFPD), Mid-step ppmb
40.75    267.17          : Step length (EFPD), Mid-step ppmb
3                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
36.5     234.64          : Step length (EFPD), Mid-step ppmb
36.5     128.17          : Step length (EFPD), Mid-step ppmb
2                        : Relative insertion cycle
1                        : Relative statepoint in insertion cycle
3                        : Number of steps in statepoint calculation
76.233   787.34          : Step length (EFPD), Mid-step ppmb
76.233   625.59          : Step length (EFPD), Mid-step ppmb
76.233   373.77          : Step length (EFPD), Mid-step ppmb
2                        : Relative statepoint in insertion cycle
1                        : Number of steps in statepoint calculation
24.9     218.65          : Step length (EFPD), Mid-step ppmb
3                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
41.8     225.91          : Step length (EFPD), Mid-step ppmb
41.8     105.94          : Step length (EFPD), Mid-step ppmb
3                        : Relative insertion cycle
1                        : Relative statepoint in insertion cycle
8                        : Number of steps in statepoint calculation
 4.58    1042.9          : Step length (EFPD), Mid-step ppmb
58.42     990.2          : Step length (EFPD), Mid-step ppmb
30.20     916.0          : Step length (EFPD), Mid-step ppmb
59.06     820.2          : Step length (EFPD), Mid-step ppmb
59.06     673.9          : Step length (EFPD), Mid-step ppmb
59.06     514.9          : Step length (EFPD), Mid-step ppmb
59.06     359.3          : Step length (EFPD), Mid-step ppmb
59.06     203.4          : Step length (EFPD), Mid-step ppmb
2                        : Relative statepoint in insertion cycle
2                        : Number of steps in statepoint calculation
47.95    92.03           : Step length (EFPD), Mid-step ppmb
47.95    2.35            : Step length (EFPD), Mid-step ppmb
18                       : # of axial nodes in CRC format
1    17.7800             : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
RODDED
3                        : Number of irradiation steps with CRA inserted
```

```
1                       : Number of axial section with CRA inserted in step 1
3 1 1 1 3 7 1           : Input card 47B
1                       : Number of axial section with CRA inserted in step 2
3 1 2 1 2 7 1           : Input card 47B
1                       : Number of axial section with CRA inserted in step 3
3 1 3 1 1 7 1           : Input card 47B
1                       : Number of different CRA absorber material mixtures
7                       : SAS2H material mixture number for CRA absorber
4                       : Number of isotopes or elements in the CRA absorber
47000   79.8            : SCALE isotope ID, Isotope wt%
49000   15.0            : SCALE isotope ID, Isotope wt%
48000   5.0             : SCALE isotope ID, Isotope wt%
13027   0.2             : SCALE isotope ID, Isotope wt%
1                       : Number of CRA designs
10.17   6               : CR absorber density, CR clad SAS2H mat. mix. number
8                       : Number of radial zones in Path B model with CRA inserted
7   0.49784             : Path B model CRA inserted (Input Card 47J)
5   0.50546
6   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.90826
3   2.93113
3   0.49784             : Path B model CRA removed (Input Card 47K)
3   0.50546
3   0.55880
3   0.63246
2   0.67310
3   0.81397
500 2.97599
3   2.99939
NO APSRA INSERTION HISTORY
18                      : # of fuel temp axial nodes (BOC-3 to Stpt2-3)
1     17.7800           : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 771.6
 912.5
1000.0
1038.6
1051.8
1052.1
1046.6
1040.3
1037.7
1041.6
1052.4
1067.6
1082.2
1091.0
1087.5
1059.2
 980.0
 803.1
```

```
18                          : # of fuel temp axial nodes (Stpt2-3 to Stpt3-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 834.5
 979.9
1045.9
1066.0
1069.1
1067.6
1065.4
1063.8
1063.3
1064.3
1066.9
1071.2
1077.2
1084.3
1088.2
1077.0
1025.7
 862.6
18                          : # of fuel temp axial nodes (Stpt3-3 to EOC-3)
1    17.7800                : Node #, node height (cm)
2    20.0025
3    20.0025
4    20.0025
5    20.0025
6    20.0025
7    20.0025
8    20.0025
9    20.0025
10   20.0025
11   20.0025
12   20.0025
13   20.0025
14   20.0025
15   20.0025
16   20.0025
17   20.0025
18   22.3520
 834.5
 979.9
1045.9
1066.0
1069.1
1067.6
1065.4
1063.8
1063.3
1064.3
1066.9
1071.2
1077.2
1084.3
```

