



# CALCULATION SUMMARY SHEET (CSS)

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Title ISOTOPIC GENERATION AND CONFIRMATION OF THE BWR APPL. MODEL

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METHOD:  DETAILED CHECK  INDEPENDENT CALCULATION

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PURPOSE AND SUMMARY OF RESULTS:

The objective of this calculation is to establish an isotopic database to represent commercial spent nuclear fuel (CSNF) from boiling water reactors (BWRs) in criticality analyses performed for the proposed Monitored Geologic Repository at Yucca Mountain, Nevada. Confirmation of the conservatism with respect to criticality in the isotopic concentration values represented by this isotopic database is performed as described in Section 3.5.3.1.2 of the *Disposal Criticality Analysis Methodology Topical Report* (Reference 7.1).

Section 2 of this report presents two requirements imposed in the *Disposal Criticality Analysis Methodology Topical Report* (Reference 7.1, pp. 3-38 and 3-39) to ensure that the isotopic concentrations used for burnup credit are conservative with respect to criticality. The calculations presented in this calculation demonstrate that the isotopic database presented here meets these requirements. However, additional confirmation should be performed using additional assemblies that may be bounding, but are not currently included in the CRC database. Also, it would be advisable to investigate the relative affect of the bounding model in a waste package, similar to the RCA confirmation calculations. This may be accomplished by calculating  $k_{eff}$  values for the each assembly listed in Table 10 in a 44 BWR waste package. All 44 locations in the waste package could be filled with the same assembly using the best-estimate isotopic concentrations present in the CRC calculations. The calculations would then be repeated using the isotopic database isotopic concentrations. These "best-estimate"  $k_{eff}$  values could be compared to the "Isotopic Database"  $k_{eff}$  values to determine the level of relative conservatism.

THE FOLLOWING COMPUTER CODES HAVE BEEN USED IN THIS DOCUMENT:

THE DOCUMENT CONTAINS ASSUMPTIONS THAT MUST BE VERIFIED PRIOR TO USE ON SAFETY-RELATED WORK

CODE/VERSION/REV  
SAS2H OF SCALE,  
VERSION 4.4A.1

CODE/VERSION/REV  
MCNP VERSION 4.B2L  
MCNP VERSION 4.B2L2

YES  NO

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**RECORD OF REVISIONS**

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00 (Initial)		June 2004
01	Corrected the title in the header	June 2004

## 1. PURPOSE

The objective of this calculation is to establish an isotopic database to represent commercial spent nuclear fuel (CSNF) from boiling water reactors (BWRs) in criticality analyses performed for the proposed Monitored Geologic Repository at Yucca Mountain, Nevada. Confirmation of the conservatism with respect to criticality in the isotopic concentration values represented by this isotopic database is performed as described in Section 3.5.3.1.2 of the *Disposal Criticality Analysis Methodology Topical Report* (Reference 7.1). The isotopic database consists of the set of 14 actinides and 15 fission products presented in Section 3.5.2.1.1 of Reference 7.1 for use in CSNF burnup credit. This set of 29 isotopes is referred to as the principal isotopes and are provided in Table 1 of this document. The oxygen isotope from the  $UO_2$  fuel is also included in the database but is not included in the 29 principal isotopes.

The isotopic database covers enrichments of  $^{235}U$  ranging from 1.5 to 5.5 weight percent (wt %) and burnups ranging from approximately zero (.001) to 75 GWd per metric ton of uranium (MTU). The burnup and fuel enrichment range covered by the isotopic database is presented in Table 3. The choice of fuel assembly and operating history values that are used in generating the isotopic database, are provided in Section 5. The tables of isotopic concentrations for the 29 principal isotopes (Table 1) are provided in Sections 6.1 and 6.2. Results of the confirmation of the conservatism with respect to criticality in the isotopic concentration values are provided in Section 6.3.

This report is an engineering calculation supporting the burnup credit methodology of YMP (Reference 7.1) and was performed under Framatome ANP Administrative Procedure 0402-01, Preparing and Processing FANP Calculations (Reference 7.2) and Framatome Quality Management Manual (Reference 7.3).

## 2. METHOD

The burnup credit methodology for CSNF applications requires the use of isotopic concentrations that are bounding with respect to criticality. The isotopic concentrations are calculated using the SAS2H sequence of SCALE 4.4a with the 44-group, ENDF/B-V cross section library (Reference 7.4) and conservative input values for fuel assembly and operating history parameters. These concentrations are calculated as a function of initial fuel enrichment and fuel assembly burnup. The method to confirm the conservatism in the isotopic concentrations consists of using MCNP 4B2 (Reference 7.5) to calculate effective neutron multiplication factor ( $k_{eff}$ ) values based on measured radiochemical assay (RCA), best-estimate, and bounding isotopic concentration values. The best-estimate values are from fuel depletion calculations for the RCA samples that approximate the physical characteristics and depletion history of the sample based on the best information available.

The following two requirements are imposed in the *Disposal Criticality Analysis Methodology Topical Report* (Reference 7.1, pp 3-38 and 3-39) to ensure that the isotopic concentrations used for burnup credit of CSNF are conservative with respect to criticality.

- A "Reactor operating histories and conditions must be selected together with burnup profiles such that the isotopic concentrations used to represent commercial SNF assemblies in waste package design shall produce values in  $k_{eff}$  that are conservative in comparison to any other expected combination of reactor history, conditions, or profiles."
- B "Bounding reactor parameters will be used to predict isotopic concentrations that, when used in criticality evaluations must produce values for  $k_{eff}$  that are conservative when compared to similar criticality evaluations using either measured radiochemical assay data or best-estimate isotopic concentrations."

For the first requirement, bounding operating histories and conditions are identified along with bounding burnup profiles from commercial reactor criticals (CRC) (Reference 7.6, 7.7, and 7.8). The experiments in Reference 7.6 along with additional PWR CRC experiments are used in calculating the lower bound tolerance limit, which may be used in establishing critical limit (CL) values for commercial light water reactor (LWR) SNF (Reference 7.9). Each of the assemblies chosen for the confirmation of the conservatism in the isotopic database is selected to provide stringent tests for requirement A. The first test is based on previous poison material history, which tends to maximize the concentrations of fissile isotopes. The second test is based on an unusual axial burnup profile indicative of an unusual operating history that could enhance flux redistribution, which would accentuate end effects. Each of the chosen assemblies is tested individually. The confirmation consists of replacing the best-estimate isotopic concentrations for the chosen fuel assembly (from the CRC statepoint calculation) with values obtained from the isotopic database while keeping the best-estimate values for the remaining fuel assemblies. This process is repeated until all the chosen assemblies are tested. The  $k_{eff}$  value must always be greater when concentrations from the isotopic database are used for the chosen fuel assembly.

For requirement B, measured RCA data (isotopic concentrations) from a CSNF sample is used in an evaluation of waste package configurations to establish  $k_{eff}$  values for the waste package. A total of 38 RCA samples were analyzed and the results summarized in Reference 7.10 and Reference 7.11. These samples are re-analyzed in the calculations for this document using data from the isotopic database. The  $k_{eff}$  values for waste package calculations with concentrations from the isotopic database must always be greater than the  $k_{eff}$  values obtained when using the measured (RCA) isotopic concentration values. The  $k_{eff}$  values in waste package calculations using concentrations from the isotopic database should always bound the  $k_{eff}$  values based on the RCA measured data. If the  $k_{eff}$  values based on the isotopic database are not bounding, an additional bias and uncertainty ( $\Delta k_I$ ) value will be established to ensure that these concentrations will always be bounding relative to the established CL values.

### 3. ASSUMPTIONS

It is assumed that, for the depletion model, the General Electric fuel assembly, GE-2a 7x7 (EIA code G2307G2a), is conservative for all BWR spent fuel with respect to retained reactivity. The basis for this is as follows:



The GE-2a assembly has the largest initial fuel loading (Reference 7.12, p 2A-15, and Reference 7.13, p 128). From the table, the assemblies with the largest average initial fuel loading weights were the 7x7 assemblies with assembly type code GE-2a (G2307G2a) and GE-2b (G2307G2b). The assembly initial loading weight for each of these 7x7 assemblies is 196 kgU and 193 kgU respectively. A review of the 8x8 assemblies in Reference 7.12, p 2A-21 indicates a maximum initial fuel loading weight of 186 kgU per assembly. This fuel loading is applicable to the assembly type code GE-4b (G4608G4b). The 7x7, GE-2a, contains the maximum average fuel loading of all the indicated BWR assemblies.

A review of the fuel pellet diameters for the 7x7 and the 8x8 assemblies (Reference 7.12) indicates that the fuel pellet associated with the 7x7, GE-2a, assembly has the largest fuel pellet diameter of 1.23952 cm. This compares to the 7x7, GE-2b, assembly with a fuel pellet diameter of 1.23698 cm. The 8x8 fuel pellet diameters range between 1.0414 (Reference 7.6, 7.7, 7.8) and 1.05664 cm (Reference 7.12, p 2A-21). In conclusion, the GE-2a assembly contains the fuel pellet with the largest pellet diameter.

A review of the active fuel length for the 7x7 and the 8x8 assemblies (Reference 7.12) indicates that the active fuel length of the BWR fuel is between 365.76 and 370.84 cm for the 7x7 and 365.76 and 381.00 cm for the 8x8. Assuming a fuel diameter of 1.23952 cm, an active fuel height of 365.76 cm and 49 fuel rods for the 7x7 assembly (GE-2a), the fuel volume is 21627 cm<sup>3</sup>. Assuming a fuel diameter of 1.05664 cm, an active fuel height of 370.84 cm, and 63 fuel rods for the 8x8 assembly (GE-4b), the fuel volume for the assembly is 20487 cm<sup>3</sup>. Additional information can be found in Section 5.1.1.7. The GE-2a assembly contains the greatest volume of fuel per assembly.

#### 4. USE OF COMPUTER SOFTWARE AND MODELS

##### 4.1 SOFTWARE

###### 4.1.1 SAS2H

The SAS2H control module of the baseline SCALE, Version 4.4a, modular code system (Reference 7.4) was used to perform the fuel assembly depletion calculations required for generating the isotopic database for the PWR application model. The software specifications are as follows:

###### SAS2H module of SCALE Version 4.4a.1

- Full Certification in accordance with procedure 0902-06, Software Certification (Reference 14)

###### 4.1.2 MCNP

The baseline MCNP code (Reference 7.5) is used to calculate the  $k_{\text{eff}}$  of the waste packages and CRCs for application model confirmation. The software specifications are as follow:

###### MCNP Version 4.B2L

- Full Certification in accordance with procedure 0902-06, Software Certification (Reference 14)

###### MCNP Version 4.B2L2

- Full Certification in accordance with procedure 0902-06, Software Certification (Reference 14)

## 5. CALCULATION

This section describes the calculations performed to create the isotopic database to represent CSNF from BWR assemblies and to confirm the conservatism in the isotopic concentrations for use in criticality analyses with burnup credit. The basis for the choice of fuel assembly and operating history parameters is that the selected model will produce isotopic concentrations that are conservative with respect to criticality.

### 5.1 SAS2H

#### 5.1.1 Fuel Depletion Calculations, Path A and B Model

The isotopic database consists of a set of 15 fission products and 14 actinides that are known as the "Principal Isotopes". A listing of the principal isotope set is provided in Table 1.

Table 1. Principal Isotopes for Commercial SNF Burnup Credit

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

Source: Reference 7.1, p. 3-30

Fuel depletion calculations to generate the isotopic database are performed using the SAS2H sequence of SCALE 4.4a with the 44-group, ENDF/B-V cross section library (Reference 7.4). SAS2H is the control module for the analytical sequence that is used for calculating isotopic concentrations of CSNF. The functional modules (or codes) within the sequence are BONAMI, NITAWL-II, XSDRNPM, COUPLE, and ORIGEN-S. The isotopic concentrations are obtained from the ORIGEN-S SAS2H module. This module performs point depletion calculations for a fuel assembly or a section of a fuel assembly. ORIGEN-S uses cell-weighted cross-sections obtained from a one-dimensional (1-D) neutron transport calculation performed by the XSDRNPM module. The COUPLE module updates cross section constants included on an ORIGEN-S working nuclear data library with data from the cell-weighted cross section library obtained from the XSDRNPM calculation. The BONAMI and NITAWL-II SAS2H modules perform problem-dependent resonance weighting of cross sections. One-dimensional transport calculations are performed to obtain energy-dependent spatial neutron flux distributions that are used in calculating cell-weighted cross sections for both the SAS2H Path A and Path B models.

The SAS2H Path A model represents a fuel rod cell from the assembly lattice. The fuel pellet, the gap, and the clad may be modeled explicitly. However, for the isotopic database calculations the fuel pellet was smeared to the clad inner diameter. The water associated with the fuel rod cell is modeled in an annular ring surrounding the cladding. The square lattice of the fuel rod cell is represented in the 1-D transport calculation as an equivalent cylinder (i.e., conserving volumes of

various materials). Flux-weighted cross sections (by energy group) are obtained for the fuel rod cell from the 1-D transport calculation. These cross sections are used in the homogenized fuel region of the path B model.

The SAS2H Path-B model is used for performing best-estimate analyses of the 15 BWR state-points to establish CL values. These analyses are documented in Reference 7.15. For consistency, the application model for the isotopic database uses a 7-region Path-B model similar to the one used for the best-estimate analyses (Reference 7.15, page 44). The 7-region, best-estimate model is presented in Figure 1 where region 1 represents the Gadolinium (Gd) fuel rod plus gap. For the isotopic database region 1 is a fuel rod cell (i.e. similar to best-estimate but with 0.0 wt%  $Gd_2O_3$ ). Region 2 represents the cladding, and region 3 represents the water surrounding the Gd fuel rod. Region 4 represents the homogenized fuel region with region 5 representing the Zirconium channel surrounding the fuel region. Region 6 contains water, and region 7 consists of either a water region or a homogenized SS304 control blade containing 18  $B_4C$  rods (natural boron).

The fuel rod cells in the assembly associated with the central cell are represented in region 4, of the Path-B model – the homogenized fuel region. The flux-weighted cross sections from the Path-A model calculation are used for region 4 of the Path B model.

The fuel depletion calculation for the isotopic database is based on conservative input values for fuel assembly and operating history parameters. The General Electric GE-2a fuel assembly (Reference 7.12) is the representative fuel assembly type chosen for the depletion calculations. The various GE-2a parameter values are provided in Table 2. Additional information is provided in Sections 5.1.1.1 through 5.1.1.7. The basis for the choice of conservative input values for fuel assembly and operating history parameters is also provided in these sections.

The various radii for the Path B model presented in Figure 1 are provided in equations 1 through 8. The values for the radii are calculated using the parameter values presented in Table 2.

Table 2. Parameter Values Used in Calculating Radii for Path B Model

Parameter	Symbol	Value
Rod Pitch (7x7), cm, Reference 7.12, p 2A-15	$P_7$	1.87452
Assembly Pitch (7x7), cm, Reference 7.16, p 8	$P_A$	15.24
Channel (can) inner width, cm, Reference 7.15, p 45	$C_{IW}$	13.2461
Channel (can) outer width, cm, Reference 7.15, p 45	$C_{OW}$	13.8557
Channel area, $cm^2$ , $(C_{OW})^2 - (C_{IW})^2$	$C_A$	16.5213
Fuel Rod Clad ID, cm, (pellet OD smeared to the clad ID), Reference 7.12, p 2A-15	$C_{ID7}$	1.26746
Fuel Rod Clad OD, cm, Reference 7.12, p 2A-15	$C_{OD7}$	1.44780
Blade thickness, cm, Reference 7.15, p 45	$B_T$	0.8331
Single control blade length, cm, Reference 7.15, p 45	$B_L$	10.4825
Blade support span, cm, Reference 7.15, p 45	$S_B$	3.937
Blade Area, $cm^2$ , $(10.4825 + 3.937/2) \times 0.8331$	$B_A$	10.3729
No. of Fuel Rods in 7x7 assembly, Reference 7.12, p 2A-15 (no water rods)	$N_{FC7}$	49

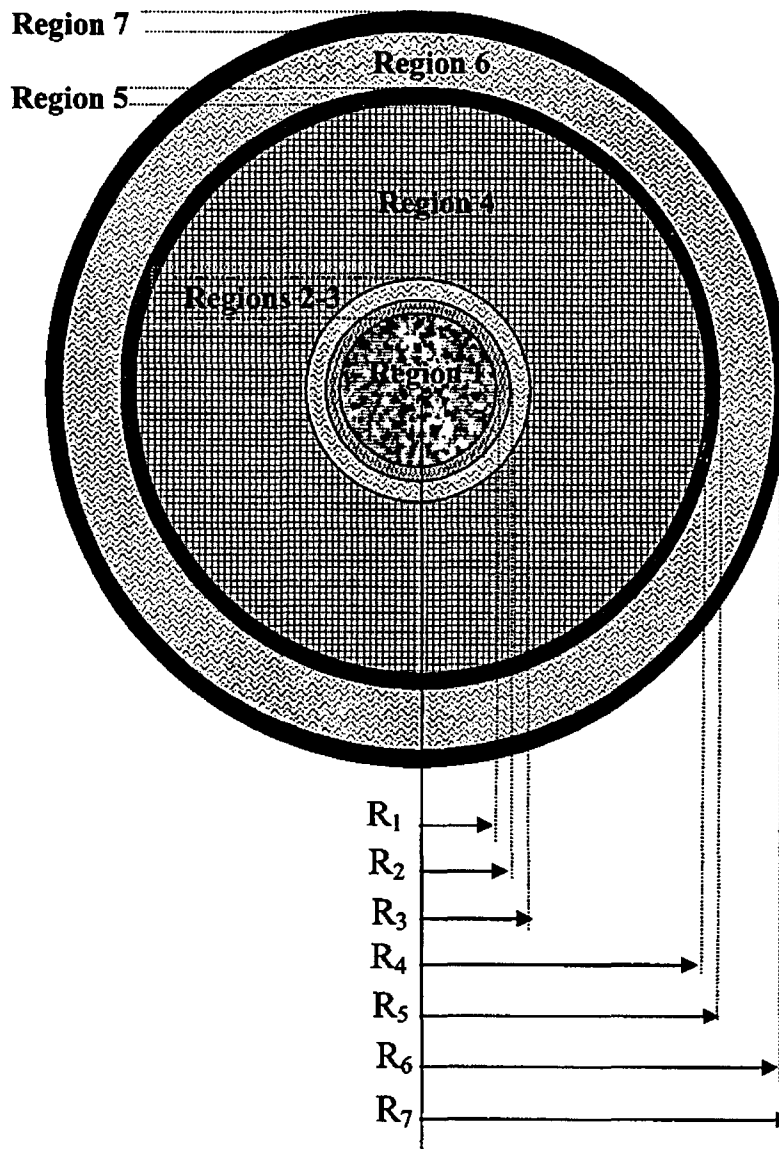


Figure 1. Path B Model with Central Cell Representing a Gadolinium Rod

Reference: 7.15, p 44 for BWR Path B model. For isotopic database the central cell is a fuel rod (i.e. same as Path A fuel rod – Gd rod contains 0.0 wt%  $Gd_2O_3$ )

- Central Cell: Region 1 through 3 (Gd rod cell)
- Region 1: Gd fuel rod plus gap
- Region 2: Gd rod cladding
- Region 3: Water
- Region 4: Homogenized Fuel Region
- Region 5: Channel
- Region 6: Bypass Region (water with no water rod tube)
- Region 7: Homogenized Control Blade or Water

Determine  $R_1$  (Basis: Reference 7.15, p 46):

$$\begin{aligned} \text{OD of fuel (ID of clad)} &= 1.26746 \text{ cm, Reference 7.12, p 2A-15} \\ R_1 = C_{ID7} / 2 &= 1.26746/2 = \underline{0.63373 \text{ cm}} \end{aligned}$$

Determine  $R_2$  (Basis: Reference 7.15, p 46):

$$\begin{aligned} \text{OD of fuel Clad} &= 1.4478 \text{ cm, Reference 7.12, p 2A-15} \\ R_2 = C_{OD7} / 2 &= 1.4478/2 = \underline{0.72390 \text{ cm}} \end{aligned}$$

Determine  $R_3$  (Basis: Reference 7.15, p 46):

$$\begin{aligned} P_7 - \text{Fuel pin pitch} &= 1.87452 \text{ cm, Reference 7.12, p 2A-15} \\ R_3 = (P_7) / [\pi]^{1/2} &= 1.87452 / [\pi]^{1/2} = \underline{1.05758 \text{ cm}} \end{aligned}$$

Determine  $R_4$  (Basis: Reference 7.15, p 47):

$$\begin{aligned} P_7 - \text{Fuel pin pitch} &= 1.87452 \text{ cm, Reference 7.12, p 2A-15} \\ N_{F7} = 7 \times 7 &= 49, \text{ Reference 7.16, p 2A-15; } N_{G7} = 1 \\ R_4 = P_7 [N_{F7} / (\pi * N_{G7})]^{1/2} &= \underline{7.40309 \text{ cm}} \end{aligned}$$

Determine  $R_5$  (Basis: Reference 7.15, p 47):

$$\begin{aligned} C_{IW} = \text{Channel inner width (cm)} &= 13.2461 \text{ cm, Reference 7.15, p 45} \\ C_{OW} = \text{Channel outer width (cm)} &= 13.8557 \text{ cm, Reference 7.15, p 45} \\ N_{F7} = 7 \times 7 &= 49, \text{ Reference 7.16, p 2A-15; } N_{G7} = 1 \\ P_7 - \text{Fuel pin pitch} &= 1.87452 \text{ cm, Reference 7.12, p 2A-15} \\ R_5 = [\{N_{F7} * (P_7)^2 + [(C_{OW})^2 - (C_{IW})^2]\} / \pi (N_{G7})]^{1/2} &= \underline{7.75014 \text{ cm}} \end{aligned}$$

Determine  $R_6$  (Basis: Reference 7.15, p 48):

$$\begin{aligned} P_A = \text{Assembly pitch} &= 15.24 \text{ cm, Reference 7.16, p 8} \\ B_L = \text{Single control blade length} &= 10.4825 \text{ cm, Reference 7.15, p 45} \\ B_T = \text{Blade thickness} &= 0.8331 \text{ cm, Reference 7.15, p 45} \\ S_B = \text{Blade support span} &= 3.937 \text{ cm, Reference 7.15, p 45} \\ R_6 = \{[(P_A)^2 - (B_T) * (B_L + S_B / 2)] / \pi (N_{G7})\}^{1/2} &= \underline{8.40405 \text{ cm}} \end{aligned}$$

Determine  $R_7$  (Basis: Reference 7.15, p 48):

$$\begin{aligned} P_A = \text{Assembly pitch} &= 15.24 \text{ cm, Reference 7.16, p 8} \\ R_7 = P_A / [\pi (N_{G7})]^{1/2} &= \underline{8.59825 \text{ cm}} \end{aligned}$$

The assembly pitch for the 7x7 assembly (Reference 7.16, p 8) is the same value as the assembly pitch for the 8x8 and 9x9 assemblies (Reference 7.15, p 45)

### 5.1.1.1 Assembly Type

The GE-2a fuel assembly was selected as the representative fuel assembly because of its large initial fuel loading of 196 kg/assembly of heavy metal, Reference 7.12, p 2A-15.

Using Reference 7.12, the assemblies with the largest average initial fuel loading weights were the 7x7 assemblies with assembly type code GE-2a (G2307G2a) and GE-2b (G2307G2b). The assembly initial loading weight for each of these 7x7 assemblies is 196 kgU and 193 kgU respectively. A review of the 8x8 assemblies in Reference 7.12, p 2A-21 indicates a maximum initial fuel loading weight of 186 kgU per assembly. This fuel loading is applicable to the assembly type code GE-4b (G4608G4b). The 7x7, GE-2a, contains the maximum average fuel loading of all the indicated BWR assemblies.

A review of the fuel pellet diameters for the 7x7 and the 8x8 assemblies (Reference 7.12, p 2A-15) indicates that the fuel pellet associated with the 7x7, GE-2a, assembly has the largest fuel pellet diameter of 1.23952 cm. This compares to the 7x7, GE-2b, assembly with a fuel pellet diameter of 1.23698 cm. The 8x8 fuel pellet diameters range between 1.0414 (Reference 7.6, 7.7, and 7.9) and 1.05664 cm (Reference 7.12, p 2A-21). The result is that the GE-2a assembly contains the fuel pellet with the largest pellet diameter.

A review of the active fuel length for the 7x7 and the 8x8 assemblies (Reference 7.12) indicates that the active fuel length of the BWR fuel is between 365.76 and 370.84 cm for the 7x7 and 365.76 and 381.00 cm for the 8x8. Assuming a fuel diameter of 1.23952 cm, an active fuel height of 365.76 cm and 49 fuel rods for the 7x7 assembly (GE-2a), the fuel volume is 21627 cm<sup>3</sup>. Assuming a fuel diameter of 1.05664 cm, an active fuel height of 370.84 cm, and 63 fuel rods for the 8x8 assembly (GE-4b), the fuel volume for the assembly is 20487 cm<sup>3</sup>. Additional information can be found in Section 5.1.1.7. The GE-2a assembly contains the greatest volume of fuel per assembly.

Fuel volumes are presented in Table 6 of this report for selected fuel assembly types along with fuel mass values based on a fuel density corresponding to 98% theoretical density. Also included are nominal fuel mass values for these assemblies. The GE-2a assembly contains the greatest volume of fuel and mass of fuel per assembly.

### 5.1.1.2 Burnup and Fuel Enrichments

The burnup (.001 – 75 GWd/mtU) and fuel enrichment range (1.5 – 5.5 <sup>235</sup>U wt %) covered by the isotopic database is presented in Table 3. The burnup values are assembly average values. The selected burnup range for the isotopic database bounds the allowable burnup range for the commercial nuclear industry today. A representative allowable fuel rod average burnup of 62 GWd/mtU is provided in Reference 7.17 (p 2 of Enclosure 1). The assembly average burnup value is less than the rod average value. Thus, considerable margin is provided in the isotopic database by including assembly average burnup values up to 75 GWd/mtU.

The current enrichment limit on commercial fuel plants is 5.0 wt% <sup>235</sup>U. The upper enrichment value of 5.5 wt% <sup>235</sup>U bounds the current inventory of commercial spent nuclear fuel.

Table 3. Selected Enrichments and Burnups for the BWR Isotopic Database

Enrichment ( <sup>235</sup> U wt%)	Burnup (GWd/mtU)
1.5	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
2.0	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
2.5	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
3.0	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
3.5	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
4.0	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
4.5	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
5.0	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75
5.5	0.001, 2.5, 5.0, 7.5, 10, 12.5,15, 17.5, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75

### 5.1.1.3 Fuel Temperature

A fuel temperature of 1200 °K was chosen as a bounding value for the fuel depletion calculations. The basis for this choice is the fuel temperature operating history data of the CRC data summary reports for Grand Gulf Unit 1 (GG1), LaSalle Unit 1 (LS1), and Quad Cities Unit 2 (QC2). The largest fuel temperatures observed in these reports are summarized in Table 4. The higher temperature values result in more <sup>239</sup>Pu production and is therefore conservative with respect to criticality. The fuel temperatures presented in Table 4 for each fuel assembly are from the axial node that has the largest fuel temperature. The remaining fuel temperature values indicated are from the same axial node. It is observed that the fuel temperatures that exceed the 1200 K are for only one burnup step and that for most of the operating history for these fuel assemblies the temperature is less than 1200 K. It is also observed that for most fuel assemblies in these three reactors the fuel temperature never exceeds 1200K. Therefore, the temperature of 1200 K is bounding.

Table 4. Limiting Fuel Temperature Data for Boiling Water Reactors

Reactor	Assembly ID	Fuel Temperature (K)	Burnup (MWd/mtU)	References
GG1	A9 (DP2)	1361	6.8	7.6, p 4-12 & 4-13
	A9 (BOC3)	1121	12.0	
	A9 (BOC4)	1091	27.5	
	A9 (EOC4)	692	35.2	
LS1	E1 (DP6)	1072	7.2	7.7, p 359
	E1 (SP7)	1277	12.8	
	E1 (BOC8)	998	28.8	
QC2	K3 (SP10)	913	0.3	7.8, p 523 & 524
	K3 (SP13)	1212	12.3	
	K3 (BOC14)	1056	14.6	
	K3 (SP16)	1035	21.7	



#### 5.1.1.4 Moderator Density and Temperature

A moderator temperature of 560.7 K (287.7 °C, 549.9 °F) was selected for the fuel depletion calculations. The basis for this value was from Reference 7.6, p 2-5, which states that 287.7 °C was the core saturation temperature for the GG1 core.

The moderator density varies axially along the height of the active fuel. A review of the moderator densities for BWR fuel (References 7.6, 7.7, and 7.8) indicates that the moderator density varies from a high of approximately 0.74 g/cm<sup>3</sup> to a low value of approximately 0.12 g/cm<sup>3</sup>. This yields an average value of 0.43 g/cm<sup>3</sup>. A moderator density value of 0.3 g/cm<sup>3</sup> was chosen to be used in the SAS2H calculations for both the in-channel and by-pass flow moderator regions. The lower moderator density (0.3 g/cm<sup>3</sup> compared with 0.43 g/cm<sup>3</sup>) will yield a harder neutron spectrum and result in more <sup>239</sup>Pu production, which is conservative with respect to criticality. However, the amount of conservatism is dependent upon the values chosen for other parameters (e.g. control blade history).

#### 5.1.1.5 Control Blades

The SAS2H depletion model includes control blades inserted for the last 15 GWd/mtU of depletion. For example, for a burnup of 15 GWd/mtU the blades are inserted the entire time. For a burnup of 20 GWd/mtU the blades are inserted from 5 to 20 GWd/mtU.

The BWR sensitivity analysis (Reference 7.18, p 1) concluded that control blade insertion has the biggest impact on reactivity of any of the depletion parameters analyzed. The largest control blade history effect was shown to be at the end of the depletion period. This ensures that the calculated discharge fuel has maximum fissile isotope concentrations. Additional depletion sensitivity data are presented in Section 5.3 of this document.

By maximizing the fissile isotope concentrations, the  $k_{eff}$  of the system is maximized. The value of 15 GWd/mtU is selected based on engineering judgment and observation of reactor operating data. Any single assembly is unlikely to experience a significant (> 3 nodes) control blade insertion over a depletion step. This approach forces a full-length insertion over an extraordinarily long depletion period. According to solicited expert opinion, even the lower nodes of any assembly are highly unlikely to ever experience control blade insertion for greater than 7 GWd/mtU. Control blade insertion data from References 7.6, 7.7, and 7.8 confirms the expert opinion. Thus, 15 GWd/mtU is sufficiently conservative to bound all anticipated reactor operation scenarios and also negates the need to model burnable absorbers.

#### 5.1.1.6 Burnable Poison in Fuel Rods

The SAS2H model used in this analysis does not contain any burnable poison fuel rods (i.e. Gd<sub>2</sub>O<sub>3</sub>). To be consistent with the Path B model used for the SAS2H depletions in Reference 7.15, the center region contains a fuel rod with 0 wt% Gd<sub>2</sub>O<sub>3</sub>. The justification for not including burnable absorbers is the use of control blades for spectrum hardening, which overshadows the effect of burnable absorbers. Additional depletion sensitivity data for burnable absorbers is provided in Section 5.3.

**5.1.1.7 Parameters for SAS2H Depletion Calculations**

Additional parameter values used for the fuel depletion calculations are presented in Table 5. These include fuel pin information needed for the Path A model, as well as fuel assembly and power information for the depletion calculations.

The depletion time steps are divided into 50-day intervals with the final time step adjusted to accommodate the desired end-point burnup value.

Table 5. Parameters Used for Fuel Depletion Calculations

<u>Parameter</u>	<u>Symbol</u>	<u>Parameter Value</u>	<u>Reference</u>
Active fuel height (cm) GE-2a	$H_f$	365.76	Reference 7.12, p 2A-15
Fuel pellet diameter (cm)	$d_f$	1.23952	Reference 7.12, p 2A-15
Fuel clad inner diameter (cm)	$C_{ID}$	1.26746	Reference 7.12, p 2A-15
Fuel clad outer diameter (cm)	$C_{OD}$	1.44780	Reference 7.12, p 2A-15
Number of fuel assemblies in core, GG1	$N_{fa}$	800	Reference 7.6, p 2-5
Core power (MWt), GG1	$P_c$	3833	Reference 7.6, p2-5
UO <sub>2</sub> fuel density (g/cm <sup>3</sup> )	$\rho_f$	10.741	98%, Theoretical Density
Atomic weight of U / UO <sub>2</sub>	$A_U / A_{UO_2}$	0.8815	Reference 7.19
Number of fuel cells per 7x7 assembly	$N_{FC7}$	49	Reference 7.12, p 2A-15

The assembly used for the SAS2h model is a 7x7 type GE-2a. The core power of 3833 MWt is based on an 800 assembly core. A fuel density value of 10.741 g/cm<sup>3</sup> (98% theoretical density) is used for these analyses. This fuel density value is chosen to bound all current and anticipated fuel density values for light water reactor fuel. Assuming a fuel pellet diameter equal to the fuel clad inner diameter provides additional conservatism.

The model contains no Gadolinium rods (center cell in Path B is a fuel rod with 0.0 wt % of Gd<sub>2</sub>O<sub>3</sub>). The Path B model also contains no water rods, which is conservative (Section 5.3). The fuel temperature is 1200 °K and the moderator density is 0.3 g/cm<sup>3</sup>.

The fuel volume, mass of uranium, and specific power for the bounding assembly are calculated based on information provided in Table 5. Assuming that the fuel pellet OD is equal to the clad ID ( $C_{ID}$ ), then the

$$\begin{aligned} \text{Fuel Volume of Assembly, } V_f &= (\pi / 4) (C_{ID})^2 (H_f) (N_{FC7}) = (\pi / 4)(1.26746)^2(365.76)(49) \\ &= \underline{22,612.61} \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Mass of UO}_2 \text{ /Assembly, } M_{UO_2} &= (\rho_f) (V_f) (1 \text{ Kg} / 1000 \text{ g}) \\ &= (10.741 \text{ g/cm}^3) (22,612.61 \text{ cm}^3) (1 \text{ kg}/1000\text{g}) = \underline{242.88} \text{ kg} \end{aligned}$$

$$A_U/A_{UO_2} = (238.0289)/[238.0289 + (15.9994) (2.0)] = 0.8815$$

$$\text{U Mass of Assy, } M_U = (M_{UO_2}) (A_U/A_{UO_2}) = (242.88 \text{ kg})(0.8815)(1\text{mt}/1000 \text{ kg}) = 0.2141 \text{ mtU}$$

$$\text{Specific Power} = P_{SAS2H} / M_U = (3833 \text{ MWt} / 800 \text{ assemblies}) / 0.2141 \text{ mtU} = 22.38 \text{ MW/mtU}$$

Sample fuel volumes and masses are presented in Table 6 that illustrate the differences between various assemblies (7x7 vs. 8x8).

Table 6. BWR Fuel Volume and Mass per Assembly

Assembly Type	Rod Array	Pellet Diameter (cm)	Fuel Height (cm)	No. of Fuel Rods	Assembly Volume (cm <sup>3</sup> )	Mass UO <sub>2</sub> at 98% TD (kg)	Mass U at 98% TD (kg)	Mass U Nominal Value (kg)
GE-2a <sup>(a)</sup>	7x7	1.23952	365.76	49	21627	232.3	204.8	196
GE-2b <sup>(a)</sup>	7x7	1.23698	365.76	49	21538	231.3	203.9	193
GE-4b <sup>(b)</sup>	8x8	1.05664	370.84	63	20487	220.1	194.0	186
GG1 <sup>(c)</sup>	8x8	1.02997	381.00	62	19681	211.4	186.3	177
LS1 <sup>(d)</sup>	8x8	1.04394	381.00	60	19567	210.2	185.3	180
QC2 <sup>(e)</sup>	8x8	1.04140	368.91	60	18854	202.5	178.5	172
QC2 <sup>(e)</sup>	8x8	1.04140	368.91	62	19482	209.3	184.5	175

<sup>(a)</sup> Reference 7.12, p 2A-15 for pellet diameter, fuel height, no. of fuel rods, and nominal mass of U

<sup>(b)</sup> Reference 7.12, p 2A-21 for pellet diameter, fuel height, no. of fuel rods, and nominal mass of U

<sup>(c)</sup> Reference 7.6, p 2-7 pellet diameter & no. fuel rods, p 3-4 fuel height, p 4-420 nominal mass of U

<sup>(d)</sup> Reference 7.7, p 5 pellet diameter, fuel height, & no. of fuel rods, p 416 nominal mass of U

<sup>(e)</sup> Reference 7.8, p 5 pellet diameter, fuel height, & no. of fuel rods, p 545 nominal mass of U

As seen from Table 6, the actual nominal mass of the chosen bounding assembly, GE-2a, is 196 kgU / assembly. Based on the theoretical density of 10.741 g/cm<sup>3</sup>, the equivalent fuel loading value (204.8 kgU) is over 4% greater than the value for the nominal GE-2a assembly (196 kgU). However, the fuel mass for the bounding model is 214.1 kgU or over 9% greater than the nominal value.

The isotopic database is generated for two different cooling times. The decay time following each burnup point in Table 3 will be 5 years (1825 days) and 10,000 years (3.65 x 10<sup>6</sup> days).

## 5.1.2 Material Specifications for SAS2H

### 5.1.2.1 Uranium Enrichment

The selected <sup>235</sup>U enrichment and burnup value combinations are presented in Table 3. The SAS2H input values for isotopes <sup>234</sup>U, <sup>236</sup>U, and <sup>238</sup>U are calculated from the initial <sup>235</sup>U enrichment based on the following equations (Reference 7.15, p 60).

$$^{234}\text{U wt}\% = (0.007731) (^{235}\text{U wt}\%)^{1.0837}$$

$$^{236}\text{U wt}\% = (0.0046) (^{235}\text{U wt}\%)$$

$$^{238}\text{U wt}\% = 100 - ^{234}\text{U wt}\% - ^{235}\text{U wt}\% - ^{236}\text{U wt}\%$$

The clad and channel material are modeled the same as for the Grand Gulf Unit 1 depletion calculations and are assumed to have a temperature of 588.6 °K (600 °F), Reference 7.15, p 60.

**5.1.2.2 Region 7, Blade Data**

The blade data, referred to as Region 7 in SAS2H Path B model, was taken from the GG1 depletion analysis, Reference 7.15, p 63. The blade region contains 18 B<sub>4</sub>C rods within a SS304 blade. The area inside the blade between the B<sub>4</sub>C rods and the SS blade contains water. The weight fractions, as taken from Reference 7.15, p 63 were; 0.0821 for B<sub>4</sub>C, 0.0243 for water, and 0.8936 for SS304.

The density for Region 7 was 5.20504 g/cm<sup>3</sup>, Reference 7.15, p 63. Region 7 will be SAS2H Material 11.

Table 8 contains the Region 7 element / isotopic data as a function of wt %. This will be used as input to SAS2H.

The SAS2H calculation will contain a blade (fully inserted) for the last 15 GWd/mtU of exposure. For example, for a burnup of 10 GWd/mtU, the blade will be inserted during the entire burnup. For a 20 GWd/mtU, the blade will not be inserted for the first 5 GWd/mtU, but will be inserted for the last 15 GWd/mtU.

Table 7 provides a summary of the element/isotope weight percents for Region 7 in the Path B model.

Table 7. Path B, Region 7 wt%

Element / Isotope	SAS2H ID	Region	Wt % (Region 7)
Boron-10	5010	B <sub>4</sub> C	1.1842
Boron-11	5011	B <sub>4</sub> C	5.2410
Carbon	6012	B <sub>4</sub> C	1.7846
Hydrogen	1000	Water	0.2724
Oxygen	8016	Water	2.1618
Carbon	6012	SS304	0.0715
Nitrogen	7014	SS304	0.0894
Silicon	14000	SS304	0.8936
Phosphorus	15000	SS304	0.0402
Sulfur	16000	SS304	0.0268
Chromium	24000	SS304	16.9776
Manganese	25000	SS304	1.7871
Iron	26000	SS304	61.2043
Nickel	28000	SS304	8.2655

Reference 7.15, pp 63 & 64

**5.2 MCNP**

The MCNP code (References 7.5) is a general-purpose Monte Carlo N-Particle code that can be used for neutron transport and has the capability to calculate  $k_{eff}$  for systems containing

fissionable material. The MCNP code is used in criticality calculations to confirm the conservatism in the isotopic database.

To confirm the bounding nature of the isotopic database, isotopic concentrations generated by the database are compared to RCA data (Reference 7.10 and 7.11), CRC data (Reference 7.6 and 7.20), and nominal assembly data taken from Reference 7.15. The MCNP calculations performed in confirming the conservatism in the isotopic database versus the RCA data and CRC data are discussed in the following two sections. Section 6.3.3 discusses the comparison to a nominal depletion assembly.

### 5.2.1 RCA keff Calculations

The RCA data (isotopic concentrations) from CSNF samples are used in waste package calculations to establish  $k_{\text{eff}}$  values for the waste package. The RCA data was previously evaluated in a 44 BWR waste package (References 7.10 and 7.11). However, these calculations included some isotopes that are not part of the Principal Isotope Set (Reference 7.1), so the RCAs are re-evaluated in this calculation. All of the 30 RCA samples analyzed in Reference 7.11, and all 8 samples analyzed in Reference 7.10 are analyzed in the calculations for this document. The samples analyzed for this document are summarized in Table 8. The table includes the samples initial enrichment values and estimated burnup values.

Reference 7.11 evaluated the RCA data by placing the sample data in all nodes of all assemblies within a 44 BWR WP. These evaluations are reported in Section 6.3.1 of this document along with the  $k_{\text{eff}}$  values calculated using the isotopic database. The isotopic database concentrations replace the RCA sample data in the fuel material cards in the MCNP input files. Also, the material density was increased to  $10.741 \text{ g/cm}^3$  because this is the density used in the SAS2H calculations for the isotopic database.

Worth noting is that the isotopic database reports concentrations for only the principal isotopes, but the RCA samples included some additional isotopes (e.g.  $^{134}\text{Cs}$ ,  $^{137}\text{Cs}$ ,  $^{155}\text{Eu}$ , and  $^{244}\text{Cm}$ ), and not some of the principal isotopes. To ensure proper comparison, the MCNP cases for the measured data were rerun. The only modification to the measured data MCNP inputs was the deletion of any isotopes not found in the Principal Isotope set. Because the isotopic database reports concentrations for all the principal isotopes, but the RCA samples included only a subset of those, the material definition using the isotopic database concentrations included only those isotopes that were included in the RCA sample being evaluated.

Table 8. RCA Samples Used for Isotopic Database Comparisons

Reactor	Sample Name	MCNP Input File Name (Sample Identifier)		Initial Enrichment (wt% <sup>235</sup> U)	Burnup (GWd/mtU)
		RCA Measured	Isotopic Database		
Limerick	D8-3D2B	1m	L01id	3.60	54.840
	D8-4G3	2m	L02id	3.60	37.020
	D9-1D2	3m	L03id	3.95	62.110
	D9-2D2	4m	L04id	3.95	65.540
	D9-4D4	5m	L05id	3.95	64.950
	D9-4G1E1	6m	L06id	3.95	56.520
	H5-3A1C	7m	L07id	3.95	57.915
	H5-3A1G	8m	L08id	3.95	57.810
Cooper	Rod add2966, cut-b	c1m	C1id	2.939	18.96
	Rod add2966, cut-k	c2m	C2id	2.939	33.07
	Rod add2966, cut-t	c3m	C3id	2.939	33.94
	Rod add2974, cut-b	c4m	C4id	2.939	17.84
	Rod add2974, cut-j	c5m	C5id	2.939	29.23
	Rod add2974, cut-u	c6m	C6id	2.939	31.04
Gundremmingen	assy. b23, rod a1, 44cm	g1m	G01id	2.530	25.730
	assy. b23, rod a1, 268cm	g2m	G02id	2.530	27.400
	assy. b23, rod b3, 268cm	g3m	G03id	2.530	21.240
	assy. b23, rod e3, 268cm	g4m	G04id	2.530	23.510
	assy. c16, rod a1, 44cm	g5m	G05id	2.530	20.300
	assy. c16, rod a1, 268cm	g6m	G06id	2.530	19.850
	assy. c16, rod b3, 268cm	g7m	G07id	2.530	14.390
	assy. c16, rod e5, 268cm	g8m	G08id	2.530	17.490
JPDR	assy. a-14, rod c-d-3-4 (2)	j01m	J01id	2.596	3.3032
	assy. a-14, rod c-d-3-4 (9)	j02m	J02id	2.596	4.0351
	assy. a-18, rod c-d-3-4 (2)	j03m	J03id	2.596	2.7120
	assy. a-18, rod c-d-3-4 (6)	j04m	J04id	2.596	4.2510
	assy. a-20, rod a-1 (3)	j05m	J05id	2.596	7.0098
	assy. a-20, rod a-1 (10)	j06m	J06id	2.596	6.1465
	assy. a-20, rod a-3 (3)	j07m	J07id	2.596	6.9535
	assy. a-20, rod a-6 (9)	j08m	J08id	2.596	6.5125
	assy. a-20, rod a-6 (1)	j09m	J09id	2.596	2.6463
	assy. a-20, rod c-3 (3)	j10m	J10id	2.596	5.0861
	assy. a-20, rod c-3 (5)	j11m	J11id	2.596	6.0808
	assy. a-20, rod a-1 (8)	j12m	J12id	2.596	6.0433
	assy. a-20, rod c-3 (10)	j13m	J13id	2.596	5.0580
	assy. a-20, rod c-3 (12)	j14m	J14id	2.596	2.1583
	assy. a-20, rod e-2 (3)	j15m	J15id	2.596	5.6022
	assy. a-20, rod e-2 (10)	j16m	J16id	2.596	5.3770

### 5.2.2 CRC Calculations

For the CRC calculations, the documentation for the BWR CRC state-points presented in Reference 7.6 was reviewed to identify the expected limiting (with respect to criticality) assemblies for the evaluated state-points. The most limiting assemblies were selected based on burnup profiles available in Table 4-2 through Table 4-364 of Reference 7.6. Enrichment, burnup, and assembly design were also taken into consideration. This process identified eleven assemblies for consideration in these confirmation calculations. These "most limiting assemblies" are listed in Table 9.

Table 9. Most Limiting Fuel Assemblies for CRC Confirmation

Reactor	Assembly	Statepoint	Assembly Design	Initial Enrichment (wt% <sup>235</sup> U)	Burnup <sup>a</sup> (GWD/MTU)
Grand Gulf, Unit 1	A16	6	8x8	2.81	18.776
Grand Gulf, Unit 1	C06	6	8x8	3.01	11.783
Grand Gulf, Unit 1	B37	13	8x8	3.01	26.485
Grand Gulf, Unit 1	D45	14	8x8	3.37	20.986
Grand Gulf, Unit 1	B32	15	8x8	3.01	31.057
Grand Gulf, Unit 1	H15	18	9x9	3.38	14.798
Grand Gulf, Unit 1	F16	18	9x9	3.42	30.138
Grand Gulf, Unit 1	K06	20	9x9	3.42	6.972
Grand Gulf, Unit 1	H22	20	9x9	3.38	17.922
Grand Gulf, Unit 1	J30	20	9x9	2.94	22.894
Grand Gulf, Unit 1	H06	21	9x9	3.38	25.608

**Notes:**

<sup>a</sup> Average Burnup

The reactor-specific data are taken from the applicable reference points as noted in Table 10.

Table 10. Reactor-specific Data for the Most Limiting Fuel Assemblies

Statepoint	Cycle	Loading Pattern	Assembly	Axial Burnup Profile
6	4	p. 3-11	A16	p. 4-22
6	4	p. 3-11	C06	p. 4-111
13	5	p. 3-12	B37	p. 4-102
14	5	p. 3-12	D45	p. 4-203
15	5	p. 3-12	B32	p. 4-94
18	7	p. 3-14	H15	p. 4-325
18	7	p. 3-14	F16	p. 4-246
20	7	p. 3-14	K06	p. 4-371
20	7	p. 3-14	H22	p. 4-332
20	7	p. 3-14	J30	p. 4-360
21	8	p. 3-15	H06	p. 4-316

The average burnup values listed in Table 9 were calculated based on the reactor-specific data using the following equation:

$$Average\ Burnup = \frac{\sum (Node\ Height) (Node\ Burnup)}{\sum (Node\ Height)}$$

The relative axial burnup profiles for the eleven assemblies considered here (Table 9) are shown in Figures 2, 3, and 4. Figure 2 contains the profiles for the selected assemblies (assembly average burnups) in the range of 0 GWd/mtU to 15 GWd/mtU. Figure 3 shows the profiles for the selected assemblies (assembly average burnups) in the range of 15 GWd/mtU to 25 GWd/mtU. Figure 4 contains the profiles for the selected assemblies (assembly average burnups) in the range of 25 GWd/mtU to 35 GWd/mtU. The figures demonstrate that the selected assemblies exhibit extreme "end-effect" burnup profiles (sharp burnup gradients at the end of the assemblies), and some non-standard axial profile shapes.

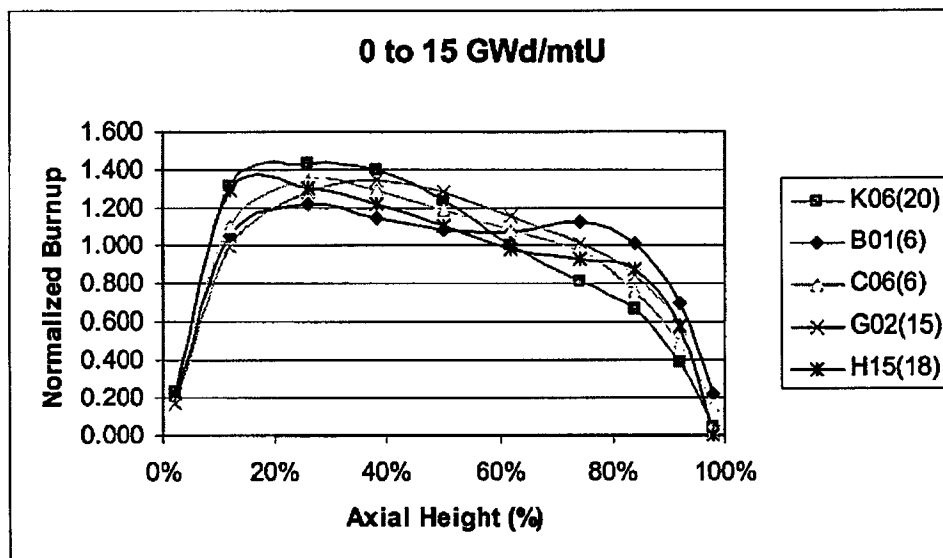


Figure 2. Axial Burnup Profiles for Assemblies with Average Assembly Burnups Between 0 GWd/mtU and 15 GWd/mtU)



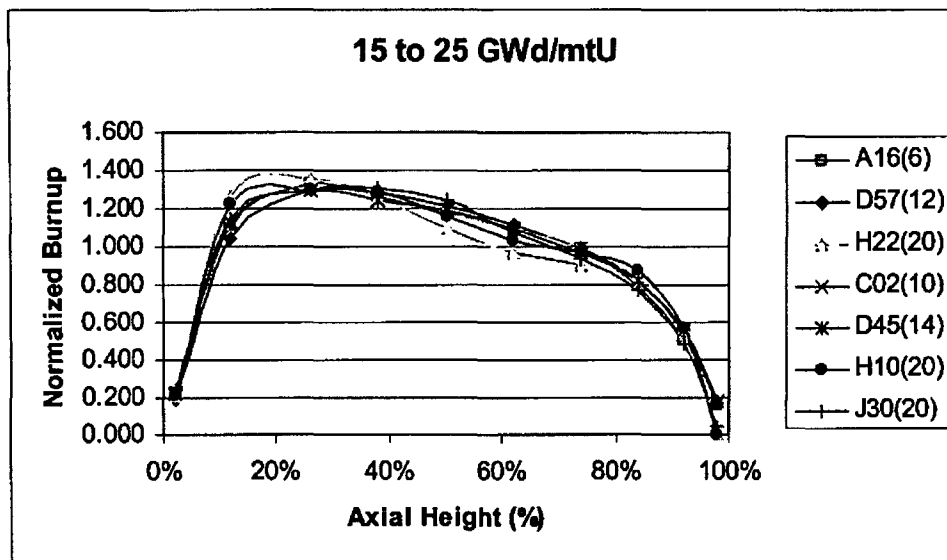


Figure 3. Axial Burnup Profiles for Assemblies with Average Assembly Burnups Between 15 GWd/mtU and 25 GWd/mtU

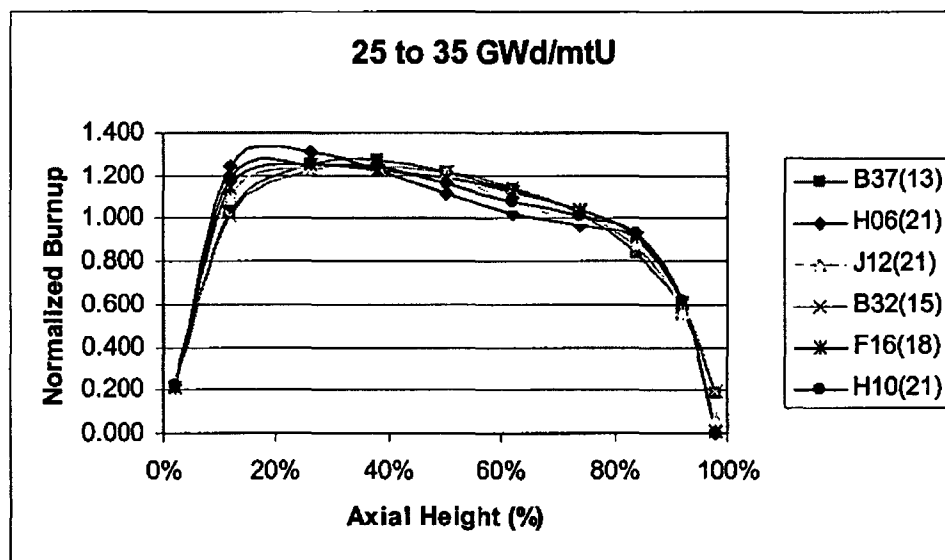


Figure 4. Axial Burnup Profiles for Assemblies with Average Assembly Burnups Between 25 GWd/mtU and 35 GWd/mtU

### 5.3 SENSITIVITY STUDY

A BWR depletion sensitivity evaluation was performed and reported in Reference 7.18. The second paragraph of page one of this reference states the following:

“Comparing the results presented in the body of this document shows that the decay time has very little impact on the sensitivity of the MCNP calculations of  $k_{\infty}$  to the variation of parameter in question. The  $\Delta k/k$  values change very little as a result of the decay time. However, comparing the data in the tables indicates that the control blade insertion has the biggest impact on the calculation of  $k_{\infty}$ . At high burnups, the control blade insertion may have as much as a 64% impact on  $k_{\infty}$ . The next most significant factor is the impact of the moderator density which demonstrates an impact of approximately 12% in  $\Delta k/k$  when the control blades are assumed to be removed. When the control blades are assumed to be inserted, the number of gadolinia rods is more important (maximum of ~11%).”

The fuel assembly type used for the depletion sensitivity evaluation in Reference 7.18 was the “Type A” fuel assembly from *Commercial Reactor Criticality Depletion for Grand Gulf, Unit 1* (Reference 7.15). Additional sensitivity evaluations are performed for this report to aid in selecting fuel assembly and operating history parameter values for the BWR isotopic database.

Representative fuel assembly types were selected for this sensitivity study. These include two 7x7 assembly types and three 8x8 assembly types. Table 11 contains information for the 7x7 and 8x8 BWR assemblies.

Table 11. Data for 7x7 and 8x8 Fuel Assembly Arrays Used in Sensitivity Study

Description	Ref 7.12 7x7 (GE-2a)	Ref 7.12 7x7 (GE-2b)	Ref 7.6 8x8 (GG1 <sup>a</sup> )	Ref 7.7 8x8 (LS1 <sup>b</sup> )	Ref 7.8 8x8 (QC2 <sup>c</sup> )
Assembly Type Code	G2307G2a	G4607G2b	G4608A	G4608GB	G2308G4
Fuel Pellet Diameter, cm	1.23952	1.23698	1.02997	1.04394	1.0414
Fuel Pellet Density, g/cm <sup>3</sup>			10.36	10.41	10.30
Theoretical Density, %	94-95	93-95	94.5	95	94
Uranium/Assembly, kg	196	193	177	180	175
Fuel Rod Clad Thickness, cm	0.09017	0.08128	0.0889	0.08127	0.08128
Fuel Rod Clad ID, cm	1.26746	1.26746	1.05156	1.06426	1.06426
Fuel Rod Clad OD, cm	1.4478	1.4300	1.22936	1.22680	1.22680
Fuel Rod Clad Material	Zr-2	Zr-2	Zr-2	Zr-2	Zr-2
Assembly Pitch, cm	15.24	15.24	15.24	15.24	15.24
Fuel Rod Pitch, cm	1.8745	1.8745	1.6154	1.6256	1.6256
Number Fuel Rods/Assembly	49	49	62	60	60 or 62
Number of Water Rods	0	0	2	1 (equal to 4)	1, 2, or 4
Active Fuel Length, cm	365.76	365.76	381.00	381.00	365.76

<sup>a</sup> Grand Gulf Unit 1 (GG1)

<sup>b</sup> LaSalle Unit 1 (LS1)

<sup>c</sup> Quad Cities Unit 2 (QC2)

The 7x7 GE2a fuel assembly had the largest uranium loading of any BWR fuel assembly in Reference 7.12. For the three 8x8 fuel assemblies considered, the 8x8 LS1 fuel assembly had the largest uranium loading. These two assemblies (7x7 GE2a and 8x8 LS1) are used in the following SAS2H fuel depletion evaluations. The pellet diameter is set equal to the fuel rod clad inner diameter (ID) and the fuel density is set equal to  $10.741 \text{ g/cm}^3$  (98% theoretical density). This results in a larger fuel loading per assembly, which is conservative with respect to criticality. Although the LaSalle Unit 1 assembly is chosen for the 8x8 fuel assembly type, the control blade and channel data are taken from Grand Gulf Unit 1 (Reference 7.15).

The isotopic concentrations for the principal isotopes from the SASH2H depletion calculations for the 7x7 and 8x8 fuel assemblies are used in the same MCNP model as was used in Reference 7.18. The basic MCNP model includes a single  $15.24 \text{ cm} \times 15.24 \text{ cm} \times 15.24 \text{ cm}$  node of an 8x8 BWR assembly. The 8x8 geometry is for a Grand Gulf Unit 1 fuel assembly (Reference 7.20).

#### Effects of Burnup

SAS2H depletion calculations are performed for the 7x 7 and 8x8 fuel assemblies for the following conditions:

Wt %  $^{235}\text{U}$  = 3.5, Fuel temp = 1400 °K, Mod Density =  $0.43 \text{ g/cm}^3$ , Decay = 1825 d  
7x7 = 49 Fuel Rods, 8x8 = 64 Fuel Rods, No water rods or gadolinia rods

Isotopic concentrations (principal isotopes) at 10, 30, and 50 GWd/mtU are input to a single fuel assembly MCNP calculation and  $k_{\infty}$  values tabulated (Table 12). Both sets of calculations are for a full set of fuel rods (49 for the 7x7 and 64 for the 8x8), at 98 % theoretical, and with the fuel smeared to the clad inner diameter. The data in Table 12 demonstrates that the  $k_{\infty}$  values for the 7x7 fuel assembly are conservative (larger) relative to the 8x8 fuel assembly at each burnup step.

Table 12. Effects of Burnup

File ID SAS2H / MCNP	Assembly Type	Burnup GWd/mtU	Rod Position	$k_{\infty}$ MCNP	$\sigma$
bwrs0013/bwrm0013	7x7	10	out	1.2795	0.0007
bwrs0014/bwrm0014	7x7	30	out	1.0829	0.0007
bwrs0012/bwrm0012	7x7	50	out	0.9152	0.0007
bwrs0017/bwrm0017	8x8	10	out	1.2775	0.0007
bwrs0018/bwrm0018	8x8	30	out	1.0693	0.0008
bwrs0010/bwrm0010	8x8	50	out	0.8872	0.0007

#### Effects of Control Blade History

The effects of control blade insertion history are investigated for the 7x7 and 8x8 fuel assemblies, and the results are presented in Table 13. The SAS2H depletion calculations are performed for the following conditions:

Wt %  $^{235}\text{U}$  = 3.5, Fuel temp = 1400 °K, Mod Density =  $0.43 \text{ g/cm}^3$ , Decay = 1825 d  
7x7 = 49 Fuel Rods, 8x8 = 64 Fuel Rods, No water rods or gadolinia rods

Table 13. Effect of Blade Insertion

File ID SAS2H / MCNP	Assembly Type	Burnup GWd/mtU	Blade Position	$k_{\infty}$ MCNP	$\sigma$
bwrs0012/bwrm0012	7x7	50	In 0 GWd	0.9152	0.0007
bwrs0015/bwrm0015	7x7	50	In 0 to 10 GWd	0.9638	0.0008
bwrs0016/bwrm0016	7x7	50	In 0 to 30 GWd	1.0640	0.0008
bwrs0028/bwrm0028	7x7	50	In 10 to 30 GWd	1.0247	0.0008
bwrs0029/bwrm0029	7x7	50	In 30 to 50 GWd	1.1143	0.0008
bwrs0010/bwrm0010	8x8	50	In 0 GWd	0.8872	0.0007
bwrs0019/bwrm0019	8x8	50	In 0 to 11 GWd	0.9385	0.0008
bwrs0020/bwrm0020	8x8	50	In 0 to 31 GWd	1.0446	0.0009
bwrs0021/bwrm0021	8x8	50	In 11 to 31 GWd	1.0116	0.0008
bwrs0022/bwrm0022	8x8	50	In 31 to 50 GWd	1.1057	0.0009
bwrs0013/bwrm0013	7x7	10	out	1.2795	0.0007
bwrs0026/bwrm0026	7x7	10	in	1.3101	0.0008
bwrs0017/bwrm0017	8x8	10	out	1.2775	0.0007
bwrs0027/bwrm0027	8x8	10	in	1.3099	0.0008
bwrs0040/bwrm0040	7x7	30	Out	1.0825	0.0009
bwrs0041/bwrm0041	7x7	30	In	1.2216	0.0009
bwrs0042/bwrm0042	8x8	30	Out	1.0692	0.0007
bwrs0043/bwrm0043	8x8	30	In	1.2194	0.0009

The data in Table 13 illustrates that rod insertion at the end of the depletion time period yields the largest  $k_{\infty}$  value (inserted 30 to 50 GWd/mtU) for both the 7x7 and 8x8 fuel assemblies. For all cases presented in Table 13, the 7x7 fuel assembly yields the largest  $k_{\infty}$  value. The margin of difference between the  $k_{\infty}$  values for the 7x7 and 8x8 assemblies is greater for the 50 GWd/mtU cases, but  $k_{\infty}$  values for the 7x7 assemblies are still greater for the 10 GWd/mtU cases although the margin is less.

