

# **United States Department of Energy**

## **National Spent Nuclear Fuel Program**

### **Volume II**

#### **Source Term Estimates for DOE Spent Nuclear Fuels**



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**U.S. Department of Energy  
Assistant Secretary for Environmental Management  
Office of Nuclear Material and Spent Fuel**

This document was developed and is controlled in accordance with NSNFP procedures. It has been reviewed and determined adequate for Beyond Category 2 consequence, TSPA, shielding, and decay heat analysis. For other uses, the information must be evaluated for adequacy if relied on to support design or decisions important to safety or waste isolation.

## **Appendix C**

### **Source Term Estimates for the Year 2010**

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# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name AMERICIUM TARGETS  
SNF ID # 776  
Fuel Units & Descr 12 - SCRAP  
Heavy Metal Mass BOL=0.078kg, EOL=0.074kg  
ROD Storage Site HANFORD

Fuel decay start date 1970  
Estimates as of: 2010  
Template FFTF (FAST, SST, 10 to 30% Pu & U)  
Template Burnup(MWd) 5011.2  
Template BOL Heavy Metal Mass (MT) 0.0329181  
Template Decay Time 35 years

Estimated  
Canister usage  
HIC  
3.00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.1822E-12	3.59	7.19	0.00E+00	2.22E-11	4.44E-11	Avg MeV	
Am-241	1.1066E-01	3.59	7.19	1.50E-01	5.48E-01	9.46E-01	0.0150	3.215E+11
Am-242m	1.9247E-03	3.59	7.19	0.00E+00	6.92E-03	1.38E-02	0.0250	4.681E+10
Am-243	1.0740E-04	3.59	7.19	9.57E+00	9.57E+00	9.57E+00	0.0375	7.733E+10
C-14	2.6042E-05	3.59	7.19	0.00E+00	9.36E-05	1.87E-04	0.0575	5.515E+10
Cl-36	3.4243E-10	3.59	7.19	0.00E+00	1.23E-09	2.46E-09	0.0850	2.325E+11
Cm-243	4.0629E-04	3.59	7.19	0.00E+00	1.46E-03	2.92E-03	0.1250	2.066E+10
Cm-244	1.6024E-03	3.59	7.19	0.00E+00	5.76E-03	1.15E-02	0.2250	2.100E+10
Co-60	3.4275E-03	3.59	7.19	0.00E+00	1.23E-02	2.46E-02	0.3750	9.100E+09
Cs-134	1.5568E-03	3.59	7.19	0.00E+00	5.59E-03	1.12E-02	0.5750	3.686E+11
Cs-135	4.7693E-05	3.59	7.19	0.00E+00	1.71E-04	3.43E-04	0.8500	3.852E+09
Cs-137	1.4007E+00	3.59	7.19	0.00E+00	5.03E+00	1.01E+01	1.2500	4.610E+09
Eu-154	1.6184E-02	3.59	7.19	0.00E+00	5.82E-02	1.16E-01	1.7500	1.043E+08
Eu-155	1.3774E-02	3.59	7.19	0.00E+00	4.95E-02	9.90E-02	2.2500	1.140E+04
Fe-55	3.8028E-04	3.59	7.19	0.00E+00	1.37E-03	2.73E-03	2.7500	1.194E+05
H-3	3.8454E-03	3.59	7.19	0.00E+00	1.38E-02	2.76E-02	3.5000	8.076E+02
I-129	1.2891E-06	3.59	7.19	0.00E+00	4.63E-06	9.26E-06	5.0000	2.874E+02
Kr-85	2.7848E-02	3.59	7.19	0.00E+00	1.00E-01	2.00E-01	7.0000	3.187E+01
Np-237	3.7516E-06	3.59	7.19	0.00E+00	1.35E-05	2.70E-05	11.0000	3.584E+00
Pa-231	1.2488E-11	3.59	7.19	0.00E+00	4.49E-11	8.97E-11		
Pb-210	2.4206E-12	3.59	7.19	0.00E+00	8.70E-12	1.74E-11		
Pm-147	1.5671E-02	3.59	7.19	0.00E+00	5.63E-02	1.13E-01		
Pu-238	1.4877E-02	3.59	7.19	0.00E+00	5.35E-02	1.07E-01		
Pu-239	-3.5520E-02	3.59	0.00	1.23E+00	1.11E+00	1.23E+00		
Pu-240	2.0690E-02	3.59	7.19	6.27E-01	7.02E-01	7.76E-01		
Pu-241	-1.4799E+00	3.59	0.00	2.82E+01	2.28E+01	2.82E+01		
Pu-242	1.1252E-05	3.59	7.19	1.67E-04	2.08E-04	2.48E-04		
Ra-226	7.8524E-12	3.59	7.19	0.00E+00	2.82E-11	5.64E-11		
Ra-228	2.4086E-16	3.59	7.19	0.00E+00	8.65E-16	1.73E-15		
Ru-106	1.5066E-05	3.59	7.19	0.00E+00	5.41E-05	1.08E-04		
Se-79	1.0127E-05	3.59	7.19	0.00E+00	3.64E-05	7.28E-05		
Sn-126	4.3902E-05	3.59	7.19	0.00E+00	1.58E-04	3.16E-04		
Sr-90	5.0088E-01	3.59	7.19	0.00E+00	1.80E+00	3.60E+00		
Tc-99	3.9412E-04	3.59	7.19	0.00E+00	1.42E-03	2.83E-03		
Th-229	2.7219E-12	3.59	7.19	0.00E+00	9.78E-12	1.96E-11		
Th-230	1.0441E-09	3.59	7.19	0.00E+00	3.75E-09	7.50E-09		
Th-232	3.1689E-16	3.59	7.19	0.00E+00	1.14E-15	2.28E-15		
Ti-208	4.6636E-07	3.59	7.19	0.00E+00	1.68E-06	3.35E-06		
U-232	1.2638E-06	3.59	7.19	0.00E+00	4.54E-06	9.08E-06		
U-233	5.7451E-10	3.59	7.19	0.00E+00	2.06E-09	4.13E-09		
U-234	4.3044E-06	3.59	7.19	0.00E+00	1.55E-05	3.09E-05		
U-235	-7.7765E-09	3.59	0.00	2.53E-07	2.26E-07	2.53E-07		
U-236	1.8050E-07	3.59	7.19	0.00E+00	6.49E-07	1.30E-06		
U-238	-1.7914E-07	3.59	0.00	1.85E-05	1.78E-05	1.85E-05		
Y-90	5.0088E-01	3.59	7.19	0.00E+00	1.80E+00	3.60E+00		
Other Radionuclides					5.09E+00	1.02E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.22E+01	4.81E+01
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	ALUM	SST	This fuel matches on all parameters except enrichment (unknown) and cladding (SST is conservative)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		3.59	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		7.19	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.30		1.00
Bounding	0.61		

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: CALVERT CLIFFS 1  
SNF ID #: 307  
Fuel Units & Descr: 2 - 14 X 14 ROD ARRAY  
Heavy Metal Mass: BOL=772kg; EOL=675 9kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1980  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup (MWd), 61 92  
Template BOL Heavy Metal Mass (MT), 0 00176911  
Template Decay Time: 25 years

Estimated  
Canister usage:  
18"x15"  
1 00

II. Estimates	m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6376E-10	91,386.55	182,773.11	0 00E+00	6 07E-05	1 21E-04	Avg. MeV	
Am-241	1.3144E-01	91,386.55	182,773.11	0 00E+00	1 20E+04	2 40E+04	0 0150	1.243E+16
Am-242m	3.0039E-04	91,386.55	182,773.11	0 00E+00	2 75E+01	5 49E+01	0.0250	2.517E+15
Am-243	6 2629E-04	91,386.55	182,773.11	0 00E+00	5 72E+01	1 14E+02	0 0375	2 436E+15
C-14	4 7965E-05	91,386.55	182,773.11	0 00E+00	4.38E+00	8 77E+00	0 0575	2 658E+15
Cl-36	8 0297E-07	91,386.55	182,773.11	0 00E+00	7 34E-02	1 47E-01	0 0850	1 408E+15
Cm-243	3.1993E-04	91,386.55	182,773.11	0 00E+00	2 92E+01	5 85E+01	0 1250	1.029E+15
Cm-244	7 1851E-02	91,386.55	182,773.11	0 00E+00	6 57E+03	1 31E+04	0 2250	1.209E+15
Co-60	9 5220E-03	91,386.55	182,773.11	0 00E+00	8 70E+02	1 74E+03	0 3750	5 187E+14
Cs-134	1 1662E-03	91,386.55	182,773.11	0 00E+00	1 07E+02	2 13E+02	0 5750	1 192E+16
Cs-135	1 4433E-05	91,386.55	182,773.11	0 00E+00	1 32E+00	2 64E+00	0 8500	2.353E+14
Cs-137	1 7603E+00	91,386.55	182,773.11	0 00E+00	1 61E+05	3.22E+05	1 2500	3 178E+14
Eu-154	4 5203E-02	91,386.55	182,773.11	0 00E+00	4 13E+03	8.26E+03	1 7500	6 963E+12
Eu-155	7 1479E-03	91,386.55	182,773.11	0 00E+00	6 53E+02	1.31E+03	2 2500	1.286E+09
Fe-55	6 1919E-04	91,386.55	182,773.11	0 00E+00	5 66E+01	1 13E+02	2 7500	1 446E+09
H-3	3 6386E-02	91,386.55	182,773.11	0 00E+00	3 33E+03	6 65E+03	3 5000	1 894E+08
I-129	9 8288E-07	91,386.55	182,773.11	0 00E+00	8 98E-02	1 80E-01	5 0000	8 095E+07
Kr-85	5 3844E-02	91,386.55	182,773.11	0 00E+00	4.92E+03	9 84E+03	7 0000	9.333E+06
Np-237	1 0546E-05	91,386.55	182,773.11	0 00E+00	9 64E-01	1 93E+00	11 0000	1 072E+06
Pa-231	1 1370E-09	91,386.55	182,773.11	0 00E+00	1 04E-04	2 08E-04		
Pb-210	3 3624E-11	91,386.55	182,773.11	0 00E+00	3 07E-06	6 15E-06		
Pm-147	5 1211E-03	91,386.55	182,773.11	0 00E+00	4 68E+02	9.36E+02		
Pu-238	8 0669E-02	91,386.55	182,773.11	0 00E+00	7 37E+03	1 47E+04		
Pu-239	1 1626E-02	91,386.55	182,773.11	0 00E+00	1 06E+03	2.12E+03		
Pu-240	1 5097E-02	91,386.55	182,773.11	0 00E+00	1.38E+03	2 76E+03		
Pu-241	1 4567E+00	91,386.55	182,773.11	0 00E+00	1.33E+05	2 66E+05		
Pu-242	6 4260E-05	91,386.55	182,773.11	0 00E+00	5 87E+00	1 17E+01		
Ra-226	1 1392E-10	91,386.55	182,773.11	0 00E+00	1 04E-05	2 08E-05		
Ra-228	5.1841E-12	91,386.55	182,773.11	0 00E+00	4 74E-07	9 48E-07		
Ru-106	5 9012E-07	91,386.55	182,773.11	0 00E+00	5.39E-02	1 08E-01		
Se-79	1.2379E-05	91,386.55	182,773.11	0 00E+00	1 13E+00	2 26E+00		
Sn-126	2 5210E-05	91,386.55	182,773.11	0 00E+00	2 30E+00	4 61E+00		
Sr-90	1 1630E+00	91,386.55	182,773.11	0 00E+00	1 06E+05	2 13E+05		
Tc-99	3 9357E-04	91,386.55	182,773.11	0 00E+00	3 60E+01	7.19E+01		
Th-229	8 5691E-11	91,386.55	182,773.11	0 00E+00	7 83E-06	1.57E-05		
Th-230	1 4493E-08	91,386.55	182,773.11	0 00E+00	1 32E-03	2 65E-03		
Th-232	5 2923E-12	91,386.55	182,773.11	0 00E+00	4 84E-07	9 67E-07		
Ti-208	1 9202E-07	91,386.55	182,773.11	0 00E+00	1.75E-02	3.51E-02		
U-232	5.2083E-07	91,386.55	182,773.11	0 00E+00	4 76E-02	9.52E-02		
U-233	2 4386E-08	91,386.55	182,773.11	0 00E+00	2.23E-03	4 46E-03		
U-234	4 7012E-05	91,386.55	182,773.11	0 00E+00	4.30E+00	8 59E+00		
U-235	-1 4492E-06	91,386.55	0.00	5 00E-02	0 00E+00	5 00E-02		
U-236	7.5759E-06	91,386.55	182,773.11	0 00E+00	6 92E-01	1 38E+00		
U-238	-2 6129E-07	91,386.55	0 00	2 52E-01	2.28E-01	2 52E-01		
Y-90	1 1631E+00	91,386.55	182,773.11	0 00E+00	1 06E+05	2.13E+05		
Other Radionuclides					1 54E+05	3 09E+05		

Thermal Power  
Nominal Heat Output (Watts) 2.51E+03  
Bounding Heat Output (Watts) 5 01E+03  
Total Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ZIRC	ZIRC
BOL HM Constituents	U	U
BOL Enrichment %	3	0 to 5

Basis for Parameter Differences.

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	32.848 60	91,386.55
Bounding	33.041 60	182,773.11

Basis for burnup used in estimate:

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	3 38	2.78
Bounding	6 78	5.53

Estimated EOL HM/Given EOL HM

1 06

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name COOPER NUCLEAR  
SNF ID # 308  
Fuel Units & Descr: 2 - 7 X 7 ROD ARRAY  
Heavy Metal Mass BOL=370kg EOL=368.2kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1982  
Estimates as of 2010  
Template PWR (Light Water Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time: 25 years

Estimated  
Canister usage:  
18"x15"  
1.00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	10,273.05	10,378.50	0.00E+00	6.82E-06	6.89E-06	Avg MeV	
Am-241	1.3144E-01	10,273.05	10,378.50	0.00E+00	1.35E+03	1.36E+03	0.0150	7.058E+14
Am-242m	3.0039E-04	10,273.05	10,378.50	0.00E+00	3.09E+00	3.12E+00	0.0250	1.429E+14
Am-243	6.2629E-04	10,273.05	10,378.50	0.00E+00	6.43E+00	6.50E+00	0.0375	1.383E+14
C-14	4.7965E-05	10,273.05	10,378.50	0.00E+00	4.93E-01	4.98E-01	0.0575	1.509E+14
Cl-36	8.0297E-07	10,273.05	10,378.50	0.00E+00	8.25E-03	8.33E-03	0.0850	7.997E+13
Cm-243	3.1993E-04	10,273.05	10,378.50	0.00E+00	3.29E+00	3.32E+00	0.1250	5.842E+13
Cm-244	7.1851E-02	10,273.05	10,378.50	0.00E+00	7.38E+02	7.46E+02	0.2250	6.865E+13
Co-60	9.5220E-03	10,273.05	10,378.50	0.00E+00	9.78E+01	9.88E+01	0.3750	2.946E+13
Cs-134	1.1662E-03	10,273.05	10,378.50	0.00E+00	1.20E+01	1.21E+01	0.5750	6.769E+14
Cs-135	1.4433E-05	10,273.05	10,378.50	0.00E+00	1.48E-01	1.50E-01	0.8500	1.336E+13
Cs-137	1.7603E+00	10,273.05	10,378.50	0.00E+00	1.81E+04	1.83E+04	1.2500	1.805E+13
Eu-154	4.5203E-02	10,273.05	10,378.50	0.00E+00	4.64E+02	4.69E+02	1.7500	3.954E+11
Eu-155	7.1479E-03	10,273.05	10,378.50	0.00E+00	7.34E+01	7.42E+01	2.2500	7.303E+07
Fe-55	6.1919E-04	10,273.05	10,378.50	0.00E+00	6.36E+00	6.43E+00	2.7500	8.208E+07
H-3	3.6386E-02	10,273.05	10,378.50	0.00E+00	3.74E+02	3.78E+02	3.5000	1.076E+07
I-129	9.8288E-07	10,273.05	10,378.50	0.00E+00	1.01E-02	1.02E-02	5.0000	4.597E+06
Kr-85	5.3844E-02	10,273.05	10,378.50	0.00E+00	5.53E+02	5.59E+02	7.0000	5.300E+05
Np-237	1.0546E-05	10,273.05	10,378.50	0.00E+00	1.08E-01	1.09E-01	11.0000	6.088E+04
Pa-231	1.1370E-09	10,273.05	10,378.50	0.00E+00	1.17E-05	1.18E-05		
Pb-210	3.3624E-11	10,273.05	10,378.50	0.00E+00	3.45E-07	3.49E-07		
Pm-147	5.1211E-03	10,273.05	10,378.50	0.00E+00	5.26E+01	5.31E+01		
Pu-238	8.0669E-02	10,273.05	10,378.50	0.00E+00	8.29E+02	8.37E+02		
Pu-239	1.1626E-02	10,273.05	10,378.50	0.00E+00	1.19E+02	1.21E+02		
Pu-240	1.5097E-02	10,273.05	10,378.50	0.00E+00	1.55E+02	1.57E+02		
Pu-241	1.4567E+00	10,273.05	10,378.50	0.00E+00	1.50E+04	1.51E+04		
Pu-242	6.4260E-05	10,273.05	10,378.50	0.00E+00	6.60E-01	6.67E-01		
Ra-226	1.1392E-10	10,273.05	10,378.50	0.00E+00	1.17E-06	1.18E-06		
Ra-228	5.1841E-12	10,273.05	10,378.50	0.00E+00	5.33E-08	5.38E-08		
Ru-106	5.9012E-07	10,273.05	10,378.50	0.00E+00	6.06E-03	6.12E-03		
Se-79	1.2379E-05	10,273.05	10,378.50	0.00E+00	1.27E-01	1.28E-01		
Sn-126	2.5210E-05	10,273.05	10,378.50	0.00E+00	2.59E-01	2.62E-01		
Sr-90	1.1630E+00	10,273.05	10,378.50	0.00E+00	1.19E+04	1.21E+04		
Tc-99	3.9357E-04	10,273.05	10,378.50	0.00E+00	4.04E+00	4.08E+00		
Th-229	8.5691E-11	10,273.05	10,378.50	0.00E+00	8.80E-07	8.89E-07		
Th-230	1.4493E-08	10,273.05	10,378.50	0.00E+00	1.49E-04	1.50E-04		
Th-232	5.2923E-12	10,273.05	10,378.50	0.00E+00	5.44E-08	5.49E-08		
Ti-208	1.9202E-07	10,273.05	10,378.50	0.00E+00	1.97E-03	1.99E-03		
U-232	5.2083E-07	10,273.05	10,378.50	0.00E+00	5.35E-03	5.41E-03	Thermal Power	
U-233	2.4386E-08	10,273.05	10,378.50	0.00E+00	2.51E-04	2.53E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4.7012E-05	10,273.05	10,378.50	0.00E+00	4.83E-01	4.88E-01	2.82E+02	2.85E+02
U-235	-1.4492E-06	10,273.05	0.00	1.28E-02	0.00E+00	1.28E-02	Total	Total
U-236	7.5759E-06	10,273.05	10,378.50	0.00E+00	7.78E-02	7.86E-02		
U-238	-2.6129E-07	10,273.05	0.00	1.22E-01	1.20E-01	1.22E-01		
Y-90	1.1631E+00	10,273.05	10,378.50	0.00E+00	1.19E+04	1.21E+04		
Other Radionuclides					1.74E+04	1.75E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	1.6	0 to 5	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	10,273.05	1,711.71	
Bounding	10,378.50	3,423.43	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.79	0.17	
Bounding	0.80	0.33	0.98

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-DFA/TDFA  
SNF ID #: 71  
Fuel Units & Descr: 261 - HEX ARRAY 217 ROD  
Heavy Metal Mass: BOL=9083 087kg; EOL=8443 742kg  
ROD Storage Site: HANFORD

Fuel decay start date: 1992  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30%, Pu & U)  
Template Burnup (MWd): 5011.2  
Template BOL Heavy Metal Mass (MT): 0.0329181  
Template Decay Time: 15 years

