# Appendix A

Data for PWR reactor models R1–R3.

Table 1. Axial Fuel Zone Description

|  |  |  |  |
| --- | --- | --- | --- |
| Zone Number | Bottom of Zone\* | Midpoint of Zone\* | Top of Zone\* |
| 1 | 0.00 | 10.16 | 20.32 |
| 2 | 20.32 | 30.48 | 40.64 |
| 3 | 40.64 | 50.80 | 60.96 |
| 4 | 60.96 | 71.12 | 81.28 |
| 5 | 81.28 | 91.44 | 101.60 |
| 6 | 101.60 | 111.76 | 121.92 |
| 7 | 121.92 | 132.08 | 142.24 |
| 8 | 142.24 | 152.40 | 162.56 |
| 9 | 162.56 | 172.72 | 182.88 |
| 10 | 182.88 | 193.04 | 203.20 |
| 11 | 203.20 | 213.36 | 223.52 |
| 12 | 223.52 | 233.68 | 243.84 |
| 13 | 243.84 | 254.00 | 264.16 |
| 14 | 264.16 | 274.32 | 284.48 |
| 15 | 284.48 | 294.64 | 304.80 |
| 16 | 304.80 | 314.96 | 325.12 |
| 17 | 325.12 | 335.28 | 345.44 |
| 18 | 345.44 | 355.60 | 365.76 |

\*Dimensions provided from bottom of active fuel

Table 2. Isotopic Number Densities for Fuel Zone 1

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 1.3917E-08 |
| U-235 | 5.2863E-04 |
| U-236 | 5.4489E-05 |
| U-238 | 2.2448E-02 |
| Np-237 | 2.5563E-06 |
| Pu-238 | 2.9206E-07 |
| Pu-239 | 9.4821E-05 |
| Pu-240 | 1.7950E-05 |
| Pu-241 | 7.9319E-06 |
| Pu-242 | 8.7872E-07 |
| Am-241 | 1.3783E-07 |
| Am-243 | 6.2665E-08 |
| Mo-95 | 1.4043E-05 |
| Tc-99 | 1.9233E-05 |
| Ru-101 | 1.7102E-05 |
| Rh-103 | 9.5666E-06 |
| Ag-109 | 8.7516E-07 |
| Cs-133 | 2.0347E-05 |
| Xe-135 | 8.3196E-09 |
| Nd-143 | 1.5579E-05 |
| Nd-145 | 1.1642E-05 |
| Sm-147 | 8.6330E-07 |
| Sm-149 | 8.8539E-08 |
| Sm-150 | 3.8776E-06 |
| Sm-151 | 4.0376E-07 |
| Eu-151 | 6.8084E-10 |
| Sm-152 | 1.9271E-06 |
| Eu-153 | 1.0424E-06 |
| Gd-155 | 4.8232E-10 |
| O-16 | 4.6945E-02 |

Table 3. Isotopic Number Densities for Fuel Zone 2

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 1.8959E-08 |
| U-235 | 4.2766E-04 |
| U-236 | 7.1531E-05 |
| U-238 | 2.2352E-02 |
| Np-237 | 4.3767E-06 |
| Pu-238 | 7.1321E-07 |
| Pu-239 | 1.1242E-04 |
| Pu-240 | 2.8412E-05 |
| Pu-241 | 1.4723E-05 |
| Pu-242 | 2.5157E-06 |
| Am-241 | 2.5070E-07 |
| Am-243 | 2.7164E-07 |
| Mo-95 | 1.9758E-05 |
| Tc-99 | 2.7133E-05 |
| Ru-101 | 2.4619E-05 |
| Rh-103 | 1.3626E-05 |
| Ag-109 | 1.5612E-06 |
| Cs-133 | 2.8628E-05 |
| Xe-135 | 9.0267E-09 |
| Nd-143 | 2.0985E-05 |
| Nd-145 | 1.6197E-05 |
| Sm-147 | 1.1083E-06 |
| Sm-149 | 9.5585E-08 |
| Sm-150 | 5.9328E-06 |
| Sm-151 | 4.6080E-07 |
| Eu-151 | 5.3538E-10 |
| Sm-152 | 2.7972E-06 |
| Eu-153 | 1.7840E-06 |
| Gd-155 | 5.5798E-10 |
| O-16 | 4.6944E-02 |

