#040607

Examinatet of "Nuclide Importance to Criticality Safety, Decay Heating, and Source Terms Related to Transport and Interim Storage of High-Burnup LWR Fuel NUREG/CR-6700 ORNL/TM-2000/284" to identified the key isotopes that show the greatest variation in importance for extended regimes. This information is important to help identify the high-burnup spent fuel characteristics that may adversely affect the accuracy of current computational methods and data, assess the potential impact on previous guidance on isotopic source terms and decay heating, and thus help identify areas for methods and data improvement.

#040907

Examination of YMRP, NUREG-1804

#041007

Preliminary analysis of the power produced in each fuel pin cell of an assembly at the start of burn u and during depletion by unique NewT "Pin Power Edits" option.

#041107

Pin Power results analyse and deviding 218 pin cells of an assembly into the 5 main groups according power produced during depletion calculatins:

**1.0818 - 1.0642 (8 pin cells)**
**1.0471 - 1.0261 (10)**
1.026 - 0.9972 (8)
**0.9888 - 0.9603 (25)**
**0.9546 - 0.9358 (8)**

For the Assembly symmetry only ¼ assembly has been calculated with proper boundary conditions (reflection) on down and left surfaces.

#041207

Created and debugged Scale-NewT assembly depletion input for 5 different depletion materials according analyse results at the previouse step and comparison k-inf for the original (single material) and new (5 materials) inputs.

k-eff = 1.30802480 one depletion material
k-eff = 1.30802480 five depletion materials

#041307

Performed depletion calculations taking into account burnups for the set of pin cell groups for different thermal powers to calculate materials for axial burnup profiles; taking into account boron letdown during depletion; taking into account 232 nuclides; for 17 burnup cycles and number of cross-section libraries produced per cycle =3.

| | **Power[MWt]** | **Burnup [gwd/mtu]** |
|---|---|---|
| **Calculation cases** | | |
| ADRP_N_L4_W5_BMY_BGN_TMH_H0_G30_B40_P43 | 43.0292 | 40 |
| ADRP_N_L4_W5_BMY_BGN_TMH_H0_G30_B27_P30 | 30 | 27 |
| ADRP_N_L4_W5_BMY_BGN_TMH_H0_G30_B18_P20 | 20 | 18 |
| ADRP_N_L4_W5_BMY_BGN_TMH_H0_G30_B9_P10 | 10 | 9 |

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#041607

Initiated software writing for MCNP input file creation by means of linear interpolation in 4-dimensional space of parameters (Nuclide; Depletion; Thermal Powers; Pin Cell groups).

#041707

Produced and debugged MCNP input for the case of 45 depleted materials (9 axial and 5 radial materials)
C21_A1_F1_W5_APB_B0 – base test case for single depleted material; k-eff = 1.16638 0.00239
C21_A7_F5_W5_APB_B0 – test case for for 45 depleted materials; k-eff = 1.16717 0.00217

#041807

Performed Keno 5.a k-eff calculations for the Hi-Star 100 mpc-24E CASC with 6-1/4-inch boral sheet with neutrons flux trap.

| | Preliminary calculations | Original calculations |
|---|---|---|
| normalinp.out | 0.9440 + or – 0.0016 | 0.94394 + or - 0.00061 |
| accunit31b.out | 0.9439 + or – 0.0018 | 0.94383 + or - 0.00063 |
| accunit3140b.out | 0.9458 + or – 0.0015 | 0.94572 + or - 0.00066 |

#042007

Completed MCNP calculations of PWR21 with 0.35 cm absorber plates (Fig.1. SN) consist of neutronit "a-978"
(borated ss; rho=7.745 g/cc; 8.8771E-2 at/(barn*cm) )

| .inp | .out | k-eff |
|---|---|---|
| C21_A1_F1_W5_APB_PM0_FT0_B0.inp | C21_A1_F1_W5_APB_PM0_FT0_B0.out | 1.16843 0.00185 |
| C21_A1_F1_W5_APB_PM2_FT0_B0.inp | C21_A1_F1_W5_APB_PM2_FT0_B0.out | 1.16741 0.00250 |
| C21_A1_F1_W5_APB_PM4_FT0_B0.inp | C21_A1_F1_W5_APB_PM4_FT0_B0.out | 1.17114 0.00250 |
| C21_A1_F1_W5_APB_PM6_FT0_B0.inp | C21_A1_F1_W5_APB_PM6_FT0_B0.out | 1.17572 0.00214 |

Cases Codes at "Sheena-TZ&MCNP cases" sheet, file SN April 2007.xls

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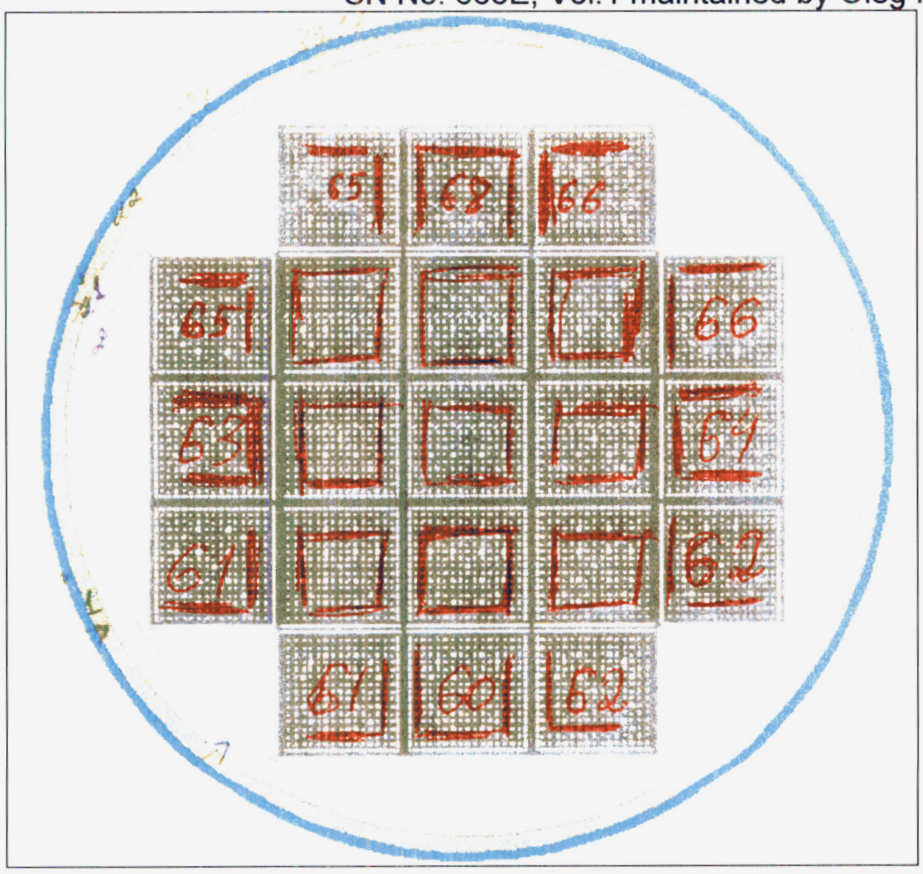


Fig.1. Absorber Plates locations:

#042307

Performed MCNP calculations of 21-PWR Waste Package with 0.35 cm absorber plates (Fig.1.) consist of boral at 0.0279 g/cm2 b-10 (75% x 0.0372)

| .inp | .out | k-eff |
|---|---|---|
| C21_A1_F1_W5_APO_PM0_FT0_B0.inp | C21_A1_F1_W5_APO_PM0_FT0_B0.out | 1.09517<br>0.00244 |

Cases Codes at "Sheena-TZ&MCNP cases" sheet, file SN April 2007.xls

#042407

Developed and debugged SCALE 5.1 (KENO V.a) input and performed calculation for 21-PWR Waste Package with 0.35cm absorber plates (Fig.1.) consist of boral at 0.0279 g/cm2 b-10 (75% x 0.0372). Performed results comparing with MCNP calculations of 21-PWR Waste Package.

| .inp: | k-eff |
|---|---|
| P21_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO3.inp | 1.0947<br>+ or -<br>0.0015 |
| .out: | |
| P21_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO3.out | |

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Cases Codes at "Scale Calculations Cases" sheet, file SN April 2007.xls

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#042507

Developed KENO-Va input for 21-PWR Waste Package with Preliminary Transportation, Aging and Disposal Canister System (TAD) inside the PWR-21 according Preliminary Transportation, Aging and Disposal Canister System Performance Specification Revision B DOC ID: WMO-TADCS-0000001

New Absorber plates widthes and as a result new assemblies pitch has been implemented to the input and, for neutron absorber plates must cover all four longitudinal sides, absorber plates' locations has been changed according Fig.2.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TAD Canister | with a length of | 212 | in= | **538.48** | cm | | External: | Internal: |
| | and a diameter of | 66.5 | in= | **168.91** | cm | Rad: | **84.455** | **79.455** |
| | | | | | | thickness | **5** | |

Absorber Plate Minimum Width:

0.433 inches= **1.09982** cm

TAD_Performance_Specification_Rev_B.pdf

1. Neutron absorber plates or tubes made from borated stainless steel produced by powder metallurgy and meeting ASTM A887-89 Grade "A" alloys.
2. Minimum thickness of neutron absorber plates shall be 0.433 inches. Maximum and nominal thickness can be based on structural requirements.
3. The neutron absorber plate shall have a boron content of 1.1 wt % to 1.2 wt %, a range that falls within the specification for 304B4 UNS S30464 as described in ASTM A887-89.
4. Neutron absorber plates or tubes must extend the full axial length (+0"/-½") of the canister internals at room temperature.
5. Neutron absorber plates or tubes must cover all four longitudinal sides of each fuel assembly.

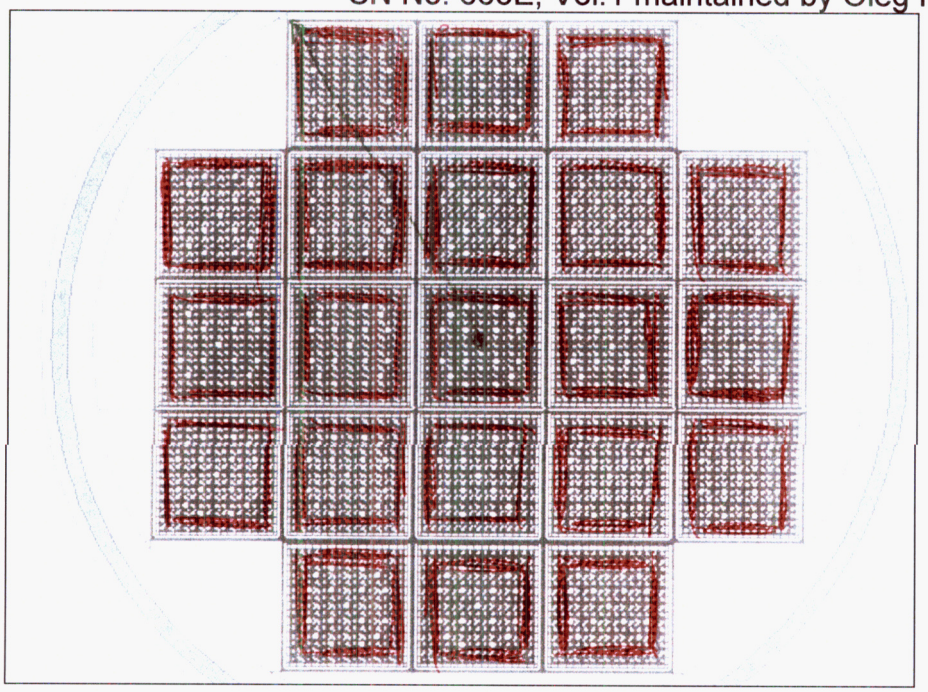

Fig.2. Absorber Plates locations

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#042607

Performed SCALE 5.1 (KENO V.a) PWR21 calculations with **1.1** cm absorber plates (Fig.2.) consist of boral at 0.0279 g/cm2 b-10 (75% x 0.0372) with TAD conteiner inside for the base case and three cases immitate absence of two, four and six absorber plates.

Cases Codes at "Scale Calculations Cases" sheet, file SN April 2007.xls

Base case:

| .inp: | k-eff |
|---|---|
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11.inp | 0.98499 + or - 0.00044 |
| .out: | |
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11.out | |

two plates out(unit 33)

| .inp: | k-eff |
|---|---|
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11_2.inp | 0.98947 + or - 0.00045 |
| .out: | |
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11_2.out | |

four plates out(unit 33)

| .inp: | k-eff |
|---|---|
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11_4.inp | 0.99552 + or - 0.00039 |
| .out: | |
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11_4.out | |

Six plates out (4 - from unit 33; + 1- 32-Right and 1- 34-Left)

| .inp: | k-eff |
|---|---|
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11_6.inp | 1.02379 + or - 0.00043 |
| .out: | |
| TAD_K5a_L4_W5_BMN_BGN_TML_H360_G21_225_B0_P0_APO11_6.out | |

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09/01/2007 (AK)(OP)

**08/16/2007**

Examination of DOE public report "Preclosure Criticality Analysis Process Report", Rev 01, March 2007

A single analysis process for determining the criticality potential or effective neutron multiplication factor (keff) of a configuration during preclosure operations.
The process can be applied to

- design calculations and
- preclosure safety analyses.

Specific deterministically selected design configurations (e.g., fully moderated, most reactive fuel state) are used for design calculations.

For the preclosure safety analysis, the probabilities of event sequences are estimated

For those event sequences that could lead to potentially critical configurations, the probability of reaching such a configuration will be evaluated

If the overall probability of reaching a potentially critical configuration is above the probability threshold, a criticality evaluation of that configuration will be performed

The proposed approach for out-of-package operations will use the most reactive fuel state (i.e., a fresh fuel assumption with no burnup credit for nonbreeder reactor fuel, or the calculated most reactive state for breeder reactor fuel)

The in-package operations will include credit for burnup similar to the postclosure methodology in *Disposal Criticality Analysis Methodology Topical Report* (YMP 2003).

The proposed approach will provide margin-to criticality for the preclosure time period.

Margin-to-criticality is the sum of

- biases and uncertainties,
- administrative margins, and
- reactivity due to use of bounding models and parameters.

For commercial SNF (CSNF), the primary difference between traditional licensing of fuel cycle facilities away from a reactor and the approach proposed here is the
**absence of burnup credit in the traditional approach.**

The proposed preclosure criticality analysis process is also applicable to scenarios involving the surface facility and fuel handling operations

The process describes only how the criticality calculations are performed for a given scenario

Sensitivity studies will be performed to ensure that a bounding representation is used.
The determination of the effective neutron multiplication factor (keff) for CSNF will consider the following:
A. Fuel rod parameters, including:
1. Fuel pellet diameter
2. Cladding material and inner and outer diameters
3. Fuel rod pellet or stack density and initial fissile enrichment of each fuel rod in the assembly (a bounding enrichment is acceptable)
4. Active fuel height.
B. Fuel assembly parameters, including:
**No new entries on this page**

**08/17/2007**

1. Assembly length and planar dimensions
2. Fuel rod pitch
3. Total number of fuel rods in the assembly
4. Locations in the fuel assembly lattice that are empty or contain nonfuel material (e.g., guide tubes, burnable poison rods)
5. Integral neutron absorber (burnable poison) content of various fuel rods and locations in fuel assembly. This is typically proprietary information and may not be available. For out-of-package operations no credit will be taken for the presence of integral absorbers. For in-package operations, no credit will be taken for residual integral absorbers in the fuel.
6. Structural materials (e.g., grids) that are an integral part of the fuel assembly.

Sufficient margin will be incorporated into the calculated keff values to account for the reactivity effects of the following:

- **Nonuniform enrichment variation (this will be handled by using the maximum enrichment over the whole assembly length)**
- **Uncertainty in the calculation of keff (bias and uncertainty determined from benchmark calculations)**
- **Uncertainty in average enrichment (this will be handled by using the maximum enrichment over the whole assembly length).**

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The proposed analysis methods and neutron cross-section data will be benchmarked by comparison with critical experiments.

The benchmarking analysis will establish both a bias (defined as the mean difference between experimental and calculated values) and uncertainty of the mean with a one-sided tolerance factor for 95 percent probability at the 95 percent confidence level (Kopp 1998, pp. 3 and 4).

The maximum keff shall be evaluated from the following expression:

$$keff = k\ (calc) + \Delta k\ (uncert) + \Delta k\ (burnup)$$

where
k (calc) = calculated nominal value of keff
Δk (uncert) = manufacturing and calculational bias and uncertainties
Δk (burnup) = **correction for the effect of the axial distribution** in burnup when credit for burnup is taken (Note: provisions for the uncertainty in the average burnup of a fuel assembly must also be made in the loading criteria)

An acceptable method for determining the maximum reactivity may be either: (1) a worst-case combination with mechanical and material conditions set to maximize keff, or (2) a sensitivity study of the reactivity effects of tolerance variations.

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**08/20/2007**

Continued investigation of missing spent fuel rods and absorber plates neutronic reactivity effects for 44-BWR TAD WP in disposal configuration: MCNP, SCALE modeling, preliminary calculations and comparisons, refining the models

**ASSEMBLY DESIGN:**

It was assumed that the **GE 7x7** assembly design is the most limiting BWR fuel assembly design for reactivity calculations.

Table **08/20/2007-1** SB-575 N06022 Material Composition

| **Element/ Isotope** | **ZAIDa** | **Wt%** | **Element/ Isotope** | **ZAID** | **Wt%** |
|---|---|---|---|---|---|
| C-nat | 6000.50c | 0.0150 | Co-59 | 27059.50c | 2.5000 |
| Mn-55 | 25055.50c | 0.5000 | W-182[b] | 74182.55c | 0.7877 |
| Si-nat | 14000.50c | 0.0800 | W-183[b] | 74183.55c | 0.4278 |
| Cr-50 | 24050.60c | 0.8879 | W-184[b] | 74184.55c | 0.9209 |
| Cr-52 | 24052.60c | 17.7863 | W-186[b] | 74186.55c | 0.8636 |
| Cr-53 | 24053.60c | 2.0554 | V | 23000.50c | 0.3500 |
| Cr-54 | 24054.60c | 0.5202 | Fe-54 | 26054.60c | 0.2260 |
| Ni-58 | 28058.60c | 36.8024 | Fe-56 | 26056.60c | 3.6759 |
| Ni-60 | 28060.60c | 14.6621 | Fe-57 | 26057.60c | 0.0865 |
| Ni-61 | 28061.60c | 0.6481 | Fe-58 | 26058.60c | 0.0116 |
| Ni-62 | 28062.60c | 2.0975 | S-32 | 16032.50c | 0.0200 |
| Ni-64 | 28064.60c | 0.5547 | P-31 | 15031.50c | 0.0200 |
| Mo-nat | 42000.50c | 13.5000 | Density = 8.69 g/cm$^3$ | | |

**b**

W-180 cross section libraries are not available so the atom percents of the remaining isotopes were used to renormalize the elemental weight and derive isotopic weight percents excluding the negligible 0.120 atom percent in nature contribution from W-180.

Table **08/20/2007-2** Material Specifications for SA-240 S31600

| Element/ Isotope | ZAIDa | Wt% | Element/ Isotope | ZAID | Wt% |
|---|---|---|---|---|---|
| C-natb | 6000.50c | 0.0200 | Fe-54 | 26054.60c | 3.7053 |
| N-14b | 7014.50c | 0.0800 | Fe-56 | 26056.60c | 60.2691 |
| Si-nat | 14000.50c | 0.7500 | Fe-57 | 26057.60c | 1.4173 |
| P-31 | 15031.50c | 0.0450 | Fe-58 | 26058.60c | 0.1905 |
| S-32 | 16032.50c | 0.0300 | Ni-58 | 28058.60c | 8.0641 |
| Cr-50 | 24050.60c | 0.7103 | Ni-60 | 28060.60c | 3.2127 |
| Cr-52 | 24052.60c | 14.2291 | Ni-61 | 28061.60c | 0.1420 |
| Cr-53 | 24053.60c | 1.6443 | Ni-62 | 28062.60c | 0.4596 |
| Cr-54 | 24054.60c | 0.4162 | Ni-64 | 28064.60c | 0.1216 |
| Mn-55 | 25055.50c | 2.0000 | Mo-nat | 42000.50c | 2.5000 |
| Densityc = 7.98 g/cm$^3$ | | | | | |

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Table **08/20/2007-3** Material Specifications for Al 6061

| Element/Isotope | ZAIDa | Wt% | Element/Isotope | ZAID | Wt% |
|---|---|---|---|---|---|
| Si-nat | 14000.50c | 0.6000 | Mg-nat | 12000.50c | 1.0000 |
| Fe-54 | 26054.60c | 0.0396 | Cr-50 | 24050.60c | 0.0081 |
| Fe-56 | 26056.60c | 0.6433 | Cr-52 | 24052.60c | 0.1632 |
| Fe-57 | 26057.60c | 0.0151 | Cr-53 | 24053.60c | 0.0189 |
| Fe-58 | 26058.60c | 0.0020 | Cr-54 | 24054.60c | 0.0048 |
| Cu-63 | 29063.60c | 0.1884 | Ti-nat | 22000.50c | 0.1500 |
| Cu-65 | 29065.60c | 0.0866 | Al-27b | 13027.50c | 96.9300 |
| Mn-55 | 25055.50c | 0.1500 | Densityc = 2.7065 g/cm3 | | |

Table **08/20/2007-4** Material Specifications for Grade 70 A516 Carbon Steel Composition

| Element/Isotope | ZAIDa | Wt% | Element/Isotope | ZAID | Wt% |
|---|---|---|---|---|---|
| C-nat | 6000.50c | 0.2700 | Fe-54 | 26054.60c | 5.5558 |
| Mn-55 | 25055.50c | 1.0450 | Fe-56 | 26056.60c | 90.3584 |
| P-31 | 15031.50c | 0.0350 | Fe-57 | 26057.60c | 2.1252 |
| S-32 | 16032.50c | 0.0350 | Fe-58 | 26058.60c | 0.2856 |
| Si-nat | 14000.50c | 0.2900 | Density = 7.850 g/cm3 | | |

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In order to simplify the geometry the spacer grids were omitted from the MCNP representations

The cladding composition was Zircaloy-2 as presented in Table **08/20/2007-5**

Table **08/20/2007-5** Zircaloy-2 Material Composition

| Element/Isotope | ZAIDa | Wt% | Element/Isotope | ZAID | Wt% |
|---|---|---|---|---|---|
| Cr-50 | 24050.60c | 0.0042 | Ni-58 | 28058.60c | 0.0370 |
| Cr-52 | 24052.60c | 0.0837 | Ni-60 | 28060.60c | 0.0147 |
| Cr-53 | 24053.60c | 0.0097 | Ni-61 | 28061.60c | 0.0007 |
| Cr-54 | 24054.60c | 0.0024 | Ni-62 | 28062.60c | 0.0021 |
| Fe-54 | 26054.60c | 0.0076 | Ni-64 | 28064.60c | 0.0006 |
| Fe-56 | 26056.60c | 0.1241 | O-16 | 8016.50c | 0.1250 |
| Fe-57 | 26057.60c | 0.0029 | Zr-nat | 40000.60c | 98.1350 |
| Fe-58 | 26058.60c | 0.0004 | Sn-nat | 50000.35c | 1.4500 |

Density = 6.55 g/cm$^3$

Table **08/20/2007-6** Zircaloy-4 Material Composition

| Element/Isotope | ZAIDa | Wt% | Element/Isotope | ZAID | Wt% |
|---|---|---|---|---|---|
| Cr-50 | 24050.60c | 0.0042 | Fe-57 | 26057.60c | 0.0045 |
| Cr-52 | 24052.60c | 0.0837 | Fe-58 | 26058.60c | 0.0006 |
| Cr-53 | 24053.60c | 0.0097 | O-16 | 8016.50c | 0.1250 |
| Cr-54 | 24054.60c | 0.0024 | Zr-nat | 40000.60c | 98.1150 |
| Fe-54 | 26054.60c | 0.0119 | Sn-nat | 50000.35c | 1.4500 |
| Fe-56 | 26056.60c | 0.1930 | Density = 6.56b g/cm3 | | |

Table **08/20/2007-7.** SS304 Material Composition

| Element | Wt% | Element | Wt% |
|---|---|---|---|
| Carbon | 0.080 | Chromium | 19.000 |
| Nitrogen | 0.100 | Manganese | 2.000 |
| Silicon | 0.750 | Iron | 68.745 |
| Phosphorous | 0.045 | Nickel | 9.250 |
| Sulfur | 0.030 | Density = 7.94 g/cm3 | |

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The primary material components in the upper and lower tie-plate regions are

- SS304 (Table **08/20/2007-7**),
- Zircaloy-2 (Table **08/20/2007-5**),
- Zircaloy-4 as represented in Table **08/20/2007-6**, and
- moderator (represented as water at 1.0 g/cm$^3$ density).