Estimated  
Canister usage:  
18"x15"  
52.20

II. Estimates	m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	638,157 18	1,276,314 37	0.00E+00	8.77E-07	1.75E-06	Avg MeV	
Am-241	7.9527E-02	638,157 18	1,276,314 37	1.75E+04	6.83E+04	1.19E+05	0.0150	6.417E+16
Am-242m	2.1053E-03	638,157 18	1,276,314 37	0.00E+00	1.34E+03	2.69E+03	0.0250	1.384E+16
Am-243	1.0760E-04	638,157 18	1,276,314 37	0.00E+00	6.87E+01	1.37E+02	0.0375	1.583E+16
C-14	2.6141E-05	638,157 18	1,276,314 37	0.00E+00	1.67E+01	3.34E+01	0.0575	1.347E+16
Cl-36	3.4243E-10	638,157 18	1,276,314 37	0.00E+00	2.19E-04	4.37E-04	0.0850	7.885E+15
Cm-243	6.6092E-04	638,157 18	1,276,314 37	0.00E+00	4.22E+02	8.44E+02	0.1250	5.889E+15
Cm-244	2.9933E-03	638,157 18	1,276,314 37	0.00E+00	1.91E+03	3.82E+03	0.2250	5.971E+15
Co-60	1.5934E-02	638,157 18	1,276,314 37	0.00E+00	1.02E+04	2.03E+04	0.3750	3.070E+15
Cs-134	4.6356E-02	638,157 18	1,276,314 37	0.00E+00	2.96E+04	5.92E+04	0.5750	1.026E+17
Cs-135	4.7693E-05	638,157 18	1,276,314 37	0.00E+00	3.04E+01	6.09E+01	0.8500	3.433E+15
Cs-137	2.1113E+00	638,157 18	1,276,314 37	0.00E+00	1.35E+06	2.69E+06	1.2500	2.989E+15
Eu-154	4.8092E-02	638,157 18	1,276,314 37	0.00E+00	3.07E+04	6.14E+04	1.7500	4.910E+13
Eu-155	6.8479E-02	638,157 18	1,276,314 37	0.00E+00	4.37E+04	8.74E+04	2.2500	1.653E+12
Fe-55	5.8479E-03	638,157 18	1,276,314 37	0.00E+00	3.73E+03	7.46E+03	2.7500	1.724E+11
H-3	8.9300E-03	638,157 18	1,276,314 37	0.00E+00	5.70E+03	1.14E+04	3.5000	1.946E+10
I-129	1.2891E-06	638,157 18	1,276,314 37	0.00E+00	8.23E-01	1.65E+00	5.0000	4.815E+07
Kr-85	7.0941E-02	638,157 18	1,276,314 37	0.00E+00	4.53E+04	9.05E+04	7.0000	5.509E+06
Np-237	2.6541E-06	638,157 18	1,276,314 37	0.00E+00	1.69E+00	3.39E+00	11.0000	6.309E+05
Pa-231	4.8970E-12	638,157 18	1,276,314 37	0.00E+00	3.13E-06	6.25E-06		
Pb-210	2.2170E-13	638,157 18	1,276,314 37	0.00E+00	1.41E-07	2.83E-07		
Pm-147	2.3617E-01	638,157 18	1,276,314 37	0.00E+00	1.51E+05	3.01E+05		
Pu-238	2.8636E-02	638,157 18	1,276,314 37	0.00E+00	1.83E+04	3.65E+04		
Pu-239	-3.5520E-02	638,157 18	0.00	1.44E+05	1.21E+05	1.44E+05		
Pu-240	2.0790E-02	638,157 18	1,276,314 37	7.31E+04	8.63E+04	9.96E+04		
Pu-241	-4.8316E-01	638,157 18	0.00	3.28E+06	2.97E+06	3.28E+06		
Pu-242	1.1052E-05	638,157 18	1,276,314 37	1.95E+01	2.65E+01	3.36E+01		
Ra-226	5.7471E-13	638,157 18	1,276,314 37	0.00E+00	3.67E-07	7.34E-07		
Ra-228	5.4957E-17	638,157 18	1,276,314 37	0.00E+00	3.51E-11	7.01E-11		
Ru-106	1.4582E-02	638,157 18	1,276,314 37	0.00E+00	9.31E+03	1.86E+04		
Se-79	1.0137E-05	638,157 18	1,276,314 37	0.00E+00	6.47E+00	1.29E+01		
Sn-126	4.3922E-05	638,157 18	1,276,314 37	0.00E+00	2.80E+01	5.61E+01		
Sr-90	7.6329E-01	638,157 18	1,276,314 37	0.00E+00	4.87E+05	9.74E+05		
Tc-99	3.9412E-04	638,157 18	1,276,314 37	0.00E+00	2.52E+02	5.03E+02		
Th-229	1.6457E-12	638,157 18	1,276,314 37	0.00E+00	1.05E-06	2.10E-06		
Th-230	1.8822E-10	638,157 18	1,276,314 37	0.00E+00	1.20E-04	2.40E-04		
Th-232	9.7601E-07	638,157 18	1,276,314 37	0.00E+00	6.23E-11	1.25E-10		
Ti-208	5.2722E-17	638,157 18	1,276,314 37	0.00E+00	3.36E-01	6.73E-01		
U-232	1.4925E-06	638,157 18	1,276,314 37	0.00E+00	9.52E-01	1.90E+00		
U-233	2.1113E-10	638,157 18	1,276,314 37	0.00E+00	1.35E-04	2.69E-04		
U-234	1.9528E-06	638,157 18	1,276,314 37	0.00E+00	1.25E+00	2.49E+00		
U-235	-9.7920E-09	638,157 18	0.00	2.95E-02	2.33E-02	2.95E-02		
U-236	1.1570E-07	638,157 18	1,276,314 37	0.00E+00	7.38E-02	1.48E-01		
U-238	-1.7914E-07	638,157 18	0.00	2.15E+00	2.03E+00	2.15E+00		
Y-90	7.6329E-01	638,157 18	1,276,314 37	0.00E+00	4.87E+05	9.74E+05		
Other Radionuclides					1.38E+06	2.77E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	FAST	FAST	This Template was used for the following reasons. This fuel matches on all parameters except enrichment.
BOL HM Constituents	SST	SST	
BOL Enrichment %	Pu and U	Pu and U	
	0.71	10 to 30	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	635,816 10	638 157 18	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding	1,362,463.07	1 276 314 37	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.46	1.00	1.00
Bounding	0.92	0.94	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-DFA/TDFA PINS  
SNF ID #: 323  
Fuel Units & Descr: 2768 - ROD  
Heavy Metal Mass BOL= , EOL=443 987kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
Estimates as of 2010  
Template FFTF (FAST, SST, 10 to 30%, Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
Template BOL Heavy Metal Mass (MT) 0.0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
41 94

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	31,146.44	69,045.35	0.00E+00	4.28E-08	9.48E-08	Avg MeV	
Am-241	7.9527E-02	31,146.44	69,045.35	9.16E+02	3.39E+03	6.41E+03	0.0150	3.470E+15
Am-242m	2.1053E-03	31,146.44	69,045.35	0.00E+00	6.56E+01	1.45E+02	0.0250	7.487E+14
Am-243	1.0760E-04	31,146.44	69,045.35	0.00E+00	3.35E+00	7.43E+00	0.0375	8.562E+14
C-14	2.6141E-05	31,146.44	69,045.35	0.00E+00	8.14E-01	1.80E+00	0.0575	7.280E+14
Cl-36	3.4243E-10	31,146.44	69,045.35	0.00E+00	1.07E-05	2.36E-05	0.0850	4.266E+14
Cm-243	6.6092E-04	31,146.44	69,045.35	0.00E+00	2.06E+01	4.56E+01	0.1250	3.186E+14
Cm-244	2.9933E-03	31,146.44	69,045.35	0.00E+00	9.32E+01	2.07E+02	0.2250	3.230E+14
Co-60	1.5934E-02	31,146.44	69,045.35	0.00E+00	4.96E+02	1.10E+03	0.3750	1.661E+14
Cs-134	4.6356E-02	31,146.44	69,045.35	0.00E+00	1.44E+03	3.20E+03	0.5750	5.549E+15
Cs-135	4.7693E-05	31,146.44	69,045.35	0.00E+00	1.49E+00	3.29E+00	0.8500	1.857E+14
Cs-137	2.1113E+00	31,146.44	69,045.35	0.00E+00	6.58E+04	1.46E+05	1.2500	1.617E+14
Eu-154	4.8092E-02	31,146.44	69,045.35	0.00E+00	1.50E+03	3.32E+03	1.7500	2.656E+12
Eu-155	6.8447E-02	31,146.44	69,045.35	0.00E+00	2.13E+03	4.73E+03	2.2500	8.941E+10
Fe-55	5.8479E-03	31,146.44	69,045.35	0.00E+00	1.82E+02	4.04E+02	2.7500	9.326E+09
H-3	8.9300E-03	31,146.44	69,045.35	0.00E+00	2.78E+02	6.17E+02	3.5000	1.053E+09
I-129	1.2891E-06	31,146.44	69,045.35	0.00E+00	4.02E-02	8.90E-02	5.0000	2.574E+06
Kr-85	7.0941E-02	31,146.44	69,045.35	0.00E+00	2.21E+03	4.90E+03	7.0000	2.945E+05
Np-237	2.6541E-06	31,146.44	69,045.35	0.00E+00	8.27E-02	1.83E-01	11.0000	3.373E+04
Pa-231	4.8970E-12	31,146.44	69,045.35	0.00E+00	1.53E-07	3.38E-07		
Pb-210	2.2170E-13	31,146.44	69,045.35	0.00E+00	6.91E-09	1.53E-08		
Pm-147	2.3617E-01	31,146.44	69,045.35	0.00E+00	7.36E+03	1.63E+04		
Pu-238	2.8636E-02	31,146.44	69,045.35	0.00E+00	8.92E+02	1.98E+03		
Pu-239	-3.5520E-02	31,146.44	0.00	7.52E+03	6.41E+03	7.52E+03		
Pu-240	2.0790E-02	31,146.44	69,045.35	3.82E+03	4.47E+03	5.26E+03		
Pu-241	-4.8316E-01	31,146.44	0.00	1.72E+05	1.57E+05	1.72E+05		
Pu-242	1.1052E-05	31,146.44	69,045.35	1.02E+00	1.36E+00	1.78E+00		
Ra-226	5.7471E-13	31,146.44	69,045.35	0.00E+00	1.79E-08	3.97E-08		
Ra-228	5.4957E-17	31,146.44	69,045.35	0.00E+00	1.71E-12	3.79E-12		
Ru-106	1.4582E-02	31,146.44	69,045.35	0.00E+00	4.54E+02	1.01E+03		
Se-79	1.0137E-05	31,146.44	69,045.35	0.00E+00	3.16E-01	7.00E-01		
Sn-126	4.3922E-05	31,146.44	69,045.35	0.00E+00	1.37E+00	3.03E+00		
Sr-90	7.6329E-01	31,146.44	69,045.35	0.00E+00	2.38E+04	5.27E+04		
Tc-99	3.9412E-04	31,146.44	69,045.35	0.00E+00	1.23E+01	2.72E+01		
Th-229	1.6457E-12	31,146.44	69,045.35	0.00E+00	5.13E-08	1.14E-07		
Th-230	1.8822E-10	31,146.44	69,045.35	0.00E+00	5.86E-06	1.30E-05		
Th-232	9.7601E-17	31,146.44	69,045.35	0.00E+00	3.04E-12	6.74E-12		
Ti-208	5.2722E-07	31,146.44	69,045.35	0.00E+00	1.64E-02	3.64E-02		
U-232	1.4925E-06	31,146.44	69,045.35	0.00E+00	4.65E-02	1.03E-01	Thermal Power	
U-233	2.1113E-10	31,146.44	69,045.35	0.00E+00	6.58E-06	1.46E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.9528E-06	31,146.44	69,045.35	0.00E+00	6.08E-02	1.35E-01	1.02E+03	1.86E+03
U-235	-9.7920E-09	31,146.44	0.00	1.54E-03	1.24E-03	1.54E-03	Total	Total
U-236	1.1570E-07	31,146.44	69,045.35	0.00E+00	3.60E-03	7.99E-03		
U-238	-1.7914E-07	31,146.44	0.00	1.12E-01	1.07E-01	1.12E-01		
Y-90	7.6329E-01	31,146.44	69,045.35	0.00E+00	2.38E+04	5.27E+04		
Other Radionuclides					6.75E+04	1.50E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate <sup>2</sup>
Nominal		31 146.44	Nominal burnup taken from SFD and converted to MWd using BOL=475 192kg
Bounding		69 045.35	Bounding burnup taken from SFD and converted to MWd using BOL=475 192kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.43		1.00
Bounding	0.95		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA PINS  
SNF ID #: 320  
Fuel Units & Descr. 1645 - ROD  
Heavy Metal Mass BOL= , EOL=389 701kg  
ROD Storage Site, HANFORD

<sup>1</sup>Fuel decay start date: 1992  
Estimates as of 2010  
Template FFTF (FAST, SST, 10 to 30%, Pu & U)  
<sup>2</sup>Template Burnup(MWd): 5011.2  
Template BOL Heavy Metal Mass (MT): 0 0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
24 92

II. Estimates		m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	1 3735E-12	27,338 13	60,603 11	0 00E+00	3 75E-08	8 32E-08	Avg. MeV		
Am-241	7 9527E-02	27,338 13	60,603 11	8 04E+02	2 98E+03	5 62E+03	0 0150	3 046E+15	
Am-242m	2 1053E-03	27,338 13	60,603 11	0 00E+00	5 76E+01	1 28E+02	0 0250	6 572E+14	
Am-243	1 0760E-04	27,338 13	60,603 11	0 00E+00	2 94E+00	6 52E+00	0 0375	7 515E+14	
C-14	2 6141E-05	27,338 13	60,603 11	0 00E+00	7 15E-01	1 58E+00	0 0575	6 390E+14	
Cl-36	3 4243E-10	27,338 13	60,603 11	0 00E+00	9 36E-06	2 08E-05	0 0850	3 744E+14	
Cm-243	6 6092E-04	27,338 13	60,603 11	0 00E+00	1 81E+01	4 01E+01	0 1250	2 796E+14	
Cm-244	2 9933E-03	27,338 13	60,603 11	0 00E+00	8 18E+01	1 81E+02	0 2250	2 835E+14	
Co-60	1 5934E-02	27,338 13	60,603 11	0 00E+00	4 36E+02	9 66E+02	0 3750	1 458E+14	
Cs-134	4 6356E-02	27,338 13	60,603 11	0 00E+00	1 27E+03	2 81E+03	0 5750	4 870E+15	
Cs-135	4 7693E-05	27,338 13	60,603 11	0 00E+00	1 30E+00	2 89E+00	0 8500	1 630E+14	
Cs-137	2 1113E+00	27,338 13	60,603 11	0 00E+00	5 77E+04	1 28E+05	1 2500	1 419E+14	
Eu-154	4 8092E-02	27,338 13	60,603 11	0 00E+00	1 31E+03	2 91E+03	1 7500	2 331E+12	
Eu-155	6 8447E-02	27,338 13	60,603 11	0 00E+00	1 87E+03	4 15E+03	2 2500	7 848E+10	
Fe-55	5 8479E-03	27,338 13	60,603 11	0 00E+00	1 60E+02	3 54E+02	2 7500	8 186E+09	
H-3	8 9300E-03	27,338 13	60,603 11	0 00E+00	2 44E+02	5 41E+02	3 5000	9 241E+08	
I-129	1 2891E-06	27,338 13	60,603 11	0 00E+00	3 52E-02	7 81E-02	5 0000	2 259E+06	
Kr-85	7 0941E-02	27,338 13	60,603 11	0 00E+00	1 94E+03	4 30E+03	7 0000	2 585E+05	
Np-237	2 6541E-06	27,338 13	60,603 11	0 00E+00	7 26E-02	1 61E-01	11 0000	2 960E+04	
Pa-231	4 8970E-12	27,338 13	60,603 11	0 00E+00	1 34E-07	2 97E-07			
Pb-210	2 2170E-13	27,338 13	60,603 11	0 00E+00	6 06E-09	1 34E-08			
Pm-147	2 3617E-01	27,338 13	60,603 11	0 00E+00	6 46E+03	1 43E+04			
Pu-238	2 8636E-02	27,338 13	60,603 11	0 00E+00	7 83E+02	1 74E+03			
Pu-239	-3 5520E-02	27,338 13	0.00	6 60E+03	5 63E+03	6 60E+03			
Pu-240	2 0790E-02	27,338 13	60,603 11	3 36E+03	3 92E+03	4 62E+03			
Pu-241	-4 8316E-01	27,338 13	0.00	1 51E+05	1 37E+05	1 51E+05			
Pu-242	1 1052E-05	27,338 13	60,603 11	8 95E-01	1 20E+00	1 56E+00			
Ra-226	5 7471E-13	27,338 13	60,603 11	0 00E+00	1 57E-08	3 48E-08			
Ra-228	5 4957E-17	27,338 13	60,603 11	0 00E+00	1 50E-12	3 33E-12			
Ru-106	1 4582E-02	27,338 13	60,603 11	0 00E+00	3 99E+02	8 84E+02			
Se-79	1 0137E-05	27,338 13	60,603 11	0 00E+00	2 77E-01	6 14E-01			
Sn-126	4 3922E-05	27,338 13	60,603 11	0 00E+00	1 20E+00	2 66E+00			
Sr-90	7 6329E-01	27,338 13	60,603 11	0 00E+00	2 09E+04	4 63E+04			
Tc-99	3 9412E-04	27,338 13	60,603 11	0 00E+00	1 08E+01	2 39E+01			
Th-229	1 6457E-12	27,338 13	60,603 11	0 00E+00	4 50E-08	9 97E-08			
Th-230	1 8822E-10	27,338 13	60,603 11	0 00E+00	5 15E-06	1 14E-05			
Th-232	9 7601E-17	27,338 13	60,603 11	0 00E+00	2 67E-12	5 91E-12			
Ti-208	5 2722E-07	27,338 13	60,603 11	0 00E+00	1 44E-02	3 20E-02			
U-232	1 4925E-06	27,338 13	60,603 11	0 00E+00	4 08E-02	9 04E-02			
U-233	2 1113E-10	27,338 13	60,603 11	0 00E+00	5 77E-06	1 28E-05			
U-234	1 9528E-06	27,338 13	60,603 11	0 00E+00	5 34E-02	1 18E-01			
U-235	-9 7920E-09	27,338 13	0.00	1 36E-03	1 09E-03	1 36E-03			
U-236	1 1570E-07	27,338 13	60,603 11	0 00E+00	3 16E-03	7 01E-03			
U-238	-1 7914E-07	27,338 13	0.00	9 87E-02	9 38E-02	9 87E-02			
Y-90	7 6329E-01	27,338 13	60,603 11	0 00E+00	2 09E+04	4 63E+04			
Other Radionuclides					5 93E+04	1 31E+05			

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

		From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)
Reactor Moderator		FAST	FAST	
Fuel Cladding		SST	SST	
BOL HM Constituents		Pu and U	Pu and U	
BOL Enrichment %			10 to 30	

### Burnup Summary (MWd)<sup>1</sup>

		From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup taken from SFD and converted to MWd using BOL=417 09kg Bounding burnup taken from SFD and converted to MWd using BOL=417 09kg
Nominal			27,338 13	
Bounding			60 603 11	

### Checks

		Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal		0 43		1 00
Bounding		0 95		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF-TFA PINS (AC-3)  
SNF ID # 1046  
Fuel Units & Descr 72 - ROD  
Heavy Metal Mass BOL= , EOL=8 878kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
Estimates as of 2010  
Template FFTF (FAST, SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
Template BOL Heavy Metal Mass (MT) 0.0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
1.09