```
1088.2
1077.0
1025.7
 862.6
18                          : # of fuel temp axial nodes (BOC-4 to Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 921.9
1121.6
1241.1
1317.6
1371.5
1409.7
1434.3
1444.7
1439.2
1416.8
1382.9
1349.0
1322.6
1305.9
1294.1
1268.9
1196.0
 984.7
18                          : # of fuel temp axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1020.3
1165.0
1221.9
1229.4
1221.6
1212.2
1205.8
1203.4
1202.9
1200.7
```

```
1195.4
1189.3
1185.2
1185.9
1192.9
1198.0
1171.3
1028.6
18                       : # of fuel temp axial nodes (Stpt3-4 to EOC-4)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1020.3
1165.0
1221.9
1229.4
1221.6
1212.2
1205.8
1203.4
1202.9
1200.7
1195.4
1189.3
1185.2
1185.9
1192.9
1198.0
1171.3
1028.6
18                       : # of fuel temp axial nodes (BOC-5 to Stpt2-5)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1023.3
1120.2
1123.5
1109.6
1094.0
1081.3
```

```
1072.8
1069.0
1070.8
1077.3
1085.9
1093.7
1098.3
1098.5
1094.8
1087.2
1064.6
 974.5
18                          : # of mod spec vol axial nodes (BOC-3 to Stpt2-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0224
0.0224
0.0224
0.0223
0.0222
0.0222
0.0221
0.0221
0.0220
0.0220
0.0219
0.0219
0.0218
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-3 to Stpt3-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0225
0.0225
```

```
0.0225
0.0224
0.0223
0.0223
0.0222
0.0221
0.0221
0.0220
0.0220
0.0219
0.0219
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt3-3 to EOC-3)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0225
0.0225
0.0225
0.0224
0.0223
0.0223
0.0222
0.0221
0.0221
0.0220
0.0220
0.0219
0.0219
0.0218
0.0217
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (BOC-4 to Stpt2-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
```

```
17    20.0025
18    22.3520
0.0233
0.0233
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0217
0.0216
0.0216
18                          : # of mod spec vol axial nodes (Stpt2-4 to Stpt3-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0233
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0217
0.0216
18                          : # of mod spec vol axial nodes (Stpt3-4 to EOC-4)
1     17.7800               : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
```

```
13     20.0025
14     20.0025
15.    20.0025
16     20.0025
17     20.0025
18     22.3520
0.0233
0.0232
0.0231
0.0230
0.0229
0.0228
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0220
0.0219
0.0218
0.0217
0.0216
18                              : # of mod spec vol axial nodes (BOC-5 to Stpt2-5)
1      17.7800                  : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
0.0232
0.0232
0.0231
0.0229
0.0228
0.0227
0.0226
0.0225
0.0224
0.0223
0.0222
0.0221
0.0220
0.0219
0.0218
0.0218
0.0217
0.0216
18                              : # of burnup axial nodes (BOC-3)
1      17.7800                  : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
```

```
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
18                       : # of burnup axial nodes (Stpt2-3)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
1.191
2.096
2.686
2.985
3.119
3.166
3.164
3.134
3.097
3.074
3.081
3.121
3.181
3.231
3.215
3.034
2.534
1.465
18                       : # of burnup axial nodes (Stpt3-3)
1     17.7800            : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
```

```
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
1.909
3.293
4.146
4.547
4.713
4.767
4.765
4.735
4.699
4.682
4.704
4.770
4.869
4.963
4.971
4.739
4.020
2.374
18                         : # of burnup axial nodes (BOC-4)
1       17.7800            : Node #, node height (cm)
2       20.0025
3       20.0025
4       20.0025
5       20.0025
6       20.0025
7       20.0025
8       20.0025
9       20.0025
10      20.0025
11      20.0025
12      20.0025
13      20.0025
14      20.0025
15      20.0025
16      20.0025
17      20.0025
18      22.3520
2.572
4.380
5.469
5.980
6.197
6.272
6.281
6.261
6.240
6.243
6.283
6.355
6.439
6.494
6.437
6.107
5.198
3.106
18                         : # of burnup axial nodes (Stpt2-4)
```