Studies indicate that the differences in  $k_{\infty}$  values (even small differences) between comparable 7x7 and 8x8 cases can be traced to the fissile isotope ( $^{235}\text{U}$  and  $^{239}\text{Pu}$ ) concentrations. This is demonstrated in Figures 5 and 6. Data in Table 13 demonstrates that the blades-in  $k_{\infty}$  at 10 GWd/mtU and 30 GWd/mtU burnup is larger for both the 7x7 and the 8x8 fuel depletions with the 7x7 having the larger  $k_{\infty}$  value for both the blades-in and blades-out condition. Figures 5 and 6 illustrate that the blades-in  $^{235}\text{U}$  and  $^{239}\text{Pu}$  concentrations values are larger at 10 GWd/mtU for both the 7x7 and the 8x8 fuel depletions with the 7x7 having the larger concentration values for both the blades-in and blades-out condition. Figures 7 and 8 illustrate that the same conclusion is valid for 30 GWd/mtU.

Effects of Gadolinia Rods

The effects of Gadolinia rods were presented in Reference 7.18, *BWR Depletion Parameter Sensitivity Evaluation*. Additional cases are evaluated in this report to support the data provided in Reference 7.18. The gadolinia cases are for an 8x8 fuel assembly with both blade insertion and no blade insertion. Additional blades-in and blades-out cases are evaluated for a 7x7 fuel assembly with no gadolinia rods (i.e. same as isotopic database). Results from these cases are presented in Table 14 (10 GWd/mtU) and Table 15 (30 GWd/mtU). These cases are run at conditions similar to conditions for the isotopic database (fuel temperature, moderator density, fuel density). The SAS2H depletion calculations are performed for the following conditions:

Wt %  $^{235}\text{U}$  = 3.0, Burnup = 10 GWd/mtU and 30 GWd/mtU, Mod Density =  $0.3 \text{ g/cm}^3$ , Fuel Temp = 1200 °K, Fuel Density =  $10.741 \text{ g/cm}^3$ , 8x8 = 62 Fuel rods, 2 water rods, 7x7 = 49 Fuel rods, 0 water rods.

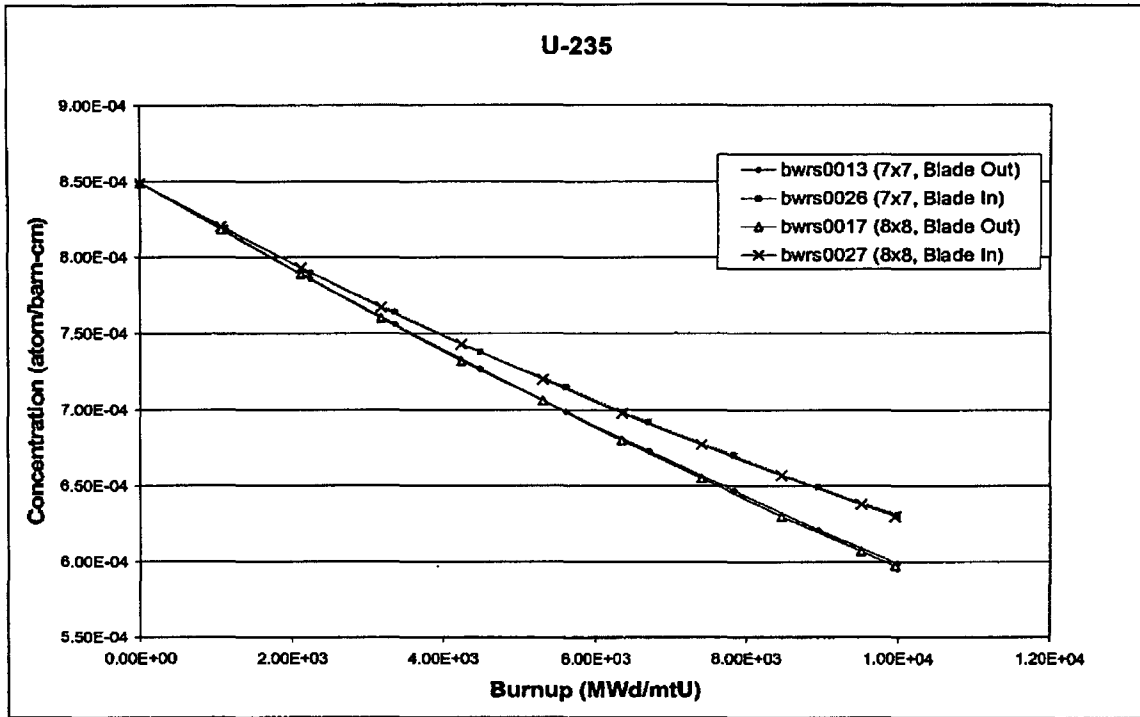


Figure 5. Isotopic Data for <sup>235</sup>U for Selected Blades-In and Blades-Out Cases (10 GWd/mtU)

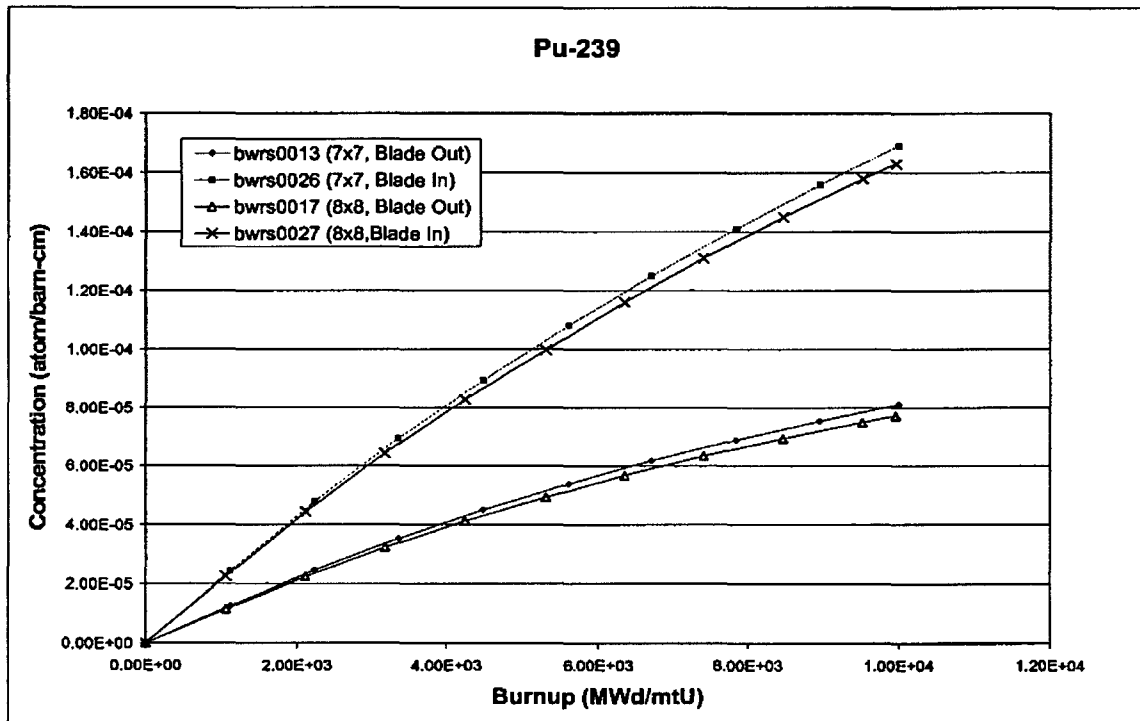


Figure 6. Isotopic Data for <sup>239</sup>Pu for Selected Blades-In and Blades-Out Cases (30 GWd/mtU)

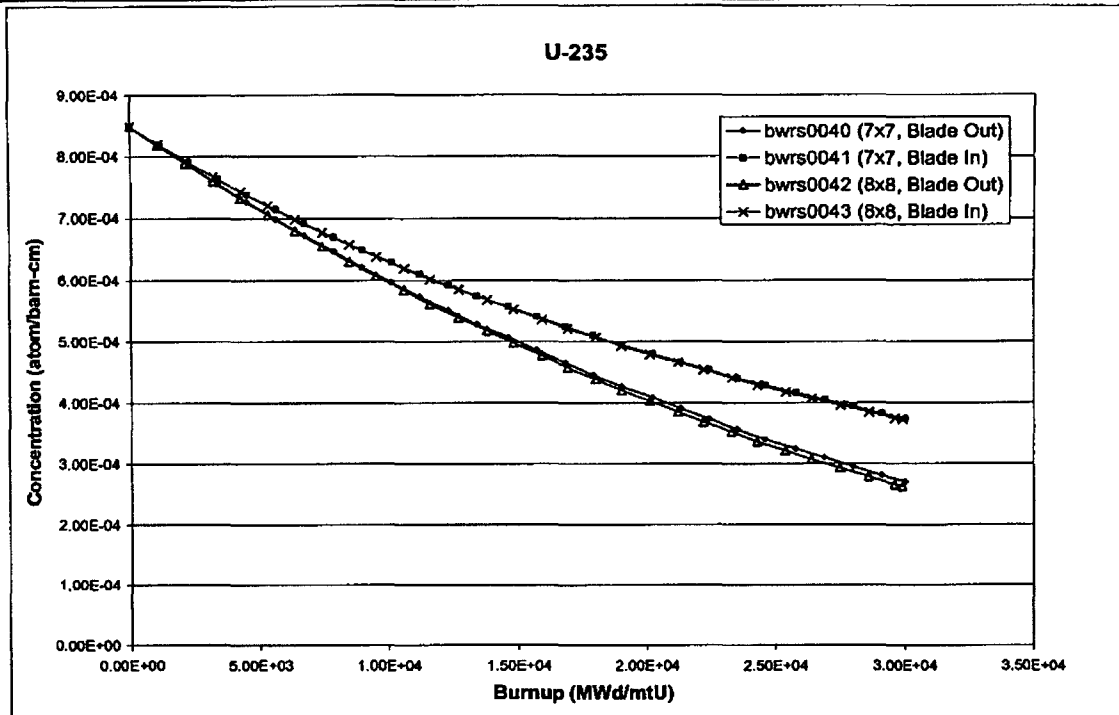


Figure 7. Isotopic Data for <sup>235</sup>U for Selected Blades-In and Blades-Out Cases (30 GWd/mtU)

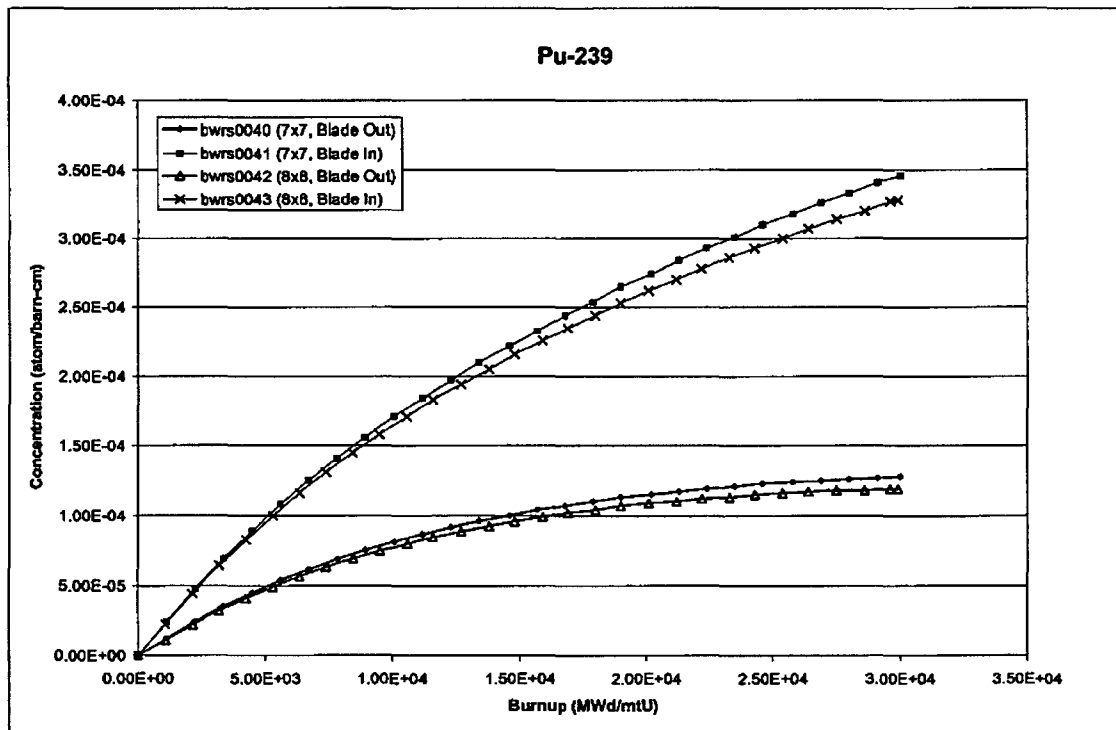


Figure 8. Isotopic Data for <sup>239</sup>Pu for Selected Blades-In and Blades-Out Cases (30 GWd/mtU)

Table 14. Effects of Gadolinia Rods for 10 GWd/mtU Burnup

File ID SAS2H / MCNP	Assembly Type	Number Gd Rods (5.0 wt %)	Blade Position	$k_{\infty}$ MCNP	$\sigma$
bwrs0030/bwrm0030	8x8	0	In	1.2752	0.0008
bwrs0031/bwrm0031	8x8	0	Out	1.2319	0.0009
bwrs0032/bwrm0032	8x8	5	In	1.2876	0.0008
bwrs0033/bwrm0033	8x8	5	Out	1.2376	0.0007
bwrs0034/bwrm0034	8x8	8	In	1.2887	0.0008
bwrs0035/bwrm0035	8x8	8	Out	1.2407	0.0008
bwrs0036/bwrm0036	8x8	10	In	1.2872	0.0008
bwrs0037/bwrm0037	8x8	10	Out	1.2448	0.0008
bwrs0038/bwrm0038	7x7	0	In	1.2894	0.0008
bwrs0039/bwrm0039	7x7	0	Out	1.2470	0.0008

Table 15. Effects of Gadolinia Rods for 30 GWd/mtU Burnup

File ID SAS2H / MCNP	Assembly Type	Number Gd Rods (5.0 wt %)	Blade Position	$k_{\infty}$ MCNP	$\sigma$
bwrs0049/bwrm0049	8x8	0	In	1.1906	0.0008
bwrs0044/bwrm0044	8x8	0	Out	1.0159	0.0007
bwrs0050/bwrm0050	8x8	5	In	1.2114	0.0008
bwrs0045/bwrm0045	8x8	5	Out	1.0290	0.0008
bwrs0051/bwrm0051	8x8	8	In	1.2166	0.0008
bwrs0046/bwrm0046	8x8	8	Out	1.0355	0.0008
bwrs0052/bwrm0052	8x8	10	In	1.2193	0.0008
bwrs0047/bwrm0047	8x8	10	Out	1.0394	0.0008
bwrs0053/bwrm0053	7x7	0	In	1.2228	0.0008
bwrs0048/bwrm0048	7x7	0	Out	1.0929	0.0008

Two set of MCNP cases were executed to investigate the Gd rod effect. The first set has a target burnup of 10 GWd/mtU while the second set has a target burnup of 30 GWd/mtU. At 10 GWd/mtU target burnup and the 8x8 fuel assembly cases with blades-out,  $k_{\infty}$  values increase as the number of gadolinia rods increases. However, the  $k_{\infty}$  value for the 7x7 fuel assembly with no gadolinia rods and blades-out is larger than any of the 8x8 fuel assembly cases. Figures 9, 10, 13, and 14 illustrate the reason for this trend in  $k_{\infty}$  for the blades-out cases. Figure 9 illustrates that the  $^{235}\text{U}$  concentration is largest for the 8x8 assembly with 10 Gd rods (0.4 % larger than the 7x7 assembly). Figure 10 illustrates that the  $^{239}\text{Pu}$  concentration is largest for the 7x7 assembly (8.4 % larger than the 8x8 assembly with 10 Gd rods). Figures 13 and 14 illustrate that the  $^{155}\text{Gd}$  and  $^{157}\text{Gd}$  concentrations are essentially zero and has negligible effect on  $k_{\infty}$ . Thus, the larger  $^{239}\text{Pu}$  concentration for the 7x7 assembly is the dominant contributor towards  $k_{\infty}$ . The relative values of the  $^{235}\text{U}$  and  $^{239}\text{Pu}$  concentrations for the remaining 8x8, blades-out cases is consistent with the relative  $k_{\infty}$  values for these assemblies.



For 10 GWd/mtU target burnup and the blades-in cases the  $k_{\infty}$  value for the 7x7 fuel assembly with no gadolinia rods is larger than any of the 8x8 fuel assembly cases. The harder neutron spectrum associated with a larger number of Gd rods yields the same trend in the concentrations of  $^{235}\text{U}$  and  $^{239}\text{Pu}$  for the blades-in cases (Figures 11 and 12) as is observed for the blades-out cases (Figures 9 and 10). Although the trend in the concentrations of  $^{235}\text{U}$  and  $^{239}\text{Pu}$  is similar, the trend in  $k_{\infty}$  is different. The  $k_{\infty}$  value for the 8 Gd rod case is larger than any of the other 8x8 blades-in cases. The  $^{235}\text{U}$  and  $^{239}\text{Pu}$  concentration values for the 10 Gd rod case are 0.2 % and 2.8 % respectively larger than the values for the 8 Gd rod case. However, the  $^{155}\text{Gd}$  and  $^{157}\text{Gd}$  (Figures 15 and 16) concentration values for the 10 Gd rod case are 2.2 % and 13.5 % respectively larger than the values for the 8 Gd rod case. This larger absorber isotope concentration has a greater negative effect on  $k_{\infty}$  than the positive effect on  $k_{\infty}$  of the larger fissile isotope concentration. However, the  $^{235}\text{U}$  concentration for the 7x7 blades-in case is 0.7 % and 0.9 % respectively lower than the  $^{235}\text{U}$  concentration for the 8 Gd rod and 10 Gd rod, 8x8 blades-in cases. The  $^{239}\text{Pu}$  concentration for the 7x7 blades-in case is 5.1 % and 2.7 % respectively higher than the  $^{239}\text{Pu}$  concentration for the 8 Gd rod and 10 Gd rod, 8x8 blades-in cases. The larger  $^{239}\text{Pu}$  concentration for the 7x7 assembly along with the absence of Gd rods results in the larger  $k_{\infty}$  value for the 7x7 assembly. The results of the same cases for a target burnup of 30 GWd/mtU show that the same conclusions are valid at that burnup value. Figures 17 through 24 show that the behavior of the isotopic concentrations for  $^{235}\text{U}$ ,  $^{239}\text{Pu}$ ,  $^{155}\text{Gd}$  and  $^{157}\text{Gd}$  do not change.

The study of effects of Gadolinia rods presented here and in Reference 7.18 supports the decision of the choice of the 7x7 GE2a fuel assembly with no Gd rods and 15 GWd/mtU control blade insertion at the end of the burnup step.

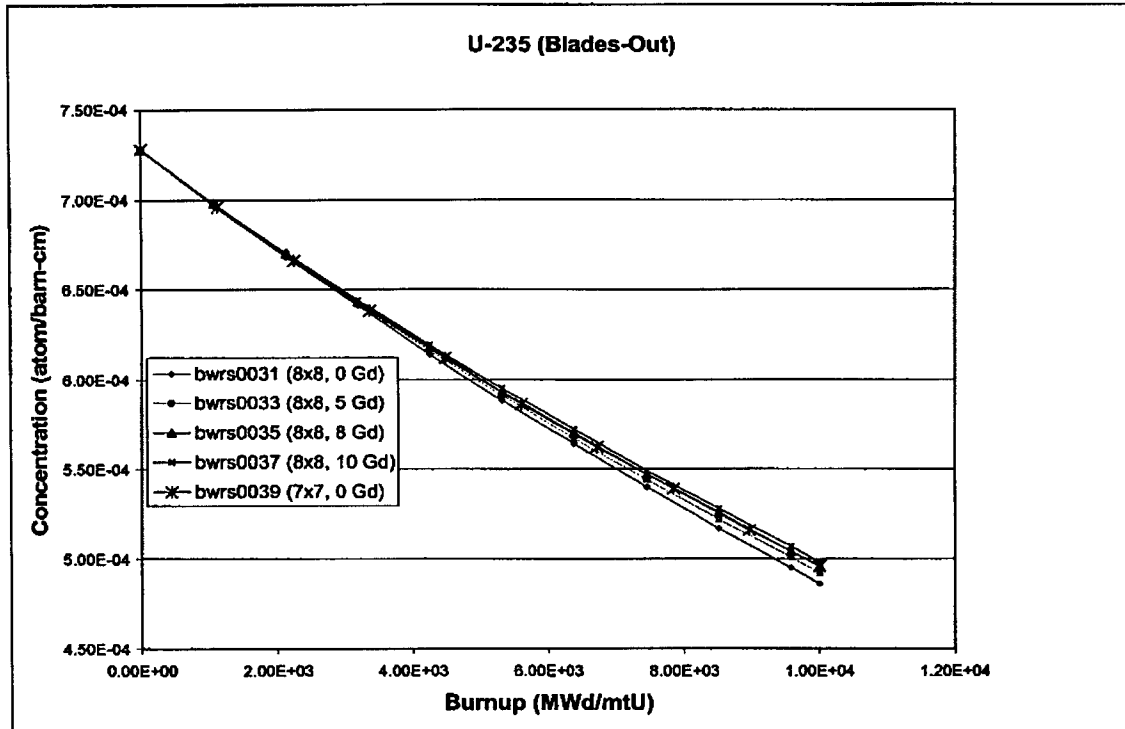


Figure 9. Isotopic Data for <sup>235</sup>U with Varying Number of Gd Rods/Blades-Out (10 GWd/mtU)

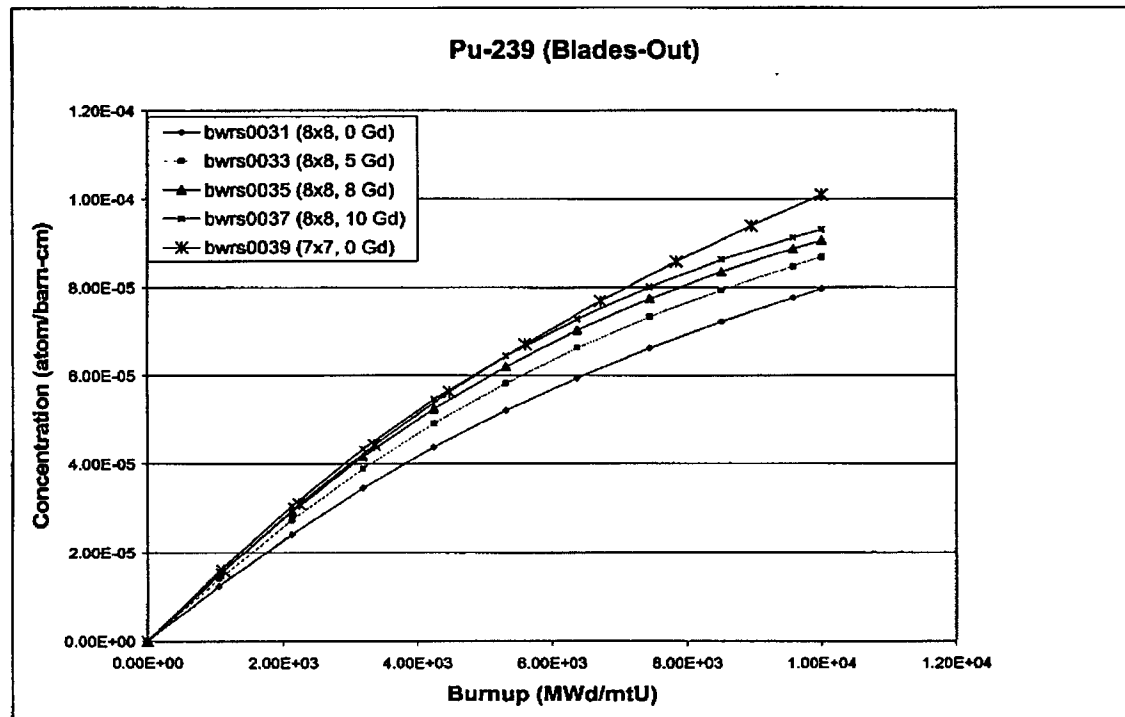


Figure 10. Isotopic Data for <sup>239</sup>Pu with Varying Number of Gd Rods/Blades-Out (10 GWd/mtU)

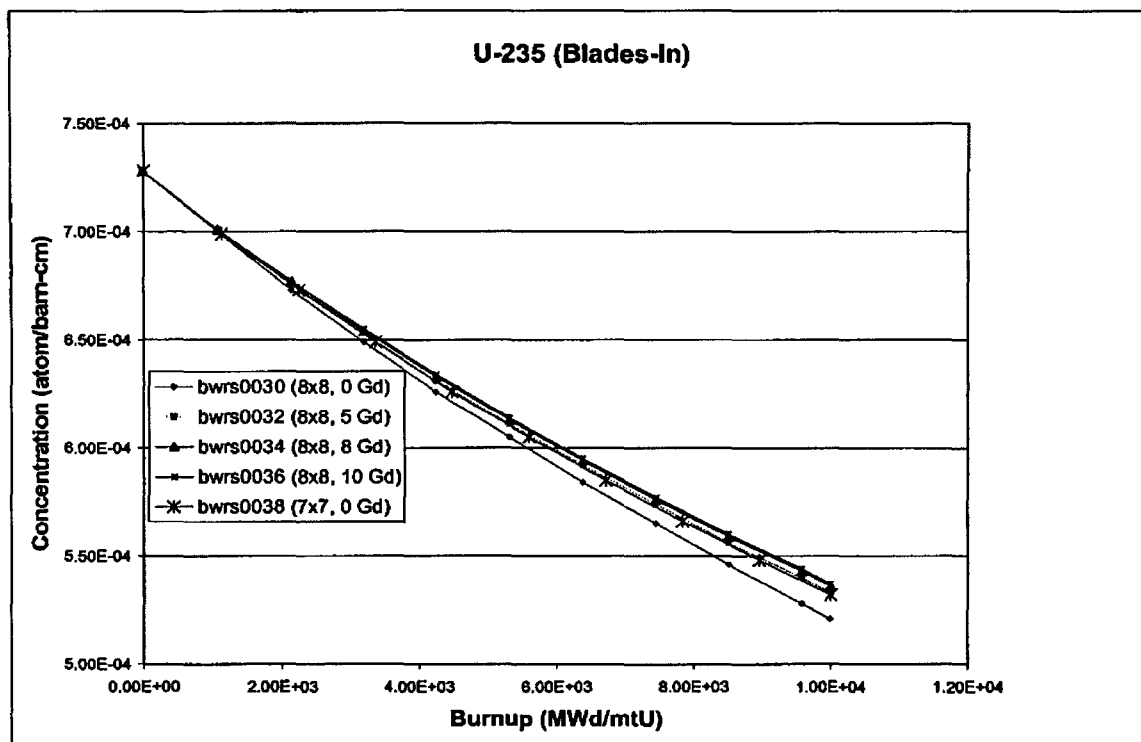


Figure 11. Isotopic Data for <sup>235</sup>U with Varying Number of Gd Rods/Blades-In (10 GWd/mtU)

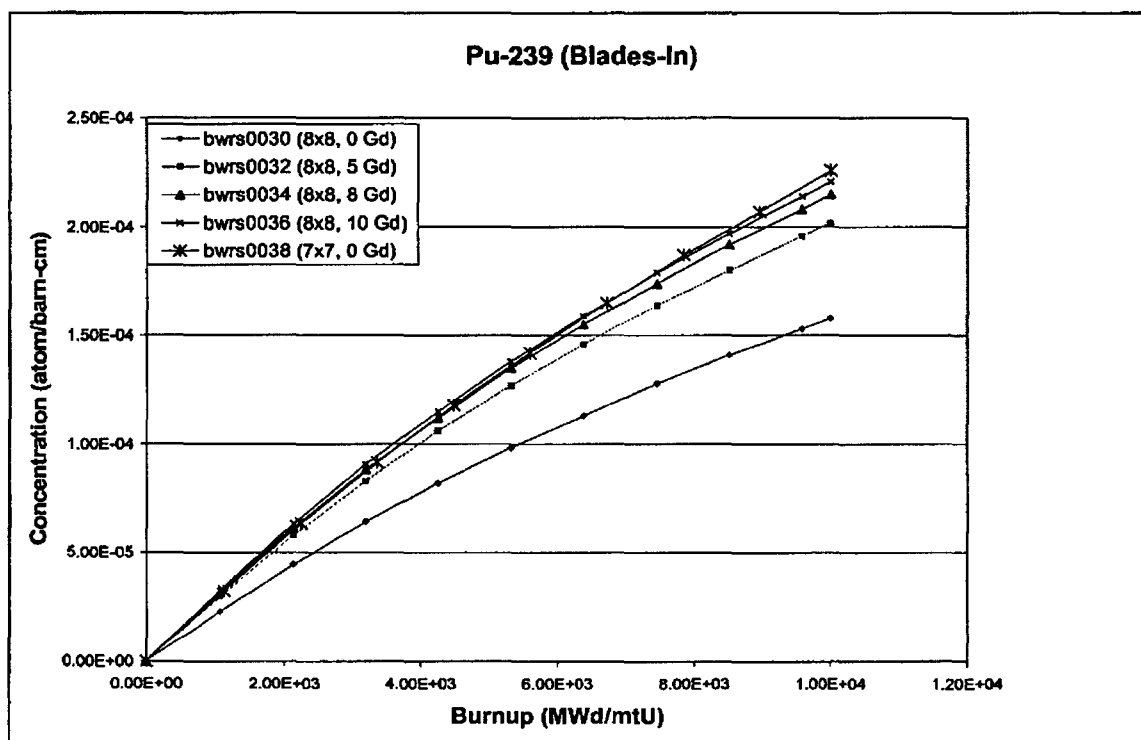


Figure 12. Isotopic Data for <sup>239</sup>Pu with Varying Number of Gd Rods/Blades-In (10 GWd/mtU)

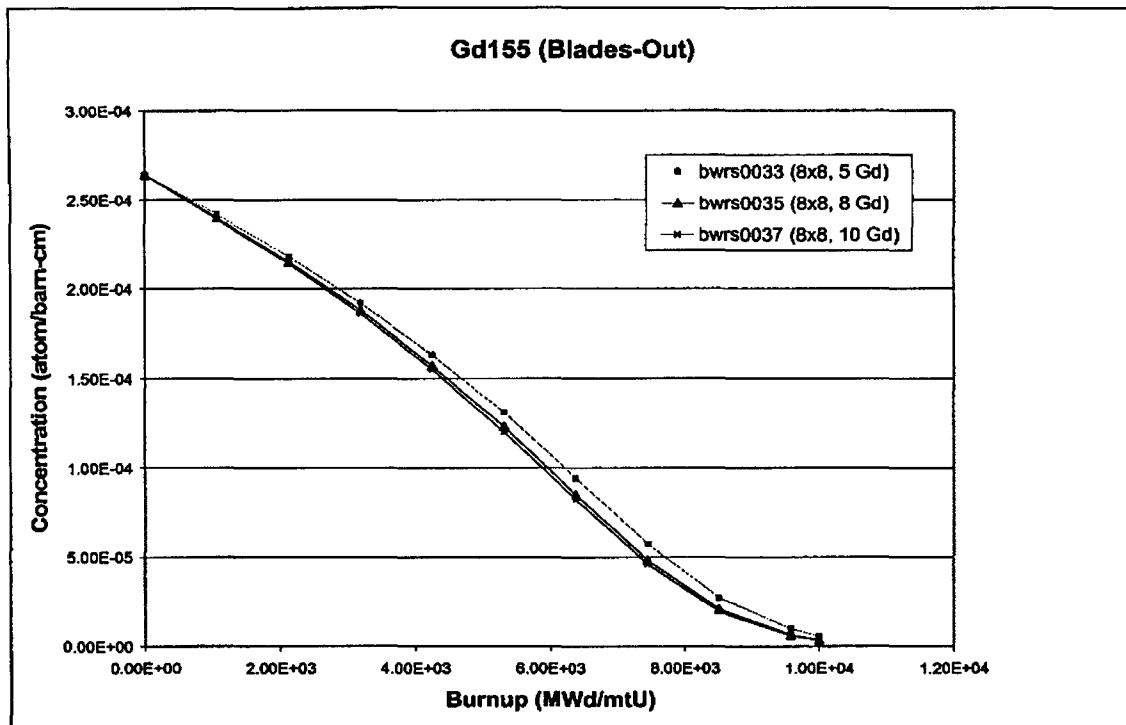


Figure 13. Isotopic Data for <sup>155</sup>Gd with Varying Number of Gd Rods/Blades-Out (10 GWd/mtU)

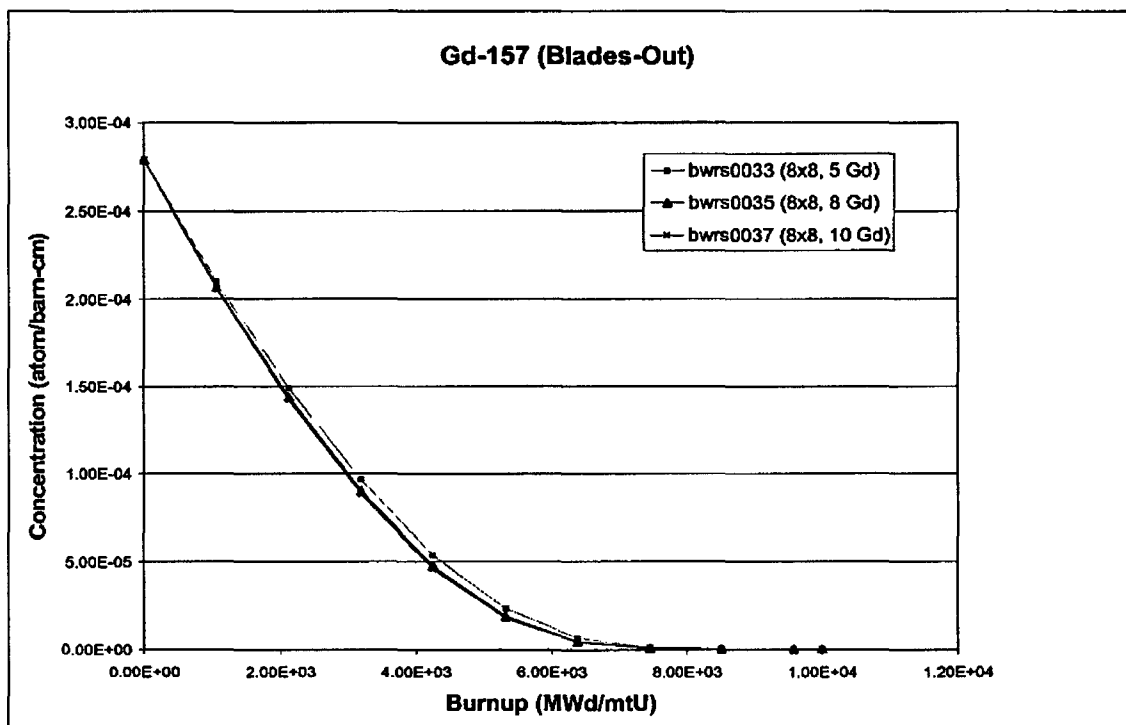


Figure 14. Isotopic Data for <sup>157</sup>Gd with Varying Number of Gd Rods/Blades-Out (10 GWd/mtU)

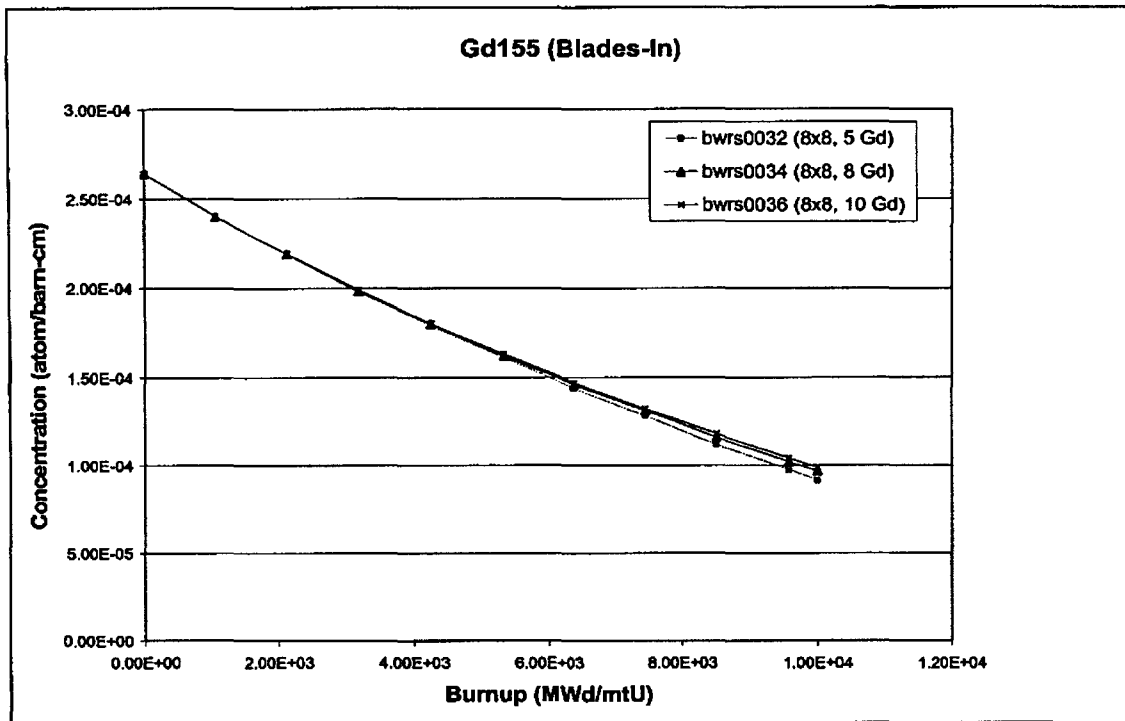


Figure 15. Isotopic Data for <sup>155</sup>Gd with Varying Number of Gd Rods/Blades-In (10 GWd/mtU)

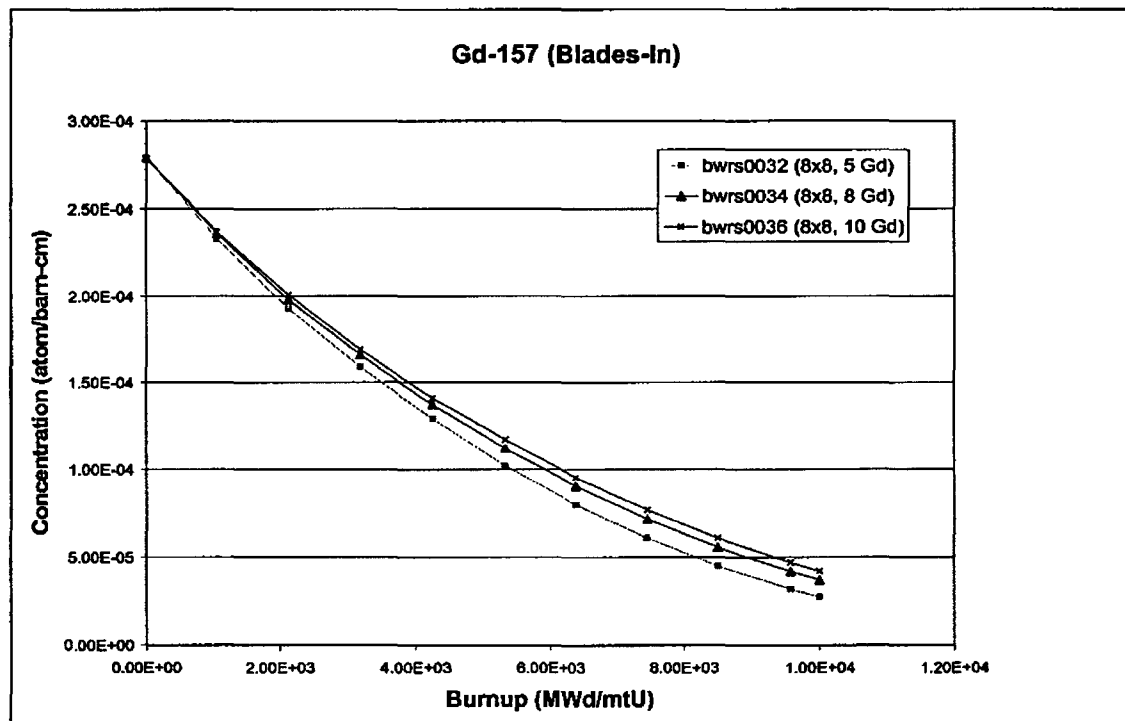


Figure 16. Isotopic Data for <sup>157</sup>Gd with Varying Number of Gd Rods/Blades-In (10 GWd/mtU)

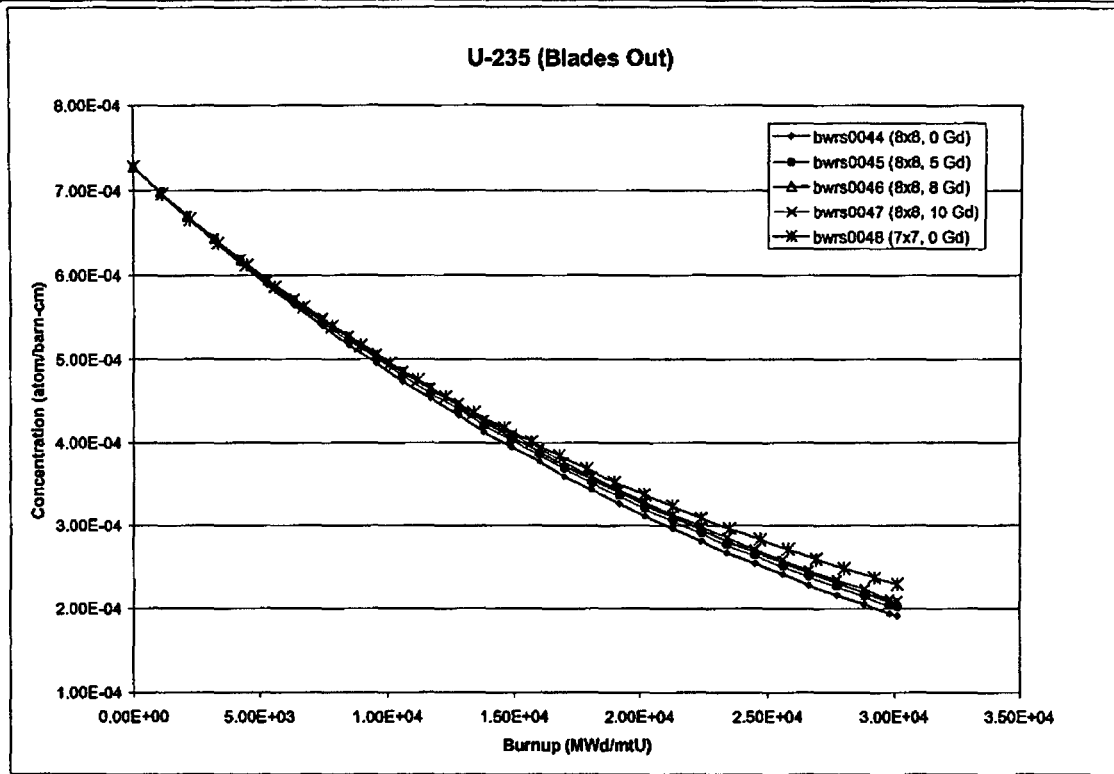


Figure 17. Isotopic Data for <sup>235</sup>U with Varying Number of Gd Rods/Blades-Out (30 GwD/mtU)

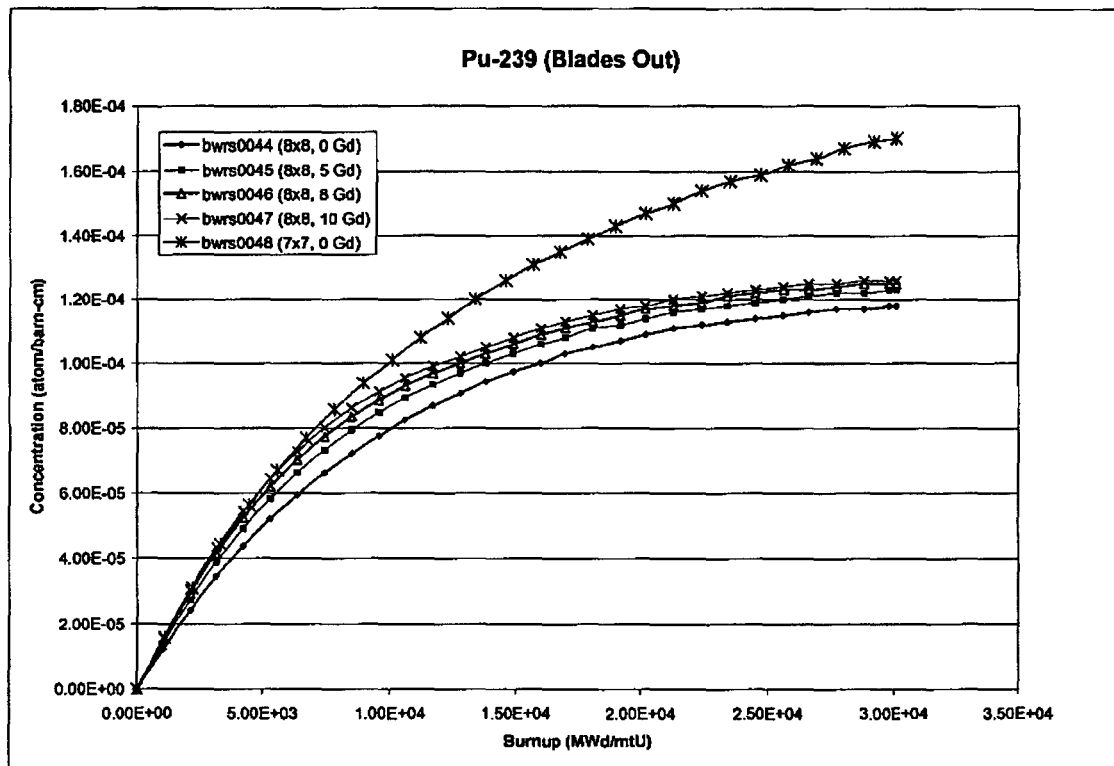


Figure 18. Isotopic Data for <sup>239</sup>Pu with Varying Number of Gd Rods/Blades-Out (30 GwD/mtU)

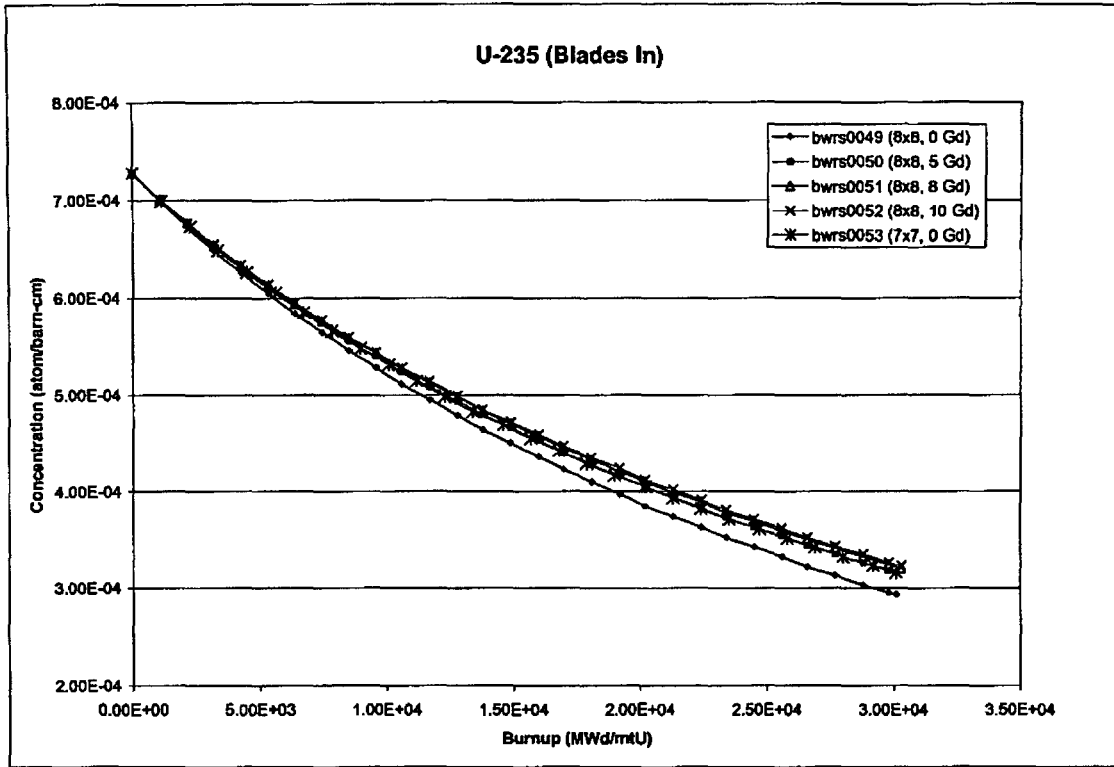


Figure 19. Isotopic Data for <sup>235</sup>U with Varying Number of Gd Rods/Blades-In (30 GWd/mtU)

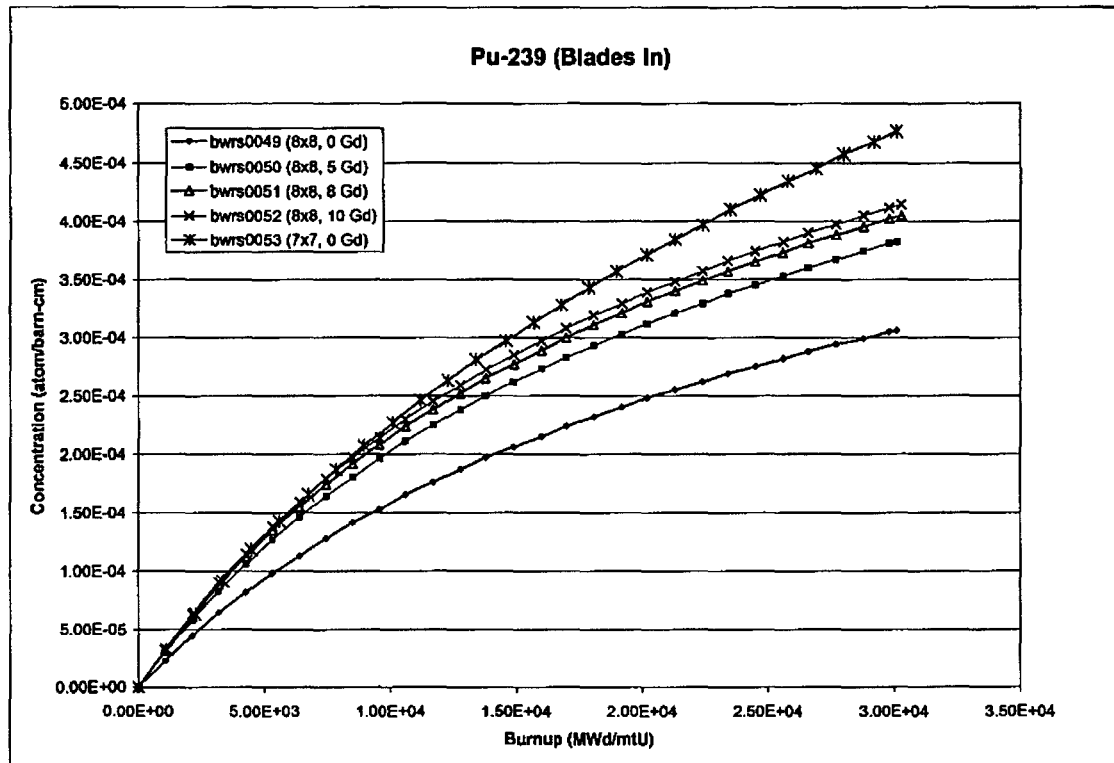


Figure 20. Isotopic Data for <sup>239</sup>Pu with Varying Number of Gd Rods/Blades-In (30 GWd/mtU)

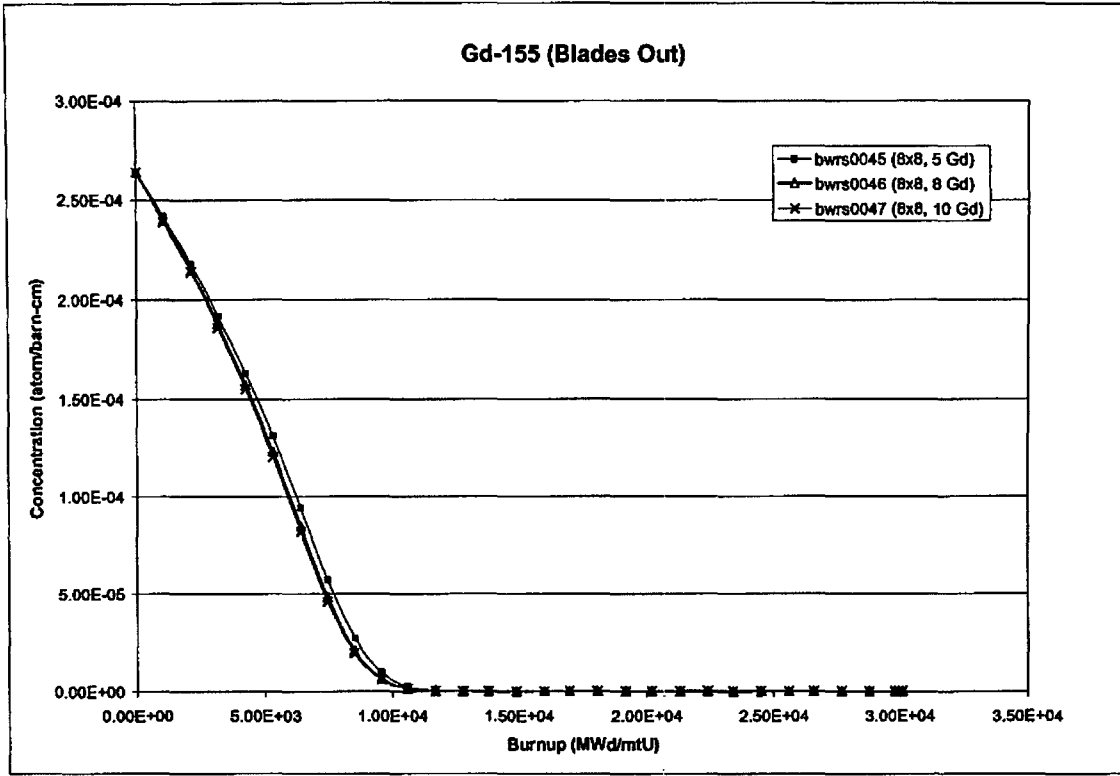


Figure 21. Isotopic Data for <sup>155</sup>Gd with Varying Number of Gd Rods/Blades-Out (30 GWd/mtU)

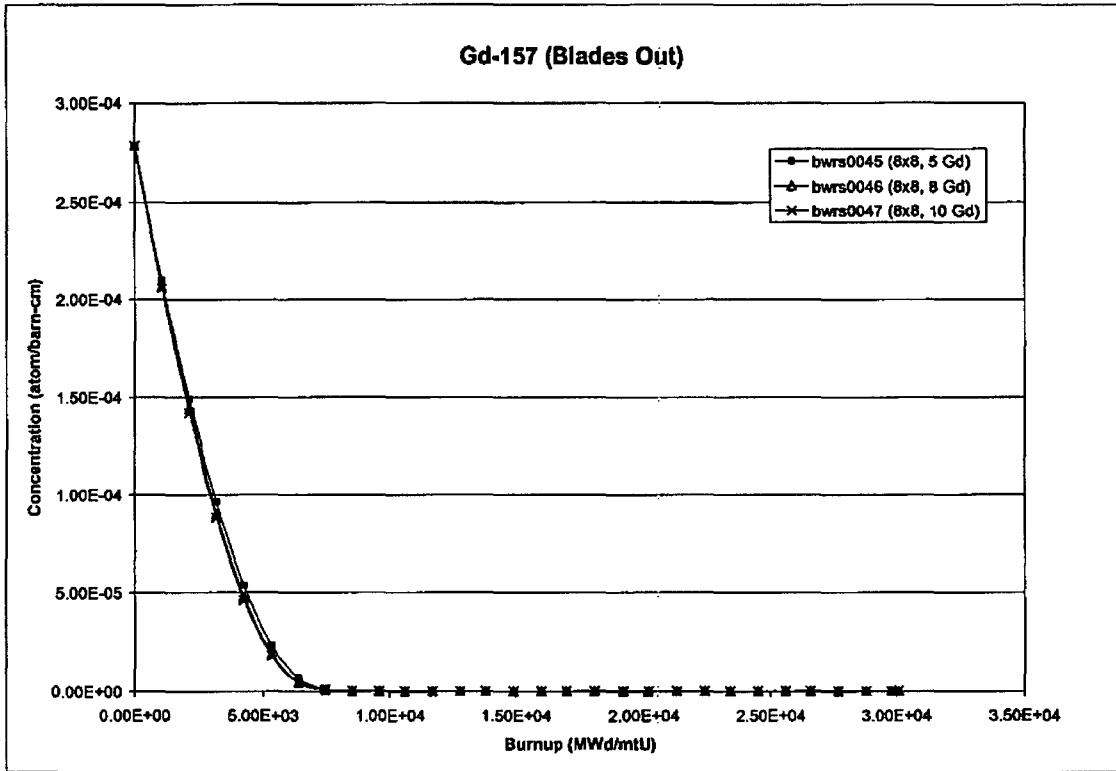


Figure 22. Isotopic Data for <sup>157</sup>Gd with Varying Number of Gd Rods/Blades-Out (30 GWd/mtU)



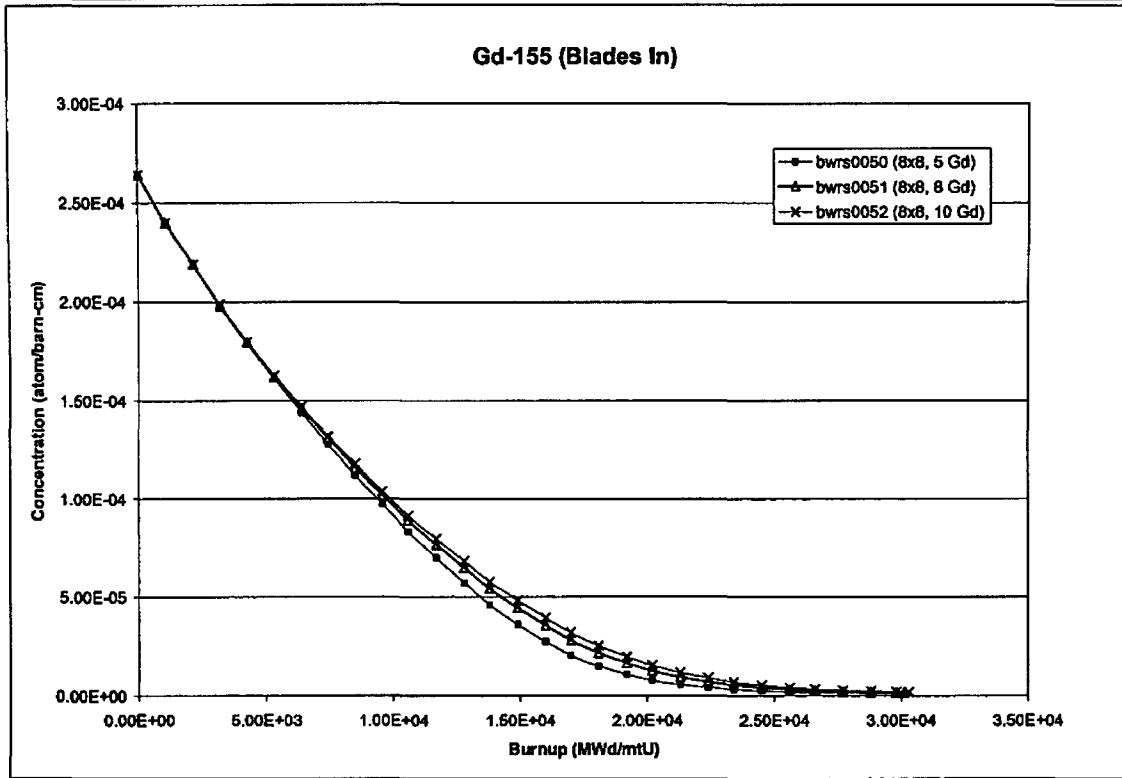


Figure 23. Isotopic Data for <sup>155</sup>Gd with Varying Number of Gd Rods/Blades-In (30 GWd/mtU)

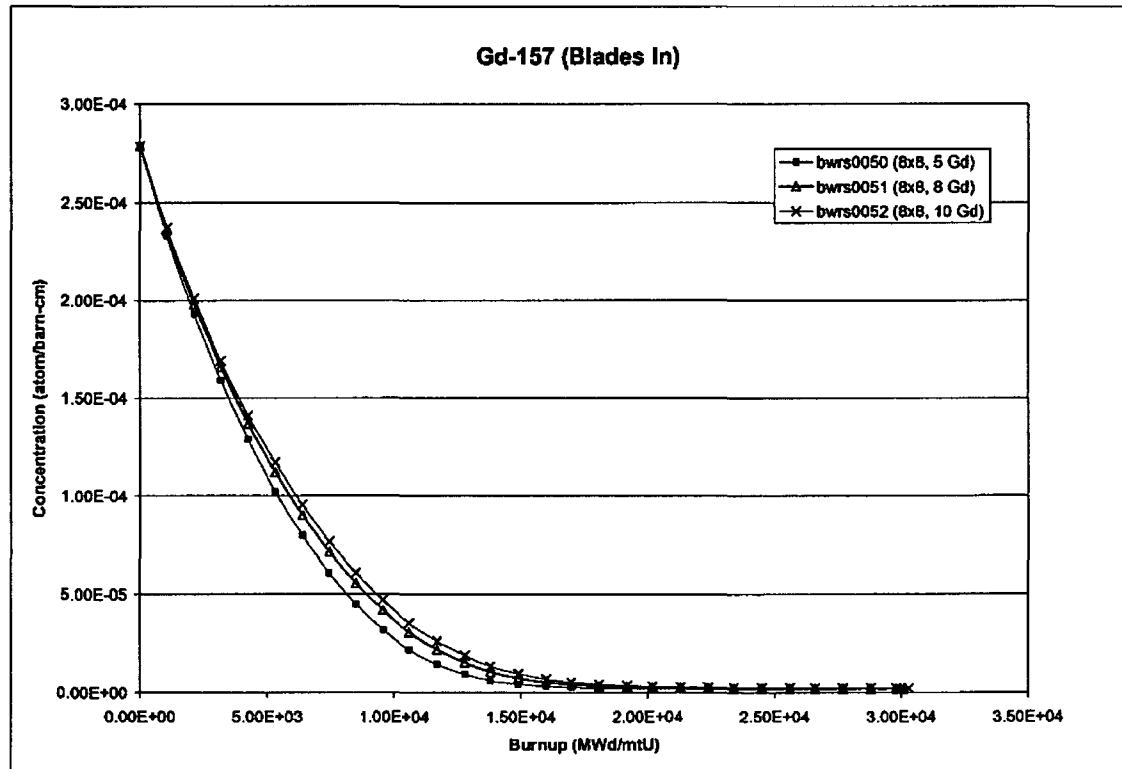


Figure 24. Isotopic Data for <sup>157</sup>Gd with Varying Number of Gd Rods/Blades-In (30 GWd/mtU)

Variation of  $^{103}\text{Rh}$ ,  $^{143}\text{Nd}$  and  $^{149}\text{Sm}$  for Selected Blades-In and Blades-Out Cases

The variation of fission product neutron absorbers such as  $^{103}\text{Rh}$ ,  $^{143}\text{Nd}$ ,  $^{149}\text{Sm}$  is of interest because changes in reactivity observed in Table 13 would be affected if the fission product absorbers were removed. This is more of interest for  $^{149}\text{Sm}$  due to the long half life of this isotope compared to the others. Figures 25, 26 and 27 show the change of isotopic concentration for selected Blades-In and Blades-Out Cases. The graphs show that for  $^{103}\text{Rh}$  and  $^{143}\text{Nd}$  there is practically no difference in isotopic concentration between the 7x7 and 8x8 assembly. Isotopic concentration of  $^{149}\text{Sm}$  is higher for the 7x7 assembly with Blades-In. For the 5 year decay cases considered here, the depletion is conservative. Despite the high  $^{149}\text{Sm}$  concentration, the 7x7 assembly with the blade inserted results in the highest  $k_{\text{eff}}$ . If the  $^{149}\text{Sm}$  is removed through the degradation process the resulting  $k_{\text{eff}}$  would still be conservative due to the higher worth of  $^{149}\text{Sm}$  in the calculations.