Table **08/20/2007-8.** Tie-Plate Homogenized Material Compositions for BWR Fuel Assembly Design

| Element/ Isotope | ZAIDa | Upper Tie-Plate Wt% | | Lower Tie-Plate Wt% | |
|---|---|---|---|---|---|
| | | Flooded | Dry | Flooded | Dry |
| H-1 | 1001.50c | 4.7396 | - | 3.7212 | - |
| C | 6000.50c | 0.0170 | 0.0294 | 0.0408 | 0.0612 |
| N-14 | 7014.50c | 0.0212 | 0.0368 | 0.0511 | 0.0765 |
| O-16 | 8016.50c | 37.6623 | 0.0790 | 29.5532 | 0.0294 |
| Si | 14000.50c | 0.1591 | 0.2759 | 0.3829 | 0.5737 |
| P-31 | 15031.50c | 0.0095 | 0.0166 | 0.0230 | 0.0344 |
| S | 16000.60c | 0.0064 | 0.0110 | 0.0153 | 0.0229 |
| Cr-50 | 24050.60c | 0.1699 | 0.2947 | 0.4060 | 0.6082 |
| Cr-52 | 24052.60c | 3.4032 | 5.9038 | 8.1318 | 12.1834 |
| Cr-53 | 24053.60c | 0.3933 | 0.6823 | 0.9397 | 1.4079 |
| Cr-54 | 24054.60c | 0.0995 | 0.1727 | 0.2379 | 0.3564 |
| Mn-55 | 25055.50c | 0.4242 | 0.7358 | 1.0210 | 1.5297 |
| Fe-54 | 26054.60c | 0.8272 | 1.4350 | 1.9845 | 2.9732 |
| Fe-56 | 26056.60c | 13.4536 | 23.3393 | 32.2754 | 48.3561 |
| Fe-57 | 26057.60c | 0.3164 | 0.5489 | 0.7591 | 1.1373 |
| Fe-58 | 26058.60c | 0.0425 | 0.0738 | 0.1020 | 0.1528 |
| Ni-58 | 28058.60c | 1.3261 | 2.3006 | 3.1769 | 4.7597 |
| Ni-60 | 28060.60c | 0.5283 | 0.9165 | 1.2657 | 1.8963 |
| Ni-61 | 28061.60c | 0.0234 | 0.0405 | 0.0559 | 0.0838 |
| Ni-62 | 28062.60c | 0.0756 | 0.1311 | 0.1811 | 0.2713 |
| Ni-64 | 28064.60c | 0.0200 | 0.0347 | 0.0479 | 0.0717 |
| Zr | 40000.60c | 35.7552 | 62.028 | 15.3981 | 23.0699 |
| Sn | 50000.35c | 0.5283 | 0.9166 | 0.2275 | 0.3409 |

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**Fuel Material:**

The uranium dioxide fresh fuel compositions for each uranium-235 enrichment used in this evaluation are specified in Table 12, and were calculated using Equation 7 (Bowman et al. 1995, p. 20) for each isotope based on the U-235 wt%.

Table **08/20/2007-9.** Fresh Fuel Compositions

| Enrichment (wt% U-235) | Wt% U-234 | Wt% U-235 | Wt% U-236 | Wt% U-238 | Wt% Oxygen |
|---|---|---|---|---|---|
| 1.5 | 0.0106 | 1.3222 | 0.0061 | 86.8098 | 11.8513 |
| 2.0 | 0.0144 | 1.7630 | 0.0081 | 86.3625 | 11.8519 |
| 2.5 | 0.0184 | 2.2037 | 0.0101 | 85.9152 | 11.8526 |
| 3.0 | 0.0224 | 2.6444 | 0.0122 | 85.4677 | 11.8533 |
| 3.5 | 0.0265 | 3.0851 | 0.0142 | 85.0202 | 11.8540 |
| 4.0 | 0.0306 | 3.5258 | 0.0162 | 84.5727 | 11.8547 |
| 4.5 | 0.0348 | 3.9665 | 0.0182 | 84.1251 | 11.8553 |
| 5.0 | 0.0390 | 4.4072 | 0.0203 | 83.6775 | 11.8560 |

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## GEOMETRIC DESCRIPTIONS

### I. Fuel Assembly

Table **08/21/2007-1**. 7x7 BWR Fuel Assembly Specifications

| Assembly Component | Specification |
|---|---|
| Lattice | 7x7 |
| Fuel Pellet Outer Diameter[a] | 1.23952 cm |
| Fuel Rod Cladding Thickness | 0.08128 cm |
| Fuel Rod Cladding Inner Diameter | 1.26746 cm |
| Fuel Rod Cladding Outer Diameter | 1.43002 cm |
| Active Fuel Length | 365.76 cm |
| Clad Material | Zircaloy-2 |
| Channel Material | Zircaloy-2 |
| Pin Pitch | 1.87452 cm |
| Channel Inner Width | 13.246 cm |
| Channel Thickness | 0.3048 cm |

[a] The representations use a smeared pellet density over the inner clad diameter

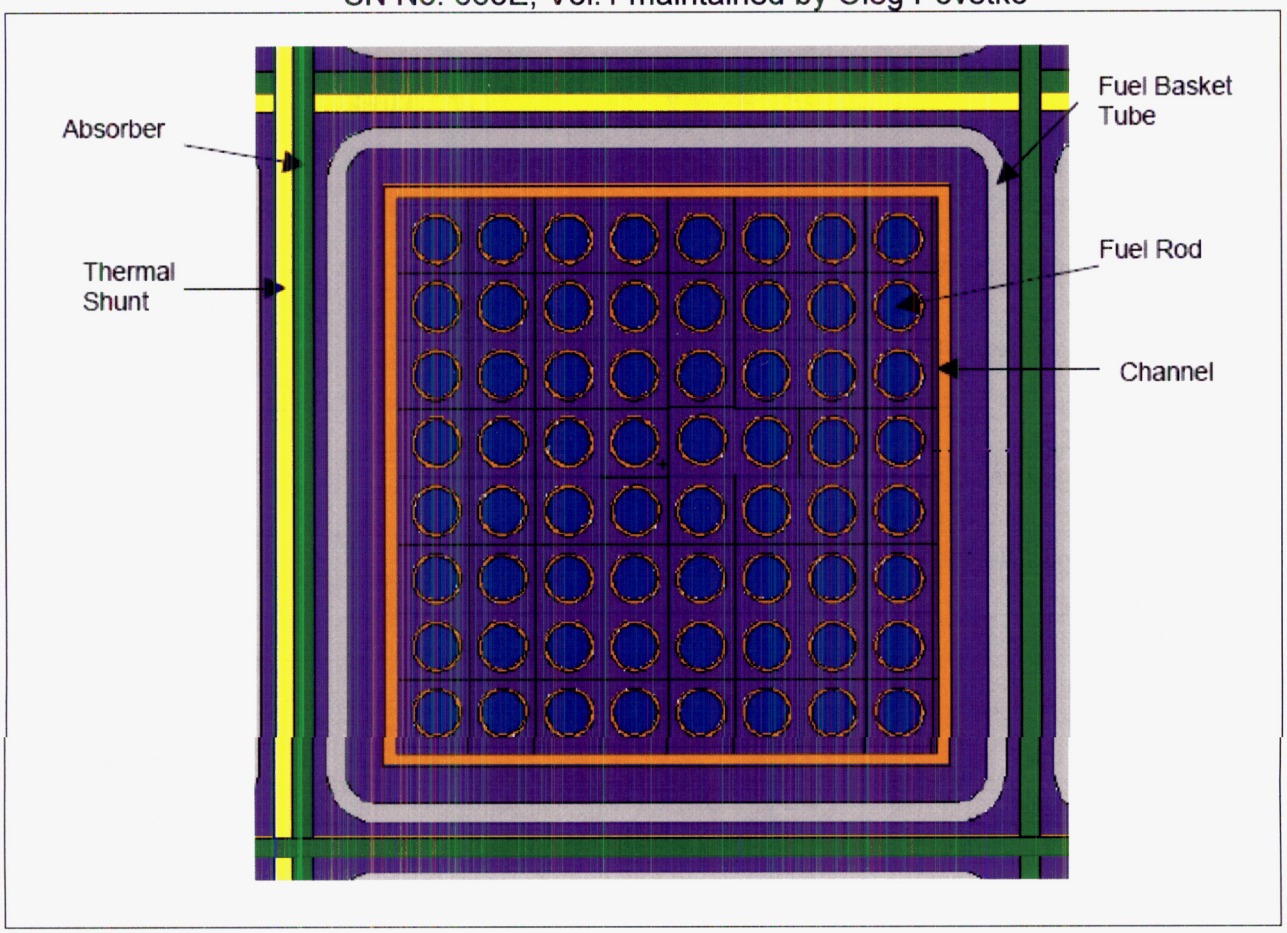


**Figure 08/21/2007-1** 7x7 BWR Channel Geometry

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44-134R

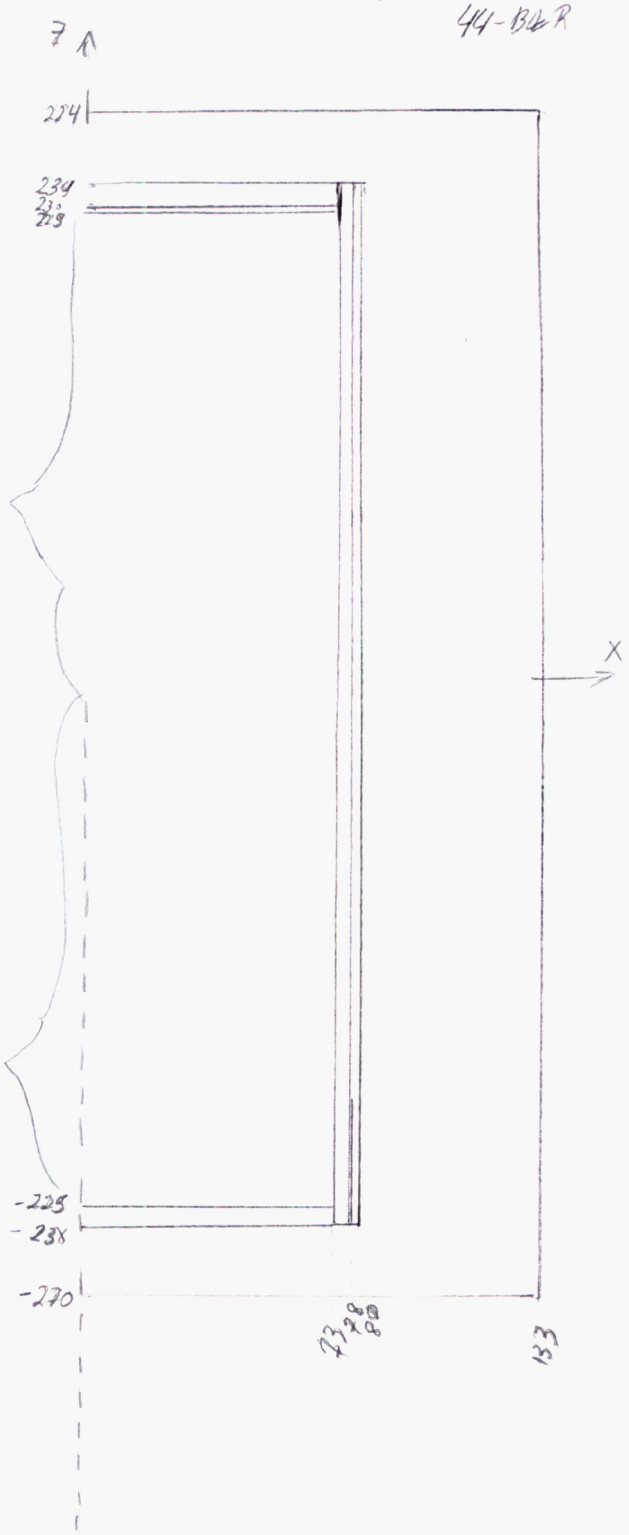

**Figure 08/21/2007-2** 44-BWR Axial Geometry

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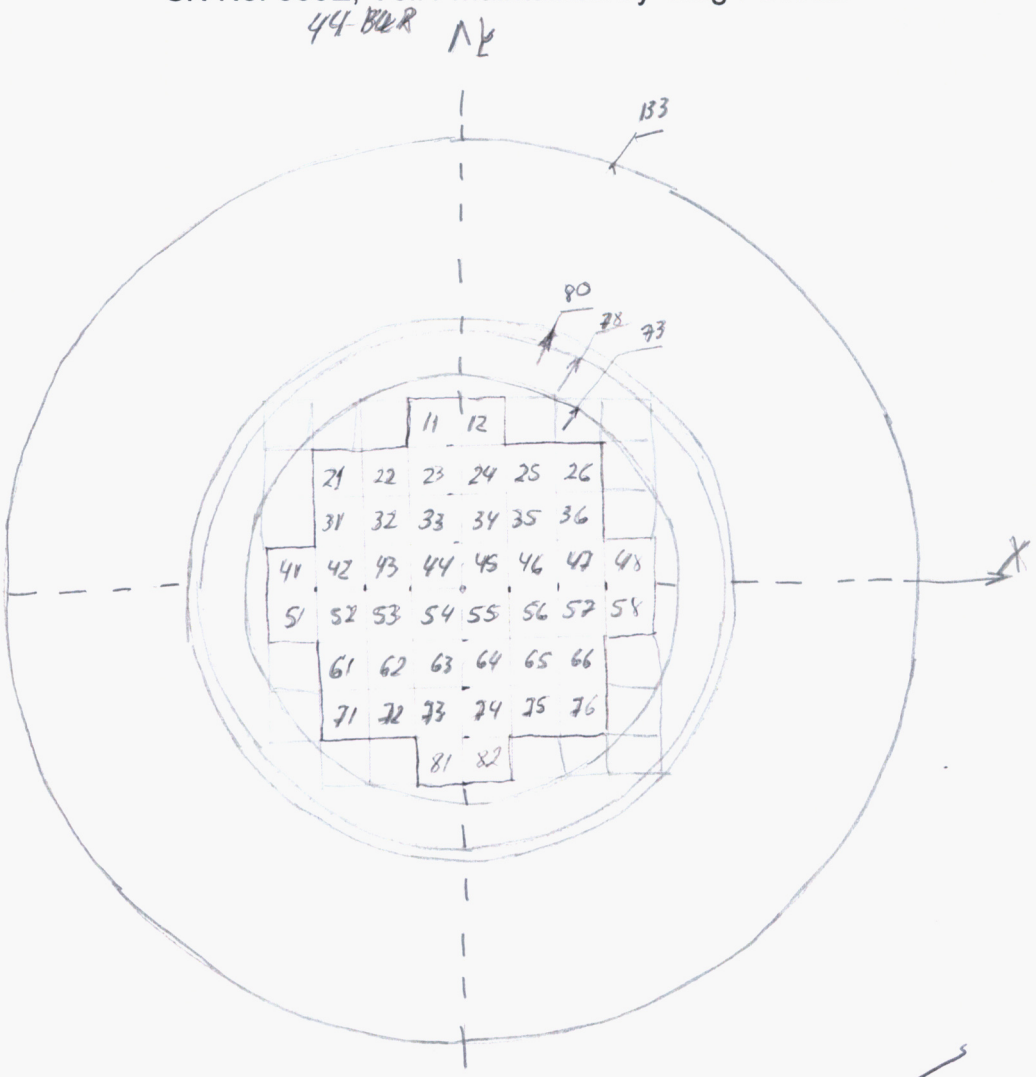
44 BLR
133
80
78
73
11 12
21 22 23 24 25 26
31 32 33 34 35 36
41 42 43 44 45 46 47 48
51 52 53 54 55 56 57 58
61 62 63 64 65 66
71 72 73 74 75 76
81 82

**Figure 08/21/2007-1** 44-BWR Radial Geometry

**No new entries on this page**

Table **08/21/2007-2**. Test Case Codes

| Test Case Code | | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| | | Waste Package | Axial Zones | Radial Zones | Total Fuel Mat. In an Assembly | W-Wt% U235 | Burnup [gwd/mtu] | Absorber Plates Parameters |
| | | 44-BWR | A | R | F | W | B | AP |
| Base: | Value | | | | | 5 | Fresh | Neutronit A978 analogous to 304B6 |
| | | | | | | | 0 | 0.5 cm |
| **BWR44_A6_R4_F1_W5_B0_APA05** | Code: | **BWR44** | **6** | **4** | **1** | **5** | **0** | **A05** |

Table **08/21/2007-2**. Calculations Results

| Test Case | Comment | K-eff | Computer Time |
|---|---|---|---|
| **C1-M**<br>**C1-Mo** | mcnp version 4b2;<br>44 BWR WP MODEL, Cooper GE 3b (7x7) Fuel Case No 1 Measured | 0.74269 ± 0.00057 | 155.80 minutes |
| BWR44_A6_R4_F1_W5_B0_APA05.inp<br>BWR44_A6_R4_F1_W5_B0_APA05.out | **50000.35c** has been chamged into the **50000.42c** | 0.74327 ± 0.00056 | 31.79 minutes |

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SN No. 663E, Vol.1 maintained by Oleg Povetko

11/01/2007 (AK)(OP)

# Neutronic reactivity effect of missing absorber plates for 44-BWR TAD WP

Technical Progress Report

Draft. October 2007.

## I. 44-BWR TAD WP Common Parameters

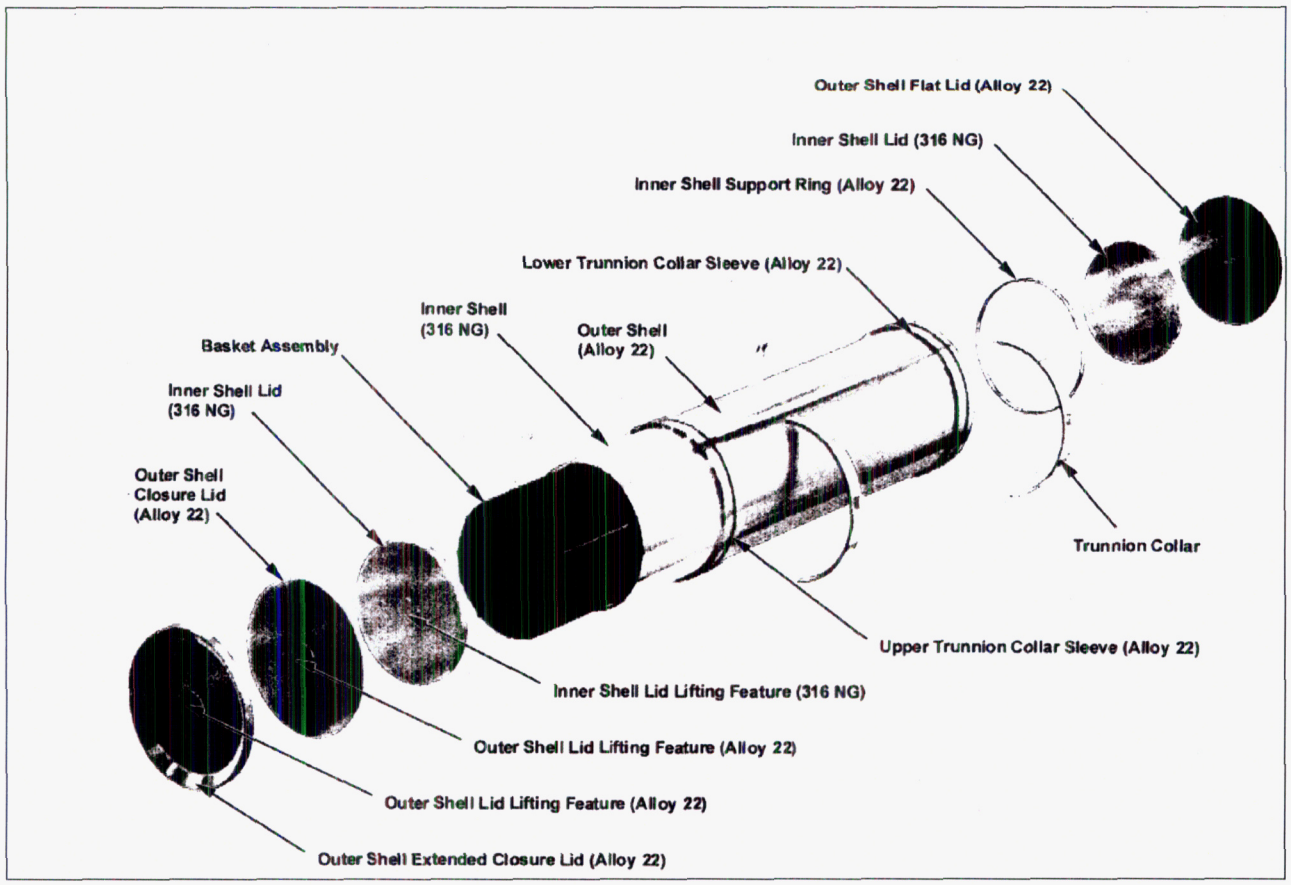


Figure I.1 44-BWR Disposal Container Configuration (from "***Uncanistered Spent Nuclear Fuel Disposal Container System Description Document***", SDD-UDC-SE-000001 REV 01, page 25)

- The 44-BWR is designed to hold forty-four commercial BWR assemblies, containing an average of 0.178 MTU/Assembly
- The 44-BWR design is the second most common waste package for the commercial assemblies making up approximately 3,732 of the waste packages needed
- The 44 **fuel tube openings** are 155.3 mm **x** 155.3 mm each
- The cavity is 4,585 mm long and has an inner diameter of 1,454 mm
- The basket length is 4,575 mm
- Waste package design shall reduce the dose rate at all external surfaces of a waste package to 1,450 rem/hr or less
- This criterion identifies a disposal container interface with the Waste Emplacement Retrieval System, Disposal Container Handling System, and Performance Confirmation Emplacement Drift Monitoring System

Table I.1 44-BWR Disposal Container/Waste Package Dimension

| | |
|---|---|
| Outer Diameter | 1.594 m |
| Outer Length | 5.165 m |
| Empty Mass | 28,068 kg |
| Loaded Mass | 42,517 kg |

## II. 44-BWR TAD WP Absorber Plates

- The absorber plates, in addition to the thermal shunts (if applicable), pattern the arrangement of fuel assemblies inside the waste package
- The material composition and thickness of the absorber plates are tailored to provide fuel-basket structural strength to
    1. maintain fuel geometry
    2. to prevent criticality
- The fuel basket plates were represented as Ni-Gd Alloy (Unified Numbering System (UNS) designation is UNS N06464) with 1.5 wt% Gd as described in Table II.2.