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1.3735E-12	634.54	787.70	0.00E+00	8.72E-10	1.08E-09	0.0150	4.001E+13
Am-241	7.9527E-02	634.54	787.70	1.83E+01	6.88E+01	8.10E+01	0.0250	8.549E+12
Am-242m	2.1053E-03	634.54	787.70	0.00E+00	1.34E+00	1.66E+00	0.0375	9.768E+12
Am-243	1.0760E-04	634.54	787.70	0.00E+00	6.83E-02	8.48E-02	0.0575	8.415E+12
C-14	2.6141E-05	634.54	787.70	0.00E+00	1.66E-02	2.06E-02	0.0850	4.867E+12
Ci-36	3.4243E-10	634.54	787.70	0.00E+00	2.17E-07	2.70E-07	0.1250	3.635E+12
Cm-243	6.6092E-04	634.54	787.70	0.00E+00	4.19E-01	5.21E-01	0.2250	3.685E+12
Cm-244	2.9933E-03	634.54	787.70	0.00E+00	1.90E+00	2.36E+00	0.3750	1.895E+12
Co-60	1.5934E-02	634.54	787.70	0.00E+00	1.01E+01	1.26E+01	0.5750	6.330E+13
Cs-134	4.6356E-02	634.54	787.70	0.00E+00	2.94E+01	3.65E+01	0.8500	2.119E+12
Cs-135	4.7693E-05	634.54	787.70	0.00E+00	3.03E-02	3.76E-02	1.2500	1.845E+12
Cs-137	2.1113E+00	634.54	787.70	0.00E+00	1.34E+03	1.66E+03	1.7500	3.030E+10
Eu-154	4.8092E-02	634.54	787.70	0.00E+00	3.05E+01	3.79E+01	2.2500	1.020E+09
Eu-155	6.8447E-02	634.54	787.70	0.00E+00	4.34E+01	5.39E+01	2.7500	1.064E+08
Fe-55	5.8479E-03	634.54	787.70	0.00E+00	3.71E+00	4.61E+00	3.5000	1.203E+07
H-3	8.9300E-03	634.54	787.70	0.00E+00	5.67E+00	7.03E+00	5.0000	3.718E+04
I-129	1.2891E-06	634.54	787.70	0.00E+00	8.18E-04	1.02E-03	7.0000	4.250E+03
Kr-85	7.0941E-02	634.54	787.70	0.00E+00	4.50E+01	5.59E+01	11.0000	4.865E+02
Np-237	2.6541E-06	634.54	787.70	0.00E+00	1.68E-03	2.09E-03		
Pa-231	4.8970E-12	634.54	787.70	0.00E+00	3.11E-09	3.86E-09		
Pb-210	2.2170E-13	634.54	787.70	0.00E+00	1.41E-10	1.75E-10		
Pm-147	2.3617E-01	634.54	787.70	0.00E+00	1.50E+02	1.86E+02		
Pu-238	2.8636E-02	634.54	787.70	0.00E+00	1.82E+01	2.26E+01		
Pu-239	-3.5520E-02	634.54	0.00	1.51E+02	1.28E+02	1.51E+02		
Pu-240	2.0790E-02	634.54	787.70	7.65E+01	8.97E+01	9.29E+01		
Pu-241	-4.8316E-01	634.54	0.00	3.44E+03	3.13E+03	3.44E+03		
Pu-242	1.1052E-05	634.54	787.70	2.04E-02	2.74E-02	2.91E-02		
Ra-226	5.7471E-13	634.54	787.70	0.00E+00	3.65E-10	4.53E-10		
Ra-228	5.4957E-17	634.54	787.70	0.00E+00	3.49E-14	4.33E-14		
Ru-106	1.4582E-02	634.54	787.70	0.00E+00	9.25E+00	1.15E+01		
Se-79	1.0137E-05	634.54	787.70	0.00E+00	6.43E-03	7.99E-03		
Sn-126	4.3922E-05	634.54	787.70	0.00E+00	2.79E-02	3.46E-02		
Sr-90	7.6329E-01	634.54	787.70	0.00E+00	4.84E+02	6.01E+02		
Tc-99	3.9412E-04	634.54	787.70	0.00E+00	2.50E-01	3.10E-01		
Th-229	1.6457E-12	634.54	787.70	0.00E+00	1.04E-09	1.30E-09		
Th-230	1.8822E-10	634.54	787.70	0.00E+00	1.19E-07	1.48E-07		
Th-232	9.7601E-17	634.54	787.70	0.00E+00	6.19E-14	7.69E-14		
Th-208	5.2722E-07	634.54	787.70	0.00E+00	3.35E-04	4.15E-04		
U-232	1.4925E-06	634.54	787.70	0.00E+00	9.47E-04	1.18E-03		
U-233	2.1113E-10	634.54	787.70	0.00E+00	1.34E-07	1.66E-07		
U-234	1.9528E-06	634.54	787.70	0.00E+00	1.24E-03	1.54E-03		
U-235	-9.7920E-09	634.54	0.00	3.09E-05	2.47E-05	3.09E-05		
U-236	1.1570E-07	634.54	787.70	0.00E+00	7.34E-05	9.11E-05		
U-238	-1.7914E-07	634.54	0.00	2.25E-03	2.14E-03	2.25E-03		
Y-90	7.6329E-01	634.54	787.70	0.00E+00	4.84E+02	6.01E+02		
Other Radionuclides					1.38E+03	1.71E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		634.54	Nominal burnup taken from SFD and converted to MWd using BOL=9.513kg
Bounding		787.70	Bounding burnup taken from SFD and converted to MWd using BOL=9.513kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.44		1.00
Bounding	0.54		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA-AB-1  
SNF ID #: 317  
Fuel Units & Descr: 1 - HEX ARRAY 217 ROD  
Heavy Metal Mass: BOL= , EOL=34 655kg  
ROD Storage Site: HANFORD

Fuel decay start date: 1992  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30%, Pu & U)  
Template Burnup(MWd), 5011.2  
Template BOL Heavy Metal Mass (MT): 0.0329181  
Template Decay Time: 15 years

Estimated  
Canister usage:  
18"x15"  
0 20

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 3735E-12	251 33	502 65	0 00E+00	3 45E-10	6 90E-10	Avg. MeV	
Am-241	7 9527E-02	251 33	502 65	6 73E+01	8 73E+01	1 07E+02	0 0150	2 853E+13
Am-242m	2 1053E-03	251 33	502 65	0 00E+00	5 29E-01	1 06E+00	0 0250	5 507E+12
Am-243	1 0760E-04	251 33	502 65	0 00E+00	2 70E-02	5 41E-02	0 0375	6 239E+12
C-14	2 6141E-05	251 33	502 65	0 00E+00	6 57E-03	1 31E-02	0 0575	6 142E+12
Cl-36	3 4243E-10	251 33	502 65	0 00E+00	8 61E-08	1 72E-07	0 0850	3 106E+12
Cm-243	6 6092E-04	251 33	502 65	0 00E+00	1 66E-01	3 32E-01	0 1250	2 322E+12
Cm-244	2 9933E-03	251 33	502 65	0 00E+00	7 52E-01	1 50E+00	0 2250	2 352E+12
Co-60	1 5934E-02	251 33	502 65	0 00E+00	4 00E+00	8 01E+00	0 3750	1 210E+12
Cs-134	4 6356E-02	251 33	502 65	0 00E+00	1 17E+01	2 33E+01	0 5750	4 039E+13
Cs-135	4 7693E-05	251 33	502 65	0 00E+00	1 20E-02	2 40E-02	0 8500	1 352E+12
Cs-137	2 1113E+00	251 33	502 65	0 00E+00	5 31E+02	1 06E+03	1 2500	1 177E+12
Eu-154	4 8092E-02	251 33	502 65	0 00E+00	1 21E+01	2 42E+01	1 7500	1 934E+10
Eu-155	6 8447E-02	251 33	502 65	0 00E+00	1 72E+01	3 44E+01	2 2500	6 512E+08
Fe-55	5 8479E-03	251 33	502 65	0 00E+00	1 47E+00	2 94E+00	2 7500	6 806E+07
H-3	8 9300E-03	251 33	502 65	0 00E+00	2 24E+00	4 49E+00	3 5000	7 806E+06
I-129	1 2891E-06	251 33	502 65	0 00E+00	3 24E-04	6 48E-04	5 0000	7 882E-04
Kr-85	7 0941E-02	251 33	502 65	0 00E+00	1 78E+01	3 57E+01	7 0000	8 982E+03
Np-237	2 6541E-06	251 33	502 65	0 00E+00	6 67E-04	1 33E-03	11 0000	1 027E+03
Pa-231	4 8970E-12	251 33	502 65	0 00E+00	1 23E-09	2 46E-09		
Pb-210	2 2170E-13	251 33	502 65	0 00E+00	5 57E-11	1 11E-10		
Pm-147	2 3617E-01	251 33	502 65	0 00E+00	5 94E+01	1 19E+02		
Pu-238	2 8636E-02	251 33	502 65	0 00E+00	7 20E+00	1 44E+01		
Pu-239	-3 5520E-02	251 33	0 00	5 52E+02	5 44E+02	5 52E+02		
Pu-240	2 0790E-02	251 33	502 65	2 81E+02	2 86E+02	2 91E+02		
Pu-241	-4 8316E-01	251 33	0 00	1 26E+04	1 25E+04	1 26E+04		
Pu-242	1 1052E-05	251 33	502 65	7 49E-02	7 77E-02	8 04E-02		
Ra-226	5 7471E-13	251 33	502 65	0 00E+00	1 44E-10	2 89E-10		
Ra-228	5 4957E-17	251 33	502 65	0 00E+00	1 38E-14	2 76E-14		
Ru-106	1 4582E-02	251 33	502 65	0 00E+00	3 66E+00	7 33E+00		
Se-79	1 0137E-05	251 33	502 65	0 00E+00	2 55E-03	5 10E-03		
Sn-126	4 3922E-05	251 33	502 65	0 00E+00	1 10E-02	2 21E-02		
Sr-90	7 6329E-01	251 33	502 65	0 00E+00	1 92E+02	3 84E+02		
Tc-99	3 9412E-04	251 33	502 65	0 00E+00	9 91E-02	1 98E-01		
Th-229	1 6457E-12	251 33	502 65	0 00E+00	4 14E-10	8 27E-10		
Th-230	1 8822E-10	251 33	502 65	0 00E+00	4 73E-08	9 46E-08		
Th-232	9 7601E-17	251 33	502 65	0 00E+00	2 45E-14	4 91E-14		
Ti-208	5 2722E-07	251 33	502 65	0 00E+00	1 33E-04	2 65E-04		
U-232	1 4925E-06	251 33	502 65	0 00E+00	3 75E-04	7 50E-04	Thermal Power	
U-233	2 1113E-10	251 33	502 65	0 00E+00	5 31E-08	1 06E-07	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 9528E-06	251 33	502 65	0 00E+00	4 91E-04	9 82E-04	3 35E+01	3 91E+01
U-235	-9 7920E-09	251 33	0 00	1 13E-04	1 11E-04	1 13E-04	Total	Total
U-236	1 1570E-07	251 33	502 65	0 00E+00	2 91E-05	5 82E-05		
U-238	-1 7914E-07	251 33	0 00	8 26E-03	8 21E-03	8 26E-03		
Y-90	7 6329E-01	251 33	502 65	0 00E+00	1 92E+02	3 84E+02		
Other Radionuclides					5 45E+02	1 09E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	FAST	FAST	This Template was used for the following reasons.
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		251 33	Nominal burnup taken from SFD and converted to MWd using BOL=34 907kg
Bounding		502 65	Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0 05		1 00
Bounding	0 09		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF-TFA-ABA-1 THRU 6  
SNF ID # 318  
Fuel Units & Descr 6 - HEX ARRAY 91 ROD  
Heavy Metal Mass BOL= , EOL=257 428kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
Estimates as of 2010  
Template FERMI (Fast Zirc 10 to 40% U)  
<sup>2</sup>Template Burnup(MWd) 58 6725048  
Template BOL Heavy Metal Mass (MT) 0.018774  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
120

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.1509E-08	5,934.58	8,479.48	0.00E+00	1.28E-04	1.82E-04	Avg MeV	
Am-241	4.6529E-07	5,934.58	8,479.48	0.00E+00	2.76E-03	3.95E-03	0.0150	9.091E+14
Am-242m	0.0000E+00	5,934.58	8,479.48	0.00E+00	0.00E+00	0.00E+00	0.0250	1.927E+14
Am-243	8.3923E-15	5,934.58	8,479.48	0.00E+00	4.98E-11	7.12E-11	0.0375	1.675E+14
C-14	2.1765E-05	5,934.58	8,479.48	0.00E+00	1.29E-01	1.85E-01	0.0575	1.759E+14
Cl-36	5.5188E-08	5,934.58	8,479.48	0.00E+00	3.28E-04	4.68E-04	0.0850	1.081E+14
Cm-243	2.5208E-14	5,934.58	8,479.48	0.00E+00	1.50E-10	2.14E-10	0.1250	6.990E+13
Cm-244	1.1259E-15	5,934.58	8,479.48	0.00E+00	6.68E-12	9.55E-12	0.2250	9.128E+13
Co-60	2.9094E-02	5,934.58	8,479.48	0.00E+00	1.73E+02	2.47E+02	0.3750	4.178E+13
Cs-134	5.1932E-04	5,934.58	8,479.48	0.00E+00	3.08E+00	4.40E+00	0.5750	6.926E+14
Cs-135	4.4996E-05	5,934.58	8,479.48	0.00E+00	2.67E-01	3.82E-01	0.8500	6.689E+12
Cs-137	2.1867E+00	5,934.58	8,479.48	0.00E+00	1.30E+04	1.85E+04	1.2500	2.054E+13
Eu-154	9.2837E-04	5,934.58	8,479.48	0.00E+00	5.51E+00	7.87E+00	1.7500	1.700E+11
Eu-155	2.3180E-02	5,934.58	8,479.48	0.00E+00	1.38E+02	1.97E+02	2.2500	4.864E+08
Fe-55	2.9332E-03	5,934.58	8,479.48	0.00E+00	1.74E+01	2.49E+01	2.7500	2.222E+07
H-3	1.0871E-02	5,934.58	8,479.48	0.00E+00	6.45E+01	9.22E+01	3.5000	2.565E+06
I-129	1.1426E-06	5,934.58	8,479.48	0.00E+00	6.78E-03	9.69E-03	5.0000	6.262E+02
Kr-85	1.4068E-01	5,934.58	8,479.48	0.00E+00	8.35E+02	1.19E+03	7.0000	5.570E+01
Np-237	3.3099E-06	5,934.58	8,479.48	0.00E+00	1.96E-02	2.81E-02	11.0000	5.315E+00
Pa-231	7.8640E-08	5,934.58	8,479.48	0.00E+00	4.67E-04	6.67E-04		
Pb-210	7.4277E-13	5,934.58	8,479.48	0.00E+00	4.41E-09	6.30E-09		
Pm-147	2.2856E-01	5,934.58	8,479.48	0.00E+00	1.36E+03	1.94E+03		
Pu-238	2.0095E-04	5,934.58	8,479.48	0.00E+00	1.19E+00	1.70E+00		
Pu-239	1.9481E-02	5,934.58	8,479.48	0.00E+00	1.16E+02	1.65E+02		
Pu-240	6.8056E-05	5,934.58	8,479.48	0.00E+00	4.04E-01	5.77E-01		
Pu-241	1.0939E-05	5,934.58	8,479.48	0.00E+00	6.49E-02	9.28E-02		
Pu-242	4.3751E-13	5,934.58	8,479.48	0.00E+00	2.60E-09	3.71E-09		
Ra-226	4.0428E-12	5,934.58	8,479.48	0.00E+00	2.40E-08	3.43E-08		
Ra-228	2.1032E-11	5,934.58	8,479.48	0.00E+00	1.25E-07	1.78E-07		
Ru-106	2.9077E-04	5,934.58	8,479.48	0.00E+00	1.73E+00	2.47E+00		
Se-79	1.6492E-05	5,934.58	8,479.48	0.00E+00	9.79E-02	1.40E-01		
Sn-126	3.7564E-05	5,934.58	8,479.48	0.00E+00	2.23E-01	3.19E-01		
Sr-90	1.9396E+00	5,934.58	8,479.48	0.00E+00	1.15E+04	1.64E+04		
Tc-99	4.4842E-04	5,934.58	8,479.48	0.00E+00	2.66E+00	3.80E+00		
Th-229	1.8544E-11	5,934.58	8,479.48	0.00E+00	1.10E-07	1.57E-07		
Th-230	9.0605E-10	5,934.58	8,479.48	0.00E+00	5.38E-06	7.68E-06		
Th-232	2.3674E-11	5,934.58	8,479.48	0.00E+00	1.40E-07	2.01E-07		
Th-208	7.0323E-09	5,934.58	8,479.48	0.00E+00	4.17E-05	5.96E-05		
U-232	1.9106E-08	5,934.58	8,479.48	0.00E+00	1.13E-04	1.62E-04	Thermal Power	
U-233	9.6774E-09	5,934.58	8,479.48	0.00E+00	5.74E-05	8.21E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4.8796E-06	5,934.58	8,479.48	0.00E+00	2.90E-02	4.14E-02	1.48E+02	2.12E+02
U-235	-2.3191E-06	5,934.58	0.00	1.46E-01	1.32E-01	1.46E-01	Total	
U-236	1.2633E-05	5,934.58	8,479.48	0.00E+00	7.50E-02	1.07E-01		
U-238	-9.5407E-08	5,934.58	0.00	6.61E-02	6.55E-02	6.61E-02		
Y-90	1.9396E+00	5,934.58	8,479.48	0.00E+00	1.15E+04	1.64E+04		
Other Radionuclides					1.29E+04	1.84E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	SST	ZIRC	This template is a good approximation since it is a FAST Uranium fuel
BOL HM Constituents	U	U	
BOL Enrichment %		10 to 40	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		5,934.58	Nominal burnup taken from SFD and converted to MWd using BOL=264 158kg
Bounding		8,479.48	Bounding burnup taken from SFD and converted to MWd using BOL=264 158kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	7.19		1.01
Bounding	10.27		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA-ACN-1 (MOX) PINS  
SNF ID #: 321  
Fuel Units & Descr: 90 - ROD  
Heavy Metal Mass: BOL= , EOL=14 346kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1992  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30%, Pu & U)  
<sup>2</sup>Template Burnup(MWd): 5011.2  
Template BOL Heavy Metal Mass (MT): 0.0329181  
Template Decay Time: 15 years

Estimated  
Canister usage:  
18"x15"  
0 02

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 3735E-12	1,038 59	2,077 18	0 00E+00	1 43E-09	2 85E-09	Avg. MeV	
Am-241	7 9527E-02	1,038 59	2,077 18	2 97E+01	1 12E+02	1 95E+02	0 0150	1 045E+14
Am-242m	2 1053E-03	1,038 59	2,077 18	0 00E+00	2 19E+00	4 37E+00	0 0250	2 253E+13
Am-243	1 0760E-04	1,038 59	2,077 18	0 00E+00	1 12E-01	2 24E-01	0 0375	2 576E+13
C-14	2 6141E-05	1,038 59	2,077 18	0 00E+00	2 72E-02	5 43E-02	0 0575	2 193E+13
Cl-36	3 4243E-10	1,038 59	2,077 18	0 00E+00	3 56E-07	7 11E-07	0 0850	1 283E+13
Cm-243	6 6092E-04	1,038 59	2,077 18	0 00E+00	6 86E-01	1 37E+00	0 1250	9 584E+12
Cm-244	2 9933E-03	1,038 59	2,077 18	0 00E+00	3 11E+00	6 22E+00	0 2250	9 718E+12
Co-60	1 5934E-02	1,038 59	2,077 18	0 00E+00	1 65E+01	3 31E+01	0 3750	4 996E+12
Cs-134	4 6356E-02	1,038 59	2,077 18	0 00E+00	4 81E+01	9 63E+01	0 5750	1 669E+14
Cs-135	4 7693E-05	1,038 59	2,077 18	0 00E+00	4 95E-02	9 91E-02	0 8500	5 587E+12
Cs-137	2 1113E+00	1,038 59	2,077 18	0 00E+00	2 19E+03	4 39E+03	1 2500	4 864E+12
Eu-154	4 8092E-02	1,038 59	2,077 18	0 00E+00	4 99E+01	9 99E+01	1 7500	7 991E+10
Eu-155	6 8447E-02	1,038 59	2,077 18	0 00E+00	7 11E+01	1 42E+02	2 2500	2 690E+09
Fe-55	5 8479E-03	1,038 59	2,077 18	0 00E+00	6 07E+00	1 21E+01	2 7500	2 806E+08
H-3	8 9300E-03	1,038 59	2,077 18	0 00E+00	9 27E+00	1 85E+01	3 5000	3 168E+07
I-129	1 2891E-06	1,038 59	2,077 18	0 00E+00	1 34E-03	2 68E-03	5 0000	7 952E+04
Kr-85	7 0941E-02	1,038 59	2,077 18	0 00E+00	7 37E+01	1 47E+02	7 0000	9 097E+03
Np-237	2 6541E-06	1,038 59	2,077 18	0 00E+00	2 76E-03	5 51E-03	11 0000	1 042E+03
Pa-231	4 8970E-12	1,038 59	2,077 18	0 00E+00	5 09E-09	1 02E-08		
Pb-210	2 2170E-13	1,038 59	2,077 18	0 00E+00	2 30E-10	4 61E-10		
Pm-147	2 3617E-01	1,038 59	2,077 18	0 00E+00	2 45E+02	4 91E+02		
Pu-238	2 8636E-02	1,038 59	2,077 18	0 00E+00	2 97E+01	5 95E+01		
Pu-239	-3 5520E-02	1,038 59	0 00	2 44E+02	2 07E+02	2 44E+02		
Pu-240	2 0790E-02	1,038 59	2,077 18	1 24E+02	1 45E+02	1 67E+02		
Pu-241	-4 8316E-01	1,038 59	0 00	5 56E+03	5 05E+03	5 56E+03		
Pu-242	1 1052E-05	1,038 59	2,077 18	3 30E-02	4 45E-02	5 60E-02		
Ra-226	5 7471E-13	1,038 59	2,077 18	0 00E+00	5 97E-10	1 19E-09		
Ra-228	5 4957E-17	1,038 59	2,077 18	0 00E+00	5 71E-14	1 14E-13		
Ru-106	1 4582E-02	1,038 59	2,077 18	0 00E+00	1 51E+01	3 03E+01		
Se-79	1 0137E-05	1,038 59	2,077 18	0 00E+00	1 05E-02	2 11E-02		
Sn-126	4 3922E-05	1,038 59	2,077 18	0 00E+00	4 56E-02	9 12E-02		
Sr-90	7 6329E-01	1,038 59	2,077 18	0 00E+00	7 93E+02	1 59E+03		
Tc-99	3 9412E-04	1,038 59	2,077 18	0 00E+00	4 09E-01	8 19E-01		
Th-229	1 6457E-12	1,038 59	2,077 18	0 00E+00	1 71E-09	3 42E-09		
Th-230	1 8822E-10	1,038 59	2,077 18	0 00E+00	1 95E-07	3 91E-07		
Th-232	9 7601E-17	1,038 59	2,077 18	0 00E+00	1 01E-13	2 03E-13		
Th-208	5 2722E-07	1,038 59	2,077 18	0 00E+00	5 48E-04	1 10E-03		
U-232	1 4925E-06	1,038 59	2,077 18	0 00E+00	1 55E-03	3 10E-03		
U-233	2 1113E-10	1,038 59	2,077 18	0 00E+00	2 19E-07	4 39E-07		
U-234	1 9528E-06	1,038 59	2,077 18	0 00E+00	2 03E-03	4 06E-03		
U-235	-9 7920E-09	1,038 59	0 00	5 00E-05	3 98E-05	5 00E-05		
U-236	1 1570E-07	1,038 59	2,077 18	0 00E+00	1 20E-04	2 40E-04		
U-238	-1 7914E-07	1,038 59	0 00	3 64E-03	3 45E-03	3 64E-03		
Y-90	7 6329E-01	1,038 59	2,077 18	0 00E+00	7 93E+02	1 59E+03		
Other Radionuclides					2 25E+03	4 50E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)
Reactor Moderator	From SFD	Used	
Fuel Cladding	FAST	FAST	
BOL HM Constituents	SST	SST	
BOL Enrichment %	Pu and U	Pu and U	
		10 to 30	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate: Nominal burnup taken from SFD and converted to MWd using BOL=15.387kg Bounding burnup assumed to be twice nominal burnup.
	From SFD	Estimated	
Nominal		1,038 59	
Bounding		2,077 18	