Table 4. Isotopic Number Densities for Fuel Zone 3

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.0979E-08 |
| U-235 | 3.8896E-04 |
| U-236 | 7.7812E-05 |
| U-238 | 2.2309E-02 |
| Np-237 | 5.2287E-06 |
| Pu-238 | 9.6289E-07 |
| Pu-239 | 1.1766E-04 |
| Pu-240 | 3.2818E-05 |
| Pu-241 | 1.7674E-05 |
| Pu-242 | 3.5136E-06 |
| Am-241 | 2.9652E-07 |
| Am-243 | 4.3586E-07 |
| Mo-95 | 2.2140E-05 |
| Tc-99 | 3.0428E-05 |
| Ru-101 | 2.7846E-05 |
| Rh-103 | 1.5306E-05 |
| Ag-109 | 1.8947E-06 |
| Cs-133 | 3.2064E-05 |
| Xe-135 | 9.1563E-09 |
| Nd-143 | 2.3065E-05 |
| Nd-145 | 1.8064E-05 |
| Sm-147 | 1.1926E-06 |
| Sm-149 | 9.7995E-08 |
| Sm-150 | 6.8722E-06 |
| Sm-151 | 4.8376E-07 |
| Eu-151 | 4.8990E-10 |
| Sm-152 | 3.1543E-06 |
| Eu-153 | 2.1403E-06 |
| Gd-155 | 5.9707E-10 |
| O-16 | 4.6944E-02 |

Table 5. Isotopic Number Densities for Fuel Zone 4

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1395E-08 |
| U-235 | 3.8112E-04 |
| U-236 | 7.9062E-05 |
| U-238 | 2.2300E-02 |
| Np-237 | 5.4123E-06 |
| Pu-238 | 1.0210E-06 |
| Pu-239 | 1.1862E-04 |
| Pu-240 | 3.3733E-05 |
| Pu-241 | 1.8288E-05 |
| Pu-242 | 3.7464E-06 |
| Am-241 | 3.0573E-07 |
| Am-243 | 4.7746E-07 |
| Mo-95 | 2.2638E-05 |
| Tc-99 | 3.1115E-05 |
| Ru-101 | 2.8527E-05 |
| Rh-103 | 1.5655E-05 |
| Ag-109 | 1.9677E-06 |
| Cs-133 | 3.2780E-05 |
| Xe-135 | 9.1739E-09 |
| Nd-143 | 2.3485E-05 |
| Nd-145 | 1.8451E-05 |
| Sm-147 | 1.2089E-06 |
| Sm-149 | 9.8456E-08 |
| Sm-150 | 7.0744E-06 |
| Sm-151 | 4.8854E-07 |
| Eu-151 | 4.8127E-10 |
| Sm-152 | 3.2285E-06 |
| Eu-153 | 2.2179E-06 |
| Gd-155 | 6.0549E-10 |
| O-16 | 4.6944E-02 |

Table 6. Isotopic Number Densities for Fuel Zone 5

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1427E-08 |
| U-235 | 3.8053E-04 |
| U-236 | 7.9157E-05 |
| U-238 | 2.2299E-02 |
| Np-237 | 5.4264E-06 |
| Pu-238 | 1.0256E-06 |
| Pu-239 | 1.1869E-04 |
| Pu-240 | 3.3804E-05 |
| Pu-241 | 1.8335E-05 |
| Pu-242 | 3.7647E-06 |
| Am-241 | 3.0643E-07 |
| Am-243 | 4.8076E-07 |
| Mo-95 | 2.2676E-05 |
| Tc-99 | 3.1168E-05 |
| Ru-101 | 2.8579E-05 |
| Rh-103 | 1.5682E-05 |
| Ag-109 | 1.9733E-06 |
| Cs-133 | 3.2834E-05 |
| Xe-135 | 9.1752E-09 |
| Nd-143 | 2.3517E-05 |
| Nd-145 | 1.8481E-05 |
| Sm-147 | 1.2102E-06 |
| Sm-149 | 9.8490E-08 |
| Sm-150 | 7.0900E-06 |
| Sm-151 | 4.8890E-07 |
| Eu-151 | 4.8062E-10 |
| Sm-152 | 3.2342E-06 |
| Eu-153 | 2.2239E-06 |
| Gd-155 | 6.0614E-10 |
| O-16 | 4.6944E-02 |

Table 7. Isotopic Number Densities for Fuel Zone 6

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1411E-08 |
| U-235 | 3.8083E-04 |
| U-236 | 7.9110E-05 |
| U-238 | 2.2299E-02 |
| Np-237 | 5.4194E-06 |
| Pu-238 | 1.0233E-06 |
| Pu-239 | 1.1866E-04 |
| Pu-240 | 3.3769E-05 |
| Pu-241 | 1.8312E-05 |
| Pu-242 | 3.7555E-06 |
| Am-241 | 3.0608E-07 |
| Am-243 | 4.7911E-07 |
| Mo-95 | 2.2657E-05 |
| Tc-99 | 3.1142E-05 |
| Ru-101 | 2.8553E-05 |
| Rh-103 | 1.5669E-05 |
| Ag-109 | 1.9705E-06 |
| Cs-133 | 3.2807E-05 |
| Xe-135 | 9.1745E-09 |
| Nd-143 | 2.3501E-05 |
| Nd-145 | 1.8466E-05 |
| Sm-147 | 1.2096E-06 |
| Sm-149 | 9.8473E-08 |
| Sm-150 | 7.0822E-06 |
| Sm-151 | 4.8872E-07 |
| Eu-151 | 4.8095E-10 |
| Sm-152 | 3.2313E-06 |
| Eu-153 | 2.2209E-06 |
| Gd-155 | 6.0581E-10 |
| O-16 | 4.6944E-02 |