Table II.1 44-BWR Disposal Container/Waist Package Components

| Component Name | Material | Thickness | Quantity |
|---|---|---|---|
| Basket B-Sideguide | SA-516 K02700 | 10 mm | 32 |
| Basket B-Stiffener | SA-516 K02700 | 10 mm | 64 |
| Basket Cornerguide | SA-516 K02700 | 10 mm | 32 |
| Basket Stiffener | SA-516 K02700 | 10 mm | 64 |
| Fuel Basket A-Plate (Absorber Plate) | Neutronit A 978 | 5 mm | 4 |
| Fuel Basket B-Plate (Absorber Plate) | Neutronit A 978 | 5 mm | 4 |
| Fuel Basket C-Plate (Absorber Plate) | Neutronit A 978 | 5 mm | 16 |
| Fuel Basket D-Plate (Absorber Plate) | Neutronit A 978 | 5 mm | 16 |
| Fuel Basket E-Plate (Absorber Plate) | Neutronit A 978 | 5 mm | 16 |
| Fuel Basket F-Plate (Thermal Shunt) | SB-209 A96061 T4 | 5 mm | 8 |
| Fuel Basket G-Plate (Thermal Shunt) | SB-209 A96061 T4 | 5 mm | 8 |
| Fuel Basket Tube | SA-516 K02700 | 5 mm | 44 |

( From "*Uncanistered Spent Nuclear Fuel Disposal Container System Description Document*", SDD-UDC-SE-000001 REV 01, page 28, Reference "Design Analysis for UCF Waste Package," Attachement II )

Table II.2. Material Specifications for Ni-Gd Alloy (UNS N06464) with 1.5 wt% Gd

| Nuclide | A | SCALE ID | MCNP ID | Density (%) | Density at/cm$^3$ |
|---|---|---|---|---|---|
| C-nat | 12.0111 | c | 6000.50c | 0.01 | $4.39210 \times 10^{19}$ |
| 25-MN | | | | | |
| | 54.9381 | MN-55 | 25055.50c | 0.5 | $4.80122 \times 10^{20}$ |
| Si-nat | 28.0853 | si | 14000.50c | 0.08 | $1.50268 \times 10^{20}$ |
| 24-CR | | | | | |
| | 49.9461 | CR-50 | 24050.60c | 0.6602 | $6.97315 \times 10^{20}$ |
| | 51.9402 | CR-52 | 24052.60c | 13.2247 | $1.34319 \times 10^{22}$ |
| | 52.9408 | CR-53 | 24053.60c | 1.5283 | $1.52291 \times 10^{21}$ |
| | 53.9394 | CR-54 | 24054.60c | 0.3868 | $3.78299 \times 10^{20}$ |
| 28-NI | | | | | |
| | 57.9357 | NI-58 | 28058.60c | 43.3679 | $3.94891 \times 10^{22}$ |
| | 59.9308 | NI-60 | 28060.60c | 17.2778 | $1.52087 \times 10^{22}$ |
| | 60.9314 | NI-61 | 28061.60c | 0.7637 | $6.61206 \times 10^{20}$ |
| | 61.928 | NI-62 | 28062.60c | 2.4717 | $2.10554 \times 10^{21}$ |
| | 63.9282 | NI-64 | 28064.60c | 0.6537 | $5.39437 \times 10^{20}$ |
| 42-MO | | | | | |
| | 95.9402 | mo | 42000.50c | 14.55 | $8.00051 \times 10^{21}$ |
| 27-CO | 58.9332 | | | | |
| | | CO-59 | 27059.50c | 2 | $1.79030 \times 10^{21}$ |
| Gd-152 | 151.9201 | GD-152 | 64152.50c | 0.0029 | $1.00702 \times 10^{18}$ |
| Gd-154 | 153.9213 | GD-154 | 64154.50c | 0.032 | $1.09675 \times 10^{19}$ |
| Gd-155 | 154.9229 | GD-155 | 64155.50c | 0.2187 | $7.44712 \times 10^{19}$ |
| Gd-156 | 155.9225 | GD-156 | 64156.50c | 0.3045 | $1.03023 \times 10^{20}$ |
| Gd-157 | 156.9241 | GD-157 | 64157.50c | 0.2343 | $7.87658 \times 10^{19}$ |
| Gd-158 | 157.9237 | GD-158 | 64158.50c | 0.3742 | $1.25000 \times 10^{20}$ |
| Gd-160 | 159.9269 | GD-160 | 64160.50c | 0.3335 | $1.10009 \times 10^{20}$ |
| 26-FE | | | | | |
| | 53.9394 | FE-54 | 26054.60c | 0.0565 | $5.52583 \times 10^{19}$ |
| | 55.9345 | FE-56 | 26056.60c | 0.919 | $8.66744 \times 10^{20}$ |
| | 56.9351 | FE-57 | 26057.60c | 0.0216 | $2.00138 \times 10^{19}$ |
| | 57.9337 | FE-58 | 26058.60c | 0.0029 | $2.64072 \times 10^{18}$ |
| S-32 | 31.9717 | S-32 | 16032.50c | 0.005 | $8.25010 \times 10^{18}$ |
| P-31 | 30.9741 | P-31 | 15031.50c | 0.005 | $8.51582 \times 10^{18}$ |
| O | 15.9994 | o | 8016.50c | 0.005 | $1.64862 \times 10^{18}$ |
| | | | **Total** | **99.9899** | **$8.59368 \times 10^{22}$** |

# III. ASSEMBLY DESIGN

**Assumptions:**

- It was assumed that the **GE 7x7** assembly design is the most limiting BWR fuel assembly design for reactivity calculations.
- In order to simplify the geometry the spacer grids were omitted from the MCNP representations.

The cladding composition was Zircaloy-2 as presented in Table III.1.

Table III.1 Zircaloy-2 Cladding Composition

| Nuclide | A | SCALE ID | MCNP ID | Density (%) | Density at/cm$^3$ |
|---|---|---|---|---|---|
| 24-CR | | | | | |
| | 49.9461 | CR-50 | 24050.60c | 0.0042 | $3.31696 \times 10^{18}$ |
| | 51.9402 | CR-52 | 24052.60c | 0.0837 | $6.35644 \times 10^{19}$ |
| | 52.9408 | CR-53 | 24053.60c | 0.0097 | $7.22726 \times 10^{18}$ |
| | 53.9394 | CR-54 | 24054.60c | 0.0024 | $1.75508 \times 10^{18}$ |
| 26-FE | | | | | |
| | 53.9394 | FE-54 | 26054.60c | 0.0076 | $5.55776 \times 10^{18}$ |
| | 55.9345 | FE-56 | 26056.60c | 0.1241 | $8.75154 \times 10^{19}$ |
| | 56.9351 | FE-57 | 26057.60c | 0.0029 | $2.00914 \times 10^{18}$ |
| | 57.9337 | FE-58 | 26058.60c | 0.0004 | $2.72346 \times 10^{17}$ |
| 28-NI | | | | | |
| | 57.9357 | NI-58 | 28058.60c | 0.037 | $2.51911 \times 10^{19}$ |
| | 59.9308 | NI-60 | 28060.60c | 0.0147 | $9.67519 \times 10^{18}$ |
| | 60.9314 | NI-61 | 28061.60c | 0.0007 | $4.53158 \times 10^{17}$ |
| | 61.928 | NI-62 | 28062.60c | 0.0021 | $1.33759 \times 10^{18}$ |
| | 63.9282 | NI-64 | 28064.60c | 0.0006 | $3.70212 \times 10^{17}$ |
| 50-SN | 118.69 | | | | |
| | | sn | 50000.42c | 1.45 | $4.81888 \times 10^{20}$ |
| 40-ZR | 91.2196 | | | | |
| | | zr | 40000.60c | 98.135 | $4.24354 \times 10^{22}$ |
| | | | **Total** | **100.0001** | **4.34337** $\times 10^{22}$ |

**Fuel Material**

The uranium dioxide fresh fuel compositions for each uranium-235 enrichment used in this evaluation are specified in Table III.2, III.3, and were calculated using Equation 7 (Bowman et al. 1995, p. 20) for each isotope based on the U-235 wt%.

Table III.2 Fresh Fuel Compositions

| Enrichment (wt% U-235) | Wt% U-234 | Wt% U-235 | Wt% U-236 | Wt% U-238 | Wt% Oxygen |
|---|---|---|---|---|---|
| 1.5 | 0.0106 | 1.3222 | 0.0061 | 86.8098 | 11.8513 |
| 2.0 | 0.0144 | 1.7630 | 0.0081 | 86.3625 | 11.8519 |
| 2.5 | 0.0184 | 2.2037 | 0.0101 | 85.9152 | 11.8526 |
| 3.0 | 0.0224 | 2.6444 | 0.0122 | 85.4677 | 11.8533 |
| 3.5 | 0.0265 | 3.0851 | 0.0142 | 85.0202 | 11.8540 |
| 4.0 | 0.0306 | 3.5258 | 0.0162 | 84.5727 | 11.8547 |
| 4.5 | 0.0348 | 3.9665 | 0.0182 | 84.1251 | 11.8553 |
| 5.0 | 0.0390 | 4.4072 | 0.0203 | 83.6775 | 11.8560 |

Fuel Density = 10.741 g/cm$^3$ which is 98% theoretical density value of 10.96 g/cm$^3$ for UO2 (Todreas and Kazimi 1990, p. 296)

Table III.3 5% Enrichment Fresh Fuel Composition Atomic Densities for SCALE Input

| Nuclide | A | SCALE ID | MCNP ID | | Density (%) | Density at/cm$^3$ |
|---|---|---|---|---|---|---|
| | 235.0441 | U-235 | 92235.50c | | 4.4072 | 1.21286x10$^{21}$ |
| | 236.0458 | U-236 | 92236.50c | | 0.0203 | 5.56283 x10$^{18}$ |
| | 238.051 | U-238 | 92238.50c | | 83.6775 | 2.27371 x10$^{22}$ |
| 8-O | 15.9994 | | | | | |
| | | o | 8016.50c | | 11.856 | 4.79325 x10$^{22}$ |
| | | | | **Total** | **100** | **7.18988** x10$^{22}$ |

# IV. GEOMETRIC DESCRIPTIONS

## Fuel Assembly

Common parameters of an assembly (Table IV.1) and its geometry (Figure IV.1) has been compiled from "*44-BWR Waste Package Loading Curve Evaluation*", CAL-DSU-NU-000008 REV 00A, and "*Uncanistered Spent Nuclear Fuel Disposal Container System Description Document*", SDD-UDC-SE-00000 1 REV 0 1

Table IV.1 7x7 BWR Fuel Assembly Specifications

| Assembly Component | Specification |
|---|---|
| Lattice | 7x7 |
| Fuel Pellet Outer Diameter[a] | 1.23952 cm |
| Fuel Rod Cladding Thickness | 0.08128 cm |
| Fuel Rod Cladding Inner Diameter | 1.26746 cm |
| Fuel Rod Cladding Outer Diameter | 1.43002 cm |
| Active Fuel Length | 365.76 cm |
| Clad Material | Zircaloy-2 |
| Channel Material | Zircaloy-2 |
| Pin Pitch | 1.87452 cm |
| Channel Inner Width | 13.246 cm |
| Channel Thickness | 0.3048 cm |

[a] The representations use a smeared pellet density over the inner clad diameter

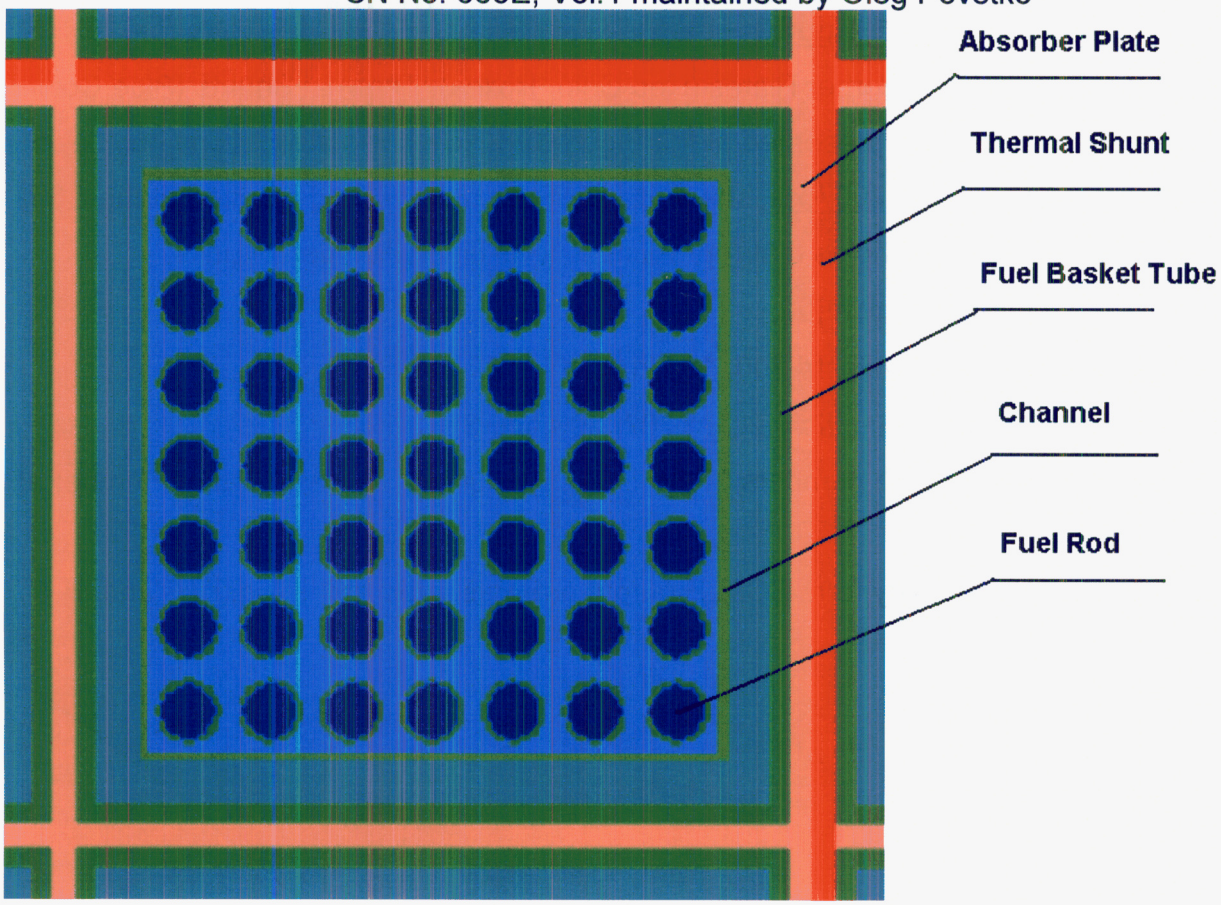


Figure IV.1 7x7 BWR Channel Geometry Plotted By SCALE Software

**44-BWR TAD WP SCALE Input Geometry**

Radial location of the Absorber Plates (Red Color Boxes), Thermal Shunts (Blue Color Boxes) and Fuel Assemblies are presented at the Figure IV.2. Their radial locations has been calculated in SN_August 2007.xls, sheet "44-BWR Geometry" and inputted at the SCALE software as a location of holes that represent several different types of units:

- Fuel Assembly - unit #500;
- Absorber Plate - units ## 100, 101, 105, 111, 121 and 141;
- Thermal Shunts – units ## 201m 202, 203 and 213;

Table IV.2 - IV.4 bind hole numbers at the SCALE input and its identification number at the Fig. IV.2.

Axial and Radial geometry form SCALE output are presented at the Fig. IV.3 and IV.4

Table IV.2 SCALE Input Hole Numbers and correspondence Fuel Assembly Identification Numbers from Fig. IV.2

| Hole # | Unit # | Assembly Code |
|---|---|---|
| 1 | 500 | 11 |
| 2 | 500 | 12 |
| 3 | 500 | 21 |
| 4 | 500 | 22 |
| 5 | 500 | 23 |
| 6 | 500 | 24 |
| 7 | 500 | 25 |
| 8 | 500 | 26 |
| 9 | 500 | 31 |
| 10 | 500 | 32 |
| 11 | 500 | 33 |
| 12 | 500 | 34 |
| 13 | 500 | 35 |
| 14 | 500 | 36 |
| 15 | 500 | 41 |
| 16 | 500 | 42 |
| 17 | 500 | 43 |
| 18 | 500 | 44 |
| 19 | 500 | 45 |
| 20 | 500 | 46 |
| 21 | 500 | 47 |
| 22 | 500 | 48 |
| 23 | 500 | 51 |
| 24 | 500 | 52 |
| 25 | 500 | 53 |
| 26 | 500 | 54 |
| 27 | 500 | 55 |
| 28 | 500 | 56 |
| 29 | 500 | 57 |
| 30 | 500 | 58 |
| 31 | 500 | 61 |
| 32 | 500 | 62 |
| 33 | 500 | 63 |
| 34 | 500 | 64 |
| 35 | 500 | 65 |
| 36 | 500 | 66 |
| 37 | 500 | 71 |
| 38 | 500 | 72 |
| 39 | 500 | 73 |
| 40 | 500 | 74 |
| 41 | 500 | 75 |
| 42 | 500 | 76 |
| 43 | 500 | 81 |
| 44 | 500 | 82 |

Table IV.3 SCALE Input Hole Numbers and correspondence Absorber Plate Identification Numbers from Fig. IV.2

| Hole # | Unit # | Absorber Plate Code |
|---|---|---|
| 45 | 100 | 100 |
| 46 | 101 | 101 |
| 47 | 101 | 102 |
| 48 | 101 | 103 |
| 49 | 101 | 104 |
| 50 | 105 | 105 |
| 51 | 105 | 106 |
| 52 | 101 | 107 |
| 53 | 101 | 108 |
| 54 | 101 | 109 |
| 55 | 101 | 110 |
| 56 | 111 | 111 |
| 57 | 111 | 112 |
| 58 | 121 | 121 |
| 59 | 121 | 122 |
| 60 | 111 | 123 |
| 61 | 111 | 124 |
| 62 | 121 | 125 |
| 63 | 121 | 126 |
| 64 | 121 | 131 |
| 65 | 121 | 132 |
| 66 | 111 | 133 |
| 67 | 111 | 134 |
| 68 | 121 | 135 |
| 69 | 121 | 136 |
| 70 | 141 | 141 |
| 71 | 141 | 148 |
| 72 | 141 | 151 |
| 73 | 141 | 158 |
| 74 | 121 | 161 |
| 75 | 121 | 162 |
| 76 | 111 | 163 |
| 77 | 111 | 164 |
| 78 | 121 | 165 |
| 79 | 121 | 166 |
| 80 | 121 | 171 |
| 81 | 121 | 172 |
| 82 | 111 | 173 |
| 83 | 111 | 174 |
| 84 | 121 | 175 |
| 85 | 121 | 176 |
| 86 | 111 | 181 |
| 87 | 111 | 182 |

Table IV.3 SCALE Input Hole Numbers and correspondence Thermal Shunt Identification Numbers from Fig. IV.2

| Hole # | Unit # | Thermal Shunt Code From |
|---|---|---|
| 88 | 201 | 201 |
| 89 | 202 | 202 |
| 90 | 203 | 203 |
| 91 | 203 | 204 |
| 92 | 202 | 205 |
| 93 | 201 | 206 |
| 94 | 201 | 207 |
| 95 | 202 | 208 |
| 96 | 203 | 209 |
| 97 | 203 | 210 |
| 98 | 202 | 211 |
| 99 | 201 | 212 |
| 100 | 213 | 213 |
| 101 | 213 | 214 |
| 102 | 213 | 215 |
| 103 | 213 | 216 |

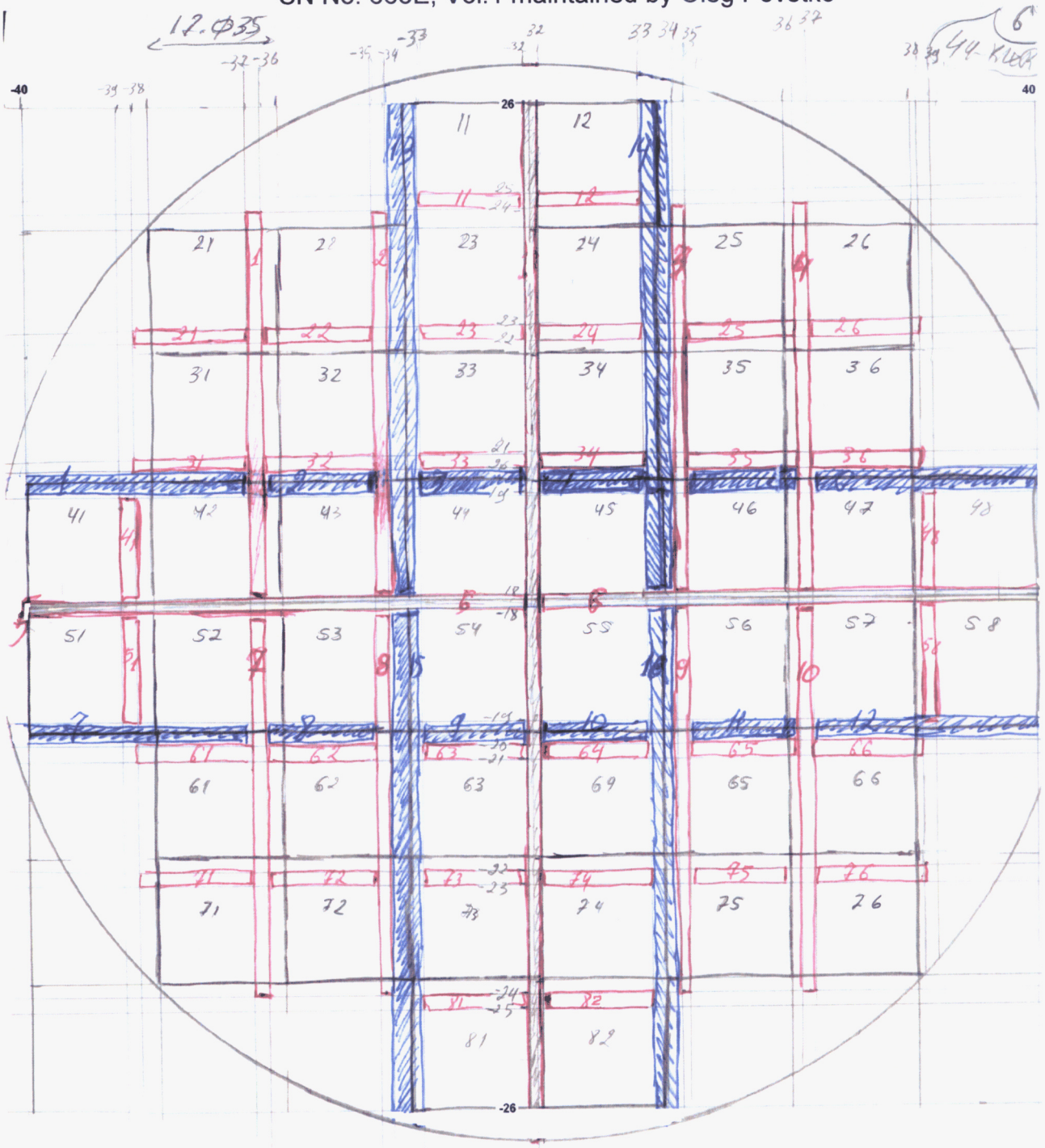


Fig. IV.2 44-BWR Absorber Plates, Thermal Shunts and Fuel Assemblies Radial Locations