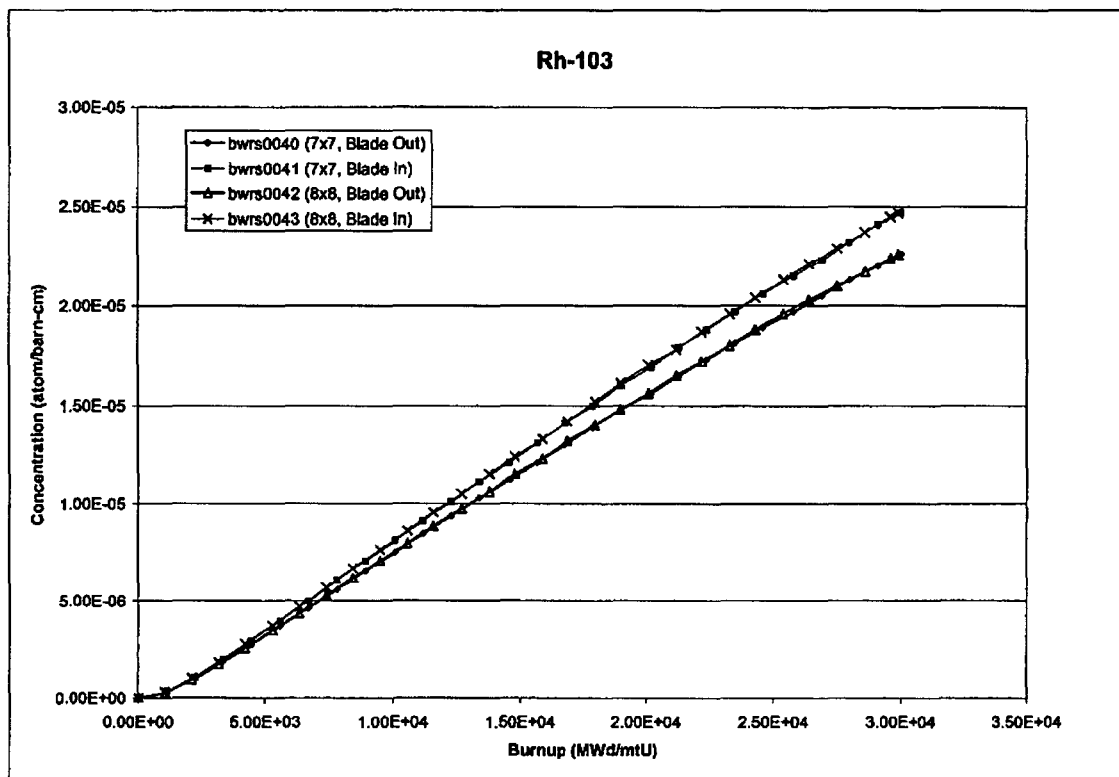


Figure 25. Isotopic Concentrations for  $^{103}\text{Rh}$  for Selected Blades-In and Blades-Out Cases

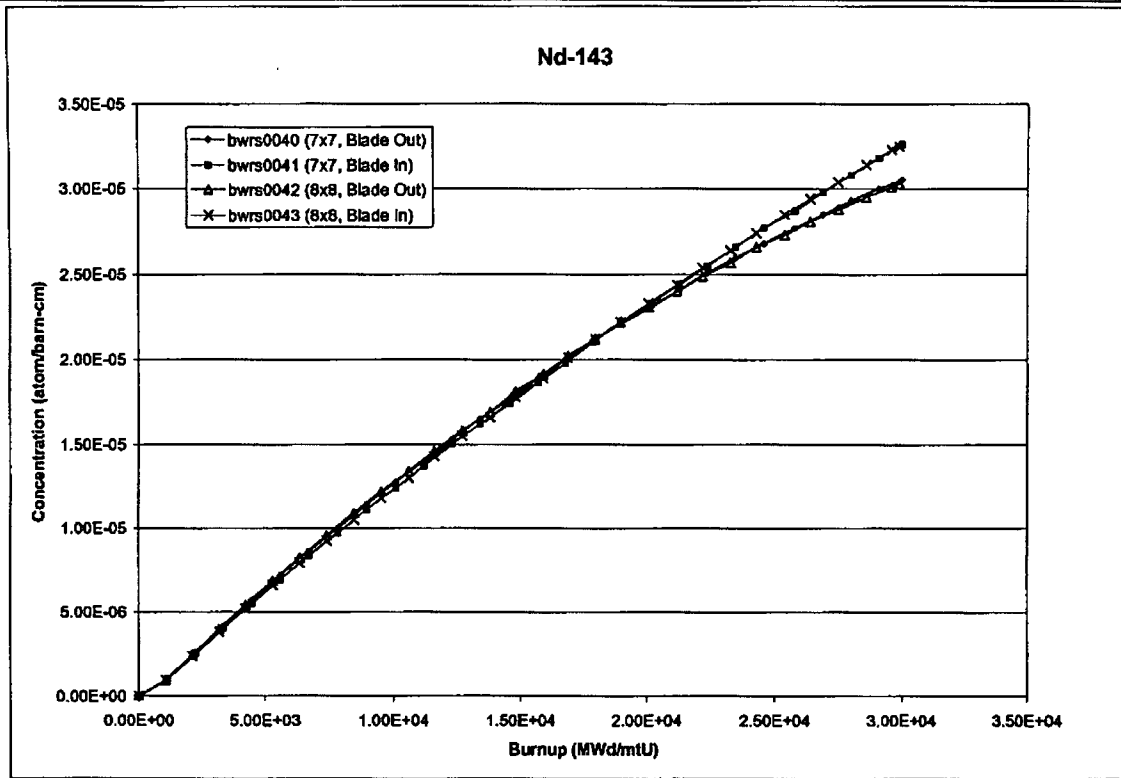


Figure 26. Isotopic Concentrations for <sup>143</sup>Nd for Selected Blades-In and Blades-Out Cases

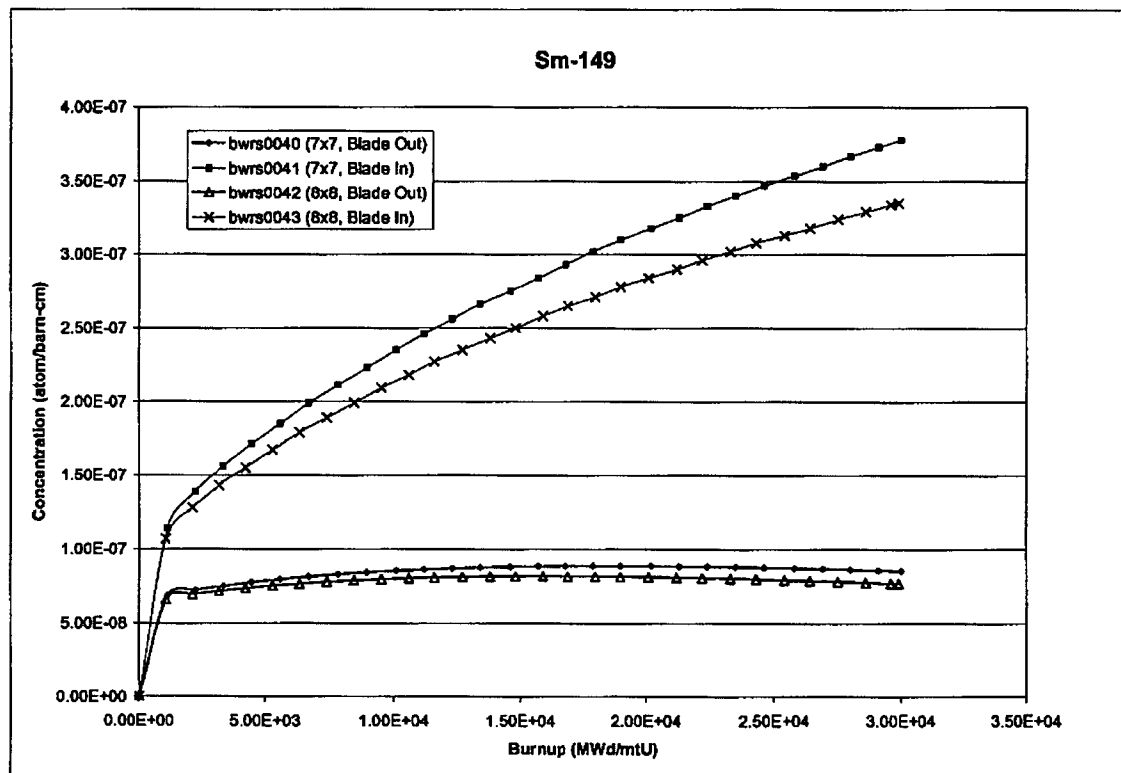


Figure 27. Isotopic Concentrations for <sup>149</sup>Sm for Selected Blades-In and Blades-Out Cases

Isotopic Concentrations for <sup>103</sup>Rh, <sup>143</sup>Nd, and <sup>149</sup>Sm with Varying Number of Gd Rods/Blades-Out

The isotopic concentrations presented in Figure 28 and Figure 29 for the Blades-Out cases with varying Gd rods show that the variation of <sup>103</sup>Rh and <sup>143</sup>Nd is negligible. The concentration of <sup>149</sup>Sm, shown in Figure 30, changes with different number of Gd rods. While Gd is present (up to approximately 10 GWd/mtU burnup) the <sup>149</sup>Sm competes with the Gd isotopes for the thermal neutrons present and builds up at a fast rate. After 10 GWd/mtU burnup the <sup>149</sup>Sm reaches an equilibrium value (production of <sup>149</sup>Sm equal to absorption of neutrons by <sup>149</sup>Sm) for all 8x8 assembly cases. The isotopic concentration of <sup>149</sup>Sm for the 7x7 no-Gd case is the highest of all after 10 GWd/mtU. Since the 7x7 no Gd case has also the highest reactivity, despite the higher <sup>149</sup>Sm concentration, the 7x7 no-Gd case is the conservative model for the isotopic database.

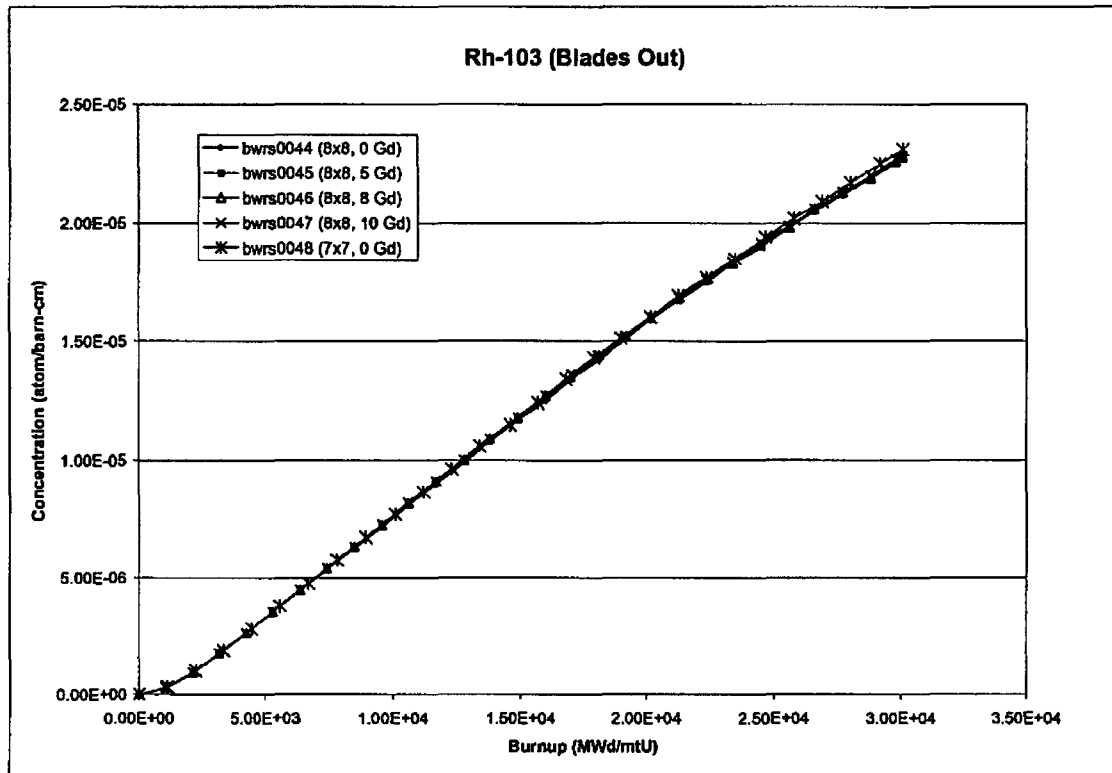


Figure 28. Isotopic Concentrations for <sup>103</sup>Rh with Varying Number of Gd Rods/Blades-Out

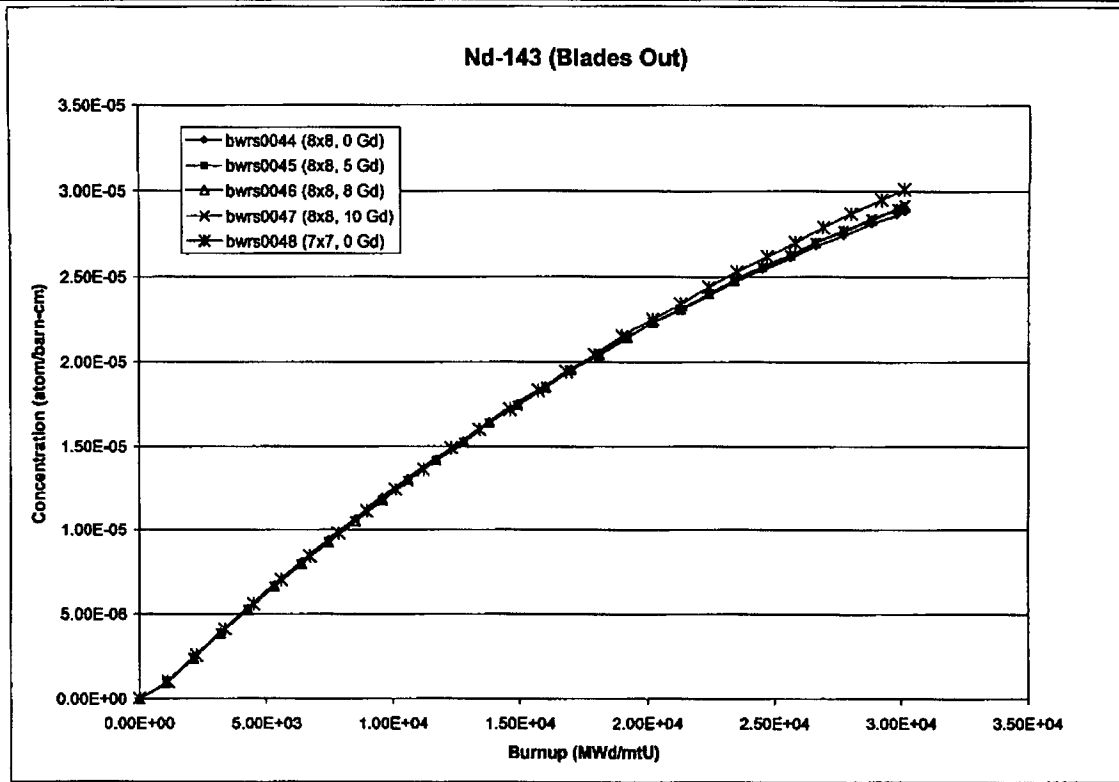


Figure 29. Isotopic Concentrations for <sup>143</sup>Nd with Varying Number of Gd Rods/Blades-Out

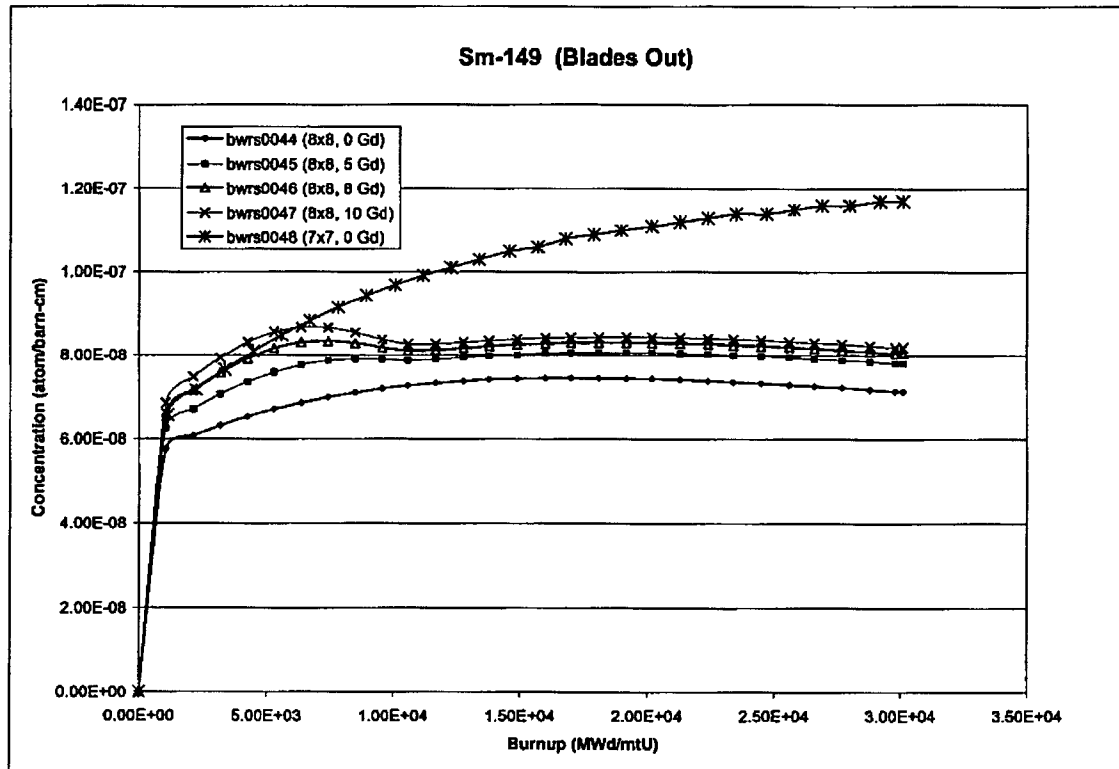


Figure 30. Isotopic Concentrations for <sup>149</sup>Sm with Varying Number of Gd Rods/Blades-Out

Isotopic Concentrations for  $^{103}\text{Rh}$ ,  $^{143}\text{Nd}$ , and  $^{149}\text{Sm}$  with Varying Number of Gd Rods/Blades-In

The isotopic concentrations presented in Figure 31 and Figure 32 for the Blades-In cases with varying Gd rods show that the variation of  $^{103}\text{Rh}$  and  $^{143}\text{Nd}$  is negligible. The concentration of  $^{149}\text{Sm}$ , shown in Figure 33, changes with different number of Gd rods. While Gd is present (up to approximately 15 GWd/mtU burnup) the  $^{149}\text{Sm}$  competes with the Gd isotopes for the thermal neutrons present and builds up at a fast rate, but after 15 GWd/mtU burnup the  $^{149}\text{Sm}$  builds up at a slower rate for all 8x8 assembly cases. The isotopic concentration of  $^{149}\text{Sm}$  for the 7x7 no Gd case is the highest of all cases after 15 GWd/mtU despite the high  $^{149}\text{Sm}$  concentration. This supports the selection of 7x7 no-Gd, blades-in configuration as the Isotopic database model .

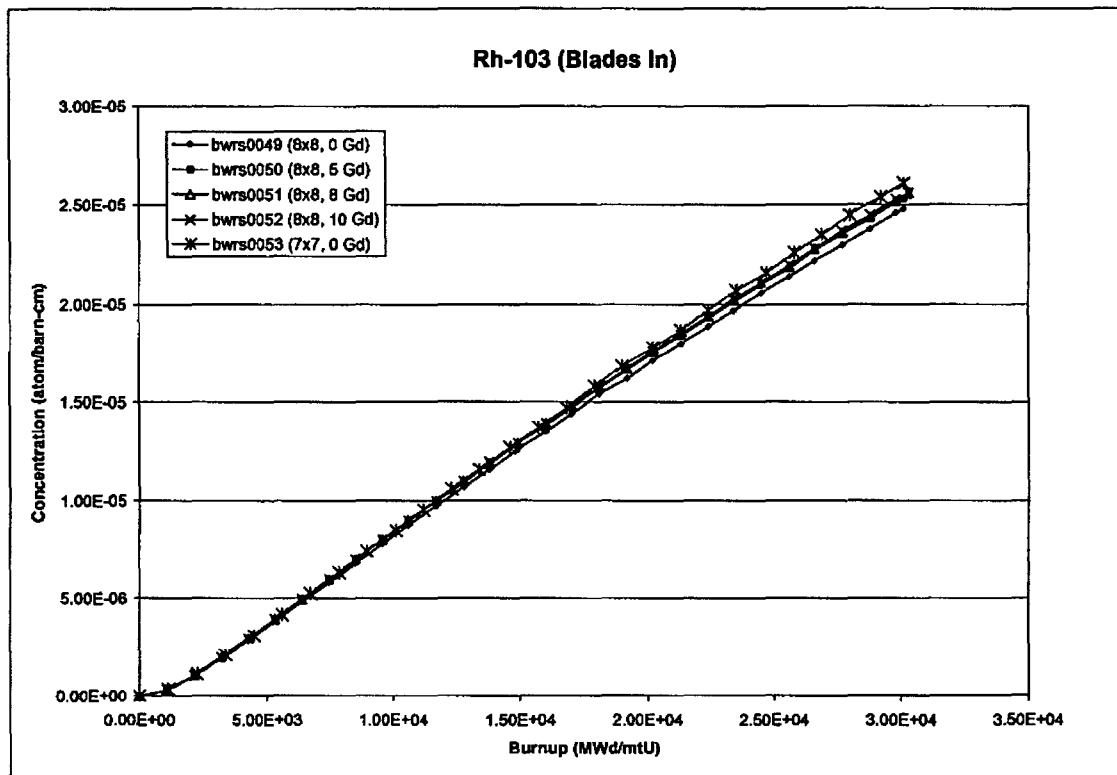


Figure 31. Isotopic Concentrations for  $^{103}\text{Rh}$  with Varying Number of Gd Rods/Blades-In

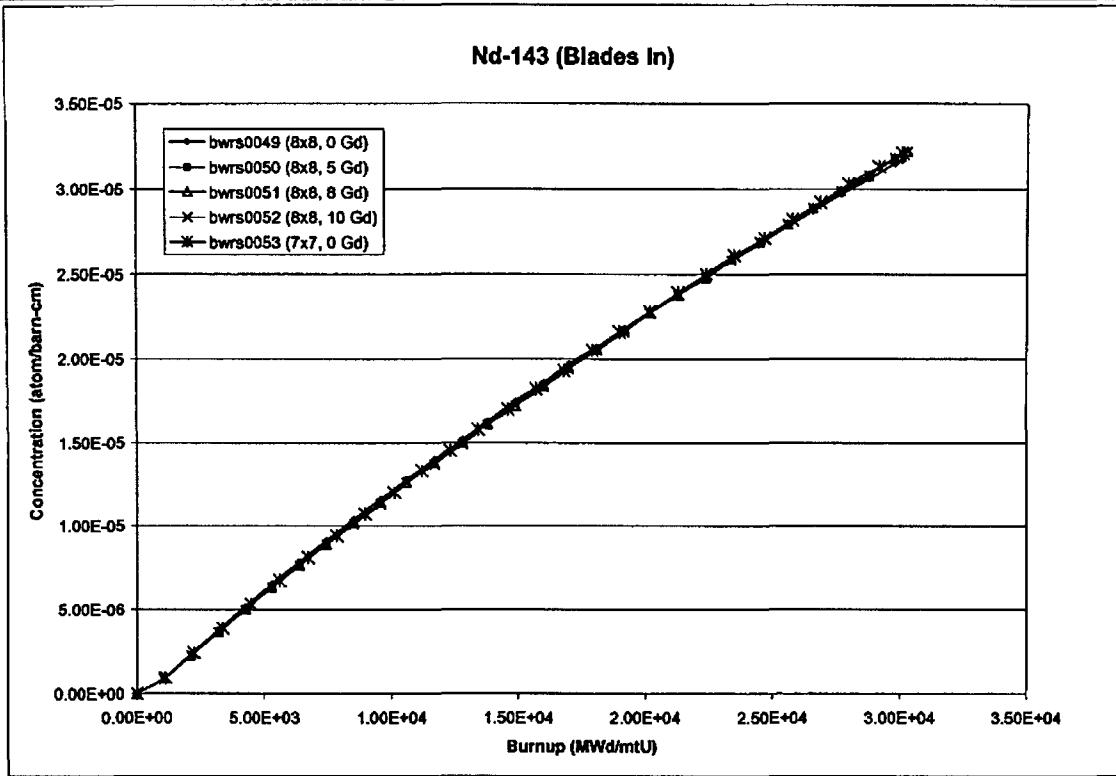


Figure 32. Isotopic Concentrations for <sup>143</sup>Nd with Varying Number of Gd Rods/Blades-In

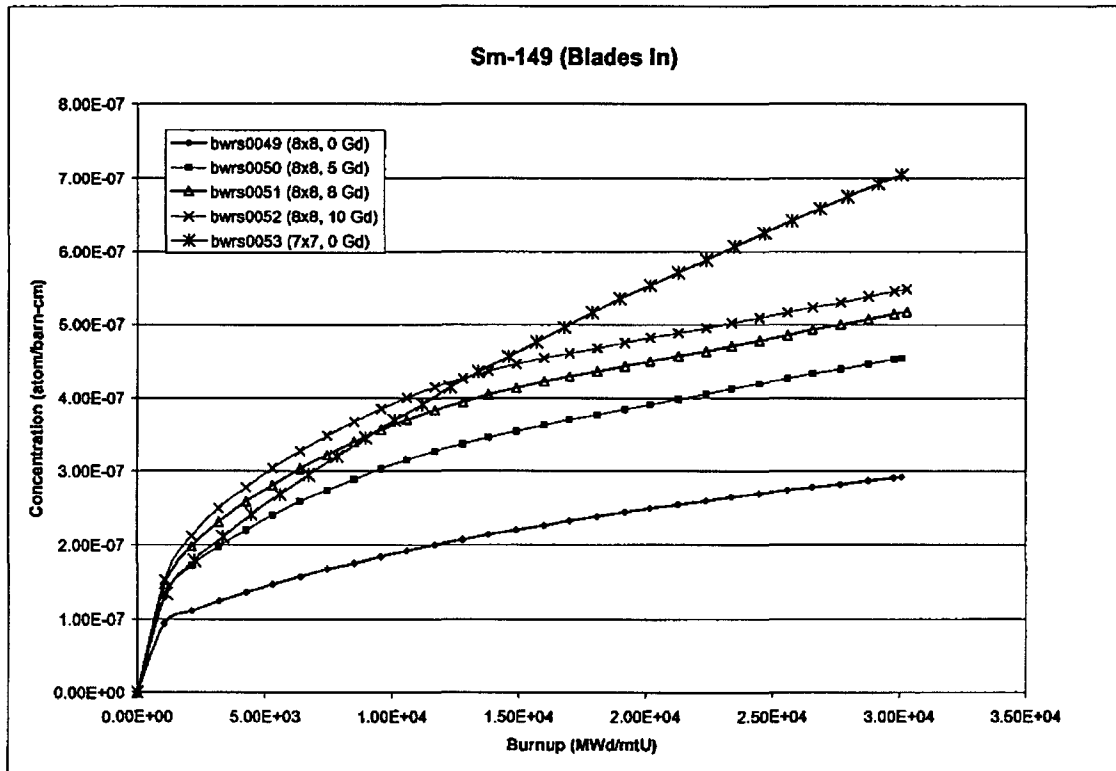


Figure 33. Isotopic Concentrations for <sup>149</sup>Sm with Varying Number of Gd Rods/Blades-In

Effects of different Channel (can) Areas

The control blades and channel data for the isotopic database is taken from Grand Gulf Unit 1 (Reference 7.6, p 2-5). The Grand Gulf data is for both 8x8 and a 9x9 assembly types. Channel data from a 7x7 fuel assembly (Reference 7.16) is evaluated in this section relative to the 8x8 data. The SAS2H depletion calculations are performed for the following conditions:

8x8 channel, ID = 13.246 cm, OD = 13.856 cm, area = 16.53 cm<sup>2</sup>, Reference 7.6, p 2-5

7x7 channel, ID = 13.406 cm, OD = 13.812 cm, area = 11.05 cm<sup>2</sup>, Reference 7.16, p 8

Results are based on 8x8, wt% <sup>235</sup>U = 3.5, Fuel temp = 1400 °K, Mod Density = 0.431 g/cm<sup>3</sup>, Burnup 50 GWd/mtU, Decay = 1825 d.

The results of this study are presented in Table 16.

Table 16. Channel Dimensional Effects

File ID SAS2H / MCNP	Channel Cross-sectional area (cm <sup>2</sup> )	Gd Rods	Blade Position	k <sub>∞</sub> MCNP	σ
bwrs0004/bwrm0004	16.53	10 (6 wt %)	Out	0.8723	0.0008
bwrs0007/bwrm0007	11.05	10 (6 wt %)	Out	0.8516	0.0007

The results indicate that the larger channel cross-sectional area (channel material displacing moderator) used for the isotopic database produces a higher k<sub>∞</sub> value and is therefore conservative.

Effects of Water Rods in Assembly

The SAS2H, Path B model for the isotopic database contained no water rods. Two SAS2H depletion calculations were performed to study the effect of water rods. The SAS2H depletion calculations are performed for the following conditions:

8x8 GG1 assembly, wt% <sup>235</sup>U = 3.5, Fuel temp = 1400 °K, Mod Density = 0.43 g/cm<sup>3</sup>, Burnup 50 GWd/mtU, Decay = 1825 d.

The results of this study are presented in Table 17.

Table 17. Effects of Water Rods

File ID SAS2H / MCNP	Number of Fuel Rods	Number of Water Rods	Gd Rods	Blade Position	k <sub>∞</sub> MCNP	σ
bwrs0006/bwrm0006	60	1=(4 fuel rod)	none	Out	0.8466	0.0007
bwrs0010/bwrm0010	64	0	none	Out	0.8872	0.0007

The results indicate that omitting the water rods produces a higher k<sub>∞</sub> value and is therefore conservative. This result is anticipated because the non-water rod case has more fuel, a harder neutron spectrum, and a higher fissile isotope content.



## 6. RESULTS

### 6.1 SAS2H RESULTS, 5 YEAR DECAY

The resulting isotopics calculated by SAS2H are presented in Tables 18 through 26 (5 year decay). Each table is based on a single enrichment and includes all selected burnup steps from 0.001 to 75 GWd/mtU. The outputs (isotopic concentrations) are reasonable when compared to the inputs and outputs and are suitable for the intended use. Confirmation is provided in Section 6.3 of this report.

Table 18. BWR Isotopics as a Function of 1.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.55E-09	3.59E-06	6.96E-06	1.02E-05	1.32E-05	1.62E-05	1.91E-05
<sup>99</sup> Tc	430990	1.53E-09	3.76E-06	7.37E-06	1.09E-05	1.42E-05	1.75E-05	2.07E-05
<sup>101</sup> Ru	441010	1.34E-09	3.32E-06	6.66E-06	9.96E-06	1.32E-05	1.65E-05	1.97E-05
<sup>103</sup> Rh	451030	9.92E-10	2.68E-06	5.51E-06	8.30E-06	1.10E-05	1.36E-05	1.61E-05
<sup>109</sup> Ag	471090	2.54E-11	2.42E-07	6.51E-07	1.12E-06	1.62E-06	2.13E-06	2.65E-06
<sup>143</sup> Nd	601430	1.40E-09	3.20E-06	6.11E-06	8.86E-06	1.15E-05	1.40E-05	1.65E-05
<sup>145</sup> Nd	601450	9.81E-10	2.23E-06	4.28E-06	6.21E-06	8.05E-06	9.82E-06	1.15E-05
<sup>147</sup> Sm	621470	4.42E-10	9.24E-07	1.65E-06	2.26E-06	2.79E-06	3.25E-06	3.67E-06
<sup>149</sup> Sm	621490	3.02E-10	1.46E-07	2.12E-07	2.71E-07	3.25E-07	3.77E-07	4.25E-07
<sup>150</sup> Sm	621500	8.79E-15	6.62E-07	1.51E-06	2.42E-06	3.35E-06	4.28E-06	5.20E-06
<sup>151</sup> Sm	621510	1.25E-10	2.27E-07	3.94E-07	5.44E-07	6.87E-07	8.27E-07	9.64E-07
<sup>152</sup> Sm	621520	8.30E-11	3.21E-07	7.03E-07	1.08E-06	1.43E-06	1.76E-06	2.08E-06
<sup>151</sup> Eu	631510	4.91E-12	9.08E-09	1.60E-08	2.23E-08	2.83E-08	3.42E-08	4.01E-08
<sup>153</sup> Eu	631530	5.98E-11	1.89E-07	4.62E-07	7.91E-07	1.15E-06	1.53E-06	1.92E-06
<sup>155</sup> Gd	641550	7.85E-12	9.94E-09	1.76E-08	2.69E-08	3.84E-08	5.23E-08	6.83E-08
<sup>233</sup> U	922330	5.02E-15	1.11E-11	1.99E-11	2.72E-11	3.32E-11	3.83E-11	4.27E-11
<sup>234</sup> U	922340	2.92E-06	2.65E-06	2.43E-06	2.26E-06	2.11E-06	1.98E-06	1.88E-06
<sup>235</sup> U	922350	3.64E-04	3.17E-04	2.84E-04	2.57E-04	2.35E-04	2.15E-04	1.98E-04
<sup>236</sup> U	922360	1.67E-06	1.27E-05	2.05E-05	2.67E-05	3.16E-05	3.57E-05	3.91E-05
<sup>238</sup> U	922380	2.36E-02	2.35E-02	2.33E-02	2.32E-02	2.31E-02	2.30E-02	2.29E-02
<sup>237</sup> Np	932370	2.84E-10	9.24E-07	2.08E-06	3.32E-06	4.59E-06	5.86E-06	7.10E-06
<sup>238</sup> Pu	942380	1.33E-17	4.54E-08	1.99E-07	4.62E-07	8.30E-07	1.30E-06	1.86E-06
<sup>239</sup> Pu	942390	4.80E-08	9.35E-05	1.61E-04	2.15E-04	2.62E-04	3.04E-04	3.41E-04
<sup>240</sup> Pu	942400	6.76E-13	5.14E-06	1.29E-05	2.12E-05	2.96E-05	3.79E-05	4.62E-05
<sup>241</sup> Pu	942410	8.54E-18	1.16E-06	4.45E-06	8.65E-06	1.32E-05	1.78E-05	2.23E-05
<sup>242</sup> Pu	942420	9.23E-23	3.66E-08	2.52E-07	6.74E-07	1.27E-06	2.00E-06	2.84E-06
<sup>241</sup> Am	952410	2.32E-18	3.23E-07	1.26E-06	2.50E-06	3.89E-06	5.35E-06	6.85E-06
<sup>242m</sup> Am	952421	4.19E-29	5.23E-11	6.90E-10	2.65E-09	6.40E-09	1.22E-08	2.00E-08
<sup>243</sup> Am	952430	1.02E-27	1.40E-09	1.95E-08	7.74E-08	1.90E-07	3.64E-07	6.00E-07

Table 18. BWR Isotopes as a Function of 1.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.72E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.22E-05	2.50E-05	3.05E-05	3.57E-05	4.06E-05	4.52E-05	4.98E-05
<sup>99</sup> Tc	430990	2.38E-05	2.68E-05	3.25E-05	3.81E-05	4.33E-05	4.83E-05	5.31E-05
<sup>101</sup> Ru	441010	2.28E-05	2.58E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.52E-05
<sup>103</sup> Rh	451030	1.81E-05	2.00E-05	2.36E-05	2.70E-05	3.00E-05	3.27E-05	3.51E-05
<sup>109</sup> Ag	471090	3.04E-06	3.47E-06	4.40E-06	5.37E-06	6.34E-06	7.30E-06	8.25E-06
<sup>143</sup> Nd	601430	1.89E-05	2.12E-05	2.50E-05	2.84E-05	3.12E-05	3.38E-05	3.60E-05
<sup>145</sup> Nd	601450	1.32E-05	1.49E-05	1.79E-05	2.08E-05	2.34E-05	2.59E-05	2.83E-05
<sup>147</sup> Sm	621470	3.98E-06	4.28E-06	4.79E-06	5.23E-06	5.59E-06	5.91E-06	6.18E-06
<sup>149</sup> Sm	621490	4.47E-07	4.67E-07	5.01E-07	5.31E-07	5.57E-07	5.81E-07	6.04E-07
<sup>150</sup> Sm	621500	6.14E-06	7.06E-06	8.80E-06	1.05E-05	1.20E-05	1.35E-05	1.49E-05
<sup>151</sup> Sm	621510	1.06E-06	1.16E-06	1.34E-06	1.52E-06	1.68E-06	1.83E-06	1.98E-06
<sup>152</sup> Sm	621520	2.34E-06	2.59E-06	3.05E-06	3.49E-06	3.89E-06	4.26E-06	4.62E-06
<sup>151</sup> Eu	631510	4.43E-08	4.84E-08	5.62E-08	6.36E-08	7.06E-08	7.73E-08	8.36E-08
<sup>153</sup> Eu	631530	2.29E-06	2.67E-06	3.44E-06	4.18E-06	4.88E-06	5.53E-06	6.14E-06
<sup>155</sup> Gd	641550	8.53E-08	1.05E-07	1.48E-07	1.95E-07	2.44E-07	2.93E-07	3.42E-07
<sup>233</sup> U	922330	4.43E-11	4.58E-11	4.82E-11	5.01E-11	5.16E-11	5.28E-11	5.39E-11
<sup>234</sup> U	922340	1.80E-06	1.73E-06	1.61E-06	1.52E-06	1.46E-06	1.42E-06	1.40E-06
<sup>235</sup> U	922350	1.68E-04	1.44E-04	1.07E-04	8.03E-05	6.09E-05	4.65E-05	3.58E-05
<sup>236</sup> U	922360	4.13E-05	4.31E-05	4.54E-05	4.66E-05	4.69E-05	4.66E-05	4.59E-05
<sup>238</sup> U	922380	2.29E-02	2.28E-02	2.27E-02	2.25E-02	2.24E-02	2.23E-02	2.21E-02
<sup>237</sup> Np	932370	8.20E-06	9.18E-06	1.09E-05	1.23E-05	1.35E-05	1.44E-05	1.52E-05
<sup>238</sup> Pu	942380	2.42E-06	3.02E-06	4.35E-06	5.81E-06	7.35E-06	8.94E-06	1.05E-05
<sup>239</sup> Pu	942390	3.59E-04	3.73E-04	3.93E-04	4.07E-04	4.18E-04	4.26E-04	4.32E-04
<sup>240</sup> Pu	942400	5.15E-05	5.65E-05	6.60E-05	7.47E-05	8.25E-05	8.94E-05	9.56E-05
<sup>241</sup> Pu	942410	2.55E-05	2.89E-05	3.53E-05	4.07E-05	4.51E-05	4.88E-05	5.17E-05
<sup>242</sup> Pu	942420	3.64E-06	4.68E-06	7.16E-06	9.99E-06	1.30E-05	1.62E-05	1.94E-05
<sup>241</sup> Am	952410	7.94E-06	9.11E-06	1.14E-05	1.34E-05	1.50E-05	1.64E-05	1.76E-05
<sup>242m</sup> Am	952421	2.69E-08	3.58E-08	5.57E-08	7.60E-08	9.54E-08	1.13E-07	1.30E-07
<sup>243</sup> Am	952430	8.72E-07	1.28E-06	2.43E-06	3.92E-06	5.65E-06	7.51E-06	9.42E-06

Table 18. BWR Isotopics as a Function of 1.5 wt%  $^{235}\text{U}$  and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
$^{16}\text{O}$	80160	4.61E-02	4.59E-02	4.57E-02	4.55E-02	4.53E-02	4.51E-02
$^{95}\text{Mo}$	420950	5.41E-05	5.83E-05	6.25E-05	6.65E-05	7.04E-05	7.42E-05
$^{99}\text{Tc}$	430990	5.78E-05	6.22E-05	6.64E-05	7.05E-05	7.45E-05	7.83E-05
$^{101}\text{Ru}$	441010	6.08E-05	6.63E-05	7.16E-05	7.69E-05	8.21E-05	8.71E-05
$^{103}\text{Rh}$	451030	3.73E-05	3.93E-05	4.11E-05	4.28E-05	4.42E-05	4.56E-05
$^{109}\text{Ag}$	471090	9.17E-06	1.01E-05	1.09E-05	1.18E-05	1.26E-05	1.34E-05
$^{143}\text{Nd}$	601430	3.81E-05	3.99E-05	4.16E-05	4.32E-05	4.47E-05	4.61E-05
$^{145}\text{Nd}$	601450	3.06E-05	3.27E-05	3.48E-05	3.68E-05	3.87E-05	4.05E-05
$^{147}\text{Sm}$	621470	6.42E-06	6.62E-06	6.81E-06	6.98E-06	7.13E-06	7.26E-06
$^{149}\text{Sm}$	621490	6.26E-07	6.47E-07	6.67E-07	6.87E-07	7.06E-07	7.25E-07
$^{150}\text{Sm}$	621500	1.62E-05	1.75E-05	1.87E-05	1.98E-05	2.09E-05	2.20E-05
$^{151}\text{Sm}$	621510	2.12E-06	2.25E-06	2.38E-06	2.50E-06	2.62E-06	2.73E-06
$^{152}\text{Sm}$	621520	4.95E-06	5.26E-06	5.56E-06	5.84E-06	6.11E-06	6.36E-06
$^{151}\text{Eu}$	631510	8.96E-08	9.53E-08	1.01E-07	1.06E-07	1.11E-07	1.16E-07
$^{153}\text{Eu}$	631530	6.69E-06	7.21E-06	7.68E-06	8.13E-06	8.53E-06	8.91E-06
$^{155}\text{Gd}$	641550	3.89E-07	4.34E-07	4.77E-07	5.18E-07	5.58E-07	5.96E-07
$^{233}\text{U}$	922330	5.48E-11	5.57E-11	5.65E-11	5.72E-11	5.79E-11	5.86E-11
$^{234}\text{U}$	922340	1.40E-06	1.40E-06	1.42E-06	1.44E-06	1.46E-06	1.49E-06
$^{235}\text{U}$	922350	2.77E-05	2.16E-05	1.69E-05	1.34E-05	1.06E-05	8.50E-06
$^{236}\text{U}$	922360	4.50E-05	4.38E-05	4.25E-05	4.11E-05	3.97E-05	3.83E-05
$^{238}\text{U}$	922380	2.20E-02	2.19E-02	2.17E-02	2.16E-02	2.15E-02	2.13E-02
$^{237}\text{Np}$	932370	1.58E-05	1.62E-05	1.65E-05	1.67E-05	1.68E-05	1.68E-05
$^{238}\text{Pu}$	942380	1.21E-05	1.35E-05	1.49E-05	1.63E-05	1.75E-05	1.86E-05
$^{239}\text{Pu}$	942390	4.38E-04	4.42E-04	4.45E-04	4.48E-04	4.51E-04	4.53E-04
$^{240}\text{Pu}$	942400	1.01E-04	1.06E-04	1.10E-04	1.14E-04	1.18E-04	1.21E-04
$^{241}\text{Pu}$	942410	5.42E-05	5.63E-05	5.80E-05	5.95E-05	6.09E-05	6.20E-05
$^{242}\text{Pu}$	942420	2.25E-05	2.57E-05	2.88E-05	3.18E-05	3.46E-05	3.74E-05
$^{241}\text{Am}$	952410	1.86E-05	1.95E-05	2.02E-05	2.09E-05	2.15E-05	2.20E-05
$^{242m}\text{Am}$	952421	1.44E-07	1.58E-07	1.70E-07	1.81E-07	1.91E-07	2.01E-07
$^{243}\text{Am}$	952430	1.13E-05	1.32E-05	1.50E-05	1.68E-05	1.85E-05	2.00E-05

Table 19. BWR Isotopics as a Function of 2.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.57E-09	3.69E-06	7.16E-06	1.05E-05	1.37E-05	1.67E-05	1.97E-05
<sup>99</sup> Tc	430990	1.54E-09	3.80E-06	7.46E-06	1.10E-05	1.44E-05	1.77E-05	2.09E-05
<sup>101</sup> Ru	441010	1.34E-09	3.32E-06	6.64E-06	9.93E-06	1.32E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.69E-10	2.56E-06	5.26E-06	7.95E-06	1.06E-05	1.31E-05	1.56E-05
<sup>109</sup> Ag	471090	2.34E-11	1.95E-07	5.42E-07	9.56E-07	1.41E-06	1.88E-06	2.36E-06
<sup>143</sup> Nd	601430	1.42E-09	3.30E-06	6.33E-06	9.18E-06	1.19E-05	1.45E-05	1.71E-05
<sup>145</sup> Nd	601450	9.88E-10	2.28E-06	4.40E-06	6.39E-06	8.28E-06	1.01E-05	1.19E-05
<sup>147</sup> Sm	621470	4.42E-10	9.45E-07	1.71E-06	2.35E-06	2.90E-06	3.39E-06	3.83E-06
<sup>149</sup> Sm	621490	2.99E-10	1.66E-07	2.32E-07	2.92E-07	3.46E-07	3.98E-07	4.46E-07
<sup>150</sup> Sm	621500	8.44E-15	6.29E-07	1.46E-06	2.35E-06	3.26E-06	4.19E-06	5.11E-06
<sup>151</sup> Sm	621510	1.23E-10	2.32E-07	4.04E-07	5.56E-07	6.98E-07	8.36E-07	9.72E-07
<sup>152</sup> Sm	621520	8.15E-11	2.98E-07	6.62E-07	1.03E-06	1.38E-06	1.71E-06	2.03E-06
<sup>151</sup> Eu	631510	4.82E-12	9.31E-09	1.64E-08	2.28E-08	2.88E-08	3.47E-08	4.06E-08
<sup>153</sup> Eu	631530	5.77E-11	1.75E-07	4.25E-07	7.29E-07	1.07E-06	1.43E-06	1.81E-06
<sup>155</sup> Gd	641550	7.43E-12	9.70E-09	1.67E-08	2.51E-08	3.55E-08	4.82E-08	6.30E-08
<sup>233</sup> U	922330	5.87E-15	1.33E-11	2.44E-11	3.36E-11	4.13E-11	4.79E-11	5.36E-11
<sup>234</sup> U	922340	3.99E-06	3.67E-06	3.39E-06	3.16E-06	2.96E-06	2.79E-06	2.64E-06
<sup>235</sup> U	922350	4.85E-04	4.32E-04	3.92E-04	3.58E-04	3.29E-04	3.04E-04	2.81E-04
<sup>236</sup> U	922360	2.23E-06	1.50E-05	2.47E-05	3.26E-05	3.92E-05	4.47E-05	4.94E-05
<sup>238</sup> U	922380	2.35E-02	2.34E-02	2.32E-02	2.31E-02	2.30E-02	2.29E-02	2.29E-02
<sup>237</sup> Np	932370	2.59E-10	8.85E-07	2.06E-06	3.38E-06	4.77E-06	6.19E-06	7.60E-06
<sup>238</sup> Pu	942380	1.01E-17	3.78E-08	1.74E-07	4.18E-07	7.70E-07	1.23E-06	1.79E-06
<sup>239</sup> Pu	942390	4.10E-08	8.49E-05	1.49E-04	2.03E-04	2.50E-04	2.91E-04	3.29E-04
<sup>240</sup> Pu	942400	5.02E-13	4.06E-06	1.08E-05	1.82E-05	2.59E-05	3.37E-05	4.16E-05
<sup>241</sup> Pu	942410	5.33E-18	8.32E-07	3.48E-06	7.10E-06	1.12E-05	1.54E-05	1.97E-05
<sup>242</sup> Pu	942420	4.52E-23	2.18E-08	1.69E-07	4.85E-07	9.58E-07	1.56E-06	2.28E-06
<sup>241</sup> Am	952410	1.45E-18	2.31E-07	9.84E-07	2.05E-06	3.29E-06	4.63E-06	6.03E-06
<sup>242m</sup> Am	952421	2.12E-29	3.25E-11	4.83E-10	1.99E-09	5.04E-09	9.89E-09	1.67E-08
<sup>243</sup> Am	952430	4.25E-28	7.25E-10	1.15E-08	4.97E-08	1.30E-07	2.60E-07	4.44E-07

Table 19. BWR Isotopics as a Function of 2.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.72E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.28E-05	2.58E-05	3.15E-05	3.69E-05	4.19E-05	4.68E-05	5.14E-05
<sup>99</sup> Tc	430990	2.41E-05	2.72E-05	3.31E-05	3.87E-05	4.41E-05	4.92E-05	5.41E-05
<sup>101</sup> Ru	441010	2.27E-05	2.58E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.52E-05
<sup>103</sup> Rh	451030	1.75E-05	1.94E-05	2.30E-05	2.64E-05	2.95E-05	3.23E-05	3.48E-05
<sup>109</sup> Ag	471090	2.72E-06	3.12E-06	3.99E-06	4.91E-06	5.85E-06	6.80E-06	7.74E-06
<sup>143</sup> Nd	601430	1.97E-05	2.20E-05	2.62E-05	2.98E-05	3.29E-05	3.56E-05	3.80E-05
<sup>145</sup> Nd	601450	1.36E-05	1.53E-05	1.85E-05	2.14E-05	2.42E-05	2.68E-05	2.92E-05
<sup>147</sup> Sm	621470	4.17E-06	4.49E-06	5.05E-06	5.51E-06	5.90E-06	6.23E-06	6.50E-06
<sup>149</sup> Sm	621490	4.67E-07	4.86E-07	5.19E-07	5.48E-07	5.73E-07	5.96E-07	6.17E-07
<sup>150</sup> Sm	621500	6.04E-06	6.96E-06	8.71E-06	1.04E-05	1.20E-05	1.35E-05	1.49E-05
<sup>151</sup> Sm	621510	1.07E-06	1.16E-06	1.35E-06	1.52E-06	1.68E-06	1.84E-06	1.99E-06
<sup>152</sup> Sm	621520	2.29E-06	2.54E-06	3.02E-06	3.46E-06	3.87E-06	4.25E-06	4.61E-06
<sup>151</sup> Eu	631510	4.47E-08	4.87E-08	5.64E-08	6.38E-08	7.08E-08	7.75E-08	8.39E-08
<sup>153</sup> Eu	631530	2.17E-06	2.54E-06	3.30E-06	4.04E-06	4.74E-06	5.41E-06	6.03E-06
<sup>155</sup> Gd	641550	7.86E-08	9.65E-08	1.37E-07	1.83E-07	2.31E-07	2.80E-07	3.30E-07
<sup>233</sup> U	922330	5.59E-11	5.79E-11	6.13E-11	6.39E-11	6.60E-11	6.76E-11	6.89E-11
<sup>234</sup> U	922340	2.53E-06	2.43E-06	2.26E-06	2.12E-06	2.01E-06	1.93E-06	1.88E-06
<sup>235</sup> U	922350	2.45E-04	2.15E-04	1.67E-04	1.30E-04	1.02E-04	7.95E-05	6.23E-05
<sup>236</sup> U	922360	5.28E-05	5.56E-05	5.97E-05	6.22E-05	6.35E-05	6.39E-05	6.36E-05
<sup>238</sup> U	922380	2.28E-02	2.27E-02	2.26E-02	2.25E-02	2.23E-02	2.22E-02	2.21E-02
<sup>237</sup> Np	932370	8.83E-06	9.98E-06	1.21E-05	1.39E-05	1.54E-05	1.67E-05	1.78E-05
<sup>238</sup> Pu	942380	2.34E-06	2.95E-06	4.33E-06	5.89E-06	7.60E-06	9.39E-06	1.12E-05
<sup>239</sup> Pu	942390	3.47E-04	3.62E-04	3.85E-04	4.01E-04	4.13E-04	4.23E-04	4.30E-04
<sup>240</sup> Pu	942400	4.66E-05	5.15E-05	6.10E-05	7.00E-05	7.82E-05	8.57E-05	9.23E-05
<sup>241</sup> Pu	942410	2.27E-05	2.60E-05	3.23E-05	3.79E-05	4.28E-05	4.68E-05	5.02E-05
<sup>242</sup> Pu	942420	2.94E-06	3.82E-06	5.97E-06	8.50E-06	1.13E-05	1.42E-05	1.73E-05
<sup>241</sup> Am	952410	7.04E-06	8.15E-06	1.04E-05	1.24E-05	1.42E-05	1.58E-05	1.71E-05
<sup>242m</sup> Am	952421	2.27E-08	3.07E-08	4.96E-08	6.99E-08	9.02E-08	1.09E-07	1.27E-07
<sup>243</sup> Am	952430	6.49E-07	9.63E-07	1.88E-06	3.14E-06	4.65E-06	6.34E-06	8.15E-06

Table 19. BWR Isotopics as a Function of 2.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.59E-02	4.57E-02	4.55E-02	4.53E-02	4.51E-02
<sup>95</sup> Mo	420950	5.59E-05	6.02E-05	6.43E-05	6.84E-05	7.23E-05	7.61E-05
<sup>99</sup> Tc	430990	5.88E-05	6.32E-05	6.75E-05	7.17E-05	7.56E-05	7.95E-05
<sup>101</sup> Ru	441010	6.08E-05	6.63E-05	7.16E-05	7.69E-05	8.21E-05	8.71E-05
<sup>103</sup> Rh	451030	3.70E-05	3.91E-05	4.10E-05	4.27E-05	4.42E-05	4.56E-05
<sup>109</sup> Ag	471090	8.67E-06	9.58E-06	1.05E-05	1.13E-05	1.22E-05	1.30E-05
<sup>143</sup> Nd	601430	4.01E-05	4.20E-05	4.37E-05	4.53E-05	4.67E-05	4.80E-05
<sup>145</sup> Nd	601450	3.15E-05	3.37E-05	3.58E-05	3.77E-05	3.96E-05	4.15E-05
<sup>147</sup> Sm	621470	6.73E-06	6.92E-06	7.10E-06	7.25E-06	7.38E-06	7.50E-06
<sup>149</sup> Sm	621490	6.38E-07	6.58E-07	6.77E-07	6.96E-07	7.15E-07	7.34E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.87E-05	1.99E-05	2.10E-05	2.21E-05
<sup>151</sup> Sm	621510	2.13E-06	2.26E-06	2.39E-06	2.51E-06	2.63E-06	2.74E-06
<sup>152</sup> Sm	621520	4.95E-06	5.27E-06	5.57E-06	5.85E-06	6.12E-06	6.38E-06
<sup>151</sup> Eu	631510	8.99E-08	9.57E-08	1.01E-07	1.06E-07	1.12E-07	1.16E-07
<sup>153</sup> Eu	631530	6.61E-06	7.14E-06	7.63E-06	8.09E-06	8.51E-06	8.90E-06
<sup>155</sup> Gd	641550	3.78E-07	4.24E-07	4.69E-07	5.12E-07	5.54E-07	5.93E-07
<sup>233</sup> U	922330	7.01E-11	7.11E-11	7.20E-11	7.29E-11	7.37E-11	7.45E-11
<sup>234</sup> U	922340	1.84E-06	1.82E-06	1.82E-06	1.83E-06	1.84E-06	1.86E-06
<sup>235</sup> U	922350	4.90E-05	3.86E-05	3.06E-05	2.43E-05	1.94E-05	1.55E-05
<sup>236</sup> U	922360	6.29E-05	6.17E-05	6.03E-05	5.86E-05	5.69E-05	5.51E-05
<sup>238</sup> U	922380	2.20E-02	2.18E-02	2.17E-02	2.16E-02	2.14E-02	2.13E-02
<sup>237</sup> Np	932370	1.87E-05	1.94E-05	1.99E-05	2.03E-05	2.05E-05	2.06E-05
<sup>238</sup> Pu	942380	1.31E-05	1.48E-05	1.65E-05	1.81E-05	1.96E-05	2.10E-05
<sup>239</sup> Pu	942390	4.36E-04	4.41E-04	4.45E-04	4.49E-04	4.51E-04	4.53E-04
<sup>240</sup> Pu	942400	9.83E-05	1.04E-04	1.08E-04	1.13E-04	1.17E-04	1.20E-04
<sup>241</sup> Pu	942410	5.30E-05	5.54E-05	5.74E-05	5.91E-05	6.06E-05	6.19E-05
<sup>242</sup> Pu	942420	2.04E-05	2.35E-05	2.66E-05	2.96E-05	3.25E-05	3.54E-05
<sup>241</sup> Am	952410	1.82E-05	1.92E-05	2.00E-05	2.08E-05	2.14E-05	2.20E-05
<sup>242m</sup> Am	952421	1.43E-07	1.58E-07	1.71E-07	1.83E-07	1.93E-07	2.03E-07
<sup>243</sup> Am	952430	1.00E-05	1.18E-05	1.37E-05	1.54E-05	1.72E-05	1.88E-05

Table 20. BWR Isotopics as a Function of 2.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.58E-09	3.76E-06	7.32E-06	1.07E-05	1.40E-05	1.72E-05	2.02E-05
<sup>99</sup> Tc	430990	1.55E-09	3.83E-06	7.52E-06	1.11E-05	1.45E-05	1.79E-05	2.12E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.62E-06	9.91E-06	1.32E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.53E-10	2.48E-06	5.08E-06	7.67E-06	1.02E-05	1.27E-05	1.51E-05
<sup>108</sup> Ag	471090	2.21E-11	1.63E-07	4.60E-07	8.26E-07	1.23E-06	1.67E-06	2.12E-06
<sup>143</sup> Nd	601430	1.44E-09	3.37E-06	6.49E-06	9.44E-06	1.23E-05	1.50E-05	1.76E-05
<sup>145</sup> Nd	601450	9.92E-10	2.32E-06	4.48E-06	6.52E-06	8.47E-06	1.03E-05	1.21E-05
<sup>147</sup> Sm	621470	4.42E-10	9.61E-07	1.75E-06	2.42E-06	3.00E-06	3.52E-06	3.98E-06
<sup>149</sup> Sm	621490	2.97E-10	1.88E-07	2.56E-07	3.16E-07	3.71E-07	4.22E-07	4.70E-07
<sup>150</sup> Sm	621500	8.23E-15	5.97E-07	1.41E-06	2.28E-06	3.18E-06	4.10E-06	5.01E-06
<sup>151</sup> Sm	621510	1.21E-10	2.37E-07	4.14E-07	5.68E-07	7.11E-07	8.48E-07	9.83E-07
<sup>152</sup> Sm	621520	8.05E-11	2.81E-07	6.28E-07	9.83E-07	1.33E-06	1.66E-06	1.98E-06
<sup>151</sup> Eu	631510	4.76E-12	9.50E-09	1.69E-08	2.33E-08	2.94E-08	3.53E-08	4.12E-08
<sup>153</sup> Eu	631530	5.64E-11	1.65E-07	3.96E-07	6.78E-07	9.98E-07	1.34E-06	1.70E-06
<sup>155</sup> Gd	641550	7.15E-12	9.62E-09	1.62E-08	2.38E-08	3.33E-08	4.49E-08	5.86E-08
<sup>233</sup> U	922330	6.67E-15	1.54E-11	2.85E-11	3.95E-11	4.89E-11	5.70E-11	6.39E-11
<sup>234</sup> U	922340	5.08E-06	4.71E-06	4.39E-06	4.11E-06	3.87E-06	3.65E-06	3.45E-06
<sup>235</sup> U	922350	6.06E-04	5.49E-04	5.03E-04	4.63E-04	4.28E-04	3.97E-04	3.70E-04
<sup>236</sup> U	922360	2.78E-06	1.68E-05	2.81E-05	3.75E-05	4.56E-05	5.25E-05	5.86E-05
<sup>238</sup> U	922380	2.33E-02	2.32E-02	2.31E-02	2.31E-02	2.30E-02	2.29E-02	2.28E-02
<sup>237</sup> Np	932370	2.42E-10	8.50E-07	2.02E-06	3.38E-06	4.84E-06	6.36E-06	7.89E-06
<sup>238</sup> Pu	942380	8.17E-18	3.22E-08	1.53E-07	3.77E-07	7.08E-07	1.15E-06	1.69E-06
<sup>239</sup> Pu	942390	3.63E-08	7.81E-05	1.40E-04	1.92E-04	2.38E-04	2.80E-04	3.17E-04
<sup>240</sup> Pu	942400	3.98E-13	3.30E-06	9.12E-06	1.58E-05	2.28E-05	3.01E-05	3.75E-05
<sup>241</sup> Pu	942410	3.68E-18	6.15E-07	2.77E-06	5.89E-06	9.52E-06	1.34E-05	1.74E-05
<sup>242</sup> Pu	942420	2.56E-23	1.37E-08	1.17E-07	3.56E-07	7.32E-07	1.23E-06	1.84E-06
<sup>241</sup> Am	952410	9.99E-19	1.70E-07	7.82E-07	1.70E-06	2.80E-06	4.02E-06	5.32E-06
<sup>242m</sup> Am	952421	1.23E-29	2.12E-11	3.47E-10	1.52E-09	4.00E-09	8.10E-09	1.40E-08
<sup>243</sup> Am	952430	2.12E-28	4.06E-10	7.12E-09	3.29E-08	9.01E-08	1.88E-07	3.31E-07