Checks			Estimated EOL HM/Given EOL HM 1 00
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 44		
Bounding	0 89		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF-TFA-ACN-1 (PU/UC) PINS  
 SNF ID # 865  
 Fuel Units & Descr 16 - ROD  
 Heavy Metal Mass BOL= , EOL=2.558kg  
 ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
 Estimates as of 2010  
 Template FFTF (FAST SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup (MWd) 5011.2  
 Template BOL Heavy Metal Mass (MT) 0.0329181  
 Template Decay Time 15 years

Estimated  
 Canister usage  
 18"x15"  
 1.00

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)		
Ac-227	1.3735E-12	185.22	370.43	0.00E+00	2.54E-10	5.09E-10	Avg MeV	
Am-241	7.9527E-02	185.22	370.43	5.29E+00	2.00E+01	3.48E+01	0.0150	1.864E+13
Am-242m	2.1053E-03	185.22	370.43	0.00E+00	3.90E-01	7.80E-01	0.0250	4.017E+12
Am-243	1.0760E-04	185.22	370.43	0.00E+00	1.99E-02	3.99E-02	0.0375	4.593E+12
C-14	2.6141E-05	185.22	370.43	0.00E+00	4.84E-03	9.68E-03	0.0575	3.911E+12
Cl-36	3.4243E-10	185.22	370.43	0.00E+00	6.34E-08	1.27E-07	0.0850	2.289E+12
Cm-243	6.6092E-04	185.22	370.43	0.00E+00	1.22E-01	2.45E-01	0.1250	1.709E+12
Cm-244	2.9933E-03	185.22	370.43	0.00E+00	5.54E-01	1.11E+00	0.2250	1.733E+12
Co-60	1.5934E-02	185.22	370.43	0.00E+00	2.95E+00	5.90E+00	0.3750	8.910E+11
Cs-134	4.6356E-02	185.22	370.43	0.00E+00	8.59E+00	1.72E+01	0.5750	2.977E+13
Cs-135	4.7693E-05	185.22	370.43	0.00E+00	8.83E-03	1.77E-02	0.8500	9.963E+11
Cs-137	2.1113E+00	185.22	370.43	0.00E+00	3.91E+02	7.82E+02	1.2500	8.675E+11
Eu-154	4.8092E-02	185.22	370.43	0.00E+00	8.91E+00	1.78E+01	1.7500	1.425E+10
Eu-155	6.8447E-02	185.22	370.43	0.00E+00	1.27E+01	2.54E+01	2.2500	4.797E+08
Fe-55	5.8479E-03	185.22	370.43	0.00E+00	1.08E+00	2.17E+00	2.7500	5.004E+07
H-3	8.9300E-03	185.22	370.43	0.00E+00	1.65E+00	3.31E+00	3.5000	5.650E+06
I-129	1.2891E-06	185.22	370.43	0.00E+00	2.39E-04	4.78E-04	5.0000	1.418E+04
Kr-85	7.0941E-02	185.22	370.43	0.00E+00	1.31E+01	2.63E+01	7.0000	1.622E+03
Np-237	2.6541E-06	185.22	370.43	0.00E+00	4.92E-04	9.83E-04	11.0000	1.858E+02
Pa-231	4.8970E-12	185.22	370.43	0.00E+00	9.07E-10	1.81E-09		
Pb-210	2.2170E-13	185.22	370.43	0.00E+00	4.11E-11	8.21E-11		
Pm-147	2.3617E-01	185.22	370.43	0.00E+00	4.37E+01	8.75E+01		
Pu-238	2.8636E-02	185.22	370.43	0.00E+00	5.30E+00	1.06E+01		
Pu-239	-3.5520E-02	185.22	0.00	4.34E+01	3.68E+01	4.34E+01		
Pu-240	2.0790E-02	185.22	370.43	2.21E+01	2.59E+01	2.98E+01		
Pu-241	-4.8316E-01	185.22	0.00	9.91E+02	9.01E+02	9.91E+02		
Pu-242	1.1052E-05	185.22	370.43	5.89E-03	7.93E-03	9.98E-03		
Ra-226	5.7471E-13	185.22	370.43	0.00E+00	1.06E-10	2.13E-10		
Ra-228	5.4957E-17	185.22	370.43	0.00E+00	1.02E-14	2.04E-14		
Ru-106	1.4582E-02	185.22	370.43	0.00E+00	2.70E+00	5.40E+00		
Se-79	1.0137E-05	185.22	370.43	0.00E+00	1.88E-03	3.76E-03		
Sn-126	4.3922E-05	185.22	370.43	0.00E+00	8.14E-03	1.63E-02		
Sr-90	7.6329E-01	185.22	370.43	0.00E+00	1.41E+02	2.83E+02		
Tc-99	3.9412E-04	185.22	370.43	0.00E+00	7.30E-02	1.46E-01		
Th-229	1.6457E-12	185.22	370.43	0.00E+00	3.05E-10	6.10E-10		
Th-230	1.8822E-10	185.22	370.43	0.00E+00	3.49E-08	6.97E-08		
Th-232	9.7601E-17	185.22	370.43	0.00E+00	1.81E-14	3.62E-14		
Ti-208	5.2722E-07	185.22	370.43	0.00E+00	9.77E-05	1.95E-04		
U-232	1.4925E-06	185.22	370.43	0.00E+00	2.76E-04	5.53E-04	Thermal Power	
U-233	2.1113E-10	185.22	370.43	0.00E+00	3.91E-08	7.82E-08	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.9528E-06	185.22	370.43	0.00E+00	3.62E-04	7.23E-04	5.99E+00	1.02E+01
U-235	-9.7920E-09	185.22	0.00	8.92E-06	7.10E-06	8.92E-06	Total	Total
U-236	1.1570E-07	185.22	370.43	0.00E+00	2.14E-05	4.29E-05		
U-238	-1.7914E-07	185.22	0.00	6.49E-04	6.16E-04	6.49E-04		
Y-90	7.6329E-01	185.22	370.43	0.00E+00	1.41E+02	2.83E+02		
Other Radionuclides					4.01E+02	8.03E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences	
Reactor Moderator	From SFD	Used	This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)	
	FAST	FAST		
Fuel Cladding	SST	SST		
BOL HM Constituents	Pu and U	Pu and U		
BOL Enrichment %		10 to 30		
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate	
	From SFD	Estimated	Nominal burnup taken from SFD and converted to MWd using BOL=2.744kg Bounding burnup assumed to be twice nominal burnup	
Nominal		185.22		
Bounding		370.43		
Checks			Estimated EOL HM/Given EOL HM	
	Burnup Multiplier	Estimated Burnup/Given Burnup	1.00	
Nominal	0.44			
Bounding	0.89			

<sup>1</sup>Reactor shutdown, core removal, storage, shipping, or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA-ACO-2 4 THRU 16  
SNF ID #: 329  
Fuel Units & Descr: 14 - HEX ARRAY 169 ROD  
Heavy Metal Mass: BOL= , EOL=605 982kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1992  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30%, Pu & U)  
<sup>2</sup>Template Burnup(MWd): 5011.2  
Template BOL Heavy Metal Mass (MT): 0.0329181  
Template Decay Time: 15 years

Estimated  
Canister usage  
18"x15"  
2 80

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 3735E-12	96,319 97	140,074 70	0 00E+00	1 32E-07	1 92E-07	Avg MeV	
Am-241	7 9527E-02	96,319 97	140,074 70	1 35E+03	9 01E+03	1 25E+04	0 0150	7 013E+15
Am-242m	2 1053E-03	96,319 97	140,074 70	0 00E+00	2 03E+02	2 95E+02	0 0250	1 518E+15
Am-243	1 0760E-04	96,319 97	140,074 70	0 00E+00	1 04E+01	1 51E+01	0 0375	1 737E+15
C-14	2 6141E-05	96,319 97	140,074 70	0 00E+00	2 52E+00	3 66E+00	0 0575	1 470E+15
Cl-36	3 4243E-10	96,319 97	140,074 70	0 00E+00	3 30E-05	4 80E-05	0 0850	8 654E+14
Cm-243	6 6092E-04	96,319 97	140,074 70	0 00E+00	6 37E+01	9 26E+01	0 1250	6 463E+14
Cm-244	2 9933E-03	96,319 97	140,074 70	0 00E+00	2 88E+02	4 19E+02	0 2250	6 553E+14
Co-60	1 5934E-02	96,319 97	140,074 70	0 00E+00	1 53E+03	2 23E+03	0 3750	3 369E+14
Cs-134	4 6356E-02	96,319 97	140,074 70	0 00E+00	4 47E+03	6 49E+03	0 5750	1 126E+16
Cs-135	4 7693E-05	96,319 97	140,074 70	0 00E+00	4 59E+00	6 68E+00	0 8500	3 768E+14
Cs-137	2 1113E+00	96,319 97	140,074 70	0 00E+00	2 03E+05	2 96E+05	1 2500	3 280E+14
Eu-154	4 8092E-02	96,319 97	140,074 70	0 00E+00	4 63E+03	6 74E+03	1 7500	5 389E+12
Eu-155	6 8447E-02	96,319 97	140,074 70	0 00E+00	6 59E+03	9 59E+03	2 2500	1 814E+11
Fe-55	5 8479E-03	96,319 97	140,074 70	0 00E+00	5 63E+02	8 19E+02	2 7500	1 892E+10
H-3	8 9300E-03	96,319 97	140,074 70	0 00E+00	8 60E+02	1 25E+03	3 5000	2 135E+09
I-129	1 2891E-06	96,319 97	140,074 70	0 00E+00	1 24E-01	1 81E-01	5 0000	4 722E+06
Kr-85	7 0941E-02	96,319 97	140,074 70	0 00E+00	6 83E+03	9 94E+03	7 0000	5 406E+05
Np-237	2 6541E-06	96,319 97	140,074 70	0 00E+00	2 56E-01	3 72E-01	11 0000	6 192E+04
Pa-231	4 8970E-12	96,319 97	140,074 70	0 00E+00	4 72E-07	6 86E-07		
Pb-210	2 2170E-13	96,319 97	140,074 70	0 00E+00	2 14E-08	3 11E-08		
Pm-147	2 3617E-01	96,319 97	140,074 70	0 00E+00	2 27E+04	3 31E+04		
Pu-238	2 8636E-02	96,319 97	140,074 70	0 00E+00	2 76E+03	4 01E+03		
Pu-239	-3 5520E-02	96,319 97	0 00	1 11E+04	7 70E+03	1 11E+04		
Pu-240	2 0790E-02	96,319 97	140,074 70	5 65E+03	7 65E+03	8 56E+03		
Pu-241	-4 8316E-01	96,319 97	0 00	2 54E+05	2 07E+05	2 54E+05		
Pu-242	1 1052E-05	96,319 97	140,074 70	1 51E+00	2 57E+00	3 06E+00		
Ra-226	5 7471E-13	96,319 97	140,074 70	0 00E+00	5 54E-08	8 05E-08		
Ra-228	5 4957E-17	96,319 97	140,074 70	0 00E+00	5 29E-12	7 70E-12		
Ru-106	1 4582E-02	96,319 97	140,074 70	0 00E+00	1 40E+03	2 04E+03		
Se-79	1 0137E-05	96,319 97	140,074 70	0 00E+00	9 76E-01	1 42E+00		
Sn-126	4 3922E-05	96,319 97	140,074 70	0 00E+00	4 23E+00	6 15E+00		
Sr-90	7 6329E-01	96,319 97	140,074 70	0 00E+00	7 35E+04	1 07E+05		
Tc-99	3 9412E-04	96,319 97	140,074 70	0 00E+00	3 80E+01	5 52E+01		
Th-229	1 6457E-12	96,319 97	140,074 70	0 00E+00	1 59E-07	2 31E-07		
Th-230	1 8822E-10	96,319 97	140,074 70	0 00E+00	1 81E-05	2 64E-05		
Th-232	9 7601E-17	96,319 97	140,074 70	0 00E+00	9 40E-12	1 37E-11		
Ti-208	5 2722E-07	96,319 97	140,074 70	0 00E+00	5 08E-02	7 39E-02		
U-232	1 4925E-06	96,319 97	140,074 70	0 00E+00	1 44E-01	2 09E-01	Thermal Power	
U-233	2 1113E-10	96,319 97	140,074 70	0 00E+00	2 03E-05	2 96E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 9528E-06	96,319 97	140,074 70	0 00E+00	1 88E-01	2 74E-01	2 52E+03	3 57E+03
U-235	-9 7920E-09	96,319 97	0 00	2 28E-03	1 34E-03	2 28E-03	Total	Total
U-236	1 1570E-07	96,319 97	140,074 70	0 00E+00	1 11E-02	1 62E-02		
U-238	-1 7914E-07	96,319 97	0 00	1 66E-01	1 49E-01	1 66E-01		
Y-90	7 6329E-01	96,319 97	140,074 70	0 00E+00	7 35E+04	1 07E+05		
Other Radionuclides					2 09E+05	3 04E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	This Template was used for the following reasons.
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		96,319 97	Nominal burnup taken from SFD and converted to MWd using BOL=702.481kg
Bounding		140 074 70	Bounding burnup taken from SFD and converted to MWd using BOL=702.481kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 90		1 00
Bounding	1 31		

<sup>1</sup>Reactor shutdown core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF-TFA-CRBR-3 & CRBR-5  
SNF ID # 322  
Fuel Units & Descr 2 - HEX ARRAY 217 ROD  
Heavy Metal Mass BOL= , EOL=69 402kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
Estimates as of 2010  
Template FFTF (FAST SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
Template BOL Heavy Metal Mass (MT) 0 0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
0 40

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	1.3735E-12	5,116 34	5,738 65	0 00E+00	7 03E-09	7 88E-09	Avg MeV	
Am-241	7 9527E-02	5,116 34	5,738 65	1 44E+02	5 51E+02	6 00E+02	0 0150	2 921E+14
Am-242m	2 1053E-03	5,116 34	5,738 65	0 00E+00	1 08E+01	1 21E+01	0 0250	6 229E+13
Am-243	1 0760E-04	5,116 34	5,738 65	0 00E+00	5 51E-01	6 17E-01	0 0375	7 117E+13
C-14	2 6141E-05	5,116 34	5,738 65	0 00E+00	1 34E-01	1 50E-01	0 0575	6 144E+13
Cl-36	3 4243E-10	5,116 34	5,738 65	0 00E+00	1 75E-06	1 97E-06	0 0850	3 545E+13
Cm-243	6 6092E-04	5,116 34	5,738 65	0 00E+00	3 38E+00	3 79E+00	0 1250	2 648E+13
Cm-244	2 9933E-03	5,116 34	5,738 65	0 00E+00	1 53E+01	1 72E+01	0 2250	2 685E+13
Co-60	1 5934E-02	5,116 34	5,738 65	0 00E+00	8 15E+01	9 14E+01	0 3750	1 380E+13
Cs-134	4 6356E-02	5,116 34	5,738 65	0 00E+00	2 37E+02	2 66E+02	0 5750	4 612E+14
Cs-135	4 7693E-05	5,116 34	5,738 65	0 00E+00	2 44E-01	2 74E-01	0 8500	1 544E+13
Cs-137	2 1113E+00	5,116 34	5,738 65	0 00E+00	1 08E+04	1 21E+04	1 2500	1 344E+13
Eu-154	4 8092E-02	5,116 34	5,738 65	0 00E+00	2 46E+02	2 76E+02	1 7500	2 208E+11
Eu-155	6 8447E-02	5,116 34	5,738 65	0 00E+00	3 50E+02	3 93E+02	2 2500	7 431E+09
Fe-55	5 8479E-03	5,116 34	5,738 65	0 00E+00	2 99E+01	3 36E+01	2 7500	7 753E+08
H-3	8 9300E-03	5,116 34	5,738 65	0 00E+00	4 57E+01	5 12E+01	3 5000	8 767E+07
I-129	1 2891E-06	5,116 34	5,738 65	0 00E+00	6 60E-03	7 40E-03	5 0000	2 809E+05
Kr-85	7 0941E-02	5,116 34	5,738 65	0 00E+00	3 63E+02	4 07E+02	7 0000	3 210E+04
Np-237	2 6541E-06	5,116 34	5,738 65	0 00E+00	1 36E-02	1 52E-02	11 0000	3 674E+03
Pa-231	4 8970E-12	5,116 34	5,738 65	0 00E+00	2 51E-08	2 81E-08		
Pb-210	2 2170E-13	5,116 34	5,738 65	0 00E+00	1 13E-09	1 27E-09		
Pm-147	2 3617E-01	5,116 34	5,738 65	0 00E+00	1 21E+03	1 36E+03		
Pu-238	2 8636E-02	5,116 34	5,738 65	0 00E+00	1 47E+02	1 64E+02		
Pu-239	-3 5520E-02	5,116 34	0 00	1 18E+03	9 98E+02	1 18E+03		
Pu-240	2 0790E-02	5,116 34	5,738 65	6 00E+02	7 06E+02	7 19E+02		
Pu-241	-4 8316E-01	5,116 34	0 00	2 69E+04	2 44E+04	2 69E+04		
Pu-242	1 1052E-05	5,116 34	5,738 65	1 60E-01	2 16E-01	2 23E-01		
Ra-226	5 7471E-13	5,116 34	5,738 65	0 00E+00	2 94E-09	3 30E-09		
Ra-228	5 4957E-17	5,116 34	5,738 65	0 00E+00	2 81E-13	3 15E-13		
Ru-106	1 4582E-02	5,116 34	5,738 65	0 00E+00	7 46E+01	8 37E+01		
Se-79	1 0137E-05	5,116 34	5,738 65	0 00E+00	5 19E-02	5 82E-02		
Sn-126	4 3922E-05	5,116 34	5,738 65	0 00E+00	2 25E-01	2 52E-01		
Sr-90	7 6329E-01	5,116 34	5,738 65	0 00E+00	3 91E+03	4 38E+03		
Tc-99	3 9412E-04	5,116 34	5,738 65	0 00E+00	2 02E+00	2 26E+00		
Th-229	1 6457E-12	5,116 34	5,738 65	0 00E+00	8 42E-09	9 44E-09		
Th-230	1 8822E-10	5,116 34	5,738 65	0 00E+00	9 63E-07	1 08E-06		
Th-232	9 7601E-17	5,116 34	5,738 65	0 00E+00	4 99E-13	5 60E-13		
Ti-208	5 2722E-07	5,116 34	5,738 65	0 00E+00	2 70E-03	3 03E-03		
U-232	1 4925E-06	5,116 34	5,738 65	0 00E+00	7 64E-03	8 56E-03	Thermal Power	
U-233	2 1113E-10	5,116 34	5,738 65	0 00E+00	1 08E-06	1 21E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 9528E-06	5,116 34	5,738 65	0 00E+00	9 99E-03	1 12E-02		
U-235	-9 7920E-09	5,116 34	0 00	2 42E-04	1 92E-04	2 42E-04		
U-236	1 1570E-07	5,116 34	5,738 65	0 00E+00	5 92E-04	6 64E-04		
U-238	-1 7914E-07	5,116 34	0 00	1 76E-02	1 67E-02	1 76E-02		
Y-90	7 6329E-01	5,116 34	5,738 65	0 00E+00	3 91E+03	4 38E+03	Total	Total
Other Radionuclides					1 11E+04	1 24E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %	10 to 30	10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		5 116 34	Nominal burnup taken from SFD and converted to MWd using BOL=74 528kg
Bounding		5 738 65	Bounding burnup taken from SFD and converted to MWd using BOL=74 528kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 45		1 00
Bounding	0 51		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA-DEA-2  
 SNF ID # 324  
 Fuel Units & Descr 1 - HEX ARRAY 217 ROD  
 Heavy Metal Mass BOL= , EOL=34 606kg  
 ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
 Estimates as of, 2010  
 Template FFTF (FAST, SST, 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
 Template BOL Heavy Metal Mass (MT), 0.0329181  
 Template Decay Time: 15 years