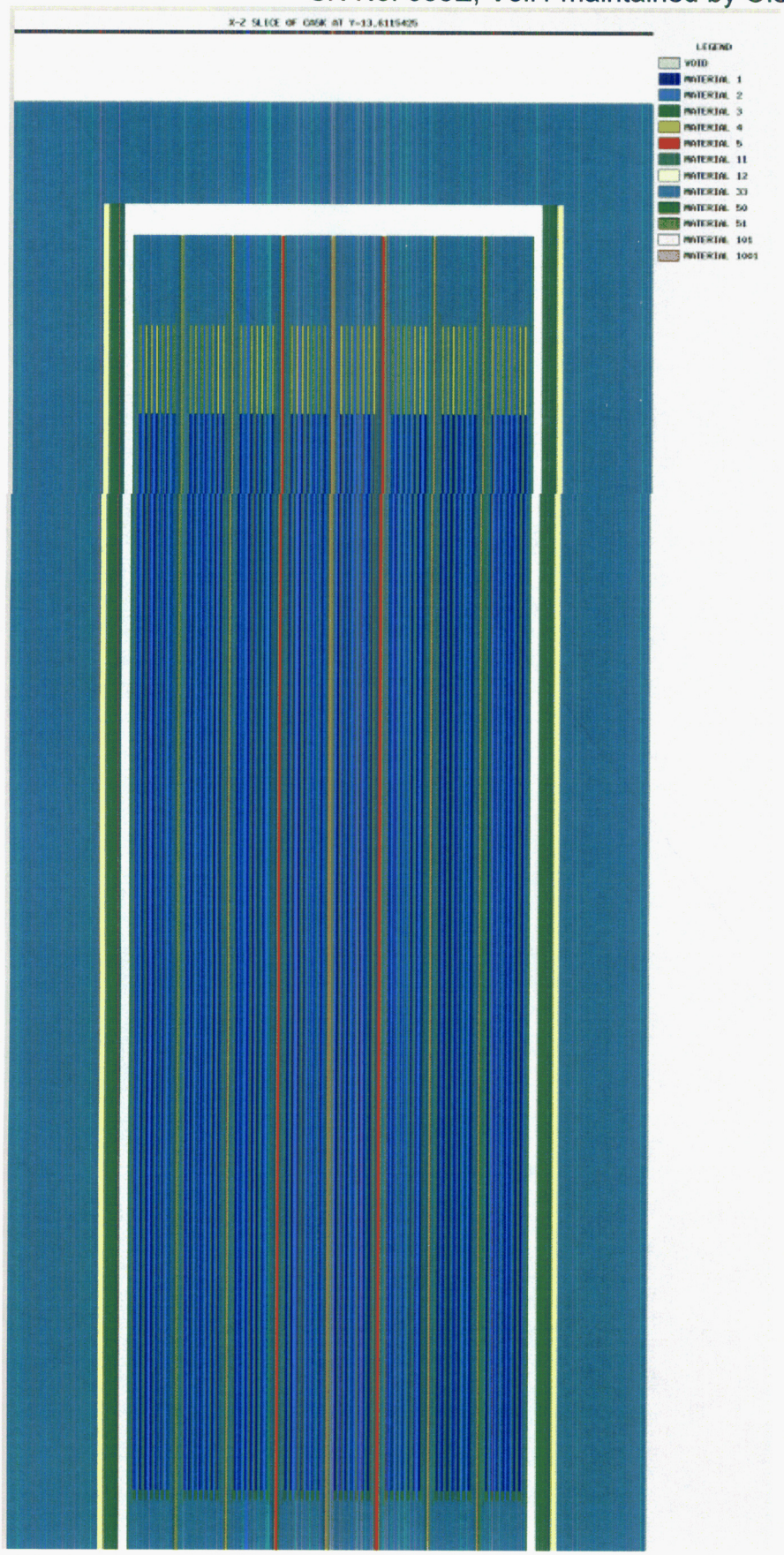
X-Z SLICE OF CASK AT Y=13.6115425
LEGEND
VOID
MATERIAL 1
MATERIAL 2
MATERIAL 3
MATERIAL 4
MATERIAL 5
MATERIAL 11
MATERIAL 12
MATERIAL 33
MATERIAL 50
MATERIAL 51
MATERIAL 101
MATERIAL 1001

Figure IV.3 44-BWR Axial Geometry Plotted By SCALE Software

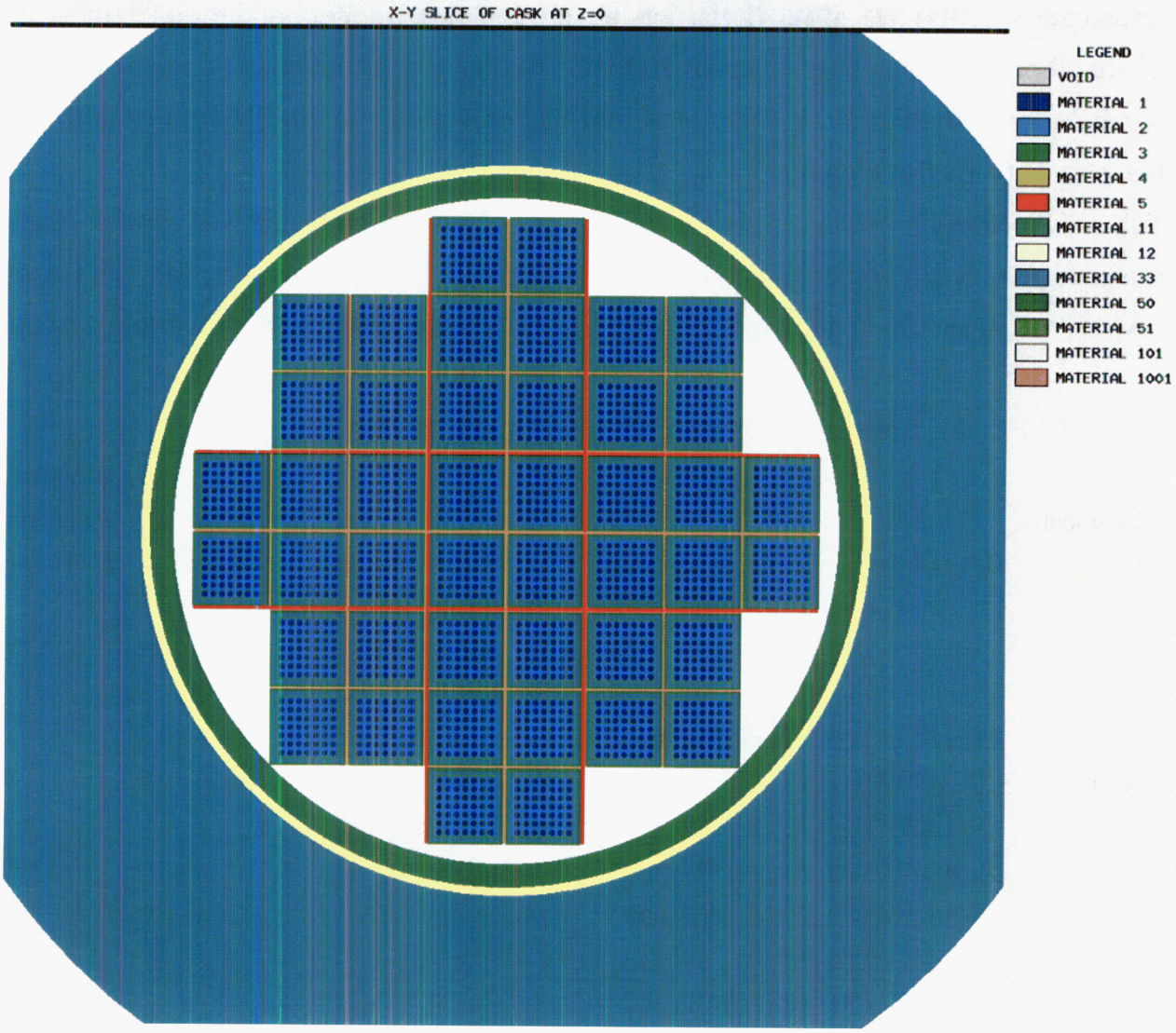


Figure IV.4 44-BWR Radial Geometry Plotted By SCALE Software

## V. CALCULATION CASES AND RESULTS

Scale cases has been designed to take into account one missing absorber plates for one of the four absorber plate types (see Table IV.3 and Fig. IV.2)

Base case - **BWR44_W5_APM0** – has all its absorber plates inputted, and for each other cases one of absorber plates has been missed: 100, 102, 105 or 134. Locations of each absorber plate can be seen at the Fig. IV.2, and their X and Y coordinates – at the SN_August 2007.xls EXCEL file, sheet "44-BWR Geometry".

Table V.2 presents results of $k_{eff}$ calculations for each of the cases as well as their reactivity (column "**Reactivity**") and changing in reactivity (column "**Delta**") comparing with the Base Case – "**BWR44_W5_APM0**", in units of reactivity * $10^4$, which is the weight of absorber plate of each type.

Table V.1 SCALE Calculation Cases Codes and input / output files

| Comments | Case Codes | | Waste Package | W-Wt% U235 | Absorber Plate Missed |
|---|---|---|---|---|---|
| | | Value: | 44-BWR | **W** | **APM** |
| Base Case | **SCALE\BWR44_W5_APM0.inp** | | | | |
| | **SCALE\BWR44_W5_APM0.out** | Code: | **BWR44** | **5** | **0** |
| | **SCALE\BWR44_W5_APM100.inp** | | | | |
| | **SCALE\BWR44_W5_APM100.out** | | | | **100** |
| | **SCALE\BWR44_W5_APM102.inp** | | | | |
| | **SCALE\BWR44_W5_APM102.out** | | | | **102** |
| | **SCALE\BWR44_W5_APM105.inp** | | | | |
| | **SCALE\BWR44_W5_APM105.out** | | | | **105** |
| | **SCALE\BWR44_W5_APM134.inp** | | | | |
| | **SCALE\BWR44_W5_APM134.out** | | | | **134** |

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Table V.2 Reactivity Effects of Missing Absorber Plates of Different Types

| Test Case Code | $k_{eff}$ | +/- | Reactivity* | Delta** |
|---|---|---|---|---|
| | | | $10^4$ | $10^4$ |
| **BWR44_W5_APM0** | 0.95208 | 0.0004 | 503.32 | 0 |
| **BWR44_W5_APM100** | 0.97406 | 0.00041 | 266.31 | 237 |
| **BWR44_W5_APM102** | 0.96245 | 0.00041 | 390.15 | 113 |
| **BWR44_W5_APM105** | 0.96603 | 0.00037 | 351.65 | 152 |
| **BWR44_W5_APM134** | 0.95677 | 0.00038 | 451.83 | 51 |

* **Reactivity = $(1 - k_{eff}) / k_{eff}$**

** **Delta = Reactivity(case) – Reactivity("BWR44_W5_APM0")**

**No new entries on this page**

**01/02/2008 (AK)(OP)**
#12012007

TDMAT Input for 4.5% Fuel Enrichment Sheet "TDMAT Input 4.5%" of the SN December 2007 Postclosure.xlsx EXCEL file.

P= **10** MW/MTU

| | # | MCNP ID | / SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| **Group of Fuel Rods #1** (Table 5.1.1.2) | 1 | 92233.50C | u233 | 6.12E-03 | 2.29E-02 | 5.36E-02 | 9.70E-02 |
| | 2 | 92234.50C | u234 | 5.78E+01 | 5.63E+01 | 5.49E+01 | 5.37E+01 |
| | 3 | 92235.50C | u235 | 6.56E+03 | 6.15E+03 | 5.80E+03 | 5.38E+03 |
| | 4 | 92236.50C | u236 | 1.09E+02 | 1.99E+02 | 2.83E+02 | 3.77E+02 |
| | 5 | 92238.50C | u238 | 1.47E+05 | 1.46E+05 | 1.46E+05 | 1.46E+05 |
| | 6 | 94238.50C | pu238 | 6.90E-27 | 2.32E-25 | 1.44E-24 | 5.01E-24 |
| | 7 | 94239.50C | pu239 | 1.07E+02 | 2.06E+02 | 2.94E+02 | 3.58E+02 |
| | 8 | 94240.50C | pu240 | 1.69E+00 | 6.61E+00 | 1.33E+01 | 2.18E+01 |
| | 9 | 94241.50C | pu241 | 7.85E-13 | 1.46E-10 | 2.80E-09 | 2.13E-08 |
| | 10 | 94242.50C | pu242 | 5.50E-03 | 9.91E-02 | 4.53E-01 | 1.35E+00 |
| | 11 | 93237.55C | np237 | 1.98E+00 | 7.51E+00 | 1.78E+01 | 3.23E+01 |
| | 12 | 60143.50C | nd143 | 1.22E+01 | 2.61E+01 | 3.83E+01 | 5.24E+01 |
| | 13 | 60145.50C | nd145 | 8.33E+00 | 1.80E+01 | 2.66E+01 | 3.69E+01 |
| | 14 | 62147.50C | sm147 | 4.76E+00 | 9.97E+00 | 1.44E+01 | 1.94E+01 |
| | 15 | 62149.50C | sm149 | 4.15E-01 | 4.21E-01 | 4.40E-01 | 4.29E-01 |
| | 16 | 62150.50C | sm150 | 2.07E+00 | 5.06E+00 | 7.86E+00 | 1.13E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 8.71E-01 | 2.31E+00 | 3.78E+00 | 5.69E+00 |
| | 19 | 63153.55C | eu153 | 4.23E-01 | 1.03E+00 | 1.74E+00 | 2.70E+00 |
| | 20 | 64155.50C | gd155 | 5.42E-02 | 8.36E-02 | 1.06E-01 | 1.35E-01 |
| | 21 | 63151.55C | eu151 | 7.60E-01 | 1.27E+00 | 1.58E+00 | 1.76E+00 |
| | 22 | 42095.50C | mo95 | 8.98E+00 | 1.94E+01 | 2.88E+01 | 4.01E+01 |
| | 23 | 43099.50C | tc99 | 8.90E+00 | 1.93E+01 | 2.88E+01 | 4.01E+01 |
| | 24 | 44101.50C | ru101 | 7.85E+00 | 1.72E+01 | 2.58E+01 | 3.62E+01 |
| | 25 | 44103.50C | rh103 | 4.97E+00 | 1.09E+01 | 1.65E+01 | 2.30E+01 |
| | 26 | 95241.50c | am241 | 5.10E-08 | 4.09E-07 | 1.28E-06 | 3.07E-06 |
| | 27 | 95242.50c | am242m | 5.13E-27 | 1.73E-25 | 1.07E-24 | 3.72E-24 |
| | 28 | 95243.50C | am243 | 1.90E-05 | 7.56E-04 | 5.66E-03 | 2.34E-02 |
| | 29 | 47109.50C | ag109 | 1.27E-01 | 4.01E-01 | 7.81E-01 | 1.30E+00 |

**No new entries on this page**

P= **20** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 2.04E-02 | 8.87E-02 | 2.00E-01 | 3.33E-01 |
| | 2 | 92234.50C | u234 | 5.64E+01 | 5.38E+01 | 5.21E+01 | 5.16E+01 |
| | 3 | 92235.50C | u235 | 6.22E+03 | 5.46E+03 | 4.83E+03 | 4.10E+03 |
| | 4 | 92236.50C | u236 | 1.86E+02 | 3.60E+02 | 5.14E+02 | 6.76E+02 |
| | 5 | 92238.50C | u238 | 1.46E+05 | 1.46E+05 | 1.46E+05 | 1.45E+05 |
| | 6 | 94238.50C | pu238 | 8.47E-26 | 2.10E-24 | 1.00E-23 | 2.67E-23 |
| | 7 | 94239.50C | pu239 | 1.99E+02 | 3.51E+02 | 4.70E+02 | 5.31E+02 |
| | 8 | 94240.50C | pu240 | 5.84E+00 | 2.02E+01 | 3.72E+01 | 5.70E+01 |
| | 9 | 94241.50C | pu241 | 9.44E-11 | 1.57E-08 | 2.66E-07 | 1.83E-06 |
| | 10 | 94242.50C | pu242 | 7.57E-02 | 1.14E+00 | 4.46E+00 | 1.17E+01 |
| | 11 | 93237.55C | np237 | 6.71E+00 | 2.96E+01 | 6.70E+01 | 1.12E+02 |
| **Group of Fuel Rods #1** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 2.40E+01 | 4.99E+01 | 7.15E+01 | 9.49E+01 |
| | 13 | 60145.50C | nd145 | 1.64E+01 | 3.50E+01 | 5.11E+01 | 6.99E+01 |
| | 14 | 62147.50C | sm147 | 9.17E+00 | 1.84E+01 | 2.54E+01 | 3.30E+01 |
| | 15 | 62149.50C | sm149 | 4.79E-01 | 5.00E-01 | 5.32E-01 | 5.15E-01 |
| | 16 | 62150.50C | sm150 | 4.57E+00 | 1.08E+01 | 1.69E+01 | 2.42E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 2.05E+00 | 5.32E+00 | 8.35E+00 | 1.20E+01 |
| | 19 | 63153.55C | eu153 | 9.32E-01 | 2.51E+00 | 4.52E+00 | 7.31E+00 |
| | 20 | 64155.50C | gd155 | 8.01E-02 | 1.31E-01 | 1.97E-01 | 3.03E-01 |
| | 21 | 63151.55C | eu151 | 1.22E+00 | 1.75E+00 | 2.06E+00 | 2.18E+00 |
| | 22 | 42095.50C | mo95 | 1.78E+01 | 3.81E+01 | 5.59E+01 | 7.69E+01 |
| | 23 | 43099.50C | tc99 | 1.77E+01 | 3.80E+01 | 5.61E+01 | 7.75E+01 |
| | 24 | 44101.50C | ru101 | 1.57E+01 | 3.43E+01 | 5.14E+01 | 7.19E+01 |
| | 25 | 44103.50C | rh103 | 1.01E+01 | 2.20E+01 | 3.30E+01 | 4.54E+01 |
| | 26 | 95241.50c | am241 | 3.44E-07 | 2.66E-06 | 1.34E-05 | 6.45E-05 |
| | 27 | 95242.50c | am242m | 6.31E-26 | 1.56E-24 | 7.46E-24 | 1.99E-23 |
| | 28 | 95243.50C | am243 | 5.44E-04 | 1.87E-02 | 1.21E-01 | 4.46E-01 |
| | 29 | 47109.50C | ag109 | 3.56E-01 | 1.20E+00 | 2.36E+00 | 3.95E+00 |

**No new entries on this page**

SN No. 663E, Vol.1 maintained by Oleg Povetko

P= **30** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 4.48E-02 | 1.89E-01 | 3.93E-01 | 5.98E-01 |
| | 2 | 92234.50C | u234 | 5.51E+01 | 5.21E+01 | 5.15E+01 | 5.41E+01 |
| | 3 | 92235.50C | u235 | 5.90E+03 | 4.82E+03 | 3.98E+03 | 3.04E+03 |
| | 4 | 92236.50C | u236 | 2.62E+02 | 5.11E+02 | 7.15E+02 | 9.17E+02 |
| | 5 | 92238.50C | u238 | 1.46E+05 | 1.46E+05 | 1.45E+05 | 1.44E+05 |
| | 6 | 94238.50C | pu238 | 3.29E-25 | 6.18E-24 | 2.39E-23 | 5.10E-23 |
| | 7 | 94239.50C | pu239 | 2.77E+02 | 4.54E+02 | 5.78E+02 | 6.13E+02 |
| | 8 | 94240.50C | pu240 | 1.15E+01 | 3.63E+01 | 6.30E+01 | 9.21E+01 |
| | 9 | 94241.50C | pu241 | 1.49E-09 | 2.22E-07 | 3.37E-06 | 2.11E-05 |
| | 10 | 94242.50C | pu242 | 3.28E-01 | 4.26E+00 | 1.47E+01 | 3.53E+01 |
| **Group of Fuel Rods #1** (Table 5.1.1.2) | 11 | 93237.55C | np237 | 1.49E+01 | 6.34E+01 | 1.32E+02 | 2.01E+02 |
| | 12 | 60143.50C | nd143 | 3.52E+01 | 7.15E+01 | 1.00E+02 | 1.28E+02 |
| | 13 | 60145.50C | nd145 | 2.44E+01 | 5.11E+01 | 7.38E+01 | 9.93E+01 |
| | 14 | 62147.50C | sm147 | 1.33E+01 | 2.55E+01 | 3.38E+01 | 4.20E+01 |
| | 15 | 62149.50C | sm149 | 5.49E-01 | 5.87E-01 | 6.28E-01 | 6.00E-01 |
| | 16 | 62150.50C | sm150 | 7.19E+00 | 1.71E+01 | 2.68E+01 | 3.83E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 3.37E+00 | 8.38E+00 | 1.26E+01 | 1.75E+01 |
| | 19 | 63153.55C | eu153 | 1.54E+00 | 4.45E+00 | 8.17E+00 | 1.32E+01 |
| | 20 | 64155.50C | gd155 | 1.01E-01 | 1.96E-01 | 3.41E-01 | 5.72E-01 |
| | 21 | 63151.55C | eu151 | 1.53E+00 | 2.01E+00 | 2.36E+00 | 2.48E+00 |
| | 22 | 42095.50C | mo95 | 2.64E+01 | 5.61E+01 | 8.15E+01 | 1.11E+02 |
| | 23 | 43099.50C | tc99 | 2.63E+01 | 5.60E+01 | 8.20E+01 | 1.12E+02 |
| | 24 | 44101.50C | ru101 | 2.35E+01 | 5.13E+01 | 7.67E+01 | 1.07E+02 |
| | 25 | 44103.50C | rh103 | 1.53E+01 | 3.31E+01 | 4.89E+01 | 6.59E+01 |
| | 26 | 95241.50c | am241 | 1.00E-06 | 1.18E-05 | 1.13E-04 | 6.54E-04 |
| | 27 | 95242.50c | am242m | 2.45E-25 | 4.60E-24 | 1.78E-23 | 3.80E-23 |
| | 28 | 95243.50C | am243 | 3.66E-03 | 1.11E-01 | 6.34E-01 | 2.11E+00 |
| | 29 | 47109.50C | ag109 | 6.71E-01 | 2.30E+00 | 4.50E+00 | 7.47E+00 |