Table 8. Isotopic Number Densities for Fuel Zone 7

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1570E-08 |
| U-235 | 3.7785E-04 |
| U-236 | 7.9583E-05 |
| U-238 | 2.2296E-02 |
| Np-237 | 5.4902E-06 |
| Pu-238 | 1.0462E-06 |
| Pu-239 | 1.1901E-04 |
| Pu-240 | 3.4119E-05 |
| Pu-241 | 1.8547E-05 |
| Pu-242 | 3.8472E-06 |
| Am-241 | 3.0957E-07 |
| Am-243 | 4.9582E-07 |
| Mo-95 | 2.2848E-05 |
| Tc-99 | 3.1405E-05 |
| Ru-101 | 2.8815E-05 |
| Rh-103 | 1.5802E-05 |
| Ag-109 | 1.9988E-06 |
| Cs-133 | 3.3081E-05 |
| Xe-135 | 9.1805E-09 |
| Nd-143 | 2.3661E-05 |
| Nd-145 | 1.8614E-05 |
| Sm-147 | 1.2157E-06 |
| Sm-149 | 9.8646E-08 |
| Sm-150 | 7.1602E-06 |
| Sm-151 | 4.9055E-07 |
| Eu-151 | 4.7772E-10 |
| Sm-152 | 3.2597E-06 |
| Eu-153 | 2.2509E-06 |
| Gd-155 | 6.0906E-10 |
| O-16 | 4.6944E-02 |

Table 9. Isotopic Number Densities for Fuel Zone 8

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1523E-08 |
| U-235 | 3.7874E-04 |
| U-236 | 7.9441E-05 |
| U-238 | 2.2297E-02 |
| Np-237 | 5.4690E-06 |
| Pu-238 | 1.0393E-06 |
| Pu-239 | 1.1891E-04 |
| Pu-240 | 3.4014E-05 |
| Pu-241 | 1.8476E-05 |
| Pu-242 | 3.8196E-06 |
| Am-241 | 3.0853E-07 |
| Am-243 | 4.9077E-07 |
| Mo-95 | 2.2791E-05 |
| Tc-99 | 3.1326E-05 |
| Ru-101 | 2.8736E-05 |
| Rh-103 | 1.5762E-05 |
| Ag-109 | 1.9903E-06 |
| Cs-133 | 3.2999E-05 |
| Xe-135 | 9.1787E-09 |
| Nd-143 | 2.3613E-05 |
| Nd-145 | 1.8570E-05 |
| Sm-147 | 1.2138E-06 |
| Sm-149 | 9.8594E-08 |
| Sm-150 | 7.1368E-06 |
| Sm-151 | 4.9000E-07 |
| Eu-151 | 4.7868E-10 |
| Sm-152 | 3.2512E-06 |
| Eu-153 | 2.2419E-06 |
| Gd-155 | 6.0808E-10 |
| O-16 | 4.6944E-02 |

Table 10. Isotopic Number Densities for Fuel Zone 9

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1380E-08 |
| U-235 | 3.8142E-04 |
| U-236 | 7.9014E-05 |
| U-238 | 2.2300E-02 |
| Np-237 | 5.4052E-06 |
| Pu-238 | 1.0187E-06 |
| Pu-239 | 1.1859E-04 |
| Pu-240 | 3.3698E-05 |
| Pu-241 | 1.8265E-05 |
| Pu-242 | 3.7373E-06 |
| Am-241 | 3.0538E-07 |
| Am-243 | 4.7581E-07 |
| Mo-95 | 2.2619E-05 |
| Tc-99 | 3.1089E-05 |
| Ru-101 | 2.8501E-05 |
| Rh-103 | 1.5642E-05 |
| Ag-109 | 1.9649E-06 |
| Cs-133 | 3.2752E-05 |
| Xe-135 | 9.1733E-09 |
| Nd-143 | 2.3469E-05 |
| Nd-145 | 1.8436E-05 |
| Sm-147 | 1.2083E-06 |
| Sm-149 | 9.8438E-08 |
| Sm-150 | 7.0666E-06 |
| Sm-151 | 4.8835E-07 |
| Eu-151 | 4.8160E-10 |
| Sm-152 | 3.2256E-06 |
| Eu-153 | 2.2149E-06 |
| Gd-155 | 6.0516E-10 |
| O-16 | 4.6944E-02 |