Table 20. BWR Isotopics as a Function of 2.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.72E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.34E-05	2.65E-05	3.24E-05	3.79E-05	4.32E-05	4.82E-05	5.30E-05
<sup>99</sup> Tc	430990	2.44E-05	2.75E-05	3.35E-05	3.93E-05	4.48E-05	5.00E-05	5.50E-05
<sup>101</sup> Ru	441010	2.27E-05	2.58E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.53E-05
<sup>103</sup> Rh	451030	1.70E-05	1.89E-05	2.25E-05	2.59E-05	2.90E-05	3.19E-05	3.45E-05
<sup>109</sup> Ag	471090	2.45E-06	2.82E-06	3.63E-06	4.50E-06	5.41E-06	6.33E-06	7.26E-06
<sup>143</sup> Nd	601430	2.03E-05	2.27E-05	2.72E-05	3.10E-05	3.44E-05	3.74E-05	3.99E-05
<sup>145</sup> Nd	601450	1.40E-05	1.57E-05	1.90E-05	2.21E-05	2.49E-05	2.76E-05	3.01E-05
<sup>147</sup> Sm	621470	4.36E-06	4.70E-06	5.31E-06	5.82E-06	6.23E-06	6.57E-06	6.85E-06
<sup>149</sup> Sm	621490	4.91E-07	5.10E-07	5.42E-07	5.69E-07	5.93E-07	6.14E-07	6.34E-07
<sup>150</sup> Sm	621500	5.94E-06	6.85E-06	8.61E-06	1.03E-05	1.19E-05	1.34E-05	1.49E-05
<sup>151</sup> Sm	621510	1.08E-06	1.17E-06	1.35E-06	1.52E-06	1.69E-06	1.84E-06	1.99E-06
<sup>152</sup> Sm	621520	2.25E-06	2.51E-06	2.99E-06	3.44E-06	3.86E-06	4.25E-06	4.61E-06
<sup>151</sup> Eu	631510	4.53E-08	4.93E-08	5.69E-08	6.42E-08	7.12E-08	7.79E-08	8.43E-08
<sup>153</sup> Eu	631530	2.05E-06	2.42E-06	3.16E-06	3.90E-06	4.61E-06	5.29E-06	5.93E-06
<sup>155</sup> Gd	641550	7.30E-08	8.96E-08	1.28E-07	1.72E-07	2.19E-07	2.68E-07	3.17E-07
<sup>233</sup> U	922330	6.69E-11	6.96E-11	7.40E-11	7.75E-11	8.02E-11	8.23E-11	8.41E-11
<sup>234</sup> U	922340	3.32E-06	3.19E-06	2.96E-06	2.77E-06	2.62E-06	2.49E-06	2.40E-06
<sup>235</sup> U	922350	3.30E-04	2.95E-04	2.36E-04	1.90E-04	1.52E-04	1.22E-04	9.72E-05
<sup>236</sup> U	922360	6.31E-05	6.69E-05	7.29E-05	7.70E-05	7.96E-05	8.10E-05	8.15E-05
<sup>238</sup> U	922380	2.27E-02	2.27E-02	2.25E-02	2.24E-02	2.23E-02	2.22E-02	2.20E-02
<sup>237</sup> Np	932370	9.22E-06	1.05E-05	1.28E-05	1.50E-05	1.69E-05	1.85E-05	2.00E-05
<sup>238</sup> Pu	942380	2.22E-06	2.82E-06	4.20E-06	5.80E-06	7.60E-06	9.54E-06	1.16E-05
<sup>239</sup> Pu	942390	3.36E-04	3.52E-04	3.76E-04	3.94E-04	4.08E-04	4.19E-04	4.28E-04
<sup>240</sup> Pu	942400	4.23E-05	4.70E-05	5.63E-05	6.54E-05	7.39E-05	8.17E-05	8.89E-05
<sup>241</sup> Pu	942410	2.02E-05	2.33E-05	2.95E-05	3.53E-05	4.03E-05	4.47E-05	4.85E-05
<sup>242</sup> Pu	942420	2.39E-06	3.13E-06	5.00E-06	7.26E-06	9.80E-06	1.25E-05	1.54E-05
<sup>241</sup> Am	952410	6.25E-06	7.30E-06	9.48E-06	1.16E-05	1.35E-05	1.51E-05	1.66E-05
<sup>242m</sup> Am	952421	1.92E-08	2.64E-08	4.42E-08	6.43E-08	8.50E-08	1.05E-07	1.24E-07
<sup>243</sup> Am	952430	4.88E-07	7.32E-07	1.47E-06	2.52E-06	3.83E-06	5.35E-06	7.02E-06



Table 20. BWR Isotopics as a Function of 2.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.59E-02	4.57E-02	4.55E-02	4.53E-02	4.51E-02
<sup>95</sup> Mo	420950	5.76E-05	6.20E-05	6.62E-05	7.03E-05	7.43E-05	7.81E-05
<sup>98</sup> Tc	430990	5.98E-05	6.43E-05	6.87E-05	7.29E-05	7.69E-05	8.08E-05
<sup>101</sup> Ru	441010	6.09E-05	6.63E-05	7.17E-05	7.70E-05	8.22E-05	8.72E-05
<sup>103</sup> Rh	451030	3.68E-05	3.89E-05	4.09E-05	4.26E-05	4.42E-05	4.56E-05
<sup>109</sup> Ag	471090	8.19E-06	9.10E-06	1.00E-05	1.09E-05	1.17E-05	1.26E-05
<sup>143</sup> Nd	601430	4.22E-05	4.42E-05	4.59E-05	4.75E-05	4.89E-05	5.02E-05
<sup>145</sup> Nd	601450	3.24E-05	3.47E-05	3.68E-05	3.88E-05	4.07E-05	4.25E-05
<sup>147</sup> Sm	621470	7.08E-06	7.27E-06	7.43E-06	7.57E-06	7.68E-06	7.78E-06
<sup>149</sup> Sm	621490	6.53E-07	6.72E-07	6.90E-07	7.09E-07	7.27E-07	7.45E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.88E-05	2.00E-05	2.11E-05	2.22E-05
<sup>151</sup> Sm	621510	2.14E-06	2.27E-06	2.40E-06	2.52E-06	2.64E-06	2.75E-06
<sup>152</sup> Sm	621520	4.96E-06	5.28E-06	5.58E-06	5.87E-06	6.14E-06	6.40E-06
<sup>151</sup> Eu	631510	9.04E-08	9.62E-08	1.02E-07	1.07E-07	1.12E-07	1.17E-07
<sup>153</sup> Eu	631530	6.52E-06	7.07E-06	7.58E-06	8.05E-06	8.48E-06	8.89E-06
<sup>155</sup> Gd	641550	3.66E-07	4.14E-07	4.61E-07	5.05E-07	5.48E-07	5.89E-07
<sup>233</sup> U	922330	8.55E-11	8.67E-11	8.78E-11	8.88E-11	8.98E-11	9.06E-11
<sup>234</sup> U	922340	2.33E-06	2.28E-06	2.26E-06	2.24E-06	2.24E-06	2.25E-06
<sup>235</sup> U	922350	7.77E-05	6.22E-05	4.98E-05	3.99E-05	3.21E-05	2.58E-05
<sup>236</sup> U	922360	8.12E-05	8.03E-05	7.90E-05	7.73E-05	7.54E-05	7.34E-05
<sup>238</sup> U	922380	2.19E-02	2.18E-02	2.16E-02	2.15E-02	2.14E-02	2.13E-02
<sup>237</sup> Np	932370	2.12E-05	2.21E-05	2.29E-05	2.35E-05	2.39E-05	2.42E-05
<sup>238</sup> Pu	942380	1.36E-05	1.57E-05	1.77E-05	1.96E-05	2.14E-05	2.30E-05
<sup>239</sup> Pu	942390	4.35E-04	4.40E-04	4.45E-04	4.49E-04	4.52E-04	4.54E-04
<sup>240</sup> Pu	942400	9.53E-05	1.01E-04	1.06E-04	1.11E-04	1.15E-04	1.19E-04
<sup>241</sup> Pu	942410	5.16E-05	5.43E-05	5.66E-05	5.85E-05	6.02E-05	6.16E-05
<sup>242</sup> Pu	942420	1.84E-05	2.14E-05	2.45E-05	2.75E-05	3.04E-05	3.33E-05
<sup>241</sup> Am	952410	1.78E-05	1.89E-05	1.98E-05	2.06E-05	2.13E-05	2.19E-05
<sup>242m</sup> Am	952421	1.42E-07	1.57E-07	1.72E-07	1.84E-07	1.96E-07	2.06E-07
<sup>243</sup> Am	952430	8.77E-06	1.06E-05	1.24E-05	1.41E-05	1.59E-05	1.75E-05

Table 21. BWR Isotopics as a Function of 3.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.59E-09	3.81E-06	7.44E-06	1.09E-05	1.43E-05	1.75E-05	2.06E-05
<sup>99</sup> Tc	430990	1.55E-09	3.85E-06	7.57E-06	1.12E-05	1.47E-05	1.81E-05	2.14E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.61E-06	9.90E-06	1.32E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.41E-10	2.42E-06	4.94E-06	7.45E-06	9.93E-06	1.24E-05	1.47E-05
<sup>109</sup> Ag	471090	2.11E-11	1.39E-07	3.98E-07	7.23E-07	1.09E-06	1.49E-06	1.91E-06
<sup>143</sup> Nd	601430	1.45E-09	3.42E-06	6.62E-06	9.65E-06	1.26E-05	1.53E-05	1.80E-05
<sup>145</sup> Nd	601450	9.96E-10	2.35E-06	4.55E-06	6.64E-06	8.63E-06	1.05E-05	1.24E-05
<sup>147</sup> Sm	621470	4.42E-10	9.73E-07	1.79E-06	2.49E-06	3.10E-06	3.64E-06	4.12E-06
<sup>149</sup> Sm	621490	2.96E-10	2.12E-07	2.82E-07	3.43E-07	3.98E-07	4.50E-07	4.98E-07
<sup>150</sup> Sm	621500	8.09E-15	5.64E-07	1.36E-06	2.22E-06	3.10E-06	4.01E-06	4.91E-06
<sup>151</sup> Sm	621510	1.20E-10	2.41E-07	4.23E-07	5.80E-07	7.25E-07	8.62E-07	9.96E-07
<sup>152</sup> Sm	621520	7.97E-11	2.68E-07	6.00E-07	9.45E-07	1.29E-06	1.62E-06	1.94E-06
<sup>151</sup> Eu	631510	4.71E-12	9.66E-09	1.73E-08	2.39E-08	3.01E-08	3.60E-08	4.19E-08
<sup>153</sup> Eu	631530	5.54E-11	1.58E-07	3.74E-07	6.38E-07	9.39E-07	1.27E-06	1.61E-06
<sup>155</sup> Gd	641550	6.94E-12	9.62E-09	1.59E-08	2.30E-08	3.17E-08	4.23E-08	5.50E-08
<sup>233</sup> U	922330	7.44E-15	1.74E-11	3.23E-11	4.51E-11	5.62E-11	6.57E-11	7.39E-11
<sup>234</sup> U	922340	6.20E-06	5.79E-06	5.43E-06	5.10E-06	4.82E-06	4.56E-06	4.32E-06
<sup>235</sup> U	922350	7.28E-04	6.67E-04	6.16E-04	5.71E-04	5.32E-04	4.96E-04	4.63E-04
<sup>236</sup> U	922360	3.34E-06	1.84E-05	3.09E-05	4.17E-05	5.11E-05	5.94E-05	6.66E-05
<sup>238</sup> U	922380	2.32E-02	2.31E-02	2.30E-02	2.30E-02	2.29E-02	2.28E-02	2.27E-02
<sup>237</sup> Np	932370	2.31E-10	8.19E-07	1.98E-06	3.34E-06	4.84E-06	6.42E-06	8.04E-06
<sup>238</sup> Pu	942380	6.89E-18	2.80E-08	1.36E-07	3.40E-07	6.48E-07	1.06E-06	1.58E-06
<sup>239</sup> Pu	942390	3.28E-08	7.24E-05	1.32E-04	1.83E-04	2.28E-04	2.69E-04	3.06E-04
<sup>240</sup> Pu	942400	3.30E-13	2.74E-06	7.82E-06	1.38E-05	2.02E-05	2.70E-05	3.39E-05
<sup>241</sup> Pu	942410	2.70E-18	4.68E-07	2.23E-06	4.92E-06	8.16E-06	1.17E-05	1.54E-05
<sup>242</sup> Pu	942420	1.59E-23	9.08E-09	8.31E-08	2.65E-07	5.66E-07	9.79E-07	1.49E-06
<sup>241</sup> Am	952410	7.35E-19	1.30E-07	6.30E-07	1.42E-06	2.40E-06	3.51E-06	4.70E-06
<sup>242m</sup> Am	952421	7.85E-30	1.44E-11	2.54E-10	1.17E-09	3.20E-09	6.66E-09	1.18E-08
<sup>243</sup> Am	952430	1.19E-28	2.42E-10	4.58E-09	2.23E-08	6.37E-08	1.37E-07	2.49E-07

Table 21. BWR Isotopics as a Function of 3.0 wt%  $^{235}\text{U}$  and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
$^{16}\text{O}$	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
$^{95}\text{Mo}$	420950	2.39E-05	2.71E-05	3.32E-05	3.89E-05	4.43E-05	4.95E-05	5.44E-05
$^{99}\text{Tc}$	430990	2.46E-05	2.78E-05	3.40E-05	3.98E-05	4.54E-05	5.08E-05	5.59E-05
$^{101}\text{Ru}$	441010	2.27E-05	2.57E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.53E-05
$^{103}\text{Rh}$	451030	1.66E-05	1.85E-05	2.21E-05	2.55E-05	2.87E-05	3.15E-05	3.42E-05
$^{108}\text{Ag}$	471090	2.21E-06	2.56E-06	3.31E-06	4.14E-06	5.01E-06	5.90E-06	6.81E-06
$^{143}\text{Nd}$	601430	2.08E-05	2.34E-05	2.81E-05	3.22E-05	3.58E-05	3.90E-05	4.18E-05
$^{145}\text{Nd}$	601450	1.43E-05	1.61E-05	1.95E-05	2.26E-05	2.56E-05	2.83E-05	3.09E-05
$^{147}\text{Sm}$	621470	4.53E-06	4.91E-06	5.57E-06	6.12E-06	6.57E-06	6.93E-06	7.23E-06
$^{149}\text{Sm}$	621490	5.18E-07	5.37E-07	5.68E-07	5.94E-07	6.17E-07	6.37E-07	6.55E-07
$^{150}\text{Sm}$	621500	5.84E-06	6.74E-06	8.50E-06	1.02E-05	1.18E-05	1.33E-05	1.48E-05
$^{151}\text{Sm}$	621510	1.09E-06	1.19E-06	1.36E-06	1.53E-06	1.70E-06	1.85E-06	2.00E-06
$^{152}\text{Sm}$	621520	2.21E-06	2.47E-06	2.96E-06	3.42E-06	3.85E-06	4.25E-06	4.62E-06
$^{151}\text{Eu}$	631510	4.60E-08	5.00E-08	5.76E-08	6.48E-08	7.18E-08	7.85E-08	8.49E-08
$^{153}\text{Eu}$	631530	1.95E-06	2.31E-06	3.04E-06	3.77E-06	4.48E-06	5.17E-06	5.82E-06
$^{155}\text{Gd}$	641550	6.82E-08	8.36E-08	1.20E-07	1.61E-07	2.07E-07	2.55E-07	3.04E-07
$^{233}\text{U}$	922330	7.75E-11	8.08E-11	8.64E-11	9.08E-11	9.43E-11	9.70E-11	9.92E-11
$^{234}\text{U}$	922340	4.16E-06	4.01E-06	3.72E-06	3.48E-06	3.27E-06	3.10E-06	2.97E-06
$^{235}\text{U}$	922350	4.19E-04	3.80E-04	3.13E-04	2.57E-04	2.11E-04	1.72E-04	1.40E-04
$^{236}\text{U}$	922360	7.22E-05	7.70E-05	8.49E-05	9.08E-05	9.49E-05	9.76E-05	9.91E-05
$^{238}\text{U}$	922380	2.26E-02	2.26E-02	2.25E-02	2.23E-02	2.22E-02	2.21E-02	2.20E-02
$^{237}\text{Np}$	932370	9.43E-06	1.08E-05	1.33E-05	1.57E-05	1.79E-05	1.99E-05	2.17E-05
$^{238}\text{Pu}$	942380	2.09E-06	2.67E-06	4.01E-06	5.62E-06	7.45E-06	9.47E-06	1.16E-05
$^{239}\text{Pu}$	942390	3.25E-04	3.42E-04	3.68E-04	3.87E-04	4.03E-04	4.15E-04	4.25E-04
$^{240}\text{Pu}$	942400	3.84E-05	4.30E-05	5.21E-05	6.10E-05	6.96E-05	7.77E-05	8.52E-05
$^{241}\text{Pu}$	942410	1.80E-05	2.09E-05	2.69E-05	3.27E-05	3.79E-05	4.25E-05	4.66E-05
$^{242}\text{Pu}$	942420	1.96E-06	2.59E-06	4.21E-06	6.22E-06	8.53E-06	1.11E-05	1.38E-05
$^{241}\text{Am}$	952410	5.57E-06	6.56E-06	8.66E-06	1.07E-05	1.27E-05	1.44E-05	1.60E-05
$^{242m}\text{Am}$	952421	1.64E-08	2.28E-08	3.94E-08	5.90E-08	8.00E-08	1.01E-07	1.21E-07
$^{243}\text{Am}$	952430	3.71E-07	5.62E-07	1.16E-06	2.04E-06	3.17E-06	4.52E-06	6.04E-06

Table 21. BWR Isotopics as a Function of 3.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.59E-02	4.57E-02	4.55E-02	4.53E-02	4.51E-02
<sup>95</sup> Mo	420950	5.91E-05	6.37E-05	6.80E-05	7.22E-05	7.62E-05	8.01E-05
<sup>99</sup> Tc	430990	6.08E-05	6.54E-05	6.99E-05	7.41E-05	7.82E-05	8.21E-05
<sup>101</sup> Ru	441010	6.09E-05	6.64E-05	7.18E-05	7.71E-05	8.23E-05	8.74E-05
<sup>103</sup> Rh	451030	3.66E-05	3.88E-05	4.08E-05	4.26E-05	4.42E-05	4.57E-05
<sup>109</sup> Ag	471090	7.72E-06	8.63E-06	9.53E-06	1.04E-05	1.13E-05	1.21E-05
<sup>143</sup> Nd	601430	4.42E-05	4.64E-05	4.82E-05	4.99E-05	5.13E-05	5.26E-05
<sup>145</sup> Nd	601450	3.34E-05	3.56E-05	3.78E-05	3.98E-05	4.17E-05	4.36E-05
<sup>147</sup> Sm	621470	7.46E-06	7.65E-06	7.81E-06	7.93E-06	8.03E-06	8.12E-06
<sup>149</sup> Sm	621490	6.73E-07	6.90E-07	7.07E-07	7.24E-07	7.41E-07	7.58E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.88E-05	2.00E-05	2.12E-05	2.23E-05
<sup>151</sup> Sm	621510	2.15E-06	2.28E-06	2.41E-06	2.54E-06	2.65E-06	2.77E-06
<sup>152</sup> Sm	621520	4.97E-06	5.30E-06	5.60E-06	5.90E-06	6.17E-06	6.44E-06
<sup>151</sup> Eu	631510	9.10E-08	9.68E-08	1.02E-07	1.08E-07	1.13E-07	1.18E-07
<sup>153</sup> Eu	631530	6.42E-06	6.99E-06	7.51E-06	8.00E-06	8.45E-06	8.87E-06
<sup>155</sup> Gd	641550	3.54E-07	4.03E-07	4.51E-07	4.97E-07	5.42E-07	5.85E-07
<sup>233</sup> U	922330	1.01E-10	1.03E-10	1.04E-10	1.05E-10	1.06E-10	1.07E-10
<sup>234</sup> U	922340	2.86E-06	2.78E-06	2.73E-06	2.69E-06	2.67E-06	2.66E-06
<sup>235</sup> U	922350	1.14E-04	9.27E-05	7.52E-05	6.09E-05	4.94E-05	4.01E-05
<sup>236</sup> U	922360	9.95E-05	9.92E-05	9.83E-05	9.68E-05	9.50E-05	9.28E-05
<sup>238</sup> U	922380	2.19E-02	2.17E-02	2.16E-02	2.15E-02	2.14E-02	2.12E-02
<sup>237</sup> Np	932370	2.32E-05	2.45E-05	2.55E-05	2.64E-05	2.70E-05	2.75E-05
<sup>238</sup> Pu	942380	1.39E-05	1.61E-05	1.84E-05	2.05E-05	2.26E-05	2.46E-05
<sup>239</sup> Pu	942390	4.32E-04	4.39E-04	4.44E-04	4.48E-04	4.52E-04	4.55E-04
<sup>240</sup> Pu	942400	9.21E-05	9.83E-05	1.04E-04	1.09E-04	1.14E-04	1.18E-04
<sup>241</sup> Pu	942410	5.00E-05	5.30E-05	5.56E-05	5.77E-05	5.96E-05	6.12E-05
<sup>242</sup> Pu	942420	1.66E-05	1.95E-05	2.25E-05	2.54E-05	2.84E-05	3.12E-05
<sup>241</sup> Am	952410	1.73E-05	1.85E-05	1.96E-05	2.05E-05	2.12E-05	2.19E-05
<sup>242m</sup> Am	952421	1.40E-07	1.57E-07	1.73E-07	1.86E-07	1.99E-07	2.10E-07
<sup>243</sup> Am	952430	7.67E-06	9.38E-06	1.11E-05	1.29E-05	1.46E-05	1.63E-05

Table 22. BWR Isotopics as a Function of 3.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.60E-09	3.85E-06	7.53E-06	1.11E-05	1.45E-05	1.78E-05	2.10E-05
<sup>99</sup> Tc	430990	1.56E-09	3.87E-06	7.61E-06	1.12E-05	1.48E-05	1.82E-05	2.16E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.61E-06	9.89E-06	1.31E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.32E-10	2.37E-06	4.83E-06	7.28E-06	9.71E-06	1.21E-05	1.44E-05
<sup>109</sup> Ag	471090	2.03E-11	1.22E-07	3.49E-07	6.39E-07	9.73E-07	1.34E-06	1.73E-06
<sup>143</sup> Nd	601430	1.45E-09	3.46E-06	6.72E-06	9.82E-06	1.28E-05	1.57E-05	1.84E-05
<sup>145</sup> Nd	601450	9.98E-10	2.37E-06	4.60E-06	6.73E-06	8.77E-06	1.07E-05	1.26E-05
<sup>147</sup> Sm	621470	4.42E-10	9.83E-07	1.82E-06	2.54E-06	3.18E-06	3.75E-06	4.26E-06
<sup>149</sup> Sm	621490	2.95E-10	2.38E-07	3.10E-07	3.73E-07	4.29E-07	4.80E-07	5.28E-07
<sup>150</sup> Sm	621500	7.99E-15	5.33E-07	1.31E-06	2.15E-06	3.03E-06	3.92E-06	4.82E-06
<sup>151</sup> Sm	621510	1.19E-10	2.44E-07	4.32E-07	5.92E-07	7.39E-07	8.77E-07	1.01E-06
<sup>152</sup> Sm	621520	7.91E-11	2.57E-07	5.76E-07	9.12E-07	1.25E-06	1.58E-06	1.90E-06
<sup>151</sup> Eu	631510	4.68E-12	9.80E-09	1.76E-08	2.45E-08	3.08E-08	3.68E-08	4.26E-08
<sup>153</sup> Eu	631530	5.46E-11	1.53E-07	3.56E-07	6.04E-07	8.89E-07	1.20E-06	1.53E-06
<sup>155</sup> Gd	641550	6.78E-12	9.68E-09	1.57E-08	2.24E-08	3.04E-08	4.03E-08	5.20E-08
<sup>233</sup> U	922330	8.18E-15	1.92E-11	3.60E-11	5.05E-11	6.31E-11	7.40E-11	8.35E-11
<sup>234</sup> U	922340	7.32E-06	6.88E-06	6.48E-06	6.13E-06	5.80E-06	5.50E-06	5.23E-06
<sup>235</sup> U	922350	8.49E-04	7.86E-04	7.31E-04	6.82E-04	6.38E-04	5.98E-04	5.61E-04
<sup>236</sup> U	922360	3.90E-06	1.98E-05	3.34E-05	4.53E-05	5.59E-05	6.53E-05	7.37E-05
<sup>238</sup> U	922380	2.31E-02	2.30E-02	2.29E-02	2.28E-02	2.28E-02	2.27E-02	2.26E-02
<sup>237</sup> Np	932370	2.23E-10	7.92E-07	1.93E-06	3.29E-06	4.81E-06	6.42E-06	8.10E-06
<sup>238</sup> Pu	942380	5.97E-18	2.47E-08	1.22E-07	3.08E-07	5.93E-07	9.82E-07	1.48E-06
<sup>239</sup> Pu	942390	3.01E-08	6.77E-05	1.24E-04	1.74E-04	2.18E-04	2.59E-04	2.96E-04
<sup>240</sup> Pu	942400	2.82E-13	2.32E-06	6.78E-06	1.21E-05	1.80E-05	2.43E-05	3.08E-05
<sup>241</sup> Pu	942410	2.08E-18	3.65E-07	1.82E-06	4.15E-06	7.03E-06	1.02E-05	1.37E-05
<sup>242</sup> Pu	942420	1.06E-23	6.23E-09	6.05E-08	2.01E-07	4.42E-07	7.83E-07	1.22E-06
<sup>241</sup> Am	952410	5.65E-19	1.01E-07	5.15E-07	1.20E-06	2.07E-06	3.07E-06	4.17E-06
<sup>242m</sup> Am	952421	5.33E-30	1.02E-11	1.90E-10	9.15E-10	2.58E-09	5.51E-09	9.92E-09
<sup>243</sup> Am	952430	7.21E-29	1.51E-10	3.04E-09	1.55E-08	4.58E-08	1.02E-07	1.89E-07

Table 22. BWR Isotopics as a Function of 3.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.44E-05	2.76E-05	3.38E-05	3.97E-05	4.53E-05	5.07E-05	5.58E-05
<sup>99</sup> Tc	430990	2.49E-05	2.81E-05	3.44E-05	4.03E-05	4.61E-05	5.15E-05	5.67E-05
<sup>101</sup> Ru	441010	2.27E-05	2.57E-05	3.19E-05	3.79E-05	4.38E-05	4.97E-05	5.54E-05
<sup>103</sup> Rh	451030	1.63E-05	1.82E-05	2.18E-05	2.52E-05	2.83E-05	3.13E-05	3.40E-05
<sup>109</sup> Ag	471090	2.01E-06	2.33E-06	3.04E-06	3.82E-06	4.64E-06	5.50E-06	6.38E-06
<sup>143</sup> Nd	601430	2.13E-05	2.39E-05	2.88E-05	3.32E-05	3.71E-05	4.05E-05	4.35E-05
<sup>145</sup> Nd	601450	1.45E-05	1.64E-05	1.99E-05	2.31E-05	2.62E-05	2.90E-05	3.17E-05
<sup>147</sup> Sm	621470	4.70E-06	5.11E-06	5.82E-06	6.42E-06	6.91E-06	7.30E-06	7.62E-06
<sup>149</sup> Sm	621490	5.49E-07	5.68E-07	5.99E-07	6.24E-07	6.45E-07	6.63E-07	6.80E-07
<sup>150</sup> Sm	621500	5.73E-06	6.63E-06	8.39E-06	1.01E-05	1.17E-05	1.33E-05	1.48E-05
<sup>151</sup> Sm	621510	1.11E-06	1.20E-06	1.38E-06	1.55E-06	1.71E-06	1.86E-06	2.01E-06
<sup>152</sup> Sm	621520	2.17E-06	2.44E-06	2.94E-06	3.40E-06	3.84E-06	4.25E-06	4.63E-06
<sup>151</sup> Eu	631510	4.69E-08	5.08E-08	5.84E-08	6.56E-08	7.25E-08	7.92E-08	8.56E-08
<sup>153</sup> Eu	631530	1.86E-06	2.21E-06	2.92E-06	3.64E-06	4.36E-06	5.05E-06	5.70E-06
<sup>155</sup> Gd	641550	6.42E-08	7.85E-08	1.12E-07	1.52E-07	1.96E-07	2.43E-07	2.92E-07
<sup>233</sup> U	922330	8.78E-11	9.18E-11	9.85E-11	1.04E-10	1.08E-10	1.12E-10	1.14E-10
<sup>234</sup> U	922340	5.05E-06	4.86E-06	4.53E-06	4.24E-06	3.98E-06	3.76E-06	3.58E-06
<sup>235</sup> U	922350	5.14E-04	4.71E-04	3.96E-04	3.32E-04	2.77E-04	2.30E-04	1.91E-04
<sup>236</sup> U	922360	8.02E-05	8.61E-05	9.59E-05	1.03E-04	1.09E-04	1.13E-04	1.16E-04
<sup>238</sup> U	922380	2.25E-02	2.25E-02	2.24E-02	2.23E-02	2.22E-02	2.20E-02	2.19E-02
<sup>237</sup> Np	932370	9.52E-06	1.09E-05	1.37E-05	1.63E-05	1.87E-05	2.09E-05	2.30E-05
<sup>238</sup> Pu	942380	1.96E-06	2.50E-06	3.80E-06	5.38E-06	7.21E-06	9.26E-06	1.15E-05
<sup>239</sup> Pu	942390	3.15E-04	3.32E-04	3.59E-04	3.80E-04	3.97E-04	4.10E-04	4.21E-04
<sup>240</sup> Pu	942400	3.51E-05	3.94E-05	4.82E-05	5.70E-05	6.56E-05	7.38E-05	8.15E-05
<sup>241</sup> Pu	942410	1.61E-05	1.88E-05	2.46E-05	3.03E-05	3.56E-05	4.03E-05	4.46E-05
<sup>242</sup> Pu	942420	1.61E-06	2.15E-06	3.56E-06	5.35E-06	7.44E-06	9.77E-06	1.23E-05
<sup>241</sup> Am	952410	4.97E-06	5.90E-06	7.91E-06	9.95E-06	1.19E-05	1.37E-05	1.54E-05
<sup>242m</sup> Am	952421	1.40E-08	1.98E-08	3.52E-08	5.42E-08	7.50E-08	9.66E-08	1.18E-07
<sup>243</sup> Am	952430	2.84E-07	4.36E-07	9.19E-07	1.65E-06	2.63E-06	3.82E-06	5.19E-06

Table 22. BWR Isotopics as a Function of 3.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.59E-02	4.57E-02	4.55E-02	4.53E-02	4.51E-02
<sup>95</sup> Mo	420950	6.06E-05	6.53E-05	6.97E-05	7.40E-05	7.81E-05	8.21E-05
<sup>99</sup> Tc	430990	6.17E-05	6.65E-05	7.10E-05	7.53E-05	7.95E-05	8.35E-05
<sup>101</sup> Ru	441010	6.10E-05	6.65E-05	7.19E-05	7.72E-05	8.24E-05	8.75E-05
<sup>103</sup> Rh	451030	3.64E-05	3.87E-05	4.07E-05	4.26E-05	4.43E-05	4.58E-05
<sup>109</sup> Ag	471090	7.28E-06	8.17E-06	9.07E-06	9.95E-06	1.08E-05	1.17E-05
<sup>143</sup> Nd	601430	4.62E-05	4.85E-05	5.05E-05	5.23E-05	5.38E-05	5.52E-05
<sup>145</sup> Nd	601450	3.42E-05	3.66E-05	3.88E-05	4.09E-05	4.28E-05	4.47E-05
<sup>147</sup> Sm	621470	7.87E-06	8.06E-06	8.22E-06	8.33E-06	8.42E-06	8.49E-06
<sup>149</sup> Sm	621490	6.96E-07	7.11E-07	7.27E-07	7.42E-07	7.58E-07	7.74E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.88E-05	2.01E-05	2.12E-05	2.24E-05
<sup>151</sup> Sm	621510	2.16E-06	2.29E-06	2.43E-06	2.55E-06	2.67E-06	2.78E-06
<sup>152</sup> Sm	621520	4.98E-06	5.32E-06	5.63E-06	5.93E-06	6.21E-06	6.47E-06
<sup>151</sup> Eu	631510	9.17E-08	9.76E-08	1.03E-07	1.09E-07	1.14E-07	1.19E-07
<sup>153</sup> Eu	631530	6.32E-06	6.90E-06	7.45E-06	7.95E-06	8.41E-06	8.84E-06
<sup>155</sup> Gd	641550	3.42E-07	3.92E-07	4.41E-07	4.88E-07	5.35E-07	5.79E-07
<sup>233</sup> U	922330	1.17E-10	1.19E-10	1.20E-10	1.21E-10	1.23E-10	1.24E-10
<sup>234</sup> U	922340	3.44E-06	3.32E-06	3.24E-06	3.17E-06	3.13E-06	3.10E-06
<sup>235</sup> U	922350	1.58E-04	1.30E-04	1.07E-04	8.78E-05	7.20E-05	5.89E-05
<sup>236</sup> U	922360	1.18E-04	1.18E-04	1.18E-04	1.17E-04	1.15E-04	1.13E-04
<sup>238</sup> U	922380	2.18E-02	2.17E-02	2.16E-02	2.14E-02	2.13E-02	2.12E-02
<sup>237</sup> Np	932370	2.48E-05	2.64E-05	2.77E-05	2.89E-05	2.98E-05	3.05E-05
<sup>238</sup> Pu	942380	1.38E-05	1.63E-05	1.87E-05	2.11E-05	2.35E-05	2.57E-05
<sup>239</sup> Pu	942390	4.30E-04	4.37E-04	4.43E-04	4.48E-04	4.52E-04	4.55E-04
<sup>240</sup> Pu	942400	8.87E-05	9.53E-05	1.01E-04	1.07E-04	1.12E-04	1.16E-04
<sup>241</sup> Pu	942410	4.83E-05	5.16E-05	5.44E-05	5.68E-05	5.89E-05	6.07E-05
<sup>242</sup> Pu	942420	1.50E-05	1.77E-05	2.06E-05	2.35E-05	2.64E-05	2.92E-05
<sup>241</sup> Am	952410	1.68E-05	1.81E-05	1.92E-05	2.02E-05	2.11E-05	2.18E-05
<sup>242m</sup> Am	952421	1.38E-07	1.56E-07	1.73E-07	1.88E-07	2.02E-07	2.14E-07
<sup>243</sup> Am	952430	6.70E-06	8.30E-06	9.97E-06	1.17E-05	1.34E-05	1.50E-05

Table 23. BWR Isotopics as a Function of 4.0 wt%  $^{235}\text{U}$  and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
$^{16}\text{O}$	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
$^{95}\text{Mo}$	420950	1.61E-09	3.88E-06	7.61E-06	1.12E-05	1.47E-05	1.81E-05	2.13E-05
$^{99}\text{Tc}$	430990	1.56E-09	3.88E-06	7.65E-06	1.13E-05	1.49E-05	1.83E-05	2.17E-05
$^{101}\text{Ru}$	441010	1.34E-09	3.31E-06	6.60E-06	9.88E-06	1.31E-05	1.63E-05	1.95E-05
$^{103}\text{Rh}$	451030	9.24E-10	2.33E-06	4.74E-06	7.14E-06	9.52E-06	1.19E-05	1.42E-05
$^{109}\text{Ag}$	471090	1.97E-11	1.09E-07	3.10E-07	5.71E-07	8.75E-07	1.21E-06	1.57E-06
$^{143}\text{Nd}$	601430	1.46E-09	3.49E-06	6.80E-06	9.97E-06	1.30E-05	1.59E-05	1.88E-05
$^{145}\text{Nd}$	601450	1.00E-09	2.38E-06	4.64E-06	6.81E-06	8.88E-06	1.09E-05	1.28E-05
$^{147}\text{Sm}$	621470	4.42E-10	9.92E-07	1.85E-06	2.59E-06	3.26E-06	3.85E-06	4.39E-06
$^{149}\text{Sm}$	621490	2.94E-10	2.63E-07	3.41E-07	4.05E-07	4.61E-07	5.14E-07	5.62E-07
$^{150}\text{Sm}$	621500	7.92E-15	5.01E-07	1.27E-06	2.09E-06	2.95E-06	3.84E-06	4.73E-06
$^{151}\text{Sm}$	621510	1.18E-10	2.46E-07	4.39E-07	6.04E-07	7.53E-07	8.92E-07	1.03E-06
$^{152}\text{Sm}$	621520	7.86E-11	2.49E-07	5.56E-07	8.83E-07	1.21E-06	1.54E-06	1.86E-06
$^{151}\text{Eu}$	631510	4.65E-12	9.91E-09	1.80E-08	2.50E-08	3.14E-08	3.75E-08	4.34E-08
$^{153}\text{Eu}$	631530	5.39E-11	1.48E-07	3.42E-07	5.77E-07	8.47E-07	1.14E-06	1.46E-06
$^{155}\text{Gd}$	641550	6.64E-12	9.77E-09	1.57E-08	2.20E-08	2.95E-08	3.87E-08	4.96E-08
$^{233}\text{U}$	922330	8.90E-15	2.10E-11	3.95E-11	5.56E-11	6.97E-11	8.20E-11	9.28E-11
$^{234}\text{U}$	922340	8.46E-06	7.99E-06	7.57E-06	7.17E-06	6.82E-06	6.49E-06	6.18E-06
$^{235}\text{U}$	922350	9.70E-04	9.05E-04	8.47E-04	7.95E-04	7.47E-04	7.03E-04	6.62E-04
$^{238}\text{U}$	922360	4.45E-06	2.10E-05	3.55E-05	4.84E-05	6.01E-05	7.06E-05	8.01E-05
$^{238}\text{U}$	922380	2.30E-02	2.29E-02	2.28E-02	2.27E-02	2.27E-02	2.26E-02	2.25E-02
$^{237}\text{Np}$	932370	2.16E-10	7.68E-07	1.88E-06	3.23E-06	4.75E-06	6.38E-06	8.09E-06
$^{238}\text{Pu}$	942380	5.28E-18	2.20E-08	1.10E-07	2.80E-07	5.44E-07	9.07E-07	1.37E-06
$^{239}\text{Pu}$	942390	2.79E-08	6.37E-05	1.18E-04	1.66E-04	2.10E-04	2.49E-04	2.86E-04
$^{240}\text{Pu}$	942400	2.45E-13	1.98E-06	5.94E-06	1.08E-05	1.62E-05	2.20E-05	2.81E-05
$^{241}\text{Pu}$	942410	1.65E-18	2.89E-07	1.51E-06	3.52E-06	6.09E-06	9.01E-06	1.22E-05
$^{242}\text{Pu}$	942420	7.41E-24	4.41E-09	4.49E-08	1.55E-07	3.49E-07	6.32E-07	1.00E-06
$^{241}\text{Am}$	952410	4.49E-19	8.01E-08	4.25E-07	1.01E-06	1.79E-06	2.70E-06	3.71E-06
$^{242m}\text{Am}$	952421	3.79E-30	7.36E-12	1.45E-10	7.23E-10	2.10E-09	4.58E-09	8.40E-09
$^{243}\text{Am}$	952430	4.64E-29	9.87E-11	2.08E-09	1.10E-08	3.35E-08	7.62E-08	1.45E-07



Table 23. BWR Isotopics as a Function of 4.0 wt%  $^{235}\text{U}$  and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
$^{16}\text{O}$	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
$^{95}\text{Mo}$	420950	2.48E-05	2.81E-05	3.44E-05	4.05E-05	4.62E-05	5.17E-05	5.70E-05
$^{99}\text{Tc}$	430990	2.51E-05	2.84E-05	3.47E-05	4.08E-05	4.66E-05	5.22E-05	5.75E-05
$^{101}\text{Ru}$	441010	2.26E-05	2.57E-05	3.19E-05	3.79E-05	4.39E-05	4.97E-05	5.55E-05
$^{103}\text{Rh}$	451030	1.60E-05	1.79E-05	2.15E-05	2.49E-05	2.81E-05	3.10E-05	3.38E-05
$^{109}\text{Ag}$	471090	1.83E-06	2.13E-06	2.79E-06	3.53E-06	4.31E-06	5.14E-06	5.99E-06
$^{143}\text{Nd}$	601430	2.17E-05	2.44E-05	2.95E-05	3.41E-05	3.82E-05	4.19E-05	4.51E-05
$^{145}\text{Nd}$	601450	1.48E-05	1.66E-05	2.02E-05	2.36E-05	2.67E-05	2.97E-05	3.25E-05
$^{147}\text{Sm}$	621470	4.86E-06	5.29E-06	6.06E-06	6.71E-06	7.24E-06	7.67E-06	8.02E-06
$^{149}\text{Sm}$	621490	5.83E-07	6.01E-07	6.32E-07	6.56E-07	6.76E-07	6.93E-07	7.08E-07
$^{150}\text{Sm}$	621500	5.63E-06	6.53E-06	8.27E-06	9.97E-06	1.16E-05	1.32E-05	1.47E-05
$^{151}\text{Sm}$	621510	1.13E-06	1.22E-06	1.40E-06	1.56E-06	1.72E-06	1.88E-06	2.03E-06
$^{152}\text{Sm}$	621520	2.14E-06	2.41E-06	2.91E-06	3.39E-06	3.83E-06	4.25E-06	4.64E-06
$^{151}\text{Eu}$	631510	4.78E-08	5.18E-08	5.93E-08	6.65E-08	7.34E-08	8.01E-08	8.64E-08
$^{153}\text{Eu}$	631530	1.78E-06	2.11E-06	2.81E-06	3.53E-06	4.24E-06	4.93E-06	5.59E-06
$^{155}\text{Gd}$	641550	6.09E-08	7.41E-08	1.06E-07	1.43E-07	1.86E-07	2.31E-07	2.80E-07
$^{233}\text{U}$	922330	9.78E-11	1.02E-10	1.10E-10	1.17E-10	1.22E-10	1.26E-10	1.30E-10
$^{234}\text{U}$	922340	5.97E-06	5.76E-06	5.38E-06	5.04E-06	4.73E-06	4.47E-06	4.25E-06
$^{235}\text{U}$	922350	6.12E-04	5.66E-04	4.84E-04	4.12E-04	3.50E-04	2.96E-04	2.49E-04
$^{236}\text{U}$	922360	8.74E-05	9.42E-05	1.06E-04	1.15E-04	1.22E-04	1.28E-04	1.32E-04
$^{238}\text{U}$	922380	2.25E-02	2.24E-02	2.23E-02	2.22E-02	2.21E-02	2.20E-02	2.19E-02
$^{237}\text{Np}$	932370	9.54E-06	1.10E-05	1.38E-05	1.66E-05	1.92E-05	2.17E-05	2.40E-05
$^{238}\text{Pu}$	942380	1.82E-06	2.34E-06	3.58E-06	5.11E-06	6.91E-06	8.96E-06	1.12E-05
$^{239}\text{Pu}$	942390	3.05E-04	3.22E-04	3.51E-04	3.73E-04	3.91E-04	4.05E-04	4.17E-04
$^{240}\text{Pu}$	942400	3.21E-05	3.62E-05	4.46E-05	5.32E-05	6.17E-05	7.00E-05	7.78E-05
$^{241}\text{Pu}$	942410	1.44E-05	1.70E-05	2.25E-05	2.80E-05	3.33E-05	3.82E-05	4.26E-05
$^{242}\text{Pu}$	942420	1.33E-06	1.79E-06	3.03E-06	4.62E-06	6.51E-06	8.64E-06	1.10E-05
$^{241}\text{Am}$	952410	4.45E-06	5.31E-06	7.23E-06	9.22E-06	1.12E-05	1.30E-05	1.47E-05
$^{242m}\text{Am}$	952421	1.20E-08	1.72E-08	3.15E-08	4.96E-08	7.03E-08	9.21E-08	1.14E-07
$^{243}\text{Am}$	952430	2.20E-07	3.41E-07	7.35E-07	1.35E-06	2.19E-06	3.24E-06	4.46E-06

Table 23. BWR Isotopics as a Function of 4.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.20E-05	6.68E-05	7.14E-05	7.57E-05	8.00E-05	8.40E-05
<sup>99</sup> Tc	430990	6.26E-05	6.75E-05	7.21E-05	7.66E-05	8.08E-05	8.48E-05
<sup>101</sup> Ru	441010	6.11E-05	6.67E-05	7.21E-05	7.74E-05	8.26E-05	8.77E-05
<sup>103</sup> Rh	451030	3.63E-05	3.86E-05	4.07E-05	4.26E-05	4.44E-05	4.60E-05
<sup>109</sup> Ag	471090	6.86E-06	7.74E-06	8.62E-06	9.50E-06	1.04E-05	1.12E-05
<sup>143</sup> Nd	601430	4.80E-05	5.05E-05	5.27E-05	5.46E-05	5.63E-05	5.77E-05
<sup>145</sup> Nd	601450	3.50E-05	3.75E-05	3.97E-05	4.19E-05	4.39E-05	4.58E-05
<sup>147</sup> Sm	621470	8.29E-06	8.49E-06	8.65E-06	8.76E-06	8.84E-06	8.90E-06
<sup>149</sup> Sm	621490	7.22E-07	7.36E-07	7.50E-07	7.64E-07	7.78E-07	7.92E-07
<sup>150</sup> Sm	621500	1.61E-05	1.75E-05	1.88E-05	2.01E-05	2.13E-05	2.24E-05
<sup>151</sup> Sm	621510	2.17E-06	2.31E-06	2.44E-06	2.57E-06	2.69E-06	2.80E-06
<sup>152</sup> Sm	621520	5.00E-06	5.34E-06	5.66E-06	5.96E-06	6.25E-06	6.51E-06
<sup>151</sup> Eu	631510	9.25E-08	9.84E-08	1.04E-07	1.09E-07	1.15E-07	1.20E-07
<sup>153</sup> Eu	631530	6.22E-06	6.82E-06	7.37E-06	7.89E-06	8.37E-06	8.81E-06
<sup>155</sup> Gd	641550	3.29E-07	3.80E-07	4.30E-07	4.79E-07	5.26E-07	5.72E-07
<sup>233</sup> U	922330	1.32E-10	1.35E-10	1.36E-10	1.38E-10	1.39E-10	1.41E-10
<sup>234</sup> U	922340	4.06E-06	3.91E-06	3.78E-06	3.69E-06	3.62E-06	3.57E-06
<sup>235</sup> U	922350	2.09E-04	1.75E-04	1.45E-04	1.21E-04	1.00E-04	8.27E-05
<sup>236</sup> U	922360	1.35E-04	1.36E-04	1.37E-04	1.36E-04	1.35E-04	1.34E-04
<sup>238</sup> U	922380	2.17E-02	2.16E-02	2.15E-02	2.14E-02	2.13E-02	2.11E-02
<sup>237</sup> Np	932370	2.60E-05	2.79E-05	2.95E-05	3.10E-05	3.21E-05	3.31E-05
<sup>238</sup> Pu	942380	1.36E-05	1.62E-05	1.88E-05	2.14E-05	2.40E-05	2.65E-05
<sup>239</sup> Pu	942390	4.27E-04	4.35E-04	4.41E-04	4.47E-04	4.51E-04	4.55E-04
<sup>240</sup> Pu	942400	8.52E-05	9.21E-05	9.85E-05	1.04E-04	1.10E-04	1.14E-04
<sup>241</sup> Pu	942410	4.65E-05	5.00E-05	5.31E-05	5.57E-05	5.80E-05	6.01E-05
<sup>242</sup> Pu	942420	1.35E-05	1.61E-05	1.88E-05	2.16E-05	2.45E-05	2.73E-05
<sup>241</sup> Am	952410	1.63E-05	1.76E-05	1.89E-05	2.00E-05	2.09E-05	2.17E-05
<sup>242m</sup> Am	952421	1.35E-07	1.55E-07	1.73E-07	1.90E-07	2.04E-07	2.17E-07
<sup>243</sup> Am	952430	5.84E-06	7.34E-06	8.92E-06	1.05E-05	1.22E-05	1.39E-05

Table 24. BWR Isotopics as a Function of 4.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.79E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.61E-09	3.90E-06	7.67E-06	1.13E-05	1.49E-05	1.83E-05	2.16E-05
<sup>99</sup> Tc	430990	1.56E-09	3.89E-06	7.68E-06	1.14E-05	1.49E-05	1.84E-05	2.19E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.60E-06	9.87E-06	1.31E-05	1.63E-05	1.95E-05
<sup>103</sup> Rh	451030	9.18E-10	2.31E-06	4.67E-06	7.03E-06	9.36E-06	1.17E-05	1.39E-05
<sup>108</sup> Ag	471090	1.91E-11	9.82E-08	2.79E-07	5.15E-07	7.92E-07	1.10E-06	1.44E-06
<sup>143</sup> Nd	601430	1.46E-09	3.52E-06	6.87E-06	1.01E-05	1.32E-05	1.62E-05	1.91E-05
<sup>145</sup> Nd	601450	1.00E-09	2.40E-06	4.68E-06	6.87E-06	8.98E-06	1.10E-05	1.30E-05
<sup>147</sup> Sm	621470	4.42E-10	9.99E-07	1.87E-06	2.64E-06	3.33E-06	3.94E-06	4.50E-06
<sup>149</sup> Sm	621490	2.94E-10	2.89E-07	3.74E-07	4.39E-07	4.97E-07	5.49E-07	5.98E-07
<sup>150</sup> Sm	621500	7.86E-15	4.71E-07	1.22E-06	2.03E-06	2.88E-06	3.75E-06	4.64E-06
<sup>151</sup> Sm	621510	1.18E-10	2.49E-07	4.45E-07	6.14E-07	7.66E-07	9.08E-07	1.04E-06
<sup>152</sup> Sm	621520	7.82E-11	2.42E-07	5.39E-07	8.58E-07	1.18E-06	1.50E-06	1.82E-06
<sup>151</sup> Eu	631510	4.62E-12	1.00E-08	1.82E-08	2.55E-08	3.21E-08	3.83E-08	4.43E-08
<sup>153</sup> Eu	631530	5.34E-11	1.45E-07	3.30E-07	5.54E-07	8.11E-07	1.09E-06	1.40E-06
<sup>155</sup> Gd	641550	6.54E-12	9.88E-09	1.58E-08	2.18E-08	2.89E-08	3.74E-08	4.76E-08
<sup>233</sup> U	922330	9.60E-15	2.27E-11	4.28E-11	6.06E-11	7.62E-11	8.98E-11	1.02E-10
<sup>234</sup> U	922340	9.61E-06	9.12E-06	8.67E-06	8.25E-06	7.86E-06	7.50E-06	7.16E-06
<sup>235</sup> U	922350	1.09E-03	1.02E-03	9.64E-04	9.09E-04	8.58E-04	8.10E-04	7.66E-04
<sup>236</sup> U	922360	5.01E-06	2.21E-05	3.74E-05	5.12E-05	6.38E-05	7.52E-05	8.57E-05
<sup>238</sup> U	922380	2.29E-02	2.28E-02	2.27E-02	2.26E-02	2.26E-02	2.25E-02	2.24E-02
<sup>237</sup> Np	932370	2.11E-10	7.47E-07	1.83E-06	3.16E-06	4.67E-06	6.31E-06	8.03E-06
<sup>238</sup> Pu	942380	4.74E-18	1.98E-08	9.97E-08	2.56E-07	5.00E-07	8.38E-07	1.27E-06
<sup>239</sup> Pu	942390	2.60E-08	6.02E-05	1.12E-04	1.59E-04	2.02E-04	2.41E-04	2.77E-04
<sup>240</sup> Pu	942400	2.17E-13	1.72E-06	5.24E-06	9.64E-06	1.46E-05	2.00E-05	2.56E-05
<sup>241</sup> Pu	942410	1.34E-18	2.33E-07	1.26E-06	3.01E-06	5.30E-06	7.95E-06	1.08E-05
<sup>242</sup> Pu	942420	5.38E-24	3.21E-09	3.40E-08	1.21E-07	2.79E-07	5.14E-07	8.26E-07
<sup>241</sup> Am	952410	3.66E-19	6.46E-08	3.55E-07	8.67E-07	1.55E-06	2.38E-06	3.30E-06
<sup>242m</sup> Am	952421	2.79E-30	5.46E-12	1.12E-10	5.76E-10	1.72E-09	3.82E-09	7.13E-09
<sup>243</sup> Am	952430	3.13E-29	6.66E-11	1.46E-09	7.95E-09	2.49E-08	5.78E-08	1.12E-07

Table 24. BWR Isotopics as a Function of 4.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.51E-05	2.85E-05	3.49E-05	4.11E-05	4.70E-05	5.27E-05	5.81E-05
<sup>98</sup> Tc	430990	2.53E-05	2.86E-05	3.50E-05	4.12E-05	4.72E-05	5.29E-05	5.83E-05
<sup>101</sup> Ru	441010	2.26E-05	2.58E-05	3.19E-05	3.80E-05	4.39E-05	4.98E-05	5.56E-05
<sup>103</sup> Rh	451030	1.58E-05	1.77E-05	2.12E-05	2.46E-05	2.78E-05	3.08E-05	3.36E-05
<sup>109</sup> Ag	471090	1.68E-06	1.95E-06	2.58E-06	3.27E-06	4.02E-06	4.81E-06	5.63E-06
<sup>143</sup> Nd	601430	2.21E-05	2.49E-05	3.01E-05	3.49E-05	3.92E-05	4.31E-05	4.66E-05
<sup>145</sup> Nd	601450	1.50E-05	1.69E-05	2.06E-05	2.40E-05	2.72E-05	3.03E-05	3.31E-05
<sup>147</sup> Sm	621470	5.00E-06	5.47E-06	6.29E-06	6.99E-06	7.57E-06	8.04E-06	8.42E-06
<sup>149</sup> Sm	621490	6.19E-07	6.38E-07	6.68E-07	6.92E-07	7.11E-07	7.26E-07	7.40E-07
<sup>150</sup> Sm	621500	5.53E-06	6.42E-06	8.16E-06	9.85E-06	1.15E-05	1.31E-05	1.46E-05
<sup>151</sup> Sm	621510	1.14E-06	1.24E-06	1.41E-06	1.58E-06	1.74E-06	1.90E-06	2.04E-06
<sup>152</sup> Sm	621520	2.10E-06	2.38E-06	2.89E-06	3.38E-06	3.83E-06	4.25E-06	4.65E-06
<sup>151</sup> Eu	631510	4.87E-08	5.28E-08	6.04E-08	6.76E-08	7.44E-08	8.10E-08	8.74E-08
<sup>153</sup> Eu	631530	1.71E-06	2.03E-06	2.71E-06	3.42E-06	4.12E-06	4.81E-06	5.48E-06
<sup>155</sup> Gd	641550	5.81E-08	7.04E-08	1.00E-07	1.36E-07	1.76E-07	2.21E-07	2.68E-07
<sup>233</sup> U	922330	1.08E-10	1.13E-10	1.22E-10	1.30E-10	1.36E-10	1.41E-10	1.45E-10
<sup>234</sup> U	922340	6.93E-06	6.70E-06	6.27E-06	5.88E-06	5.53E-06	5.22E-06	4.95E-06
<sup>235</sup> U	922350	7.13E-04	6.64E-04	5.76E-04	4.97E-04	4.28E-04	3.67E-04	3.13E-04
<sup>236</sup> U	922360	9.39E-05	1.01E-04	1.15E-04	1.26E-04	1.35E-04	1.42E-04	1.47E-04
<sup>238</sup> U	922380	2.24E-02	2.23E-02	2.22E-02	2.21E-02	2.20E-02	2.19E-02	2.18E-02
<sup>237</sup> Np	932370	9.49E-06	1.10E-05	1.39E-05	1.67E-05	1.95E-05	2.22E-05	2.47E-05
<sup>238</sup> Pu	942380	1.70E-06	2.18E-06	3.37E-06	4.84E-06	6.59E-06	8.61E-06	1.09E-05
<sup>239</sup> Pu	942390	2.96E-04	3.14E-04	3.43E-04	3.66E-04	3.84E-04	4.00E-04	4.13E-04
<sup>240</sup> Pu	942400	2.94E-05	3.33E-05	4.14E-05	4.97E-05	5.81E-05	6.63E-05	7.42E-05
<sup>241</sup> Pu	942410	1.29E-05	1.53E-05	2.06E-05	2.59E-05	3.11E-05	3.60E-05	4.05E-05
<sup>242</sup> Pu	942420	1.11E-06	1.51E-06	2.58E-06	4.00E-06	5.70E-06	7.66E-06	9.82E-06
<sup>241</sup> Am	952410	3.99E-06	4.80E-06	6.62E-06	8.55E-06	1.05E-05	1.23E-05	1.41E-05
<sup>242m</sup> Am	952421	1.03E-08	1.50E-08	2.82E-08	4.55E-08	6.56E-08	8.75E-08	1.10E-07
<sup>243</sup> Am	952430	1.71E-07	2.69E-07	5.92E-07	1.11E-06	1.83E-06	2.75E-06	3.84E-06

Table 24. BWR Isotopics as a Function of 4.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>18</sup> O	80160	4.62E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.32E-05	6.82E-05	7.29E-05	7.74E-05	8.17E-05	8.59E-05
<sup>99</sup> Tc	430990	6.35E-05	6.85E-05	7.32E-05	7.77E-05	8.21E-05	8.62E-05
<sup>101</sup> Ru	441010	6.13E-05	6.68E-05	7.23E-05	7.76E-05	8.28E-05	8.80E-05
<sup>103</sup> Rh	451030	3.62E-05	3.85E-05	4.07E-05	4.27E-05	4.45E-05	4.61E-05
<sup>109</sup> Ag	471090	6.47E-06	7.33E-06	8.19E-06	9.06E-06	9.93E-06	1.08E-05
<sup>143</sup> Nd	601430	4.97E-05	5.24E-05	5.48E-05	5.69E-05	5.87E-05	6.03E-05
<sup>145</sup> Nd	601450	3.58E-05	3.83E-05	4.07E-05	4.29E-05	4.50E-05	4.69E-05
<sup>147</sup> Sm	621470	8.71E-06	8.94E-06	9.10E-06	9.22E-06	9.30E-06	9.35E-06
<sup>149</sup> Sm	621490	7.52E-07	7.65E-07	7.76E-07	7.89E-07	8.01E-07	8.14E-07
<sup>150</sup> Sm	621500	1.61E-05	1.75E-05	1.88E-05	2.01E-05	2.13E-05	2.25E-05
<sup>151</sup> Sm	621510	2.19E-06	2.32E-06	2.46E-06	2.58E-06	2.70E-06	2.82E-06
<sup>152</sup> Sm	621520	5.02E-06	5.37E-06	5.69E-06	6.00E-06	6.29E-06	6.56E-06
<sup>151</sup> Eu	631510	9.35E-08	9.94E-08	1.05E-07	1.10E-07	1.16E-07	1.21E-07
<sup>153</sup> Eu	631530	6.12E-06	6.72E-06	7.29E-06	7.82E-06	8.32E-06	8.78E-06
<sup>155</sup> Gd	641550	3.17E-07	3.68E-07	4.18E-07	4.68E-07	5.17E-07	5.65E-07
<sup>233</sup> U	922330	1.48E-10	1.51E-10	1.53E-10	1.55E-10	1.56E-10	1.58E-10
<sup>234</sup> U	922340	4.72E-06	4.53E-06	4.37E-06	4.24E-06	4.14E-06	4.06E-06
<sup>235</sup> U	922350	2.66E-04	2.25E-04	1.90E-04	1.60E-04	1.34E-04	1.12E-04
<sup>236</sup> U	922360	1.51E-04	1.54E-04	1.56E-04	1.56E-04	1.55E-04	1.54E-04
<sup>238</sup> U	922380	2.17E-02	2.16E-02	2.14E-02	2.13E-02	2.12E-02	2.11E-02
<sup>237</sup> Np	932370	2.70E-05	2.91E-05	3.10E-05	3.27E-05	3.42E-05	3.54E-05
<sup>238</sup> Pu	942380	1.33E-05	1.59E-05	1.86E-05	2.14E-05	2.42E-05	2.69E-05
<sup>239</sup> Pu	942390	4.23E-04	4.32E-04	4.39E-04	4.46E-04	4.51E-04	4.55E-04
<sup>240</sup> Pu	942400	8.18E-05	8.89E-05	9.55E-05	1.02E-04	1.07E-04	1.12E-04
<sup>241</sup> Pu	942410	4.46E-05	4.83E-05	5.16E-05	5.45E-05	5.70E-05	5.92E-05
<sup>242</sup> Pu	942420	1.22E-05	1.46E-05	1.72E-05	1.99E-05	2.27E-05	2.54E-05
<sup>241</sup> Am	952410	1.57E-05	1.71E-05	1.85E-05	1.96E-05	2.07E-05	2.16E-05
<sup>242m</sup> Am	952421	1.32E-07	1.53E-07	1.73E-07	1.91E-07	2.07E-07	2.21E-07
<sup>243</sup> Am	952430	5.10E-06	6.48E-06	7.96E-06	9.51E-06	1.11E-05	1.27E-05

Table 25. BWR Isotopics as a Function of 5.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.79E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.61E-09	3.92E-06	7.73E-06	1.14E-05	1.50E-05	1.85E-05	2.19E-05
<sup>99</sup> Tc	430990	1.56E-09	3.90E-06	7.70E-06	1.14E-05	1.50E-05	1.85E-05	2.20E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.60E-06	9.87E-06	1.31E-05	1.63E-05	1.95E-05
<sup>103</sup> Rh	451030	9.12E-10	2.28E-06	4.61E-06	6.93E-06	9.23E-06	1.15E-05	1.37E-05
<sup>109</sup> Ag	471090	1.87E-11	8.98E-08	2.53E-07	4.68E-07	7.22E-07	1.01E-06	1.32E-06
<sup>143</sup> Nd	601430	1.47E-09	3.54E-06	6.93E-06	1.02E-05	1.33E-05	1.64E-05	1.93E-05
<sup>145</sup> Nd	601450	1.00E-09	2.41E-06	4.71E-06	6.93E-06	9.06E-06	1.11E-05	1.31E-05
<sup>147</sup> Sm	621470	4.42E-10	1.00E-06	1.89E-06	2.68E-06	3.39E-06	4.03E-06	4.61E-06
<sup>149</sup> Sm	621490	2.93E-10	3.14E-07	4.08E-07	4.75E-07	5.34E-07	5.88E-07	6.37E-07
<sup>150</sup> Sm	621500	7.82E-15	4.42E-07	1.17E-06	1.97E-06	2.81E-06	3.67E-06	4.55E-06
<sup>151</sup> Sm	621510	1.17E-10	2.50E-07	4.51E-07	6.24E-07	7.79E-07	9.22E-07	1.06E-06
<sup>152</sup> Sm	621520	7.79E-11	2.36E-07	5.25E-07	8.36E-07	1.15E-06	1.47E-06	1.79E-06
<sup>151</sup> Eu	631510	4.60E-12	1.01E-08	1.85E-08	2.59E-08	3.27E-08	3.90E-08	4.51E-08
<sup>153</sup> Eu	631530	5.30E-11	1.42E-07	3.20E-07	5.34E-07	7.80E-07	1.05E-06	1.35E-06
<sup>155</sup> Gd	641550	6.44E-12	1.00E-08	1.59E-08	2.17E-08	2.84E-08	3.64E-08	4.60E-08
<sup>233</sup> U	922330	1.03E-14	2.44E-11	4.61E-11	6.54E-11	8.24E-11	9.75E-11	1.11E-10
<sup>234</sup> U	922340	1.08E-05	1.03E-05	9.78E-06	9.34E-06	8.92E-06	8.54E-06	8.17E-06
<sup>235</sup> U	922350	1.21E-03	1.14E-03	1.08E-03	1.02E-03	9.70E-04	9.19E-04	8.72E-04
<sup>236</sup> U	922360	5.56E-06	2.32E-05	3.91E-05	5.37E-05	6.70E-05	7.93E-05	9.07E-05
<sup>238</sup> U	922380	2.27E-02	2.27E-02	2.26E-02	2.25E-02	2.25E-02	2.24E-02	2.23E-02
<sup>237</sup> Np	932370	2.06E-10	7.28E-07	1.79E-06	3.10E-06	4.59E-06	6.22E-06	7.95E-06
<sup>238</sup> Pu	942380	4.30E-18	1.80E-08	9.10E-08	2.35E-07	4.60E-07	7.75E-07	1.18E-06
<sup>239</sup> Pu	942390	2.45E-08	5.71E-05	1.07E-04	1.53E-04	1.94E-04	2.32E-04	2.68E-04
<sup>240</sup> Pu	942400	1.95E-13	1.50E-06	4.67E-06	8.67E-06	1.32E-05	1.82E-05	2.35E-05
<sup>241</sup> Pu	942410	1.12E-18	1.91E-07	1.06E-06	2.59E-06	4.63E-06	7.03E-06	9.69E-06
<sup>242</sup> Pu	942420	4.02E-24	2.39E-09	2.61E-08	9.51E-08	2.24E-07	4.21E-07	6.86E-07
<sup>241</sup> Am	952410	3.03E-19	5.29E-08	2.99E-07	7.46E-07	1.36E-06	2.10E-06	2.95E-06
<sup>242m</sup> Am	952421	2.11E-30	4.13E-12	8.76E-11	4.64E-10	1.41E-09	3.21E-09	6.08E-09
<sup>243</sup> Am	952430	2.18E-29	4.62E-11	1.04E-09	5.84E-09	1.87E-08	4.43E-08	8.72E-08