**No new entries on this page**

P= **43** MW/MTU

**Group of Fuel Rods # 1** (Table 5.1.1.2)

| # | MCNP ID | / SCALE ID | Years of Burnup: 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|
| 1 | 92233.50C | u233 | 9.08E-02 | 3.48E-01 | 6.52E-01 | 8.97E-01 |
| 2 | 92234.50C | u234 | 5.37E+01 | 5.11E+01 | 5.43E+01 | 6.40E+01 |
| 3 | 92235.50C | u235 | 5.49E+03 | 4.06E+03 | 3.05E+03 | 1.98E+03 |
| 4 | 92236.50C | u236 | 3.58E+02 | 6.87E+02 | 9.32E+02 | 1.14E+03 |
| 5 | 92238.50C | u238 | 1.46E+05 | 1.45E+05 | 1.44E+05 | 1.43E+05 |
| 6 | 94238.50C | pu238 | 9.91E-25 | 1.36E-23 | 4.16E-23 | 6.88E-23 |
| 7 | 94239.50C | pu239 | 3.63E+02 | 5.46E+02 | 6.56E+02 | 6.54E+02 |
| 8 | 94240.50C | pu240 | 2.02E+01 | 5.85E+01 | 9.57E+01 | 1.32E+02 |
| 9 | 94241.50C | pu241 | 1.66E-08 | 2.16E-06 | 2.88E-05 | 1.59E-04 |
| 10 | 94242.50C | pu242 | 1.14E+00 | 1.25E+01 | 3.83E+01 | 8.43E+01 |
| 11 | 93237.55C | np237 | 3.03E+01 | 1.17E+02 | 2.19E+02 | 3.01E+02 |
| 12 | 60143.50C | nd143 | 4.92E+01 | 9.66E+01 | 1.31E+02 | 1.59E+02 |
| 13 | 60145.50C | nd145 | 3.44E+01 | 7.09E+01 | 1.01E+02 | 1.33E+02 |
| 14 | 62147.50C | sm147 | 1.81E+01 | 3.30E+01 | 4.14E+01 | 4.84E+01 |
| 15 | 62149.50C | sm149 | 6.48E-01 | 7.05E-01 | 7.54E-01 | 7.10E-01 |
| 16 | 62150.50C | sm150 | 1.08E+01 | 2.60E+01 | 4.08E+01 | 5.80E+01 |
| 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | 5.18E+00 | 1.22E+01 | 1.77E+01 | 2.39E+01 |
| 19 | 63153.55C | eu153 | 2.48E+00 | 7.52E+00 | 1.38E+01 | 2.17E+01 |
| 20 | 64155.50C | gd155 | 1.30E-01 | 3.15E-01 | 6.04E-01 | 1.03E+00 |
| 21 | 63151.55C | eu151 | 1.79E+00 | 2.26E+00 | 2.70E+00 | 2.81E+00 |
| 22 | 42095.50C | mo95 | 3.75E+01 | 7.85E+01 | 1.13E+02 | 1.51E+02 |
| 23 | 43099.50C | tc99 | 3.74E+01 | 7.86E+01 | 1.14E+02 | 1.53E+02 |
| 24 | 44101.50C | ru101 | 3.37E+01 | 7.32E+01 | 1.09E+02 | 1.51E+02 |
| 25 | 44103.50C | rh103 | 2.21E+01 | 4.72E+01 | 6.83E+01 | 8.91E+01 |
| 26 | 95241.50c | am241 | 2.73E-06 | 7.48E-05 | 8.88E-04 | 4.83E-03 |
| 27 | 95242.50c | am242m | 7.37E-25 | 1.01E-23 | 3.09E-23 | 5.12E-23 |
| 28 | 95243.50C | am243 | 1.90E-02 | 4.91E-01 | 2.45E+00 | 7.24E+00 |
| 29 | 47109.50C | ag109 | 1.19E+00 | 4.09E+00 | 7.89E+00 | 1.29E+01 |

**No new entries on this page**

P= **55** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 1.45E-01 | 5.01E-01 | 8.68E-01 | 1.10E+00 |
| | 2 | 92234.50C | u234 | 5.26E+01 | 5.17E+01 | 6.05E+01 | 7.81E+01 |
| | 3 | 92235.50C | u235 | 5.13E+03 | 3.45E+03 | 2.34E+03 | 1.29E+03 |
| | 4 | 92236.50C | u236 | 4.43E+02 | 8.30E+02 | 1.09E+03 | 1.27E+03 |
| | 5 | 92238.50C | u238 | 1.46E+05 | 1.45E+05 | 1.43E+05 | 1.41E+05 |
| | 6 | 94238.50C | pu238 | 1.95E-24 | 2.06E-23 | 5.26E-23 | 7.00E-23 |
| | 7 | 94239.50C | pu239 | 4.28E+02 | 6.01E+02 | 6.94E+02 | 6.65E+02 |
| | 8 | 94240.50C | pu240 | 2.89E+01 | 7.88E+01 | 1.23E+02 | 1.61E+02 |
| | 9 | 94241.50C | pu241 | 8.30E-08 | 9.61E-06 | 1.14E-04 | 5.57E-04 |
| | 10 | 94242.50C | pu242 | 2.55E+00 | 2.47E+01 | 6.91E+01 | 1.42E+02 |
| | 11 | 93237.55C | np237 | 4.84E+01 | 1.68E+02 | 2.91E+02 | 3.67E+02 |
| **Group of Fuel Rods # 1** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 6.15E+01 | 1.17E+02 | 1.53E+02 | 1.74E+02 |
| | 13 | 60145.50C | nd145 | 4.33E+01 | 8.79E+01 | 1.23E+02 | 1.58E+02 |
| | 14 | 62147.50C | sm147 | 2.22E+01 | 3.84E+01 | 4.57E+01 | 5.02E+01 |
| | 15 | 62149.50C | sm149 | 7.45E-01 | 8.17E-01 | 8.70E-01 | 8.13E-01 |
| | 16 | 62150.50C | sm150 | 1.43E+01 | 3.47E+01 | 5.45E+01 | 7.61E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 6.85E+00 | 1.54E+01 | 2.19E+01 | 2.91E+01 |
| | 19 | 63153.55C | eu153 | 3.49E+00 | 1.08E+01 | 1.94E+01 | 2.96E+01 |
| | 20 | 64155.50C | gd155 | 1.63E-01 | 4.59E-01 | 9.04E-01 | 1.50E+00 |
| | 21 | 63151.55C | eu151 | 1.97E+00 | 2.46E+00 | 2.99E+00 | 3.09E+00 |
| | 22 | 42095.50C | mo95 | 4.75E+01 | 9.82E+01 | 1.39E+02 | 1.83E+02 |
| | 23 | 43099.50C | tc99 | 4.74E+01 | 9.84E+01 | 1.40E+02 | 1.85E+02 |
| | 24 | 44101.50C | ru101 | 4.30E+01 | 9.31E+01 | 1.38E+02 | 1.90E+02 |
| | 25 | 44103.50C | rh103 | 2.84E+01 | 5.97E+01 | 8.44E+01 | 1.06E+02 |
| | 26 | 95241.50c | am241 | 6.28E-06 | 3.04E-04 | 3.47E-03 | 1.68E-02 |
| | 27 | 95242.50c | am242m | 1.45E-24 | 1.54E-23 | 3.91E-23 | 5.21E-23 |
| | 28 | 95243.50C | am243 | 5.61E-02 | 1.27E+00 | 5.65E+00 | 1.52E+01 |
| | 29 | 47109.50C | ag109 | 1.76E+00 | 6.02E+00 | 1.14E+01 | 1.84E+01 |

**No new entries on this page**

P= **10** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 6.77E-03 | 2.51E-02 | 5.88E-02 | 1.06E-01 |
| | 2 | 92234.50C | u234 | 6.51E+01 | 6.34E+01 | 6.18E+01 | 6.05E+01 |
| | 3 | 92235.50C | u235 | 7.40E+03 | 6.95E+03 | 6.56E+03 | 6.10E+03 |
| | 4 | 92236.50C | u236 | 1.21E+02 | 2.20E+02 | 3.13E+02 | 4.16E+02 |
| | 5 | 92238.50C | u238 | 1.65E+05 | 1.65E+05 | 1.65E+05 | 1.64E+05 |
| | 6 | 94238.50C | pu238 | 7.34E-27 | 2.48E-25 | 1.55E-24 | 5.43E-24 |
| | 7 | 94239.50C | pu239 | 1.20E+02 | 2.30E+02 | 3.30E+02 | 4.03E+02 |
| | 8 | 94240.50C | pu240 | 1.85E+00 | 7.21E+00 | 1.46E+01 | 2.38E+01 |
| | 9 | 94241.50C | pu241 | 8.03E-13 | 1.49E-10 | 2.87E-09 | 2.19E-08 |
| | 10 | 94242.50C | pu242 | 5.78E-03 | 1.04E-01 | 4.78E-01 | 1.42E+00 |
| | 11 | 93237.55C | np237 | 2.18E+00 | 8.24E+00 | 1.95E+01 | 3.55E+01 |
| **Group of Fuel Rods #2** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 1.34E+01 | 2.86E+01 | 4.20E+01 | 5.75E+01 |
| | 13 | 60145.50C | nd145 | 9.13E+00 | 1.97E+01 | 2.92E+01 | 4.04E+01 |
| | 14 | 62147.50C | sm147 | 5.21E+00 | 1.09E+01 | 1.58E+01 | 2.13E+01 |
| | 15 | 62149.50C | sm149 | 4.69E-01 | 4.76E-01 | 4.99E-01 | 4.87E-01 |
| | 16 | 62150.50C | sm150 | 2.25E+00 | 5.52E+00 | 8.60E+00 | 1.23E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 9.49E-01 | 2.50E+00 | 4.12E+00 | 6.19E+00 |
| | 19 | 63153.55C | eu153 | 4.64E-01 | 1.13E+00 | 1.90E+00 | 2.95E+00 |
| | 20 | 64155.50C | gd155 | 6.00E-02 | 9.26E-02 | 1.17E-01 | 1.49E-01 |
| | 21 | 63151.55C | eu151 | 8.40E-01 | 1.41E+00 | 1.77E+00 | 1.98E+00 |
| | 22 | 42095.50C | mo95 | 9.83E+00 | 2.13E+01 | 3.16E+01 | 4.39E+01 |
| | 23 | 43099.50C | tc99 | 9.75E+00 | 2.11E+01 | 3.15E+01 | 4.40E+01 |
| | 24 | 44101.50C | ru101 | 8.60E+00 | 1.88E+01 | 2.83E+01 | 3.97E+01 |
| | 25 | 44103.50C | rh103 | 5.46E+00 | 1.20E+01 | 1.81E+01 | 2.53E+01 |
| | 26 | 95241.50c | am241 | 5.51E-08 | 4.43E-07 | 1.39E-06 | 3.30E-06 |
| | 27 | 95242.50c | am242m | 5.47E-27 | 1.85E-25 | 1.16E-24 | 4.04E-24 |
| | 28 | 95243.50C | am243 | 1.98E-05 | 7.88E-04 | 5.92E-03 | 2.45E-02 |
| | 29 | 47109.50C | ag109 | 1.39E-01 | 4.38E-01 | 8.53E-01 | 1.42E+00 |

**No new entries on this page**

P= **20** MW/MTU

| Group of Fuel Rods #2 (Table 5.1.1.2) | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 2.25E-02 | 9.73E-02 | 2.20E-01 | 3.68E-01 |
| | 2 | 92234.50C | u234 | 6.35E+01 | 6.06E+01 | 5.87E+01 | 5.81E+01 |
| | 3 | 92235.50C | u235 | 7.02E+03 | 6.18E+03 | 5.50E+03 | 4.69E+03 |
| | 4 | 92236.50C | u236 | 2.06E+02 | 3.97E+02 | 5.68E+02 | 7.47E+02 |
| | 5 | 92238.50C | u238 | 1.65E+05 | 1.64E+05 | 1.64E+05 | 1.63E+05 |
| | 6 | 94238.50C | pu238 | 9.07E-26 | 2.27E-24 | 1.10E-23 | 2.96E-23 |
| | 7 | 94239.50C | pu239 | 2.23E+02 | 3.94E+02 | 5.31E+02 | 6.03E+02 |
| | 8 | 94240.50C | pu240 | 6.38E+00 | 2.21E+01 | 4.07E+01 | 6.26E+01 |
| | 9 | 94241.50C | pu241 | 9.66E-11 | 1.61E-08 | 2.74E-07 | 1.89E-06 |
| | 10 | 94242.50C | pu242 | 7.98E-02 | 1.21E+00 | 4.73E+00 | 1.24E+01 |
| | 11 | 93237.55C | np237 | 7.36E+00 | 3.24E+01 | 7.37E+01 | 1.23E+02 |
| | 12 | 60143.50C | nd143 | 2.63E+01 | 5.47E+01 | 7.86E+01 | 1.05E+02 |
| | 13 | 60145.50C | nd145 | 1.80E+01 | 3.83E+01 | 5.61E+01 | 7.68E+01 |
| | 14 | 62147.50C | sm147 | 1.01E+01 | 2.02E+01 | 2.80E+01 | 3.64E+01 |
| | 15 | 62149.50C | sm149 | 5.41E-01 | 5.66E-01 | 6.03E-01 | 5.84E-01 |
| | 16 | 62150.50C | sm150 | 5.00E+00 | 1.19E+01 | 1.85E+01 | 2.65E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 2.23E+00 | 5.80E+00 | 9.12E+00 | 1.31E+01 |
| | 19 | 63153.55C | eu153 | 1.02E+00 | 2.74E+00 | 4.93E+00 | 7.97E+00 |
| | 20 | 64155.50C | gd155 | 8.88E-02 | 1.45E-01 | 2.16E-01 | 3.30E-01 |
| | 21 | 63151.55C | eu151 | 1.36E+00 | 1.97E+00 | 2.33E+00 | 2.47E+00 |
| | 22 | 42095.50C | mo95 | 1.95E+01 | 4.17E+01 | 6.14E+01 | 8.44E+01 |
| | 23 | 43099.50C | tc99 | 1.94E+01 | 4.16E+01 | 6.16E+01 | 8.51E+01 |
| | 24 | 44101.50C | ru101 | 1.72E+01 | 3.75E+01 | 5.64E+01 | 7.89E+01 |
| | 25 | 44103.50C | rh103 | 1.11E+01 | 2.42E+01 | 3.63E+01 | 5.00E+01 |
| | 26 | 95241.50c | am241 | 3.73E-07 | 2.87E-06 | 1.42E-05 | 6.73E-05 |
| | 27 | 95242.50c | am242m | 6.75E-26 | 1.69E-24 | 8.18E-24 | 2.20E-23 |
| | 28 | 95243.50C | am243 | 5.68E-04 | 1.96E-02 | 1.28E-01 | 4.70E-01 |
| | 29 | 47109.50C | ag109 | 3.90E-01 | 1.31E+00 | 2.58E+00 | 4.32E+00 |

***No new entries on this page***

SN No. 663E, Vol.1 maintained by Oleg Povetko

P= **30** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 4.92E-02 | 2.08E-01 | 4.35E-01 | 6.65E-01 |
| | 2 | 92234.50C | u234 | 6.21E+01 | 5.87E+01 | 5.79E+01 | 6.07E+01 |
| | 3 | 92235.50C | u235 | 6.66E+03 | 5.48E+03 | 4.56E+03 | 3.52E+03 |
| | 4 | 92236.50C | u236 | 2.89E+02 | 5.63E+02 | 7.91E+02 | 1.02E+03 |
| | 5 | 92238.50C | u238 | 1.65E+05 | 1.64E+05 | 1.63E+05 | 1.62E+05 |
| | 6 | 94238.50C | pu238 | 3.54E-25 | 6.76E-24 | 2.65E-23 | 5.75E-23 |
| | 7 | 94239.50C | pu239 | 3.11E+02 | 5.13E+02 | 6.56E+02 | 7.00E+02 |
| | 8 | 94240.50C | pu240 | 1.25E+01 | 3.98E+01 | 6.93E+01 | 1.02E+02 |
| | 9 | 94241.50C | pu241 | 1.53E-09 | 2.28E-07 | 3.49E-06 | 2.20E-05 |
| | 10 | 94242.50C | pu242 | 3.46E-01 | 4.51E+00 | 1.57E+01 | 3.77E+01 |
| | 11 | 93237.55C | np237 | 1.63E+01 | 6.97E+01 | 1.46E+02 | 2.23E+02 |
| **Group of Fuel Rods #2** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 3.86E+01 | 7.86E+01 | 1.11E+02 | 1.42E+02 |
| | 13 | 60145.50C | nd145 | 2.67E+01 | 5.61E+01 | 8.11E+01 | 1.09E+02 |
| | 14 | 62147.50C | sm147 | 1.46E+01 | 2.81E+01 | 3.73E+01 | 4.65E+01 |
| | 15 | 62149.50C | sm149 | 6.18E-01 | 6.62E-01 | 7.11E-01 | 6.81E-01 |
| | 16 | 62150.50C | sm150 | 7.86E+00 | 1.87E+01 | 2.94E+01 | 4.21E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 3.67E+00 | 9.14E+00 | 1.38E+01 | 1.92E+01 |
| | 19 | 63153.55C | eu153 | 1.68E+00 | 4.84E+00 | 8.92E+00 | 1.44E+01 |
| | 20 | 64155.50C | gd155 | 1.12E-01 | 2.15E-01 | 3.72E-01 | 6.23E-01 |
| | 21 | 63151.55C | eu151 | 1.71E+00 | 2.27E+00 | 2.68E+00 | 2.82E+00 |
| | 22 | 42095.50C | mo95 | 2.90E+01 | 6.15E+01 | 8.95E+01 | 1.22E+02 |
| | 23 | 43099.50C | tc99 | 2.89E+01 | 6.14E+01 | 9.02E+01 | 1.23E+02 |
| | 24 | 44101.50C | ru101 | 2.58E+01 | 5.62E+01 | 8.42E+01 | 1.18E+02 |
| | 25 | 44103.50C | rh103 | 1.67E+01 | 3.63E+01 | 5.39E+01 | 7.28E+01 |
| | 26 | 95241.50c | am241 | 1.09E-06 | 1.25E-05 | 1.18E-04 | 6.82E-04 |
| | 27 | 95242.50c | am242m | 2.63E-25 | 5.03E-24 | 1.97E-23 | 4.28E-23 |
| | 28 | 95243.50C | am243 | 3.83E-03 | 1.16E-01 | 6.70E-01 | 2.24E+00 |
| | 29 | 47109.50C | ag109 | 7.33E-01 | 2.51E+00 | 4.93E+00 | 8.19E+00 |

**No new entries on this page**

P= **43** MW/MTU

**Group of Fuel Rods # 2** (Table 5.1.1.2)

| # | MCNP ID | / SCALE ID | Years of Burnup: 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|
| 1 | 92233.50C | u233 | 9.97E-02 | 3.85E-01 | 7.26E-01 | 1.01E+00 |
| 2 | 92234.50C | u234 | 6.05E+01 | 5.76E+01 | 6.10E+01 | 7.15E+01 |
| 3 | 92235.50C | u235 | 6.22E+03 | 4.65E+03 | 3.52E+03 | 2.33E+03 |
| 4 | 92236.50C | u236 | 3.95E+02 | 7.59E+02 | 1.03E+03 | 1.27E+03 |
| 5 | 92238.50C | u238 | 1.64E+05 | 1.63E+05 | 1.62E+05 | 1.61E+05 |
| 6 | 94238.50C | pu238 | 1.07E-24 | 1.50E-23 | 4.69E-23 | 7.91E-23 |
| 7 | 94239.50C | pu239 | 4.07E+02 | 6.20E+02 | 7.50E+02 | 7.51E+02 |
| 8 | 94240.50C | pu240 | 2.20E+01 | 6.43E+01 | 1.06E+02 | 1.47E+02 |
| 9 | 94241.50C | pu241 | 1.70E-08 | 2.23E-06 | 3.01E-05 | 1.68E-04 |
| 10 | 94242.50C | pu242 | 1.20E+00 | 1.33E+01 | 4.10E+01 | 9.08E+01 |
| 11 | 93237.55C | np237 | 3.32E+01 | 1.29E+02 | 2.44E+02 | 3.38E+02 |
| 12 | 60143.50C | nd143 | 5.41E+01 | 1.07E+02 | 1.45E+02 | 1.77E+02 |
| 13 | 60145.50C | nd145 | 3.77E+01 | 7.79E+01 | 1.11E+02 | 1.47E+02 |
| 14 | 62147.50C | sm147 | 1.99E+01 | 3.64E+01 | 4.59E+01 | 5.39E+01 |
| 15 | 62149.50C | sm149 | 7.28E-01 | 7.95E-01 | 8.54E-01 | 8.06E-01 |
| 16 | 62150.50C | sm150 | 1.18E+01 | 2.84E+01 | 4.48E+01 | 6.38E+01 |
| 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | 5.64E+00 | 1.33E+01 | 1.94E+01 | 2.63E+01 |
| 19 | 63153.55C | eu153 | 2.70E+00 | 8.20E+00 | 1.51E+01 | 2.38E+01 |
| 20 | 64155.50C | gd155 | 1.43E-01 | 3.43E-01 | 6.58E-01 | 1.13E+00 |
| 21 | 63151.55C | eu151 | 2.01E+00 | 2.57E+00 | 3.08E+00 | 3.21E+00 |
| 22 | 42095.50C | mo95 | 4.11E+01 | 8.62E+01 | 1.24E+02 | 1.66E+02 |
| 23 | 43099.50C | tc99 | 4.10E+01 | 8.63E+01 | 1.25E+02 | 1.69E+02 |
| 24 | 44101.50C | ru101 | 3.70E+01 | 8.03E+01 | 1.20E+02 | 1.67E+02 |
| 25 | 44103.50C | rh103 | 2.42E+01 | 5.19E+01 | 7.54E+01 | 9.89E+01 |
| 26 | 95241.50c | am241 | 2.95E-06 | 7.80E-05 | 9.28E-04 | 5.09E-03 |
| 27 | 95242.50c | am242m | 7.99E-25 | 1.12E-23 | 3.49E-23 | 5.88E-23 |
| 28 | 95243.50C | am243 | 1.99E-02 | 5.17E-01 | 2.60E+00 | 7.75E+00 |
| 29 | 47109.50C | ag109 | 1.30E+00 | 4.47E+00 | 8.65E+00 | 1.42E+01 |

**No new entries on this page**

P= **55** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 1.59E-01 | 5.56E-01 | 9.72E-01 | 1.24E+00 |
| | 2 | 92234.50C | u234 | 5.92E+01 | 5.81E+01 | 6.77E+01 | 8.73E+01 |
| | 3 | 92235.50C | u235 | 5.83E+03 | 3.97E+03 | 2.74E+03 | 1.54E+03 |
| | 4 | 92236.50C | u236 | 4.88E+02 | 9.18E+02 | 1.21E+03 | 1.43E+03 |
| | 5 | 92238.50C | u238 | 1.64E+05 | 1.63E+05 | 1.61E+05 | 1.59E+05 |
| | 6 | 94238.50C | pu238 | 2.13E-24 | 2.31E-23 | 6.00E-23 | 8.17E-23 |
| | 7 | 94239.50C | pu239 | 4.82E+02 | 6.85E+02 | 7.96E+02 | 7.66E+02 |
| | 8 | 94240.50C | pu240 | 3.17E+01 | 8.68E+01 | 1.36E+02 | 1.81E+02 |
| | 9 | 94241.50C | pu241 | 8.54E-08 | 9.98E-06 | 1.20E-04 | 5.94E-04 |
| | 10 | 94242.50C | pu242 | 2.70E+00 | 2.63E+01 | 7.43E+01 | 1.54E+02 |
| | 11 | 93237.55C | np237 | 5.31E+01 | 1.87E+02 | 3.26E+02 | 4.15E+02 |
| **Group of Fuel Rods # 2** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 6.75E+01 | 1.29E+02 | 1.70E+02 | 1.96E+02 |
| | 13 | 60145.50C | nd145 | 4.75E+01 | 9.68E+01 | 1.36E+02 | 1.76E+02 |
| | 14 | 62147.50C | sm147 | 2.44E+01 | 4.24E+01 | 5.09E+01 | 5.64E+01 |
| | 15 | 62149.50C | sm149 | 8.36E-01 | 9.21E-01 | 9.85E-01 | 9.24E-01 |
| | 16 | 62150.50C | sm150 | 1.56E+01 | 3.80E+01 | 5.99E+01 | 8.41E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 7.47E+00 | 1.69E+01 | 2.41E+01 | 3.22E+01 |
| | 19 | 63153.55C | eu153 | 3.80E+00 | 1.18E+01 | 2.12E+01 | 3.26E+01 |
| | 20 | 64155.50C | gd155 | 1.79E-01 | 5.00E-01 | 9.88E-01 | 1.65E+00 |
| | 21 | 63151.55C | eu151 | 2.22E+00 | 2.80E+00 | 3.41E+00 | 3.54E+00 |
| | 22 | 42095.50C | mo95 | 5.21E+01 | 1.08E+02 | 1.54E+02 | 2.03E+02 |
| | 23 | 43099.50C | tc99 | 5.20E+01 | 1.08E+02 | 1.55E+02 | 2.06E+02 |
| | 24 | 44101.50C | ru101 | 4.72E+01 | 1.02E+02 | 1.52E+02 | 2.10E+02 |
| | 25 | 44103.50C | rh103 | 3.12E+01 | 6.58E+01 | 9.35E+01 | 1.19E+02 |
| | 26 | 95241.50c | am241 | 6.72E-06 | 3.17E-04 | 3.65E-03 | 1.79E-02 |
| | 27 | 95242.50c | am242m | 1.59E-24 | 1.72E-23 | 4.47E-23 | 6.08E-23 |
| | 28 | 95243.50C | am243 | 5.89E-02 | 1.35E+00 | 6.04E+00 | 1.63E+01 |
| | 29 | 47109.50C | ag109 | 1.93E+00 | 6.59E+00 | 1.26E+01 | 2.03E+01 |