Table 11. Isotopic Number Densities for Fuel Zone 10

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1443E-08 |
| U-235 | 3.8023E-04 |
| U-236 | 7.9204E-05 |
| U-238 | 2.2298E-02 |
| Np-237 | 5.4335E-06 |
| Pu-238 | 1.0278E-06 |
| Pu-239 | 1.1873E-04 |
| Pu-240 | 3.3839E-05 |
| Pu-241 | 1.8359E-05 |
| Pu-242 | 3.7738E-06 |
| Am-241 | 3.0678E-07 |
| Am-243 | 4.8242E-07 |
| Mo-95 | 2.2695E-05 |
| Tc-99 | 3.1194E-05 |
| Ru-101 | 2.8605E-05 |
| Rh-103 | 1.5695E-05 |
| Ag-109 | 1.9762E-06 |
| Cs-133 | 3.2862E-05 |
| Xe-135 | 9.1758E-09 |
| Nd-143 | 2.3533E-05 |
| Nd-145 | 1.8496E-05 |
| Sm-147 | 1.2108E-06 |
| Sm-149 | 9.8508E-08 |
| Sm-150 | 7.0978E-06 |
| Sm-151 | 4.8909E-07 |
| Eu-151 | 4.8030E-10 |
| Sm-152 | 3.2370E-06 |
| Eu-153 | 2.2269E-06 |
| Gd-155 | 6.0646E-10 |
| O-16 | 4.6944E-02 |

Table 12. Isotopic Number Densities for Fuel Zone 11

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1332E-08 |
| U-235 | 3.8232E-04 |
| U-236 | 7.8871E-05 |
| U-238 | 2.2301E-02 |
| Np-237 | 5.3840E-06 |
| Pu-238 | 1.0119E-06 |
| Pu-239 | 1.1848E-04 |
| Pu-240 | 3.3593E-05 |
| Pu-241 | 1.8194E-05 |
| Pu-242 | 3.7101E-06 |
| Am-241 | 3.0433E-07 |
| Am-243 | 4.7089E-07 |
| Mo-95 | 2.2562E-05 |
| Tc-99 | 3.1010E-05 |
| Ru-101 | 2.8422E-05 |
| Rh-103 | 1.5602E-05 |
| Ag-109 | 1.9564E-06 |
| Cs-133 | 3.2670E-05 |
| Xe-135 | 9.1714E-09 |
| Nd-143 | 2.3421E-05 |
| Nd-145 | 1.8392E-05 |
| Sm-147 | 1.2065E-06 |
| Sm-149 | 9.8386E-08 |
| Sm-150 | 7.0432E-06 |
| Sm-151 | 4.8780E-07 |
| Eu-151 | 4.8258E-10 |
| Sm-152 | 3.2171E-06 |
| Eu-153 | 2.2059E-06 |
| Gd-155 | 6.0419E-10 |
| O-16 | 4.6944E-02 |

Table 13. Isotopic Number Densities for Fuel Zone 12

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1332E-08 |
| U-235 | 3.8232E-04 |
| U-236 | 7.8871E-05 |
| U-238 | 2.2301E-02 |
| Np-237 | 5.3840E-06 |
| Pu-238 | 1.0119E-06 |
| Pu-239 | 1.1848E-04 |
| Pu-240 | 3.3593E-05 |
| Pu-241 | 1.8194E-05 |
| Pu-242 | 3.7101E-06 |
| Am-241 | 3.0433E-07 |
| Am-243 | 4.7089E-07 |
| Mo-95 | 2.2562E-05 |
| Tc-99 | 3.1010E-05 |
| Ru-101 | 2.8422E-05 |
| Rh-103 | 1.5602E-05 |
| Ag-109 | 1.9564E-06 |
| Cs-133 | 3.2670E-05 |
| Xe-135 | 9.1714E-09 |
| Nd-143 | 2.3421E-05 |
| Nd-145 | 1.8392E-05 |
| Sm-147 | 1.2065E-06 |
| Sm-149 | 9.8386E-08 |
| Sm-150 | 7.0432E-06 |
| Sm-151 | 4.8780E-07 |
| Eu-151 | 4.8258E-10 |
| Sm-152 | 3.2171E-06 |
| Eu-153 | 2.2059E-06 |
| Gd-155 | 6.0419E-10 |
| O-16 | 4.6944E-02 |

Table 14. Isotopic Number Densities for Fuel Zone 13

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.1284E-08 |
| U-235 | 3.8322E-04 |
| U-236 | 7.8728E-05 |
| U-238 | 2.2302E-02 |
| Np-237 | 5.3628E-06 |
| Pu-238 | 1.0052E-06 |
| Pu-239 | 1.1837E-04 |
| Pu-240 | 3.3487E-05 |
| Pu-241 | 1.8123E-05 |
| Pu-242 | 3.6830E-06 |
| Am-241 | 3.0327E-07 |
| Am-243 | 4.6601E-07 |
| Mo-95 | 2.2504E-05 |
| Tc-99 | 3.0931E-05 |
| Ru-101 | 2.8344E-05 |
| Rh-103 | 1.5562E-05 |
| Ag-109 | 1.9480E-06 |
| Cs-133 | 3.2587E-05 |
| Xe-135 | 9.1695E-09 |
| Nd-143 | 2.3372E-05 |
| Nd-145 | 1.8347E-05 |
| Sm-147 | 1.2046E-06 |
| Sm-149 | 9.8333E-08 |
| Sm-150 | 7.0198E-06 |
| Sm-151 | 4.8725E-07 |
| Eu-151 | 4.8356E-10 |
| Sm-152 | 3.2086E-06 |
| Eu-153 | 2.1969E-06 |
| Gd-155 | 6.0322E-10 |
| O-16 | 4.6944E-02 |