Table 25. BWR Isotopics as a Function of 5.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.54E-05	2.88E-05	3.54E-05	4.17E-05	4.78E-05	5.36E-05	5.91E-05
<sup>99</sup> Tc	430990	2.54E-05	2.88E-05	3.53E-05	4.16E-05	4.76E-05	5.34E-05	5.90E-05
<sup>101</sup> Ru	441010	2.26E-05	2.58E-05	3.19E-05	3.80E-05	4.40E-05	4.99E-05	5.57E-05
<sup>103</sup> Rh	451030	1.56E-05	1.75E-05	2.10E-05	2.44E-05	2.76E-05	3.07E-05	3.35E-05
<sup>109</sup> Ag	471090	1.55E-06	1.80E-06	2.38E-06	3.04E-06	3.75E-06	4.50E-06	5.29E-06
<sup>143</sup> Nd	601430	2.24E-05	2.53E-05	3.07E-05	3.56E-05	4.02E-05	4.43E-05	4.80E-05
<sup>145</sup> Nd	601450	1.51E-05	1.71E-05	2.08E-05	2.44E-05	2.77E-05	3.08E-05	3.38E-05
<sup>147</sup> Sm	621470	5.14E-06	5.63E-06	6.51E-06	7.26E-06	7.88E-06	8.39E-06	8.81E-06
<sup>149</sup> Sm	621490	6.58E-07	6.77E-07	7.08E-07	7.31E-07	7.49E-07	7.63E-07	7.75E-07
<sup>150</sup> Sm	621500	5.43E-06	6.31E-06	8.05E-06	9.74E-06	1.14E-05	1.30E-05	1.45E-05
<sup>151</sup> Sm	621510	1.16E-06	1.26E-06	1.43E-06	1.60E-06	1.76E-06	1.91E-06	2.06E-06
<sup>152</sup> Sm	621520	2.07E-06	2.35E-06	2.87E-06	3.36E-06	3.82E-06	4.26E-06	4.66E-06
<sup>151</sup> Eu	631510	4.97E-08	5.39E-08	6.15E-08	6.87E-08	7.56E-08	8.22E-08	8.85E-08
<sup>153</sup> Eu	631530	1.64E-06	1.95E-06	2.62E-06	3.31E-06	4.01E-06	4.70E-06	5.37E-06
<sup>155</sup> Gd	641550	5.58E-08	6.73E-08	9.52E-08	1.29E-07	1.68E-07	2.11E-07	2.57E-07
<sup>233</sup> U	922330	1.17E-10	1.23E-10	1.34E-10	1.42E-10	1.49E-10	1.55E-10	1.60E-10
<sup>234</sup> U	922340	7.92E-06	7.67E-06	7.19E-06	6.76E-06	6.36E-06	6.01E-06	5.70E-06
<sup>235</sup> U	922350	8.17E-04	7.66E-04	6.71E-04	5.87E-04	5.11E-04	4.43E-04	3.83E-04
<sup>236</sup> U	922360	9.96E-05	1.08E-04	1.23E-04	1.35E-04	1.46E-04	1.55E-04	1.62E-04
<sup>238</sup> U	922380	2.23E-02	2.22E-02	2.21E-02	2.20E-02	2.19E-02	2.18E-02	2.17E-02
<sup>237</sup> Np	932370	9.41E-06	1.09E-05	1.39E-05	1.68E-05	1.97E-05	2.25E-05	2.52E-05
<sup>238</sup> Pu	942380	1.58E-06	2.04E-06	3.16E-06	4.57E-06	6.26E-06	8.23E-06	1.05E-05
<sup>239</sup> Pu	942390	2.88E-04	3.05E-04	3.35E-04	3.59E-04	3.78E-04	3.95E-04	4.08E-04
<sup>240</sup> Pu	942400	2.71E-05	3.08E-05	3.85E-05	4.65E-05	5.47E-05	6.28E-05	7.07E-05
<sup>241</sup> Pu	942410	1.16E-05	1.39E-05	1.89E-05	2.40E-05	2.91E-05	3.40E-05	3.86E-05
<sup>242</sup> Pu	942420	9.29E-07	1.27E-06	2.22E-06	3.47E-06	5.01E-06	6.80E-06	8.79E-06
<sup>241</sup> Am	952410	3.59E-06	4.34E-06	6.07E-06	7.93E-06	9.82E-06	1.17E-05	1.34E-05
<sup>242m</sup> Am	952421	8.87E-09	1.31E-08	2.52E-08	4.16E-08	6.12E-08	8.29E-08	1.06E-07
<sup>243</sup> Am	952430	1.35E-07	2.13E-07	4.80E-07	9.15E-07	1.53E-06	2.34E-06	3.31E-06

Table 25. BWR Isotopics as a Function of 5.0 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.62E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.44E-05	6.95E-05	7.43E-05	7.90E-05	8.34E-05	8.77E-05
<sup>98</sup> Tc	430990	6.43E-05	6.94E-05	7.42E-05	7.89E-05	8.33E-05	8.75E-05
<sup>101</sup> Ru	441010	6.14E-05	6.70E-05	7.24E-05	7.78E-05	8.31E-05	8.82E-05
<sup>103</sup> Rh	451030	3.61E-05	3.85E-05	4.07E-05	4.27E-05	4.46E-05	4.63E-05
<sup>109</sup> Ag	471090	6.10E-06	6.94E-06	7.79E-06	8.64E-06	9.50E-06	1.04E-05
<sup>143</sup> Nd	601430	5.13E-05	5.42E-05	5.68E-05	5.91E-05	6.11E-05	6.28E-05
<sup>145</sup> Nd	601450	3.65E-05	3.91E-05	4.16E-05	4.38E-05	4.60E-05	4.80E-05
<sup>147</sup> Sm	621470	9.13E-06	9.38E-06	9.56E-06	9.69E-06	9.77E-06	9.82E-06
<sup>149</sup> Sm	621490	7.86E-07	7.96E-07	8.06E-07	8.16E-07	8.27E-07	8.38E-07
<sup>150</sup> Sm	621500	1.60E-05	1.74E-05	1.88E-05	2.01E-05	2.14E-05	2.26E-05
<sup>151</sup> Sm	621510	2.20E-06	2.34E-06	2.47E-06	2.60E-06	2.72E-06	2.84E-06
<sup>152</sup> Sm	621520	5.04E-06	5.39E-06	5.73E-06	6.04E-06	6.33E-06	6.61E-06
<sup>151</sup> Eu	631510	9.46E-08	1.00E-07	1.06E-07	1.12E-07	1.17E-07	1.22E-07
<sup>153</sup> Eu	631530	6.01E-06	6.63E-06	7.21E-06	7.75E-06	8.26E-06	8.74E-06
<sup>155</sup> Gd	641550	3.06E-07	3.56E-07	4.06E-07	4.57E-07	5.07E-07	5.56E-07
<sup>233</sup> U	922330	1.64E-10	1.67E-10	1.70E-10	1.72E-10	1.74E-10	1.75E-10
<sup>234</sup> U	922340	5.43E-06	5.19E-06	4.99E-06	4.83E-06	4.70E-06	4.59E-06
<sup>235</sup> U	922350	3.29E-04	2.82E-04	2.41E-04	2.05E-04	1.73E-04	1.46E-04
<sup>236</sup> U	922360	1.67E-04	1.71E-04	1.74E-04	1.75E-04	1.75E-04	1.75E-04
<sup>238</sup> U	922380	2.16E-02	2.15E-02	2.14E-02	2.13E-02	2.12E-02	2.10E-02
<sup>237</sup> Np	932370	2.77E-05	3.01E-05	3.22E-05	3.42E-05	3.59E-05	3.74E-05
<sup>238</sup> Pu	942380	1.29E-05	1.55E-05	1.83E-05	2.12E-05	2.41E-05	2.70E-05
<sup>239</sup> Pu	942390	4.20E-04	4.29E-04	4.37E-04	4.44E-04	4.50E-04	4.54E-04
<sup>240</sup> Pu	942400	7.84E-05	8.56E-05	9.25E-05	9.88E-05	1.05E-04	1.10E-04
<sup>241</sup> Pu	942410	4.27E-05	4.66E-05	5.00E-05	5.31E-05	5.58E-05	5.83E-05
<sup>242</sup> Pu	942420	1.10E-05	1.33E-05	1.58E-05	1.83E-05	2.10E-05	2.37E-05
<sup>241</sup> Am	952410	1.51E-05	1.66E-05	1.80E-05	1.93E-05	2.04E-05	2.14E-05
<sup>242m</sup> Am	952421	1.28E-07	1.51E-07	1.71E-07	1.91E-07	2.08E-07	2.24E-07
<sup>243</sup> Am	952430	4.45E-06	5.72E-06	7.10E-06	8.56E-06	1.01E-05	1.17E-05



Table 26. BWR Isotopics as a Function of 5.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.79E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.62E-09	3.94E-06	7.77E-06	1.15E-05	1.51E-05	1.86E-05	2.21E-05
<sup>99</sup> Tc	430990	1.57E-09	3.91E-06	7.73E-06	1.14E-05	1.51E-05	1.86E-05	2.21E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.60E-06	9.86E-06	1.31E-05	1.63E-05	1.95E-05
<sup>103</sup> Rh	451030	9.08E-10	2.26E-06	4.56E-06	6.85E-06	9.12E-06	1.14E-05	1.36E-05
<sup>109</sup> Ag	471090	1.83E-11	8.30E-08	2.32E-07	4.28E-07	6.62E-07	9.25E-07	1.21E-06
<sup>143</sup> Nd	601430	1.47E-09	3.56E-06	6.98E-06	1.03E-05	1.35E-05	1.66E-05	1.96E-05
<sup>145</sup> Nd	601450	1.00E-09	2.42E-06	4.74E-06	6.97E-06	9.14E-06	1.12E-05	1.33E-05
<sup>147</sup> Sm	621470	4.42E-10	1.01E-06	1.91E-06	2.71E-06	3.44E-06	4.11E-06	4.71E-06
<sup>149</sup> Sm	621490	2.93E-10	3.38E-07	4.43E-07	5.14E-07	5.74E-07	6.29E-07	6.78E-07
<sup>150</sup> Sm	621500	7.79E-15	4.15E-07	1.13E-06	1.92E-06	2.74E-06	3.59E-06	4.46E-06
<sup>151</sup> Sm	621510	1.17E-10	2.52E-07	4.56E-07	6.33E-07	7.91E-07	9.37E-07	1.07E-06
<sup>152</sup> Sm	621520	7.76E-11	2.31E-07	5.12E-07	8.16E-07	1.13E-06	1.44E-06	1.75E-06
<sup>151</sup> Eu	631510	4.59E-12	1.01E-08	1.87E-08	2.63E-08	3.33E-08	3.98E-08	4.59E-08
<sup>153</sup> Eu	631530	5.26E-11	1.39E-07	3.12E-07	5.17E-07	7.53E-07	1.01E-06	1.30E-06
<sup>155</sup> Gd	641550	6.36E-12	1.01E-08	1.61E-08	2.17E-08	2.81E-08	3.57E-08	4.48E-08
<sup>233</sup> U	922330	1.10E-14	2.60E-11	4.93E-11	7.01E-11	8.86E-11	1.05E-10	1.19E-10
<sup>234</sup> U	922340	1.19E-05	1.14E-05	1.09E-05	1.04E-05	1.00E-05	9.60E-06	9.21E-06
<sup>235</sup> U	922350	1.33E-03	1.26E-03	1.20E-03	1.14E-03	1.08E-03	1.03E-03	9.80E-04
<sup>236</sup> U	922360	6.12E-06	2.42E-05	4.07E-05	5.59E-05	7.00E-05	8.31E-05	9.52E-05
<sup>238</sup> U	922380	2.26E-02	2.25E-02	2.25E-02	2.24E-02	2.23E-02	2.23E-02	2.22E-02
<sup>237</sup> Np	932370	2.02E-10	7.10E-07	1.75E-06	3.03E-06	4.50E-06	6.12E-06	7.84E-06
<sup>238</sup> Pu	942380	3.94E-18	1.65E-08	8.35E-08	2.16E-07	4.25E-07	7.19E-07	1.10E-06
<sup>239</sup> Pu	942390	2.32E-08	5.43E-05	1.03E-04	1.47E-04	1.87E-04	2.25E-04	2.60E-04
<sup>240</sup> Pu	942400	1.76E-13	1.33E-06	4.18E-06	7.84E-06	1.20E-05	1.67E-05	2.16E-05
<sup>241</sup> Pu	942410	9.40E-19	1.58E-07	8.99E-07	2.24E-06	4.07E-06	6.25E-06	8.69E-06
<sup>242</sup> Pu	942420	3.07E-24	1.81E-09	2.03E-08	7.58E-08	1.82E-07	3.47E-07	5.73E-07
<sup>241</sup> Am	952410	2.55E-19	4.38E-08	2.53E-07	6.45E-07	1.19E-06	1.87E-06	2.64E-06
<sup>242m</sup> Am	952421	1.63E-30	3.17E-12	6.93E-11	3.77E-10	1.17E-09	2.70E-09	5.19E-09
<sup>243</sup> Am	952430	1.57E-29	3.28E-11	7.61E-10	4.36E-09	1.42E-08	3.43E-08	6.85E-08

Table 26. BWR Isotopics as a Function of 5.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.64E-02
<sup>95</sup> Mo	420950	2.56E-05	2.91E-05	3.58E-05	4.22E-05	4.84E-05	5.43E-05	6.00E-05
<sup>99</sup> Tc	430990	2.56E-05	2.90E-05	3.56E-05	4.20E-05	4.81E-05	5.40E-05	5.96E-05
<sup>101</sup> Ru	441010	2.27E-05	2.58E-05	3.19E-05	3.80E-05	4.41E-05	5.00E-05	5.58E-05
<sup>103</sup> Rh	451030	1.54E-05	1.73E-05	2.09E-05	2.43E-05	2.75E-05	3.05E-05	3.34E-05
<sup>109</sup> Ag	471090	1.43E-06	1.67E-06	2.22E-06	2.83E-06	3.51E-06	4.23E-06	4.98E-06
<sup>143</sup> Nd	601430	2.27E-05	2.56E-05	3.12E-05	3.63E-05	4.10E-05	4.53E-05	4.92E-05
<sup>145</sup> Nd	601450	1.53E-05	1.73E-05	2.11E-05	2.47E-05	2.81E-05	3.13E-05	3.44E-05
<sup>147</sup> Sm	621470	5.26E-06	5.78E-06	6.71E-06	7.51E-06	8.18E-06	8.74E-06	9.19E-06
<sup>149</sup> Sm	621490	7.00E-07	7.19E-07	7.50E-07	7.73E-07	7.89E-07	8.03E-07	8.13E-07
<sup>150</sup> Sm	621500	5.34E-06	6.21E-06	7.93E-06	9.62E-06	1.13E-05	1.29E-05	1.44E-05
<sup>151</sup> Sm	621510	1.18E-06	1.28E-06	1.46E-06	1.62E-06	1.78E-06	1.93E-06	2.08E-06
<sup>152</sup> Sm	621520	2.04E-06	2.32E-06	2.85E-06	3.35E-06	3.82E-06	4.26E-06	4.67E-06
<sup>151</sup> Eu	631510	5.07E-08	5.50E-08	6.28E-08	7.00E-08	7.68E-08	8.34E-08	8.97E-08
<sup>153</sup> Eu	631530	1.58E-06	1.89E-06	2.53E-06	3.21E-06	3.90E-06	4.59E-06	5.26E-06
<sup>155</sup> Gd	641550	5.39E-08	6.47E-08	9.09E-08	1.23E-07	1.60E-07	2.02E-07	2.47E-07
<sup>233</sup> U	922330	1.27E-10	1.33E-10	1.45E-10	1.55E-10	1.63E-10	1.70E-10	1.75E-10
<sup>234</sup> U	922340	8.93E-06	8.66E-06	8.15E-06	7.67E-06	7.23E-06	6.84E-06	6.48E-06
<sup>235</sup> U	922350	9.23E-04	8.69E-04	7.70E-04	6.80E-04	5.98E-04	5.25E-04	4.58E-04
<sup>236</sup> U	922360	1.05E-04	1.14E-04	1.30E-04	1.44E-04	1.56E-04	1.67E-04	1.75E-04
<sup>238</sup> U	922380	2.22E-02	2.21E-02	2.20E-02	2.19E-02	2.18E-02	2.17E-02	2.16E-02
<sup>237</sup> Np	932370	9.30E-06	1.08E-05	1.38E-05	1.68E-05	1.98E-05	2.27E-05	2.56E-05
<sup>238</sup> Pu	942380	1.47E-06	1.91E-06	2.97E-06	4.31E-06	5.94E-06	7.85E-06	1.00E-05
<sup>239</sup> Pu	942390	2.79E-04	2.97E-04	3.27E-04	3.52E-04	3.72E-04	3.89E-04	4.04E-04
<sup>240</sup> Pu	942400	2.50E-05	2.85E-05	3.59E-05	4.36E-05	5.16E-05	5.95E-05	6.74E-05
<sup>241</sup> Pu	942410	1.05E-05	1.26E-05	1.73E-05	2.23E-05	2.72E-05	3.21E-05	3.66E-05
<sup>242</sup> Pu	942420	7.82E-07	1.08E-06	1.91E-06	3.03E-06	4.42E-06	6.04E-06	7.89E-06
<sup>241</sup> Am	952410	3.23E-06	3.94E-06	5.57E-06	7.36E-06	9.20E-06	1.10E-05	1.28E-05
<sup>242m</sup> Am	952421	7.67E-09	1.14E-08	2.26E-08	3.80E-08	5.70E-08	7.84E-08	1.01E-07
<sup>243</sup> Am	952430	1.07E-07	1.71E-07	3.91E-07	7.59E-07	1.29E-06	1.99E-06	2.86E-06

Table 26. BWR Isotopics as a Function of 5.5 wt% <sup>235</sup>U and Burnup, 5 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.62E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.55E-05	7.07E-05	7.57E-05	8.04E-05	8.50E-05	8.94E-05
<sup>99</sup> Tc	430990	6.51E-05	7.03E-05	7.52E-05	8.00E-05	8.45E-05	8.88E-05
<sup>101</sup> Ru	441010	6.15E-05	6.71E-05	7.26E-05	7.80E-05	8.33E-05	8.85E-05
<sup>103</sup> Rh	451030	3.60E-05	3.84E-05	4.07E-05	4.28E-05	4.47E-05	4.65E-05
<sup>109</sup> Ag	471090	5.77E-06	6.57E-06	7.40E-06	8.24E-06	9.08E-06	9.93E-06
<sup>143</sup> Nd	601430	5.27E-05	5.59E-05	5.87E-05	6.11E-05	6.33E-05	6.52E-05
<sup>145</sup> Nd	601450	3.72E-05	3.99E-05	4.24E-05	4.48E-05	4.70E-05	4.90E-05
<sup>147</sup> Sm	621470	9.55E-06	9.83E-06	1.00E-05	1.02E-05	1.03E-05	1.03E-05
<sup>149</sup> Sm	621490	8.23E-07	8.31E-07	8.39E-07	8.48E-07	8.56E-07	8.66E-07
<sup>150</sup> Sm	621500	1.59E-05	1.74E-05	1.88E-05	2.01E-05	2.14E-05	2.26E-05
<sup>151</sup> Sm	621510	2.22E-06	2.36E-06	2.49E-06	2.62E-06	2.74E-06	2.86E-06
<sup>152</sup> Sm	621520	5.06E-06	5.42E-06	5.76E-06	6.08E-06	6.38E-06	6.66E-06
<sup>151</sup> Eu	631510	9.58E-08	1.02E-07	1.07E-07	1.13E-07	1.18E-07	1.23E-07
<sup>153</sup> Eu	631530	5.91E-06	6.53E-06	7.12E-06	7.68E-06	8.20E-06	8.69E-06
<sup>155</sup> Gd	641550	2.94E-07	3.44E-07	3.95E-07	4.46E-07	4.97E-07	5.46E-07
<sup>233</sup> U	922330	1.80E-10	1.83E-10	1.86E-10	1.89E-10	1.91E-10	1.93E-10
<sup>234</sup> U	922340	6.17E-06	5.89E-06	5.66E-06	5.45E-06	5.29E-06	5.15E-06
<sup>235</sup> U	922350	3.98E-04	3.45E-04	2.97E-04	2.55E-04	2.18E-04	1.86E-04
<sup>236</sup> U	922360	1.82E-04	1.87E-04	1.91E-04	1.93E-04	1.95E-04	1.95E-04
<sup>238</sup> U	922380	2.15E-02	2.14E-02	2.13E-02	2.12E-02	2.11E-02	2.10E-02
<sup>237</sup> Np	932370	2.83E-05	3.08E-05	3.32E-05	3.53E-05	3.73E-05	3.90E-05
<sup>238</sup> Pu	942380	1.24E-05	1.51E-05	1.79E-05	2.08E-05	2.38E-05	2.69E-05
<sup>239</sup> Pu	942390	4.16E-04	4.26E-04	4.35E-04	4.42E-04	4.48E-04	4.53E-04
<sup>240</sup> Pu	942400	7.50E-05	8.24E-05	8.94E-05	9.60E-05	1.02E-04	1.08E-04
<sup>241</sup> Pu	942410	4.09E-05	4.48E-05	4.84E-05	5.16E-05	5.46E-05	5.72E-05
<sup>242</sup> Pu	942420	9.91E-06	1.21E-05	1.44E-05	1.69E-05	1.94E-05	2.20E-05
<sup>241</sup> Am	952410	1.45E-05	1.61E-05	1.75E-05	1.88E-05	2.00E-05	2.11E-05
<sup>242m</sup> Am	952421	1.25E-07	1.48E-07	1.70E-07	1.90E-07	2.09E-07	2.26E-07
<sup>243</sup> Am	952430	3.88E-06	5.05E-06	6.32E-06	7.70E-06	9.15E-06	1.06E-05

6.2 SAS2H RESULTS, 10 YEAR DECAY

The resulting isotopics calculated by SAS2H are presented in Tables 27 through 35 (10,000 year decay). Each table is based on a single enrichment and includes all selected burnup steps from 0.001 to 75 GWd/mtU. The outputs (isotopic concentrations) are reasonable when compared to the inputs and outputs and are suitable for the intended use. Confirmation is provided in Section 6.3 of this report.

Table 27. BWR Isotopics as a Function of 1.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.55E-09	3.59E-06	6.96E-06	1.02E-05	1.32E-05	1.62E-05	1.91E-05
<sup>99</sup> Tc	430990	1.48E-09	3.64E-06	7.14E-06	1.05E-05	1.38E-05	1.69E-05	2.00E-05
<sup>101</sup> Ru	441010	1.34E-09	3.32E-06	6.66E-06	9.96E-06	1.32E-05	1.65E-05	1.97E-05
<sup>103</sup> Rh	451030	9.92E-10	2.68E-06	5.51E-06	8.30E-06	1.10E-05	1.36E-05	1.61E-05
<sup>108</sup> Ag	471090	2.54E-11	2.42E-07	6.51E-07	1.12E-06	1.62E-06	2.13E-06	2.65E-06
<sup>143</sup> Nd	601430	1.40E-09	3.20E-06	6.11E-06	8.86E-06	1.15E-05	1.40E-05	1.65E-05
<sup>145</sup> Nd	601450	9.81E-10	2.23E-06	4.28E-06	6.21E-06	8.05E-06	9.82E-06	1.15E-05
<sup>147</sup> Sm	621470	5.96E-10	1.25E-06	2.20E-06	2.98E-06	3.63E-06	4.19E-06	4.69E-06
<sup>149</sup> Sm	621490	3.02E-10	1.46E-07	2.12E-07	2.71E-07	3.25E-07	3.77E-07	4.25E-07
<sup>150</sup> Sm	621500	8.79E-15	6.62E-07	1.51E-06	2.42E-06	3.35E-06	4.28E-06	5.20E-06
<sup>151</sup> Sm	621510	1.83E-39	3.31E-36	5.75E-36	7.94E-36	1.00E-35	1.21E-35	1.41E-35
<sup>152</sup> Sm	621520	8.30E-11	3.21E-07	7.03E-07	1.08E-06	1.43E-06	1.76E-06	2.08E-06
<sup>151</sup> Eu	631510	1.30E-10	2.36E-07	4.10E-07	5.67E-07	7.16E-07	8.61E-07	1.00E-06
<sup>153</sup> Eu	631530	5.98E-11	1.89E-07	4.62E-07	7.91E-07	1.15E-06	1.53E-06	1.92E-06
<sup>155</sup> Gd	641550	1.50E-11	1.88E-08	3.31E-08	5.04E-08	7.17E-08	9.71E-08	1.26E-07
<sup>233</sup> U	922330	9.02E-13	7.50E-09	2.41E-08	4.47E-08	6.69E-08	8.95E-08	1.12E-07
<sup>234</sup> U	922340	2.88E-06	2.66E-06	2.60E-06	2.68E-06	2.90E-06	3.23E-06	3.68E-06
<sup>235</sup> U	922350	3.64E-04	3.41E-04	3.24E-04	3.11E-04	3.00E-04	2.91E-04	2.84E-04
<sup>236</sup> U	922360	1.67E-06	1.60E-05	2.90E-05	4.05E-05	5.09E-05	6.04E-05	6.93E-05
<sup>238</sup> U	922380	2.36E-02	2.35E-02	2.33E-02	2.32E-02	2.31E-02	2.30E-02	2.29E-02
<sup>237</sup> Np	932370	2.83E-10	2.45E-06	7.96E-06	1.48E-05	2.22E-05	2.97E-05	3.71E-05
<sup>238</sup> Pu	942380	1.40E-45	1.28E-27	4.49E-31	1.72E-30	4.16E-30	7.91E-30	1.30E-29
<sup>239</sup> Pu	942390	3.60E-08	7.02E-05	1.21E-04	1.62E-04	1.97E-04	2.28E-04	2.56E-04
<sup>240</sup> Pu	942400	2.35E-13	1.79E-06	4.50E-06	7.38E-06	1.03E-05	1.32E-05	1.61E-05
<sup>241</sup> Pu	942410	0.00E+00	4.29E-16	2.28E-14	1.92E-13	7.92E-13	2.24E-12	5.03E-12
<sup>242</sup> Pu	942420	9.06E-23	3.59E-08	2.47E-07	6.62E-07	1.25E-06	1.97E-06	2.79E-06
<sup>241</sup> Am	952410	1.25E-24	1.84E-13	1.37E-12	7.32E-12	2.69E-11	7.31E-11	1.62E-10
<sup>242m</sup> Am	952421	1.40E-45	9.34E-28	3.28E-31	1.26E-30	3.05E-30	5.79E-30	9.51E-30
<sup>243</sup> Am	952430	3.99E-28	5.47E-10	4.78E-02	3.02E-08	7.43E-08	1.42E-07	2.35E-07

Table 27. BWR Isotopics as a Function of 1.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.22E-05	2.50E-05	3.05E-05	3.57E-05	4.06E-05	4.52E-05	4.98E-05
<sup>99</sup> Tc	430990	2.30E-05	2.59E-05	3.15E-05	3.68E-05	4.19E-05	4.68E-05	5.14E-05
<sup>101</sup> Ru	441010	2.28E-05	2.58E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.52E-05
<sup>103</sup> Rh	451030	1.81E-05	2.00E-05	2.36E-05	2.70E-05	3.00E-05	3.27E-05	3.51E-05
<sup>109</sup> Ag	471090	3.04E-06	3.47E-06	4.40E-06	5.37E-06	6.34E-06	7.30E-06	8.25E-06
<sup>143</sup> Nd	601430	1.89E-05	2.12E-05	2.50E-05	2.84E-05	3.12E-05	3.38E-05	3.60E-05
<sup>145</sup> Nd	601450	1.32E-05	1.49E-05	1.79E-05	2.08E-05	2.34E-05	2.59E-05	2.83E-05
<sup>147</sup> Sm	621470	5.05E-06	5.38E-06	5.96E-06	6.43E-06	6.82E-06	7.15E-06	7.44E-06
<sup>149</sup> Sm	621490	4.47E-07	4.67E-07	5.01E-07	5.31E-07	5.57E-07	5.81E-07	6.04E-07
<sup>150</sup> Sm	621500	6.14E-06	7.06E-06	8.80E-06	1.05E-05	1.20E-05	1.35E-05	1.49E-05
<sup>151</sup> Sm	621510	1.55E-35	1.69E-35	1.96E-35	2.21E-35	2.45E-35	2.68E-35	2.89E-35
<sup>152</sup> Sm	621520	2.34E-06	2.59E-06	3.05E-06	3.49E-06	3.89E-06	4.27E-06	4.62E-06
<sup>151</sup> Eu	631510	1.11E-06	1.21E-06	1.40E-06	1.58E-06	1.75E-06	1.91E-06	2.07E-06
<sup>153</sup> Eu	631530	2.29E-06	2.67E-06	3.44E-06	4.18E-06	4.88E-06	5.53E-06	6.14E-06
<sup>155</sup> Gd	641550	1.57E-07	1.93E-07	2.71E-07	3.56E-07	4.43E-07	5.30E-07	6.15E-07
<sup>233</sup> U	922330	1.29E-07	1.46E-07	1.78E-07	2.05E-07	2.27E-07	2.46E-07	2.61E-07
<sup>234</sup> U	922340	4.16E-06	4.68E-06	5.87E-06	7.22E-06	8.68E-06	1.02E-05	1.17E-05
<sup>235</sup> U	922350	2.58E-04	2.37E-04	2.05E-04	1.82E-04	1.66E-04	1.54E-04	1.45E-04
<sup>236</sup> U	922360	7.50E-05	8.01E-05	8.90E-05	9.63E-05	1.02E-04	1.08E-04	1.12E-04
<sup>238</sup> U	922380	2.29E-02	2.28E-02	2.27E-02	2.25E-02	2.24E-02	2.23E-02	2.21E-02
<sup>237</sup> Np	932370	4.27E-05	4.84E-05	5.90E-05	6.80E-05	7.55E-05	8.17E-05	8.69E-05
<sup>238</sup> Pu	942380	1.75E-29	2.33E-29	3.62E-29	4.94E-29	6.20E-29	7.36E-29	8.42E-29
<sup>239</sup> Pu	942390	2.70E-04	2.81E-04	2.96E-04	3.08E-04	3.17E-04	3.24E-04	3.29E-04
<sup>240</sup> Pu	942400	1.80E-05	1.98E-05	2.33E-05	2.66E-05	2.97E-05	3.26E-05	3.53E-05
<sup>241</sup> Pu	942410	9.70E-12	1.92E-11	5.65E-11	1.23E-10	2.19E-10	3.43E-10	4.93E-10
<sup>242</sup> Pu	942420	3.58E-06	4.60E-06	7.05E-06	9.83E-06	1.28E-05	1.59E-05	1.91E-05
<sup>241</sup> Am	952410	3.09E-10	6.07E-10	1.78E-09	3.86E-09	6.87E-09	1.08E-08	1.55E-08
<sup>242m</sup> Am	952421	1.28E-29	1.70E-29	2.65E-29	3.62E-29	4.54E-29	5.39E-29	6.16E-29
<sup>243</sup> Am	952430	3.41E-07	5.01E-07	9.50E-07	1.53E-06	2.21E-06	2.93E-06	3.68E-06

Table 27. BWR Isotopics as a Function of 1.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.59E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	5.41E-05	5.83E-05	6.25E-05	6.65E-05	7.04E-05	7.42E-05
<sup>99</sup> Tc	430990	5.59E-05	6.02E-05	6.43E-05	6.83E-05	7.21E-05	7.58E-05
<sup>101</sup> Ru	441010	6.08E-05	6.63E-05	7.16E-05	7.69E-05	8.21E-05	8.71E-05
<sup>103</sup> Rh	451030	3.73E-05	3.93E-05	4.11E-05	4.28E-05	4.42E-05	4.56E-05
<sup>109</sup> Ag	471090	9.17E-06	1.01E-05	1.09E-05	1.18E-05	1.26E-05	1.34E-05
<sup>143</sup> Nd	601430	3.81E-05	3.99E-05	4.16E-05	4.32E-05	4.47E-05	4.61E-05
<sup>145</sup> Nd	601450	3.06E-05	3.27E-05	3.48E-05	3.68E-05	3.87E-05	4.05E-05
<sup>147</sup> Sm	621470	7.69E-06	7.90E-06	8.10E-06	8.27E-06	8.43E-06	8.58E-06
<sup>149</sup> Sm	621490	6.26E-07	6.47E-07	6.67E-07	6.87E-07	7.06E-07	7.25E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.87E-05	1.98E-05	2.09E-05	2.20E-05
<sup>151</sup> Sm	621510	3.10E-35	3.29E-35	3.47E-35	3.65E-35	3.82E-35	3.98E-35
<sup>152</sup> Sm	621520	4.95E-06	5.26E-06	5.56E-06	5.84E-06	6.11E-06	6.37E-06
<sup>151</sup> Eu	631510	2.21E-06	2.35E-06	2.48E-06	2.61E-06	2.73E-06	2.84E-06
<sup>153</sup> Eu	631530	6.69E-06	7.21E-06	7.68E-06	8.13E-06	8.53E-06	8.91E-06
<sup>155</sup> Gd	641550	6.97E-07	7.76E-07	8.50E-07	9.21E-07	9.88E-07	1.05E-06
<sup>233</sup> U	922330	2.74E-07	2.84E-07	2.93E-07	3.01E-07	3.07E-07	3.13E-07
<sup>234</sup> U	922340	1.32E-05	1.47E-05	1.61E-05	1.74E-05	1.86E-05	1.97E-05
<sup>235</sup> U	922350	1.38E-04	1.33E-04	1.29E-04	1.27E-04	1.25E-04	1.23E-04
<sup>236</sup> U	922360	1.16E-04	1.19E-04	1.22E-04	1.24E-04	1.27E-04	1.29E-04
<sup>238</sup> U	922380	2.20E-02	2.19E-02	2.17E-02	2.16E-02	2.15E-02	2.13E-02
<sup>237</sup> Np	932370	9.11E-05	9.47E-05	9.77E-05	1.00E-04	1.02E-04	1.04E-04
<sup>238</sup> Pu	942380	9.38E-29	1.03E-28	1.10E-28	1.18E-28	1.24E-28	1.31E-28
<sup>239</sup> Pu	942390	3.34E-04	3.38E-04	3.42E-04	3.45E-04	3.48E-04	3.50E-04
<sup>240</sup> Pu	942400	3.78E-05	4.01E-05	4.24E-05	4.45E-05	4.65E-05	4.85E-05
<sup>241</sup> Pu	942410	6.63E-10	8.50E-10	1.05E-09	1.26E-09	1.47E-09	1.68E-09
<sup>242</sup> Pu	942420	2.23E-05	2.54E-05	2.85E-05	3.15E-05	3.45E-05	3.73E-05
<sup>241</sup> Am	952410	2.09E-08	2.67E-08	3.30E-08	3.95E-08	4.62E-08	5.29E-08
<sup>242m</sup> Am	952421	6.87E-29	7.50E-29	8.08E-29	8.62E-29	9.11E-29	9.56E-29
<sup>243</sup> Am	952430	4.43E-06	5.17E-06	5.88E-06	6.56E-06	7.21E-06	7.83E-06

Table 28. BWR Isotopics as a Function of 2.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup Gwd/mtU 0.001	Burnup Gwd/mtU 2.5	Burnup Gwd/mtU 5.0	Burnup Gwd/mtU 7.5	Burnup Gwd/mtU 10	Burnup Gwd/mtU 12.5	Burnup Gwd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.57E-09	3.69E-06	7.16E-06	1.05E-05	1.37E-05	1.67E-05	1.97E-05
<sup>99</sup> Tc	430990	1.49E-09	3.68E-06	7.21E-06	1.06E-05	1.39E-05	1.71E-05	2.03E-05
<sup>101</sup> Ru	441010	1.34E-09	3.32E-06	6.64E-06	9.93E-06	1.32E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.69E-10	2.56E-06	5.26E-06	7.95E-06	1.06E-05	1.31E-05	1.56E-05
<sup>109</sup> Ag	471090	2.34E-11	1.95E-07	5.42E-07	9.56E-07	1.41E-06	1.88E-06	2.36E-06
<sup>143</sup> Nd	601430	1.42E-09	3.30E-06	6.33E-06	9.18E-06	1.19E-05	1.45E-05	1.71E-05
<sup>145</sup> Nd	601450	9.88E-10	2.28E-06	4.40E-06	6.39E-06	8.28E-06	1.01E-05	1.19E-05
<sup>147</sup> Sm	621470	5.97E-10	1.27E-06	2.27E-06	3.09E-06	3.78E-06	4.37E-06	4.89E-06
<sup>149</sup> Sm	621490	2.99E-10	1.66E-07	2.32E-07	2.92E-07	3.46E-07	3.98E-07	4.46E-07
<sup>150</sup> Sm	621500	8.44E-15	6.29E-07	1.46E-06	2.35E-06	3.26E-06	4.19E-06	5.11E-06
<sup>151</sup> Sm	621510	1.79E-39	3.39E-36	5.90E-36	8.11E-36	1.02E-35	1.22E-35	1.42E-35
<sup>152</sup> Sm	621520	8.15E-11	2.98E-07	6.62E-07	1.03E-06	1.38E-06	1.71E-06	2.03E-06
<sup>151</sup> Eu	631510	1.28E-10	2.41E-07	4.21E-07	5.78E-07	7.27E-07	8.71E-07	1.01E-06
<sup>153</sup> Eu	631530	5.77E-11	1.75E-07	4.25E-07	7.29E-07	1.07E-06	1.43E-06	1.81E-06
<sup>155</sup> Gd	641550	1.42E-11	1.83E-08	3.14E-08	4.69E-08	6.62E-08	8.94E-08	1.16E-07
<sup>233</sup> U	922330	8.23E-13	6.07E-09	2.02E-08	3.88E-08	5.95E-08	8.11E-08	1.03E-07
<sup>234</sup> U	922340	3.92E-06	3.64E-06	3.50E-06	3.52E-06	3.67E-06	3.95E-06	4.35E-06
<sup>235</sup> U	922350	4.85E-04	4.53E-04	4.29E-04	4.09E-04	3.91E-04	3.76E-04	3.63E-04
<sup>236</sup> U	922360	2.23E-06	1.76E-05	3.17E-05	4.44E-05	5.60E-05	6.67E-05	7.66E-05
<sup>238</sup> U	922380	2.35E-02	2.34E-02	2.32E-02	2.31E-02	2.30E-02	2.29E-02	2.29E-02
<sup>237</sup> Np	932370	2.58E-10	1.98E-06	6.65E-06	1.28E-05	1.97E-05	2.68E-05	3.41E-05
<sup>238</sup> Pu	942380	0.00E+00	7.92E-28	3.14E-31	1.29E-30	3.27E-30	6.43E-30	1.08E-29
<sup>239</sup> Pu	942390	3.08E-08	6.37E-05	1.12E-04	1.52E-04	1.88E-04	2.19E-04	2.47E-04
<sup>240</sup> Pu	942400	1.75E-13	1.42E-06	3.75E-06	6.33E-06	9.02E-06	1.18E-05	1.45E-05
<sup>241</sup> Pu	942410	0.00E+00	1.71E-16	1.07E-14	9.97E-14	4.44E-13	1.33E-12	3.14E-12
<sup>242</sup> Pu	942420	4.43E-23	2.14E-08	1.66E-07	4.76E-07	9.42E-07	1.54E-06	2.24E-06
<sup>241</sup> Am	952410	7.78E-25	1.27E-13	8.48E-13	4.18E-12	1.56E-11	4.42E-11	1.02E-10
<sup>242m</sup> Am	952421	0.00E+00	5.80E-28	2.30E-31	9.47E-31	2.40E-30	4.71E-30	7.94E-30
<sup>243</sup> Am	952430	1.66E-28	2.83E-10	4.50E-09	1.94E-08	5.07E-08	1.02E-07	1.74E-07

Table 28. BWR Isotopics as a Function of 2.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWD/mtU 17.5	Burnup GWD/mtU 20	Burnup GWD/mtU 25	Burnup GWD/mtU 30	Burnup GWD/mtU 35	Burnup GWD/mtU 40	Burnup GWD/mtU 45
<sup>18</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.28E-05	2.58E-05	3.15E-05	3.69E-05	4.19E-05	4.68E-05	5.14E-05
<sup>99</sup> Tc	430990	2.33E-05	2.63E-05	3.20E-05	3.74E-05	4.26E-05	4.76E-05	5.23E-05
<sup>101</sup> Ru	441010	2.27E-05	2.58E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.52E-05
<sup>103</sup> Rh	451030	1.75E-05	1.94E-05	2.30E-05	2.64E-05	2.95E-05	3.23E-05	3.48E-05
<sup>109</sup> Ag	471090	2.72E-06	3.12E-06	3.99E-06	4.91E-06	5.85E-06	6.80E-06	7.74E-06
<sup>143</sup> Nd	601430	1.97E-05	2.20E-05	2.62E-05	2.98E-05	3.29E-05	3.56E-05	3.80E-05
<sup>145</sup> Nd	601450	1.36E-05	1.53E-05	1.85E-05	2.14E-05	2.42E-05	2.68E-05	2.92E-05
<sup>147</sup> Sm	621470	5.29E-06	5.65E-06	6.27E-06	6.77E-06	7.18E-06	7.52E-06	7.80E-06
<sup>149</sup> Sm	621490	4.67E-07	4.86E-07	5.19E-07	5.48E-07	5.73E-07	5.96E-07	6.17E-07
<sup>150</sup> Sm	621500	6.04E-06	6.96E-06	8.71E-06	1.04E-05	1.20E-05	1.35E-05	1.49E-05
<sup>151</sup> Sm	621510	1.56E-35	1.70E-35	1.96E-35	2.21E-35	2.45E-35	2.68E-35	2.90E-35
<sup>152</sup> Sm	621520	2.29E-06	2.54E-06	3.02E-06	3.46E-06	3.87E-06	4.26E-06	4.61E-06
<sup>151</sup> Eu	631510	1.11E-06	1.21E-06	1.40E-06	1.58E-06	1.75E-06	1.92E-06	2.07E-06
<sup>153</sup> Eu	631530	2.17E-06	2.54E-06	3.30E-06	4.04E-06	4.74E-06	5.41E-06	6.03E-06
<sup>155</sup> Gd	641550	1.45E-07	1.77E-07	2.51E-07	3.33E-07	4.19E-07	5.07E-07	5.93E-07
<sup>233</sup> U	922330	1.19E-07	1.36E-07	1.69E-07	1.99E-07	2.24E-07	2.45E-07	2.63E-07
<sup>234</sup> U	922340	4.79E-06	5.29E-06	6.48E-06	7.88E-06	9.45E-06	1.11E-05	1.29E-05
<sup>235</sup> U	922350	3.32E-04	3.06E-04	2.63E-04	2.31E-04	2.05E-04	1.86E-04	1.71E-04
<sup>236</sup> U	922360	8.33E-05	8.93E-05	9.98E-05	1.09E-04	1.16E-04	1.22E-04	1.27E-04
<sup>238</sup> U	922380	2.28E-02	2.27E-02	2.26E-02	2.25E-02	2.23E-02	2.22E-02	2.21E-02
<sup>237</sup> Np	932370	3.94E-05	4.51E-05	5.60E-05	6.58E-05	7.42E-05	8.13E-05	8.73E-05
<sup>239</sup> Pu	942380	1.48E-29	1.99E-29	3.22E-29	4.55E-29	5.86E-29	7.11E-29	8.26E-29
<sup>239</sup> Pu	942390	2.61E-04	2.72E-04	2.90E-04	3.03E-04	3.13E-04	3.21E-04	3.27E-04
<sup>240</sup> Pu	942400	1.63E-05	1.80E-05	2.15E-05	2.48E-05	2.80E-05	3.09E-05	3.37E-05
<sup>241</sup> Pu	942410	6.04E-12	1.20E-11	3.71E-11	8.47E-11	1.58E-10	2.59E-10	3.86E-10
<sup>242</sup> Pu	942420	2.89E-06	3.75E-06	5.87E-06	8.37E-06	1.11E-05	1.40E-05	1.71E-05
<sup>241</sup> Am	952410	1.93E-10	3.82E-10	1.17E-09	2.67E-09	4.99E-09	8.16E-09	1.22E-08
<sup>242m</sup> Am	952421	1.08E-29	1.46E-29	2.36E-29	3.33E-29	4.29E-29	5.20E-29	6.04E-29
<sup>243</sup> Am	952430	2.54E-07	3.76E-07	7.35E-07	1.23E-06	1.82E-06	2.48E-06	3.18E-06



Table 28. BWR Isotopics as a Function of 2.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.59E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	5.59E-05	6.02E-05	6.43E-05	6.84E-05	7.23E-05	7.61E-05
<sup>98</sup> Tc	430990	5.69E-05	6.12E-05	6.54E-05	6.94E-05	7.32E-05	7.69E-05
<sup>101</sup> Ru	441010	6.08E-05	6.63E-05	7.16E-05	7.69E-05	8.21E-05	8.71E-05
<sup>103</sup> Rh	451030	3.70E-05	3.91E-05	4.10E-05	4.27E-05	4.42E-05	4.56E-05
<sup>109</sup> Ag	471090	8.67E-06	9.58E-06	1.05E-05	1.13E-05	1.22E-05	1.30E-05
<sup>143</sup> Nd	601430	4.01E-05	4.20E-05	4.37E-05	4.53E-05	4.67E-05	4.80E-05
<sup>145</sup> Nd	601450	3.15E-05	3.37E-05	3.58E-05	3.77E-05	3.96E-05	4.15E-05
<sup>147</sup> Sm	621470	8.03E-06	8.24E-06	8.41E-06	8.57E-06	8.71E-06	8.84E-06
<sup>149</sup> Sm	621490	6.38E-07	6.58E-07	6.77E-07	6.96E-07	7.15E-07	7.34E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.87E-05	1.99E-05	2.10E-05	2.21E-05
<sup>151</sup> Sm	621510	3.10E-35	3.30E-35	3.49E-35	3.66E-35	3.83E-35	4.00E-35
<sup>152</sup> Sm	621520	4.95E-06	5.27E-06	5.57E-06	5.85E-06	6.12E-06	6.38E-06
<sup>151</sup> Eu	631510	2.22E-06	2.36E-06	2.49E-06	2.62E-06	2.74E-06	2.86E-06
<sup>153</sup> Eu	631530	6.61E-06	7.14E-06	7.63E-06	8.09E-06	8.51E-06	8.90E-06
<sup>155</sup> Gd	641550	6.78E-07	7.59E-07	8.36E-07	9.10E-07	9.80E-07	1.05E-06
<sup>233</sup> U	922330	2.78E-07	2.91E-07	3.01E-07	3.10E-07	3.18E-07	3.24E-07
<sup>234</sup> U	922340	1.46E-05	1.64E-05	1.80E-05	1.96E-05	2.11E-05	2.25E-05
<sup>235</sup> U	922350	1.59E-04	1.50E-04	1.43E-04	1.38E-04	1.34E-04	1.30E-04
<sup>236</sup> U	922360	1.31E-04	1.34E-04	1.37E-04	1.40E-04	1.42E-04	1.44E-04
<sup>238</sup> U	922380	2.20E-02	2.18E-02	2.17E-02	2.16E-02	2.14E-02	2.13E-02
<sup>237</sup> Np	932370	9.24E-05	9.66E-05	1.00E-04	1.03E-04	1.06E-04	1.08E-04
<sup>238</sup> Pu	942380	9.30E-29	1.02E-28	1.11E-28	1.19E-28	1.26E-28	1.32E-28
<sup>239</sup> Pu	942390	3.33E-04	3.37E-04	3.41E-04	3.45E-04	3.48E-04	3.50E-04
<sup>240</sup> Pu	942400	3.64E-05	3.88E-05	4.12E-05	4.34E-05	4.55E-05	4.75E-05
<sup>241</sup> Pu	942410	5.36E-10	7.06E-10	8.91E-10	1.09E-09	1.29E-09	1.50E-09
<sup>242</sup> Pu	942420	2.01E-05	2.32E-05	2.63E-05	2.93E-05	3.23E-05	3.52E-05
<sup>241</sup> Am	952410	1.69E-08	2.22E-08	2.80E-08	3.42E-08	4.06E-08	4.72E-08
<sup>242m</sup> Am	952421	6.80E-29	7.49E-29	8.12E-29	8.68E-29	9.20E-29	9.67E-29
<sup>243</sup> Am	952430	3.91E-06	4.63E-06	5.35E-06	6.04E-06	6.71E-06	7.35E-06

Table 29. BWR Isotopics as a Function of 2.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.58E-09	3.76E-06	7.32E-06	1.07E-05	1.40E-05	1.72E-05	2.02E-05
<sup>99</sup> Tc	430990	1.50E-09	3.71E-06	7.28E-06	1.07E-05	1.41E-05	1.73E-05	2.05E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.62E-06	9.91E-06	1.32E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.53E-10	2.48E-06	5.08E-06	7.67E-06	1.02E-05	1.27E-05	1.51E-05
<sup>109</sup> Ag	471090	2.21E-11	1.63E-07	4.60E-07	8.26E-07	1.23E-06	1.67E-06	2.12E-06
<sup>143</sup> Nd	601430	1.44E-09	3.37E-06	6.49E-06	9.44E-06	1.23E-05	1.50E-05	1.76E-05
<sup>145</sup> Nd	601450	9.92E-10	2.32E-06	4.48E-06	6.52E-06	8.47E-06	1.03E-05	1.21E-05
<sup>147</sup> Sm	621470	5.97E-10	1.29E-06	2.33E-06	3.19E-06	3.91E-06	4.53E-06	5.08E-06
<sup>149</sup> Sm	621490	2.97E-10	1.88E-07	2.56E-07	3.16E-07	3.71E-07	4.22E-07	4.70E-07
<sup>150</sup> Sm	621500	8.23E-15	5.97E-07	1.41E-06	2.28E-06	3.18E-06	4.10E-06	5.01E-06
<sup>151</sup> Sm	621510	1.77E-39	3.46E-36	6.04E-36	8.29E-36	1.04E-35	1.24E-35	1.43E-35
<sup>152</sup> Sm	621520	8.05E-11	2.81E-07	6.28E-07	9.83E-07	1.33E-06	1.66E-06	1.98E-06
<sup>151</sup> Eu	631510	1.26E-10	2.46E-07	4.31E-07	5.91E-07	7.40E-07	8.84E-07	1.02E-06
<sup>153</sup> Eu	631530	5.64E-11	1.65E-07	3.96E-07	6.78E-07	9.98E-07	1.34E-06	1.70E-06
<sup>155</sup> Gd	641550	1.37E-11	1.81E-08	3.03E-08	4.45E-08	6.20E-08	8.31E-08	1.08E-07
<sup>233</sup> U	922330	7.73E-13	5.11E-09	1.73E-08	3.40E-08	5.31E-08	7.36E-08	9.47E-08
<sup>234</sup> U	922340	4.98E-06	4.65E-06	4.46E-06	4.40E-06	4.49E-06	4.70E-06	5.05E-06
<sup>235</sup> U	922350	6.06E-04	5.69E-04	5.38E-04	5.11E-04	4.88E-04	4.67E-04	4.49E-04
<sup>236</sup> U	922360	2.78E-06	1.89E-05	3.40E-05	4.78E-05	6.04E-05	7.22E-05	8.30E-05
<sup>238</sup> U	922380	2.33E-02	2.32E-02	2.31E-02	2.31E-02	2.30E-02	2.29E-02	2.28E-02
<sup>237</sup> Np	932370	2.42E-10	1.66E-06	5.67E-06	1.12E-05	1.75E-05	2.43E-05	3.13E-05
<sup>238</sup> Pu	942380	0.00E+00	5.18E-28	2.25E-31	9.86E-31	2.60E-30	5.26E-30	9.09E-30
<sup>239</sup> Pu	942390	2.72E-08	5.86E-05	1.05E-04	1.44E-04	1.79E-04	2.10E-04	2.38E-04
<sup>240</sup> Pu	942400	1.39E-13	1.15E-06	3.18E-06	5.49E-06	7.94E-06	1.05E-05	1.31E-05
<sup>241</sup> Pu	942410	0.00E+00	7.61E-17	5.35E-15	5.43E-14	2.57E-13	8.11E-13	1.99E-12
<sup>242</sup> Pu	942420	2.51E-23	1.35E-08	1.15E-07	3.49E-07	7.19E-07	1.21E-06	1.81E-06
<sup>241</sup> Am	952410	5.37E-25	9.26E-14	5.75E-13	2.58E-12	9.49E-12	2.75E-11	6.53E-11
<sup>242m</sup> Am	952421	0.00E+00	3.79E-28	1.65E-31	7.22E-31	1.90E-30	3.85E-30	6.65E-30
<sup>243</sup> Am	952430	8.29E-29	1.59E-10	2.78E-09	1.28E-08	3.52E-08	7.34E-08	1.29E-07

Table 29. BWR Isotopics as a Function of 2.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.34E-05	2.65E-05	3.24E-05	3.79E-05	4.32E-05	4.82E-05	5.30E-05
<sup>99</sup> Tc	430990	2.36E-05	2.66E-05	3.25E-05	3.80E-05	4.33E-05	4.84E-05	5.32E-05
<sup>101</sup> Ru	441010	2.27E-05	2.58E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.53E-05
<sup>103</sup> Rh	451030	1.70E-05	1.89E-05	2.25E-05	2.59E-05	2.90E-05	3.19E-05	3.45E-05
<sup>109</sup> Ag	471090	2.45E-06	2.82E-06	3.63E-06	4.50E-06	5.41E-06	6.33E-06	7.26E-06
<sup>143</sup> Nd	601430	2.03E-05	2.27E-05	2.72E-05	3.10E-05	3.44E-05	3.74E-05	3.99E-05
<sup>145</sup> Nd	601450	1.40E-05	1.57E-05	1.90E-05	2.21E-05	2.49E-05	2.76E-05	3.01E-05
<sup>147</sup> Sm	621470	5.52E-06	5.91E-06	6.59E-06	7.13E-06	7.56E-06	7.91E-06	8.20E-06
<sup>149</sup> Sm	621490	4.91E-07	5.10E-07	5.42E-07	5.69E-07	5.93E-07	6.14E-07	6.34E-07
<sup>150</sup> Sm	621500	5.94E-06	6.85E-06	8.61E-06	1.03E-05	1.19E-05	1.34E-05	1.49E-05
<sup>151</sup> Sm	621510	1.58E-35	1.71E-35	1.97E-35	2.22E-35	2.46E-35	2.69E-35	2.91E-35
<sup>152</sup> Sm	621520	2.25E-06	2.51E-06	2.99E-06	3.44E-06	3.86E-06	4.25E-06	4.62E-06
<sup>151</sup> Eu	631510	1.12E-06	1.22E-06	1.41E-06	1.59E-06	1.76E-06	1.92E-06	2.08E-06
<sup>153</sup> Eu	631530	2.05E-06	2.42E-06	3.16E-06	3.90E-06	4.61E-06	5.29E-06	5.93E-06
<sup>155</sup> Gd	641550	1.34E-07	1.64E-07	2.34E-07	3.12E-07	3.96E-07	4.83E-07	5.70E-07
<sup>233</sup> U	922330	1.10E-07	1.27E-07	1.60E-07	1.91E-07	2.18E-07	2.42E-07	2.63E-07
<sup>234</sup> U	922340	5.44E-06	5.90E-06	7.03E-06	8.43E-06	1.00E-05	1.18E-05	1.37E-05
<sup>235</sup> U	922350	4.14E-04	3.83E-04	3.30E-04	2.88E-04	2.54E-04	2.27E-04	2.05E-04
<sup>236</sup> U	922360	9.06E-05	9.76E-05	1.10E-04	1.20E-04	1.29E-04	1.36E-04	1.42E-04
<sup>238</sup> U	922380	2.27E-02	2.27E-02	2.25E-02	2.24E-02	2.23E-02	2.22E-02	2.20E-02
<sup>237</sup> Np	932370	3.64E-05	4.20E-05	5.30E-05	6.32E-05	7.23E-05	8.02E-05	8.71E-05
<sup>238</sup> Pu	942380	1.25E-29	1.72E-29	2.87E-29	4.18E-29	5.53E-29	6.84E-29	8.08E-29
<sup>239</sup> Pu	942390	2.52E-04	2.64E-04	2.83E-04	2.97E-04	3.08E-04	3.17E-04	3.25E-04
<sup>240</sup> Pu	942400	1.48E-05	1.64E-05	1.98E-05	2.31E-05	2.63E-05	2.93E-05	3.22E-05
<sup>241</sup> Pu	942410	3.85E-12	7.75E-12	2.48E-11	5.91E-11	1.15E-10	1.96E-10	3.01E-10
<sup>242</sup> Pu	942420	2.35E-06	3.08E-06	4.92E-06	7.14E-06	9.65E-06	1.24E-05	1.52E-05
<sup>241</sup> Am	952410	1.24E-10	2.47E-10	7.84E-10	1.86E-09	3.63E-09	6.16E-09	9.47E-09
<sup>242m</sup> Am	952421	9.15E-30	1.26E-29	2.10E-29	3.06E-29	4.05E-29	5.01E-29	5.91E-29
<sup>243</sup> Am	952430	1.91E-07	2.86E-07	5.74E-07	9.85E-07	1.50E-06	2.09E-06	2.74E-06

Table 29. BWR Isotopics as a Function of 2.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>85</sup> Mo	420950	5.76E-05	6.20E-05	6.62E-05	7.03E-05	7.43E-05	7.81E-05
<sup>99</sup> Tc	430990	5.78E-05	6.22E-05	6.65E-05	7.05E-05	7.44E-05	7.82E-05
<sup>101</sup> Ru	441010	6.09E-05	6.63E-05	7.17E-05	7.70E-05	8.22E-05	8.72E-05
<sup>103</sup> Rh	451030	3.68E-05	3.89E-05	4.09E-05	4.26E-05	4.42E-05	4.56E-05
<sup>109</sup> Ag	471090	8.19E-06	9.10E-06	1.00E-05	1.09E-05	1.17E-05	1.26E-05
<sup>143</sup> Nd	601430	4.22E-05	4.42E-05	4.59E-05	4.75E-05	4.89E-05	5.02E-05
<sup>145</sup> Nd	601450	3.24E-05	3.47E-05	3.68E-05	3.88E-05	4.07E-05	4.25E-05
<sup>147</sup> Sm	621470	8.43E-06	8.62E-06	8.79E-06	8.92E-06	9.04E-06	9.15E-06
<sup>149</sup> Sm	621490	6.53E-07	6.72E-07	6.90E-07	7.09E-07	7.27E-07	7.45E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.88E-05	2.00E-05	2.11E-05	2.22E-05
<sup>151</sup> Sm	621510	3.12E-35	3.31E-35	3.50E-35	3.68E-35	3.85E-35	4.02E-35
<sup>152</sup> Sm	621520	4.96E-06	5.28E-06	5.59E-06	5.87E-06	6.15E-06	6.41E-06
<sup>151</sup> Eu	631510	2.23E-06	2.37E-06	2.50E-06	2.63E-06	2.75E-06	2.87E-06
<sup>153</sup> Eu	631530	6.52E-06	7.07E-06	7.58E-06	8.05E-06	8.48E-06	8.89E-06
<sup>155</sup> Gd	641550	6.56E-07	7.40E-07	8.20E-07	8.97E-07	9.70E-07	1.04E-06
<sup>233</sup> U	922330	2.80E-07	2.95E-07	3.08E-07	3.18E-07	3.27E-07	3.34E-07
<sup>234</sup> U	922340	1.57E-05	1.76E-05	1.95E-05	2.14E-05	2.31E-05	2.48E-05
<sup>235</sup> U	922350	1.87E-04	1.73E-04	1.62E-04	1.53E-04	1.46E-04	1.41E-04
<sup>236</sup> U	922360	1.47E-04	1.50E-04	1.54E-04	1.56E-04	1.58E-04	1.60E-04
<sup>238</sup> U	922380	2.19E-02	2.18E-02	2.16E-02	2.15E-02	2.14E-02	2.13E-02
<sup>237</sup> Np	932370	9.29E-05	9.78E-05	1.02E-04	1.06E-04	1.09E-04	1.11E-04
<sup>238</sup> Pu	942380	9.21E-29	1.02E-28	1.12E-28	1.20E-28	1.27E-28	1.34E-28
<sup>239</sup> Pu	942390	3.31E-04	3.36E-04	3.40E-04	3.44E-04	3.47E-04	3.50E-04
<sup>240</sup> Pu	942400	3.49E-05	3.75E-05	3.99E-05	4.22E-05	4.44E-05	4.64E-05
<sup>241</sup> Pu	942410	4.30E-10	5.81E-10	7.49E-10	9.32E-10	1.13E-09	1.33E-09
<sup>242</sup> Pu	942420	1.82E-05	2.12E-05	2.42E-05	2.72E-05	3.02E-05	3.31E-05
<sup>241</sup> Am	952410	1.35E-08	1.83E-08	2.36E-08	2.93E-08	3.54E-08	4.17E-08
<sup>242m</sup> Am	952421	6.74E-29	7.49E-29	8.16E-29	8.77E-29	9.32E-29	9.82E-29
<sup>243</sup> Am	952430	3.43E-06	4.13E-06	4.83E-06	5.52E-06	6.20E-06	6.85E-06