**No new entries on this page**

P= **10** MW/MTU

| Group of Fuel Rods # 3 (Table 5.1.1.2) | # | MCNP ID | / SCALE ID | Years of Burnup: 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|---|
| | 1 | 92233.50C | u233 | 5.16E-03 | 1.90E-02 | 4.45E-02 | 8.04E-02 |
| | 2 | 92234.50C | u234 | 5.06E+01 | 4.93E+01 | 4.81E+01 | 4.71E+01 |
| | 3 | 92235.50C | u235 | 5.76E+03 | 5.43E+03 | 5.13E+03 | 4.78E+03 |
| | 4 | 92236.50C | u236 | 9.21E+01 | 1.67E+02 | 2.38E+02 | 3.16E+02 |
| | 5 | 92238.50C | u238 | 1.28E+05 | 1.28E+05 | 1.28E+05 | 1.28E+05 |
| | 6 | 94238.50C | pu238 | 5.39E-27 | 1.83E-25 | 1.16E-24 | 4.05E-24 |
| | 7 | 94239.50C | pu239 | 9.23E+01 | 1.77E+02 | 2.55E+02 | 3.12E+02 |
| | 8 | 94240.50C | pu240 | 1.39E+00 | 5.42E+00 | 1.10E+01 | 1.79E+01 |
| | 9 | 94241.50C | pu241 | 5.62E-13 | 1.04E-10 | 2.02E-09 | 1.54E-08 |
| | 10 | 94242.50C | pu242 | 4.19E-03 | 7.55E-02 | 3.47E-01 | 1.03E+00 |
| | 11 | 93237.55C | np237 | 1.66E+00 | 6.23E+00 | 1.47E+01 | 2.68E+01 |
| | 12 | 60143.50C | nd143 | 1.01E+01 | 2.16E+01 | 3.18E+01 | 4.35E+01 |
| | 13 | 60145.50C | nd145 | 6.89E+00 | 1.49E+01 | 2.21E+01 | 3.06E+01 |
| | 14 | 62147.50C | sm147 | 3.94E+00 | 8.26E+00 | 1.19E+01 | 1.61E+01 |
| | 15 | 62149.50C | sm149 | 3.67E-01 | 3.73E-01 | 3.91E-01 | 3.82E-01 |
| | 16 | 62150.50C | sm150 | 1.69E+00 | 4.15E+00 | 6.48E+00 | 9.29E+00 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 7.11E-01 | 1.87E+00 | 3.09E+00 | 4.65E+00 |
| | 19 | 63153.55C | eu153 | 3.50E-01 | 8.47E-01 | 1.43E+00 | 2.21E+00 |
| | 20 | 64155.50C | gd155 | 4.58E-02 | 7.07E-02 | 8.93E-02 | 1.13E-01 |
| | 21 | 63151.55C | eu151 | 6.41E-01 | 1.09E+00 | 1.37E+00 | 1.54E+00 |
| | 22 | 42095.50C | mo95 | 7.42E+00 | 1.61E+01 | 2.39E+01 | 3.32E+01 |
| | 23 | 43099.50C | tc99 | 7.36E+00 | 1.59E+01 | 2.38E+01 | 3.32E+01 |
| | 24 | 44101.50C | ru101 | 6.49E+00 | 1.42E+01 | 2.14E+01 | 3.00E+01 |
| | 25 | 44103.50C | rh103 | 4.12E+00 | 9.04E+00 | 1.37E+01 | 1.91E+01 |
| | 26 | 95241.50c | am241 | 4.11E-08 | 3.31E-07 | 1.04E-06 | 2.45E-06 |
| | 27 | 95242.50c | am242m | 4.01E-27 | 1.36E-25 | 8.59E-25 | 3.02E-24 |
| | 28 | 95243.50C | am243 | 1.43E-05 | 5.67E-04 | 4.28E-03 | 1.77E-02 |
| | 29 | 47109.50C | ag109 | 1.05E-01 | 3.30E-01 | 6.43E-01 | 1.07E+00 |

**No new entries on this page**

P= **20** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 1.70E-02 | 7.35E-02 | 1.67E-01 | 2.80E-01 |
| | 2 | 92234.50C | u234 | 4.94E+01 | 4.72E+01 | 4.57E+01 | 4.52E+01 |
| | 3 | 92235.50C | u235 | 5.48E+03 | 4.85E+03 | 4.33E+03 | 3.71E+03 |
| | 4 | 92236.50C | u236 | 1.57E+02 | 3.02E+02 | 4.32E+02 | 5.70E+02 |
| | 5 | 92238.50C | u238 | 1.28E+05 | 1.28E+05 | 1.27E+05 | 1.27E+05 |
| | 6 | 94238.50C | pu238 | 6.70E-26 | 1.70E-24 | 8.29E-24 | 2.25E-23 |
| | 7 | 94239.50C | pu239 | 1.72E+02 | 3.05E+02 | 4.13E+02 | 4.71E+02 |
| | 8 | 94240.50C | pu240 | 4.79E+00 | 1.66E+01 | 3.08E+01 | 4.74E+01 |
| | 9 | 94241.50C | pu241 | 6.78E-11 | 1.13E-08 | 1.93E-07 | 1.34E-06 |
| | 10 | 94242.50C | pu242 | 5.78E-02 | 8.77E-01 | 3.45E+00 | 9.10E+00 |
| **Group of Fuel Rods # 3** (Table 5.1.1.2) | 11 | 93237.55C | np237 | 5.58E+00 | 2.45E+01 | 5.59E+01 | 9.39E+01 |
| | 12 | 60143.50C | nd143 | 1.98E+01 | 4.14E+01 | 5.97E+01 | 7.96E+01 |
| | 13 | 60145.50C | nd145 | 1.36E+01 | 2.90E+01 | 4.25E+01 | 5.82E+01 |
| | 14 | 62147.50C | sm147 | 7.60E+00 | 1.53E+01 | 2.13E+01 | 2.77E+01 |
| | 15 | 62149.50C | sm149 | 4.22E-01 | 4.41E-01 | 4.71E-01 | 4.57E-01 |
| | 16 | 62150.50C | sm150 | 3.76E+00 | 8.93E+00 | 1.39E+01 | 2.00E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 1.67E+00 | 4.35E+00 | 6.87E+00 | 9.89E+00 |
| | 19 | 63153.55C | eu153 | 7.68E-01 | 2.06E+00 | 3.70E+00 | 5.97E+00 |
| | 20 | 64155.50C | gd155 | 6.78E-02 | 1.10E-01 | 1.63E-01 | 2.48E-01 |
| | 21 | 63151.55C | eu151 | 1.05E+00 | 1.53E+00 | 1.82E+00 | 1.94E+00 |
| | 22 | 42095.50C | mo95 | 1.47E+01 | 3.15E+01 | 4.65E+01 | 6.40E+01 |
| | 23 | 43099.50C | tc99 | 1.46E+01 | 3.14E+01 | 4.66E+01 | 6.45E+01 |
| | 24 | 44101.50C | ru101 | 1.30E+01 | 2.84E+01 | 4.27E+01 | 5.98E+01 |
| | 25 | 44103.50C | rh103 | 8.35E+00 | 1.83E+01 | 2.75E+01 | 3.79E+01 |
| | 26 | 95241.50c | am241 | 2.79E-07 | 2.13E-06 | 1.03E-05 | 4.81E-05 |
| | 27 | 95242.50c | am242m | 4.98E-26 | 1.26E-24 | 6.17E-24 | 1.68E-23 |
| | 28 | 95243.50C | am243 | 4.09E-04 | 1.42E-02 | 9.26E-02 | 3.42E-01 |
| | 29 | 47109.50C | ag109 | 2.94E-01 | 9.84E-01 | 1.95E+00 | 3.25E+00 |

**No new entries on this page**

P= **30** MW/MTU

| Group of Fuel Rods # 3 (Table 5.1.1.2) | # | MCNP ID | / SCALE ID | Years of Burnup: 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|---|
| | 1 | 92233.50C | u233 | 3.72E-02 | 1.58E-01 | 3.31E-01 | 5.10E-01 |
| | 2 | 92234.50C | u234 | 4.84E+01 | 4.57E+01 | 4.51E+01 | 4.71E+01 |
| | 3 | 92235.50C | u235 | 5.21E+03 | 4.32E+03 | 3.61E+03 | 2.82E+03 |
| | 4 | 92236.50C | u236 | 2.20E+02 | 4.29E+02 | 6.04E+02 | 7.78E+02 |
| | 5 | 92238.50C | u238 | 1.28E+05 | 1.27E+05 | 1.27E+05 | 1.26E+05 |
| | 6 | 94238.50C | pu238 | 2.63E-25 | 5.10E-24 | 2.03E-23 | 4.45E-23 |
| | 7 | 94239.50C | pu239 | 2.40E+02 | 3.99E+02 | 5.13E+02 | 5.51E+02 |
| | 8 | 94240.50C | pu240 | 9.43E+00 | 3.00E+01 | 5.25E+01 | 7.75E+01 |
| | 9 | 94241.50C | pu241 | 1.07E-09 | 1.61E-07 | 2.48E-06 | 1.57E-05 |
| | 10 | 94242.50C | pu242 | 2.51E-01 | 3.29E+00 | 1.15E+01 | 2.78E+01 |
| | 11 | 93237.55C | np237 | 1.23E+01 | 5.28E+01 | 1.11E+02 | 1.71E+02 |
| | 12 | 60143.50C | nd143 | 2.92E+01 | 5.96E+01 | 8.41E+01 | 1.09E+02 |
| | 13 | 60145.50C | nd145 | 2.02E+01 | 4.25E+01 | 6.16E+01 | 8.33E+01 |
| | 14 | 62147.50C | sm147 | 1.10E+01 | 2.13E+01 | 2.85E+01 | 3.56E+01 |
| | 15 | 62149.50C | sm149 | 4.81E-01 | 5.16E-01 | 5.55E-01 | 5.33E-01 |
| | 16 | 62150.50C | sm150 | 5.92E+00 | 1.41E+01 | 2.22E+01 | 3.18E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 2.75E+00 | 6.88E+00 | 1.05E+01 | 1.46E+01 |
| | 19 | 63153.55C | eu153 | 1.26E+00 | 3.63E+00 | 6.69E+00 | 1.08E+01 |
| | 20 | 64155.50C | gd155 | 8.50E-02 | 1.62E-01 | 2.79E-01 | 4.68E-01 |
| | 21 | 63151.55C | eu151 | 1.32E+00 | 1.78E+00 | 2.10E+00 | 2.22E+00 |
| | 22 | 42095.50C | mo95 | 2.19E+01 | 4.65E+01 | 6.79E+01 | 9.26E+01 |
| | 23 | 43099.50C | tc99 | 2.18E+01 | 4.65E+01 | 6.84E+01 | 9.38E+01 |
| | 24 | 44101.50C | ru101 | 1.95E+01 | 4.25E+01 | 6.39E+01 | 8.93E+01 |
| | 25 | 44103.50C | rh103 | 1.27E+01 | 2.75E+01 | 4.09E+01 | 5.55E+01 |
| | 26 | 95241.50c | am241 | 8.14E-07 | 9.07E-06 | 8.40E-05 | 4.88E-04 |
| | 27 | 95242.50c | am242m | 1.95E-25 | 3.79E-24 | 1.51E-23 | 3.31E-23 |
| | 28 | 95243.50C | am243 | 2.76E-03 | 8.40E-02 | 4.88E-01 | 1.64E+00 |
| | 29 | 47109.50C | ag109 | 5.52E-01 | 1.89E+00 | 3.71E+00 | 6.19E+00 |

**No new entries on this page**

P= **43** MW/MTU

| # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|
| | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| 1 | 92233.50C | u233 | 7.54E-02 | 2.93E-01 | 5.57E-01 | 7.78E-01 |
| 2 | 92234.50C | u234 | 4.71E+01 | 4.48E+01 | 4.73E+01 | 5.53E+01 |
| 3 | 92235.50C | u235 | 4.87E+03 | 3.69E+03 | 2.82E+03 | 1.89E+03 |
| 4 | 92236.50C | u236 | 3.01E+02 | 5.79E+02 | 7.92E+02 | 9.81E+02 |
| 5 | 92238.50C | u238 | 1.28E+05 | 1.27E+05 | 1.26E+05 | 1.25E+05 |
| 6 | 94238.50C | pu238 | 8.02E-25 | 1.15E-23 | 3.63E-23 | 6.22E-23 |
| 7 | 94239.50C | pu239 | 3.16E+02 | 4.85E+02 | 5.90E+02 | 5.93E+02 |
| 8 | 94240.50C | pu240 | 1.66E+01 | 4.87E+01 | 8.06E+01 | 1.13E+02 |
| 9 | 94241.50C | pu241 | 1.20E-08 | 1.58E-06 | 2.15E-05 | 1.21E-04 |
| 10 | 94242.50C | pu242 | 8.75E-01 | 9.75E+00 | 3.03E+01 | 6.75E+01 |
| 11 | 93237.55C | np237 | 2.51E+01 | 9.82E+01 | 1.87E+02 | 2.61E+02 |
| 12 | 60143.50C | nd143 | 4.09E+01 | 8.11E+01 | 1.11E+02 | 1.37E+02 |
| 13 | 60145.50C | nd145 | 2.85E+01 | 5.91E+01 | 8.44E+01 | 1.12E+02 |
| 14 | 62147.50C | sm147 | 1.51E+01 | 2.77E+01 | 3.52E+01 | 4.16E+01 |
| 15 | 62149.50C | sm149 | 5.65E-01 | 6.18E-01 | 6.66E-01 | 6.30E-01 |
| 16 | 62150.50C | sm150 | 8.89E+00 | 2.14E+01 | 3.39E+01 | 4.85E+01 |
| 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | 4.23E+00 | 1.01E+01 | 1.48E+01 | 2.01E+01 |
| 19 | 63153.55C | eu153 | 2.03E+00 | 6.15E+00 | 1.13E+01 | 1.80E+01 |
| 20 | 64155.50C | gd155 | 1.09E-01 | 2.58E-01 | 4.94E-01 | 8.53E-01 |
| 21 | 63151.55C | eu151 | 1.57E+00 | 2.01E+00 | 2.42E+00 | 2.53E+00 |
| 22 | 42095.50C | mo95 | 3.11E+01 | 6.53E+01 | 9.43E+01 | 1.27E+02 |
| 23 | 43099.50C | tc99 | 3.10E+01 | 6.54E+01 | 9.52E+01 | 1.29E+02 |
| 24 | 44101.50C | ru101 | 2.79E+01 | 6.09E+01 | 9.12E+01 | 1.27E+02 |
| 25 | 44103.50C | rh103 | 1.83E+01 | 3.94E+01 | 5.75E+01 | 7.59E+01 |
| 26 | 95241.50c | am241 | 2.19E-06 | 5.58E-05 | 6.64E-04 | 3.67E-03 |
| 27 | 95242.50c | am242m | 5.96E-25 | 8.53E-24 | 2.70E-23 | 4.63E-23 |
| 28 | 95243.50C | am243 | 1.44E-02 | 3.76E-01 | 1.91E+00 | 5.74E+00 |
| 29 | 47109.50C | ag109 | 9.78E-01 | 3.37E+00 | 6.54E+00 | 1.08E+01 |

**Group of Fuel Rods # 3** (Table 5.1.1.2)

**No new entries on this page**

SN No. 663E, Vol.1 maintained by Oleg Povetko

P= **55** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 1.20E-01 | 4.25E-01 | 7.50E-01 | 9.63E-01 |
| | 2 | 92234.50C | u234 | 4.62E+01 | 4.52E+01 | 5.23E+01 | 6.73E+01 |
| | 3 | 92235.50C | u235 | 4.58E+03 | 3.16E+03 | 2.21E+03 | 1.26E+03 |
| | 4 | 92236.50C | u236 | 3.72E+02 | 7.02E+02 | 9.30E+02 | 1.10E+03 |
| | 5 | 92238.50C | u238 | 1.28E+05 | 1.27E+05 | 1.25E+05 | 1.24E+05 |
| | 6 | 94238.50C | pu238 | 1.60E-24 | 1.78E-23 | 4.71E-23 | 6.51E-23 |
| | 7 | 94239.50C | pu239 | 3.74E+02 | 5.37E+02 | 6.29E+02 | 6.05E+02 |
| | 8 | 94240.50C | pu240 | 2.39E+01 | 6.60E+01 | 1.04E+02 | 1.40E+02 |
| | 9 | 94241.50C | pu241 | 6.01E-08 | 7.09E-06 | 8.65E-05 | 4.33E-04 |
| | 10 | 94242.50C | pu242 | 1.97E+00 | 1.94E+01 | 5.51E+01 | 1.16E+02 |
| **Group of Fuel Rods # 3** (Table 5.1.1.2) | 11 | 93237.55C | np237 | 4.02E+01 | 1.43E+02 | 2.52E+02 | 3.23E+02 |
| | 12 | 60143.50C | nd143 | 5.12E+01 | 9.85E+01 | 1.31E+02 | 1.53E+02 |
| | 13 | 60145.50C | nd145 | 3.60E+01 | 7.35E+01 | 1.03E+02 | 1.35E+02 |
| | 14 | 62147.50C | sm147 | 1.85E+01 | 3.24E+01 | 3.92E+01 | 4.38E+01 |
| | 15 | 62149.50C | sm149 | 6.47E-01 | 7.15E-01 | 7.68E-01 | 7.21E-01 |
| | 16 | 62150.50C | sm150 | 1.18E+01 | 2.87E+01 | 4.55E+01 | 6.42E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 5.62E+00 | 1.28E+01 | 1.84E+01 | 2.47E+01 |
| | 19 | 63153.55C | eu153 | 2.85E+00 | 8.82E+00 | 1.60E+01 | 2.48E+01 |
| | 20 | 64155.50C | gd155 | 1.35E-01 | 3.75E-01 | 7.43E-01 | 1.26E+00 |
| | 21 | 63151.55C | eu151 | 1.73E+00 | 2.20E+00 | 2.69E+00 | 2.78E+00 |
| | 22 | 42095.50C | mo95 | 3.94E+01 | 8.19E+01 | 1.17E+02 | 1.55E+02 |
| | 23 | 43099.50C | tc99 | 3.93E+01 | 8.22E+01 | 1.18E+02 | 1.58E+02 |
| | 24 | 44101.50C | ru101 | 3.57E+01 | 7.76E+01 | 1.16E+02 | 1.61E+02 |
| | 25 | 44103.50C | rh103 | 2.36E+01 | 5.00E+01 | 7.16E+01 | 9.15E+01 |
| | 26 | 95241.50c | am241 | 4.94E-06 | 2.26E-04 | 2.63E-03 | 1.31E-02 |
| | 27 | 95242.50c | am242m | 1.19E-24 | 1.32E-23 | 3.50E-23 | 4.84E-23 |
| | 28 | 95243.50C | am243 | 4.26E-02 | 9.83E-01 | 4.46E+00 | 1.22E+01 |
| | 29 | 47109.50C | ag109 | 1.45E+00 | 4.98E+00 | 9.52E+00 | 1.55E+01 |

**No new entries on this page**

P= **10** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 1.46E-02 | 5.30E-02 | 1.24E-01 | 2.24E-01 |
| | 2 | 92234.50C | u234 | 1.45E+02 | 1.41E+02 | 1.38E+02 | 1.35E+02 |
| | 3 | 92235.50C | u235 | 1.65E+04 | 1.56E+04 | 1.47E+04 | 1.38E+04 |
| | 4 | 92236.50C | u236 | 2.59E+02 | 4.68E+02 | 6.67E+02 | 8.85E+02 |
| | 5 | 92238.50C | u238 | 3.67E+05 | 3.66E+05 | 3.66E+05 | 3.65E+05 |
| | 6 | 94238.50C | pu238 | 1.46E-26 | 4.97E-25 | 3.16E-24 | 1.11E-23 |
| | 7 | 94239.50C | pu239 | 2.62E+02 | 5.05E+02 | 7.29E+02 | 8.94E+02 |
| | 8 | 94240.50C | pu240 | 3.84E+00 | 1.50E+01 | 3.05E+01 | 4.98E+01 |
| | 9 | 94241.50C | pu241 | 1.47E-12 | 2.71E-10 | 5.28E-09 | 4.00E-08 |
| | 10 | 94242.50C | pu242 | 1.12E-02 | 2.01E-01 | 9.32E-01 | 2.76E+00 |
| | 11 | 93237.55C | np237 | 4.69E+00 | 1.74E+01 | 4.11E+01 | 7.47E+01 |
| **Group of Fuel Rods # 4** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 2.82E+01 | 6.00E+01 | 8.85E+01 | 1.21E+02 |
| | 13 | 60145.50C | nd145 | 1.92E+01 | 4.13E+01 | 6.14E+01 | 8.50E+01 |
| | 14 | 62147.50C | sm147 | 1.10E+01 | 2.30E+01 | 3.33E+01 | 4.49E+01 |
| | 15 | 62149.50C | sm149 | 1.06E+00 | 1.07E+00 | 1.13E+00 | 1.10E+00 |
| | 16 | 62150.50C | sm150 | 4.67E+00 | 1.15E+01 | 1.80E+01 | 2.58E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 1.97E+00 | 5.16E+00 | 8.53E+00 | 1.28E+01 |
| | 19 | 63153.55C | eu153 | 9.76E-01 | 2.35E+00 | 3.96E+00 | 6.12E+00 |
| | 20 | 64155.50C | gd155 | 1.29E-01 | 1.99E-01 | 2.51E-01 | 3.17E-01 |
| | 21 | 63151.55C | eu151 | 1.80E+00 | 3.08E+00 | 3.90E+00 | 4.42E+00 |
| | 22 | 42095.50C | mo95 | 2.07E+01 | 4.46E+01 | 6.65E+01 | 9.22E+01 |
| | 23 | 43099.50C | tc99 | 2.05E+01 | 4.43E+01 | 6.64E+01 | 9.24E+01 |
| | 24 | 44101.50C | ru101 | 1.81E+01 | 3.94E+01 | 5.95E+01 | 8.33E+01 |
| | 25 | 44103.50C | rh103 | 1.15E+01 | 2.52E+01 | 3.82E+01 | 5.33E+01 |
| | 26 | 95241.50c | am241 | 1.13E-07 | 9.11E-07 | 2.87E-06 | 6.72E-06 |
| | 27 | 95242.50c | am242m | 1.09E-26 | 3.70E-25 | 2.35E-24 | 8.29E-24 |
| | 28 | 95243.50C | am243 | 3.77E-05 | 1.50E-03 | 1.14E-02 | 4.68E-02 |
| | 29 | 47109.50C | ag109 | 2.93E-01 | 9.15E-01 | 1.79E+00 | 2.96E+00 |