Table 15. Isotopic Number Densities for Fuel Zone 14

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.0931E-08 |
| U-235 | 3.8987E-04 |
| U-236 | 7.7666E-05 |
| U-238 | 2.2310E-02 |
| Np-237 | 5.2076E-06 |
| Pu-238 | 9.5630E-07 |
| Pu-239 | 1.1754E-04 |
| Pu-240 | 3.2712E-05 |
| Pu-241 | 1.7603E-05 |
| Pu-242 | 3.4873E-06 |
| Am-241 | 2.9544E-07 |
| Am-243 | 4.3122E-07 |
| Mo-95 | 2.2083E-05 |
| Tc-99 | 3.0348E-05 |
| Ru-101 | 2.7768E-05 |
| Rh-103 | 1.5266E-05 |
| Ag-109 | 1.8864E-06 |
| Cs-133 | 3.1981E-05 |
| Xe-135 | 9.1540E-09 |
| Nd-143 | 2.3016E-05 |
| Nd-145 | 1.8019E-05 |
| Sm-147 | 1.1907E-06 |
| Sm-149 | 9.7940E-08 |
| Sm-150 | 6.8490E-06 |
| Sm-151 | 4.8321E-07 |
| Eu-151 | 4.9091E-10 |
| Sm-152 | 3.1457E-06 |
| Eu-153 | 2.1314E-06 |
| Gd-155 | 5.9610E-10 |
| O-16 | 4.6944E-02 |

Table 16. Isotopic Number Densities for Fuel Zone 15

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.0851E-08 |
| U-235 | 3.9139E-04 |
| U-236 | 7.7422E-05 |
| U-238 | 2.2312E-02 |
| Np-237 | 5.1724E-06 |
| Pu-238 | 9.4538E-07 |
| Pu-239 | 1.1735E-04 |
| Pu-240 | 3.2535E-05 |
| Pu-241 | 1.7485E-05 |
| Pu-242 | 3.4435E-06 |
| Am-241 | 2.9365E-07 |
| Am-243 | 4.2356E-07 |
| Mo-95 | 2.1987E-05 |
| Tc-99 | 3.0215E-05 |
| Ru-101 | 2.7637E-05 |
| Rh-103 | 1.5198E-05 |
| Ag-109 | 1.8725E-06 |
| Cs-133 | 3.1843E-05 |
| Xe-135 | 9.1502E-09 |
| Nd-143 | 2.2934E-05 |
| Nd-145 | 1.7944E-05 |
| Sm-147 | 1.1875E-06 |
| Sm-149 | 9.7849E-08 |
| Sm-150 | 6.8102E-06 |
| Sm-151 | 4.8229E-07 |
| Eu-151 | 4.9262E-10 |
| Sm-152 | 3.1314E-06 |
| Eu-153 | 2.1166E-06 |
| Gd-155 | 5.9448E-10 |
| O-16 | 4.6944E-02 |

Table 17. Isotopic Number Densities for Fuel Zone 16

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 2.0021E-08 |
| U-235 | 4.0717E-04 |
| U-236 | 7.4876E-05 |
| U-238 | 2.2329E-02 |
| Np-237 | 4.8164E-06 |
| Pu-238 | 8.3793E-07 |
| Pu-239 | 1.1529E-04 |
| Pu-240 | 3.0718E-05 |
| Pu-241 | 1.6267E-05 |
| Pu-242 | 3.0135E-06 |
| Am-241 | 2.7497E-07 |
| Am-243 | 3.5059E-07 |
| Mo-95 | 2.1004E-05 |
| Tc-99 | 2.8856E-05 |
| Ru-101 | 2.6299E-05 |
| Rh-103 | 1.4506E-05 |
| Ag-109 | 1.7323E-06 |
| Cs-133 | 3.0427E-05 |
| Xe-135 | 9.1042E-09 |
| Nd-143 | 2.2086E-05 |
| Nd-145 | 1.7176E-05 |
| Sm-147 | 1.1537E-06 |
| Sm-149 | 9.6886E-08 |
| Sm-150 | 6.4180E-06 |
| Sm-151 | 4.7283E-07 |
| Eu-151 | 5.1069E-10 |
| Sm-152 | 2.9844E-06 |
| Eu-153 | 1.9671E-06 |
| Gd-155 | 5.7811E-10 |
| O-16 | 4.6944E-02 |