```
1     17.7800         : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 5.802
 9.730
12.125
13.334
13.933
14.226
14.357
14.377
14.306
14.180
14.075
14.049
14.114
14.231
14.238
13.731
11.962
 7.403
18                    : # of burnup axial nodes (Stpt3-4)
1     17.7800         : Node #, node height (cm)
2     20.0025
3     20.0025
4     20.0025
5     20.0025
6     20.0025
7     20.0025
8     20.0025
9     20.0025
10    20.0025
11    20.0025
12    20.0025
13    20.0025
14    20.0025
15    20.0025
16    20.0025
17    20.0025
18    22.3520
 6.227
10.390
12.900
14.148
14.757
15.050
15.179
15.200
15.128
15.001
14.898
14.878
14.955
15.089
15.114
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```
14.607
12.768
 7.947
18                        : # of burnup axial nodes (BOC-5)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
 7.696
12.626
15.493
16.843
17.449
17.701
17.782
17.773
17.713
17.641
17.618
17.680
17.808
17.932
17.886
17.247
15.132
 9.538
18                        : # of burnup axial nodes (Stpt2-5)
1      17.7800            : Node #, node height (cm)
2      20.0025
3      20.0025
4      20.0025
5      20.0025
6      20.0025
7      20.0025
8      20.0025
9      20.0025
10     20.0025
11     20.0025
12     20.0025
13     20.0025
14     20.0025
15     20.0025
16     20.0025
17     20.0025
18     22.3520
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22.795
27.865
29.933
30.688
30.908
30.892
30.773
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30.562
30.601
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30.961
31.076
30.854
29.747
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B25/CR3A18N17DC03T000AC03T168.notes	aXXVIf.355	7	Jul 31 1997	8619	ASCII
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B27/CR3A19N15DC03T000AC03T168.notes	aXXVIf.439	7	Jul 31 1997	8786	ASCII
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B27/CR3A19N17DC03T000AC03T168.notes	aXXVIf.445	7	Jul 31 1997	8608	ASCII
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B28/CR3A23N11DC03T000AC03T168.notes	aXXVIf.481	7	Jul 31 1997	8669	ASCII
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B28/CR3A26N03DC04T228AC04T253.notes	aXXVIf.510	9	Jul 31 1997	10631	ASCII
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B28/CR3A26N04DC04T228AC04T253.notes	aXXVIf.512	9	Jul 31 1997	10827	ASCII
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B28/CR3A26N08DC04T228AC04T253.notes	aXXVIf.520	9	Jul 31 1997	10870	ASCII
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B28/CR3A26N09DC04T228AC04T253.notes	aXXVIf.522	9	Jul 31 1997	10845	ASCII
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B28/CR3A26N11DC04T228AC04T253.notes	aXXVIf.526	9	Jul 31 1997	10775	ASCII
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B28/CR3A26N15DC04T228AC04T253.notes	aXXVIf.534	9	Jul 31 1997	10801	ASCII