Estimated  
 Canister usage  
 18"x15"  
 0.20

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	3.46	6.92	0.00E+00	4.75E-12	9.51E-12	Avg. MeV	
Am-241	7.9527E-02	3.46	6.92	6.67E+01	6.70E+01	6.73E+01	0.0150	3.943E+12
Am-242m	2.1053E-03	3.46	6.92	0.00E+00	7.29E-03	1.46E-02	0.0250	1.374E+11
Am-243	1.0760E-04	3.46	6.92	0.00E+00	3.72E-04	7.45E-04	0.0375	9.220E+10
C-14	2.6141E-05	3.46	6.92	0.00E+00	9.05E-05	1.81E-04	0.0575	9.982E+11
Cl-36	3.4243E-10	3.46	6.92	0.00E+00	1.19E-09	2.37E-09	0.0850	4.379E+10
Cm-243	6.6092E-04	3.46	6.92	0.00E+00	2.29E-03	4.57E-03	0.1250	3.482E+10
Cm-244	2.9933E-03	3.46	6.92	0.00E+00	1.04E-02	2.07E-02	0.2250	3.270E+10
Co-60	1.5934E-02	3.46	6.92	0.00E+00	5.51E-02	1.10E-01	0.3750	1.797E+10
Cs-134	4.6356E-02	3.46	6.92	0.00E+00	1.60E-01	3.21E-01	0.5750	5.563E+11
Cs-135	4.7693E-05	3.46	6.92	0.00E+00	1.65E-04	3.30E-04	0.8500	1.863E+10
Cs-137	2.1113E+00	3.46	6.92	0.00E+00	7.31E+00	1.46E+01	1.2500	1.621E+10
Eu-154	4.8092E-02	3.46	6.92	0.00E+00	1.66E-01	3.33E-01	1.7500	2.668E+08
Eu-155	6.8447E-02	3.46	6.92	0.00E+00	2.37E-01	4.74E-01	2.2500	9.267E+06
Fe-55	5.8479E-03	3.46	6.92	0.00E+00	2.02E-02	4.05E-02	2.7500	1.110E+06
H-3	8.9300E-03	3.46	6.92	0.00E+00	3.09E-02	6.18E-02	3.5000	2.610E+05
I-129	1.2891E-06	3.46	6.92	0.00E+00	4.46E-06	8.92E-06	5.0000	6.629E+04
Kr-85	7.0941E-02	3.46	6.92	0.00E+00	2.46E-01	4.91E-01	7.0000	7.545E+03
Np-237	2.6541E-06	3.46	6.92	0.00E+00	9.19E-06	1.84E-05	11.0000	8.623E+02
Pa-231	4.8970E-12	3.46	6.92	0.00E+00	1.69E-11	3.39E-11		
Pb-210	2.2170E-13	3.46	6.92	0.00E+00	7.67E-13	1.53E-12		
Pm-147	2.3617E-01	3.46	6.92	0.00E+00	8.17E-01	1.63E+00		
Pu-238	2.8636E-02	3.46	6.92	0.00E+00	9.91E-02	1.98E-01		
Pu-239	-3.5520E-02	3.46	0.00	5.48E+02	5.48E+02	5.48E+02		
Pu-240	2.0790E-02	3.46	6.92	2.78E+02	2.78E+02	2.79E+02		
Pu-241	-4.8316E-01	3.46	0.00	1.25E+04	1.25E+04	1.25E+04		
Pu-242	1.1052E-05	3.46	6.92	7.42E-02	7.43E-02	7.43E-02		
Ra-226	5.7471E-13	3.46	6.92	0.00E+00	1.99E-12	3.98E-12		
Ra-228	5.4957E-17	3.46	6.92	0.00E+00	1.90E-16	3.80E-16		
Ru-106	1.4582E-02	3.46	6.92	0.00E+00	5.05E-02	1.01E-01		
Se-79	1.0137E-05	3.46	6.92	0.00E+00	3.51E-05	7.02E-05		
Sn-126	4.3922E-05	3.46	6.92	0.00E+00	1.52E-04	3.04E-04		
Sr-90	7.6329E-01	3.46	6.92	0.00E+00	2.64E+00	5.28E+00		
Tc-99	3.9412E-04	3.46	6.92	0.00E+00	1.36E-03	2.73E-03		
Th-229	1.6457E-12	3.46	6.92	0.00E+00	5.70E-12	1.14E-11		
Th-230	1.8822E-10	3.46	6.92	0.00E+00	6.51E-10	1.30E-09		
Th-232	9.7601E-17	3.46	6.92	0.00E+00	3.38E-16	6.76E-16		
Ti-208	5.2722E-07	3.46	6.92	0.00E+00	1.82E-06	3.65E-06		
U-232	1.4925E-06	3.46	6.92	0.00E+00	5.17E-06	1.03E-05		
U-233	2.1113E-10	3.46	6.92	0.00E+00	7.31E-10	1.46E-09		
U-234	1.9528E-06	3.46	6.92	0.00E+00	6.76E-06	1.35E-05		
U-235	-9.7920E-09	3.46	0.00	1.12E-04	1.12E-04	1.12E-04		
U-236	1.1570E-07	3.46	6.92	0.00E+00	4.00E-07	8.01E-07		
U-238	-1.7914E-07	3.46	0.00	8.19E-03	8.19E-03	8.19E-03		
Y-90	7.6329E-01	3.46	6.92	0.00E+00	2.64E+00	5.28E+00		
Other Radionuclides					7.50E+00	1.50E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	FAST	FAST	This Template was used for the following reasons:
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>3</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		3.46	Nominal burnup taken from SFD and converted to MWd using BOL=34.61kg
Bounding		6.92	Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.00		1.00
Bounding	0.00		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF-TFA-FC-1  
SNF ID # 325  
Fuel Units & Descr 1 - HEX ARRAY 91 ROD  
Heavy Metal Mass BOL= , EOL=42.584kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
Estimates as of 2010  
Template FFTF (FAST SST 10 to 30%, Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
Template BOL Heavy Metal Mass (MT) 0.0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
0.20

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	2,694.34	5,388.68	0.00E+00	3.70E-09	7.40E-09	Avg MeV	
Am-241	7.9527E-02	2,694.34	5,388.68	8.73E+01	3.02E+02	5.16E+02	0.0150	2.717E+14
Am-242m	2.1053E-03	2,694.34	5,388.68	0.00E+00	5.67E+00	1.13E+01	0.0250	5.845E+13
Am-243	1.0760E-04	2,694.34	5,388.68	0.00E+00	2.90E-01	5.80E-01	0.0375	6.682E+13
C-14	2.6141E-05	2,694.34	5,388.68	0.00E+00	7.04E-02	1.41E-01	0.0575	5.704E+13
Cl-36	3.4243E-10	2,694.34	5,388.68	0.00E+00	9.23E-07	1.85E-06	0.0850	3.329E+13
Cm-243	6.6092E-04	2,694.34	5,388.68	0.00E+00	1.78E+00	3.56E+00	0.1250	2.486E+13
Cm-244	2.9933E-03	2,694.34	5,388.68	0.00E+00	8.06E+00	1.61E+01	0.2250	2.521E+13
Co-60	1.5934E-02	2,694.34	5,388.68	0.00E+00	4.29E+01	8.59E+01	0.3750	1.296E+13
Cs-134	4.6356E-02	2,694.34	5,388.68	0.00E+00	1.25E+02	2.50E+02	0.5750	4.330E+14
Cs-135	4.7693E-05	2,694.34	5,388.68	0.00E+00	1.29E-01	2.57E-01	0.8500	1.449E+13
Cs-137	2.1113E+00	2,694.34	5,388.68	0.00E+00	5.69E+03	1.14E+04	1.2500	1.262E+13
Eu-154	4.8092E-02	2,694.34	5,388.68	0.00E+00	1.30E+02	2.59E+02	1.7500	2.073E+11
Eu-155	6.8447E-02	2,694.34	5,388.68	0.00E+00	1.84E+02	3.69E+02	2.2500	6.978E+09
Fe-55	5.8479E-04	2,694.34	5,388.68	0.00E+00	1.58E+01	3.15E+01	2.7500	7.279E+08
H-3	8.9300E-03	2,694.34	5,388.68	0.00E+00	2.41E+01	4.81E+01	3.5000	8.221E+07
I-129	1.2891E-06	2,694.34	5,388.68	0.00E+00	3.47E-03	6.95E-03	5.0000	2.165E+05
Kr-85	7.0941E-02	2,694.34	5,388.68	0.00E+00	1.91E+02	3.82E+02	7.0000	2.477E+04
Np-237	2.6541E-06	2,694.34	5,388.68	0.00E+00	7.15E-03	1.43E-02	11.0000	2.836E+03
Pa-231	4.8970E-12	2,694.34	5,388.68	0.00E+00	1.32E-08	2.64E-08		
Pb-210	2.2170E-13	2,694.34	5,388.68	0.00E+00	5.97E-10	1.19E-09		
Pm-147	2.3617E-01	2,694.34	5,388.68	0.00E+00	6.36E+02	1.27E+03		
Pu-238	2.8636E-02	2,694.34	5,388.68	0.00E+00	7.72E+01	1.54E+02		
Pu-239	-3.5520E-02	2,694.34	0.00	7.17E+02	6.21E+02	7.17E+02		
Pu-240	2.0790E-02	2,694.34	5,388.68	3.64E+02	4.20E+02	4.76E+02		
Pu-241	-4.8316E-01	2,694.34	0.00	1.64E+04	1.50E+04	1.64E+04		
Pu-242	1.1052E-05	2,694.34	5,388.68	9.71E-02	1.27E-01	1.57E-01		
Ra-226	5.7471E-13	2,694.34	5,388.68	0.00E+00	1.55E-09	3.10E-09		
Ra-228	5.4957E-17	2,694.34	5,388.68	0.00E+00	1.48E-13	2.96E-13		
Ru-106	1.4582E-02	2,694.34	5,388.68	0.00E+00	3.93E+01	7.86E+01		
Se-79	1.0137E-05	2,694.34	5,388.68	0.00E+00	2.73E-02	5.46E-02		
Sn-126	4.3922E-05	2,694.34	5,388.68	0.00E+00	1.18E-01	2.37E-01		
Sr-90	7.6329E-01	2,694.34	5,388.68	0.00E+00	2.06E+03	4.11E+03		
Tc-99	3.9412E-04	2,694.34	5,388.68	0.00E+00	1.06E+00	2.12E+00		
Th-229	1.6457E-12	2,694.34	5,388.68	0.00E+00	4.43E-09	8.87E-09		
Th-230	1.8822E-10	2,694.34	5,388.68	0.00E+00	5.07E-07	1.01E-06		
Th-232	9.7601E-17	2,694.34	5,388.68	0.00E+00	2.63E-13	5.26E-13		
Ti-208	5.2722E-07	2,694.34	5,388.68	0.00E+00	1.42E-03	2.84E-03		
U-232	1.4925E-06	2,694.34	5,388.68	0.00E+00	4.02E-03	8.04E-03	Thermal Power	
U-233	2.1113E-10	2,694.34	5,388.68	0.00E+00	5.69E-07	1.14E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.9528E-06	2,694.34	5,388.68	0.00E+00	5.26E-03	1.05E-02	9.14E+01	1.52E+02
U-235	-9.7920E-09	2,694.34	0.00	1.47E-04	1.21E-04	1.47E-04	Total	Total
U-236	1.1570E-07	2,694.34	5,388.68	0.00E+00	3.12E-04	6.23E-04		
U-238	-1.7914E-07	2,694.34	0.00	1.07E-02	1.02E-02	1.07E-02		
Y-90	7.6329E-01	2,694.34	5,388.68	0.00E+00	2.06E+03	4.11E+03		
Other Radionuclides					5.84E+03	1.17E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	FAST	FAST
Fuel Cladding	SST	SST
BOL HM Constituents	Pu and U	Pu and U
BOL Enrichment %		10 to 30

### Basis for Parameter Differences\*

This Template was used for the following reasons  
This fuel matches on all parameters except enrichment (unknown)

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal		2,694.34
Bounding		5,388.68

### Basis for burnup used in estimate

Nominal burnup taken from SFD and converted to MWd using BOL=45.283kg  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.39	
Bounding	0.78	

Estimated EOL HM/Given EOL HM

1.00

\* Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

\* Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA-MFF-1 & 1A (CDE)  
SNF ID #: 330  
Fuel Units & Descr: 2 - HEX ARRAY 169 ROD  
Heavy Metal Mass BOL= , EOL=88.107kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date: 1992  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd): 5011.2  
Template BOL Heavy Metal Mass (MT): 0.0329181  
Template Decay Time: 15 years

Estimated  
Canister usage  
18"x15"  
0.40

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cl/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	10,382.82	20,765.65	0.00E+00	1.43E-08	2.85E-08	Avg MeV	
Am-241	7.9527E-02	10,382.82	20,765.65	1.90E+02	1.02E+03	1.84E+03	0.0150	1.039E+15
Am-242m	2.1053E-03	10,382.82	20,765.65	0.00E+00	2.19E+01	4.37E+01	0.0250	2.251E+14
Am-243	1.0760E-04	10,382.82	20,765.65	0.00E+00	1.12E+00	2.23E+00	0.0375	2.575E+14
C-14	2.6141E-05	10,382.82	20,765.65	0.00E+00	2.71E-01	5.43E-01	0.0575	2.178E+14
Cl-36	3.4243E-10	10,382.82	20,765.65	0.00E+00	3.56E-06	7.11E-06	0.0850	1.283E+14
Cm-243	6.6092E-04	10,382.82	20,765.65	0.00E+00	6.86E+00	1.37E+01	0.1250	9.581E+13
Cm-244	2.9933E-03	10,382.82	20,765.65	0.00E+00	3.11E+01	6.22E+01	0.2250	9.715E+13
Co-60	1.5934E-02	10,382.82	20,765.65	0.00E+00	1.65E+02	3.31E+02	0.3750	4.995E+13
Cs-134	4.6356E-02	10,382.82	20,765.65	0.00E+00	4.81E+02	9.63E+02	0.5750	1.669E+15
Cs-135	4.7693E-05	10,382.82	20,765.65	0.00E+00	4.95E-01	9.90E-01	0.8500	5.585E+13
Cs-137	2.1113E+00	10,382.82	20,765.65	0.00E+00	2.19E+04	4.38E+04	1.2500	4.863E+13
Eu-154	4.8092E-02	10,382.82	20,765.65	0.00E+00	4.99E+02	9.99E+02	1.7500	7.989E+11
Eu-155	6.8447E-02	10,382.82	20,765.65	0.00E+00	7.11E+02	1.42E+03	2.2500	2.689E+10
Fe-55	5.8479E-03	10,382.82	20,765.65	0.00E+00	6.07E+01	1.21E+02	2.7500	2.805E+09
H-3	8.9300E-03	10,382.82	20,765.65	0.00E+00	9.27E+01	1.85E+02	3.5000	3.165E+08
I-129	1.2891E-06	10,382.82	20,765.65	0.00E+00	1.34E-02	2.68E-02	5.0000	6.893E+05
Kr-85	7.0941E-02	10,382.82	20,765.65	0.00E+00	7.37E+02	1.47E+03	7.0000	7.892E+04
Np-237	2.6541E-06	10,382.82	20,765.65	0.00E+00	2.76E-02	5.51E-02	11.0000	9.040E+03
Pa-231	4.8970E-12	10,382.82	20,765.65	0.00E+00	5.08E-08	1.02E-07		
Pb-210	2.2170E-13	10,382.82	20,765.65	0.00E+00	2.30E-09	4.60E-09		
Pm-147	2.3617E-01	10,382.82	20,765.65	0.00E+00	2.45E+03	4.90E+03		
Pu-238	2.8636E-02	10,382.82	20,765.65	0.00E+00	2.97E+02	5.95E+02		
Pu-239	-3.5520E-02	10,382.82	0.00	1.56E+03	1.19E+03	1.56E+03		
Pu-240	2.0790E-02	10,382.82	20,765.65	7.92E+02	1.01E+03	1.22E+03		
Pu-241	-4.8316E-01	10,382.82	0.00	3.56E+04	3.06E+04	3.56E+04		
Pu-242	1.1052E-05	10,382.82	20,765.65	2.11E-01	3.26E-01	4.41E-01		
Ra-226	5.7471E-13	10,382.82	20,765.65	0.00E+00	5.97E-09	1.19E-08		
Ra-228	5.4957E-17	10,382.82	20,765.65	0.00E+00	5.71E-13	1.14E-12		
Ru-106	1.4582E-02	10,382.82	20,765.65	0.00E+00	1.51E+02	3.03E+02		
Se-79	1.0137E-05	10,382.82	20,765.65	0.00E+00	1.05E-01	2.11E-01		
Sn-126	4.3922E-05	10,382.82	20,765.65	0.00E+00	4.56E-01	9.12E-01		
Sr-90	7.6329E-01	10,382.82	20,765.65	0.00E+00	7.93E+03	1.59E+04		
Tc-99	3.9412E-04	10,382.82	20,765.65	0.00E+00	4.09E+00	8.18E+00		
Th-229	1.6457E-12	10,382.82	20,765.65	0.00E+00	1.71E-08	3.42E-08		
Th-230	1.8822E-10	10,382.82	20,765.65	0.00E+00	1.95E-06	3.91E-06		
Th-232	9.7601E-17	10,382.82	20,765.65	0.00E+00	1.01E-12	2.03E-12		
Ti-208	5.2722E-07	10,382.82	20,765.65	0.00E+00	5.47E-03	1.09E-02		
U-232	1.4925E-06	10,382.82	20,765.65	0.00E+00	1.55E-02	3.10E-02	Thermal Power	
U-233	2.1113E-10	10,382.82	20,765.65	0.00E+00	2.19E-06	4.38E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.9528E-06	10,382.82	20,765.65	0.00E+00	2.03E-02	4.06E-02	2.91E+02	5.24E+02
U-235	-9.7920E-09	10,382.82	0.00	3.20E-04	2.18E-04	3.20E-04	Total	Total
U-236	1.1570E-07	10,382.82	20,765.65	0.00E+00	1.20E-03	2.40E-03		
U-238	-1.7914E-07	10,382.82	0.00	2.33E-02	2.14E-02	2.33E-02		
Y-90	7.6329E-01	10,382.82	20,765.65	0.00E+00	7.93E+03	1.59E+04		
Other Radionuclides					2.25E+04	4.50E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	This Template was used for the following reasons.
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		10,382.82	Nominal burnup taken from SFD and converted to MWd using BOL=98.509kg
Bounding		20,765.65	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.69		1.00
Bounding	1.38		

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF-TFA-P0-2 4 & 5  
SNF ID #: 333  
Fuel Units & Descr: 3 - HEX ARRAY 169 ROD  
Heavy Metal Mass BOL= EOL=131.25kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
Estimates as of 2010  
Template FFTF (FAST, SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup (MWd) 5011.2  
Template BOL Heavy Metal Mass (MT) 0.0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
0.60