**No new entries on this page**

P= **20** MW/MTU

| # | MCNP ID | / SCALE ID | Years of Burnup: 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|
| 1 | 92233.50C | u233 | 4.76E-02 | 2.05E-01 | 4.67E-01 | 7.87E-01 |
| 2 | 92234.50C | u234 | 1.41E+02 | 1.35E+02 | 1.31E+02 | 1.29E+02 |
| 3 | 92235.50C | u235 | 1.57E+04 | 1.40E+04 | 1.25E+04 | 1.08E+04 |
| 4 | 92236.50C | u236 | 4.40E+02 | 8.46E+02 | 1.21E+03 | 1.60E+03 |
| 5 | 92238.50C | u238 | 3.66E+05 | 3.65E+05 | 3.64E+05 | 3.63E+05 |
| 6 | 94238.50C | pu238 | 1.82E-25 | 4.66E-24 | 2.31E-23 | 6.34E-23 |
| 7 | 94239.50C | pu239 | 4.89E+02 | 8.73E+02 | 1.19E+03 | 1.36E+03 |
| 8 | 94240.50C | pu240 | 1.33E+01 | 4.62E+01 | 8.58E+01 | 1.32E+02 |
| 9 | 94241.50C | pu241 | 1.77E-10 | 2.94E-08 | 5.08E-07 | 3.51E-06 |
| 10 | 94242.50C | pu242 | 1.55E-01 | 2.35E+00 | 9.30E+00 | 2.45E+01 |
| 11 | 93237.55C | np237 | 1.56E+01 | 6.83E+01 | 1.56E+02 | 2.64E+02 |
| 12 | 60143.50C | nd143 | 5.53E+01 | 1.15E+02 | 1.67E+02 | 2.23E+02 |
| 13 | 60145.50C | nd145 | 3.79E+01 | 8.06E+01 | 1.19E+02 | 1.62E+02 |
| 14 | 62147.50C | sm147 | 2.12E+01 | 4.26E+01 | 5.94E+01 | 7.74E+01 |
| 15 | 62149.50C | sm149 | 1.21E+00 | 1.27E+00 | 1.36E+00 | 1.32E+00 |
| 16 | 62150.50C | sm150 | 1.04E+01 | 2.48E+01 | 3.88E+01 | 5.55E+01 |
| 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | 4.61E+00 | 1.20E+01 | 1.91E+01 | 2.74E+01 |
| 19 | 63153.55C | eu153 | 2.14E+00 | 5.69E+00 | 1.03E+01 | 1.65E+01 |
| 20 | 64155.50C | gd155 | 1.91E-01 | 3.08E-01 | 4.56E-01 | 6.88E-01 |
| 21 | 63151.55C | eu151 | 2.96E+00 | 4.37E+00 | 5.23E+00 | 5.61E+00 |
| 22 | 42095.50C | mo95 | 4.09E+01 | 8.76E+01 | 1.29E+02 | 1.78E+02 |
| 23 | 43099.50C | tc99 | 4.07E+01 | 8.74E+01 | 1.30E+02 | 1.80E+02 |
| 24 | 44101.50C | ru101 | 3.62E+01 | 7.89E+01 | 1.19E+02 | 1.66E+02 |
| 25 | 44103.50C | rh103 | 2.33E+01 | 5.09E+01 | 7.68E+01 | 1.06E+02 |
| 26 | 95241.50c | am241 | 7.69E-07 | 5.86E-06 | 2.79E-05 | 1.28E-04 |
| 27 | 95242.50c | am242m | 1.36E-25 | 3.46E-24 | 1.72E-23 | 4.72E-23 |
| 28 | 95243.50C | am243 | 1.09E-03 | 3.75E-02 | 2.47E-01 | 9.11E-01 |
| 29 | 47109.50C | ag109 | 8.17E-01 | 2.73E+00 | 5.41E+00 | 9.03E+00 |

**Group of Fuel Rods # 4** (Table 5.1.1.2)

**No new entries on this page**

P= **30** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 1.04E-01 | 4.42E-01 | 9.33E-01 | 1.44E+00 |
| | 2 | 92234.50C | u234 | 1.38E+02 | 1.31E+02 | 1.29E+02 | 1.34E+02 |
| | 3 | 92235.50C | u235 | 1.50E+04 | 1.25E+04 | 1.05E+04 | 8.29E+03 |
| | 4 | 92236.50C | u236 | 6.18E+02 | 1.20E+03 | 1.70E+03 | 2.19E+03 |
| | 5 | 92238.50C | u238 | 3.66E+05 | 3.64E+05 | 3.62E+05 | 3.61E+05 |
| | 6 | 94238.50C | pu238 | 7.18E-25 | 1.42E-23 | 5.72E-23 | 1.28E-22 |
| | 7 | 94239.50C | pu239 | 6.85E+02 | 1.15E+03 | 1.48E+03 | 1.61E+03 |
| | 8 | 94240.50C | pu240 | 2.62E+01 | 8.36E+01 | 1.47E+02 | 2.17E+02 |
| | 9 | 94241.50C | pu241 | 2.80E-09 | 4.20E-07 | 6.55E-06 | 4.16E-05 |
| | 10 | 94242.50C | pu242 | 6.73E-01 | 8.82E+00 | 3.11E+01 | 7.53E+01 |
| **Group of Fuel Rods # 4** (Table 5.1.1.2) | 11 | 93237.55C | np237 | 3.43E+01 | 1.48E+02 | 3.13E+02 | 4.85E+02 |
| | 12 | 60143.50C | nd143 | 8.14E+01 | 1.66E+02 | 2.36E+02 | 3.06E+02 |
| | 13 | 60145.50C | nd145 | 5.62E+01 | 1.18E+02 | 1.72E+02 | 2.33E+02 |
| | 14 | 62147.50C | sm147 | 3.07E+01 | 5.94E+01 | 7.97E+01 | 9.99E+01 |
| | 15 | 62149.50C | sm149 | 1.38E+00 | 1.48E+00 | 1.60E+00 | 1.54E+00 |
| | 16 | 62150.50C | sm150 | 1.64E+01 | 3.91E+01 | 6.17E+01 | 8.85E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 7.60E+00 | 1.91E+01 | 2.91E+01 | 4.07E+01 |
| | 19 | 63153.55C | eu153 | 3.51E+00 | 1.00E+01 | 1.86E+01 | 3.00E+01 |
| | 20 | 64155.50C | gd155 | 2.39E-01 | 4.51E-01 | 7.74E-01 | 1.29E+00 |
| | 21 | 63151.55C | eu151 | 3.75E+00 | 5.11E+00 | 6.07E+00 | 6.45E+00 |
| | 22 | 42095.50C | mo95 | 6.09E+01 | 1.29E+02 | 1.89E+02 | 2.58E+02 |
| | 23 | 43099.50C | tc99 | 6.07E+01 | 1.29E+02 | 1.91E+02 | 2.62E+02 |
| | 24 | 44101.50C | ru101 | 5.43E+01 | 1.18E+02 | 1.78E+02 | 2.49E+02 |
| | 25 | 44103.50C | rh103 | 3.53E+01 | 7.67E+01 | 1.15E+02 | 1.56E+02 |
| | 26 | 95241.50c | am241 | 2.25E-06 | 2.45E-05 | 2.24E-04 | 1.30E-03 |
| | 27 | 95242.50c | am242m | 5.34E-25 | 1.05E-23 | 4.26E-23 | 9.51E-23 |
| | 28 | 95243.50C | am243 | 7.34E-03 | 2.23E-01 | 1.31E+00 | 4.40E+00 |
| | 29 | 47109.50C | ag109 | 1.53E+00 | 5.24E+00 | 1.03E+01 | 1.72E+01 |

**No new entries on this page**

P= **43** MW/MTU

| | # | MCNP ID | / SCALE ID | Years of Burnup: 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|---|
| | 1 | 92233.50C | u233 | 2.11E-01 | 8.23E-01 | 1.58E+00 | 2.23E+00 |
| | 2 | 92234.50C | u234 | 1.35E+02 | 1.28E+02 | 1.35E+02 | 1.57E+02 |
| | 3 | 92235.50C | u235 | 1.40E+04 | 1.07E+04 | 8.27E+03 | 5.66E+03 |
| | 4 | 92236.50C | u236 | 8.43E+02 | 1.62E+03 | 2.23E+03 | 2.77E+03 |
| | 5 | 92238.50C | u238 | 3.65E+05 | 3.63E+05 | 3.60E+05 | 3.57E+05 |
| | 6 | 94238.50C | pu238 | 2.21E-24 | 3.23E-23 | 1.04E-22 | 1.83E-22 |
| | 7 | 94239.50C | pu239 | 9.03E+02 | 1.40E+03 | 1.72E+03 | 1.74E+03 |
| | 8 | 94240.50C | pu240 | 4.62E+01 | 1.36E+02 | 2.26E+02 | 3.18E+02 |
| | 9 | 94241.50C | pu241 | 3.14E-08 | 4.15E-06 | 5.73E-05 | 3.25E-04 |
| | 10 | 94242.50C | pu242 | 2.35E+00 | 2.62E+01 | 8.22E+01 | 1.84E+02 |
| | 11 | 93237.55C | np237 | 7.01E+01 | 2.76E+02 | 5.30E+02 | 7.47E+02 |
| **Group of Fuel Rods # 4** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 1.14E+02 | 2.27E+02 | 3.12E+02 | 3.88E+02 |
| | 13 | 60145.50C | nd145 | 7.94E+01 | 1.65E+02 | 2.36E+02 | 3.14E+02 |
| | 14 | 62147.50C | sm147 | 4.21E+01 | 7.75E+01 | 9.89E+01 | 1.18E+02 |
| | 15 | 62149.50C | sm149 | 1.62E+00 | 1.78E+00 | 1.92E+00 | 1.83E+00 |
| | 16 | 62150.50C | sm150 | 2.47E+01 | 5.95E+01 | 9.45E+01 | 1.35E+02 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 1.17E+01 | 2.79E+01 | 4.12E+01 | 5.62E+01 |
| | 19 | 63153.55C | eu153 | 5.63E+00 | 1.70E+01 | 3.15E+01 | 5.01E+01 |
| | 20 | 64155.50C | gd155 | 3.06E-01 | 7.14E-01 | 1.37E+00 | 2.37E+00 |
| | 21 | 63151.55C | eu151 | 4.47E+00 | 5.82E+00 | 7.01E+00 | 7.39E+00 |
| | 22 | 42095.50C | mo95 | 8.65E+01 | 1.82E+02 | 2.63E+02 | 3.55E+02 |
| | 23 | 43099.50C | tc99 | 8.63E+01 | 1.82E+02 | 2.66E+02 | 3.61E+02 |
| | 24 | 44101.50C | ru101 | 7.78E+01 | 1.69E+02 | 2.55E+02 | 3.55E+02 |
| | 25 | 44103.50C | rh103 | 5.12E+01 | 1.10E+02 | 1.61E+02 | 2.14E+02 |
| | 26 | 95241.50c | am241 | 6.04E-06 | 1.48E-04 | 1.77E-03 | 9.86E-03 |
| | 27 | 95242.50c | am242m | 1.64E-24 | 2.40E-23 | 7.76E-23 | 1.36E-22 |
| | 28 | 95243.50C | am243 | 3.82E-02 | 1.00E+00 | 5.14E+00 | 1.55E+01 |
| | 29 | 47109.50C | ag109 | 2.72E+00 | 9.34E+00 | 1.82E+01 | 3.00E+01 |

**No new entries on this page**

SN No. 663E, Vol.1 maintained by Oleg Povetko

P= **55** MW/MTU

| # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|
| | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| 1 | 92233.50C | u233 | 3.37E-01 | 1.20E+00 | 2.14E+00 | 2.78E+00 |
| 2 | 92234.50C | u234 | 1.32E+02 | 1.29E+02 | 1.49E+02 | 1.91E+02 |
| 3 | 92235.50C | u235 | 1.32E+04 | 9.26E+03 | 6.54E+03 | 3.85E+03 |
| 4 | 92236.50C | u236 | 1.04E+03 | 1.97E+03 | 2.63E+03 | 3.13E+03 |
| 5 | 92238.50C | u238 | 3.65E+05 | 3.62E+05 | 3.58E+05 | 3.54E+05 |
| 6 | 94238.50C | pu238 | 4.43E-24 | 5.07E-23 | 1.37E-22 | 1.95E-22 |
| 7 | 94239.50C | pu239 | 1.07E+03 | 1.56E+03 | 1.84E+03 | 1.79E+03 |
| 8 | 94240.50C | pu240 | 6.65E+01 | 1.85E+02 | 2.94E+02 | 3.96E+02 |
| 9 | 94241.50C | pu241 | 1.58E-07 | 1.87E-05 | 2.32E-04 | 1.18E-03 |
| 10 | 94242.50C | pu242 | 5.28E+00 | 5.23E+01 | 1.50E+02 | 3.16E+02 |
| 11 | 93237.55C | np237 | 1.13E+02 | 4.03E+02 | 7.18E+02 | 9.32E+02 |
| 12 | 60143.50C | nd143 | 1.43E+02 | 2.76E+02 | 3.70E+02 | 4.36E+02 |
| 13 | 60145.50C | nd145 | 1.00E+02 | 2.05E+02 | 2.90E+02 | 3.79E+02 |
| 14 | 62147.50C | sm147 | 5.16E+01 | 9.08E+01 | 1.11E+02 | 1.25E+02 |
| 15 | 62149.50C | sm149 | 1.85E+00 | 2.05E+00 | 2.22E+00 | 2.09E+00 |
| 16 | 62150.50C | sm150 | 3.27E+01 | 7.98E+01 | 1.27E+02 | 1.80E+02 |
| 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | 1.56E+01 | 3.56E+01 | 5.14E+01 | 6.92E+01 |
| 19 | 63153.55C | eu153 | 7.90E+00 | 2.44E+01 | 4.46E+01 | 6.92E+01 |
| 20 | 64155.50C | gd155 | 3.78E-01 | 1.04E+00 | 2.06E+00 | 3.51E+00 |
| 21 | 63151.55C | eu151 | 4.96E+00 | 6.38E+00 | 7.82E+00 | 8.16E+00 |
| 22 | 42095.50C | mo95 | 1.10E+02 | 2.28E+02 | 3.28E+02 | 4.36E+02 |
| 23 | 43099.50C | tc99 | 1.10E+02 | 2.29E+02 | 3.31E+02 | 4.43E+02 |
| 24 | 44101.50C | ru101 | 9.94E+01 | 2.16E+02 | 3.24E+02 | 4.51E+02 |
| 25 | 44103.50C | rh103 | 6.59E+01 | 1.40E+02 | 2.01E+02 | 2.59E+02 |
| 26 | 95241.50c | am241 | 1.35E-05 | 5.99E-04 | 7.06E-03 | 3.56E-02 |
| 27 | 95242.50c | am242m | 3.30E-24 | 3.77E-23 | 1.02E-22 | 1.45E-22 |
| 28 | 95243.50C | am243 | 1.14E-01 | 2.63E+00 | 1.21E+01 | 3.33E+01 |
| 29 | 47109.50C | ag109 | 4.03E+00 | 1.38E+01 | 2.65E+01 | 4.32E+01 |

**Group of Fuel Rods # 4** (Table 5.1.1.2)

**No new entries on this page**

P= **10** MW/MTU

| # | MCNP ID | / SCALE ID | | | | |
|---|---|---|---|---|---|---|
| | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| 1 | 92233.50C | u233 | 5.76E-03 | 2.09E-02 | 4.89E-02 | 8.82E-02 |
| 2 | 92234.50C | u234 | 5.79E+01 | 5.64E+01 | 5.51E+01 | 5.39E+01 |
| 3 | 92235.50C | u235 | 6.60E+03 | 6.24E+03 | 5.91E+03 | 5.54E+03 |
| 4 | 92236.50C | u236 | 1.03E+02 | 1.85E+02 | 2.64E+02 | 3.50E+02 |
| 5 | 92238.50C | u238 | 1.47E+05 | 1.46E+05 | 1.46E+05 | 1.46E+05 |
| 6 | 94238.50C | pu238 | 5.63E-27 | 1.92E-25 | 1.23E-24 | 4.35E-24 |
| 7 | 94239.50C | pu239 | 1.05E+02 | 2.02E+02 | 2.92E+02 | 3.59E+02 |
| 8 | 94240.50C | pu240 | 1.51E+00 | 5.89E+00 | 1.20E+01 | 1.96E+01 |
| 9 | 94241.50C | pu241 | 5.53E-13 | 1.02E-10 | 2.00E-09 | 1.51E-08 |
| 10 | 94242.50C | pu242 | 4.28E-03 | 7.68E-02 | 3.58E-01 | 1.06E+00 |
| 11 | 93237.55C | np237 | 1.86E+00 | 6.85E+00 | 1.62E+01 | 2.94E+01 |
| 12 | 60143.50C | nd143 | 1.11E+01 | 2.36E+01 | 3.49E+01 | 4.76E+01 |
| 13 | 60145.50C | nd145 | 7.55E+00 | 1.62E+01 | 2.42E+01 | 3.34E+01 |
| 14 | 62147.50C | sm147 | 4.32E+00 | 9.03E+00 | 1.31E+01 | 1.77E+01 |
| 15 | 62149.50C | sm149 | 4.25E-01 | 4.33E-01 | 4.55E-01 | 4.45E-01 |
| 16 | 62150.50C | sm150 | 1.83E+00 | 4.51E+00 | 7.07E+00 | 1.01E+01 |
| 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | 7.71E-01 | 2.02E+00 | 3.34E+00 | 5.02E+00 |
| 19 | 63153.55C | eu153 | 3.84E-01 | 9.23E-01 | 1.56E+00 | 2.40E+00 |
| 20 | 64155.50C | gd155 | 5.10E-02 | 7.89E-02 | 9.97E-02 | 1.25E-01 |
| 21 | 63151.55C | eu151 | 7.12E-01 | 1.22E+00 | 1.56E+00 | 1.77E+00 |
| 22 | 42095.50C | mo95 | 8.12E+00 | 1.75E+01 | 2.61E+01 | 3.62E+01 |
| 23 | 43099.50C | tc99 | 8.06E+00 | 1.74E+01 | 2.61E+01 | 3.63E+01 |
| 24 | 44101.50C | ru101 | 7.11E+00 | 1.55E+01 | 2.34E+01 | 3.27E+01 |
| 25 | 44103.50C | rh103 | 4.52E+00 | 9.89E+00 | 1.50E+01 | 2.10E+01 |
| 26 | 95241.50c | am241 | 4.41E-08 | 3.56E-07 | 1.12E-06 | 2.62E-06 |
| 27 | 95242.50c | am242m | 4.19E-27 | 1.43E-25 | 9.15E-25 | 3.23E-24 |
| 28 | 95243.50C | am243 | 1.44E-05 | 5.69E-04 | 4.33E-03 | 1.78E-02 |
| 29 | 47109.50C | ag109 | 1.15E-01 | 3.59E-01 | 7.03E-01 | 1.16E+00 |

**Group of Fuel Rods # 5** (Table 5.1.1.2)

**No new entries on this page**

SN No. 663E, Vol.1 maintained by Oleg Povetko

P= **20** MW/MTU

| # | MCNP ID | / SCALE ID | Years of Burnup: 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|
| 1 | 92233.50C | u233 | 1.88E-02 | 8.07E-02 | 1.85E-01 | 3.11E-01 |
| 2 | 92234.50C | u234 | 5.66E+01 | 5.41E+01 | 5.23E+01 | 5.17E+01 |
| 3 | 92235.50C | u235 | 6.29E+03 | 5.61E+03 | 5.03E+03 | 4.37E+03 |
| 4 | 92236.50C | u236 | 1.74E+02 | 3.34E+02 | 4.80E+02 | 6.31E+02 |
| 5 | 92238.50C | u238 | 1.47E+05 | 1.46E+05 | 1.46E+05 | 1.45E+05 |
| 6 | 94238.50C | pu238 | 7.05E-26 | 1.82E-24 | 9.07E-24 | 2.51E-23 |
| 7 | 94239.50C | pu239 | 1.95E+02 | 3.50E+02 | 4.78E+02 | 5.50E+02 |
| 8 | 94240.50C | pu240 | 5.23E+00 | 1.81E+01 | 3.38E+01 | 5.20E+01 |
| 9 | 94241.50C | pu241 | 6.69E-11 | 1.11E-08 | 1.93E-07 | 1.33E-06 |
| 10 | 94242.50C | pu242 | 5.93E-02 | 8.99E-01 | 3.58E+00 | 9.41E+00 |
| 11 | 93237.55C | np237 | 6.15E+00 | 2.69E+01 | 6.18E+01 | 1.04E+02 |
| 12 | 60143.50C | nd143 | 2.17E+01 | 4.53E+01 | 6.57E+01 | 8.77E+01 |
| 13 | 60145.50C | nd145 | 1.49E+01 | 3.17E+01 | 4.67E+01 | 6.38E+01 |
| 14 | 62147.50C | sm147 | 8.33E+00 | 1.68E+01 | 2.34E+01 | 3.05E+01 |
| 15 | 62149.50C | sm149 | 4.87E-01 | 5.11E-01 | 5.48E-01 | 5.35E-01 |
| 16 | 62150.50C | sm150 | 4.09E+00 | 9.71E+00 | 1.52E+01 | 2.18E+01 |
| 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | 1.80E+00 | 4.69E+00 | 7.47E+00 | 1.08E+01 |
| 19 | 63153.55C | eu153 | 8.40E-01 | 2.23E+00 | 4.03E+00 | 6.47E+00 |
| 20 | 64155.50C | gd155 | 7.58E-02 | 1.22E-01 | 1.80E-01 | 2.70E-01 |
| 21 | 63151.55C | eu151 | 1.18E+00 | 1.75E+00 | 2.10E+00 | 2.26E+00 |
| 22 | 42095.50C | mo95 | 1.61E+01 | 3.44E+01 | 5.09E+01 | 7.00E+01 |
| 23 | 43099.50C | tc99 | 1.60E+01 | 3.43E+01 | 5.12E+01 | 7.06E+01 |
| 24 | 44101.50C | ru101 | 1.42E+01 | 3.10E+01 | 4.68E+01 | 6.54E+01 |
| 25 | 44103.50C | rh103 | 9.17E+00 | 2.00E+01 | 3.03E+01 | 4.17E+01 |
| 26 | 95241.50c | am241 | 3.01E-07 | 2.28E-06 | 1.08E-05 | 4.89E-05 |
| 27 | 95242.50c | am242m | 5.25E-26 | 1.35E-24 | 6.75E-24 | 1.87E-23 |
| 28 | 95243.50C | am243 | 4.13E-04 | 1.43E-02 | 9.45E-02 | 3.48E-01 |
| 29 | 47109.50C | ag109 | 3.21E-01 | 1.07E+00 | 2.13E+00 | 3.54E+00 |