Table 18. Isotopic Number Densities for Fuel Zone 17

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 1.8129E-08 |
| U-235 | 4.4386E-04 |
| U-236 | 6.8854E-05 |
| U-238 | 2.2369E-02 |
| Np-237 | 4.0465E-06 |
| Pu-238 | 6.2533E-07 |
| Pu-239 | 1.0999E-04 |
| Pu-240 | 2.6631E-05 |
| Pu-241 | 1.3535E-05 |
| Pu-242 | 2.1664E-06 |
| Am-241 | 2.3159E-07 |
| Am-243 | 2.2009E-07 |
| Mo-95 | 1.8795E-05 |
| Tc-99 | 2.5801E-05 |
| Ru-101 | 2.3330E-05 |
| Rh-103 | 1.2943E-05 |
| Ag-109 | 1.4341E-06 |
| Cs-133 | 2.7236E-05 |
| Xe-135 | 8.9507E-09 |
| Nd-143 | 2.0115E-05 |
| Nd-145 | 1.5437E-05 |
| Sm-147 | 1.0713E-06 |
| Sm-149 | 9.4520E-08 |
| Sm-150 | 5.5668E-06 |
| Sm-151 | 4.5146E-07 |
| Eu-151 | 5.5597E-10 |
| Sm-152 | 2.6519E-06 |
| Eu-153 | 1.6474E-06 |
| Gd-155 | 5.4302E-10 |
| O-16 | 4.6944E-02 |

Table 19. Isotopic Number Densities for Fuel Zone 18

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| U-234 | 1.3127E-08 |
| U-235 | 5.4495E-04 |
| U-236 | 5.1662E-05 |
| U-238 | 2.2462E-02 |
| Np-237 | 2.3127E-06 |
| Pu-238 | 2.4774E-07 |
| Pu-239 | 9.1408E-05 |
| Pu-240 | 1.6410E-05 |
| Pu-241 | 6.9938E-06 |
| Pu-242 | 7.1677E-07 |
| Am-241 | 1.2166E-07 |
| Am-243 | 4.7347E-08 |
| Mo-95 | 1.3178E-05 |
| Tc-99 | 1.8038E-05 |
| Ru-101 | 1.5991E-05 |
| Rh-103 | 8.9523E-06 |
| Ag-109 | 7.8604E-07 |
| Cs-133 | 1.9090E-05 |
| Xe-135 | 8.1477E-09 |
| Nd-143 | 1.4711E-05 |
| Nd-145 | 1.0943E-05 |
| Sm-147 | 8.2085E-07 |
| Sm-149 | 8.7330E-08 |
| Sm-150 | 3.5906E-06 |
| Sm-151 | 3.9449E-07 |
| Eu-151 | 7.0813E-10 |
| Sm-152 | 1.7938E-06 |
| Eu-153 | 9.4517E-07 |
| Gd-155 | 4.7477E-10 |
| O-16 | 4.6945E-02 |

Table 20. Isotopic Number Densities for Moderator Zone 1

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 5.04493E-02 |
| B-10 | 8.57161E-06 |
| B-11 | 3.45018E-05 |
| O-16 | 2.52247E-02 |

Table 21. Isotopic Number Densities for Moderator Zone 2

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 5.02253E-02 |
| B-10 | 8.53355E-06 |
| B-11 | 3.43486E-05 |
| O-16 | 2.51126E-02 |

Table 22. Isotopic Number Densities for Moderator Zone 3

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.99999E-02 |
| B-10 | 8.49526E-06 |
| B-11 | 3.41945E-05 |
| O-16 | 2.50000E-02 |

Table 23. Isotopic Number Densities for Moderator Zone 4

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.97719E-02 |
| B-10 | 8.45651E-06 |
| B-11 | 3.40385E-05 |
| O-16 | 2.48859E-02 |

Table 24. Isotopic Number Densities for Moderator Zone 5

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.95418E-02 |
| B-10 | 8.41743E-06 |
| B-11 | 3.38812E-05 |
| O-16 | 2.47709E-02 |

Table 25. Isotopic Number Densities for Moderator Zone 6

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.93091E-02 |
| B-10 | 8.37789E-06 |
| B-11 | 3.37220E-05 |
| O-16 | 2.46546E-02 |

Table 26. Isotopic Number Densities for Moderator Zone 7

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.90751E-02 |
| B-10 | 8.33812E-06 |
| B-11 | 3.35620E-05 |
| O-16 | 2.45375E-02 |

Table 27. Isotopic Number Densities for Moderator Zone 8

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.88383E-02 |
| B-10 | 8.29790E-06 |
| B-11 | 3.34001E-05 |
| O-16 | 2.44192E-02 |

Table 28. Isotopic Number Densities for Moderator Zone 9

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.85996E-02 |
| B-10 | 8.25733E-06 |
| B-11 | 3.32368E-05 |
| O-16 | 2.42998E-02 |