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	10,725.31	11,359.60	0.00E+00	1.47E-08	1.56E-08	Avg MeV	
Am-241	7.9527E-02	10,725.31	11,359.60	2.74E+02	1.13E+03	1.18E+03	0.0150	5.775E+14
Am-242m	2.1053E-03	10,725.31	11,359.60	0.00E+00	2.26E+01	2.39E+01	0.0250	1.233E+14
Am-243	1.0760E-04	10,725.31	11,359.60	0.00E+00	1.15E+00	1.22E+00	0.0375	1.409E+14
C-14	2.6141E-05	10,725.31	11,359.60	0.00E+00	2.80E-01	2.97E-01	0.0575	1.215E+14
Cl-36	3.4243E-10	10,725.31	11,359.60	0.00E+00	3.67E-06	3.89E-06	0.0850	7.018E+13
Cm-243	6.6092E-04	10,725.31	11,359.60	0.00E+00	7.09E+00	7.51E+00	0.1250	5.242E+13
Cm-244	2.9933E-03	10,725.31	11,359.60	0.00E+00	3.21E+01	3.40E+01	0.2250	5.315E+13
Co-60	1.5934E-02	10,725.31	11,359.60	0.00E+00	1.71E+02	1.81E+02	0.3750	2.733E+13
Cs-134	4.6356E-02	10,725.31	11,359.60	0.00E+00	4.97E+02	5.27E+02	0.5750	9.129E+14
Cs-135	4.7693E-05	10,725.31	11,359.60	0.00E+00	5.12E-01	5.42E-01	0.8500	3.055E+13
Cs-137	2.1113E+00	10,725.31	11,359.60	0.00E+00	2.26E+04	2.40E+04	1.2500	2.660E+13
Eu-154	4.8092E-02	10,725.31	11,359.60	0.00E+00	5.16E+02	5.46E+02	1.7500	4.370E+11
Eu-155	6.8447E-02	10,725.31	11,359.60	0.00E+00	7.34E+02	7.78E+02	2.2500	1.471E+10
Fe-55	5.8479E-03	10,725.31	11,359.60	0.00E+00	6.27E+01	6.64E+01	2.7500	1.535E+09
H-3	8.9300E-03	10,725.31	11,359.60	0.00E+00	9.58E+01	1.01E+02	3.5000	1.735E+08
I-129	1.2891E-06	10,725.31	11,359.60	0.00E+00	1.38E-02	1.46E-02	5.0000	5.454E+05
Kr-85	7.0941E-02	10,725.31	11,359.60	0.00E+00	7.61E+02	8.06E+02	7.0000	6.233E+04
Np-237	2.6541E-06	10,725.31	11,359.60	0.00E+00	2.85E-02	3.01E-02	11.0000	7.135E+03
Pa-231	4.8970E-12	10,725.31	11,359.60	0.00E+00	5.25E-08	5.56E-08		
Pb-210	2.2170E-13	10,725.31	11,359.60	0.00E+00	2.38E-09	2.52E-09		
Pm-147	2.3617E-01	10,725.31	11,359.60	0.00E+00	2.53E+03	2.68E+03		
Pu-238	2.8636E-02	10,725.31	11,359.60	0.00E+00	3.07E+02	3.25E+02		
Pu-239	-3.5520E-02	10,725.31	0.00	2.25E+03	1.87E+03	2.25E+03		
Pu-240	2.0790E-02	10,725.31	11,359.60	1.14E+03	1.37E+03	1.38E+03		
Pu-241	-4.8316E-01	10,725.31	0.00	5.13E+04	4.61E+04	5.13E+04		
Pu-242	1.1052E-05	10,725.31	11,359.60	3.05E-01	4.23E-01	4.30E-01		
Ra-226	5.7471E-13	10,725.31	11,359.60	0.00E+00	6.16E-09	6.53E-09		
Ra-228	5.4957E-17	10,725.31	11,359.60	0.00E+00	5.89E-13	6.24E-13		
Ru-106	1.4582E-02	10,725.31	11,359.60	0.00E+00	1.56E+02	1.66E+02		
Se-79	1.0137E-05	10,725.31	11,359.60	0.00E+00	1.09E-01	1.15E-01		
Sn-126	4.3922E-05	10,725.31	11,359.60	0.00E+00	4.71E-01	4.99E-01		
Sr-90	7.6329E-01	10,725.31	11,359.60	0.00E+00	8.19E+03	8.67E+03		
Tc-99	3.9412E-04	10,725.31	11,359.60	0.00E+00	4.23E+00	4.48E+00		
Th-229	1.6457E-12	10,725.31	11,359.60	0.00E+00	1.77E-08	1.87E-08		
Th-230	1.8822E-10	10,725.31	11,359.60	0.00E+00	2.02E-06	2.14E-06		
Th-232	9.7601E-17	10,725.31	11,359.60	0.00E+00	1.05E-12	1.11E-12		
Ti-208	5.2722E-07	10,725.31	11,359.60	0.00E+00	5.65E-03	5.99E-03		
U-232	1.4925E-06	10,725.31	11,359.60	0.00E+00	1.60E-02	1.70E-02	Thermal Power	
U-233	2.1113E-10	10,725.31	11,359.60	0.00E+00	2.26E-06	2.40E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.9528E-06	10,725.31	11,359.60	0.00E+00	2.09E-02	2.22E-02	3.33E+02	3.58E+02
U-235	-9.7920E-09	10,725.31	0.00	4.61E-04	3.56E-04	4.61E-04	Total	Total
U-236	1.1570E-07	10,725.31	11,359.60	0.00E+00	1.24E-03	1.31E-03		
U-238	-1.7914E-07	10,725.31	0.00	3.36E-02	3.17E-02	3.36E-02		
Y-90	7.6329E-01	10,725.31	11,359.60	0.00E+00	8.19E+03	8.67E+03		
Other Radionuclides					2.32E+04	2.46E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	This Template was used for the following reasons:
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %	10 to 30	10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		10,725.31	Nominal burnup taken from SFD and converted to MWd using BOL=141.995kg
Bounding		11,359.60	Bounding burnup taken from SFD and converted to MWd using BOL=141.995kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.50		1.00
Bounding	0.53		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA-SRF-384  
SNF ID #: 334  
Fuel Units & Descr: 2 - HEX ARRAY 91 ROD  
Heavy Metal Mass: BOL= , EOL=85.81kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1992  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30%, Pu & U)  
<sup>2</sup>Template Burnup(MWd), 5011.2  
Template BOL Heavy Metal Mass (MT) 0.0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x15"  
0.40

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	3,631.59	3,953.60	0.00E+00	4.99E-09	5.43E-09	Avg MeV	
Am-241	7.9527E-02	3,631.59	3,953.60	1.72E+02	4.61E+02	4.87E+02	0.0150	2.052E+14
Am-242m	2.1053E-03	3,631.59	3,953.60	0.00E+00	7.65E+00	8.32E+00	0.0250	4.298E+13
Am-243	1.0760E-04	3,631.59	3,953.60	0.00E+00	3.91E-01	4.25E-01	0.0375	4.904E+13
C-14	2.6141E-05	3,631.59	3,953.60	0.00E+00	9.49E-02	1.03E-01	0.0575	4.335E+13
Cf-253	3.4243E-10	3,631.59	3,953.60	0.00E+00	1.24E-06	1.35E-06	0.0850	2.443E+13
Cm-243	6.6092E-04	3,631.59	3,953.60	0.00E+00	2.40E+00	2.61E+00	0.1250	1.825E+13
Cm-244	2.9933E-03	3,631.59	3,953.60	0.00E+00	1.09E+01	1.18E+01	0.2250	1.850E+13
Co-60	1.5934E-02	3,631.59	3,953.60	0.00E+00	5.79E+01	6.30E+01	0.3750	9.512E+12
Cs-134	4.6356E-02	3,631.59	3,953.60	0.00E+00	1.68E+02	1.83E+02	0.5750	3.177E+14
Cs-135	4.7693E-05	3,631.59	3,953.60	0.00E+00	1.73E-01	1.89E-01	0.8500	1.063E+13
Cs-137	2.1113E+00	3,631.59	3,953.60	0.00E+00	7.67E+03	8.35E+03	1.2500	9.259E+12
Eu-154	4.8092E-02	3,631.59	3,953.60	0.00E+00	1.75E+02	1.90E+02	1.7500	1.521E+11
Eu-155	6.8447E-02	3,631.59	3,953.60	0.00E+00	2.49E+02	2.71E+02	2.2500	5.120E+09
Fe-55	5.8479E-03	3,631.59	3,953.60	0.00E+00	2.12E+01	2.31E+01	2.7500	5.344E+08
H-3	8.9300E-03	3,631.59	3,953.60	0.00E+00	3.24E+01	3.53E+01	3.5000	6.057E+07
I-129	1.2891E-06	3,631.59	3,953.60	0.00E+00	4.68E-03	5.10E-03	5.0000	2.663E+05
Kr-85	7.0941E-02	3,631.59	3,953.60	0.00E+00	2.58E+02	2.80E+02	7.0000	3.040E+04
Np-237	2.6541E-06	3,631.59	3,953.60	0.00E+00	9.64E-03	1.05E-02	11.0000	3.478E+03
Pa-231	4.8970E-12	3,631.59	3,953.60	0.00E+00	1.78E-08	1.94E-08		
Pb-210	2.2170E-13	3,631.59	3,953.60	0.00E+00	8.05E-10	8.77E-10		
Pm-147	2.3617E-01	3,631.59	3,953.60	0.00E+00	8.58E+02	9.34E+02		
Pu-238	2.8636E-02	3,631.59	3,953.60	0.00E+00	1.04E+02	1.13E+02		
Pu-239	3.5520E-02	3,631.59	0.00	1.42E+03	1.29E+03	1.42E+03		
Pu-240	2.0790E-02	3,631.59	3,953.60	7.20E+02	7.95E+02	8.02E+02		
Pu-241	-4.8316E-01	3,631.59	0.00	3.23E+04	3.05E+04	3.23E+04		
Pu-242	1.1052E-05	3,631.59	3,953.60	1.92E-01	2.32E-01	2.36E-01		
Ra-226	5.7471E-13	3,631.59	3,953.60	0.00E+00	2.09E-09	2.27E-09		
Ra-228	5.4957E-17	3,631.59	3,953.60	0.00E+00	2.00E-13	2.17E-13		
Ru-106	1.4582E-02	3,631.59	3,953.60	0.00E+00	5.30E+01	5.77E+01		
Se-79	1.0137E-05	3,631.59	3,953.60	0.00E+00	3.68E-02	4.01E-02		
Sn-126	4.3922E-05	3,631.59	3,953.60	0.00E+00	1.60E-01	1.74E-01		
Sr-90	7.6329E-01	3,631.59	3,953.60	0.00E+00	2.77E+03	3.02E+03		
Tc-99	3.9412E-04	3,631.59	3,953.60	0.00E+00	1.43E+00	1.56E+00		
Th-229	1.6457E-12	3,631.59	3,953.60	0.00E+00	5.98E-09	6.51E-09		
Th-230	1.8822E-10	3,631.59	3,953.60	0.00E+00	6.84E-07	7.44E-07		
Th-232	9.7601E-17	3,631.59	3,953.60	0.00E+00	3.54E-13	3.86E-13		
Ti-208	5.2722E-07	3,631.59	3,953.60	0.00E+00	1.91E-03	2.08E-03		
U-232	1.4925E-06	3,631.59	3,953.60	0.00E+00	5.42E-03	5.90E-03		
U-233	2.1113E-10	3,631.59	3,953.60	0.00E+00	7.67E-07	8.35E-07		
U-234	1.9528E-06	3,631.59	3,953.60	0.00E+00	7.09E-03	7.72E-03		
U-235	-9.7920E-09	3,631.59	0.00	2.91E-04	2.55E-04	2.91E-04		
U-236	1.1570E-07	3,631.59	3,953.60	0.00E+00	4.20E-04	4.57E-04		
U-238	-1.7914E-07	3,631.59	0.00	2.12E-02	2.05E-02	2.12E-02		
Y-90	7.6329E-01	3,631.59	3,953.60	0.00E+00	2.77E+03	3.02E+03		
Other Radionuclides					7.87E+03	8.57E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.46E+02	1.57E+02
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences <sup>1</sup>
Reactor Moderator	FAST	FAST	This Template was used for the following reasons.
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		3,631.59	Nominal burnup taken from SFD and converted to MWd using BOL=89.448kg
Bounding		3,953.60	Bounding burnup taken from SFD and converted to MWd using BOL=89.448kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.27		1.00
Bounding	0.29		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF-TFA-UO-1  
 SNF ID # 335  
 Fuel Units & Descr 1 - HEX ARRAY 217 ROD  
 Heavy Metal Mass BOL= EOL=35 012kg  
 ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
 Estimates as of: 2010  
 Template FFTF (FAST SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
 Template BOL Heavy Metal Mass (MT) 0.0329181  
 Template Decay Time 15 years

Estimated  
 Canister usage  
 18"x15"  
 0.20

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1.3735E-12	835.27	1,229.60	0.00E+00	1.15E-09	1.69E-09	0.0150	6.464E+13
Am-241	7.9527E-02	835.27	1,229.60	6.91E+01	1.36E+02	1.67E+02	0.0250	1.338E+13
Am-242m	2.1053E-03	835.27	1,229.60	0.00E+00	1.76E+00	2.59E+00	0.0375	1.525E+13
Am-243	1.0760E-04	835.27	1,229.60	0.00E+00	8.99E-02	1.32E-01	0.0575	1.370E+13
C-14	2.6141E-05	835.27	1,229.60	0.00E+00	2.18E-02	3.21E-02	0.0850	7.597E+12
Cl-36	3.4243E-10	835.27	1,229.60	0.00E+00	2.86E-07	4.21E-07	0.1250	5.676E+12
Cm-243	6.6092E-04	835.27	1,229.60	0.00E+00	5.52E-01	8.13E-01	0.2250	5.753E+12
Cm-244	2.9933E-03	835.27	1,229.60	0.00E+00	2.50E+00	3.68E+00	0.3750	2.959E+12
Co-60	1.5934E-02	835.27	1,229.60	0.00E+00	1.33E+01	1.96E+01	0.5750	9.881E+13
Cs-134	4.6356E-02	835.27	1,229.60	0.00E+00	3.87E+01	5.70E+01	0.8500	3.307E+12
Cs-135	4.7693E-05	835.27	1,229.60	0.00E+00	3.98E-02	5.86E-02	1.2500	2.879E+12
Cs-137	2.1113E+00	835.27	1,229.60	0.00E+00	1.76E+03	2.60E+03	1.7500	4.730E+10
Eu-154	4.8092E-02	835.27	1,229.60	0.00E+00	4.02E+01	5.91E+01	2.2500	1.592E+09
Eu-155	6.8447E-02	835.27	1,229.60	0.00E+00	5.72E+01	8.42E+01	2.7500	1.662E+08
Fe-55	5.8479E-03	835.27	1,229.60	0.00E+00	4.88E+00	7.19E+00	3.5000	1.887E+07
H-3	8.9300E-03	835.27	1,229.60	0.00E+00	7.46E+00	1.10E+01	5.0000	9.816E+04
I-129	1.2891E-06	835.27	1,229.60	0.00E+00	1.08E-03	1.59E-03	7.0000	1.120E+04
Kr-85	7.0941E-02	835.27	1,229.60	0.00E+00	5.93E+01	8.72E+01	11.0000	1.281E+03
Np-237	2.6541E-06	835.27	1,229.60	0.00E+00	2.22E-03	3.26E-03		
Pa-231	4.8970E-12	835.27	1,229.60	0.00E+00	4.09E-09	6.02E-09		
Pb-210	2.2170E-13	835.27	1,229.60	0.00E+00	1.85E-10	2.73E-10		
Pm-147	2.3617E-01	835.27	1,229.60	0.00E+00	1.97E+02	2.90E+02		
Pu-238	2.8636E-02	835.27	1,229.60	0.00E+00	2.39E+01	3.52E+01		
Pu-239	-3.5520E-02	835.27	0.00	5.67E+02	5.38E+02	5.67E+02		
Pu-240	2.0790E-02	835.27	1,229.60	2.88E+02	3.06E+02	3.14E+02		
Pu-241	-4.8316E-01	835.27	0.00	1.29E+04	1.25E+04	1.29E+04		
Pu-242	1.1052E-05	835.27	1,229.60	7.69E-02	8.61E-02	9.05E-02		
Ra-226	5.7471E-13	835.27	1,229.60	0.00E+00	4.80E-10	7.07E-10		
Ra-228	5.4957E-17	835.27	1,229.60	0.00E+00	4.59E-14	6.76E-14		
Ru-106	1.4582E-02	835.27	1,229.60	0.00E+00	1.22E+01	1.79E+01		
Se-79	1.0137E-05	835.27	1,229.60	0.00E+00	8.47E-03	1.25E-02		
Sn-126	4.3922E-05	835.27	1,229.60	0.00E+00	3.67E-02	5.40E-02		
Sr-90	7.6329E-01	835.27	1,229.60	0.00E+00	6.38E+02	9.39E+02		
Tc-99	3.9412E-04	835.27	1,229.60	0.00E+00	3.29E-01	4.85E-01		
Th-229	1.6457E-12	835.27	1,229.60	0.00E+00	1.37E-09	2.02E-09		
Th-230	1.8822E-10	835.27	1,229.60	0.00E+00	1.57E-07	2.31E-07		
Th-232	9.7601E-07	835.27	1,229.60	0.00E+00	8.15E-14	1.20E-13		
Ti-208	5.2722E-07	835.27	1,229.60	0.00E+00	4.40E-04	6.48E-04		
U-232	1.4925E-06	835.27	1,229.60	0.00E+00	1.25E-03	1.84E-03	Thermal Power	
U-233	2.1113E-10	835.27	1,229.60	0.00E+00	1.76E-07	2.60E-07	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.9528E-06	835.27	1,229.60	0.00E+00	1.63E-03	2.40E-03	4.61E+01	5.54E+01
U-235	-9.7920E-09	835.27	0.00	1.16E-04	1.08E-04	1.16E-04	Total	Total
U-236	1.1570E-07	835.27	1,229.60	0.00E+00	9.66E-05	1.42E-04		
U-238	-1.7914E-07	835.27	0.00	8.48E-03	8.33E-03	8.48E-03		
Y-90	7.6329E-01	835.27	1,229.60	0.00E+00	6.38E+02	9.39E+02		
Other Radionuclides					1.81E+03	2.67E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		835.27	Nominal burnup taken from SFD and converted to MWd using BOL=35.848kg
Bounding		1,229.60	Bounding burnup taken from SFD and converted to MWd using BOL=35.848kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.15		1.00
Bounding	0.23		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF-TFA-WBO18 & WBO42  
SNF ID #: 336  
Fuel Units & Descr: 2 - HEX ARRAY 61 ROD  
Heavy Metal Mass: BOL= : EOL=94 984kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1992  
Estimates as of 2010  
Template FERMI (Fast, Zirc. 10 to 40%, U)  
<sup>2</sup>Template Burnup(MWd): 58 6725048  
Template BOL Heavy Metal Mass (MT): 0 018774  
Template Decay Time: 15 years

Estimated  
Canister usage:  
18"x15"  
0 40

II, Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 1509E-08	1,204 37	1,348 90	0 00E+00	2 59E-05	2 90E-05	Avg. MeV	
Am-241	4 6529E-07	1,204 37	1,348 90	0 00E+00	5 60E-04	6 28E-04	0 0150	1 446E+14
Am-242m	0 0000E+00	1,204 37	1,348 90	0 00E+00	0 00E+00	0 00E+00	0 0250	3 066E+13
Am-243	8 3923E-15	1,204 37	1,348 90	0 00E+00	1 01E-11	1 13E-11	0 0375	2 665E+13
C-14	2 1765E-05	1,204 37	1,348 90	0 00E+00	2 62E-02	2 94E-02	0 0575	2 799E+13
Cl-36	5 5188E-08	1,204 37	1,348 90	0 00E+00	6 65E-05	7 44E-05	0 0850	1 720E+13
Cm-243	2 5208E-14	1,204 37	1,348 90	0 00E+00	3 04E-11	3 40E-11	0 1250	1 112E+13
Cm-244	1 1259E-15	1,204 37	1,348 90	0 00E+00	1 36E-12	1 52E-12	0 2250	1 452E+13
Co-60	2 9094E-02	1,204 37	1,348 90	0 00E+00	3 50E+01	3 92E+01	0 3750	6 647E+12
Cs-134	5 1932E-04	1,204 37	1,348 90	0 00E+00	6 25E-01	7 01E-01	0 5750	1 102E+14
Cs-135	4 4996E-05	1,204 37	1,348 90	0 00E+00	5 42E-02	6 07E-02	0 8500	1 064E+12
Cs-137	2 1867E+00	1,204 37	1,348 90	0 00E+00	2 63E+03	2 95E+03	1 2500	3 267E+12
Eu-154	9 2377E-04	1,204 37	1,348 90	0 00E+00	1 12E+00	1 25E+00	1 7500	2 705E+10
Eu-155	2 3180E-02	1,204 37	1,348 90	0 00E+00	2 79E+01	3 13E+01	2 2500	7 737E+07
Fe-55	2 9332E-03	1,204 37	1,348 90	0 00E+00	3 53E+00	3 96E+00	2 7500	3 535E+06
H-3	1 0871E-02	1,204 37	1,348 90	0 00E+00	1 31E+01	1 47E+01	3 5000	4 081E+05
I-129	1 1426E-06	1,204 37	1,348 90	0 00E+00	1 38E-03	1 54E-03	5 0000	1 311E+02
Kr-85	1 4068E-01	1,204 37	1,348 90	0 00E+00	1 69E+02	1 90E+02	7 0000	1 249E+01
Np-237	3 3099E-06	1,204 37	1,348 90	0 00E+00	3 99E-03	4 46E-03	11 0000	1 262E+00
Pa-231	7 8640E-08	1,204 37	1,348 90	0 00E+00	9 47E-05	1 06E-04		
Pb-210	7 4277E-13	1,204 37	1,348 90	0 00E+00	8 95E-10	1 00E-09		
Pm-147	2 2856E-01	1,204 37	1,348 90	0 00E+00	2 75E+02	3 08E+02		
Pu-238	2 0095E-04	1,204 37	1,348 90	0 00E+00	2 42E-01	2 71E-01		
Pu-239	1 9481E-02	1,204 37	1,348 90	0 00E+00	2 35E+01	2 63E+01		
Pu-240	6 8056E-05	1,204 37	1,348 90	0 00E+00	8 20E-02	9 18E-02		
Pu-241	1 0939E-05	1,204 37	1,348 90	0 00E+00	1 32E-02	1 48E-02		
Pu-242	4 3751E-13	1,204 37	1,348 90	0 00E+00	5 27E-10	5 90E-10		
Ra-226	4 0428E-12	1,204 37	1,348 90	0 00E+00	4 87E-09	5 45E-09		
Ra-228	2 1032E-11	1,204 37	1,348 90	0 00E+00	2 53E-08	2 84E-08		
Ru-106	2 9077E-04	1,204 37	1,348 90	0 00E+00	3 50E-01	3 92E-01		
Se-79	1 6492E-05	1,204 37	1,348 90	0 00E+00	1 99E-02	2 22E-02		
Sn-126	3 7564E-05	1,204 37	1,348 90	0 00E+00	4 52E-02	5 07E-02		
Sr-90	1 9396E+00	1,204 37	1,348 90	0 00E+00	2 34E+03	2 62E+03		
Tc-99	4 4842E-04	1,204 37	1,348 90	0 00E+00	5 40E-01	6 05E-01		
Th-229	1 8544E-11	1,204 37	1,348 90	0 00E+00	2 23E-08	2 50E-08		
Th-230	9 0605E-10	1,204 37	1,348 90	0 00E+00	1 09E-06	1 22E-06		
Th-232	2 3674E-11	1,204 37	1,348 90	0 00E+00	2 85E-08	3 19E-08		
Ti-208	7 0323E-09	1,204 37	1,348 90	0 00E+00	8 47E-06	9 49E-06		
U-232	1 9106E-08	1,204 37	1,348 90	0 00E+00	2 30E-05	2 58E-05	Thermal Power	
U-233	9 6774E-09	1,204 37	1,348 90	0 00E+00	1 17E-05	1 31E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4 8796E-06	1,204 37	1,348 90	0 00E+00	5 88E-03	6 58E-03	3 01E+01	3 37E+01
U-235	-2 3191E-06	1,204 37	0 00	5 33E-02	5 05E-02	5 33E-02	Total	Total
U-236	1 2633E-05	1,204 37	1,348 90	0 00E+00	1 52E-02	1 70E-02		
U-238	-9 5407E-08	1,204 37	0 00	2 41E-02	2 40E-02	2 41E-02		
Y-90	1 9396E+00	1,204 37	1,348 90	0 00E+00	2 34E+03	2 62E+03		
Other Radionuclides					2 62E+03	2 93E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This template is a good approximation since it is a FAST, Uranium fuel
Reactor Moderator	FAST	FAST	
Fuel Cladding	SST	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %		10 to 40	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup taken from SFD and converted to MWd using BOL=96.35kg Bounding burnup taken from SFD and converted to MWd using BOL=96.35kg
Nominal		1,204 37	
Bounding		1,348 90	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	4 00		
Bounding	4 48		1 00