**Group of Fuel Rods # 5** (Table 5.1.1.2)

**No new entries on this page**

P= **30** MW/MTU

| # | MCNP ID | / SCALE ID | Years of Burnup: | 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|---|
| 1 | 92233.50C | u233 | | 4.09E-02 | 1.74E-01 | 3.70E-01 | 5.75E-01 |
| 2 | 92234.50C | u234 | | 5.54E+01 | 5.24E+01 | 5.15E+01 | 5.36E+01 |
| 3 | 92235.50C | u235 | | 6.00E+03 | 5.03E+03 | 4.25E+03 | 3.38E+03 |
| 4 | 92236.50C | u236 | | 2.44E+02 | 4.74E+02 | 6.71E+02 | 8.65E+02 |
| 5 | 92238.50C | u238 | | 1.46E+05 | 1.46E+05 | 1.45E+05 | 1.44E+05 |
| 6 | 94238.50C | pu238 | | 2.79E-25 | 5.56E-24 | 2.27E-23 | 5.14E-23 |
| 7 | 94239.50C | pu239 | | 2.74E+02 | 4.61E+02 | 6.00E+02 | 6.52E+02 |
| 8 | 94240.50C | pu240 | | 1.03E+01 | 3.29E+01 | 5.80E+01 | 8.57E+01 |
| 9 | 94241.50C | pu241 | | 1.06E-09 | 1.59E-07 | 2.50E-06 | 1.59E-05 |
| 10 | 94242.50C | pu242 | | 2.58E-01 | 3.38E+00 | 1.20E+01 | 2.90E+01 |
| 11 | 93237.55C | np237 | | 1.35E+01 | 5.83E+01 | 1.24E+02 | 1.93E+02 |
| 12 | 60143.50C | nd143 | | 3.20E+01 | 6.55E+01 | 9.30E+01 | 1.21E+02 |
| 13 | 60145.50C | nd145 | | 2.21E+01 | 4.64E+01 | 6.77E+01 | 9.15E+01 |
| 14 | 62147.50C | sm147 | | 1.21E+01 | 2.34E+01 | 3.14E+01 | 3.94E+01 |
| 15 | 62149.50C | sm149 | | 5.54E-01 | 5.97E-01 | 6.47E-01 | 6.25E-01 |
| 16 | 62150.50C | sm150 | | 6.45E+00 | 1.53E+01 | 2.43E+01 | 3.47E+01 |
| 17 | 62151.50C | sm151 | | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | | 2.97E+00 | 7.45E+00 | 1.14E+01 | 1.60E+01 |
| 19 | 63153.55C | eu153 | | 1.38E+00 | 3.93E+00 | 7.29E+00 | 1.18E+01 |
| 20 | 64155.50C | gd155 | | 9.49E-02 | 1.78E-01 | 3.04E-01 | 5.05E-01 |
| 21 | 63151.55C | eu151 | | 1.50E+00 | 2.05E+00 | 2.45E+00 | 2.61E+00 |
| 22 | 42095.50C | mo95 | | 2.40E+01 | 5.08E+01 | 7.46E+01 | 1.02E+02 |
| 23 | 43099.50C | tc99 | | 2.39E+01 | 5.08E+01 | 7.52E+01 | 1.03E+02 |
| 24 | 44101.50C | ru101 | | 2.13E+01 | 4.65E+01 | 7.01E+01 | 9.79E+01 |
| 25 | 44103.50C | rh103 | | 1.39E+01 | 3.02E+01 | 4.52E+01 | 6.13E+01 |
| 26 | 95241.50c | am241 | | 8.79E-07 | 9.44E-06 | 8.56E-05 | 4.95E-04 |
| 27 | 95242.50c | am242m | | 2.08E-25 | 4.14E-24 | 1.69E-23 | 3.82E-23 |
| 28 | 95243.50C | am243 | | 2.80E-03 | 8.51E-02 | 5.02E-01 | 1.68E+00 |
| 29 | 47109.50C | ag109 | | 6.03E-01 | 2.06E+00 | 4.06E+00 | 6.74E+00 |

**Group of Fuel Rods # 5** (Table 5.1.1.2)

**No new entries on this page**

P= **43** MW/MTU

| # | MCNP ID | / SCALE ID | Years of Burnup: | 0.551951 | 1.20493 | 1.81456 | 2.54511 |
|---|---|---|---|---|---|---|---|
| 1 | 92233.50C | u233 | | 8.30E-02 | 3.26E-01 | 6.29E-01 | 8.94E-01 |
| 2 | 92234.50C | u234 | | 5.39E+01 | 5.13E+01 | 5.39E+01 | 6.26E+01 |
| 3 | 92235.50C | u235 | | 5.63E+03 | 4.34E+03 | 3.37E+03 | 2.34E+03 |
| 4 | 92236.50C | u236 | | 3.33E+02 | 6.41E+02 | 8.83E+02 | 1.10E+03 |
| 5 | 92238.50C | u238 | | 1.46E+05 | 1.45E+05 | 1.44E+05 | 1.43E+05 |
| 6 | 94238.50C | pu238 | | 8.62E-25 | 1.28E-23 | 4.20E-23 | 7.50E-23 |
| 7 | 94239.50C | pu239 | | 3.62E+02 | 5.65E+02 | 6.98E+02 | 7.14E+02 |
| 8 | 94240.50C | pu240 | | 1.82E+01 | 5.35E+01 | 8.95E+01 | 1.26E+02 |
| 9 | 94241.50C | pu241 | | 1.19E-08 | 1.58E-06 | 2.20E-05 | 1.25E-04 |
| 10 | 94242.50C | pu242 | | 9.02E-01 | 1.01E+01 | 3.18E+01 | 7.09E+01 |
| 11 | 93237.55C | np237 | | 2.76E+01 | 1.09E+02 | 2.11E+02 | 3.00E+02 |
| 12 | 60143.50C | nd143 | | 4.49E+01 | 8.93E+01 | 1.24E+02 | 1.54E+02 |
| 13 | 60145.50C | nd145 | | 3.12E+01 | 6.47E+01 | 9.31E+01 | 1.24E+02 |
| 14 | 62147.50C | sm147 | | 1.66E+01 | 3.05E+01 | 3.90E+01 | 4.65E+01 |
| 15 | 62149.50C | sm149 | | 6.48E-01 | 7.14E-01 | 7.77E-01 | 7.42E-01 |
| 16 | 62150.50C | sm150 | | 9.69E+00 | 2.33E+01 | 3.72E+01 | 5.32E+01 |
| 17 | 62151.50C | sm151 | | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 18 | 62152.50C | sm152 | | 4.59E+00 | 1.09E+01 | 1.62E+01 | 2.21E+01 |
| 19 | 63153.55C | eu153 | | 2.21E+00 | 6.66E+00 | 1.24E+01 | 1.97E+01 |
| 20 | 64155.50C | gd155 | | 1.21E-01 | 2.80E-01 | 5.37E-01 | 9.28E-01 |
| 21 | 63151.55C | eu151 | | 1.79E+00 | 2.34E+00 | 2.84E+00 | 3.01E+00 |
| 22 | 42095.50C | mo95 | | 3.40E+01 | 7.14E+01 | 1.04E+02 | 1.40E+02 |
| 23 | 43099.50C | tc99 | | 3.40E+01 | 7.16E+01 | 1.05E+02 | 1.42E+02 |
| 24 | 44101.50C | ru101 | | 3.06E+01 | 6.66E+01 | 1.00E+02 | 1.40E+02 |
| 25 | 44103.50C | rh103 | | 2.01E+01 | 4.33E+01 | 6.37E+01 | 8.45E+01 |
| 26 | 95241.50c | am241 | | 2.36E-06 | 5.67E-05 | 6.79E-04 | 3.80E-03 |
| 27 | 95242.50c | am242m | | 6.41E-25 | 9.53E-24 | 3.12E-23 | 5.58E-23 |
| 28 | 95243.50C | am243 | | 1.46E-02 | 3.83E-01 | 1.98E+00 | 5.97E+00 |
| 29 | 47109.50C | ag109 | | 1.07E+00 | 3.67E+00 | 7.16E+00 | 1.18E+01 |

**Group of Fuel Rods # 5** (Table 5.1.1.2)

**No new entries on this page**

P= **55** MW/MTU

| | # | MCNP ID / | SCALE ID | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Years of Burnup:** | **0.551951** | **1.20493** | **1.81456** | **2.54511** |
| | 1 | 92233.50C | u233 | 1.33E-01 | 4.77E-01 | 8.56E-01 | 1.12E+00 |
| | 2 | 92234.50C | u234 | 5.29E+01 | 5.16E+01 | 5.94E+01 | 7.63E+01 |
| | 3 | 92235.50C | u235 | 5.31E+03 | 3.76E+03 | 2.68E+03 | 1.62E+03 |
| | 4 | 92236.50C | u236 | 4.12E+02 | 7.79E+02 | 1.04E+03 | 1.25E+03 |
| | 5 | 92238.50C | u238 | 1.46E+05 | 1.45E+05 | 1.43E+05 | 1.42E+05 |
| | 6 | 94238.50C | pu238 | 1.74E-24 | 2.03E-23 | 5.58E-23 | 8.14E-23 |
| | 7 | 94239.50C | pu239 | 4.31E+02 | 6.32E+02 | 7.51E+02 | 7.35E+02 |
| | 8 | 94240.50C | pu240 | 2.62E+01 | 7.28E+01 | 1.17E+02 | 1.58E+02 |
| | 9 | 94241.50C | pu241 | 5.99E-08 | 7.14E-06 | 8.94E-05 | 4.58E-04 |
| | 10 | 94242.50C | pu242 | 2.03E+00 | 2.01E+01 | 5.82E+01 | 1.23E+02 |
| | 11 | 93237.55C | np237 | 4.44E+01 | 1.60E+02 | 2.87E+02 | 3.77E+02 |
| **Group of Fuel Rods # 5** (Table 5.1.1.2) | 12 | 60143.50C | nd143 | 5.62E+01 | 1.09E+02 | 1.47E+02 | 1.75E+02 |
| | 13 | 60145.50C | nd145 | 3.94E+01 | 8.07E+01 | 1.14E+02 | 1.50E+02 |
| | 14 | 62147.50C | sm147 | 2.03E+01 | 3.58E+01 | 4.37E+01 | 4.94E+01 |
| | 15 | 62149.50C | sm149 | 7.41E-01 | 8.26E-01 | 8.97E-01 | 8.50E-01 |
| | 16 | 62150.50C | sm150 | 1.28E+01 | 3.13E+01 | 4.99E+01 | 7.08E+01 |
| | 17 | 62151.50C | sm151 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| | 18 | 62152.50C | sm152 | 6.09E+00 | 1.40E+01 | 2.02E+01 | 2.72E+01 |
| | 19 | 63153.55C | eu153 | 3.10E+00 | 9.58E+00 | 1.75E+01 | 2.72E+01 |
| | 20 | 64155.50C | gd155 | 1.49E-01 | 4.05E-01 | 8.10E-01 | 1.38E+00 |
| | 21 | 63151.55C | eu151 | 1.99E+00 | 2.58E+00 | 3.17E+00 | 3.33E+00 |
| | 22 | 42095.50C | mo95 | 4.31E+01 | 8.97E+01 | 1.29E+02 | 1.72E+02 |
| | 23 | 43099.50C | tc99 | 4.31E+01 | 9.01E+01 | 1.31E+02 | 1.75E+02 |
| | 24 | 44101.50C | ru101 | 3.91E+01 | 8.50E+01 | 1.28E+02 | 1.78E+02 |
| | 25 | 44103.50C | rh103 | 2.59E+01 | 5.51E+01 | 7.97E+01 | 1.03E+02 |
| | 26 | 95241.50c | am241 | 5.23E-06 | 2.29E-04 | 2.72E-03 | 1.38E-02 |
| | 27 | 95242.50c | am242m | 1.29E-24 | 1.51E-23 | 4.15E-23 | 6.06E-23 |
| | 28 | 95243.50C | am243 | 4.34E-02 | 1.01E+00 | 4.66E+00 | 1.29E+01 |
| | 29 | 47109.50C | ag109 | 1.58E+00 | 5.42E+00 | 1.04E+01 | 1.70E+01 |

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#12022007

Critica Limits (CL) and Upper Subcritical Limits (USL) calculations results for the Loading Curve evaluation:

**5% Enrichment (File Loading Curve December 2007.xlsx, sheet "5 % Enrichment"):**

| Postclosure Burnup (GWd/ MTU) | AENCF | CL(AENCF) | Preclosure Burnup (GWd/ MTU) | AENCF | USL (AENCF) |
|---|---|---|---|---|---|
| 10 | 0.1689 | 0.981423 | 10 | 0.1689 | 0.931423 |
| 15 | 0.1755 | 0.98101 | 15 | 0.1741 | 0.931098 |
| 20 | 0.1824 | 0.980578 | 20 | 0.1812 | 0.930653 |
| 25 | 0.1874 | 0.980265 | 25 | 0.1864 | 0.930328 |
| 30 | 0.1936 | 0.979877 | 30 | 0.1928 | 0.929927 |
| 35 | 0.2004 | 0.979451 | 35 | 0.1994 | 0.929514 |
| 40 | 0.2047 | 0.979182 | 40 | 0.2036 | 0.929251 |
| 45 | 0.2125 | 0.978693 | 45 | 0.2101 | 0.928844 |

**4.5% Enrichment: (File Loading Curve December 2007.xlsx, sheet "4.5 % Enrichment"):**

| Postclosure Burnup (GWd/ MTU) | AENCF | CL(AENCF) | Preclosure Burnup (GWd/ MTU) | AENCF | USL (AENCF) |
|---|---|---|---|---|---|
| 5 | 0.1661 | 0.981599 | 5 | 0.1654 | 0.931643 |
| 10 | 0.1727 | 0.981186 | 10 | 0.172 | 0.931229 |
| 15 | 0.1793 | 0.980772 | 15 | 0.1786 | 0.930816 |
| 20 | 0.1863 | 0.980334 | 20 | 0.1855 | 0.930384 |
| 25 | 0.1918 | 0.979989 | 25 | 0.1918 | 0.929989 |
| 30 | 0.1982 | 0.979589 | 30 | 0.1977 | 0.92962 |
| 35 | 0.2067 | 0.979056 | 35 | 0.2044 | 0.9292 |
| 40 | 0.2107 | 0.978806 | 40 | 0.2104 | 0.928825 |
| 45 | 0.2187 | 0.978305 | 45 | 0.2188 | 0.928299 |

No new entries on this page.

**4.2% Enrichment: (File Loading Curve December 2007.xlsx, sheet "4.2 % Enrichment"):**

| Postclosure Burnup (GWd/ MTU) | AENCF | CL(AENCF) | Preclosure Burnup (GWd/ MTU) | AENCF | USL (AENCF) |
|---|---|---|---|---|---|
| 5 | 0.17 | 0.981355 | 5 | 0.1669 | 0.931549 |
| 10 | 0.1763 | 0.98096 | 10 | 0.1739 | 0.93111 |
| 15 | 0.1841 | 0.980472 | 15 | 0.1809 | 0.930672 |
| 20 | 0.1915 | 0.980008 | 20 | 0.18795 | 0.930231 |
| 25 | 0.1979 | 0.979608 | 25 | 0.1942 | 0.929839 |
| 30 | 0.2044 | 0.9792 | 30 | 0.2006 | 0.929438 |
| 35 | 0.2126 | 0.978687 | 35 | 0.20805 | 0.928972 |
| 40 | 0.218 | 0.978349 | 40 | 0.21375 | 0.928615 |
| 45 | 0.2257 | 0.977867 | 45 | 0.22195 | 0.928101 |

**2.83% Enrichment: (File Loading Curve December 2007.xlsx, sheet "2.83 % Enrichment"):**

| Postclosure Burnup (GWd/ MTU) | AENCF | CL(AENCF) | Preclosure Burnup (GWd/ MTU) | AENCF | USL (AENCF) |
|---|---|---|---|---|---|
| | | | 5 | 0.18225 | 0.930588 |
| 10 | 0.1885 | 0.980196 | 10 | 0.19205 | 0.929974 |
| 15 | 0.1983 | 0.979582 | 15 | 0.20185 | 0.92936 |
| 20 | 0.2067 | 0.979056 | 20 | 0.211 | 0.928787 |
| 25 | 0.2136 | 0.978624 | 25 | 0.21895 | 0.928289 |
| 30 | 0.2215 | 0.97813 | 30 | 0.2273 | 0.927766 |
| 35 | 0.231 | 0.977535 | 35 | 0.236 | 0.927222 |
| 40 | 0.2379 | 0.977103 | 40 | 0.2434 | 0.926758 |

No new entries on this page.

#12032007

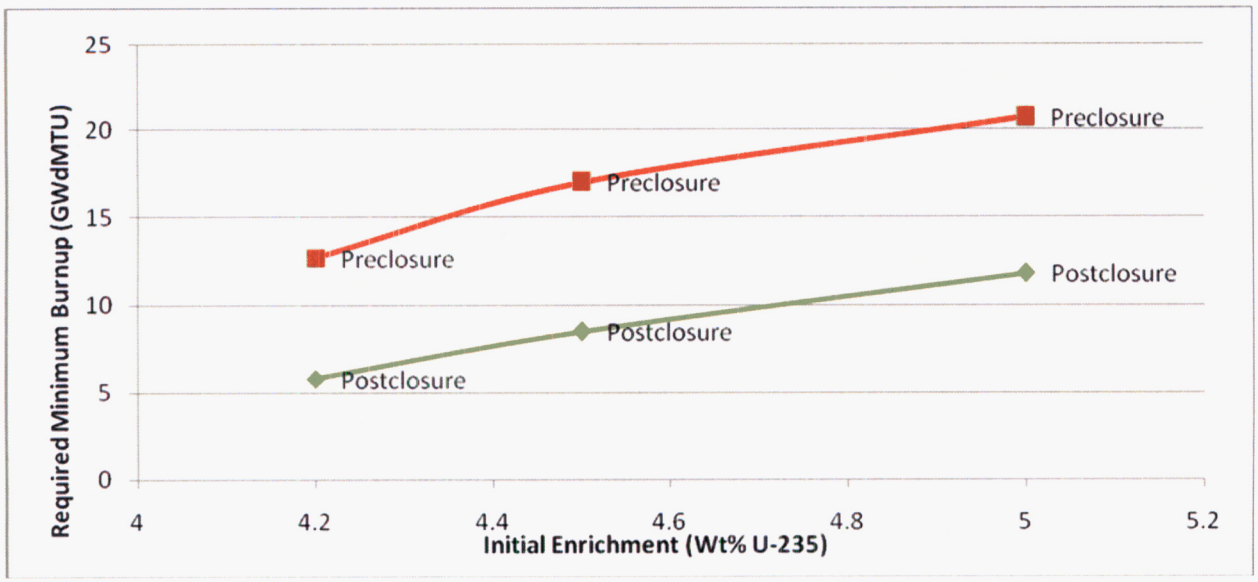
Loading Curve for the Postclosure and Preclosure periods (see Loading Curve December 2007.xlsx, sheet "Loading Curve")

**Postclosure:**

| Initial Enrichment Wt% U-235 | Required Minimum Burnup GWdMTU |
|---|---|
| 4.2 | 5.8 |
| 4.5 | 8.5 |
| 5 | 11.8 |

**Preclosure:**

| Initial Enrichment Wt% U-235 | Required Minimum Burnup GWdMTU |
|---|---|
| 4.2 | 12.7 |
| 4.5 | 17 |
| 5 | 20.7 |

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#12042007 #12052007

**Work Plan for Milestone 14002.01.181.830 (Gap 11)**
Conducted sensitivity analyses for burnup credit for the corresponding loading curve:

# Assembly Misloading

MCNP Calculation Cases
**Base case 1:** All assemblies in a TAD are filled with the same universe (Universe #56);
**Base case 2:** Central Assembly is filled with its own, different universe (Universe #57), but inputted parameters for the Universe #57 is completely the same as for the Universe #56, so the physical properties of the central and all the others assemblies are the same.

| MCNP case | Enrichment | Burnup | Central Assembly Enrichment | Central Assembly Burnup |
|---|---|---|---|---|
| | Wt % U-235 | gWd/MT U | Wt % U-235 | gWd/MT U |
| **5% Enrichment, Burnup 20.7 Gwd/MTU:** | | | | |
| TAD_A7_F5_W5_APB11_B20p7 (Base Case) All assemblies in a TAD are the same | 5 | 20.7 | - | - |
| TAD_A7_F5_W5_APB11_B20p7_Misload_ (Base Case) Additional Input for the Central Assembly | 5 | 20.7 | 5 | 20.7 |
| TAD_A7_F5_W5_APB11_B20p7_Misload_0B | 5 | 20.7 | 5 | 0 |
| TAD_A7_F5_W5_APB11_B20p7_Misload_9B | 5 | 20.7 | 5 | 9 |
| **4.5% Enrichment, Burnup 17 Gwd/MTU:** | | | | |
| TAD_A7_F5_W45_APB11_B17 (Base Case) All assemblies in a TAD are the same | 4.5 | 17 | - | - |
| TAD_A7_F5_W45_APB11_B17_Misload_ (Base Case) Additional Input for the Central Assembly | 4.5 | 17 | 4.5 | 17 |
| TAD_A7_F5_W45_APB11_B17_Misload_0B | 4.5 | 17 | 4.5 | 0 |
| TAD_A7_F5_W45_APB11_B17_Misload_9B | 4.5 | 17 | 4.5 | 9 |
| **4.2% Enrichment, Burnup 12.7 Gwd/MTU:** | | | | |
| TAD_A7_F5_W42_APB11_B12p7 (Base Case) All assemblies in a TAD are the same | 4.2 | 12.7 | - | - |
| TAD_A7_F5_W42_APB11_B12p7_Misload_ (Base Case) Additional Input for the Central Assembly | 4.2 | 12.7 | 4.2 | 12.7 |
| TAD_A7_F5_W42_APB11_B12p7_Misload_0B | 4.2 | 12.7 | 4.2 | 0 |

No new entries on this page.

Misleading Assembly Calculation Results
(see SN December 2007 Postclosure.xlsx, Sheet "Misleading Assembly")

| MCNP case | $K_{eff}$ ($\sigma$) | Reactivity ($*10^4$) |
|---|---|---|
| **5% Enrichment, Burnup 20.7 Gwd/MTU:** | | |
| TAD_A7_F5_W5_APB11_B20p7 | 0.92478 (0.00243) | - |
| TAD_A7_F5_W5_APB11_B20p7_Misload_ | 0.92074 (0.00188) | - |
| TAD_A7_F5_W5_APB11_B20p7_Misload_0B | 0.95872 (0.00203) | 430 |
| TAD_A7_F5_W5_APB11_B20p7_Misload_9B | 0.93226 (0.00196) | 134 |
| **4.5% Enrichment, Burnup 17 Gwd/MTU:** | | |
| TAD_A7_F5_W45_APB11_B17 | 0.92164 (0.00213) | - |
| TAD_A7_F5_W45_APB11_B17_Misload_ | 0.91872 (0.00215) | - |
| TAD_A7_F5_W45_APB11_B17_Misload_0B | 0.94973 (0.00211) | 355 |
| TAD_A7_F5_W45_APB11_B17_Misload_9B | 0.93065 (0.00250) | 140 |
| **4.2% Enrichment, Burnup 12.7 Gwd/MTU:** | | |
| TAD_A7_F5_W42_APB11_B12p7 | 0.93603 (0.00194) | - |
| TAD_A7_F5_W42_APB11_B12p7_Misload_ | 0.93372 (0.00231) | - |
| TAD_A7_F5_W42_APB11_B12p7_Misload_0B | 0.95466 (0.00196) | 235 |

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Notebook closed 5/20/09
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JRW. 6/11/09

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