Table 29. Isotopic Number Densities for Moderator Zone 10

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.85153E-02 |
| B-10 | 8.24302E-06 |
| B-11 | 3.31792E-05 |
| O-16 | 2.42577E-02 |

Table 30. Isotopic Number Densities for Moderator Zone 11

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.84264E-02 |
| B-10 | 8.22791E-06 |
| B-11 | 3.31184E-05 |
| O-16 | 2.42132E-02 |

Table 31. Isotopic Number Densities for Moderator Zone 12

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.83334E-02 |
| B-10 | 8.21211E-06 |
| B-11 | 3.30548E-05 |
| O-16 | 2.41667E-02 |

Table 32. Isotopic Number Densities for Moderator Zone 13

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.82351E-02 |
| B-10 | 8.19541E-06 |
| B-11 | 3.29876E-05 |
| O-16 | 2.41176E-02 |

Table 33. Isotopic Number Densities for Moderator Zone 14

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.81328E-02 |
| B-10 | 8.17803E-06 |
| B-11 | 3.29176E-05 |
| O-16 | 2.40664E-02 |

Table 34. Isotopic Number Densities for Moderator Zone 15

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.80258E-02 |
| B-10 | 8.15985E-06 |
| B-11 | 3.28444E-05 |
| O-16 | 2.40129E-02 |

Table 35. Isotopic Number Densities for Moderator Zone 16

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.79135E-02 |
| B-10 | 8.14076E-06 |
| B-11 | 3.27676E-05 |
| O-16 | 2.39567E-02 |

Table 36. Isotopic Number Densities for Moderator Zone 17

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.77971E-02 |
| B-10 | 8.12099E-06 |
| B-11 | 3.26880E-05 |
| O-16 | 2.38986E-02 |

Table 37. Isotopic Number Densities for Moderator Zone 18

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.76761E-02 |
| B-10 | 8.10042E-06 |
| B-11 | 3.26052E-05 |
| O-16 | 2.38380E-02 |

Table 38. Isotopic Number Densities for Water Reflector

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| H-1 | 4.88798E-02 |
| B-10 | 8.30494E-06 |
| B-11 | 3.34284E-05 |
| O-16 | 2.44399E-02 |

Table 39. Isotopic Number Densities for Zircaloy-4 Cladding

|  |  |
| --- | --- |
| Isotope | Number density(atoms/barn-cm) |
| Cr-50 | 3.30121E-06 |
| Cr-52 | 6.36606E-05 |
| Cr-53 | 7.21860E-06 |
| Cr-54 | 1.79686E-06 |
| Fe-54 | 8.68307E-06 |
| Fe-56 | 1.36306E-04 |
| Fe-57 | 3.14789E-06 |
| Fe-58 | 4.18926E-07 |
| Zr-90 | 2.18865E-02 |
| Zr-91 | 4.77292E-03 |
| Zr-92 | 7.29551E-03 |
| Zr-94 | 7.39335E-03 |
| Zr-96 | 1.19110E-03 |
| Sn-112 | 4.68066E-06 |
| Sn-114 | 3.18478E-06 |
| Sn-115 | 1.64064E-06 |
| Sn-116 | 7.01616E-05 |
| Sn-117 | 3.70592E-05 |
| Sn-118 | 1.16872E-04 |
| Sn-119 | 4.14504E-05 |
| Sn-120 | 1.57212E-04 |
| Sn-122 | 2.23417E-05 |
| Sn-124 | 2.79392E-05 |
| Hf-174 | 3.54138E-09 |
| Hf-176 | 1.16423E-07 |
| Hf-177 | 4.11686E-07 |
| Hf-178 | 6.03806E-07 |
| Hf-179 | 3.01460E-07 |
| Hf-180 | 7.76449E-07 |

Table 40. Isotopic Number Densities for SS-304

|  |  |
| --- | --- |
| Species | Number density(atoms/barn-cm) |
| C | 3.18488E-04 |
| Si-28 | 1.57010E-03 |
| Si-29 | 7.97625E-05 |
| Si-30 | 5.26416E-05 |
| P-31 | 6.94688E-05 |
| Cr-50 | 7.59178E-04 |
| Cr-52 | 1.46402E-02 |
| Cr-53 | 1.65988E-03 |
| Cr-54 | 4.13224E-04 |
| Mn-55 | 1.74072E-03 |
| Fe-54 | 3.45419E-03 |
| Fe-56 | 5.36980E-02 |
| Fe-57 | 1.22946E-03 |
| Fe-58 | 1.63927E-04 |
| Ni-58 | 5.28417E-03 |
| Ni-60 | 2.02017E-03 |
| Ni-61 | 8.74631E-05 |
| Ni-62 | 2.77870E-04 |
| Ni-64 | 7.04349E-05 |