<sup>1</sup>Reactor shutdown core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name GE TEST  
SNF ID # 96  
Fuel Units & Descr 22 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL= EOL=45 203kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1972  
Estimates as of 2010  
Template FFTF (FAST SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd): 5011.2  
Template BOL Heavy Metal Mass (MT) 0.0329181  
Template Decay Time<sup>3</sup> 35 years

Estimated  
Canister usage  
HIC  
2.00

II. Estimates		m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	Avg MeV
Ac-227	6.1822E-12	45,119.38	45,119.38	0.00E+00	2.79E-07	2.79E-07	0.0150	1.459E+15	0.0150
Am-241	1.1066E-01	45,119.38	45,119.38	1.74E+02	5.17E+03	5.17E+03	0.0250	2.932E+14	0.0250
Am-242m	1.9247E-03	45,119.38	45,119.38	0.00E+00	8.68E+01	8.68E+01	0.0375	3.409E+14	0.0375
Am-243	1.0740E-04	45,119.38	45,119.38	0.00E+00	4.85E+00	4.85E+00	0.0575	3.353E+14	0.0575
C-14	2.6042E-05	45,119.38	45,119.38	0.00E+00	1.17E+00	1.17E+00	0.0850	1.633E+14	0.0850
Cl-36	3.4243E-10	45,119.38	45,119.38	0.00E+00	1.83E+01	1.83E+01	0.1250	1.149E+14	0.1250
Cm-243	4.0629E-04	45,119.38	45,119.38	0.00E+00	7.23E+01	7.23E+01	0.2250	1.318E+14	0.2250
Cm-244	1.6024E-03	45,119.38	45,119.38	0.00E+00	1.55E+02	1.55E+02	0.3750	5.712E+13	0.3750
Co-60	3.4275E-03	45,119.38	45,119.38	0.00E+00	7.02E+01	7.02E+01	0.5750	2.314E+15	0.5750
Cs-134	1.5566E-03	45,119.38	45,119.38	0.00E+00	2.15E+00	2.15E+00	0.8500	2.418E+13	0.8500
Cs-135	4.7693E-05	45,119.38	45,119.38	0.00E+00	6.32E+04	6.32E+04	1.2500	2.894E+13	1.2500
Cs-137	1.4007E+00	45,119.38	45,119.38	0.00E+00	7.30E+02	7.30E+02	1.7500	6.547E+11	1.7500
Eu-154	1.6184E-02	45,119.38	45,119.38	0.00E+00	6.21E+02	6.21E+02	2.2500	1.296E+08	2.2500
Eu-155	1.3774E-02	45,119.38	45,119.38	0.00E+00	1.72E+01	1.72E+01	2.7500	7.467E+08	2.7500
Fe-55	3.8028E-04	45,119.38	45,119.38	0.00E+00	1.74E+02	1.74E+02	3.5000	2.769E+06	3.5000
H-3	3.8454E-03	45,119.38	45,119.38	0.00E+00	5.82E-02	5.82E-02	5.0000	8.765E+05	5.0000
I-129	1.2891E-06	45,119.38	45,119.38	0.00E+00	1.26E+03	1.26E+03	7.0000	1.001E+05	7.0000
Kr-85	2.7848E-02	45,119.38	45,119.38	0.00E+00	1.69E-01	1.69E-01	11.0000	1.145E+04	11.0000
Np-237	3.7516E-06	45,119.38	45,119.38	0.00E+00	5.63E-07	5.63E-07			
Pa-231	1.2488E-11	45,119.38	45,119.38	0.00E+00	1.09E-07	1.09E-07			
Pb-210	2.4206E-12	45,119.38	45,119.38	0.00E+00	7.07E+02	7.07E+02			
Pm-147	1.5671E-02	45,119.38	45,119.38	0.00E+00	6.71E+02	6.71E+02			
Pu-238	1.4877E-02	45,119.38	45,119.38	0.00E+00	1.43E+03	1.43E+03			
Pu-239	-3.5520E-02	45,119.38	0.00	1.43E+03	0.00E+00	1.43E+03			
Pu-240	2.0690E-02	45,119.38	45,119.38	7.27E+02	1.66E+03	1.66E+03			
Pu-241	-1.4799E+00	45,119.38	0.00	3.26E+04	0.00E+00	3.26E+04			
Pu-242	1.1252E-05	45,119.38	45,119.38	1.94E-01	7.02E-01	7.02E-01			
Ra-226	7.8524E-12	45,119.38	45,119.38	0.00E+00	3.54E-07	3.54E-07			
Ra-228	2.4086E-16	45,119.38	45,119.38	0.00E+00	1.09E-11	1.09E-11			
Ru-106	1.5066E-05	45,119.38	45,119.38	0.00E+00	6.80E-01	6.80E-01			
Se-79	1.0127E-05	45,119.38	45,119.38	0.00E+00	4.57E-01	4.57E-01			
Sn-126	4.3902E-05	45,119.38	45,119.38	0.00E+00	1.98E+00	1.98E+00			
Sr-90	5.0088E-01	45,119.38	45,119.38	0.00E+00	2.26E+04	2.26E+04			
Tc-99	3.9412E-04	45,119.38	45,119.38	0.00E+00	1.78E+01	1.78E+01			
Th-229	2.7219E-12	45,119.38	45,119.38	0.00E+00	1.23E-07	1.23E-07			
Th-230	1.0441E-09	45,119.38	45,119.38	0.00E+00	4.71E-05	4.71E-05			
Th-232	3.1689E-16	45,119.38	45,119.38	0.00E+00	1.43E-11	1.43E-11			
Ti-208	4.6636E-07	45,119.38	45,119.38	0.00E+00	2.10E-02	2.10E-02			
U-232	1.2638E-06	45,119.38	45,119.38	0.00E+00	5.70E-02	5.70E-02			
U-233	5.7451E-10	45,119.38	45,119.38	0.00E+00	2.59E-05	2.59E-05			
U-234	4.3044E-06	45,119.38	45,119.38	0.00E+00	1.94E-01	1.94E-01			
U-235	-7.7765E-09	45,119.38	0.00	2.94E-04	0.00E+00	2.94E-04			
U-236	1.8050E-07	45,119.38	45,119.38	0.00E+00	8.14E-03	8.14E-03			
U-238	-1.7914E-07	45,119.38	0.00	2.14E-02	1.33E-02	2.14E-02			
Y-90	5.0088E-01	45,119.38	45,119.38	0.00E+00	2.26E+04	2.26E+04			
Other Radionuclides					6.39E+04	6.39E+04			

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences.
Reactor Moderator	FAST	FAST	This Template was used for the following reasons:
Fuel Cladding	ZIRC	SST	This fuel matches on all parameters except enrichment (unknown) and cladding (SST is conservative)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %	10 to 30	10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		45,119.38	Nominal burnup set equal to bounding burnup
Bounding		45,119.38	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	3.28		1.05
Bounding	3.28		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: LWR COMMERCIAL FUEL  
SNF ID #: 130  
Fuel Units & Descr: 6 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL= , EOL=63 893kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1982  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 25 years

Estimated  
Canister usage  
HIC  
3 00

II. Estimates	m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6376E-10	60,759 03	60,759 03	0 00E+00	4 03E-05	4 03E-05	Avg MeV	
Am-241	1 3144E-01	60,759 03	60,759 03	0 00E+00	7 99E+03	7 99E+03	0 0150	4 132E+15
Am-242m	3 0039E-04	60,759 03	60,759 03	0 00E+00	1 83E+01	1 83E+01	0 0250	8 368E+14
Am-243	6 2629E-04	60,759 03	60,759 03	0 00E+00	3 81E+01	3 81E+01	0 0375	8 099E+14
C-14	4 7965E-05	60,759 03	60,759 03	0 00E+00	2 91E+00	2 91E+00	0 0575	8 835E+14
Ci-36	8 0297E-07	60,759 03	60,759 03	0 00E+00	4 88E-02	4 88E-02	0 0850	4 682E+14
Cm-243	3 1993E-04	60,759 03	60,759 03	0 00E+00	1 94E+01	1 94E+01	0 1250	3 420E+14
Cm-244	7 1851E-02	60,759 03	60,759 03	0 00E+00	4 37E+03	4 37E+03	0 2250	4 019E+14
Co-60	9 5220E-03	60,759 03	60,759 03	0 00E+00	5 79E+02	5 79E+02	0 3750	1 724E+14
Cs-134	1 1662E-03	60,759 03	60,759 03	0 00E+00	7 09E+01	7 09E+01	0 5750	3 963E+15
Cs-135	1 4433E-05	60,759 03	60,759 03	0 00E+00	8 77E-01	8 77E-01	0 8500	7 821E+13
Cs-137	1 7603E+00	60,759 03	60,759 03	0 00E+00	1 07E+05	1 07E+05	1 2500	1 056E+14
Eu-154	4 5203E-02	60,759 03	60,759 03	0 00E+00	2 75E+03	2 75E+03	1 7500	2 315E+12
Eu-155	7 1479E-03	60,759 03	60,759 03	0 00E+00	4 34E+02	4 34E+02	2 2500	4 275E+08
Fe-55	6 1919E-04	60,759 03	60,759 03	0 00E+00	3 76E+01	3 76E+01	2 7500	4 805E+08
H-3	3 6386E-02	60,759 03	60,759 03	0 00E+00	2 21E+03	2 21E+03	3 5000	6 297E+07
I-129	9 8288E-07	60,759 03	60,759 03	0 00E+00	5 97E-02	5 97E-02	5 0000	2 691E+07
Kr-85	5 3844E-02	60,759 03	60,759 03	0 00E+00	3 27E+03	3 27E+03	7 0000	3 102E+06
Np-237	1 0546E-05	60,759 03	60,759 03	0 00E+00	6 41E-01	6 41E-01	11 0000	3 564E+05
Pa-231	1 1370E-09	60,759 03	60,759 03	0 00E+00	6 91E-05	6 91E-05		
Pb-210	3 3624E-11	60,759 03	60,759 03	0 00E+00	2 04E-06	2 04E-06		
Pm-147	5 1211E-03	60,759 03	60,759 03	0 00E+00	3 11E+02	3 11E+02		
Pu-238	8 0669E-02	60,759 03	60,759 03	0 00E+00	4 90E+03	4 90E+03		
Pu-239	1 1626E-02	60,759 03	60,759 03	0 00E+00	7 06E+02	7 06E+02		
Pu-240	1 5097E-02	60,759 03	60,759 03	0 00E+00	9 17E+02	9 17E+02		
Pu-241	1 4567E+00	60,759 03	60,759 03	0 00E+00	8 85E+04	8 85E+04		
Pu-242	6 4260E-05	60,759 03	60,759 03	0 00E+00	3 90E+00	3 90E+00		
Ra-226	1 1392E-10	60,759 03	60,759 03	0 00E+00	6 92E-06	6 92E-06		
Ra-228	5 1841E-12	60,759 03	60,759 03	0 00E+00	3 15E-07	3 15E-07		
Ru-106	5 9012E-07	60,759 03	60,759 03	0 00E+00	3 59E-02	3 59E-02		
Se-79	1 2379E-05	60,759 03	60,759 03	0 00E+00	7 52E-01	7 52E-01		
Sn-126	2 5210E-05	60,759 03	60,759 03	0 00E+00	1 53E+00	1 53E+00		
Sr-90	1 1630E+00	60,759 03	60,759 03	0 00E+00	7 07E+04	7 07E+04		
Tc-99	3 9357E-04	60,759 03	60,759 03	0 00E+00	2 39E+01	2 39E+01		
Th-229	8 5691E-11	60,759 03	60,759 03	0 00E+00	5 21E-06	5 21E-06		
Th-230	1 4493E-08	60,759 03	60,759 03	0 00E+00	8 81E-04	8 81E-04		
Th-232	5 2923E-12	60,759 03	60,759 03	0 00E+00	3 22E-07	3 22E-07		
Ti-208	1 9202E-07	60,759 03	60,759 03	0 00E+00	1 17E-02	1 17E-02		
U-232	5 2083E-07	60,759 03	60,759 03	0 00E+00	3 16E-02	3 16E-02		
U-233	2 4386E-08	60,759 03	60,759 03	0 00E+00	1 48E-03	1 48E-03		
U-234	4 7012E-05	60,759 03	60,759 03	0 00E+00	2 86E+00	2 86E+00		
U-235	-1 4492E-06	60,759 03	0 00	8 84E-03	0 00E+00	8 84E-03		
U-236	7 5759E-06	60,759 03	60,759 03	0 00E+00	4 60E-01	4 60E-01		
U-238	-2 6129E-07	60,759 03	0 00	4 16E-02	2 57E-02	4 16E-02		
Y-90	1 1631E+00	60,759 03	60,759 03	0 00E+00	7 07E+04	7 07E+04		
Other Radionuclides					1 03E+05	1 03E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	ZIRC	ZIRC	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	U	U	
BOL Enrichment %		0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal:		60,759 03	Nominal burnup set equal to bounding burnup.
Bounding:		60 759 03	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	13 58		1 59
Bounding	13 58		

<sup>1</sup>Reactor shutdown, core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name LWR SCRAP  
SNF ID # 309  
Fuel Units & Descr 1 - SCRAP  
Heavy Metal Mass BOL=76 554kg EOL=75 31kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1963  
Estimates as of 2010  
Template PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 35 years

Estimated  
Canister usage  
HIC  
1.00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	2,143.51	2,449.72	0.00E+00	1.88E-06	2.15E-06	Avg MeV	
Am-241	4.352E-01	2,143.51	2,449.72	0.00E+00	3.08E+02	3.52E+02	0.0150	1.318E+14
Am-242m	2.8698E-04	2,143.51	2,449.72	0.00E+00	6.15E-01	7.03E-01	0.0250	2.658E+13
Am-243	6.2565E-04	2,143.51	2,449.72	0.00E+00	1.34E+00	1.53E+00	0.0375	2.535E+13
C-14	4.7901E-05	2,143.51	2,449.72	0.00E+00	1.03E-01	1.17E-01	0.0575	2.929E+13
Cl-36	8.0297E-07	2,143.51	2,449.72	0.00E+00	1.72E-03	1.97E-03	0.0850	1.475E+13
Cm-243	2.5081E-04	2,143.51	2,449.72	0.00E+00	5.38E-01	6.14E-01	0.1250	1.023E+13
Cm-244	4.9015E-02	2,143.51	2,449.72	0.00E+00	1.05E+02	1.20E+02	0.2250	1.265E+13
Co-60	2.5581E-03	2,143.51	2,449.72	0.00E+00	5.48E+00	6.27E+00	0.3750	5.438E+12
Cs-134	4.0536E-05	2,143.51	2,449.72	0.00E+00	8.69E-02	9.93E-02	0.5750	1.265E+14
Cs-135	1.4433E-05	2,143.51	2,449.72	0.00E+00	3.09E-02	3.54E-02	0.8500	1.750E+12
Cs-137	1.3979E+00	2,143.51	2,449.72	0.00E+00	3.00E+03	3.42E+03	1.2500	1.719E+12
Eu-154	2.0203E-02	2,143.51	2,449.72	0.00E+00	4.33E+01	4.95E+01	1.7500	5.147E+10
Eu-155	1.7684E-03	2,143.51	2,449.72	0.00E+00	3.79E+00	4.33E+00	2.2500	8.288E+06
Fe-55	4.3136E-05	2,143.51	2,449.72	0.00E+00	9.25E-02	1.06E-01	2.7500	1.698E+07
H-3	2.0769E-02	2,143.51	2,449.72	0.00E+00	4.45E+01	5.09E+01	3.5000	1.749E+06
I-129	9.8288E-07	2,143.51	2,449.72	0.00E+00	2.11E-03	2.41E-03	5.0000	7.476E+05
Kr-85	2.8214E-02	2,143.51	2,449.72	0.00E+00	6.05E+01	6.91E+01	7.0000	8.617E+04
Np-237	1.1218E-05	2,143.51	2,449.72	0.00E+00	2.40E-02	2.75E-02	11.0000	9.896E+03
Pa-231	1.3036E-09	2,143.51	2,449.72	0.00E+00	2.79E-06	3.19E-06		
Pb-210	8.5078E-11	2,143.51	2,449.72	0.00E+00	1.82E-07	2.08E-07		
Pm-147	3.6531E-04	2,143.51	2,449.72	0.00E+00	7.83E-01	8.95E-01		
Pu-238	7.4564E-02	2,143.51	2,449.72	0.00E+00	1.60E+02	1.83E+02		
Pu-239	1.1623E-02	2,143.51	2,449.72	0.00E+00	2.49E+01	2.85E+01		
Pu-240	1.5132E-02	2,143.51	2,449.72	0.00E+00	3.24E+01	3.71E+01		
Pu-241	9.0036E-01	2,143.51	2,449.72	0.00E+00	1.93E+03	2.21E+03		
Pu-242	6.4260E-05	2,143.51	2,449.72	0.00E+00	1.38E-01	1.57E-01		
Ra-226	2.2804E-10	2,143.51	2,449.72	0.00E+00	4.89E-07	5.59E-07		
Ra-228	5.2713E-12	2,143.51	2,449.72	0.00E+00	1.13E-08	1.29E-08		
Ru-106	6.1160E-10	2,143.51	2,449.72	0.00E+00	1.31E-06	1.50E-06		
Se-79	1.2377E-05	2,143.51	2,449.72	0.00E+00	2.65E-02	3.03E-02		
Sn-126	2.5210E-05	2,143.51	2,449.72	0.00E+00	5.40E-02	6.18E-02		
Sr-90	9.1667E-01	2,143.51	2,449.72	0.00E+00	1.96E+03	2.25E+03		
Tc-99	3.9357E-04	2,143.51	2,449.72	0.00E+00	8.44E-01	9.64E-01		
Th-229	1.2057E-10	2,143.51	2,449.72	0.00E+00	2.58E-07	2.95E-07		
Th-230	2.1043E-08	2,143.51	2,449.72	0.00E+00	4.51E-05	5.16E-05		
Th-232	5.2972E-12	2,143.51	2,449.72	0.00E+00	1.14E-08	1.30E-08		
Ti-208	1.7474E-07	2,143.51	2,449.72	0.00E+00	3.75E-04	4.28E-04		
U-232	4.7368E-07	2,143.51	2,449.72	0.00E+00	1.02E-03	1.16E-03		
U-233	2.5097E-08	2,143.51	2,449.72	0.00E+00	5.38E-05	6.15E-05		
U-234	5.0000E-05	2,143.51	2,449.72	0.00E+00	1.07E-01	1.22E-01		
U-235	-1.4489E-06	2,143.51	0.00	4.58E-03	1.47E-03	4.58E-03		
U-236	7.5824E-06	2,143.51	2,449.72	0.00E+00	1.63E-02	1.86E-02		
U-238	-2.6129E-07	2,143.51	0.00	2.50E-02	2.45E-02	2.50E-02		
Y-90	9.1699E-01	2,143.51	2,449.72	0.00E+00	1.97E+03	2.25E+03		
Other Radionuclides					2.88E+03	3.29E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences	
Reactor Moderator	From SFD	Used		
Fuel Cladding	LIGHT WATER	LIGHT WATER		
BOL HM Constituents	ZIRC	ZIRC		
BOL Enrichment %	U	U		
	2.767	0 to 5		
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate	
	From SFD	Estimated		
Nominal	2,143.51	1,182.79		
Bounding	2,449.72	2,365.59		
			Nominal burnup taken directly from SFD (converted to MWd)	
			Bounding burnup taken directly from SFD (converted to MWd)	
Checks			Estimated EOL HM/Given EOL HM	
	Burnup Multiplier	Estimated Burnup/Given Burnup		
Nominal	0.80	0.55		
Bounding	0.91	0.97		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name N REACTOR  
SNF ID # 991  
Fuel Units & Descr 103673 - 2 CONCENTRIC TUBES  
Heavy Metal Mass BOL=2102208 523kg EOL=2099824 044kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date: 1971  
Estimates as of: 2010  
Template: N-Reactor (Graphite, Zirc 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 69600  
Template BOL Heavy Metal Mass (MT) 11.6  
Template Decay Time: 35 years