Table 30. BWR Isotopics as a Function of 3.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>18</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.59E-09	3.81E-06	7.44E-06	1.09E-05	1.43E-05	1.75E-05	2.06E-05
<sup>99</sup> Tc	430990	1.50E-09	3.73E-06	7.33E-06	1.08E-05	1.42E-05	1.75E-05	2.07E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.61E-06	9.90E-06	1.32E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.41E-10	2.42E-06	4.94E-06	7.45E-06	9.93E-06	1.24E-05	1.47E-05
<sup>109</sup> Ag	471090	2.11E-11	1.39E-07	3.98E-07	7.23E-07	1.09E-06	1.49E-06	1.91E-06
<sup>143</sup> Nd	601430	1.45E-09	3.42E-06	6.62E-06	9.65E-06	1.26E-05	1.53E-05	1.80E-05
<sup>145</sup> Nd	601450	9.96E-10	2.35E-06	4.55E-06	6.64E-06	8.63E-06	1.05E-05	1.24E-05
<sup>147</sup> Sm	621470	5.97E-10	1.31E-06	2.38E-06	3.27E-06	4.03E-06	4.69E-06	5.27E-06
<sup>149</sup> Sm	621490	2.96E-10	2.12E-07	2.82E-07	3.43E-07	3.98E-07	4.50E-07	4.98E-07
<sup>150</sup> Sm	621500	8.09E-15	5.64E-07	1.36E-06	2.22E-06	3.10E-06	4.01E-06	4.91E-06
<sup>151</sup> Sm	621510	1.75E-39	3.51E-36	6.18E-36	8.47E-36	1.06E-35	1.26E-35	1.45E-35
<sup>152</sup> Sm	621520	7.97E-11	2.68E-07	6.00E-07	9.45E-07	1.29E-06	1.62E-06	1.94E-06
<sup>151</sup> Eu	631510	1.25E-10	2.50E-07	4.40E-07	6.04E-07	7.55E-07	8.98E-07	1.04E-06
<sup>153</sup> Eu	631530	5.54E-11	1.58E-07	3.74E-07	6.38E-07	9.39E-07	1.27E-06	1.61E-06
<sup>155</sup> Gd	641550	1.33E-11	1.81E-08	2.97E-08	4.27E-08	5.87E-08	7.82E-08	1.01E-07
<sup>233</sup> U	922330	7.37E-13	4.44E-09	1.51E-08	3.01E-08	4.78E-08	6.70E-08	8.71E-08
<sup>234</sup> U	922340	6.06E-06	5.69E-06	5.44E-06	5.33E-06	5.35E-06	5.50E-06	5.79E-06
<sup>235</sup> U	922350	7.28E-04	6.85E-04	6.49E-04	6.17E-04	5.89E-04	5.63E-04	5.40E-04
<sup>236</sup> U	922360	3.34E-06	2.02E-05	3.60E-05	5.07E-05	6.43E-05	7.69E-05	8.88E-05
<sup>238</sup> U	922380	2.32E-02	2.31E-02	2.30E-02	2.30E-02	2.29E-02	2.28E-02	2.27E-02
<sup>237</sup> Np	932370	2.30E-10	1.43E-06	4.92E-06	9.87E-06	1.57E-05	2.21E-05	2.87E-05
<sup>238</sup> Pu	942380	0.00E+00	3.52E-28	1.65E-31	7.61E-31	2.08E-30	4.33E-30	7.64E-30
<sup>239</sup> Pu	942390	2.46E-08	5.44E-05	9.88E-05	1.37E-04	1.71E-04	2.02E-04	2.30E-04
<sup>240</sup> Pu	942400	1.15E-13	9.55E-07	2.72E-06	4.80E-06	7.04E-06	9.40E-06	1.18E-05
<sup>241</sup> Pu	942410	0.00E+00	3.72E-17	2.85E-15	3.08E-14	1.54E-13	5.06E-13	1.29E-12
<sup>242</sup> Pu	942420	1.56E-23	8.92E-09	8.16E-08	2.61E-07	5.56E-07	9.62E-07	1.47E-06
<sup>241</sup> Am	952410	3.95E-25	6.98E-14	4.18E-13	1.70E-12	6.04E-12	1.76E-11	4.28E-11
<sup>242m</sup> Am	952421	0.00E+00	2.58E-28	1.21E-31	5.57E-31	1.52E-30	3.17E-30	5.59E-30
<sup>243</sup> Am	952430	4.64E-29	9.45E-11	1.79E-09	8.72E-09	2.49E-08	5.37E-08	9.74E-08

Table 30. BWR Isotopics as a Function of 3.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.39E-05	2.71E-05	3.32E-05	3.89E-05	4.43E-05	4.95E-05	5.44E-05
<sup>99</sup> Tc	430990	2.38E-05	2.69E-05	3.29E-05	3.86E-05	4.40E-05	4.91E-05	5.41E-05
<sup>101</sup> Ru	441010	2.27E-05	2.57E-05	3.19E-05	3.79E-05	4.38E-05	4.96E-05	5.53E-05
<sup>103</sup> Rh	451030	1.66E-05	1.85E-05	2.21E-05	2.55E-05	2.87E-05	3.15E-05	3.42E-05
<sup>109</sup> Ag	471090	2.21E-06	2.56E-06	3.31E-06	4.14E-06	5.01E-06	5.90E-06	6.81E-06
<sup>143</sup> Nd	601430	2.08E-05	2.34E-05	2.81E-05	3.22E-05	3.58E-05	3.90E-05	4.18E-05
<sup>145</sup> Nd	601450	1.43E-05	1.61E-05	1.95E-05	2.26E-05	2.56E-05	2.83E-05	3.09E-05
<sup>147</sup> Sm	621470	5.74E-06	6.17E-06	6.90E-06	7.49E-06	7.96E-06	8.33E-06	8.63E-06
<sup>149</sup> Sm	621490	5.18E-07	5.37E-07	5.68E-07	5.94E-07	6.17E-07	6.37E-07	6.55E-07
<sup>150</sup> Sm	621500	5.84E-06	6.74E-06	8.50E-06	1.02E-05	1.18E-05	1.33E-05	1.48E-05
<sup>151</sup> Sm	621510	1.60E-35	1.73E-35	1.99E-35	2.24E-35	2.48E-35	2.70E-35	2.92E-35
<sup>152</sup> Sm	621520	2.21E-06	2.47E-06	2.96E-06	3.42E-06	3.85E-06	4.25E-06	4.62E-06
<sup>151</sup> Eu	631510	1.14E-06	1.24E-06	1.42E-06	1.60E-06	1.77E-06	1.93E-06	2.09E-06
<sup>153</sup> Eu	631530	1.95E-06	2.31E-06	3.04E-06	3.77E-06	4.48E-06	5.17E-06	5.82E-06
<sup>155</sup> Gd	641550	1.25E-07	1.53E-07	2.18E-07	2.93E-07	3.74E-07	4.59E-07	5.47E-07
<sup>233</sup> U	922330	1.02E-07	1.18E-07	1.51E-07	1.83E-07	2.12E-07	2.38E-07	2.61E-07
<sup>234</sup> U	922340	6.13E-06	6.54E-06	7.59E-06	8.93E-06	1.05E-05	1.23E-05	1.43E-05
<sup>235</sup> U	922350	5.01E-04	4.66E-04	4.05E-04	3.54E-04	3.11E-04	2.76E-04	2.47E-04
<sup>236</sup> U	922360	9.72E-05	1.05E-04	1.19E-04	1.31E-04	1.41E-04	1.50E-04	1.56E-04
<sup>238</sup> U	922380	2.26E-02	2.26E-02	2.25E-02	2.23E-02	2.22E-02	2.21E-02	2.20E-02
<sup>237</sup> Np	932370	3.37E-05	3.91E-05	5.00E-05	6.04E-05	7.00E-05	7.86E-05	8.61E-05
<sup>238</sup> Pu	942380	1.06E-29	1.48E-29	2.56E-29	3.84E-29	5.20E-29	6.56E-29	7.87E-29
<sup>239</sup> Pu	942390	2.44E-04	2.57E-04	2.76E-04	2.92E-04	3.04E-04	3.14E-04	3.22E-04
<sup>240</sup> Pu	942400	1.34E-05	1.50E-05	1.82E-05	2.15E-05	2.47E-05	2.77E-05	3.07E-05
<sup>241</sup> Pu	942410	2.51E-12	5.11E-12	1.69E-11	4.17E-11	8.42E-11	1.48E-10	2.34E-10
<sup>242</sup> Pu	942420	1.92E-06	2.54E-06	4.14E-06	6.12E-06	8.40E-06	1.09E-05	1.36E-05
<sup>241</sup> Am	952410	8.15E-11	1.64E-10	5.35E-10	1.32E-09	2.65E-09	4.65E-09	7.36E-09
<sup>242m</sup> Am	952421	7.79E-30	1.09E-29	1.87E-29	2.81E-29	3.81E-29	4.80E-29	5.76E-29
<sup>243</sup> Am	952430	1.45E-07	2.20E-07	4.53E-07	7.95E-07	1.24E-06	1.77E-06	2.36E-06

Table 30. BWR Isotopics as a Function of 3.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.61E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	5.91E-05	6.37E-05	6.80E-05	7.22E-05	7.62E-05	8.01E-05
<sup>99</sup> Tc	430990	5.88E-05	6.33E-05	6.76E-05	7.17E-05	7.57E-05	7.95E-05
<sup>101</sup> Ru	441010	6.09E-05	6.64E-05	7.18E-05	7.71E-05	8.23E-05	8.74E-05
<sup>103</sup> Rh	451030	3.66E-05	3.88E-05	4.08E-05	4.26E-05	4.42E-05	4.57E-05
<sup>109</sup> Ag	471090	7.72E-06	8.63E-06	9.53E-06	1.04E-05	1.13E-05	1.21E-05
<sup>143</sup> Nd	601430	4.42E-05	4.64E-05	4.82E-05	4.99E-05	5.13E-05	5.26E-05
<sup>145</sup> Nd	601450	3.34E-05	3.56E-05	3.78E-05	3.98E-05	4.17E-05	4.36E-05
<sup>147</sup> Sm	621470	8.87E-06	9.05E-06	9.20E-06	9.33E-06	9.43E-06	9.51E-06
<sup>149</sup> Sm	621490	6.73E-07	6.90E-07	7.07E-07	7.24E-07	7.41E-07	7.58E-07
<sup>150</sup> Sm	621500	1.62E-05	1.75E-05	1.88E-05	2.00E-05	2.12E-05	2.23E-05
<sup>151</sup> Sm	621510	3.13E-35	3.33E-35	3.52E-35	3.70E-35	3.87E-35	4.04E-35
<sup>152</sup> Sm	621520	4.97E-06	5.30E-06	5.61E-06	5.90E-06	6.18E-06	6.44E-06
<sup>151</sup> Eu	631510	2.24E-06	2.38E-06	2.51E-06	2.64E-06	2.77E-06	2.89E-06
<sup>153</sup> Eu	631530	6.42E-06	6.99E-06	7.51E-06	8.00E-06	8.45E-06	8.87E-06
<sup>155</sup> Gd	641550	6.34E-07	7.20E-07	8.03E-07	8.82E-07	9.58E-07	1.03E-06
<sup>233</sup> U	922330	2.80E-07	2.97E-07	3.12E-07	3.24E-07	3.34E-07	3.43E-07
<sup>234</sup> U	922340	1.64E-05	1.85E-05	2.07E-05	2.28E-05	2.48E-05	2.67E-05
<sup>235</sup> U	922350	2.23E-04	2.03E-04	1.87E-04	1.74E-04	1.64E-04	1.55E-04
<sup>236</sup> U	922360	1.62E-04	1.67E-04	1.71E-04	1.74E-04	1.76E-04	1.78E-04
<sup>238</sup> U	922380	2.19E-02	2.17E-02	2.16E-02	2.15E-02	2.14E-02	2.12E-02
<sup>237</sup> Np	932370	9.27E-05	9.84E-05	1.03E-04	1.07E-04	1.11E-04	1.14E-04
<sup>238</sup> Pu	942380	9.10E-29	1.02E-28	1.12E-28	1.21E-28	1.29E-28	1.36E-28
<sup>239</sup> Pu	942390	3.28E-04	3.34E-04	3.39E-04	3.43E-04	3.47E-04	3.50E-04
<sup>240</sup> Pu	942400	3.35E-05	3.61E-05	3.86E-05	4.10E-05	4.33E-05	4.54E-05
<sup>241</sup> Pu	942410	3.43E-10	4.75E-10	6.26E-10	7.94E-10	9.75E-10	1.17E-09
<sup>242</sup> Pu	942420	1.64E-05	1.93E-05	2.22E-05	2.51E-05	2.81E-05	3.10E-05
<sup>241</sup> Am	952410	1.08E-08	1.49E-08	1.97E-08	2.49E-08	3.06E-08	3.67E-08
<sup>242m</sup> Am	952421	6.66E-29	7.47E-29	8.21E-29	8.87E-29	9.46E-29	9.99E-29
<sup>243</sup> Am	952430	3.00E-06	3.67E-06	4.35E-06	5.03E-06	5.70E-06	6.36E-06

Table 31. BWR Isotopics as a Function of 3.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.60E-09	3.85E-06	7.53E-06	1.11E-05	1.45E-05	1.78E-05	2.10E-05
<sup>99</sup> Tc	430990	1.51E-09	3.74E-06	7.37E-06	1.09E-05	1.43E-05	1.76E-05	2.09E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.61E-06	9.89E-06	1.31E-05	1.64E-05	1.96E-05
<sup>103</sup> Rh	451030	9.32E-10	2.37E-06	4.83E-06	7.28E-06	9.71E-06	1.21E-05	1.44E-05
<sup>109</sup> Ag	471090	2.03E-11	1.22E-07	3.49E-07	6.39E-07	9.73E-07	1.34E-06	1.73E-06
<sup>143</sup> Nd	601430	1.45E-09	3.46E-06	6.72E-06	9.82E-06	1.28E-05	1.57E-05	1.84E-05
<sup>145</sup> Nd	601450	9.98E-10	2.37E-06	4.60E-06	6.73E-06	8.77E-06	1.07E-05	1.26E-05
<sup>147</sup> Sm	621470	5.97E-10	1.33E-06	2.42E-06	3.35E-06	4.14E-06	4.83E-06	5.44E-06
<sup>149</sup> Sm	621490	2.95E-10	2.38E-07	3.10E-07	3.73E-07	4.29E-07	4.80E-07	5.28E-07
<sup>150</sup> Sm	621500	7.99E-15	5.33E-07	1.31E-06	2.15E-06	3.03E-06	3.92E-06	4.82E-06
<sup>151</sup> Sm	621510	1.74E-39	3.56E-36	6.30E-36	8.64E-36	1.08E-35	1.28E-35	1.47E-35
<sup>152</sup> Sm	621520	7.91E-11	2.57E-07	5.76E-07	9.13E-07	1.25E-06	1.58E-06	1.90E-06
<sup>151</sup> Eu	631510	1.24E-10	2.54E-07	4.49E-07	6.17E-07	7.70E-07	9.14E-07	1.05E-06
<sup>153</sup> Eu	631530	5.46E-11	1.53E-07	3.56E-07	6.04E-07	8.89E-07	1.20E-06	1.53E-06
<sup>155</sup> Gd	641550	1.30E-11	1.82E-08	2.94E-08	4.15E-08	5.63E-08	7.42E-08	9.55E-08
<sup>233</sup> U	922330	7.11E-13	3.95E-09	1.33E-08	2.69E-08	4.32E-08	6.12E-08	8.04E-08
<sup>234</sup> U	922340	7.15E-06	6.75E-06	6.46E-06	6.29E-06	6.25E-06	6.34E-06	6.57E-06
<sup>235</sup> U	922350	8.49E-04	8.03E-04	7.62E-04	7.26E-04	6.93E-04	6.62E-04	6.35E-04
<sup>236</sup> U	922360	3.90E-06	2.13E-05	3.78E-05	5.32E-05	6.76E-05	8.11E-05	9.38E-05
<sup>238</sup> U	922380	2.31E-02	2.30E-02	2.29E-02	2.28E-02	2.28E-02	2.27E-02	2.26E-02
<sup>237</sup> Np	932370	2.22E-10	1.27E-06	4.33E-06	8.79E-06	1.42E-05	2.01E-05	2.64E-05
<sup>238</sup> Pu	942380	0.00E+00	2.48E-28	1.24E-31	5.95E-31	1.68E-30	3.58E-30	6.45E-30
<sup>239</sup> Pu	942390	2.26E-08	5.08E-05	9.34E-05	1.31E-04	1.64E-04	1.94E-04	2.22E-04
<sup>240</sup> Pu	942400	9.81E-14	8.06E-07	2.36E-06	4.23E-06	6.28E-06	8.46E-06	1.07E-05
<sup>241</sup> Pu	942410	0.00E+00	1.95E-17	1.60E-15	1.82E-14	9.46E-14	3.22E-13	8.46E-13
<sup>242</sup> Pu	942420	1.04E-23	6.12E-09	5.94E-08	1.98E-07	4.34E-07	7.70E-07	1.20E-06
<sup>241</sup> Am	952410	3.04E-25	5.41E-14	3.19E-13	1.19E-12	4.02E-12	1.17E-11	2.87E-11
<sup>242m</sup> Am	952421	0.00E+00	1.82E-28	3.40E-27	4.35E-31	1.23E-30	2.62E-30	4.72E-30
<sup>243</sup> Am	952430	2.82E-29	5.92E-11	1.19E-09	6.06E-09	1.79E-08	3.98E-08	7.39E-08



Table 31. BWR Isotopics as a Function of 3.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.44E-05	2.76E-05	3.38E-05	3.97E-05	4.53E-05	5.07E-05	5.58E-05
<sup>99</sup> Tc	430990	2.41E-05	2.72E-05	3.32E-05	3.90E-05	4.46E-05	4.99E-05	5.49E-05
<sup>101</sup> Ru	441010	2.27E-05	2.57E-05	3.19E-05	3.79E-05	4.38E-05	4.97E-05	5.54E-05
<sup>103</sup> Rh	451030	1.63E-05	1.82E-05	2.18E-05	2.52E-05	2.83E-05	3.13E-05	3.40E-05
<sup>109</sup> Ag	471090	2.01E-06	2.33E-06	3.04E-06	3.82E-06	4.64E-06	5.50E-06	6.38E-06
<sup>143</sup> Nd	601430	2.13E-05	2.39E-05	2.88E-05	3.32E-05	3.71E-05	4.05E-05	4.35E-05
<sup>145</sup> Nd	601450	1.45E-05	1.64E-05	1.99E-05	2.31E-05	2.62E-05	2.90E-05	3.17E-05
<sup>147</sup> Sm	621470	5.95E-06	6.41E-06	7.20E-06	7.85E-06	8.36E-06	8.76E-06	9.08E-06
<sup>149</sup> Sm	621490	5.49E-07	5.68E-07	5.99E-07	6.24E-07	6.45E-07	6.63E-07	6.80E-07
<sup>150</sup> Sm	621500	5.73E-06	6.63E-06	8.39E-06	1.01E-05	1.17E-05	1.33E-05	1.48E-05
<sup>151</sup> Sm	621510	1.62E-35	1.75E-35	2.01E-35	2.26E-35	2.49E-35	2.72E-35	2.94E-35
<sup>152</sup> Sm	621520	2.17E-06	2.44E-06	2.94E-06	3.41E-06	3.84E-06	4.25E-06	4.63E-06
<sup>151</sup> Eu	631510	1.16E-06	1.25E-06	1.44E-06	1.61E-06	1.78E-06	1.94E-06	2.10E-06
<sup>153</sup> Eu	631530	1.86E-06	2.21E-06	2.92E-06	3.64E-06	4.36E-06	5.05E-06	5.70E-06
<sup>155</sup> Gd	641550	1.18E-07	1.43E-07	2.04E-07	2.75E-07	3.53E-07	4.37E-07	5.24E-07
<sup>233</sup> U	922330	9.48E-08	1.10E-07	1.43E-07	1.75E-07	2.05E-07	2.32E-07	2.57E-07
<sup>234</sup> U	922340	6.85E-06	7.21E-06	8.17E-06	9.43E-06	1.10E-05	1.28E-05	1.48E-05
<sup>235</sup> U	922350	5.93E-04	5.54E-04	4.85E-04	4.27E-04	3.76E-04	3.33E-04	2.97E-04
<sup>236</sup> U	922360	1.03E-04	1.12E-04	1.27E-04	1.41E-04	1.53E-04	1.62E-04	1.71E-04
<sup>238</sup> U	922380	2.25E-02	2.25E-02	2.24E-02	2.23E-02	2.22E-02	2.20E-02	2.19E-02
<sup>237</sup> Np	932370	3.12E-05	3.64E-05	4.71E-05	5.76E-05	6.75E-05	7.66E-05	8.47E-05
<sup>239</sup> Pu	942380	9.09E-30	1.29E-29	2.29E-29	3.52E-29	4.88E-29	6.28E-29	7.65E-29
<sup>239</sup> Pu	942390	2.37E-04	2.49E-04	2.70E-04	2.86E-04	2.99E-04	3.10E-04	3.19E-04
<sup>240</sup> Pu	942400	1.22E-05	1.37E-05	1.68E-05	2.00E-05	2.32E-05	2.62E-05	2.92E-05
<sup>241</sup> Pu	942410	1.66E-12	3.43E-12	1.17E-11	2.98E-11	6.19E-11	1.12E-10	1.82E-10
<sup>242</sup> Pu	942420	1.58E-06	2.11E-06	3.51E-06	5.27E-06	7.32E-06	9.62E-06	1.21E-05
<sup>241</sup> Am	952410	5.47E-11	1.11E-10	3.71E-10	9.40E-10	1.95E-09	3.52E-09	5.72E-09
<sup>242m</sup> Am	952421	6.65E-30	9.41E-30	1.67E-29	2.58E-29	3.57E-29	4.59E-29	5.60E-29
<sup>243</sup> Am	952430	1.11E-07	1.70E-07	3.59E-07	6.46E-07	1.03E-06	1.49E-06	2.03E-06

Table 31. BWR Isotopics as a Function of 3.5 wt%  $^{235}\text{U}$  and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
$^{16}\text{O}$	80160	4.61E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
$^{95}\text{Mo}$	420950	6.06E-05	6.53E-05	6.97E-05	7.40E-05	7.81E-05	8.21E-05
$^{99}\text{Tc}$	430990	5.97E-05	6.43E-05	6.87E-05	7.29E-05	7.69E-05	8.08E-05
$^{101}\text{Ru}$	441010	6.10E-05	6.65E-05	7.19E-05	7.72E-05	8.24E-05	8.75E-05
$^{103}\text{Rh}$	451030	3.64E-05	3.87E-05	4.07E-05	4.26E-05	4.43E-05	4.58E-05
$^{109}\text{Ag}$	471090	7.28E-06	8.17E-06	9.07E-06	9.95E-06	1.08E-05	1.17E-05
$^{143}\text{Nd}$	601430	4.62E-05	4.85E-05	5.05E-05	5.23E-05	5.38E-05	5.52E-05
$^{145}\text{Nd}$	601450	3.42E-05	3.66E-05	3.88E-05	4.09E-05	4.28E-05	4.47E-05
$^{147}\text{Sm}$	621470	9.33E-06	9.52E-06	9.66E-06	9.77E-06	9.85E-06	9.92E-06
$^{149}\text{Sm}$	621490	6.96E-07	7.11E-07	7.27E-07	7.42E-07	7.58E-07	7.74E-07
$^{150}\text{Sm}$	621500	1.62E-05	1.75E-05	1.88E-05	2.01E-05	2.12E-05	2.24E-05
$^{151}\text{Sm}$	621510	3.15E-35	3.35E-35	3.54E-35	3.72E-35	3.90E-35	4.06E-35
$^{152}\text{Sm}$	621520	4.99E-06	5.32E-06	5.63E-06	5.93E-06	6.21E-06	6.48E-06
$^{151}\text{Eu}$	631510	2.25E-06	2.39E-06	2.53E-06	2.66E-06	2.78E-06	2.90E-06
$^{153}\text{Eu}$	631530	6.32E-06	6.90E-06	7.45E-06	7.95E-06	8.41E-06	8.84E-06
$^{155}\text{Gd}$	641550	6.11E-07	6.98E-07	7.83E-07	8.65E-07	9.44E-07	1.02E-06
$^{233}\text{U}$	922330	2.78E-07	2.97E-07	3.14E-07	3.28E-07	3.40E-07	3.51E-07
$^{234}\text{U}$	922340	1.69E-05	1.92E-05	2.15E-05	2.38E-05	2.61E-05	2.83E-05
$^{235}\text{U}$	922350	2.66E-04	2.40E-04	2.18E-04	2.01E-04	1.86E-04	1.74E-04
$^{236}\text{U}$	922360	1.77E-04	1.83E-04	1.88E-04	1.91E-04	1.94E-04	1.96E-04
$^{238}\text{U}$	922380	2.18E-02	2.17E-02	2.16E-02	2.14E-02	2.13E-02	2.12E-02
$^{237}\text{Np}$	932370	9.19E-05	9.83E-05	1.04E-04	1.09E-04	1.13E-04	1.16E-04
$^{238}\text{Pu}$	942380	8.95E-29	1.02E-28	1.13E-28	1.22E-28	1.31E-28	1.39E-28
$^{239}\text{Pu}$	942390	3.26E-04	3.32E-04	3.38E-04	3.42E-04	3.46E-04	3.49E-04
$^{240}\text{Pu}$	942400	3.21E-05	3.48E-05	3.73E-05	3.98E-05	4.21E-05	4.43E-05
$^{241}\text{Pu}$	942410	2.73E-10	3.86E-10	5.20E-10	6.71E-10	8.38E-10	1.02E-09
$^{242}\text{Pu}$	942420	1.47E-05	1.75E-05	2.03E-05	2.32E-05	2.61E-05	2.90E-05
$^{241}\text{Am}$	952410	8.60E-09	1.22E-08	1.63E-08	2.11E-08	2.63E-08	3.20E-08
$^{242m}\text{Am}$	952421	6.55E-29	7.43E-29	8.23E-29	8.95E-29	9.59E-29	1.02E-28
$^{243}\text{Am}$	952430	2.62E-06	3.25E-06	3.90E-06	4.56E-06	5.23E-06	5.88E-06

Table 32. BWR Isotopics as a Function of 4.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.78E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.61E-09	3.88E-06	7.61E-06	1.12E-05	1.47E-05	1.81E-05	2.13E-05
<sup>99</sup> Tc	430990	1.51E-09	3.76E-06	7.40E-06	1.09E-05	1.44E-05	1.77E-05	2.10E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.60E-06	9.88E-06	1.31E-05	1.63E-05	1.95E-05
<sup>103</sup> Rh	451030	9.24E-10	2.33E-06	4.74E-06	7.14E-06	9.52E-06	1.19E-05	1.42E-05
<sup>109</sup> Ag	471090	1.97E-11	1.09E-07	3.10E-07	5.71E-07	8.75E-07	1.21E-06	1.57E-06
<sup>143</sup> Nd	601430	1.46E-09	3.49E-06	6.80E-06	9.97E-06	1.30E-05	1.59E-05	1.88E-05
<sup>145</sup> Nd	601450	1.00E-09	2.38E-06	4.64E-06	6.81E-06	8.88E-06	1.09E-05	1.28E-05
<sup>147</sup> Sm	621470	5.96E-10	1.34E-06	2.46E-06	3.41E-06	4.24E-06	4.96E-06	5.60E-06
<sup>149</sup> Sm	621490	2.94E-10	2.63E-07	3.41E-07	4.05E-07	4.61E-07	5.14E-07	5.62E-07
<sup>150</sup> Sm	621500	7.92E-15	5.01E-07	1.27E-06	2.09E-06	2.95E-06	3.84E-06	4.73E-06
<sup>151</sup> Sm	621510	1.73E-39	3.59E-36	6.40E-36	8.81E-36	1.10E-35	1.30E-35	1.50E-35
<sup>152</sup> Sm	621520	7.86E-11	2.49E-07	5.56E-07	8.84E-07	1.21E-06	1.54E-06	1.86E-06
<sup>151</sup> Eu	631510	1.23E-10	2.56E-07	4.57E-07	6.29E-07	7.84E-07	9.30E-07	1.07E-06
<sup>153</sup> Eu	631530	5.39E-11	1.48E-07	3.42E-07	5.77E-07	8.47E-07	1.14E-06	1.46E-06
<sup>155</sup> Gd	641550	1.27E-11	1.84E-08	2.93E-08	4.07E-08	5.44E-08	7.10E-08	9.08E-08
<sup>233</sup> U	922330	6.91E-13	3.58E-09	1.19E-08	2.42E-08	3.92E-08	5.61E-08	7.43E-08
<sup>234</sup> U	922340	8.26E-06	7.83E-06	7.50E-06	7.28E-06	7.19E-06	7.23E-06	7.39E-06
<sup>235</sup> U	922350	9.70E-04	9.21E-04	8.77E-04	8.36E-04	7.99E-04	7.65E-04	7.33E-04
<sup>236</sup> U	922360	4.45E-06	2.23E-05	3.94E-05	5.55E-05	7.06E-05	8.49E-05	9.83E-05
<sup>238</sup> U	922380	2.30E-02	2.29E-02	2.28E-02	2.27E-02	2.27E-02	2.26E-02	2.25E-02
<sup>237</sup> Np	932370	2.15E-10	1.15E-06	3.87E-06	7.90E-06	1.28E-05	1.84E-05	2.44E-05
<sup>238</sup> Pu	942380	0.00E+00	1.80E-28	3.54E-27	4.70E-31	1.36E-30	2.98E-30	5.46E-30
<sup>239</sup> Pu	942390	2.09E-08	4.78E-05	8.86E-05	1.25E-04	1.57E-04	1.87E-04	2.15E-04
<sup>240</sup> Pu	942400	8.55E-14	6.91E-07	2.07E-06	3.76E-06	5.64E-06	7.66E-06	9.78E-06
<sup>241</sup> Pu	942410	0.00E+00	1.08E-17	9.33E-16	1.11E-14	5.98E-14	2.10E-13	5.66E-13
<sup>242</sup> Pu	942420	7.28E-24	4.33E-09	4.41E-08	1.52E-07	3.43E-07	6.21E-07	9.83E-07
<sup>241</sup> Am	952410	2.41E-25	4.28E-14	2.51E-13	8.70E-13	2.78E-12	7.94E-12	1.96E-11
<sup>242m</sup> Am	952421	0.00E+00	1.32E-28	2.59E-27	3.44E-31	9.98E-31	2.18E-30	3.99E-30
<sup>243</sup> Am	952430	1.82E-29	3.86E-11	8.13E-10	4.30E-09	1.31E-08	2.98E-08	5.66E-08

Table 32. BWR Isotopics as a Function of 4.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.48E-05	2.81E-05	3.44E-05	4.05E-05	4.62E-05	5.17E-05	5.70E-05
<sup>99</sup> Tc	430990	2.43E-05	2.74E-05	3.36E-05	3.95E-05	4.51E-05	5.05E-05	5.57E-05
<sup>101</sup> Ru	441010	2.26E-05	2.57E-05	3.19E-05	3.79E-05	4.39E-05	4.97E-05	5.55E-05
<sup>103</sup> Rh	451030	1.60E-05	1.79E-05	2.15E-05	2.49E-05	2.81E-05	3.10E-05	3.38E-05
<sup>109</sup> Ag	471090	1.83E-06	2.13E-06	2.79E-06	3.53E-06	4.31E-06	5.14E-06	5.99E-06
<sup>143</sup> Nd	601430	2.17E-05	2.44E-05	2.95E-05	3.41E-05	3.82E-05	4.19E-05	4.51E-05
<sup>145</sup> Nd	601450	1.48E-05	1.66E-05	2.02E-05	2.36E-05	2.67E-05	2.97E-05	3.25E-05
<sup>147</sup> Sm	621470	6.14E-06	6.64E-06	7.50E-06	8.19E-06	8.75E-06	9.20E-06	9.54E-06
<sup>149</sup> Sm	621490	5.83E-07	6.01E-07	6.32E-07	6.56E-07	6.76E-07	6.93E-07	7.08E-07
<sup>150</sup> Sm	621500	5.63E-06	6.53E-06	8.27E-06	9.97E-06	1.16E-05	1.32E-05	1.47E-05
<sup>151</sup> Sm	621510	1.64E-35	1.78E-35	2.04E-35	2.28E-35	2.52E-35	2.74E-35	2.96E-35
<sup>152</sup> Sm	621520	2.14E-06	2.41E-06	2.92E-06	3.39E-06	3.84E-06	4.25E-06	4.64E-06
<sup>151</sup> Eu	631510	1.17E-06	1.27E-06	1.45E-06	1.63E-06	1.80E-06	1.96E-06	2.11E-06
<sup>153</sup> Eu	631530	1.78E-06	2.11E-06	2.81E-06	3.53E-06	4.24E-06	4.93E-06	5.59E-06
<sup>155</sup> Gd	641550	1.11E-07	1.35E-07	1.92E-07	2.59E-07	3.34E-07	4.16E-07	5.01E-07
<sup>233</sup> U	922330	8.81E-08	1.03E-07	1.35E-07	1.67E-07	1.97E-07	2.26E-07	2.52E-07
<sup>234</sup> U	922340	7.62E-06	7.93E-06	8.78E-06	9.94E-06	1.14E-05	1.32E-05	1.52E-05
<sup>235</sup> U	922350	6.88E-04	6.47E-04	5.71E-04	5.05E-04	4.47E-04	3.97E-04	3.53E-04
<sup>236</sup> U	922360	1.08E-04	1.18E-04	1.35E-04	1.50E-04	1.63E-04	1.74E-04	1.84E-04
<sup>238</sup> U	922380	2.25E-02	2.24E-02	2.23E-02	2.22E-02	2.21E-02	2.20E-02	2.19E-02
<sup>237</sup> Np	932370	2.89E-05	3.39E-05	4.44E-05	5.49E-05	6.49E-05	7.43E-05	8.29E-05
<sup>238</sup> Pu	942380	7.79E-30	1.12E-29	2.05E-29	3.23E-29	4.57E-29	5.99E-29	7.41E-29
<sup>239</sup> Pu	942390	2.29E-04	2.42E-04	2.64E-04	2.80E-04	2.94E-04	3.06E-04	3.15E-04
<sup>240</sup> Pu	942400	1.12E-05	1.26E-05	1.56E-05	1.87E-05	2.17E-05	2.48E-05	2.78E-05
<sup>241</sup> Pu	942410	1.12E-12	2.35E-12	8.21E-12	2.15E-11	4.59E-11	8.49E-11	1.41E-10
<sup>242</sup> Pu	942420	1.31E-06	1.76E-06	2.98E-06	4.54E-06	6.40E-06	8.51E-06	1.08E-05
<sup>241</sup> Am	952410	3.75E-11	7.63E-11	2.61E-10	6.80E-10	1.45E-09	2.67E-09	4.45E-09
<sup>242m</sup> Am	952421	5.70E-30	8.18E-30	1.50E-29	2.36E-29	3.34E-29	4.38E-29	5.42E-29
<sup>243</sup> Am	952430	8.59E-08	1.33E-07	2.87E-07	5.28E-07	8.56E-07	1.26E-06	1.75E-06

Table 32. BWR Isotopics as a Function of 4.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.62E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.20E-05	6.68E-05	7.14E-05	7.57E-05	8.00E-05	8.40E-05
<sup>99</sup> Tc	430990	6.06E-05	6.53E-05	6.98E-05	7.41E-05	7.82E-05	8.21E-05
<sup>101</sup> Ru	441010	6.11E-05	6.67E-05	7.21E-05	7.74E-05	8.26E-05	8.77E-05
<sup>103</sup> Rh	451030	3.63E-05	3.86E-05	4.07E-05	4.26E-05	4.44E-05	4.60E-05
<sup>109</sup> Ag	471090	6.86E-06	7.74E-06	8.62E-06	9.50E-06	1.04E-05	1.12E-05
<sup>143</sup> Nd	601430	4.80E-05	5.05E-05	5.27E-05	5.46E-05	5.63E-05	5.77E-05
<sup>145</sup> Nd	601450	3.50E-05	3.75E-05	3.97E-05	4.19E-05	4.39E-05	4.58E-05
<sup>147</sup> Sm	621470	9.80E-06	1.00E-05	1.01E-05	1.03E-05	1.03E-05	1.04E-05
<sup>149</sup> Sm	621490	7.22E-07	7.36E-07	7.50E-07	7.64E-07	7.78E-07	7.92E-07
<sup>150</sup> Sm	621500	1.61E-05	1.75E-05	1.88E-05	2.01E-05	2.13E-05	2.24E-05
<sup>151</sup> Sm	621510	3.17E-35	3.37E-35	3.56E-35	3.74E-35	3.92E-35	4.09E-35
<sup>152</sup> Sm	621520	5.00E-06	5.34E-06	5.66E-06	5.97E-06	6.25E-06	6.52E-06
<sup>151</sup> Eu	631510	2.26E-06	2.41E-06	2.54E-06	2.68E-06	2.80E-06	2.92E-06
<sup>153</sup> Eu	631530	6.22E-06	6.82E-06	7.37E-06	7.89E-06	8.37E-06	8.81E-06
<sup>155</sup> Gd	641550	5.88E-07	6.76E-07	7.62E-07	8.47E-07	9.28E-07	1.01E-06
<sup>233</sup> U	922330	2.75E-07	2.96E-07	3.14E-07	3.31E-07	3.44E-07	3.56E-07
<sup>234</sup> U	922340	1.74E-05	1.97E-05	2.21E-05	2.46E-05	2.70E-05	2.94E-05
<sup>235</sup> U	922350	3.16E-04	2.84E-04	2.56E-04	2.33E-04	2.14E-04	1.98E-04
<sup>236</sup> U	922360	1.92E-04	1.99E-04	2.04E-04	2.09E-04	2.12E-04	2.14E-04
<sup>238</sup> U	922380	2.17E-02	2.16E-02	2.15E-02	2.14E-02	2.13E-02	2.11E-02
<sup>237</sup> Np	932370	9.07E-05	9.77E-05	1.04E-04	1.09E-04	1.14E-04	1.18E-04
<sup>238</sup> Pu	942380	8.78E-29	1.01E-28	1.13E-28	1.23E-28	1.33E-28	1.41E-28
<sup>239</sup> Pu	942390	3.23E-04	3.30E-04	3.36E-04	3.41E-04	3.45E-04	3.49E-04
<sup>240</sup> Pu	942400	3.06E-05	3.34E-05	3.60E-05	3.86E-05	4.09E-05	4.32E-05
<sup>241</sup> Pu	942410	2.17E-10	3.13E-10	4.30E-10	5.64E-10	7.16E-10	8.82E-10
<sup>242</sup> Pu	942420	1.33E-05	1.59E-05	1.86E-05	2.14E-05	2.42E-05	2.70E-05
<sup>241</sup> Am	952410	6.84E-09	9.86E-09	1.35E-08	1.77E-08	2.25E-08	2.77E-08
<sup>242m</sup> Am	952421	6.43E-29	7.37E-29	8.24E-29	9.02E-29	9.72E-29	1.03E-28
<sup>243</sup> Am	952430	2.28E-06	2.87E-06	3.49E-06	4.12E-06	4.77E-06	5.42E-06

Table 33. BWR Isotopics as a Function of 4.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.79E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.61E-09	3.90E-06	7.67E-06	1.13E-05	1.49E-05	1.83E-05	2.16E-05
<sup>99</sup> Tc	430990	1.51E-09	3.77E-06	7.43E-06	1.10E-05	1.45E-05	1.78E-05	2.12E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.60E-06	9.87E-06	1.31E-05	1.63E-05	1.95E-05
<sup>103</sup> Rh	451030	9.18E-10	2.31E-06	4.67E-06	7.03E-06	9.36E-06	1.17E-05	1.39E-05
<sup>109</sup> Ag	471090	1.91E-11	9.82E-08	2.79E-07	5.15E-07	7.92E-07	1.10E-06	1.44E-06
<sup>143</sup> Nd	601430	1.46E-09	3.52E-06	6.87E-06	1.01E-05	1.32E-05	1.62E-05	1.91E-05
<sup>145</sup> Nd	601450	1.00E-09	2.40E-06	4.68E-06	6.87E-06	8.98E-06	1.10E-05	1.30E-05
<sup>147</sup> Sm	621470	5.96E-10	1.35E-06	2.49E-06	3.47E-06	4.33E-06	5.08E-06	5.75E-06
<sup>149</sup> Sm	621490	2.94E-10	2.89E-07	3.74E-07	4.39E-07	4.97E-07	5.49E-07	5.98E-07
<sup>150</sup> Sm	621500	7.86E-15	4.71E-07	1.22E-06	2.03E-06	2.88E-06	3.75E-06	4.64E-06
<sup>151</sup> Sm	621510	1.72E-39	3.63E-36	6.50E-36	8.96E-36	1.12E-35	1.32E-35	1.52E-35
<sup>152</sup> Sm	621520	7.82E-11	2.42E-07	5.39E-07	8.58E-07	1.18E-06	1.51E-06	1.82E-06
<sup>151</sup> Eu	631510	1.22E-10	2.59E-07	4.64E-07	6.40E-07	7.98E-07	9.46E-07	1.09E-06
<sup>153</sup> Eu	631530	5.34E-11	1.45E-07	3.30E-07	5.54E-07	8.11E-07	1.09E-06	1.40E-06
<sup>155</sup> Gd	641550	1.25E-11	1.86E-08	2.94E-08	4.02E-08	5.31E-08	6.85E-08	8.70E-08
<sup>233</sup> U	922330	6.75E-13	3.30E-09	1.08E-08	2.20E-08	3.59E-08	5.17E-08	6.89E-08
<sup>234</sup> U	922340	9.38E-06	8.92E-06	8.56E-06	8.30E-06	8.16E-06	8.14E-06	8.25E-06
<sup>235</sup> U	922350	1.09E-03	1.04E-03	9.92E-04	9.48E-04	9.08E-04	8.70E-04	8.35E-04
<sup>236</sup> U	922360	5.01E-06	2.32E-05	4.08E-05	5.75E-05	7.33E-05	8.82E-05	1.02E-04
<sup>238</sup> U	922380	2.29E-02	2.28E-02	2.27E-02	2.26E-02	2.26E-02	2.25E-02	2.24E-02
<sup>237</sup> Np	932370	2.10E-10	1.05E-06	3.49E-06	7.16E-06	1.17E-05	1.69E-05	2.26E-05
<sup>238</sup> Pu	942380	0.00E+00	1.33E-28	2.73E-27	3.75E-31	1.12E-30	2.49E-30	4.64E-30
<sup>239</sup> Pu	942390	1.95E-08	4.51E-05	8.44E-05	1.19E-04	1.51E-04	1.81E-04	2.08E-04
<sup>240</sup> Pu	942400	7.57E-14	5.99E-07	1.83E-06	3.36E-06	5.08E-06	6.95E-06	8.94E-06
<sup>241</sup> Pu	942410	0.00E+00	6.32E-18	5.66E-16	6.97E-15	3.87E-14	1.39E-13	3.84E-13
<sup>242</sup> Pu	942420	5.28E-24	3.15E-09	3.34E-08	1.19E-07	2.74E-07	5.05E-07	8.12E-07
<sup>241</sup> Am	952410	1.96E-25	3.44E-14	2.03E-13	6.65E-13	2.00E-12	5.57E-12	1.37E-11
<sup>242m</sup> Am	952421	0.00E+00	9.75E-29	2.00E-27	2.74E-31	8.17E-31	1.82E-30	3.39E-30
<sup>243</sup> Am	952430	1.22E-29	2.60E-11	5.70E-10	3.11E-09	9.72E-09	2.26E-08	4.37E-08

Table 33. BWR Isotopics as a Function of 4.5 wt% <sup>235</sup>U and Burnup, 10 Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.63E-02
<sup>95</sup> Mo	420950	2.51E-05	2.85E-05	3.49E-05	4.11E-05	4.70E-05	5.27E-05	5.81E-05
<sup>99</sup> Tc	430990	2.45E-05	2.77E-05	3.39E-05	3.99E-05	4.56E-05	5.11E-05	5.64E-05
<sup>101</sup> Ru	441010	2.26E-05	2.58E-05	3.19E-05	3.80E-05	4.39E-05	4.98E-05	5.56E-05
<sup>103</sup> Rh	451030	1.58E-05	1.77E-05	2.12E-05	2.46E-05	2.78E-05	3.08E-05	3.36E-05
<sup>109</sup> Ag	471090	1.68E-06	1.95E-06	2.58E-06	3.27E-06	4.02E-06	4.81E-06	5.63E-06
<sup>143</sup> Nd	601430	2.21E-05	2.49E-05	3.01E-05	3.49E-05	3.92E-05	4.31E-05	4.66E-05
<sup>145</sup> Nd	601450	1.50E-05	1.69E-05	2.06E-05	2.40E-05	2.72E-05	3.03E-05	3.31E-05
<sup>147</sup> Sm	621470	6.33E-06	6.86E-06	7.78E-06	8.53E-06	9.14E-06	9.62E-06	1.00E-05
<sup>149</sup> Sm	621490	6.19E-07	6.38E-07	6.68E-07	6.92E-07	7.11E-07	7.26E-07	7.40E-07
<sup>150</sup> Sm	621500	5.53E-06	6.42E-06	8.16E-06	9.85E-06	1.15E-05	1.31E-05	1.46E-05
<sup>151</sup> Sm	621510	1.67E-35	1.81E-35	2.06E-35	2.31E-35	2.54E-35	2.77E-35	2.98E-35
<sup>152</sup> Sm	621520	2.10E-06	2.38E-06	2.89E-06	3.38E-06	3.83E-06	4.25E-06	4.65E-06
<sup>151</sup> Eu	631510	1.19E-06	1.29E-06	1.47E-06	1.65E-06	1.82E-06	1.98E-06	2.13E-06
<sup>153</sup> Eu	631530	1.71E-06	2.03E-06	2.71E-06	3.42E-06	4.12E-06	4.81E-06	5.48E-06
<sup>155</sup> Gd	641550	1.06E-07	1.28E-07	1.81E-07	2.45E-07	3.17E-07	3.96E-07	4.79E-07
<sup>233</sup> U	922330	8.20E-08	9.65E-08	1.27E-07	1.59E-07	1.90E-07	2.19E-07	2.46E-07
<sup>234</sup> U	922340	8.43E-06	8.68E-06	9.43E-06	1.05E-05	1.19E-05	1.36E-05	1.55E-05
<sup>235</sup> U	922350	7.87E-04	7.43E-04	6.61E-04	5.89E-04	5.24E-04	4.67E-04	4.16E-04
<sup>236</sup> U	922360	1.13E-04	1.23E-04	1.42E-04	1.58E-04	1.73E-04	1.86E-04	1.97E-04
<sup>238</sup> U	922380	2.24E-02	2.23E-02	2.22E-02	2.21E-02	2.20E-02	2.19E-02	2.18E-02
<sup>237</sup> Np	932370	2.69E-05	3.17E-05	4.18E-05	5.22E-05	6.23E-05	7.20E-05	8.09E-05
<sup>238</sup> Pu	942380	6.69E-30	9.73E-30	1.83E-29	2.95E-29	4.27E-29	5.69E-29	7.15E-29
<sup>239</sup> Pu	942390	2.22E-04	2.35E-04	2.57E-04	2.75E-04	2.89E-04	3.02E-04	3.12E-04
<sup>240</sup> Pu	942400	1.03E-05	1.16E-05	1.45E-05	1.74E-05	2.04E-05	2.34E-05	2.64E-05
<sup>241</sup> Pu	942410	7.71E-13	1.63E-12	5.85E-12	1.57E-11	3.43E-11	6.48E-11	1.10E-10
<sup>242</sup> Pu	942420	1.09E-06	1.48E-06	2.54E-06	3.93E-06	5.61E-06	7.54E-06	9.67E-06
<sup>241</sup> Am	952410	2.62E-11	5.35E-11	1.87E-10	4.97E-10	1.08E-09	2.04E-09	3.47E-09
<sup>242m</sup> Am	952421	4.90E-30	7.12E-30	1.34E-29	2.16E-29	3.12E-29	4.16E-29	5.23E-29
<sup>243</sup> Am	952430	6.70E-08	1.05E-07	2.31E-07	4.33E-07	7.15E-07	1.07E-06	1.50E-06

Table 33. BWR Isotopics as a Function of 4.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.62E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.32E-05	6.82E-05	7.29E-05	7.74E-05	8.17E-05	8.59E-05
<sup>99</sup> Tc	430990	6.14E-05	6.63E-05	7.08E-05	7.52E-05	7.94E-05	8.34E-05
<sup>101</sup> Ru	441010	6.13E-05	6.68E-05	7.23E-05	7.76E-05	8.28E-05	8.80E-05
<sup>103</sup> Rh	451030	3.62E-05	3.85E-05	4.07E-05	4.27E-05	4.45E-05	4.61E-05
<sup>109</sup> Ag	471090	6.47E-06	7.33E-06	8.19E-06	9.06E-06	9.93E-06	1.08E-05
<sup>143</sup> Nd	601430	4.97E-05	5.24E-05	5.48E-05	5.69E-05	5.87E-05	6.03E-05
<sup>145</sup> Nd	601450	3.58E-05	3.83E-05	4.07E-05	4.29E-05	4.50E-05	4.69E-05
<sup>147</sup> Sm	621470	1.03E-05	1.05E-05	1.07E-05	1.08E-05	1.08E-05	1.09E-05
<sup>149</sup> Sm	621490	7.52E-07	7.65E-07	7.76E-07	7.89E-07	8.01E-07	8.14E-07
<sup>150</sup> Sm	621500	1.61E-05	1.75E-05	1.88E-05	2.01E-05	2.13E-05	2.25E-05
<sup>151</sup> Sm	621510	3.19E-35	3.39E-35	3.58E-35	3.77E-35	3.95E-35	4.12E-35
<sup>152</sup> Sm	621520	5.02E-06	5.37E-06	5.70E-06	6.00E-06	6.29E-06	6.57E-06
<sup>151</sup> Eu	631510	2.28E-06	2.42E-06	2.56E-06	2.69E-06	2.82E-06	2.94E-06
<sup>153</sup> Eu	631530	6.12E-06	6.72E-06	7.29E-06	7.82E-06	8.32E-06	8.78E-06
<sup>155</sup> Gd	641550	5.65E-07	6.53E-07	7.40E-07	8.27E-07	9.10E-07	9.91E-07
<sup>233</sup> U	922330	2.71E-07	2.93E-07	3.13E-07	3.31E-07	3.47E-07	3.60E-07
<sup>234</sup> U	922340	1.77E-05	2.00E-05	2.25E-05	2.51E-05	2.77E-05	3.03E-05
<sup>235</sup> U	922350	3.72E-04	3.34E-04	3.00E-04	2.72E-04	2.47E-04	2.27E-04
<sup>236</sup> U	922360	2.06E-04	2.14E-04	2.20E-04	2.26E-04	2.30E-04	2.33E-04
<sup>238</sup> U	922380	2.17E-02	2.16E-02	2.14E-02	2.13E-02	2.12E-02	2.11E-02
<sup>237</sup> Np	932370	8.91E-05	9.66E-05	1.03E-04	1.09E-04	1.14E-04	1.19E-04
<sup>238</sup> Pu	942380	8.58E-29	9.95E-29	1.12E-28	1.24E-28	1.34E-28	1.44E-28
<sup>239</sup> Pu	942390	3.20E-04	3.28E-04	3.34E-04	3.39E-04	3.44E-04	3.48E-04
<sup>240</sup> Pu	942400	2.93E-05	3.21E-05	3.47E-05	3.73E-05	3.98E-05	4.21E-05
<sup>241</sup> Pu	942410	1.73E-10	2.54E-10	3.54E-10	4.73E-10	6.09E-10	7.61E-10
<sup>242</sup> Pu	942420	1.20E-05	1.44E-05	1.70E-05	1.97E-05	2.24E-05	2.52E-05
<sup>241</sup> Am	952410	5.44E-09	7.99E-09	1.11E-08	1.49E-08	1.92E-08	2.39E-08
<sup>242m</sup> Am	952421	6.28E-29	7.28E-29	8.21E-29	9.06E-29	9.83E-29	1.05E-28
<sup>243</sup> Am	952430	1.99E-06	2.53E-06	3.11E-06	3.72E-06	4.34E-06	4.97E-06



Table 34. BWR Isotopics as a Function of 5.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.79E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.61E-09	3.92E-06	7.73E-06	1.14E-05	1.50E-05	1.85E-05	2.19E-05
<sup>99</sup> Tc	430990	1.51E-09	3.78E-06	7.46E-06	1.10E-05	1.45E-05	1.79E-05	2.13E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.60E-06	9.87E-06	1.31E-05	1.63E-05	1.95E-05
<sup>103</sup> Rh	451030	9.12E-10	2.28E-06	4.61E-06	6.93E-06	9.23E-06	1.15E-05	1.37E-05
<sup>109</sup> Ag	471090	1.87E-11	8.98E-08	2.53E-07	4.68E-07	7.22E-07	1.01E-06	1.32E-06
<sup>143</sup> Nd	601430	1.47E-09	3.54E-06	6.93E-06	1.02E-05	1.33E-05	1.64E-05	1.93E-05
<sup>145</sup> Nd	601450	1.00E-09	2.41E-06	4.71E-06	6.93E-06	9.06E-06	1.11E-05	1.31E-05
<sup>147</sup> Sm	621470	5.96E-10	1.35E-06	2.51E-06	3.52E-06	4.41E-06	5.19E-06	5.88E-06
<sup>149</sup> Sm	621490	2.93E-10	3.14E-07	4.08E-07	4.75E-07	5.34E-07	5.88E-07	6.37E-07
<sup>150</sup> Sm	621500	7.82E-15	4.42E-07	1.17E-06	1.97E-06	2.81E-06	3.67E-06	4.55E-06
<sup>151</sup> Sm	621510	1.71E-39	3.65E-36	6.58E-36	9.10E-36	1.14E-35	1.35E-35	1.54E-35
<sup>152</sup> Sm	621520	7.79E-11	2.36E-07	5.25E-07	8.36E-07	1.15E-06	1.47E-06	1.79E-06
<sup>151</sup> Eu	631510	1.22E-10	2.60E-07	4.70E-07	6.50E-07	8.11E-07	9.61E-07	1.10E-06
<sup>153</sup> Eu	631530	5.30E-11	1.42E-07	3.20E-07	5.34E-07	7.80E-07	1.05E-06	1.35E-06
<sup>155</sup> Gd	641550	1.23E-11	1.88E-08	2.96E-08	4.00E-08	5.21E-08	6.66E-08	8.38E-08
<sup>233</sup> U	922330	6.61E-13	3.07E-09	9.87E-09	2.01E-08	3.30E-08	4.78E-08	6.40E-08
<sup>234</sup> U	922340	1.05E-05	1.00E-05	9.63E-06	9.34E-06	9.16E-06	9.09E-06	9.14E-06
<sup>235</sup> U	922350	1.21E-03	1.16E-03	1.11E-03	1.06E-03	1.02E-03	9.77E-04	9.39E-04
<sup>236</sup> U	922360	5.56E-06	2.42E-05	4.21E-05	5.93E-05	7.56E-05	9.12E-05	1.06E-04
<sup>238</sup> U	922380	2.27E-02	2.27E-02	2.26E-02	2.25E-02	2.25E-02	2.24E-02	2.23E-02
<sup>237</sup> Np	932370	2.05E-10	9.77E-07	3.18E-06	6.53E-06	1.07E-05	1.56E-05	2.09E-05
<sup>238</sup> Pu	942380	0.00E+00	1.01E-28	2.14E-27	3.02E-31	9.19E-31	2.09E-30	3.95E-30
<sup>239</sup> Pu	942390	1.84E-08	4.28E-05	8.06E-05	1.15E-04	1.46E-04	1.74E-04	2.01E-04
<sup>240</sup> Pu	942400	6.78E-14	5.24E-07	1.62E-06	3.02E-06	4.61E-06	6.34E-06	8.19E-06
<sup>241</sup> Pu	942410	0.00E+00	3.83E-18	3.55E-16	4.50E-15	2.56E-14	9.42E-14	2.65E-13
<sup>242</sup> Pu	942420	3.94E-24	2.34E-09	2.56E-08	9.34E-08	2.20E-07	4.14E-07	6.74E-07
<sup>241</sup> Am	952410	1.63E-25	2.81E-14	1.67E-13	5.25E-13	1.49E-12	4.01E-12	9.78E-12
<sup>242m</sup> Am	952421	0.00E+00	7.37E-29	1.56E-27	2.21E-31	6.72E-31	1.53E-30	2.89E-30
<sup>243</sup> Am	952430	8.54E-30	1.81E-11	4.08E-10	2.28E-09	7.31E-09	1.73E-08	3.41E-08

Table 34. BWR Isotopics as a Function of 5.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.64E-02
<sup>95</sup> Mo	420950	2.54E-05	2.88E-05	3.54E-05	4.17E-05	4.78E-05	5.36E-05	5.91E-05
<sup>99</sup> Tc	430990	2.46E-05	2.79E-05	3.42E-05	4.03E-05	4.61E-05	5.17E-05	5.71E-05
<sup>101</sup> Ru	441010	2.26E-05	2.58E-05	3.19E-05	3.80E-05	4.40E-05	4.99E-05	5.57E-05
<sup>103</sup> Rh	451030	1.56E-05	1.75E-05	2.10E-05	2.44E-05	2.76E-05	3.07E-05	3.35E-05
<sup>109</sup> Ag	471090	1.55E-06	1.80E-06	2.38E-06	3.04E-06	3.75E-06	4.50E-06	5.29E-06
<sup>143</sup> Nd	601430	2.24E-05	2.53E-05	3.07E-05	3.56E-05	4.02E-05	4.43E-05	4.80E-05
<sup>145</sup> Nd	601450	1.51E-05	1.71E-05	2.08E-05	2.44E-05	2.77E-05	3.08E-05	3.38E-05
<sup>147</sup> Sm	621470	6.50E-06	7.06E-06	8.04E-06	8.85E-06	9.51E-06	1.00E-05	1.05E-05
<sup>149</sup> Sm	621490	6.58E-07	6.77E-07	7.08E-07	7.31E-07	7.49E-07	7.63E-07	7.75E-07
<sup>150</sup> Sm	621500	5.43E-06	6.31E-06	8.05E-06	9.74E-06	1.14E-05	1.30E-05	1.45E-05
<sup>151</sup> Sm	621510	1.70E-35	1.84E-35	2.09E-35	2.34E-35	2.57E-35	2.79E-35	3.01E-35
<sup>152</sup> Sm	621520	2.07E-06	2.35E-06	2.87E-06	3.37E-06	3.83E-06	4.26E-06	4.66E-06
<sup>151</sup> Eu	631510	1.21E-06	1.31E-06	1.50E-06	1.67E-06	1.84E-06	2.00E-06	2.15E-06
<sup>153</sup> Eu	631530	1.64E-06	1.95E-06	2.62E-06	3.31E-06	4.01E-06	4.70E-06	5.37E-06
<sup>155</sup> Gd	641550	1.01E-07	1.22E-07	1.72E-07	2.32E-07	3.01E-07	3.77E-07	4.58E-07
<sup>233</sup> U	922330	7.65E-08	9.04E-08	1.20E-07	1.51E-07	1.82E-07	2.11E-07	2.39E-07
<sup>234</sup> U	922340	9.27E-06	9.48E-06	1.01E-05	1.11E-05	1.24E-05	1.39E-05	1.58E-05
<sup>235</sup> U	922350	8.89E-04	8.42E-04	7.55E-04	6.76E-04	6.06E-04	5.42E-04	4.85E-04
<sup>236</sup> U	922360	1.17E-04	1.28E-04	1.48E-04	1.66E-04	1.82E-04	1.96E-04	2.09E-04
<sup>238</sup> U	922380	2.23E-02	2.22E-02	2.21E-02	2.20E-02	2.19E-02	2.18E-02	2.17E-02
<sup>237</sup> Np	932370	2.51E-05	2.96E-05	3.95E-05	4.97E-05	5.98E-05	6.95E-05	7.87E-05
<sup>238</sup> Pu	942380	5.77E-30	8.50E-30	1.64E-29	2.70E-29	3.98E-29	5.39E-29	6.87E-29
<sup>239</sup> Pu	942390	2.16E-04	2.29E-04	2.51E-04	2.70E-04	2.85E-04	2.97E-04	3.08E-04
<sup>240</sup> Pu	942400	9.43E-06	1.07E-05	1.34E-05	1.63E-05	1.92E-05	2.21E-05	2.51E-05
<sup>241</sup> Pu	942410	5.37E-13	1.15E-12	4.22E-12	1.16E-11	2.58E-11	4.98E-11	8.62E-11
<sup>242</sup> Pu	942420	9.14E-07	1.25E-06	2.18E-06	3.42E-06	4.93E-06	6.69E-06	8.66E-06
<sup>241</sup> Am	952410	1.86E-11	3.82E-11	1.35E-10	3.67E-10	8.16E-10	1.57E-09	2.72E-09
<sup>242m</sup> Am	952421	4.22E-30	6.22E-30	1.20E-29	1.98E-29	2.91E-29	3.94E-29	5.03E-29
<sup>243</sup> Am	952430	5.27E-08	8.34E-08	1.88E-07	3.58E-07	5.99E-07	9.13E-07	1.30E-06

Table 34. BWR Isotopics as a Function of 5.0 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.62E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.44E-05	6.95E-05	7.43E-05	7.90E-05	8.34E-05	8.77E-05
<sup>99</sup> Tc	430990	6.22E-05	6.71E-05	7.18E-05	7.63E-05	8.06E-05	8.47E-05
<sup>101</sup> Ru	441010	6.14E-05	6.70E-05	7.24E-05	7.78E-05	8.31E-05	8.82E-05
<sup>103</sup> Rh	451030	3.61E-05	3.85E-05	4.07E-05	4.27E-05	4.46E-05	4.63E-05
<sup>109</sup> Ag	471090	6.10E-06	6.94E-06	7.79E-06	8.64E-06	9.50E-06	1.04E-05
<sup>143</sup> Nd	601430	5.13E-05	5.42E-05	5.68E-05	5.91E-05	6.11E-05	6.28E-05
<sup>145</sup> Nd	601450	3.65E-05	3.91E-05	4.16E-05	4.38E-05	4.60E-05	4.80E-05
<sup>147</sup> Sm	621470	1.08E-05	1.10E-05	1.12E-05	1.13E-05	1.14E-05	1.14E-05
<sup>149</sup> Sm	621490	7.86E-07	7.96E-07	8.06E-07	8.16E-07	8.27E-07	8.38E-07
<sup>150</sup> Sm	621500	1.60E-05	1.74E-05	1.88E-05	2.01E-05	2.14E-05	2.26E-05
<sup>151</sup> Sm	621510	3.22E-35	3.42E-35	3.61E-35	3.80E-35	3.97E-35	4.14E-35
<sup>152</sup> Sm	621520	5.04E-06	5.40E-06	5.73E-06	6.04E-06	6.34E-06	6.62E-06
<sup>151</sup> Eu	631510	2.30E-06	2.44E-06	2.58E-06	2.71E-06	2.84E-06	2.96E-06
<sup>153</sup> Eu	631530	6.01E-06	6.63E-06	7.21E-06	7.75E-06	8.26E-06	8.74E-06
<sup>155</sup> Gd	641550	5.43E-07	6.30E-07	7.18E-07	8.06E-07	8.91E-07	9.74E-07
<sup>233</sup> U	922330	2.65E-07	2.89E-07	3.11E-07	3.30E-07	3.48E-07	3.63E-07
<sup>234</sup> U	922340	1.80E-05	2.03E-05	2.28E-05	2.55E-05	2.82E-05	3.10E-05
<sup>235</sup> U	922350	4.35E-04	3.90E-04	3.51E-04	3.16E-04	2.86E-04	2.61E-04
<sup>236</sup> U	922360	2.19E-04	2.28E-04	2.36E-04	2.42E-04	2.47E-04	2.51E-04
<sup>238</sup> U	922380	2.16E-02	2.15E-02	2.14E-02	2.13E-02	2.12E-02	2.10E-02
<sup>237</sup> Np	932370	8.73E-05	9.52E-05	1.02E-04	1.09E-04	1.15E-04	1.20E-04
<sup>238</sup> Pu	942380	8.35E-29	9.79E-29	1.11E-28	1.24E-28	1.35E-28	1.46E-28
<sup>239</sup> Pu	942390	3.17E-04	3.25E-04	3.32E-04	3.38E-04	3.43E-04	3.47E-04
<sup>240</sup> Pu	942400	2.79E-05	3.07E-05	3.34E-05	3.60E-05	3.86E-05	4.09E-05
<sup>241</sup> Pu	942410	1.38E-10	2.06E-10	2.92E-10	3.95E-10	5.17E-10	6.54E-10
<sup>242</sup> Pu	942420	1.08E-05	1.31E-05	1.56E-05	1.81E-05	2.07E-05	2.34E-05
<sup>241</sup> Am	952410	4.33E-09	6.47E-09	9.17E-09	1.24E-08	1.62E-08	2.06E-08
<sup>242m</sup> Am	952421	6.11E-29	7.16E-29	8.16E-29	9.07E-29	9.91E-29	1.06E-28
<sup>243</sup> Am	952430	1.74E-06	2.24E-06	2.77E-06	3.35E-06	3.94E-06	4.56E-06