B28/CR3A26N16DC04T000AC04T228.notes	aXXVIf.535	8	Jul 31 1997	9242	ASCII
B28/CR3A26N16DC04T228AC04T253.notes	aXXVIf.536	9	Jul 31 1997	10833	ASCII
B28/CR3A26N17DC04T000AC04T228.notes	aXXVIf.537	8	Jul 31 1997	9178	ASCII
B28/CR3A26N17DC04T228AC04T253.notes	aXXVIf.538	9	Jul 31 1997	10707	ASCII
B28/CR3A26N18DC04T000AC04T228.notes	aXXVIf.539	7	Jul 31 1997	9022	ASCII
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C21/CR3A21N02DC03T168AC03T250.notes	aXXVIf1.137	7	Jul 31 1997	9226	ASCII
C21/CR3A21N02DC03T250AC04T000.notes	aXXVIf1.138	7	Jul 31 1997	9352	ASCII
C21/CR3A21N03DC03T168AC03T250.notes	aXXVIf1.139	8	Jul 31 1997	9467	ASCII
C21/CR3A21N03DC03T250AC04T000.notes	aXXVIf1.140	8	Jul 31 1997	9496	ASCII
C21/CR3A21N04DC03T168AC03T250.notes	aXXVIf1.141	8	Jul 31 1997	9575	ASCII
C21/CR3A21N04DC03T250AC04T000.notes	aXXVIf1.142	8	Jul 31 1997	9492	ASCII
C21/CR3A21N05DC03T168AC03T250.notes	aXXVIf1.143	8	Jul 31 1997	9575	ASCII
C21/CR3A21N05DC03T250AC04T000.notes	aXXVIf1.144	8	Jul 31 1997	9578	ASCII
C21/CR3A21N06DC03T168AC03T250.notes	aXXVIf1.145	8	Jul 31 1997	9626	ASCII
C21/CR3A21N06DC03T250AC04T000.notes	aXXVIf1.146	8	Jul 31 1997	9576	ASCII
C21/CR3A21N07DC03T168AC03T250.notes	aXXVIf1.147	8	Jul 31 1997	9626	ASCII
C21/CR3A21N07DC03T250AC04T000.notes	aXXVIf1.148	8	Jul 31 1997	9578	ASCII
C21/CR3A21N08DC03T168AC03T250.notes	aXXVIf1.149	8	Jul 31 1997	9618	ASCII
C21/CR3A21N08DC03T250AC04T000.notes	aXXVIf1.150	8	Jul 31 1997	9566	ASCII
C21/CR3A21N09DC03T168AC03T250.notes	aXXVIf1.151	8	Jul 31 1997	9581	ASCII
C21/CR3A21N09DC03T250AC04T000.notes	aXXVIf1.152	8	Jul 31 1997	9574	ASCII
C21/CR3A21N10DC03T168AC03T250.notes	aXXVIf1.153	8	Jul 31 1997	9573	ASCII
C21/CR3A21N10DC03T250AC04T000.notes	aXXVIf1.154	8	Jul 31 1997	9572	ASCII
C21/CR3A21N11DC03T168AC03T250.notes	aXXVIf1.155	8	Jul 31 1997	9581	ASCII
C21/CR3A21N11DC03T250AC04T000.notes	aXXVIf1.156	8	Jul 31 1997	9580	ASCII
C21/CR3A21N12DC03T168AC03T250.notes	aXXVIf1.157	8	Jul 31 1997	9579	ASCII
C21/CR3A21N12DC03T250AC04T000.notes	aXXVIf1.158	8	Jul 31 1997	9578	ASCII
C21/CR3A21N13DC03T168AC03T250.notes	aXXVIf1.159	8	Jul 31 1997	9622	ASCII
C21/CR3A21N13DC03T250AC04T000.notes	aXXVIf1.160	8	Jul 31 1997	9558	ASCII
C21/CR3A21N14DC03T168AC03T250.notes	aXXVIf1.161	8	Jul 31 1997	9608	ASCII
C21/CR3A21N14DC03T250AC04T000.notes	aXXVIf1.162	8	Jul 31 1997	9560	ASCII
C21/CR3A21N15DC03T168AC03T250.notes	aXXVIf1.163	8	Jul 31 1997	9610	ASCII
C21/CR3A21N15DC03T250AC04T000.notes	aXXVIf1.164	8	Jul 31 1997	9651	ASCII
C21/CR3A21N16DC03T168AC03T250.notes	aXXVIf1.165	8	Jul 31 1997	9567	ASCII
C21/CR3A21N16DC03T250AC04T000.notes	aXXVIf1.166	8	Jul 31 1997	9574	ASCII
C21/CR3A21N17DC03T168AC03T250.notes	aXXVIf1.167	8	Jul 31 1997	9495	ASCII
C21/CR3A21N17DC03T250AC04T000.notes	aXXVIf1.168	8	Jul 31 1997	9498	ASCII
C21/CR3A21N18DC03T168AC03T250.notes	aXXVIf1.169	7	Jul 31 1997	9197	ASCII
C21/CR3A21N18DC03T250AC04T000.notes	aXXVIf1.170	7	Jul 31 1997	9237	ASCII