Table 41. Isotopic Number Densities for Lower Smeared Reflector

|  |  |
| --- | --- |
| Species | Number density(atoms/barn-cm) |
| H-1 | 4.22261E-02 |
| B-10 | 8.57161E-06 |
| B-11 | 3.45018E-05 |
| C | 5.17543E-05 |
| O-16 | 2.11130E-02 |
| Si-28 | 2.55142E-04 |
| Si-29 | 1.29614E-05 |
| Si-30 | 8.55425E-06 |
| P-31 | 1.12887E-05 |
| Cr-50 | 1.23366E-04 |
| Cr-52 | 2.37903E-03 |
| Cr-53 | 2.69731E-04 |
| Cr-54 | 6.71489E-05 |
| Mn-55 | 2.82867E-04 |
| Fe-54 | 5.61305E-04 |
| Fe-56 | 8.72592E-03 |
| Fe-57 | 1.99787E-04 |
| Fe-58 | 2.66382E-05 |
| Ni-58 | 8.58677E-04 |
| Ni-60 | 3.28277E-04 |
| Ni-61 | 1.42128E-05 |
| Ni-62 | 4.51538E-05 |
| Ni-64 | 1.14457E-05 |

Table 42. Isotopic Number Densities for Upper Smeared Reflector

|  |  |
| --- | --- |
| Species | Number density(atoms/barn-cm) |
| H-1 | 4.13256E-02 |
| B-10 | 8.10042E-06 |
| B-11 | 3.26052E-05 |
| C | 4.22634E-05 |
| O-16 | 2.06628E-02 |
| Si-28 | 2.08353E-04 |
| Si-29 | 1.05845E-05 |
| Si-30 | 6.98554E-06 |
| P-31 | 9.21852E-06 |
| Cr-50 | 1.00743E-04 |
| Cr-52 | 1.94275E-03 |
| Cr-53 | 2.20267E-04 |
| Cr-54 | 5.48348E-05 |
| Mn-55 | 2.30993E-04 |
| Fe-54 | 4.58370E-04 |
| Fe-56 | 7.12572E-03 |
| Fe-57 | 1.63149E-04 |
| Fe-58 | 2.17532E-05 |
| Ni-58 | 7.01209E-04 |
| Ni-60 | 2.68076E-04 |
| Ni-61 | 1.16064E-05 |
| Ni-62 | 3.68733E-05 |
| Ni-64 | 9.34671E-06 |

Table 43. Axially Varying Fuel, Cladding, and Moderator Temperatures

|  |  |  |  |
| --- | --- | --- | --- |
| Zone Number | FuelTemperature (K) | CladdingTemperature (K) | ModeratorTemperature (K) |
| 1 | 816.1 | 597.3 | 558.73 |
| 2 | 918.5 | 614.3 | 560.56 |
| 3 | 966.4 | 623.0 | 562.38 |
| 4 | 985.5 | 627.4 | 564.19 |
| 5 | 991.5 | 629.8 | 565.99 |
| 6 | 992.9 | 631.5 | 567.78 |
| 7 | 993.4 | 633.1 | 569.55 |
| 8 | 994.2 | 634.7 | 571.31 |
| 9 | 995.0 | 636.3 | 573.05 |
| 10 | 995.6 | 636.9 | 573.66 |
| 11 | 995.6 | 637.5 | 574.30 |
| 12 | 995.5 | 638.0 | 574.97 |
| 13 | 995.2 | 638.6 | 575.66 |
| 14 | 993.8 | 639.0 | 576.39 |
| 15 | 987.8 | 638.7 | 577.13 |
| 16 | 969.5 | 636.7 | 577.91 |
| 17 | 924.5 | 630.6 | 578.71 |
| 18 | 828.7 | 616.9 | 579.53 |

Table 44. Temperature for Non-Varying Components

|  |  |
| --- | --- |
| Component | Temperature (K) |
| SS304 (baffle plates and core barrel) | 571.0 |
| Water in radial reflector and guide tubes | 571.0 |
| Zircaloy-4 guide tubes | 630.0 |
| Lower smeared reflector | 558.73 |
| Upper smeared reflector | 579.53 |

Table 45. Fuel Assembly Dimensions

|  |  |
| --- | --- |
| Component | Dimension (cm) |
| Fuel pellet outer radius | 0.40958 |
| Cladding inner radius | 0.41783 |
| Cladding outer radius | 0.47498 |
| Fuel rod pitch (center-to-center) | 1.25984 |
| Guide tube inner radius | 0.56135 |
| Guide tube outer radius | 0.602 |
| Assembly pitch (center-to-center) | 21.50364 |

Table 46. Other Reactor Dimensions

|  |  |
| --- | --- |
| Component | Dimension (cm) |
| Baffle plate thickness | 2.8575 |
| Core barrel inner radius | 187.96 |
| Core barrel outer radius | 193.675 |
| Lower plenum length | 3.673 |
| Top plenum length | 13.904 |
| Lower smeared reflector length | 26.327 |
| Top smeared reflector length | 16.096 |