Table 35. BWR Isotopics as a Function of 5.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 0.001	Burnup GWd/mtU 2.5	Burnup GWd/mtU 5.0	Burnup GWd/mtU 7.5	Burnup GWd/mtU 10	Burnup GWd/mtU 12.5	Burnup GWd/mtU 15
<sup>16</sup> O	80160	4.79E-02	4.79E-02	4.78E-02	4.77E-02	4.76E-02	4.75E-02	4.74E-02
<sup>95</sup> Mo	420950	1.62E-09	3.94E-06	7.77E-06	1.15E-05	1.51E-05	1.86E-05	2.21E-05
<sup>99</sup> Tc	430990	1.51E-09	3.79E-06	7.48E-06	1.11E-05	1.46E-05	1.80E-05	2.14E-05
<sup>101</sup> Ru	441010	1.34E-09	3.31E-06	6.60E-06	9.86E-06	1.31E-05	1.63E-05	1.95E-05
<sup>103</sup> Rh	451030	9.08E-10	2.26E-06	4.56E-06	6.85E-06	9.12E-06	1.14E-05	1.36E-05
<sup>109</sup> Ag	471090	1.83E-11	8.30E-08	2.32E-07	4.28E-07	6.62E-07	9.25E-07	1.21E-06
<sup>143</sup> Nd	601430	1.47E-09	3.56E-06	6.98E-06	1.03E-05	1.35E-05	1.66E-05	1.96E-05
<sup>145</sup> Nd	601450	1.00E-09	2.42E-06	4.74E-06	6.97E-06	9.14E-06	1.12E-05	1.33E-05
<sup>147</sup> Sm	621470	5.96E-10	1.36E-06	2.54E-06	3.57E-06	4.48E-06	5.29E-06	6.01E-06
<sup>149</sup> Sm	621490	2.93E-10	3.38E-07	4.43E-07	5.14E-07	5.74E-07	6.29E-07	6.78E-07
<sup>150</sup> Sm	621500	7.79E-15	4.15E-07	1.13E-06	1.92E-06	2.74E-06	3.59E-06	4.46E-06
<sup>151</sup> Sm	621510	1.71E-39	3.68E-36	6.66E-36	9.23E-36	1.15E-35	1.37E-35	1.57E-35
<sup>152</sup> Sm	621520	7.76E-11	2.31E-07	5.12E-07	8.16E-07	1.13E-06	1.44E-06	1.76E-06
<sup>151</sup> Eu	631510	1.21E-10	2.62E-07	4.75E-07	6.59E-07	8.24E-07	9.76E-07	1.12E-06
<sup>153</sup> Eu	631530	5.26E-11	1.39E-07	3.12E-07	5.17E-07	7.53E-07	1.01E-06	1.30E-06
<sup>155</sup> Gd	641550	1.22E-11	1.90E-08	2.99E-08	4.00E-08	5.15E-08	6.51E-08	8.13E-08
<sup>233</sup> U	922330	6.50E-13	2.89E-09	9.11E-09	1.85E-08	3.05E-08	4.43E-08	5.97E-08
<sup>234</sup> U	922340	1.17E-05	1.11E-05	1.07E-05	1.04E-05	1.02E-05	1.01E-05	1.01E-05
<sup>235</sup> U	922350	1.33E-03	1.28E-03	1.23E-03	1.18E-03	1.13E-03	1.09E-03	1.04E-03
<sup>236</sup> U	922360	6.12E-06	2.50E-05	4.34E-05	6.10E-05	7.78E-05	9.39E-05	1.09E-04
<sup>238</sup> U	922380	2.26E-02	2.25E-02	2.25E-02	2.24E-02	2.23E-02	2.23E-02	2.22E-02
<sup>237</sup> Np	932370	2.02E-10	9.16E-07	2.93E-06	6.00E-06	9.91E-06	1.45E-05	1.95E-05
<sup>238</sup> Pu	942380	0.00E+00	7.74E-29	1.69E-27	2.45E-31	7.61E-31	1.76E-30	3.38E-30
<sup>239</sup> Pu	942390	1.74E-08	4.08E-05	7.71E-05	1.10E-04	1.41E-04	1.69E-04	1.95E-04
<sup>240</sup> Pu	942400	6.14E-14	4.62E-07	1.45E-06	2.73E-06	4.19E-06	5.80E-06	7.53E-06
<sup>241</sup> Pu	942410	0.00E+00	2.40E-18	2.28E-16	2.97E-15	1.72E-14	6.48E-14	1.85E-13
<sup>242</sup> Pu	942420	3.02E-24	1.78E-09	2.00E-08	7.45E-08	1.79E-07	3.41E-07	5.63E-07
<sup>241</sup> Am	952410	1.37E-25	2.33E-14	1.40E-13	4.25E-13	1.15E-12	2.97E-12	7.13E-12
<sup>242m</sup> Am	952421	0.00E+00	5.67E-29	1.24E-27	1.79E-31	5.57E-31	1.29E-30	2.47E-30
<sup>243</sup> Am	952430	6.14E-30	1.28E-11	2.97E-10	1.70E-09	5.56E-09	1.34E-08	2.68E-08

Table 35. BWR Isotopics as a Function of 5.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)						
		Burnup GWd/mtU 17.5	Burnup GWd/mtU 20	Burnup GWd/mtU 25	Burnup GWd/mtU 30	Burnup GWd/mtU 35	Burnup GWd/mtU 40	Burnup GWd/mtU 45
<sup>16</sup> O	80160	4.73E-02	4.73E-02	4.71E-02	4.69E-02	4.67E-02	4.65E-02	4.64E-02
<sup>95</sup> Mo	420950	2.56E-05	2.91E-05	3.58E-05	4.22E-05	4.84E-05	5.43E-05	6.00E-05
<sup>99</sup> Tc	430990	2.48E-05	2.81E-05	3.44E-05	4.06E-05	4.65E-05	5.22E-05	5.77E-05
<sup>101</sup> Ru	441010	2.27E-05	2.58E-05	3.19E-05	3.80E-05	4.41E-05	5.00E-05	5.58E-05
<sup>103</sup> Rh	451030	1.54E-05	1.73E-05	2.09E-05	2.43E-05	2.75E-05	3.05E-05	3.34E-05
<sup>109</sup> Ag	471090	1.43E-06	1.67E-06	2.22E-06	2.83E-06	3.51E-06	4.23E-06	4.98E-06
<sup>143</sup> Nd	601430	2.27E-05	2.56E-05	3.12E-05	3.63E-05	4.10E-05	4.53E-05	4.92E-05
<sup>145</sup> Nd	601450	1.53E-05	1.73E-05	2.11E-05	2.47E-05	2.81E-05	3.13E-05	3.44E-05
<sup>147</sup> Sm	621470	6.66E-06	7.25E-06	8.29E-06	9.16E-06	9.87E-06	1.04E-05	1.09E-05
<sup>149</sup> Sm	621490	7.00E-07	7.19E-07	7.50E-07	7.73E-07	7.89E-07	8.03E-07	8.13E-07
<sup>150</sup> Sm	621500	5.34E-06	6.21E-06	7.93E-06	9.62E-06	1.13E-05	1.29E-05	1.44E-05
<sup>151</sup> Sm	621510	1.72E-35	1.87E-35	2.13E-35	2.37E-35	2.60E-35	2.82E-35	3.04E-35
<sup>152</sup> Sm	621520	2.04E-06	2.32E-06	2.85E-06	3.35E-06	3.82E-06	4.26E-06	4.68E-06
<sup>151</sup> Eu	631510	1.23E-06	1.33E-06	1.52E-06	1.69E-06	1.86E-06	2.02E-06	2.17E-06
<sup>153</sup> Eu	631530	1.58E-06	1.89E-06	2.53E-06	3.21E-06	3.90E-06	4.59E-06	5.26E-06
<sup>155</sup> Gd	641550	9.77E-08	1.17E-07	1.64E-07	2.21E-07	2.86E-07	3.60E-07	4.39E-07
<sup>233</sup> U	922330	7.16E-08	8.49E-08	1.14E-07	1.44E-07	1.74E-07	2.04E-07	2.33E-07
<sup>234</sup> U	922340	1.02E-05	1.03E-05	1.09E-05	1.17E-05	1.29E-05	1.44E-05	1.62E-05
<sup>235</sup> U	922350	9.93E-04	9.44E-04	8.52E-04	7.68E-04	6.91E-04	6.22E-04	5.59E-04
<sup>236</sup> U	922360	1.21E-04	1.32E-04	1.54E-04	1.73E-04	1.90E-04	2.06E-04	2.20E-04
<sup>238</sup> U	922380	2.22E-02	2.21E-02	2.20E-02	2.19E-02	2.18E-02	2.17E-02	2.16E-02
<sup>237</sup> Np	932370	2.34E-05	2.78E-05	3.73E-05	4.73E-05	5.73E-05	6.70E-05	7.64E-05
<sup>238</sup> Pu	942380	4.98E-30	7.43E-30	1.47E-29	2.47E-29	3.70E-29	5.10E-29	6.58E-29
<sup>239</sup> Pu	942390	2.10E-04	2.23E-04	2.46E-04	2.64E-04	2.80E-04	2.93E-04	3.04E-04
<sup>240</sup> Pu	942400	8.70E-06	9.93E-06	1.25E-05	1.53E-05	1.81E-05	2.10E-05	2.38E-05
<sup>241</sup> Pu	942410	3.80E-13	8.20E-13	3.08E-12	8.62E-12	1.96E-11	3.85E-11	6.77E-11
<sup>242</sup> Pu	942420	7.69E-07	1.06E-06	1.88E-06	2.98E-06	4.35E-06	5.95E-06	7.76E-06
<sup>241</sup> Am	952410	1.35E-11	2.77E-11	9.95E-11	2.74E-10	6.20E-10	1.21E-09	2.13E-09
<sup>242m</sup> Am	952421	3.65E-30	5.44E-30	1.07E-29	1.81E-29	2.71E-29	3.73E-29	4.82E-29
<sup>243</sup> Am	952430	4.18E-08	6.68E-08	1.53E-07	2.97E-07	5.04E-07	7.79E-07	1.12E-06

Table 35. BWR Isotopics as a Function of 5.5 wt% <sup>235</sup>U and Burnup, 10K Year Decay (Cont.)

Isotope	SAS2H ID	Isotopic Concentrations atoms / (barn - cm)					
		Burnup GWd/mtU 50	Burnup GWd/mtU 55	Burnup GWd/mtU 60	Burnup GWd/mtU 65	Burnup GWd/mtU 70	Burnup GWd/mtU 75
<sup>16</sup> O	80160	4.62E-02	4.60E-02	4.58E-02	4.56E-02	4.54E-02	4.52E-02
<sup>95</sup> Mo	420950	6.55E-05	7.07E-05	7.57E-05	8.04E-05	8.50E-05	8.94E-05
<sup>99</sup> Tc	430990	6.30E-05	6.80E-05	7.28E-05	7.74E-05	8.18E-05	8.60E-05
<sup>101</sup> Ru	441010	6.15E-05	6.71E-05	7.26E-05	7.80E-05	8.33E-05	8.85E-05
<sup>103</sup> Rh	451030	3.60E-05	3.84E-05	4.07E-05	4.28E-05	4.47E-05	4.65E-05
<sup>109</sup> Ag	471090	5.77E-06	6.57E-06	7.40E-06	8.24E-06	9.08E-06	9.93E-06
<sup>143</sup> Nd	601430	5.27E-05	5.59E-05	5.87E-05	6.11E-05	6.33E-05	6.52E-05
<sup>145</sup> Nd	601450	3.72E-05	3.99E-05	4.24E-05	4.48E-05	4.70E-05	4.90E-05
<sup>147</sup> Sm	621470	1.13E-05	1.15E-05	1.17E-05	1.18E-05	1.19E-05	1.19E-05
<sup>149</sup> Sm	621490	8.23E-07	8.31E-07	8.39E-07	8.48E-07	8.56E-07	8.66E-07
<sup>150</sup> Sm	621500	1.59E-05	1.74E-05	1.88E-05	2.01E-05	2.14E-05	2.26E-05
<sup>151</sup> Sm	621510	3.25E-35	3.45E-35	3.64E-35	3.82E-35	4.00E-35	4.17E-35
<sup>152</sup> Sm	621520	5.06E-06	5.43E-06	5.77E-06	6.09E-06	6.39E-06	6.67E-06
<sup>151</sup> Eu	631510	2.32E-06	2.46E-06	2.60E-06	2.73E-06	2.86E-06	2.98E-06
<sup>153</sup> Eu	631530	5.91E-06	6.53E-06	7.12E-06	7.68E-06	8.20E-06	8.69E-06
<sup>155</sup> Gd	641550	5.22E-07	6.08E-07	6.96E-07	7.84E-07	8.71E-07	9.56E-07
<sup>233</sup> U	922330	2.59E-07	2.84E-07	3.07E-07	3.28E-07	3.47E-07	3.64E-07
<sup>234</sup> U	922340	1.82E-05	2.05E-05	2.31E-05	2.57E-05	2.85E-05	3.14E-05
<sup>235</sup> U	922350	5.02E-04	4.52E-04	4.06E-04	3.66E-04	3.31E-04	3.00E-04
<sup>236</sup> U	922360	2.32E-04	2.42E-04	2.51E-04	2.58E-04	2.64E-04	2.69E-04
<sup>238</sup> U	922380	2.15E-02	2.14E-02	2.13E-02	2.12E-02	2.11E-02	2.10E-02
<sup>237</sup> Np	932370	8.52E-05	9.35E-05	1.01E-04	1.08E-04	1.14E-04	1.20E-04
<sup>238</sup> Pu	942380	8.10E-29	9.59E-29	1.10E-28	1.24E-28	1.36E-28	1.47E-28
<sup>239</sup> Pu	942390	3.14E-04	3.22E-04	3.29E-04	3.36E-04	3.41E-04	3.46E-04
<sup>240</sup> Pu	942400	2.67E-05	2.95E-05	3.22E-05	3.48E-05	3.73E-05	3.98E-05
<sup>241</sup> Pu	942410	1.10E-10	1.67E-10	2.40E-10	3.30E-10	4.37E-10	5.60E-10
<sup>242</sup> Pu	942420	9.76E-06	1.19E-05	1.42E-05	1.66E-05	1.91E-05	2.17E-05
<sup>241</sup> Am	952410	3.46E-09	5.25E-09	7.54E-09	1.04E-08	1.37E-08	1.76E-08
<sup>242m</sup> Am	952421	5.93E-29	7.02E-29	8.07E-29	9.05E-29	9.95E-29	1.08E-28
<sup>243</sup> Am	952430	1.52E-06	1.97E-06	2.47E-06	3.01E-06	3.58E-06	4.16E-06

## 6.3 MCNP RESULTS

### 6.3.1 Confirmation of Isotopic Database Using RCA Data

The results presented in References 7.10 and 7.11 evaluated the RCA data by placing the sample data in all nodes of all assemblies within a 44 BWR waste package. These cases were rerun as described in Section 5.2.1 above. The resulting  $k_{\text{eff}}$  values are recorded in Table 36 along with the  $k_{\text{eff}}$  values calculated using isotopic database concentration values. For all of the samples using the isotopic database, the material density was increased to 10.741 g/cm<sup>3</sup>. This density change is consistent with the density used in the bounding isotopic concentration calculations.

Section 2 of this report presents two requirements imposed in the Disposal Criticality Analysis Methodology Topical Report (Reference 7.1, pp. 3-38 and 3-39) to ensure that the isotopic concentrations used for burnup credit are conservative with respect to criticality. For the second requirement the  $k_{\text{eff}}$  values for waste package calculations with concentrations from the isotopic database must always be greater than the  $k_{\text{eff}}$  values obtained when using the measured (RCA) isotopic concentration values. The last column of Table 36 presents  $\Delta k_{\text{eff}} / k_{\text{eff}}$  values for waste package calculations with concentrations from the isotopic database compared with WP calculations with measured isotopic concentrations. A positive value indicates a "bounded sample". That is to say that the  $k_{\text{eff}}$  value for the 44 BWR WP containing the material concentrations from the isotopic database exceeds the  $k_{\text{eff}}$  value for the 44 BWR WP containing the material concentrations based on the RCA values. In all cases, the isotopic database materials were bounding when compared to the RCAs.

Table 36. RCA Sample Comparison to Isotopic Database Concentration in a 44 BWR Waste Package

Sample Name	Isotopic Database (ID)		RCA		[ $\Delta k/k$ ] <sup>a</sup> (%)
	$k_{eff}$	$\sigma$	$k_{eff}$	$\sigma$	
D8-3D2B	0.76073	0.00072	0.56062	0.00044	35.69%
D8-4G3	0.80084	0.00058	0.63548	0.00057	26.02%
D9-1D2	0.75160	0.00055	0.46859	0.00039	60.40%
D9-2D2	0.74515	0.00056	0.50906	0.00042	46.38%
D9-4D4	0.74679	0.00059	0.53387	0.00051	39.88%
D9-4G1E1	0.76307	0.00063	0.56883	0.00049	34.15%
H5-3A1C	0.76020	0.00062	0.59039	0.00052	28.76%
H5-3A1G	0.75909	0.00064	0.59217	0.00058	28.19%
Rod add2966, cut-b	0.88817	0.00074	0.74136	0.00065	19.80%
Rod add2966, cut-k	0.86304	0.00063	0.64206	0.00052	34.42%
Rod add2966, cut-t	0.86200	0.00061	0.60751	0.00046	41.89%
Rod add2974, cut-b	0.89008	0.00064	0.76164	0.00059	16.86%
Rod add2974, cut-j	0.86940	0.00068	0.69331	0.00056	25.40%
Rod add2974, cut-u	0.86695	0.00061	0.64811	0.00053	33.77%
assy. b23, rod a1, 44cm	0.73073	0.00067	0.54400	0.00055	34.33%
assy. b23, rod a1, 268cm	0.72980	0.00067	0.57765	0.00057	26.34%
assy. b23, rod b3, 268cm	0.73435	0.00069	0.61827	0.00062	18.77%
assy. b23, rod e3, 268cm	0.73265	0.00068	0.59666	0.00054	22.79%
assy. c16, rod a1, 44cm	0.73495	0.00069	0.56778	0.00058	29.44%
assy. c16, rod a1, 268cm	0.73487	0.00070	0.60154	0.00056	22.16%
assy. c16, rod b3, 268cm	0.74020	0.00059	0.63653	0.00064	16.29%
assy. c16, rod e5, 268cm	0.73713	0.00066	0.59853	0.00050	23.16%
assy. a-14, rod c-d-3-4 (2)	0.78744	0.00063	0.74262	0.00066	6.04%
assy. a-14, rod c-d-3-4 (9)	0.78946	0.00062	0.73526	0.00064	7.37%
assy. a-18, rod c-d-3-4 (2)	0.78426	0.00066	0.74296	0.00072	5.56%
assy. a-18, rod c-d-3-4 (6)	0.79064	0.00068	0.73467	0.00062	7.62%
assy. a-20, rod a-1 (3)	0.79684	0.00072	0.71585	0.00060	11.31%
assy. a-20, rod a-1 (10)	0.79588	0.00066	0.71048	0.00053	12.02%
assy. a-20, rod a-3 (3)	0.79930	0.00065	0.71494	0.00063	11.80%
assy. a-20, rod a-6 (9)	0.79757	0.00074	0.71572	0.00063	11.44%
assy. a-20, rod a-6 (1)	0.78378	0.00058	0.74448	0.00058	5.28%
assy. a-20, rod c-3 (3)	0.79354	0.00076	0.73457	0.00066	8.03%
assy. a-20, rod c-3 (5)	0.79556	0.00064	0.72902	0.00065	9.13%
assy. a-20, rod a-1 (8)	0.79680	0.00065	0.72427	0.00064	10.01%
assy. a-20, rod c-3 (10)	0.79367	0.00068	0.72774	0.00060	9.06%
assy. a-20, rod c-3 (12)	0.77975	0.00067	0.74484	0.00065	4.69%
assy. a-20, rod e-2 (3)	0.79471	0.00070	0.73042	0.00063	8.80%
assy. a-20, rod e-2 (10)	0.79367	0.00071	0.72369	0.00066	9.67%

## Notes:

$$^a. \Delta k/k (\%) = [k_{eff}(\text{Isotopic Database}) - k_{eff}(\text{RCA})] \times 100 / k_{eff}(\text{RCA})$$



### 6.3.2 Confirmation of Isotopic Database Using CRC Data

The CRCs have been previously evaluated using MCNP. The calculated  $k_{\text{eff}}$  values for the CRCs are documented in Reference 7.20 and are not re-evaluated in this calculation. The comparison of CRC data is based on the  $k_{\text{eff}}$  results calculated using the best-estimate isotopic data set. The applicable  $k_{\text{eff}}$  values are listed in Table 37, along with the new values calculated using the isotopic database material compositions. For each cycle reported, the first  $k_{\text{eff}}$  and  $\sigma$  values are the original best-estimate CRC  $k_{\text{eff}}$  values taken from Reference 7.20. Using the best-estimate CRC  $k_{\text{eff}}$  values identifies the full range of conservatism built into the isotopic database, including the conservatism resulting from the use of the principal isotopes instead of the entire best-estimate material description.

The revised MCNP input files are based on the actual MCNP input files taken from the CRC reactivity calculation report (Reference 7.20). For each evaluated assembly, the isotopic database concentrations replaced the CRC material data in the MCNP fuel material cards for all fuel nodes of the affected assembly. Also, the material density for each axial fuel node was changed to  $10.741 \text{ g/cm}^3$ . This density change is consistent with the density used in the bounding isotopic concentration calculations. Only one set of assembly fuel data was modified in each of the MCNP calculations reported in Table 37. The total number of affected assemblies in the entire core is listed in Table 37.

The data reported in Table 37 demonstrates that the isotopic database provides bounding material definitions for all tested assemblies. Because these assemblies are expected to be the most difficult to bound in the available BWR CRC database, this demonstrates that the isotopic database approach will bound the current CRC database. Thus, requirement A discussed in Section 2 of this document and in Reference 7.1, Section 3.5.3.1.2 is satisfied.

However, additional confirmation should be performed using additional assemblies that may be bounding, but are not currently included in the CRC database. Also, it would be advisable to investigate the relative affect of the bounding model in a waste package, similar to the RCA confirmation calculations documented above. This may be accomplished by calculating  $k_{\text{eff}}$  values for the each assembly listed in Table 10 in a 44 BWR waste package. All 44 locations in the waste package could be filled with the same assembly using the best-estimate isotopic concentrations present in the CRC calculations. The calculations would then be repeated using the isotopic database isotopic concentrations. These "best-estimate"  $k_{\text{eff}}$  values could be compared to the "Isotopic Database"  $k_{\text{eff}}$  values to determine the level of relative conservatism.

Table 37. Comparison of CRCs to Isotopic Database Concentrations

State-point	Assembly	Number of Effected Assemblies	$k_{eff}$	$\sigma$	$[\Delta k/k]^a$ (%)
6	Base <sup>b</sup>		0.99324	0.0001	
	A16	8	1.00238	0.00012	0.92%
	C06	8	0.99401	0.00010	0.08%
13	Base <sup>b</sup>		0.98551	0.0001	
	B37	8	0.99057	0.00010	0.51%
14	Base <sup>b</sup>		0.98295	0.0001	
	D45	8	0.98310	0.00010	0.02%
15	Base <sup>b</sup>		0.98309	0.0001	
	B32	8	0.98373	0.00010	0.07%
18	Base <sup>b</sup>		0.98993	0.0001	
	H15	8	0.99044	0.00010	0.05%
	F16	4	0.99006	0.00010	0.01%
20	Base <sup>b</sup>		0.96644	0.0001	
	K06	8	0.96661	0.00010	0.02%
	H22	8	0.96714	0.00010	0.07%
	J30	8	0.96916	0.00011	0.28%
21	Base <sup>b</sup>		0.99211	0.0001	
	H06	8	1.00096	0.00011	0.89%

**Notes:**

<sup>a</sup>  $\Delta k/k$  (%) =  $[k_{eff}(\text{Isotopic Database}) - k_{eff}(\text{Base})] \times 100 / k_{eff}(\text{Base})$

<sup>b</sup> Base is based on best-estimate isotopic data (Reference 7.20)

**6.3.3 Confirmation of Isotopic Database Using Nominal Depletion Data**

For comparison to the conservative isotopic database depletion, a nominal depletion was defined based on information from the *Commercial Reactor Criticality Depletion for Grand Gulf, Unit 1* (Reference 7.15). For this calculation, the base depletion is taken from the Assembly C16, node 3 depletion calculation for state-point 15 recorded in Reference 7.15. This SAS2H input file was selected for the following reasons:

- C16 is an 8x8 assembly
- Contains 6 Gadolinia rods (4wt% Gd<sub>2</sub>O<sub>3</sub>)
- Burnup of 43.63 GWd/mtU (maximum node burnup available for the state-points recorded in Reference 7.15 of any 8x8 assembly)
- Significant control rod history compared to other 8x8 assemblies depleted in Reference 7.15

The C16, node 3 depletion input file was modified to reflect nominal values for various parameters. The following parameters are considered nominal for BWR fuel assemblies.

- Fuel temperature, 1000 K (consistent with C16 node 3, ranges from 1122 K to 865 K)
- Moderator Density,  $0.43 \text{ g/cm}^3$  (consistent with node 4 values for C16, intended to match node 4 moderator density with node 3 control rod history)

These provide the nominal parameter set used as the baseline for comparison for the determination of the conservatism of the isotopic database.

For comparison to the isotopic database, convenient enrichment burnup pairs were selected. The nominal depletion SAS2H inputs were modified to reflect the enrichment in the  $\text{UO}_2$  rods only. The Gadolinia rod uranium enrichment remained consistent with the C16, node 3 value. To facilitate the uranium enrichment changes, only  $^{235}\text{U}$  and  $^{238}\text{U}$  were included in the fuel description.  $^{234}\text{U}$  and  $^{236}\text{U}$  were added to list of "tracked" isotopes. The burnup step lengths were modified to provide steps that ended on the selected burnup values. For the 50 GWd/mtU cases, depletion steps, consistent with the last step recorded in the C16, node 3 depletion input, were added to the end of the depletion. Finally, the final decay time was extended to 5 years for comparison with the 5 year decayed isotopic database values.

The isotopic concentrations generated by SAS2H were placed in a 7x7 assembly in a 44 BWR Waste Package. The base model is the Cooper 7x7 (sample c1m, Table 8) used in the Cooper RCA calculations reported above. The calculated  $k_{\text{eff}}$  values for the nominal depletion assembly in a 44 BWR Waste Package are listed in Table 38, along with the values calculated using the isotopic database material compositions. The calculated  $\Delta k_{\text{eff}}$  values are shown in Figure 34.

Table 38. Comparison of Nominal Depletion Assemblies to Isotopic Database Concentrations

MCNP File Name	Enrichment (wt% <sup>235</sup> U)	Burnup (GWd/mt U)	Nominal Depletion Assembly		Isotopic Database		$\Delta k_{eff}^a$
			$k_{eff}$	$\sigma$	$k_{eff}$	$\sigma$	
bwr310	3.0	10.0	0.77892	0.00062	0.85388	0.00074	0.07496
bwr320	3.0	20.0	0.73099	0.00061	0.83141	0.00069	0.10042
bwr330	3.0	30.0	0.67143	0.00055	0.80003	0.00065	0.12860
bwr340	3.0	40.0	0.58425	0.00052	0.77664	0.00064	0.19239
bwr350	3.0	50.0	0.52599	0.00049	0.75485	0.00071	0.22886
bwr410	4.0	10.0	0.84828	0.00061	0.88921	0.00059	0.04093
bwr420	4.0	20.0	0.79600	0.00067	0.85702	0.00068	0.06102
bwr430	4.0	30.0	0.73984	0.00063	0.82657	0.00066	0.08673
bwr440	4.0	40.0	0.65649	0.00058	0.79615	0.00065	0.13966
bwr450	4.0	50.0	0.58881	0.00051	0.77134	0.00057	0.18253
bwr510	5.0	10.0	0.89856	0.00071	0.91902	0.00069	0.02046
bwr520	5.0	20.0	0.84699	0.00061	0.88542	0.00058	0.03843
bwr530	5.0	30.0	0.79648	0.00063	0.85147	0.00067	0.05499
bwr540	5.0	40.0	0.72449	0.00055	0.81982	0.00064	0.09533
bwr550	5.0	50.0	0.65625	0.00055	0.79027	0.00056	0.13402

## Notes:

$$^a \Delta k_{eff} = k_{eff} (\text{Isotopic Database}) - k_{eff} (\text{Nominal})$$

The MCNP input files are based on the 44 BWR Waste Package input files containing 7x7 assemblies. For each evaluated assembly, the isotopic database concentrations replaced the nominal depletion assembly material data in the MCNP fuel material cards. Also, the fuel material density was set to 10.741 g/cm<sup>3</sup>. This density is consistent with the density used in the bounding isotopic concentration calculations. The fuel material definitions for all forty-four assemblies in the 44 BWR Waste Package were modified in the MCNP calculations reported in Table 38.

Figure 34 shows the calculated  $\Delta k_{eff}$  relative to the absolute value of the calculated bias plus uncertainty for the CRCs,  $1-0.0003*(\text{System Average Burnup})+0.9829$ , Reference 7.9, Table 6, and the absolute value of the lower limit and uncertainty for the RCAs,  $-4.813e^{-4}*(\text{System Average Burnup})-0.0366$ , Reference 7.11 Table 6-1). Figure 34 indicates that the isotopic database bounding depletion model is conservative with respect to the nominal depletion model for all three enrichments presented over most of the range of burnups presented. For 3.0 wt%, the isotopic database bounding depletion model is always conservative over the presented range of burnups. However, for 4.0 wt%, the isotopic database bounding depletion model is only

conservative, versus the RCAs for burnups greater than 10.3 GWd/mtU. Also, for the 5.0 wt% cases, the isotopic database bounding depletion model is only conservative versus the CRCs for burnups greater than 9.7 GWd/mtU and versus the RCAs for burnups greater than 26.6 GWd/mtU. Above these burnup values, the calculated  $k_{eff}$  value meets the criteria for conservatism presented in Reference 7.1.

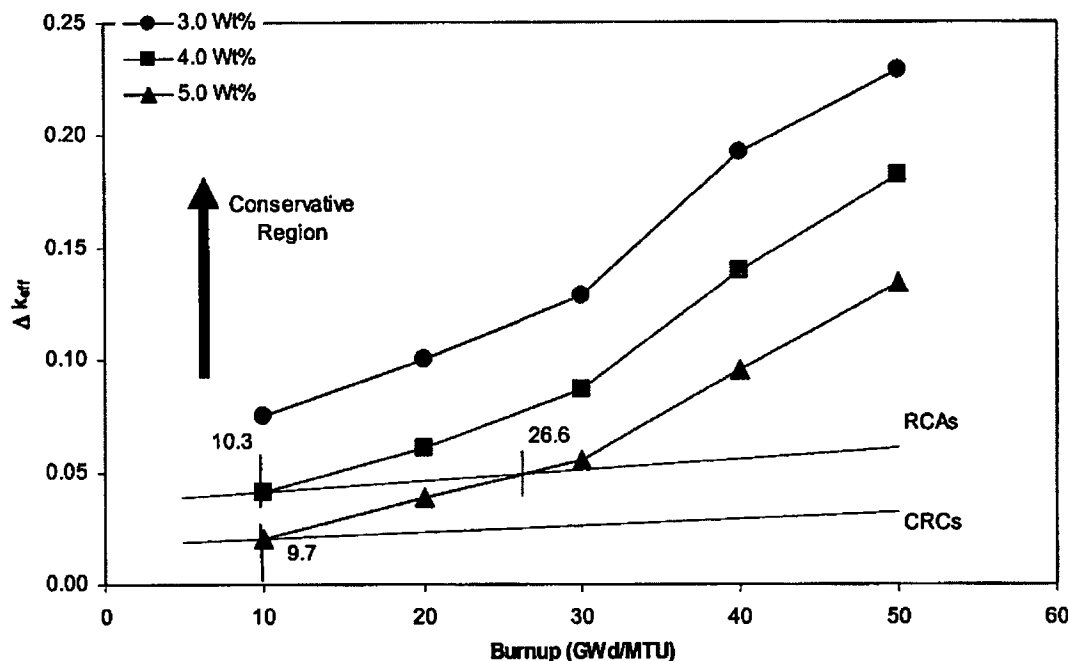


Figure 34. Comparison of  $\Delta k_{eff}$  for Isotopic Database versus Nominal Depletion

## 7. REFERENCES

- 7.1 AREVA/FANP Document Number 38-5032055-01, 2003. YMP. *Disposal Criticality Analysis Methodology Topical Report*, YMP/TR-004Q, Rev. 02, Las Vegas, Nevada: Yucca Mountain Site Characterization Office. DOC.20031110.0005.
- 7.2 AREVA/FANP, Administrative Procedure, Number: 0402-01, Preparing and Processing FANP Calculations, February 2003, Framatome ANP, Lynchburg, VA
- 7.3 AREVA/FANP Document Number 56-5015885, 2003, Framatome ANP Inc. Quality Management Manual.
- 7.4 *SAS2H: A Coupled One-Dimensional Depletion and Shielding Analysis Module*, NUREG/CR-200, Revision 6, Volume 1, Section S2, ORNL/NUREG/CSD-2/V2/R6, March 2000. Distributed by the Computational Physics and Engineering Division, Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee
- 7.5 Briesmeister, J. F., Ed., "MCNP™ – A General Monte Carlo N-Particle Transport Code, Version 4B" LA-12625-M, Los Alamos National Laboratory (LANL), March 1997
- 7.6 AREVA/FANP Document Number 38-5028974-00, 2001. *Summary Report of Commercial Reactor Criticality Data for Grand Gulf Unit 1*, TDR-UDC-NU-000002 REV 00, Las Vegas, Nevada: Yucca Mountain Site Characterization Office
- 7.7 AREVA/FANP Document Number 38-5035940-00, 1999. *Summary Report of Commercial Reactor Criticality Data for LaSalle Unit 1*, B-00000000-01717-5705-00138 Rev 00, Las Vegas, Nevada: Yucca Mountain Site Characterization Office
- 7.8 AREVA/FANP Document Number 38-5036356-00, 1999. *Summary Report of Commercial Reactor Criticality Data for Quad Cities Unit 2*, B-00000000-01717-5705-00096 Rev 01, Las Vegas, Nevada: Yucca Mountain Site Characterization Office
- 7.9 AREVA/FANP Document Number 32-5037984-01, 2004. *Critical Limit Development for PWR and BWR SNF Waste Package*, May 2004, Framatome ANP, Lynchburg, VA
- 7.10 AREVA/FANP Document Number 38-5040793-00, 2003. *Limerick Unit 1 Radiochemical Assay Comparisons to SAS2H Calculations*, CAL-DSU-NU-000002 REV 00A, Las Vegas, Nevada: Yucca Mountain Site Characterization Office. MOL.20031002.0139
- 7.11 AREVA/FANP Document Number 38-5040775-00, 2003. *Calculation of Isotopic Bias and Uncertainty for BWR SNF*, CAL-DSU-NU-000003 REV A, Las Vegas, Nevada: Yucca Mountain Site Characterization Office
- 7.12 DOE (U.S. Department of Energy) 1992, *Characteristics of Potential Repository Wastes*, DOE/RW-0184-R1, Volume 1, U.S. DOE OCRWM, July, 1992

- 7.13 DOE 1996, *Spent Nuclear Fuel Discharges from U.S. Reactors 1994*, Washington, D.C.: U.S. Department of Energy, Energy Information Administration.
- 7.14 AREVA/FANP, Administrative Procedure, Number: 0902-06, Software Certification, December 2003, Framatome ANP, Lynchburg, VA
- 7.15 AREVA/FANP Document Number 32-5028092-00, 2003. *Commercial Reactor Criticality Depletion for Grand Gulf, Unit 1*. September 2003, Framatome ANP, Lynchburg, VA
- 7.16 AREVA/FANP Document Number 38-2300004-00, 2000. *Cooper Nuclear Station Cycle 1 Data*, April 2000
- 7.17 AREVA/FANP Document Number 43-10186PA-01, 2000. *Extended Burnup Evaluation*.
- 7.18 AREVA/FANP Document Number 32-5030781-00, 2003. *BWR Depletion Parameter Sensitivity Evaluation*, September 2003, Framatome ANP, Lynchburg, VA
- 7.19 Parrington, J.R., et al, *Nuclides and Isotopes, Chart of the Nuclides*, 15<sup>th</sup> Edition, 1996, San Jose, California, General Electric Corporation, and KAPL, Inc.
- 7.20 AREVA/FANP Document Number 32-5029393-00, 2003. *Commercial Reactor Reactivity Analysis for Grand Gulf, Unit 1*, September 2003, Framatome ANP, Lynchburg, VA

## 8. COMPUTER OUTPUT

Table 39 lists the SAS2H Tape 72/output files for the sensitivity study.

Table 40 lists the MCNP output files for the sensitivity study.

Table 41 lists the SAS2H Tape 72/output files for the isotopic database generation, 5 year decay.

Table 42 lists the SAS2H Tape 72/output files for the isotopic database generation, 10,000 year decay.

Table 43 lists the SAS2H Tape 72/output files for the nominal depletion cases used for confirmation of the isotopic database.

Table 44 lists the MCNP output files for confirmation of the isotopic database.

Table 39. Sensitivity Study SAS2H Tape 72/Output Files

File Name	File Size (bytes)	Date of Last Update	Time
bwrs0001.ft72	1908764	17-Feb-2004	13:55
bwrs0001.out	46016102	17-Feb-2004	13:56
bwrs0002.ft72	1908764	17-Feb-2004	14:03
bwrs0002.out	46403470	17-Feb-2004	14:03
bwrs0003.ft72	1908764	17-Feb-2004	14:07
bwrs0003.out	47535974	17-Feb-2004	14:07
bwrs0004.ft72	1908764	16-Feb-2004	13:09
bwrs0004.out	46017095	16-Feb-2004	13:09
bwrs0005.ft72	1908764	16-Feb-2004	13:09
bwrs0005.out	46366836	16-Feb-2004	13:09
bwrs0006.ft72	1908764	16-Feb-2004	13:18
bwrs0006.out	47498234	16-Feb-2004	13:18
bwrs0007.ft72	1908764	17-Feb-2004	13:56
bwrs0007.out	46012735	17-Feb-2004	13:56
bwrs0008.ft72	1908764	16-Feb-2004	13:19
bwrs0008.out	46017095	16-Feb-2004	13:19
bwrs0009.ft72	2030600	17-Feb-2004	10:44
bwrs0009.out	47695831	17-Feb-2004	10:44
bwrs0010.ft72	2030600	17-Feb-2004	11:06
bwrs0010.out	49148978	17-Feb-2004	11:06
bwrs0011.ft72	1908764	16-Feb-2004	14:10
bwrs0011.out	46332830	16-Feb-2004	14:10
bwrs0012.ft72	1908764	16-Feb-2004	14:27
bwrs0012.out	46259969	16-Feb-2004	14:27
bwrs0013.ft72	446732	16-Feb-2004	15:51
bwrs0013.out	10070487	16-Feb-2004	15:51
bwrs0014.ft72	1177748	16-Feb-2004	15:54
bwrs0014.out	28147892	16-Feb-2004	15:54
bwrs0015.ft72	1949376	16-Feb-2004	15:58
bwrs0015.out	47490875	16-Feb-2004	15:58



Table 39. Sensitivity Study SAS2H Tape 72/Output Files (Cont'd)

File Name	File Size (bytes)	Date of Last Update	Time
Bwrs0016.ft72	1949376	16-Feb-2004	17:08
Bwrs0016.out	47840515	16-Feb-2004	17:08
Bwrs0017.ft72	487344	17-Feb-2004	11:03
Bwrs0017.out	11038729	17-Feb-2004	11:03
bwrs0018.ft72	1258972	17-Feb-2004	11:09
bwrs0018.out	30075306	17-Feb-2004	11:09
bwrs0019.ft72	2071212	17-Feb-2004	11:35
bwrs0019.out	50406433	17-Feb-2004	11:35
bwrs0020.ft72	2071212	17-Feb-2004	11:35
bwrs0020.out	50775197	17-Feb-2004	11:35
bwrs0021.ft72	2111824	17-Feb-2004	11:43
bwrs0021.out	51551245	17-Feb-2004	11:43
bwrs0022.ft72	2071212	17-Feb-2004	13:01
bwrs0022.out	50536482	17-Feb-2004	13:01
bwrs0023.ft72	1908764	17-Feb-2004	14:21
bwrs0023.out	47072831	17-Feb-2004	14:21
bwrs0024.ft72	1908764	17-Feb-2004	14:21
bwrs0024.out	47426361	17-Feb-2004	14:21
bwrs0025.ft72	1908764	17-Feb-2004	14:26
bwrs0025.out	48492378	17-Feb-2004	14:27
bwrs0026.ft72	446732	17-Feb-2004	14:17
bwrs0026.out	10283019	17-Feb-2004	14:17
bwrs0027.ft72	487344	17-Feb-2004	13:35
bwrs0027.out	11280604	17-Feb-2004	13:35
bwrs0028.ft72	1989988	16-Feb-2004	16:40
bwrs0028.out	48619538	16-Feb-2004	16:40
bwrs0029.ft72	1949376	16-Feb-2004	16:38
bwrs0029.out	47633241	16-Feb-2004	16:38
bwrs0030.ft72	487344	17-Feb-2004	14:47
bwrs0030.out	11547124	17-Feb-2004	14:47
bwrs0031.ft72	487344	17-Feb-2004	15:02
bwrs0031.out	11288778	17-Feb-2004	15:02
bwrs0032.ft72	487344	17-Feb-2004	15:02
bwrs0032.out	11331515	17-Feb-2004	15:02
bwrs0033.ft72	487344	17-Feb-2004	15:02
bwrs0033.out	11062044	17-Feb-2004	15:02
bwrs0034.ft72	487344	17-Feb-2004	15:02
bwrs0034.out	11246608	17-Feb-2004	15:02
bwrs0035.ft72	487344	17-Feb-2004	15:00
bwrs0035.out	10978429	17-Feb-2004	15:00
bwrs0036.ft72	487344	17-Feb-2004	15:00
bwrs0036.out	11193969	17-Feb-2004	15:00
bwrs0037.ft72	487344	17-Feb-2004	15:01
bwrs0037.out	10928304	17-Feb-2004	15:01
bwrs0038.ft72	446732	16-Feb-2004	16:43
bwrs0038.out	10227538	16-Feb-2004	16:43
bwrs0039.ft72	446732	16-Feb-2004	16:44
bwrs0039.out	10008696	16-Feb-2004	16:44

Table 39. Sensitivity Study SAS2H Tape 72/Output Files (Cont'd)

File Name	File Size (bytes)	Date of Last Update	Time
bwrs0040.out	28147884	24-May-2004	13:14
bwrs0040.ft72	1177748	24-May-2004	13:13
bwrs0041.out	28724349	24-May-2004	13:16
bwrs0041.ft72	1177748	24-May-2004	13:16
bwrs0042.out	30075306	24-May-2004	13:16
bwrs0042.ft72	1258972	24-May-2004	13:16
bwrs0043.out	30700297	24-May-2004	13:16
bwrs0043.ft72	1258972	24-May-2004	13:16
bwrs0044.out	30769273	24-May-2004	14:32
bwrs0044.ft72	1258972	24-May-2004	14:32
bwrs0045.out	30181919	24-May-2004	15:48
bwrs0045.ft72	1258972	24-May-2004	15:48
bwrs0046.out	29950715	24-May-2004	15:48
bwrs0046.ft72	1258972	24-May-2004	15:48
bwrs0047.out	29813944	24-May-2004	15:48
bwrs0047.ft72	1258972	24-May-2004	15:48
bwrs0048.out	27977193	24-May-2004	15:49
bwrs0048.ft72	1177748	24-May-2004	15:49
bwrs0049.out	31438209	24-May-2004	15:52
bwrs0049.ft72	1258972	24-May-2004	15:52
bwrs0050.out	30874636	24-May-2004	16:21
bwrs0050.ft72	1258972	24-May-2004	16:21
bwrs0051.out	30643665	24-May-2004	15:55
bwrs0051.ft72	1258972	24-May-2004	15:55
bwrs0052.out	30501931	24-May-2004	15:54
bwrs0052.ft72	1258972	24-May-2004	15:54
bwrs0053.out	28556033	24-May-2004	16:23
bwrs0053.ft72	1177748	24-May-2004	16:23

Table 40. Sensitivity Study MCNP Output Files

File Name	File Size (bytes)	Date of Last Update	Time
bwrn0001.out	271953	17-Feb-2004	15:39
bwrn0002.out	270849	17-Feb-2004	15:40
bwrn0003.out	271953	17-Feb-2004	15:53
bwrn0004.out	271953	17-Feb-2004	15:39
bwrn0005.out	271953	17-Feb-2004	15:39
bwrn0006.out	271953	17-Feb-2004	15:53
bwrn0007.out	267562	17-Feb-2004	17:06
bwrn0008.out	271953	17-Feb-2004	15:52
bwrn0009.out	270837	17-Feb-2004	15:52
bwrn0010.out	270837	17-Feb-2004	15:53
bwrn0011.out	271346	17-Feb-2004	15:58
bwrn0012.out	259370	17-Feb-2004	16:05
bwrn0013.out	271952	17-Feb-2004	16:05

Table 40. Sensitivity Study MCNP Output Files (Cont'd)

bwrn0014.out	271944	17-Feb-2004	16:02
bwrn0015.out	267559	17-Feb-2004	16:10
bwrn0016.out	271944	17-Feb-2004	16:04
bwrn0017.out	271944	17-Feb-2004	16:07
bwrn0018.out	270848	17-Feb-2004	16:11
bwrn0019.out	271952	17-Feb-2004	16:15
bwrn0020.out	271944	17-Feb-2004	16:17
bwrn0021.out	271944	17-Feb-2004	16:18
bwrn0022.out	271014	17-Feb-2004	16:14
bwrn0023.out	271022	17-Feb-2004	16:19
bwrn0024.out	270848	17-Feb-2004	16:22
bwrn0025.out	271944	17-Feb-2004	16:19
bwrn0026.out	270241	17-Feb-2004	16:31
bwrn0027.out	271344	17-Feb-2004	16:31
bwrn0028.out	270836	17-Feb-2004	16:30
bwrn0029.out	267562	17-Feb-2004	16:30
bwrn0030.out	271944	17-Feb-2004	16:29
bwrn0031.out	271944	17-Feb-2004	16:32
bwrn0032.out	271024	17-Feb-2004	16:34
bwrn0033.out	271946	17-Feb-2004	16:48
bwrn0034.out	271953	17-Feb-2004	16:48
bwrn0035.out	271953	17-Feb-2004	16:49
bwrn0036.out	271032	17-Feb-2004	16:43
bwrn0037.out	271006	17-Feb-2004	16:44
bwrn0038.out	271344	17-Feb-2004	16:48
bwrn0039.out	271944	17-Feb-2004	16:47
bwrn0040.out	271945	24-May-2004	17:14
bwrn0041.out	270829	24-May-2004	17:13
bwrn0042.out	271953	24-May-2004	17:14
bwrn0043.out	271025	24-May-2004	17:13
bwrn0044.out	271937	24-May-2004	17:15
bwrn0045.out	271945	24-May-2004	17:15
bwrn0046.out	271945	24-May-2004	17:15
bwrn0047.out	271033	24-May-2004	17:15
bwrn0048.out	270829	24-May-2004	17:14
bwrn0049.out	271953	24-May-2004	17:13
bwrn0050.out	271032	24-May-2004	17:24
bwrn0051.out	271952	24-May-2004	17:24
bwrn0052.out	271947	24-May-2004	17:28
bwrn0053.out	271944	24-May-2004	17:26

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay

File Name	File Size (bytes)	Date of Last Update	Time
bse1.5b0.001y5.ft72	121836	29-Jan-2004	10:12
bse1.5b0.001y5.out	2099603	28-Jan-2004	16:30
bse1.5b2.5y5.ft72	203060	29-Jan-2004	10:12
bse1.5b2.5y5.out	4148362	28-Jan-2004	16:30
bse1.5b5.0y5.ft72	284284	29-Jan-2004	10:12
bse1.5b5.0y5.out	6176175	28-Jan-2004	16:31
bse1.5b7.5y5.ft72	365508	29-Jan-2004	10:12
bse1.5b7.5y5.out	8209217	28-Jan-2004	16:31
bse1.5b10.0y5.ft72	446732	29-Jan-2004	10:12
bse1.5b10.0y5.out	10243883	28-Jan-2004	16:31
bse1.5b12.5y5.ft72	568568	29-Jan-2004	10:12
bse1.5b12.5y5.out	13297030	28-Jan-2004	16:32
bse1.5b15.0y5.ft72	649792	29-Jan-2004	10:12
bse1.5b15.0y5.out	15333961	28-Jan-2004	16:32
bse1.5b17.5y5.ft72	771628	29-Jan-2004	10:12
bse1.5b17.5y5.out	18289014	28-Jan-2004	16:34
bse1.5b20.0y5.ft72	852852	29-Jan-2004	10:12
bse1.5b20.0y5.out	20286085	28-Jan-2004	16:34
bse1.5b25.0y5.ft72	1015300	29-Jan-2004	10:12
bse1.5b25.0y5.out	24279650	28-Jan-2004	16:36
bse1.5b30.0y5.ft72	1218360	29-Jan-2004	10:12
bse1.5b30.0y5.out	29291106	28-Jan-2004	16:39
bse1.5b35.0y5.ft72	1380808	29-Jan-2004	10:12
bse1.5b35.0y5.out	33312694	28-Jan-2004	16:40
bse1.5b40.0y5.ft72	1583868	29-Jan-2004	10:12
bse1.5b40.0y5.out	38326392	28-Jan-2004	16:41
bse1.5b45.0y5.ft72	1746316	29-Jan-2004	10:12
bse1.5b45.0y5.out	42323782	28-Jan-2004	16:40
bse1.5b50.0y5.ft72	1949376	29-Jan-2004	10:12
bse1.5b50.0y5.out	47339234	28-Jan-2004	16:47
bse1.5b55.0y5.ft72	2111824	29-Jan-2004	10:12
bse1.5b55.0y5.out	51362488	28-Jan-2004	16:42
bse1.5b60.0y5.ft72	2314884	29-Jan-2004	10:12
bse1.5b60.0y5.out	56391312	28-Jan-2004	16:43
bse1.5b65.0y5.ft72	2477332	29-Jan-2004	10:12
bse1.5b65.0y5.out	60413419	28-Jan-2004	16:44
bse1.5b70.0y5.ft72	2680392	29-Jan-2004	10:12
bse1.5b70.0y5.out	65440543	28-Jan-2004	16:51
bse1.5b75.0y5.ft72	2842840	29-Jan-2004	10:12
bse1.5b75.0y5.out	69437051	28-Jan-2004	16:50

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse2.0b0.001y5.ft72	121836	29-Jan-2004	10:12
bse2.0b0.001y5.out	2099603	28-Jan-2004	16:41
bse2.0b2.5y5.ft72	203060	29-Jan-2004	10:12
bse2.0b2.5y5.out	4147116	28-Jan-2004	16:41
bse2.0b5.0y5.ft72	284284	29-Jan-2004	10:12
bse2.0b5.0y5.out	6170792	28-Jan-2004	16:42
bse2.0b7.5y5.ft72	365508	29-Jan-2004	10:12
bse2.0b7.5y5.out	8203113	28-Jan-2004	16:43
bse2.0b10.0y5.ft72	446732	29-Jan-2004	10:12
bse2.0b10.0y5.out	10237533	28-Jan-2004	16:43
bse2.0b12.5y5.ft72	568568	29-Jan-2004	10:12
bse2.0b12.5y5.out	13290422	28-Jan-2004	16:45
bse2.0b15.0y5.ft72	649792	29-Jan-2004	10:12
bse2.0b15.0y5.out	15327682	28-Jan-2004	16:46
bse2.0b17.5y5.ft72	771628	29-Jan-2004	10:12
bse2.0b17.5y5.out	18281794	28-Jan-2004	16:47
bse2.0b20.0y5.ft72	852852	29-Jan-2004	10:12
bse2.0b20.0y5.out	20279984	28-Jan-2004	16:46
bse2.0b25.0y5.ft72	1015300	29-Jan-2004	10:12
bse2.0b25.0y5.out	24269695	28-Jan-2004	16:48
bse2.0b30.0y5.ft72	1218360	29-Jan-2004	10:12
bse2.0b30.0y5.out	29261420	28-Jan-2004	16:50
bse2.0b35.0y5.ft72	1380808	29-Jan-2004	10:12
bse2.0b35.0y5.out	33259953	28-Jan-2004	16:50
bse2.0b40.0y5.ft72	1583868	29-Jan-2004	10:12
bse2.0b40.0y5.out	38256656	28-Jan-2004	16:54
bse2.0b45.0y5.ft72	1746316	29-Jan-2004	10:12
bse2.0b45.0y5.out	42254334	28-Jan-2004	16:55
bse2.0b50.0y5.ft72	1949376	29-Jan-2004	10:12
bse2.0b50.0y5.out	47251325	28-Jan-2004	16:56
bse2.0b55.0y5.ft72	2111824	29-Jan-2004	10:12
bse2.0b55.0y5.out	51249858	28-Jan-2004	17:03
bse2.0b60.0y5.ft72	2314884	29-Jan-2004	10:12
bse2.0b60.0y5.out	56247932	28-Jan-2004	17:08
bse2.0b65.0y5.ft72	2477332	29-Jan-2004	10:12
bse2.0b65.0y5.out	60245827	28-Jan-2004	17:09
bse2.0b70.0y5.ft72	2680392	29-Jan-2004	10:12
bse2.0b70.0y5.out	65242754	28-Jan-2004	17:10
bse2.0b75.0y5.ft72	2842840	29-Jan-2004	10:12
bse2.0b75.0y5.out	69239600	28-Jan-2004	17:03

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse2.5b0.001y5.ft72	121836	29-Jan-2004	10:12
bse2.5b0.001y5.out	2099771	28-Jan-2004	16:54
bse2.5b2.5y5.ft72	203060	29-Jan-2004	10:12
bse2.5b2.5y5.out	4146404	28-Jan-2004	16:55
bse2.5b5.0y5.ft72	284284	29-Jan-2004	10:12
bse2.5b5.0y5.out	6167722	28-Jan-2004	16:56
bse2.5b7.5y5.ft72	365508	29-Jan-2004	10:12
bse2.5b7.5y5.out	8199441	28-Jan-2004	16:56
bse2.5b10.0y5.ft72	446732	29-Jan-2004	10:12
bse2.5b10.0y5.out	10233837	28-Jan-2004	16:57
bse2.5b12.5y5.ft72	568568	29-Jan-2004	10:12
bse2.5b12.5y5.out	13286320	28-Jan-2004	16:58
bse2.5b15.0y5.ft72	649792	29-Jan-2004	10:12
bse2.5b15.0y5.out	15323051	28-Jan-2004	16:58
bse2.5b17.5y5.ft72	771628	29-Jan-2004	10:12
bse2.5b17.5y5.out	18277573	28-Jan-2004	17:00
bse2.5b20.0y5.ft72	852852	29-Jan-2004	10:12
bse2.5b20.0y5.out	20273521	28-Jan-2004	17:01
bse2.5b25.0y5.ft72	1015300	29-Jan-2004	10:12
bse2.5b25.0y5.out	24264392	28-Jan-2004	17:05
bse2.5b30.0y5.ft72	1218360	29-Jan-2004	10:12
bse2.5b30.0y5.out	29256778	28-Jan-2004	17:04
bse2.5b35.0y5.ft72	1380808	29-Jan-2004	10:12
bse2.5b35.0y5.out	33253850	28-Jan-2004	17:05
bse2.5b40.0y5.ft72	1583868	29-Jan-2004	10:12
bse2.5b40.0y5.out	38251758	28-Jan-2004	17:08
bse2.5b45.0y5.ft72	1746316	29-Jan-2004	10:12
bse2.5b45.0y5.out	42249973	28-Jan-2004	17:11
bse2.5b50.0y5.ft72	1949376	29-Jan-2004	10:12
bse2.5b50.0y5.out	47246865	28-Jan-2004	17:12
bse2.5b55.0y5.ft72	2111824	29-Jan-2004	10:12
bse2.5b55.0y5.out	51244873	28-Jan-2004	17:14
bse2.5b60.0y5.ft72	2314884	29-Jan-2004	10:12
bse2.5b60.0y5.out	56242888	28-Jan-2004	17:13
bse2.5b65.0y5.ft72	2477332	29-Jan-2004	10:12
bse2.5b65.0y5.out	60242127	28-Jan-2004	17:21
bse2.5b70.0y5.ft72	2680392	29-Jan-2004	10:12
bse2.5b70.0y5.out	65239557	28-Jan-2004	17:22
bse2.5b75.0y5.ft72	2842840	29-Jan-2004	10:12
bse2.5b75.0y5.out	69237703	28-Jan-2004	17:23

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse3.0b0.001y5.ft72	121836	29-Jan-2004	10:12
bse3.0b0.001y5.out	2099813	28-Jan-2004	17:11
bse3.0b2.5y5.ft72	203060	29-Jan-2004	10:12
bse3.0b2.5y5.out	4146022	28-Jan-2004	17:11
bse3.0b5.0y5.ft72	284284	29-Jan-2004	10:12
bse3.0b5.0y5.out	6166353	28-Jan-2004	17:12
bse3.0b7.5y5.ft72	365508	29-Jan-2004	10:12
bse3.0b7.5y5.out	8194872	28-Jan-2004	17:13
bse3.0b10.0y5.ft72	446732	29-Jan-2004	10:12
bse3.0b10.0y5.out	10227535	28-Jan-2004	17:14
bse3.0b12.5y5.ft72	568568	29-Jan-2004	10:12
bse3.0b12.5y5.out	13279719	28-Jan-2004	17:15
bse3.0b15.0y5.ft72	649792	29-Jan-2004	10:12
bse3.0b15.0y5.out	15315475	28-Jan-2004	17:16
bse3.0b17.5y5.ft72	771628	29-Jan-2004	10:12
bse3.0b17.5y5.out	18273977	28-Jan-2004	17:17
bse3.0b20.0y5.ft72	852852	29-Jan-2004	10:12
bse3.0b20.0y5.out	20270072	28-Jan-2004	17:16
bse3.0b25.0y5.ft72	1015300	29-Jan-2004	10:12
bse3.0b25.0y5.out	24261012	28-Jan-2004	17:17
bse3.0b30.0y5.ft72	1218360	29-Jan-2004	10:12
bse3.0b30.0y5.out	29251400	28-Jan-2004	17:23
bse3.0b35.0y5.ft72	1380808	29-Jan-2004	10:12
bse3.0b35.0y5.out	33247498	28-Jan-2004	17:22
bse3.0b40.0y5.ft72	1583868	29-Jan-2004	10:12
bse3.0b40.0y5.out	38244518	28-Jan-2004	17:26
bse3.0b45.0y5.ft72	1746316	29-Jan-2004	10:12
bse3.0b45.0y5.out	42244206	28-Jan-2004	17:27
bse3.0b50.0y5.ft72	1949376	29-Jan-2004	10:12
bse3.0b50.0y5.out	47241364	28-Jan-2004	17:28
bse3.0b55.0y5.ft72	2111824	29-Jan-2004	10:12
bse3.0b55.0y5.out	51239728	28-Jan-2004	17:30
bse3.0b60.0y5.ft72	2314884	29-Jan-2004	10:12
bse3.0b60.0y5.out	56237545	28-Jan-2004	17:33
bse3.0b65.0y5.ft72	2477332	29-Jan-2004	10:12
bse3.0b65.0y5.out	60236564	28-Jan-2004	17:34
bse3.0b70.0y5.ft72	2680392	29-Jan-2004	10:12
bse3.0b70.0y5.out	65235024	28-Jan-2004	17:36
bse3.0b75.0y5.ft72	2842840	29-Jan-2004	10:12
bse3.0b75.0y5.out	69232847	28-Jan-2004	17:36

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse3.5b0.001y5.ft72	121836	29-Jan-2004	10:12
bse3.5b0.001y5.out	2099810	28-Jan-2004	17:26
bse3.5b2.5y5.ft72	203060	29-Jan-2004	10:12
bse3.5b2.5y5.out	4143477	28-Jan-2004	17:27
bse3.5b5.0y5.ft72	284284	29-Jan-2004	10:12
bse3.5b5.0y5.out	6163432	28-Jan-2004	17:28
bse3.5b7.5y5.ft72	365508	29-Jan-2004	10:12
bse3.5b7.5y5.out	8191861	28-Jan-2004	17:29
bse3.5b10.0y5.ft72	446732	29-Jan-2004	10:12
bse3.5b10.0y5.out	10223189	28-Jan-2004	17:31
bse3.5b12.5y5.ft72	568568	29-Jan-2004	10:12
bse3.5b12.5y5.out	13275119	28-Jan-2004	17:32
bse3.5b15.0y5.ft72	649792	29-Jan-2004	10:12
bse3.5b15.0y5.out	15310765	28-Jan-2004	17:32
bse3.5b17.5y5.ft72	771628	29-Jan-2004	10:12
bse3.5b17.5y5.out	18268548	28-Jan-2004	17:34
bse3.5b20.0y5.ft72	852852	29-Jan-2004	10:12
bse3.5b20.0y5.out	20266523	28-Jan-2004	17:34
bse3.5b25.0y5.ft72	1015300	29-Jan-2004	10:12
bse3.5b25.0y5.out	24255792	28-Jan-2004	17:35
bse3.5b30.0y5.ft72	1218360	29-Jan-2004	10:12
bse3.5b30.0y5.out	29247233	28-Jan-2004	17:38
bse3.5b35.0y5.ft72	1380808	29-Jan-2004	10:12
bse3.5b35.0y5.out	33243432	28-Jan-2004	17:40
bse3.5b40.0y5.ft72	1583868	29-Jan-2004	10:12
bse3.5b40.0y5.out	38239114	28-Jan-2004	17:43
bse3.5b45.0y5.ft72	1746316	29-Jan-2004	10:12
bse3.5b45.0y5.out	42238363	28-Jan-2004	17:44
bse3.5b50.0y5.ft72	1949376	29-Jan-2004	10:12
bse3.5b50.0y5.out	47236358	28-Jan-2004	17:45
bse3.5b55.0y5.ft72	2111824	29-Jan-2004	10:12
bse3.5b55.0y5.out	51235417	28-Jan-2004	17:49
bse3.5b60.0y5.ft72	2314884	29-Jan-2004	10:12
bse3.5b60.0y5.out	56233814	28-Jan-2004	17:44
bse3.5b65.0y5.ft72	2477332	29-Jan-2004	10:12
bse3.5b65.0y5.out	60232180	28-Jan-2004	17:45
bse3.5b70.0y5.ft72	2680392	29-Jan-2004	10:12
bse3.5b70.0y5.out	65230044	28-Jan-2004	17:49
bse3.5b75.0y5.ft72	2842840	29-Jan-2004	10:12
bse3.5b75.0y5.out	69228863	28-Jan-2004	17:48



Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse4.0b0.001y5.ft72	121836	29-Jan-2004	10:12
bse4.0b0.001y5.out	2099797	28-Jan-2004	17:44
bse4.0b2.5y5.ft72	203060	29-Jan-2004	10:12
bse4.0b2.5y5.out	4143383	28-Jan-2004	17:44
bse4.0b5.0y5.ft72	284284	29-Jan-2004	10:12
bse4.0b5.0y5.out	6165632	28-Jan-2004	17:45
bse4.0b7.5y5.ft72	365508	29-Jan-2004	10:12
bse4.0b7.5y5.out	8191654	28-Jan-2004	17:46
bse4.0b10.0y5.ft72	446732	29-Jan-2004	10:12
bse4.0b10.0y5.out	10221789	28-Jan-2004	17:46
bse4.0b12.5y5.ft72	568568	29-Jan-2004	10:12
bse4.0b12.5y5.out	13273600	28-Jan-2004	17:48
bse4.0b15.0y5.ft72	649792	29-Jan-2004	10:12
bse4.0b15.0y5.out	15308858	28-Jan-2004	17:49
bse4.0b17.5y5.ft72	771628	29-Jan-2004	10:12
bse4.0b17.5y5.out	18262083	28-Jan-2004	17:50
bse4.0b20.0y5.ft72	852852	29-Jan-2004	10:12
bse4.0b20.0y5.out	20258636	28-Jan-2004	17:49
bse4.0b25.0y5.ft72	1015300	29-Jan-2004	10:12
bse4.0b25.0y5.out	24250677	28-Jan-2004	17:49
bse4.0b30.0y5.ft72	1218360	29-Jan-2004	10:12
bse4.0b30.0y5.out	29242097	28-Jan-2004	17:54
bse4.0b35.0y5.ft72	1380808	29-Jan-2004	10:12
bse4.0b35.0y5.out	33237749	28-Jan-2004	17:54
bse4.0b40.0y5.ft72	1583868	29-Jan-2004	10:12
bse4.0b40.0y5.out	38233264	28-Jan-2004	17:57
bse4.0b45.0y5.ft72	1746316	29-Jan-2004	10:12
bse4.0b45.0y5.out	42232313	28-Jan-2004	17:58
bse4.0b50.0y5.ft72	1949376	29-Jan-2004	10:12
bse4.0b50.0y5.out	47230391	28-Jan-2004	17:58
bse4.0b55.0y5.ft72	2111824	29-Jan-2004	10:12
bse4.0b55.0y5.out	51229961	28-Jan-2004	18:03
bse4.0b60.0y5.ft72	2314884	29-Jan-2004	10:12
bse4.0b60.0y5.out	56228039	28-Jan-2004	18:04
bse4.0b65.0y5.ft72	2477332	29-Jan-2004	10:12
bse4.0b65.0y5.out	60226361	28-Jan-2004	18:05
bse4.0b70.0y5.ft72	2680392	29-Jan-2004	10:12
bse4.0b70.0y5.out	65223952	28-Jan-2004	18:05
bse4.0b75.0y5.ft72	2842840	29-Jan-2004	10:12
bse4.0b75.0y5.out	69222667	28-Jan-2004	18:06

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse4.5b0.001y5.ft72	121836	29-Jan-2004	10:12
bse4.5b0.001y5.out	2099999	28-Jan-2004	17:58
bse4.5b2.5y5.ft72	203060	29-Jan-2004	10:12
bse4.5b2.5y5.out	4143767	28-Jan-2004	17:58
bse4.5b5.0y5.ft72	284284	29-Jan-2004	10:12
bse4.5b5.0y5.out	6162808	28-Jan-2004	17:59
bse4.5b7.5y5.ft72	365508	29-Jan-2004	10:12
bse4.5b7.5y5.out	8190341	28-Jan-2004	17:59
bse4.5b10.0y5.ft72	446732	29-Jan-2004	10:12
bse4.5b10.0y5.out	10219536	28-Jan-2004	18:00
bse4.5b12.5y5.ft72	568568	29-Jan-2004	10:12
bse4.5b12.5y5.out	13269955	28-Jan-2004	18:02
bse4.5b15.0y5.ft72	649792	29-Jan-2004	10:12
bse4.5b15.0y5.out	15304965	28-Jan-2004	18:02
bse4.5b17.5y5.ft72	771628	29-Jan-2004	10:12
bse4.5b17.5y5.out	18259259	28-Jan-2004	18:03
bse4.5b20.0y5.ft72	852852	29-Jan-2004	10:12
bse4.5b20.0y5.out	20254033	28-Jan-2004	18:05
bse4.5b25.0y5.ft72	1015300	29-Jan-2004	10:12
bse4.5b25.0y5.out	24245834	28-Jan-2004	18:06
bse4.5b30.0y5.ft72	1218360	29-Jan-2004	10:12
bse4.5b30.0y5.out	29237862	28-Jan-2004	18:08
bse4.5b35.0y5.ft72	1380808	29-Jan-2004	10:12
bse4.5b35.0y5.out	33233594	28-Jan-2004	18:09
bse4.5b40.0y5.ft72	1583868	29-Jan-2004	10:12
bse4.5b40.0y5.out	38228075	28-Jan-2004	18:14
bse4.5b45.0y5.ft72	1746316	29-Jan-2004	10:12
bse4.5b45.0y5.out	42226857	28-Jan-2004	18:10
bse4.5b50.0y5.ft72	1949376	29-Jan-2004	10:12
bse4.5b50.0y5.out	47224433	28-Jan-2004	18:11
bse4.5b55.0y5.ft72	2111824	29-Jan-2004	10:12
bse4.5b55.0y5.out	51223326	28-Jan-2004	18:16
bse4.5b60.0y5.ft72	2314884	29-Jan-2004	10:12
bse4.5b60.0y5.out	56222029	28-Jan-2004	18:17
bse4.5b65.0y5.ft72	2477332	29-Jan-2004	10:12
bse4.5b65.0y5.out	60220507	28-Jan-2004	18:14
bse4.5b70.0y5.ft72	2680392	29-Jan-2004	10:13
bse4.5b70.0y5.out	65218237	28-Jan-2004	18:20
bse4.5b75.0y5.ft72	2842840	29-Jan-2004	10:13
bse4.5b75.0y5.out	69216682	28-Jan-2004	18:21

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse5.0b0.001y5.ft72	121836	29-Jan-2004	10:13
bse5.0b0.001y5.out	2099996	28-Jan-2004	18:11
bse5.0b2.5y5.ft72	203060	29-Jan-2004	10:13
bse5.0b2.5y5.out	4143255	28-Jan-2004	18:12
bse5.0b5.0y5.ft72	284284	29-Jan-2004	10:13
bse5.0b5.0y5.out	6161630	28-Jan-2004	18:13
bse5.0b7.5y5.ft72	365508	29-Jan-2004	10:13
bse5.0b7.5y5.out	8187694	28-Jan-2004	18:14
bse5.0b10.0y5.ft72	446732	29-Jan-2004	10:13
bse5.0b10.0y5.out	10217154	28-Jan-2004	18:14
bse5.0b12.5y5.ft72	568568	29-Jan-2004	10:13
bse5.0b12.5y5.out	13266824	28-Jan-2004	18:16
bse5.0b15.0y5.ft72	649792	29-Jan-2004	10:13
bse5.0b15.0y5.out	15301274	28-Jan-2004	18:16
bse5.0b17.5y5.ft72	771628	29-Jan-2004	10:13
bse5.0b17.5y5.out	18256191	28-Jan-2004	18:17
bse5.0b20.0y5.ft72	852852	29-Jan-2004	10:13
bse5.0b20.0y5.out	20250523	28-Jan-2004	18:18
bse5.0b25.0y5.ft72	1015300	29-Jan-2004	10:13
bse5.0b25.0y5.out	24243168	28-Jan-2004	18:20
bse5.0b30.0y5.ft72	1218360	29-Jan-2004	10:13
bse5.0b30.0y5.out	29235013	28-Jan-2004	18:22
bse5.0b35.0y5.ft72	1380808	29-Jan-2004	10:13
bse5.0b35.0y5.out	33230124	28-Jan-2004	18:22
bse5.0b40.0y5.ft72	1583868	29-Jan-2004	10:13
bse5.0b40.0y5.out	38225204	28-Jan-2004	18:25
bse5.0b45.0y5.ft72	1746316	29-Jan-2004	10:13
bse5.0b45.0y5.out	42223355	28-Jan-2004	18:25
bse5.0b50.0y5.ft72	1949376	29-Jan-2004	10:13
bse5.0b50.0y5.out	47220208	28-Jan-2004	18:27
bse5.0b55.0y5.ft72	2111824	29-Jan-2004	10:13
bse5.0b55.0y5.out	51218713	28-Jan-2004	18:33
bse5.0b60.0y5.ft72	2314884	29-Jan-2004	10:13
bse5.0b60.0y5.out	56215866	28-Jan-2004	18:37
bse5.0b65.0y5.ft72	2477332	29-Jan-2004	10:13
bse5.0b65.0y5.out	60214542	28-Jan-2004	18:39
bse5.0b70.0y5.ft72	2680392	29-Jan-2004	10:13
bse5.0b70.0y5.out	65212081	28-Jan-2004	18:40
bse5.0b75.0y5.ft72	2842840	29-Jan-2004	10:13
bse5.0b75.0y5.out	69210964	28-Jan-2004	18:34

Table 41. BWR Isotopic Database SAS2H Tape 72/Output Files, 5 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse5.5b0.001y5.ft72	121836	29-Jan-2004	10:13
bse5.5b0.001y5.out	2099935	28-Jan-2004	18:25
bse5.5b2.5y5.ft72	203060	29-Jan-2004	10:13
bse5.5b2.5y5.out	4142599	28-Jan-2004	18:26
bse5.5b5.0y5.ft72	284284	29-Jan-2004	10:13
bse5.5b5.0y5.out	6160011	28-Jan-2004	18:26
bse5.5b7.5y5.ft72	365508	29-Jan-2004	10:13
bse5.5b7.5y5.out	8184268	28-Jan-2004	18:27
bse5.5b10.0y5.ft72	446732	29-Jan-2004	10:13
bse5.5b10.0y5.out	10214111	28-Jan-2004	18:28
bse5.5b12.5y5.ft72	568568	29-Jan-2004	10:13
bse5.5b12.5y5.out	13262668	28-Jan-2004	18:29
bse5.5b15.0y5.ft72	649792	29-Jan-2004	10:13
bse5.5b15.0y5.out	15297371	28-Jan-2004	18:29
bse5.5b17.5y5.ft72	771628	29-Jan-2004	10:13
bse5.5b17.5y5.out	18253591	28-Jan-2004	18:31
bse5.5b20.0y5.ft72	852852	29-Jan-2004	10:13
bse5.5b20.0y5.out	20247441	28-Jan-2004	18:31
bse5.5b25.0y5.ft72	1015300	29-Jan-2004	10:13
bse5.5b25.0y5.out	24240811	28-Jan-2004	18:33
bse5.5b30.0y5.ft72	1218360	29-Jan-2004	10:13
bse5.5b30.0y5.out	29233226	28-Jan-2004	18:35
bse5.5b35.0y5.ft72	1380808	29-Jan-2004	10:13
bse5.5b35.0y5.out	33228006	28-Jan-2004	18:35
bse5.5b40.0y5.ft72	1583868	29-Jan-2004	10:13
bse5.5b40.0y5.out	38223307	28-Jan-2004	18:39
bse5.5b45.0y5.ft72	1746316	29-Jan-2004	10:13
bse5.5b45.0y5.out	42220938	28-Jan-2004	18:39
bse5.5b50.0y5.ft72	1949376	29-Jan-2004	10:13
bse5.5b50.0y5.out	47217681	28-Jan-2004	18:42
bse5.5b55.0y5.ft72	2111824	29-Jan-2004	10:13
bse5.5b55.0y5.out	51216133	28-Jan-2004	18:43
bse5.5b60.0y5.ft72	2314884	29-Jan-2004	10:13
bse5.5b60.0y5.out	56212898	28-Jan-2004	18:45
bse5.5b65.0y5.ft72	2477332	29-Jan-2004	10:13
bse5.5b65.0y5.out	60210528	28-Jan-2004	18:48
bse5.5b70.0y5.ft72	2680392	29-Jan-2004	10:13
bse5.5b70.0y5.out	65207736	28-Jan-2004	18:50
bse5.5b75.0y5.ft72	2842840	29-Jan-2004	10:13
bse5.5b75.0y5.out	69206200	28-Jan-2004	18:51

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay

File Name	File Size (bytes)	Date of Last Update	Time
bse1.5b0.001y10k.ft72	121836	2-Feb-2004	10:19
bse1.5b0.001y10k.out	2095177	2-Feb-2004	10:19
bse1.5b2.5y10k.ft72	203060	2-Feb-2004	10:19
bse1.5b2.5y10k.out	4135090	2-Feb-2004	10:19
bse1.5b5.0y10k.ft72	284284	2-Feb-2004	10:20
bse1.5b5.0y10k.out	6161919	2-Feb-2004	10:20
bse1.5b7.5y10k.ft72	365508	2-Feb-2004	10:20
bse1.5b7.5y10k.out	8194715	2-Feb-2004	10:20
bse1.5b10.0y10k.ft72	446732	2-Feb-2004	10:21
bse1.5b10.0y10k.out	10228569	2-Feb-2004	10:21
bse1.5b12.5y10k.ft72	568568	2-Feb-2004	10:21
bse1.5b12.5y10k.out	13281544	2-Feb-2004	10:21
bse1.5b15.0y10k.ft72	649792	2-Feb-2004	10:22
bse1.5b15.0y10k.out	15318484	2-Feb-2004	10:22
bse1.5b17.5y10k.ft72	771628	2-Feb-2004	10:22
bse1.5b17.5y10k.out	18273200	2-Feb-2004	10:22
bse1.5b20.0y10k.ft72	852852	2-Feb-2004	10:23
bse1.5b20.0y10k.out	20270189	2-Feb-2004	10:23
bse1.5b25.0y10k.ft72	1015300	2-Feb-2004	10:23
bse1.5b25.0y10k.out	24263590	2-Feb-2004	10:23
bse1.5b30.0y10k.ft72	1218360	2-Feb-2004	10:27
bse1.5b30.0y10k.out	29274874	2-Feb-2004	10:27
bse1.5b35.0y10k.ft72	1380808	2-Feb-2004	10:29
bse1.5b35.0y10k.out	33296052	2-Feb-2004	10:29
bse1.5b40.0y10k.ft72	1583868	2-Feb-2004	10:30
bse1.5b40.0y10k.out	38309832	2-Feb-2004	10:30
bse1.5b45.0y10k.ft72	1746316	2-Feb-2004	10:31
bse1.5b45.0y10k.out	42307304	2-Feb-2004	10:31
bse1.5b50.0y10k.ft72	1949376	2-Feb-2004	10:30
bse1.5b50.0y10k.out	47322523	2-Feb-2004	10:30
bse1.5b55.0y10k.ft72	2111824	2-Feb-2004	10:31
bse1.5b55.0y10k.out	51345608	2-Feb-2004	10:31
bse1.5b60.0y10k.ft72	2314884	2-Feb-2004	10:31
bse1.5b60.0y10k.out	56374104	2-Feb-2004	10:31
bse1.5b65.0y10k.ft72	2477332	2-Feb-2004	10:32
bse1.5b65.0y10k.out	60396211	2-Feb-2004	10:32
bse1.5b70.0y10k.ft72	2680392	2-Feb-2004	10:40
bse1.5b70.0y10k.out	65423343	2-Feb-2004	10:40
bse1.5b75.0y10k.ft72	2842840	2-Feb-2004	10:42
bse1.5b75.0y10k.out	69419851	2-Feb-2004	10:42

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse2.0b0.001y10k.ft72	121836	2-Feb-2004	10:30
bse2.0b0.001y10k.out	2095349	2-Feb-2004	10:30
bse2.0b2.5y10k.ft72	203060	2-Feb-2004	10:31
bse2.0b2.5y10k.out	4133762	2-Feb-2004	10:31
bse2.0b5.0y10k.ft72	284284	2-Feb-2004	10:31
bse2.0b5.0y10k.out	6156536	2-Feb-2004	10:31
bse2.0b7.5y10k.ft72	365508	2-Feb-2004	10:32
bse2.0b7.5y10k.out	8188611	2-Feb-2004	10:32
bse2.0b10.0y10k.ft72	446732	2-Feb-2004	10:33
bse2.0b10.0y10k.out	10222302	2-Feb-2004	10:33
bse2.0b12.5y10k.ft72	568568	2-Feb-2004	10:34
bse2.0b12.5y10k.out	13275264	2-Feb-2004	10:34
bse2.0b15.0y10k.ft72	649792	2-Feb-2004	10:34
bse2.0b15.0y10k.out	15312188	2-Feb-2004	10:34
bse2.0b17.5y10k.ft72	771628	2-Feb-2004	10:35
bse2.0b17.5y10k.out	18266464	2-Feb-2004	10:35
bse2.0b20.0y10k.ft72	852852	2-Feb-2004	10:36
bse2.0b20.0y10k.out	20264088	2-Feb-2004	10:36
bse2.0b25.0y10k.ft72	1015300	2-Feb-2004	10:37
bse2.0b25.0y10k.out	24254037	2-Feb-2004	10:37
bse2.0b30.0y10k.ft72	1218360	2-Feb-2004	10:38
bse2.0b30.0y10k.out	29245516	2-Feb-2004	10:38
bse2.0b35.0y10k.ft72	1380808	2-Feb-2004	10:38
bse2.0b35.0y10k.out	33243483	2-Feb-2004	10:38
bse2.0b40.0y10k.ft72	1583868	2-Feb-2004	10:43
bse2.0b40.0y10k.out	38239948	2-Feb-2004	10:43
bse2.0b45.0y10k.ft72	1746316	2-Feb-2004	10:45
bse2.0b45.0y10k.out	42237790	2-Feb-2004	10:45
bse2.0b50.0y10k.ft72	1949376	2-Feb-2004	10:47
bse2.0b50.0y10k.out	47234371	2-Feb-2004	10:47
bse2.0b55.0y10k.ft72	2111824	2-Feb-2004	10:46
bse2.0b55.0y10k.out	51233052	2-Feb-2004	10:46
bse2.0b60.0y10k.ft72	2314884	2-Feb-2004	10:48
bse2.0b60.0y10k.out	56231124	2-Feb-2004	10:48
bse2.0b65.0y10k.ft72	2477332	2-Feb-2004	10:49
bse2.0b65.0y10k.out	60228609	2-Feb-2004	10:49
bse2.0b70.0y10k.ft72	2680392	2-Feb-2004	10:48
bse2.0b70.0y10k.out	65225454	2-Feb-2004	10:48
bse2.0b75.0y10k.ft72	2842840	2-Feb-2004	10:56
bse2.0b75.0y10k.out	69222302	2-Feb-2004	10:56

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse2.5b0.001y10k.ft72	121836	2-Feb-2004	10:44
bse2.5b0.001y10k.out	2095596	2-Feb-2004	10:44
bse2.5b2.5y10k.ft72	203060	2-Feb-2004	10:44
bse2.5b2.5y10k.out	4133222	2-Feb-2004	10:45
bse2.5b5.0y10k.ft72	284284	2-Feb-2004	10:46
bse2.5b5.0y10k.out	6154131	2-Feb-2004	10:46
bse2.5b7.5y10k.ft72	365508	2-Feb-2004	10:46
bse2.5b7.5y10k.out	8185030	2-Feb-2004	10:46
bse2.5b10.0y10k.ft72	446732	2-Feb-2004	10:50
bse2.5b10.0y10k.out	10218683	2-Feb-2004	10:51
bse2.5b12.5y10k.ft72	568568	2-Feb-2004	10:48
bse2.5b12.5y10k.out	13270744	2-Feb-2004	10:48
bse2.5b15.0y10k.ft72	649792	2-Feb-2004	10:51
bse2.5b15.0y10k.out	15307738	2-Feb-2004	10:51
bse2.5b17.5y10k.ft72	771628	2-Feb-2004	10:51
bse2.5b17.5y10k.out	18262259	2-Feb-2004	10:51
bse2.5b20.0y10k.ft72	852852	2-Feb-2004	10:52
bse2.5b20.0y10k.out	20257797	2-Feb-2004	10:52
bse2.5b25.0y10k.ft72	1015300	2-Feb-2004	10:53
bse2.5b25.0y10k.out	24248739	2-Feb-2004	10:53
bse2.5b30.0y10k.ft72	1218360	2-Feb-2004	10:54
bse2.5b30.0y10k.out	29240800	2-Feb-2004	10:54
bse2.5b35.0y10k.ft72	1380808	2-Feb-2004	10:55
bse2.5b35.0y10k.out	33237544	2-Feb-2004	10:55
bse2.5b40.0y10k.ft72	1583868	2-Feb-2004	10:58
bse2.5b40.0y10k.out	38235124	2-Feb-2004	10:58
bse2.5b45.0y10k.ft72	1746316	2-Feb-2004	10:59
bse2.5b45.0y10k.out	42233175	2-Feb-2004	10:59
bse2.5b50.0y10k.ft72	1949376	2-Feb-2004	11:00
bse2.5b50.0y10k.out	47230059	2-Feb-2004	11:00
bse2.5b55.0y10k.ft72	2111824	2-Feb-2004	11:03
bse2.5b55.0y10k.out	51227911	2-Feb-2004	11:04
bse2.5b60.0y10k.ft72	2314884	2-Feb-2004	11:07
bse2.5b60.0y10k.out	56226017	2-Feb-2004	11:07
bse2.5b65.0y10k.ft72	2477332	2-Feb-2004	11:09
bse2.5b65.0y10k.out	60225174	2-Feb-2004	11:09
bse2.5b70.0y10k.ft72	2680392	2-Feb-2004	11:08
bse2.5b70.0y10k.out	65222357	2-Feb-2004	11:09
bse2.5b75.0y10k.ft72	2842840	2-Feb-2004	11:12
bse2.5b75.0y10k.out	69220421	2-Feb-2004	11:12

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse3.0b0.001y10k.ft72	121836	2-Feb-2004	10:58
bse3.0b0.001y10k.out	2095630	2-Feb-2004	10:58
bse3.0b10.0y10k.ft72	446732	2-Feb-2004	11:02
bse3.0b10.0y10k.out	10212869	2-Feb-2004	11:02
bse3.0b12.5y10k.ft72	568568	2-Feb-2004	11:03
bse3.0b12.5y10k.out	13264552	2-Feb-2004	11:03
bse3.0b15.0y10k.ft72	649792	2-Feb-2004	11:03
bse3.0b15.0y10k.out	15300308	2-Feb-2004	11:03
bse3.0b17.5y10k.ft72	771628	2-Feb-2004	11:05
bse3.0b17.5y10k.out	18258646	2-Feb-2004	11:05
bse3.0b2.5y10k.ft72	203060	2-Feb-2004	10:59
bse3.0b2.5y10k.out	4133234	2-Feb-2004	10:59
bse3.0b20.0y10k.ft72	852852	2-Feb-2004	11:06
bse3.0b20.0y10k.out	20254668	2-Feb-2004	11:06
bse3.0b25.0y10k.ft72	1015300	2-Feb-2004	11:08
bse3.0b25.0y10k.out	24245116	2-Feb-2004	11:08
bse3.0b30.0y10k.ft72	1218360	2-Feb-2004	11:09
bse3.0b30.0y10k.out	29235665	2-Feb-2004	11:09
bse3.0b35.0y10k.ft72	1380808	2-Feb-2004	11:10
bse3.0b35.0y10k.out	33231274	2-Feb-2004	11:10
bse3.0b40.0y10k.ft72	1583868	2-Feb-2004	11:12
bse3.0b40.0y10k.out	38228122	2-Feb-2004	11:12
bse3.0b45.0y10k.ft72	1746316	2-Feb-2004	11:13
bse3.0b45.0y10k.out	42227318	2-Feb-2004	11:13
bse3.0b5.0y10k.ft72	284284	2-Feb-2004	11:00
bse3.0b5.0y10k.out	6153155	2-Feb-2004	11:00
bse3.0b50.0y10k.ft72	1949376	2-Feb-2004	11:16
bse3.0b50.0y10k.out	47224476	2-Feb-2004	11:16
bse3.0b55.0y10k.ft72	2111824	2-Feb-2004	11:22
bse3.0b55.0y10k.out	51222848	2-Feb-2004	11:22
bse3.0b60.0y10k.ft72	2314884	2-Feb-2004	11:23
bse3.0b60.0y10k.out	56220592	2-Feb-2004	11:23
bse3.0b65.0y10k.ft72	2477332	2-Feb-2004	11:24
bse3.0b65.0y10k.out	60219692	2-Feb-2004	11:24
bse3.0b7.5y10k.ft72	365508	2-Feb-2004	11:01
bse3.0b7.5y10k.out	8180534	2-Feb-2004	11:01
bse3.0b70.0y10k.ft72	2680392	2-Feb-2004	11:20
bse3.0b70.0y10k.out	65217808	2-Feb-2004	11:20
bse3.0b75.0y10k.ft72	2842840	2-Feb-2004	11:22
bse3.0b75.0y10k.out	69215557	2-Feb-2004	11:22



Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse3.5b0.001y10k.ft72	121836	2-Feb-2004	11:13
bse3.5b0.001y10k.out	2095630	2-Feb-2004	11:13
bse3.5b2.5y10k.ft72	203060	2-Feb-2004	11:13
bse3.5b2.5y10k.out	4131304	2-Feb-2004	11:13
bse3.5b5.0y10k.ft72	284284	2-Feb-2004	11:14
bse3.5b5.0y10k.out	6150332	2-Feb-2004	11:14
bse3.5b7.5y10k.ft72	365508	2-Feb-2004	11:15
bse3.5b7.5y10k.out	8177440	2-Feb-2004	11:15
bse3.5b10.0y10k.ft72	446732	2-Feb-2004	11:16
bse3.5b10.0y10k.out	10208518	2-Feb-2004	11:16
bse3.5b12.5y10k.ft72	568568	2-Feb-2004	11:17
bse3.5b12.5y10k.out	13260121	2-Feb-2004	11:17
bse3.5b15.0y10k.ft72	649792	2-Feb-2004	11:19
bse3.5b15.0y10k.out	15295525	2-Feb-2004	11:19
bse3.5b17.5y10k.ft72	771628	2-Feb-2004	11:20
bse3.5b17.5y10k.out	18253308	2-Feb-2004	11:20
bse3.5b20.0y10k.ft72	852852	2-Feb-2004	11:21
bse3.5b20.0y10k.out	20250963	2-Feb-2004	11:21
bse3.5b25.0y10k.ft72	1015300	2-Feb-2004	11:24
bse3.5b25.0y10k.out	24239896	2-Feb-2004	11:24
bse3.5b30.0y10k.ft72	1218360	2-Feb-2004	11:26
bse3.5b30.0y10k.out	29231493	2-Feb-2004	11:26
bse3.5b35.0y10k.ft72	1380808	2-Feb-2004	11:26
bse3.5b35.0y10k.out	33227118	2-Feb-2004	11:26
bse3.5b40.0y10k.ft72	1583868	2-Feb-2004	11:26
bse3.5b40.0y10k.out	38222554	2-Feb-2004	11:26
bse3.5b45.0y10k.ft72	1746316	2-Feb-2004	11:29
bse3.5b45.0y10k.out	42221401	2-Feb-2004	11:29
bse3.5b50.0y10k.ft72	1949376	2-Feb-2004	11:30
bse3.5b50.0y10k.out	47219314	2-Feb-2004	11:30
bse3.5b55.0y10k.ft72	2111824	2-Feb-2004	11:30
bse3.5b55.0y10k.out	51218698	2-Feb-2004	11:30
bse3.5b60.0y10k.ft72	2314884	2-Feb-2004	11:34
bse3.5b60.0y10k.out	56216779	2-Feb-2004	11:34
bse3.5b65.0y10k.ft72	2477332	2-Feb-2004	11:35
bse3.5b65.0y10k.out	60215227	2-Feb-2004	11:35
bse3.5b70.0y10k.ft72	2680392	2-Feb-2004	11:38
bse3.5b70.0y10k.out	65213082	2-Feb-2004	11:38
bse3.5b75.0y10k.ft72	2842840	2-Feb-2004	11:39
bse3.5b75.0y10k.out	69211492	2-Feb-2004	11:39

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse4.0b0.001y10k.ft72	121836	2-Feb-2004	11:27
bse4.0b0.001y10k.out	2095617	2-Feb-2004	11:27
bse4.0b2.5y10k.ft72	203060	2-Feb-2004	11:27
bse4.0b2.5y10k.out	4131358	2-Feb-2004	11:27
bse4.0b5.0y10k.ft72	284284	2-Feb-2004	11:29
bse4.0b5.0y10k.out	6152106	2-Feb-2004	11:29
bse4.0b7.5y10k.ft72	365508	2-Feb-2004	11:30
bse4.0b7.5y10k.out	8177144	2-Feb-2004	11:30
bse4.0b10.0y10k.ft72	446732	2-Feb-2004	11:31
bse4.0b10.0y10k.out	10207041	2-Feb-2004	11:31
bse4.0b12.5y10k.ft72	568568	2-Feb-2004	11:31
bse4.0b12.5y10k.out	13258924	2-Feb-2004	11:31
bse4.0b15.0y10k.ft72	649792	2-Feb-2004	11:35
bse4.0b15.0y10k.out	15293691	2-Feb-2004	11:35
bse4.0b17.5y10k.ft72	771628	2-Feb-2004	11:35
bse4.0b17.5y10k.out	18246834	2-Feb-2004	11:35
bse4.0b20.0y10k.ft72	852852	2-Feb-2004	11:34
bse4.0b20.0y10k.out	20243150	2-Feb-2004	11:34
bse4.0b25.0y10k.ft72	1015300	2-Feb-2004	11:34
bse4.0b25.0y10k.out	24234699	2-Feb-2004	11:34
bse4.0b30.0y10k.ft72	1218360	2-Feb-2004	11:41
bse4.0b30.0y10k.out	29226037	2-Feb-2004	11:41
bse4.0b35.0y10k.ft72	1380808	2-Feb-2004	11:38
bse4.0b35.0y10k.out	33221525	2-Feb-2004	11:38
bse4.0b40.0y10k.ft72	1583868	2-Feb-2004	11:41
bse4.0b40.0y10k.out	38216884	2-Feb-2004	11:41
bse4.0b45.0y10k.ft72	1746316	2-Feb-2004	11:44
bse4.0b45.0y10k.out	42215605	2-Feb-2004	11:44
bse4.0b50.0y10k.ft72	1949376	2-Feb-2004	11:45
bse4.0b50.0y10k.out	47213437	2-Feb-2004	11:45
bse4.0b55.0y10k.ft72	2111824	2-Feb-2004	11:44
bse4.0b55.0y10k.out	51212999	2-Feb-2004	11:45
bse4.0b60.0y10k.ft72	2314884	2-Feb-2004	11:48
bse4.0b60.0y10k.out	56211233	2-Feb-2004	11:48
bse4.0b65.0y10k.ft72	2477332	2-Feb-2004	11:46
bse4.0b65.0y10k.out	60209390	2-Feb-2004	11:46
bse4.0b70.0y10k.ft72	2680392	2-Feb-2004	11:48
bse4.0b70.0y10k.out	65206982	2-Feb-2004	11:48
bse4.0b75.0y10k.ft72	2842840	2-Feb-2004	11:52
bse4.0b75.0y10k.out	69205697	2-Feb-2004	11:52

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse4.5b0.001y10k.ft72	121836	2-Feb-2004	11:42
bse4.5b0.001y10k.out	2095734	2-Feb-2004	11:42
bse4.5b2.5y10k.ft72	203060	2-Feb-2004	11:42
bse4.5b2.5y10k.out	4131914	2-Feb-2004	11:42
bse4.5b5.0y10k.ft72	284284	2-Feb-2004	11:43
bse4.5b5.0y10k.out	6149609	2-Feb-2004	11:43
bse4.5b7.5y10k.ft72	365508	2-Feb-2004	11:44
bse4.5b7.5y10k.out	8176003	2-Feb-2004	11:44
bse4.5b10.0y10k.ft72	446732	2-Feb-2004	11:47
bse4.5b10.0y10k.out	10204953	2-Feb-2004	11:47
bse4.5b12.5y10k.ft72	568568	2-Feb-2004	11:48
bse4.5b12.5y10k.out	13255289	2-Feb-2004	11:48
bse4.5b15.0y10k.ft72	649792	2-Feb-2004	11:48
bse4.5b15.0y10k.out	15289971	2-Feb-2004	11:48
bse4.5b17.5y10k.ft72	771628	2-Feb-2004	11:49
bse4.5b17.5y10k.out	18244028	2-Feb-2004	11:49
bse4.5b20.0y10k.ft72	852852	2-Feb-2004	11:50
bse4.5b20.0y10k.out	20238637	2-Feb-2004	11:50
bse4.5b25.0y10k.ft72	1015300	2-Feb-2004	11:51
bse4.5b25.0y10k.out	24230028	2-Feb-2004	11:51
bse4.5b30.0y10k.ft72	1218360	2-Feb-2004	11:55
bse4.5b30.0y10k.out	29221728	2-Feb-2004	11:55
bse4.5b35.0y10k.ft72	1380808	2-Feb-2004	11:56
bse4.5b35.0y10k.out	33217542	2-Feb-2004	11:56
bse4.5b40.0y10k.ft72	1583868	2-Feb-2004	11:57
bse4.5b40.0y10k.out	38211774	2-Feb-2004	11:57
bse4.5b45.0y10k.ft72	1746316	2-Feb-2004	11:54
bse4.5b45.0y10k.out	42210141	2-Feb-2004	11:54
bse4.5b50.0y10k.ft72	1949376	2-Feb-2004	11:56
bse4.5b50.0y10k.out	47207471	2-Feb-2004	11:56
bse4.5b55.0y10k.ft72	2111824	2-Feb-2004	12:05
bse4.5b55.0y10k.out	51206360	2-Feb-2004	12:05
bse4.5b60.0y10k.ft72	2314884	2-Feb-2004	11:58
bse4.5b60.0y10k.out	56205222	2-Feb-2004	11:58
bse4.5b65.0y10k.ft72	2477332	2-Feb-2004	12:02
bse4.5b65.0y10k.out	60203718	2-Feb-2004	12:02
bse4.5b70.0y10k.ft72	2680392	2-Feb-2004	12:06
bse4.5b70.0y10k.out	65201349	2-Feb-2004	12:06
bse4.5b75.0y10k.ft72	2842840	2-Feb-2004	12:07
bse4.5b75.0y10k.out	69199884	2-Feb-2004	12:08

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse5.0b0.001y10k.ft72	121836	2-Feb-2004	11:56
bse5.0b0.001y10k.out	2095734	2-Feb-2004	11:56
bse5.0b2.5y10k.ft72	203060	2-Feb-2004	11:57
bse5.0b2.5y10k.out	4131566	2-Feb-2004	11:57
bse5.0b5.0y10k.ft72	284284	2-Feb-2004	11:57
bse5.0b5.0y10k.out	6148514	2-Feb-2004	11:57
bse5.0b7.5y10k.ft72	365508	2-Feb-2004	11:58
bse5.0b7.5y10k.out	8173515	2-Feb-2004	11:58
bse5.0b10.0y10k.ft72	446732	2-Feb-2004	11:59
bse5.0b10.0y10k.out	10202488	2-Feb-2004	11:59
bse5.0b12.5y10k.ft72	568568	2-Feb-2004	11:59
bse5.0b12.5y10k.out	13252158	2-Feb-2004	11:59
bse5.0b15.0y10k.ft72	649792	2-Feb-2004	12:00
bse5.0b15.0y10k.out	15286444	2-Feb-2004	12:00
bse5.0b17.5y10k.ft72	771628	2-Feb-2004	12:01
bse5.0b17.5y10k.out	18241114	2-Feb-2004	12:01
bse5.0b20.0y10k.ft72	852852	2-Feb-2004	12:02
bse5.0b20.0y10k.out	20235127	2-Feb-2004	12:02
bse5.0b25.0y10k.ft72	1015300	2-Feb-2004	12:04
bse5.0b25.0y10k.out	24227526	2-Feb-2004	12:04
bse5.0b30.0y10k.ft72	1218360	2-Feb-2004	12:04
bse5.0b30.0y10k.out	29218953	2-Feb-2004	12:04
bse5.0b35.0y10k.ft72	1380808	2-Feb-2004	12:06
bse5.0b35.0y10k.out	33214146	2-Feb-2004	12:06
bse5.0b40.0y10k.ft72	1583868	2-Feb-2004	12:08
bse5.0b40.0y10k.out	38209062	2-Feb-2004	12:08
bse5.0b45.0y10k.ft72	1746316	2-Feb-2004	12:08
bse5.0b45.0y10k.out	42206803	2-Feb-2004	12:08
bse5.0b50.0y10k.ft72	1949376	2-Feb-2004	12:11
bse5.0b50.0y10k.out	47203410	2-Feb-2004	12:11
bse5.0b55.0y10k.ft72	2111824	2-Feb-2004	12:16
bse5.0b55.0y10k.out	51201756	2-Feb-2004	12:16
bse5.0b60.0y10k.ft72	2314884	2-Feb-2004	12:18
bse5.0b60.0y10k.out	56198903	2-Feb-2004	12:18
bse5.0b65.0y10k.ft72	2477332	2-Feb-2004	12:14
bse5.0b65.0y10k.out	60197652	2-Feb-2004	12:14
bse5.0b70.0y10k.ft72	2680392	2-Feb-2004	12:20
bse5.0b70.0y10k.out	65195118	2-Feb-2004	12:21
bse5.0b75.0y10k.ft72	2842840	2-Feb-2004	12:22
bse5.0b75.0y10k.out	69194002	2-Feb-2004	12:22

Table 42. BWR Isotopic Database SAS2H Tape 72/Output Files, 10,000 Year Decay (Cont.)

File Name	File Size (bytes)	Date of Last Update	Time
bse5.5b0.001y10k.ft72	121836	2-Feb-2004	12:09
bse5.5b0.001y10k.out	2095517	2-Feb-2004	12:09
bse5.5b2.5y10k.ft72	203060	2-Feb-2004	12:10
bse5.5b2.5y10k.out	4130836	2-Feb-2004	12:10
bse5.5b5.0y10k.ft72	284284	2-Feb-2004	12:10
bse5.5b5.0y10k.out	6146993	2-Feb-2004	12:10
bse5.5b7.5y10k.ft72	365508	2-Feb-2004	12:11
bse5.5b7.5y10k.out	8170422	2-Feb-2004	12:11
bse5.5b10.0y10k.ft72	446732	2-Feb-2004	12:12
bse5.5b10.0y10k.out	10199518	2-Feb-2004	12:12
bse5.5b12.5y10k.ft72	568568	2-Feb-2004	12:13
bse5.5b12.5y10k.out	13247929	2-Feb-2004	12:13
bse5.5b15.0y10k.ft72	649792	2-Feb-2004	12:14
bse5.5b15.0y10k.out	15282788	2-Feb-2004	12:14
bse5.5b17.5y10k.ft72	771628	2-Feb-2004	12:14
bse5.5b17.5y10k.out	18238433	2-Feb-2004	12:14
bse5.5b20.0y10k.ft72	852852	2-Feb-2004	12:16
bse5.5b20.0y10k.out	20231873	2-Feb-2004	12:16
bse5.5b25.0y10k.ft72	1015300	2-Feb-2004	12:17
bse5.5b25.0y10k.out	24225161	2-Feb-2004	12:17
bse5.5b30.0y10k.ft72	1218360	2-Feb-2004	12:21
bse5.5b30.0y10k.out	29217092	2-Feb-2004	12:22
bse5.5b35.0y10k.ft72	1380808	2-Feb-2004	12:22
bse5.5b35.0y10k.out	33211954	2-Feb-2004	12:22
bse5.5b40.0y10k.ft72	1583868	2-Feb-2004	12:22
bse5.5b40.0y10k.out	38207247	2-Feb-2004	12:22
bse5.5b45.0y10k.ft72	1746316	2-Feb-2004	12:22
bse5.5b45.0y10k.out	42204550	2-Feb-2004	12:22
bse5.5b50.0y10k.ft72	1949376	2-Feb-2004	12:24
bse5.5b50.0y10k.out	47201039	2-Feb-2004	12:24
bse5.5b55.0y10k.ft72	2111824	2-Feb-2004	12:26
bse5.5b55.0y10k.out	51199163	2-Feb-2004	12:26
bse5.5b60.0y10k.ft72	2314884	2-Feb-2004	12:35
bse5.5b60.0y10k.out	56195945	2-Feb-2004	12:35
bse5.5b65.0y10k.ft72	2477332	2-Feb-2004	12:36
bse5.5b65.0y10k.out	60193739	2-Feb-2004	12:37
bse5.5b70.0y10k.ft72	2680392	2-Feb-2004	12:41
bse5.5b70.0y10k.out	65190942	2-Feb-2004	12:41
bse5.5b75.0y10k.ft72	2842840	2-Feb-2004	12:35
bse5.5b75.0y10k.out	69189156	2-Feb-2004	12:35

Table 43. BWR Isotopic Database SAS2H Tape 72/Output Files, For Nominal Depletion/Confirmation

File Name	Size	Date	Time	Description
N310.ft72	243672	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 10 GWd/mtU burnup
N310.out	5082377	3/5/2004	10:10:08	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 10 GWd/mtU burnup
N320.ft72	446732	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 20 GWd/mtU burnup
N320.out	10137376	3/5/2004	10:10:55	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 20 GWd/mtU burnup
N330.ft72	649792	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 30 GWd/mtU burnup
N330.out	15191320	3/5/2004	10:11:34	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 30 GWd/mtU burnup
N340.ft72	934076	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 40 GWd/mtU burnup
N340.out	22249144	3/5/2004	10:11:40	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 40 GWd/mtU burnup
N350.ft72	1096524	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 50 GWd/mtU burnup
N350.out	26284986	3/5/2004	9:46:35	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 50 GWd/mtU burnup
N410.ft72	243672	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 10 GWd/mtU burnup
N410.out	5079874	3/5/2004	10:29:55	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 10 GWd/mtU burnup
N420.ft72	446732	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 20 GWd/mtU burnup
N420.out	10128642	3/5/2004	10:31:22	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 20 GWd/mtU burnup
N430.ft72	649792	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 30 GWd/mtU burnup

Table 43. BWR Isotopic Database SAS2H Tape 72/Output Files, For Nominal Depletion/Confirmation (cont.)

File Name	Size	Date	Time	Description
N430.out	15177020	3/5/2004	10:31:49	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 30 GWd/mtU burnup
N440.ft72	934076	4/8/2004	16:04:03	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 40 GWd/mtU burnup
N440.out	22229789	3/5/2004	10:32:58	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 40 GWd/mtU burnup
N450.ft72	1096524	4/8/2004	16:04:04	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 50 GWd/mtU burnup
N450.out	26265478	3/5/2004	10:35:35	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 50 GWd/mtU burnup
N510.ft72	243672	4/8/2004	16:04:04	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 10 GWd/mtU burnup
N510.out	5078680	3/5/2004	10:31:09	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 10 GWd/mtU burnup
N520.ft72	446732	4/8/2004	16:04:04	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 20 GWd/mtU burnup
N520.out	10126138	3/5/2004	10:31:50	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 20 GWd/mtU burnup
N530.ft72	649792	4/8/2004	16:04:04	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 30 GWd/mtU burnup
N530.out	15169384	3/5/2004	10:31:31	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 30 GWd/mtU burnup
N540.ft72	934076	4/8/2004	16:04:04	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 40 GWd/mtU burnup
N540.out	22216417	3/5/2004	10:35:03	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 40 GWd/mtU burnup
N550.ft72	1096524	4/8/2004	16:04:04	SAS2H tape 72 file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 50 GWd/mtU burnup
N550.out	26249260	3/5/2004	10:35:39	SAS2H output file for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 50 GWd/mtU burnup

Table 44. BWR Isotopic Database MCNP Output Files Confirmation

File Name	Size	Date	Time	Description
1ma.out	406716	4/6/2004	12:08:07	MCNP output for Limerick sample 1 using the RCA measured data.
2m.out	404799	2/20/2004	10:45:49	MCNP output for Limerick sample 2 using the RCA measured data.
3m.out	406263	2/20/2004	10:49:13	MCNP output for Limerick sample 3 using the RCA measured data.
4m.out	404703	2/20/2004	10:49:38	MCNP output for Limerick sample 4 using the RCA measured data.
5m.out	406263	2/20/2004	10:59:06	MCNP output for Limerick sample 5 using the RCA measured data.
6m.out	406167	2/20/2004	11:14:30	MCNP output for Limerick sample 6 using the RCA measured data.
7m.out	406264	2/23/2004	8:52:17	MCNP output for Limerick sample 7 using the RCA measured data.
8m.out	398522	2/23/2004	8:52:36	MCNP output for Limerick sample 8 using the RCA measured data.
L01ida.out	406570	4/6/2004	13:18:44	MCNP output for Limerick sample 1 using the isotopic concentrations generated using the Isotopic Database.
L02id.out	406266	2/20/2004	11:21:34	MCNP output for Limerick sample 2 using the isotopic concentrations generated using the Isotopic Database.
L03id.out	404706	2/20/2004	11:47:00	MCNP output for Limerick sample 3 using the isotopic concentrations generated using the Isotopic Database.
L04id.out	406170	2/20/2004	11:51:45	MCNP output for Limerick sample 4 using the isotopic concentrations generated using the Isotopic Database.
L05id.out	404802	2/20/2004	11:56:15	MCNP output for Limerick sample 5 using the isotopic concentrations generated using the Isotopic Database.
L06id.out	404998	2/20/2004	11:56:17	MCNP output for Limerick sample 6 using the isotopic concentrations generated using the Isotopic Database.
L07id.out	406171	2/23/2004	8:50:45	MCNP output for Limerick sample 7 using the isotopic concentrations generated using the Isotopic Database.
L08id.out	405391	2/23/2004	8:50:30	MCNP output for Limerick sample 8 using the isotopic concentrations generated using the Isotopic Database.
c1m.out	398360	2/19/2004	11:48:49	MCNP output for Cooper sample 1 using the RCA measured data.
c2m.out	398365	2/19/2004	11:47:59	MCNP output for Cooper sample 2 using the RCA measured data.
c3m.out	398365	2/19/2004	11:37:13	MCNP output for Cooper sample 3 using the RCA measured data.
c4m.out	396900	2/19/2004	11:32:54	MCNP output for Cooper sample 4 using the RCA measured data.



Table 44. BWR Isotopic Database MCNP Output Files Confirmation (cont.)

File Name	Size	Date	Time	Description
c5m.out	398360	2/19/2004	11:30:15	MCNP output for Cooper sample 5 using the RCA measured data.
c6m.out	398360	2/19/2004	11:30:46	MCNP output for Cooper sample 6 using the RCA measured data.
C1id.out	398359	2/19/2004	10:50:26	MCNP output for Cooper sample 1 using the isotopic concentrations generated using the Isotopic Database.
C2id.out	396976	2/19/2004	10:48:25	MCNP output for Cooper sample 2 using the isotopic concentrations generated using the Isotopic Database.
C3id.out	398359	2/19/2004	11:04:44	MCNP output for Cooper sample 3 using the isotopic concentrations generated using the Isotopic Database.
C4id.out	397852	2/19/2004	11:04:46	MCNP output for Cooper sample 4 using the isotopic concentrations generated using the Isotopic Database.
C5id.out	398359	2/19/2004	11:19:18	MCNP output for Cooper sample 5 using the isotopic concentrations generated using the Isotopic Database.
C6id.out	397852	2/19/2004	11:17:11	MCNP output for Cooper sample 6 using the isotopic concentrations generated using the Isotopic Database.
g1m.out	392312	2/19/2004	12:26:39	MCNP output for Gundremingen sample 1 using the RCA measured data.
g2m.out	391800	2/19/2004	12:30:54	MCNP output for Gundremingen sample 2 using the RCA measured data.
g3m.out	390432	2/19/2004	12:38:14	MCNP output for Gundremingen sample 3 using the RCA measured data.
g4m.out	386222	2/19/2004	12:41:23	MCNP output for Gundremingen sample 4 using the RCA measured data.
g5ma.out	392814	4/6/2004	13:11:18	MCNP output for Gundremingen sample 5 using the RCA measured data.
g6m.out	392307	2/19/2004	12:52:44	MCNP output for Gundremingen sample 6 using the RCA measured data.
g7m.out	391799	2/19/2004	12:52:45	MCNP output for Gundremingen sample 7 using the RCA measured data.
g8m.out	391799	2/19/2004	12:56:21	MCNP output for Gundremingen sample 8 using the RCA measured data.
G01id.out	391796	2/19/2004	11:53:38	MCNP output for Gundremingen sample 1 using the isotopic concentrations generated using the Isotopic Database.
G02id.out	391892	2/19/2004	11:57:54	MCNP output for Gundremingen sample 2 using the isotopic concentrations generated using the Isotopic Database.
G03id.out	386230	2/19/2004	12:02:47	MCNP output for Gundremingen sample 3 using the isotopic concentrations generated using the Isotopic Database.
G04id.out	391898	2/19/2004	12:07:01	MCNP output for Gundremingen sample 4 using the isotopic concentrations generated using the Isotopic Database.
G05id.out	391023	2/19/2004	12:11:19	MCNP output for Gundremingen sample 5 using the isotopic concentrations generated using the Isotopic Database.

Table 44. BWR Isotopic Database MCNP Output Files Confirmation (cont.)

File Name	Size	Date	Time	Description
G06ida.out	391331	4/6/2004	12:03:56	MCNP output for Gundremingen sample 6 using the isotopic concentrations generated using the Isotopic Database.
G07ida.out	391331	4/6/2004	11:50:55	MCNP output for Gundremingen sample 7 using the isotopic concentrations generated using the Isotopic Database.
G08id.out	391016	2/19/2004	12:24:52	MCNP output for Gundremingen sample 8 using the isotopic concentrations generated using the Isotopic Database.
j01m.out	394690	2/20/2004	8:10:43	MCNP output for JPDR sample 1 using the RCA measured data.
j02m.out	393274	2/20/2004	8:35:27	MCNP output for JPDR sample 2 using the RCA measured data.
j03m.out	393862	2/20/2004	8:37:04	MCNP output for JPDR sample 3 using the RCA measured data.
j04m.out	394642	2/20/2004	8:38:55	MCNP output for JPDR sample 4 using the RCA measured data.
j05m.out	395906	2/20/2004	8:39:23	MCNP output for JPDR sample 5 using the RCA measured data.
j06m.out	396467	2/20/2004	9:08:08	MCNP output for JPDR sample 6 using the RCA measured data.
j07m.out	394982	2/20/2004	9:07:33	MCNP output for JPDR sample 7 using the RCA measured data.
j08m.out	395495	2/20/2004	9:10:02	MCNP output for JPDR sample 8 using the RCA measured data.
j09m.out	394394	2/20/2004	9:09:29	MCNP output for JPDR sample 9 using the RCA measured data.
j10m.out	394982	2/20/2004	9:35:05	MCNP output for JPDR sample 10 using the RCA measured data.
j11m.out	395954	2/20/2004	9:37:29	MCNP output for JPDR sample 11 using the RCA measured data.
j12m.out	395858	2/20/2004	9:40:13	MCNP output for JPDR sample 12 using the RCA measured data.
j13m.out	394982	2/20/2004	9:40:00	MCNP output for JPDR sample 13 using the RCA measured data.
j14m.out	395954	2/20/2004	10:07:23	MCNP output for JPDR sample 14 using the RCA measured data.
j15m.out	353467	2/20/2004	10:08:45	MCNP output for JPDR sample 15 using the RCA measured data.
j16m.out	396467	2/20/2004	10:09:41	MCNP output for JPDR sample 16 using the RCA measured data.
J01ida.out	395043	4/6/2004	13:22:18	MCNP output for JPDR sample 1 using the isotopic concentrations generated using the Isotopic Database.
J02id.out	394733	2/19/2004	14:10:15	MCNP output for JPDR sample 2 using the isotopic concentrations generated using the Isotopic Database.
J03id.out	393519	2/20/2004	8:06:07	MCNP output for JPDR sample 3 using the isotopic concentrations generated using the Isotopic Database.

Table 44. BWR Isotopic Database MCNP Output Files Confirmation (cont.)

File Name	Size	Date	Time	Description
J04id.out	394733	2/19/2004	14:10:09	MCNP output for JPDR sample 4 using the isotopic concentrations generated using the Isotopic Database.
J05id.out	393615	2/20/2004	8:07:12	MCNP output for JPDR sample 5 using the isotopic concentrations generated using the Isotopic Database.
J06id.out	394485	2/19/2004	14:24:15	MCNP output for JPDR sample 6 using the isotopic concentrations generated using the Isotopic Database.
J07id.out	394729	2/19/2004	16:14:45	MCNP output for JPDR sample 7 using the isotopic concentrations generated using the Isotopic Database.
J08id.out	395853	2/19/2004	16:28:42	MCNP output for JPDR sample 8 using the isotopic concentrations generated using the Isotopic Database.
J09id.out	395853	2/19/2004	16:43:02	MCNP output for JPDR sample 9 using the isotopic concentrations generated using the Isotopic Database.
J10id.out	395949	2/19/2004	16:57:11	MCNP output for JPDR sample 10 using the isotopic concentrations generated using the Isotopic Database.
J11id.out	395219	2/19/2004	17:11:11	MCNP output for JPDR sample 11 using the isotopic concentrations generated using the Isotopic Database.
J12id.out	395853	2/19/2004	17:25:13	MCNP output for JPDR sample 12 using the isotopic concentrations generated using the Isotopic Database.
J13id.out	395126	2/19/2004	17:39:20	MCNP output for JPDR sample 13 using the isotopic concentrations generated using the Isotopic Database.
J14id.out	390326	2/19/2004	17:53:42	MCNP output for JPDR sample 14 using the isotopic concentrations generated using the Isotopic Database.
J15id.out	395853	2/19/2004	18:07:45	MCNP output for JPDR sample 15 using the isotopic concentrations generated using the Isotopic Database.
J16id.out	395073	2/19/2004	18:21:40	MCNP output for JPDR sample 16 using the isotopic concentrations generated using the Isotopic Database.
A16_06.out	529030829	2/20/2004	16:56:44	MCNP output for Grand Gulf Unit 1, Statepoint 6 using the isotopic concentrations generated using the Isotopic Database in Assembly A16.
B32_15.out	552448164	2/23/2004	2:39:33	MCNP output for Grand Gulf Unit 1, Statepoint 15 using the isotopic concentrations generated using the Isotopic Database in Assembly B32.
B37_13.out	550585651	2/8/2004	16:45:36	MCNP output for Grand Gulf Unit 1, Statepoint 13 using the isotopic concentrations generated using the Isotopic Database in Assembly B37.
C06_06.out	529030709	2/8/2004	19:12:23	MCNP output for Grand Gulf Unit 1, Statepoint 6 using the isotopic concentrations generated using the Isotopic Database in Assembly C06.
D45_14.out	551027044	2/10/2004	12:15:48	MCNP output for Grand Gulf Unit 1, Statepoint 14 using the isotopic concentrations generated using the Isotopic Database in Assembly D45.
F16_18.out	561159987	2/12/2004	0:51:04	MCNP output for Grand Gulf Unit 1, Statepoint 18 using the isotopic concentrations generated using the Isotopic Database in Assembly F16.

Table 44. BWR Isotopic Database MCNP Output Files Confirmation (cont.)

File Name	Size	Date	Time	Description
H06_21.out	561617301	2/14/2004	23:27:19	MCNP output for Grand Gulf Unit 1, Statepoint 21 using the isotopic concentrations generated using the Isotopic Database in Assembly H06.
H15_18.out	560758531	2/12/2004	0:48:08	MCNP output for Grand Gulf Unit 1, Statepoint 18 using the isotopic concentrations generated using the Isotopic Database in Assembly H15.
H22_20.out	579548454	2/15/2004	5:26:26	MCNP output for Grand Gulf Unit 1, Statepoint 20 using the isotopic concentrations generated using the Isotopic Database in Assembly H22.
J30_20.out	579512230	2/14/2004	23:19:47	MCNP output for Grand Gulf Unit 1, Statepoint 20 using the isotopic concentrations generated using the Isotopic Database in Assembly J30.
K06_20.out	579548453	2/20/2004	23:09:05	MCNP output for Grand Gulf Unit 1, Statepoint 20 using the isotopic concentrations generated using the Isotopic Database in Assembly K06.
n310m.out	407313	4/8/2004	11:30:14	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 10 GWd/mtU burnup
n320m.out	407313	4/8/2004	12:36:53	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 20 GWd/mtU burnup
n330m.out	407313	4/8/2004	12:35:41	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 30 GWd/mtU burnup
n340m.out	407313	4/8/2004	12:38:52	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 40 GWd/mtU burnup
n350m.out	407313	4/8/2004	12:48:31	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 3wt% enrichment and a 50 GWd/mtU burnup
n410m.out	407313	4/8/2004	14:32:58	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 10 GWd/mtU burnup
n420m.out	407313	4/8/2004	14:27:33	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 20 GWd/mtU burnup
n430m.out	407449	4/8/2004	13:23:49	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 30 GWd/mtU burnup
n440m.out	407313	4/8/2004	13:39:36	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 40 GWd/mtU burnup
n450m.out	407313	4/8/2004	13:46:27	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 4wt% enrichment and a 50 GWd/mtU burnup

Table 44. BWR Isotopic Database MCNP Output Files Confirmation (cont.)

File Name	Size	Date	Time	Description
n510m.out	405849	4/8/2004	14:48:51	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 10 GWd/mtU burnup
n520m.out	407313	4/8/2004	14:50:51	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 20 GWd/mtU burnup
n530m.out	405849	4/8/2004	15:41:33	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 30 GWd/mtU burnup
n540m.out	407366	4/8/2004	15:40:39	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 40 GWd/mtU burnup
n550m.out	407313	4/8/2004	15:52:46	MCNP output for a nominal depletion using Grand Gulf Unit 1 Assembly C16 base depletion but a 5wt% enrichment and a 50 GWd/mtU burnup
bwr310.out	404819	2/25/2004	9:28:30	MCNP output for a 3wt% enrichment and a 10 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr320.out	406915	2/25/2004	9:28:17	MCNP output for a 3wt% enrichment and a 20 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr330.out	405513	2/25/2004	9:28:14	MCNP output for a 3wt% enrichment and a 30 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr340a.out	407315	4/8/2004	9:09:45	MCNP output for a 3wt% enrichment and a 40 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr350.out	404628	2/25/2004	10:00:36	MCNP output for a 3wt% enrichment and a 50 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr410.out	406977	2/25/2004	10:02:28	MCNP output for a 4wt% enrichment and a 10 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr420.out	406968	2/25/2004	10:02:34	MCNP output for a 4wt% enrichment and a 20 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr430.out	394429	2/25/2004	10:02:52	MCNP output for a 4wt% enrichment and a 30 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr440.out	406185	2/25/2004	10:34:42	MCNP output for a 4wt% enrichment and a 40 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr450.out	406915	2/25/2004	10:36:44	MCNP output for a 4wt% enrichment and a 50 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.

Table 44. BWR Isotopic Database MCNP Output Files Confirmation (cont.)

File Name	Size	Date	Time	Description
bwr510.out	405451	2/25/2004	10:36:57	MCNP output for a 5wt% enrichment and a 10 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr520.out	406039	2/25/2004	10:36:39	MCNP output for a 5wt% enrichment and a 20 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr530.out	406039	2/25/2004	11:02:01	MCNP output for a 5wt% enrichment and a 30 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr540.out	406038	2/25/2004	10:55:31	MCNP output for a 5wt% enrichment and a 40 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.
bwr550.out	406915	2/25/2004	11:03:47	MCNP output for a 5wt% enrichment and a 50 GWd/mtU burnup using the isotopic concentrations generated using the Isotopic Database.

9. DESIGN VERIFICATION CHECK LIST

1.	Were the inputs correctly selected and incorporated into design or analysis?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
2.	Are assumptions necessary to perform the design or analysis activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent re-verifications when the detailed design activities are completed?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
3.	Are the appropriate quality and quality assurance requirements specified? Or, for documents prepared per FANP procedures, have the procedural requirements been met?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
4.	If the design or analysis cites or is required to cite requirements or criteria based upon applicable codes, standards, specific regulatory requirements, including issue and addenda, are these properly identified, and are the requirements/criteria for design or analysis met?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
5.	Have applicable construction and operating experience been considered?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
6.	Have the design interface requirements been satisfied?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
7.	Was an appropriate design or analytical method used?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
8.	Is the output reasonable compared to inputs?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A
9.	Are the specified parts, equipment and processes suitable for the required application?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
10.	Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
11.	Have adequate maintenance features and requirements been specified?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
12.	Are accessibility and other design provisions adequate for performance of needed maintenance and repair?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
13.	Has adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
14.	Has the design properly considered radiation exposure to the public and plant personnel?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
15.	Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
16.	Have adequate pre-operational and subsequent periodic test requirements been appropriately specified?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
17.	Are adequate handling, storage, cleaning and shipping requirements specified?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
18.	Are adequate identification requirements specified?	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input checked="" type="checkbox"/> N/A
19.	Is the document prepared and being released under the FANP Quality Assurance Program? If not, are requirements for record preparation review, approval, retention, etc., adequately specified?	<input checked="" type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> N/A

Comments: None

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Claude W. Mays  
 (First, MI, Last) Printed / Typed Name

*Claude W. Mays*  
 Signature

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2. Record Date 06/23/04	3. Accession Number <i>Att-to:</i> DOC. 20040630.0007
4. Author Name(s) John Scaglione	5. Authorization Organization Criticality / Licensing

6. Title/Description  
 Generation and Verification of the BWR Application Model – Table 41 Con\_5-yr. Decay Output-Iso – Table 42\_10K-yr. Decay Output-Isotopic -

7. Document Number(s) 32-5035847	8. Version Designator N/A
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9. Document Type <i>dc 02404</i> <del>Attachment SAS2H DVD 2</del>	10. Medium DVD (2)
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11. Access Control Code  
*PUB*

12. Traceability Designator  
 32-5035847

13. Comments  
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6. Title/Description  
Generation and Verification of the BWR Application Model – Table 42 Cont.\_10K-yr. Decay Output-Isotopic -

7. Document Number(s)  
32-5035847

8. Version Designator  
N/A

9. Document Type *dc 081404*  
~~Attachment SAS2H DVD-3~~ *Data*

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6. Title/Description  
Generation and Verification of the BWR Application Model – Table 44 Cont. Iso DB Confirmation-MCNP -

7. Document Number(s)  
32-5035847

8. Version Designator  
N/A

9. Document Type *dc 081404*  
~~Attachment MCNP DVD-2~~ *Data*

10. Medium  
DVD (2)

11. Access Control Code  
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12. Traceability Designator  
32-5035847

13. Comments  
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6. Title/Description  
 Generation and Verification of the BWR Application Model – Table 40\_Sensitivity Output-MCNP-Table 43\_Nominal Depletion Output-SAS2H – Table 44 Iso DB Confirmation-MCNP

7. Document Number(s) 32-5035847	8. Version Designator N/A
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9. Document Type <del>Attachment SAS2H DVD 4 &amp; MCNP DVD 1</del> <i>dc 081404 data</i>	10. Medium DVD (2)
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11. Access Control Code  
 PUB

12. Traceability Designator  
 32-5035847

13. Comments  
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4. Author Name(s)  
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6. Title/Description  
Generation and Verification of the BWR Application Model – Table 39\_Sensitivity Output-Tape72 – Table 41\_5-yr. Decay Output-Isotopic -

7. Document Number(s)  
32-5035847

8. Version Designator  
N/A

9. Document Type *dc 081404*  
~~Attachment SAS2H DVD-1~~ *Data*

10. Medium  
DVD (2)

11. Access Control Code  
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12. Traceability Designator  
32-5035847

13. Comments  
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MCNP

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