Estimated  
Canister usage  
MCO  
333.97

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.2184E-10	5.060,015.91	5,718,007.18	0.00E+00	2.13E-03	2.41E-03	Avg. MeV	
Am-241	9.6379E-02	5.060,015.91	5,718,007.18	0.00E+00	4.88E+05	5.51E+05	0.0150	2.778E+17
Am-242m	5.8463E-05	5.060,015.91	5,718,007.18	0.00E+00	2.96E+02	3.34E+02	0.0250	5.678E+16
Am-243	4.6279E-05	5.060,015.91	5,718,007.18	0.00E+00	2.34E+02	2.65E+02	0.0375	5.253E+16
C-14	9.2026E-05	5.060,015.91	5,718,007.18	0.00E+00	4.66E+02	5.26E+02	0.0575	5.995E+16
Cl-36	0.0000E+00	5.060,015.91	5,718,007.18	0.00E+00	0.00E+00	0.00E+00	0.0850	3.153E+16
Cm-243	0.0000E+00	5.060,015.91	5,718,007.18	0.00E+00	0.00E+00	0.00E+00	0.1250	2.094E+16
Cm-244	4.5445E-04	5.060,015.91	5,718,007.18	0.00E+00	2.30E+03	2.60E+03	0.2250	2.705E+16
Co-60	6.3707E-05	5.060,015.91	5,718,007.18	0.00E+00	3.22E+02	3.64E+02	0.3750	1.171E+16
Cs-134	1.4042E-05	5.060,015.91	5,718,007.18	0.00E+00	7.11E+01	8.03E+01	0.5750	2.525E+17
Cs-135	1.0066E-05	5.060,015.91	5,718,007.18	0.00E+00	5.09E+01	5.76E+01	0.8500	2.565E+15
Cs-137	1.1945E+00	5.060,015.91	5,718,007.18	0.00E+00	6.04E+06	6.83E+06	1.2500	1.399E+15
Eu-154	6.6451E-03	5.060,015.91	5,718,007.18	0.00E+00	3.36E+04	3.80E+04	1.7500	7.096E+13
Eu-155	2.9052E-04	5.060,015.91	5,718,007.18	0.00E+00	1.47E+03	1.66E+03	2.2500	5.737E+09
Fe-55	2.8807E-06	5.060,015.91	5,718,007.18	0.00E+00	1.46E+01	1.65E+01	2.7500	1.379E+08
H-3	2.1063E-03	5.060,015.91	5,718,007.18	0.00E+00	1.07E+04	1.20E+04	3.5000	1.220E+08
I-129	8.6006E-07	5.060,015.91	5,718,007.18	0.00E+00	4.35E+00	4.92E+00	5.0000	5.152E+07
Kr-85	2.6739E-02	5.060,015.91	5,718,007.18	0.00E+00	1.35E+05	1.53E+05	7.0000	5.841E+06
Np-237	8.5589E-06	5.060,015.91	5,718,007.18	0.00E+00	4.33E+01	4.89E+01	11.0000	6.655E+05
Pa-231	1.2500E-09	5.060,015.91	5,718,007.18	0.00E+00	6.33E-03	7.15E-03		
Pb-210	2.3017E-11	5.060,015.91	5,718,007.18	0.00E+00	1.16E-04	1.32E-04		
Pm-147	5.9856E-04	5.060,015.91	5,718,007.18	0.00E+00	3.03E+03	3.42E+03		
Pu-238	2.0029E-02	5.060,015.91	5,718,007.18	0.00E+00	1.01E+05	1.15E+05		
Pu-239	2.8836E-02	5.060,015.91	5,718,007.18	0.00E+00	1.46E+05	1.65E+05		
Pu-240	2.2802E-02	5.060,015.91	5,718,007.18	0.00E+00	1.15E+05	1.30E+05		
Pu-241	6.1020E-01	5.060,015.91	5,718,007.18	0.00E+00	3.09E+06	3.49E+06		
Pu-242	1.4526E-05	5.060,015.91	5,718,007.18	0.00E+00	7.35E+01	8.31E+01		
Ra-226	9.7701E-11	5.060,015.91	5,718,007.18	0.00E+00	4.94E-04	5.59E-04		
Ra-228	1.1068E-14	5.060,015.91	5,718,007.18	0.00E+00	5.60E-08	6.33E-08		
Ru-106	5.9224E-10	5.060,015.91	5,718,007.18	0.00E+00	3.00E-03	3.39E-03		
Se-79	1.0899E-05	5.060,015.91	5,718,007.18	0.00E+00	5.52E+01	6.23E+01		
Sn-126	0.0000E+00	5.060,015.91	5,718,007.18	0.00E+00	0.00E+00	0.00E+00		
Sr-90	8.4899E-01	5.060,015.91	5,718,007.18	0.00E+00	4.30E+06	4.85E+06		
Tc-99	3.6494E-04	5.060,015.91	5,718,007.18	0.00E+00	1.85E+03	2.09E+03		
Th-229	1.2928E-12	5.060,015.91	5,718,007.18	0.00E+00	6.54E-06	7.39E-06		
Th-230	1.6293E-08	5.060,015.91	5,718,007.18	0.00E+00	8.24E-02	9.32E-02		
Th-232	1.6451E-14	5.060,015.91	5,718,007.18	0.00E+00	8.32E-08	9.41E-08		
Th-208	3.4382E-15	5.060,015.91	5,718,007.18	0.00E+00	1.74E-08	1.97E-08		
U-232	0.0000E+00	5.060,015.91	5,718,007.18	0.00E+00	0.00E+00	0.00E+00		
U-233	9.9425E-10	5.060,015.91	5,718,007.18	0.00E+00	5.03E-03	5.69E-03		
U-234	6.5575E-05	5.060,015.91	5,718,007.18	0.00E+00	3.32E+02	3.75E+02		
U-235	-1.2944E-06	5.060,015.91	0.00	5.22E+01	4.57E+01	5.22E+01		
U-236	1.1951E-05	5.060,015.91	5,718,007.18	0.00E+00	6.05E+01	6.83E+01		
U-238	-3.0619E-07	5.060,015.91	0.00	6.98E+02	6.97E+02	6.98E+02		
Y-90	8.4928E-01	5.060,015.91	5,718,007.18	0.00E+00	4.30E+06	4.86E+06		
Other Radionuclides					5.80E+06	6.55E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences.
Reactor Moderator:	GRAPHITE	GRAPHITE	
Fuel Cladding:	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %:	1.15	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	5.060,015.91	2.515,522.81	
Bounding	5.718,007.18	5.031,045.62	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.40	0.50	1.00
Bounding	0.45	0.88	

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name POINT BEACH  
SNF ID # 311  
Fuel Units & Descr 3 - 14 X 14 ROD ARRAY  
Heavy Metal Mass BOL=1167kg EOL=1161.5kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1981  
Estimates as of 2010  
Template PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
150

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	6 6376E-10	38,160 90	38,160 90	0 00E+00	2 53E-05	2 53E-05	0 0150	2.595E+15
Am-241	1 3144E-01	38,160 90	38,160 90	0 00E+00	5 02E+03	5 02E+03	0 0250	5.256E+14
Am-242m	3 0039E-04	38,160 90	38,160 90	0 00E+00	1 15E+01	1 15E+01	0 0375	5.087E+14
Am-243	6 2629E-04	38,160 90	38,160 90	0 00E+00	2 39E+01	2 39E+01	0 0575	5.549E+14
C-14	4 7965E-05	38,160 90	38,160 90	0 00E+00	1 83E+00	1 83E+00	0 0850	2.940E+14
Cl-36	8 0297E-07	38,160 90	38,160 90	0 00E+00	3 06E-02	3 06E-02	0 1250	2.148E+14
Cm-243	3 1993E-04	38,160 90	38,160 90	0 00E+00	1.22E+01	1.22E+01	0.2250	2.524E+14
Cm-244	7 1851E-02	38,160 90	38,160 90	0 00E+00	2 74E+03	2 74E+03	0 3750	1.083E+14
Co-60	9 5220E-03	38,160 90	38,160 90	0 00E+00	3 63E+02	3 63E+02	0 5750	2.489E+15
Cs-134	1 1662E-03	38,160 90	38,160 90	0 00E+00	4 45E+01	4 45E+01	0 8500	4.912E+13
Cs-135	1.4433E-05	38,160 90	38,160 90	0 00E+00	5 51E-01	5 51E-01	1.2500	6.636E+13
Cs-137	1 7603E+00	38,160 90	38,160 90	0 00E+00	6 72E+04	6 72E+04	1 7500	1.454E+12
Eu-154	4 5203E-02	38,160 90	38,160 90	0 00E+00	1.73E+03	1.73E+03	2.2500	2.685E+08
Eu-155	7 1479E-03	38,160 90	38,160 90	0 00E+00	2 73E+02	2 73E+02	2.7500	3.018E+08
Fe-55	6 1919E-04	38,160 90	38,160 90	0 00E+00	2 36E+01	2 36E+01	3 5000	3.955E+07
H-3	3 6386E-02	38,160 90	38,160 90	0 00E+00	1 39E+03	1 39E+03	5 0000	1.690E+07
I-129	9 8288E-07	38,160 90	38,160 90	0 00E+00	3 75E-02	3 75E-02	7 0000	1.949E+06
Kr-85	5 3844E-02	38,160 90	38,160 90	0 00E+00	2 05E+03	2 05E+03	11 0000	2.238E+05
Np-237	1 0546E-05	38,160 90	38,160 90	0 00E+00	4.02E-01	4 02E-01		
Pa-231	1 1370E-09	38,160 90	38,160 90	0 00E+00	4 34E-05	4 34E-05		
Pb-210	3 3624E-11	38,160 90	38,160 90	0 00E+00	1 28E-06	1 28E-06		
Pm-147	5 1211E-03	38,160 90	38,160 90	0 00E+00	1 95E+02	1 95E+02		
Pu-238	8 0669E-02	38,160 90	38,160 90	0 00E+00	3 08E+03	3 08E+03		
Pu-239	1 1626E-02	38,160 90	38,160 90	0 00E+00	4 44E+02	4 44E+02		
Pu-240	1 5097E-02	38,160 90	38,160 90	0 00E+00	5 76E+02	5 76E+02		
Pu-241	1 4567E+00	38,160 90	38,160 90	0 00E+00	5 56E+04	5 56E+04		
Pu-242	6 4260E-05	38,160 90	38,160 90	0 00E+00	2 45E+00	2 45E+00		
Ra-226	1 1392E-10	38,160 90	38,160 90	0 00E+00	4 35E-06	4 35E-06		
Ra-228	5 1841E-12	38,160 90	38,160 90	0 00E+00	1 98E-07	1 98E-07		
Ru-106	5 9012E-07	38,160 90	38,160 90	0 00E+00	2 25E-02	2 25E-02		
Se-79	1.2379E-05	38,160 90	38,160 90	0 00E+00	4 72E-01	4 72E-01		
Sn-126	2 5210E-05	38,160 90	38,160 90	0 00E+00	9 62E-01	9 62E-01		
Sr-90	1 1630E+00	38,160 90	38,160 90	0 00E+00	4 44E+04	4 44E+04		
Tc-99	3 9357E-04	38,160 90	38,160 90	0 00E+00	1.50E+01	1 50E+01		
Th-229	8 5691E-11	38,160 90	38,160 90	0 00E+00	3 27E-06	3 27E-06		
Th-230	1 4493E-08	38,160 90	38,160 90	0 00E+00	5 53E-04	5 53E-04		
Th-232	5.2923E-12	38,160 90	38,160 90	0 00E+00	2 02E-07	2 02E-07		
Th-208	1.9202E-07	38,160 90	38,160 90	0 00E+00	7.33E-03	7.33E-03		
U-232	5.2083E-07	38,160 90	38,160 90	0 00E+00	1.99E-02	1 99E-02		
U-233	2 4386E-08	38,160 90	38,160 90	0 00E+00	9 31E-04	9 31E-04		
U-234	4 7012E-05	38,160 90	38,160 90	0 00E+00	1 79E+00	1 79E+00		
U-235	-1 4492E-06	38,160 90	0 00	6 30E-02	7 74E-03	6 30E-02		
U-236	7 5759E-06	38,160 90	38,160 90	0 00E+00	2 89E-01	2 89E-01		
U-238	-2 6129E-07	38,160 90	0 00	3 82E-01	3 72E-01	3 82E-01		
Y-90	1.1631E+00	38,160 90	38,160 90	0 00E+00	4 44E+04	4 44E+04		
Other Radionuclides					6 45E+04	6 45E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences.
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2.5	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	38 160 90	5,230 14	
Bounding	38 160 90	10,460 29	

Nominal burnup taken directly from SFD (converted to MWd)  
Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.93	0.14	
Bounding	0.93	0.27	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT PWR C2 BLKT  
SNF ID #: 193  
Fuel Units & Descr: 72 - 19 FLAT PLATES  
Heavy Metal Mass: BOL=16236kg EOL=15780 002kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1969  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61.92  
Template BOL Heavy Metal Mass (MT): 0.00176911  
Template Decay Time: 35 years

Estimated  
Canister usage  
MCO  
18.00

## II. Estimates

	m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	433,632.15	867,264.30	0.00E+00	3.81E-04	7.61E-04	Avg MeV	
Am-241	1.4352E-01	433,632.15	867,264.30	0.00E+00	6.22E+04	1.24E+05	0.0150	4.666E+16
Am-242m	2.8698E-04	433,632.15	867,264.30	0.00E+00	1.24E+02	2.49E+02	0.0250	9.410E+15
Am-243	6.2565E-04	433,632.15	867,264.30	0.00E+00	2.71E+02	5.43E+02	0.0375	8.975E+15
C-14	4.7901E-05	433,632.15	867,264.30	0.00E+00	2.08E+01	4.15E+01	0.0575	1.037E+16
Cl-36	8.0297E-07	433,632.15	867,264.30	0.00E+00	3.48E-01	6.96E-01	0.0850	5.221E+15
Cm-243	2.5081E-04	433,632.15	867,264.30	0.00E+00	1.09E+02	2.18E+02	0.1250	3.623E+15
Cm-244	4.9015E-02	433,632.15	867,264.30	0.00E+00	2.13E+04	4.25E+04	0.2250	4.477E+15
Co-60	2.5581E-03	433,632.15	867,264.30	0.00E+00	1.11E+03	2.22E+03	0.3750	1.925E+15
Cs-134	4.0536E-05	433,632.15	867,264.30	0.00E+00	1.76E+01	3.52E+01	0.5750	4.478E+16
Cs-135	1.4433E-05	433,632.15	867,264.30	0.00E+00	6.26E+00	1.25E+01	0.8500	6.195E+14
Cs-137	1.3979E+00	433,632.15	867,264.30	0.00E+00	6.06E+05	1.21E+06	1.2500	6.085E+14
Eu-154	2.0203E-02	433,632.15	867,264.30	0.00E+00	8.76E+03	1.75E+04	1.7500	1.822E+13
Eu-155	1.7684E-03	433,632.15	867,264.30	0.00E+00	7.67E+02	1.53E+03	2.2500	2.934E+09
Fe-55	4.3136E-05	433,632.15	867,264.30	0.00E+00	1.87E+01	3.74E+01	2.7500	6.012E+09
H-3	2.0769E-02	433,632.15	867,264.30	0.00E+00	9.01E+03	1.80E+04	3.5000	6.190E+08
I-129	9.8288E-07	433,632.15	867,264.30	0.00E+00	4.26E-01	8.52E-01	5.0000	2.647E+08
Kr-85	2.8214E-02	433,632.15	867,264.30	0.00E+00	1.22E+04	2.45E+04	7.0000	3.050E+07
Np-237	1.1218E-05	433,632.15	867,264.30	0.00E+00	4.86E+00	9.73E+00	11.0000	3.503E+06
Pa-231	1.3036E-09	433,632.15	867,264.30	0.00E+00	5.65E-04	1.13E-03		
Pb-210	8.5078E-11	433,632.15	867,264.30	0.00E+00	3.69E-05	7.38E-05		
Pm-147	3.6531E-04	433,632.15	867,264.30	0.00E+00	1.58E+02	3.17E+02		
Pu-238	7.4564E-02	433,632.15	867,264.30	0.00E+00	3.23E+04	6.47E+04		
Pu-239	1.1623E-02	433,632.15	867,264.30	0.00E+00	5.04E+03	1.01E+04		
Pu-240	1.5132E-02	433,632.15	867,264.30	0.00E+00	6.56E+03	1.31E+04		
Pu-241	9.0036E-01	433,632.15	867,264.30	0.00E+00	3.90E+05	7.81E+05		
Pu-242	6.4260E-05	433,632.15	867,264.30	0.00E+00	2.79E+01	5.57E+01		
Ra-226	2.2804E-10	433,632.15	867,264.30	0.00E+00	9.89E-05	1.98E-04		
Ra-228	5.2713E-12	433,632.15	867,264.30	0.00E+00	2.29E-06	4.57E-06		
Ru-106	6.1160E-10	433,632.15	867,264.30	0.00E+00	2.65E-04	5.30E-04		
Se-79	1.2377E-05	433,632.15	867,264.30	0.00E+00	5.37E+00	1.07E+01		
Sn-126	2.5210E-05	433,632.15	867,264.30	0.00E+00	1.09E+01	2.19E+01		
Sr-90	9.1667E-01	433,632.15	867,264.30	0.00E+00	3.97E+05	7.95E+05		
Tc-99	3.9357E-04	433,632.15	867,264.30	0.00E+00	1.71E+02	3.41E+02		
Th-229	1.2057E-10	433,632.15	867,264.30	0.00E+00	5.23E-05	1.05E-04		
Th-230	2.1043E-08	433,632.15	867,264.30	0.00E+00	9.13E-03	1.83E-02		
Th-232	5.2972E-12	433,632.15	867,264.30	0.00E+00	2.30E-06	4.59E-06		
Ti-208	1.7474E-07	433,632.15	867,264.30	0.00E+00	7.58E-02	1.52E-01		
U-232	4.7368E-07	433,632.15	867,264.30	0.00E+00	2.05E-01	4.11E-01		
U-233	2.5097E-08	433,632.15	867,264.30	0.00E+00	1.09E-02	2.18E-02		
U-234	5.0000E-05	433,632.15	867,264.30	0.00E+00	2.17E+01	4.34E+01		
U-235	-1.4489E-06	433,632.15	0.00	2.49E-01	0.00E+00	2.49E-01		
U-236	7.5824E-06	433,632.15	867,264.30	0.00E+00	3.29E+00	6.58E+00		
U-238	-2.6129E-07	433,632.15	0.00	5.42E+00	5.30E+00	5.42E+00		
Y-90	9.1699E-01	433,632.15	867,264.30	0.00E+00	3.98E+05	7.95E+05		
Other Radionuclides					5.82E+05	1.16E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	0.71	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	263,023.20	433,632.15	
Bounding	399,405.60	867,264.30	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.76	1.65	
Bounding	1.53	2.17	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SINGLE PASS REACTOR FUEL  
SNF ID # 198  
Fuel Units & Descr. 835 - TUBE  
Heavy Metal Mass BOL=2891 605kg EOL=2885 844kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1971  
Estimates as of 2010  
Template N Reactor (Graphite Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 69600  
Template BOL Heavy Metal Mass (MT) 11.6  
Template Decay Time 35 years

Estimated  
Canister usage  
MCO  
0.86

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	4.2184E-10	6,078.13	12,156.27	0.00E+00	2.56E-06	5.13E-06	0.0150	5.907E+14
Am-241	9.6379E-02	6,078.13	12,156.27	0.00E+00	5.86E+02	1.17E+03	0.0250	1.207E+14
Am-242m	5.8463E-05	6,078.13	12,156.27	0.00E+00	3.55E-01	7.11E-01	0.0375	1.117E+14
Am-243	4.6279E-05	6,078.13	12,156.27	0.00E+00	2.81E-01	5.63E-01	0.0575	1.275E+14
C-14	9.2026E-05	6,078.13	12,156.27	0.00E+00	5.59E-01	1.12E+00	0.0850	6.703E+13
Cl-36	0.0000E+00	6,078.13	12,156.27	0.00E+00	0.00E+00	0.00E+00	0.1250	4.451E+13
Cm-243	0.0000E+00	6,078.13	12,156.27	0.00E+00	0.00E+00	0.00E+00	0.2250	5.750E+13
Cm-244	4.5445E-04	6,078.13	12,156.27	0.00E+00	2.76E+00	5.52E+00	0.3750	2.488E+13
Co-60	6.3707E-05	6,078.13	12,156.27	0.00E+00	3.87E-01	7.74E-01	0.5750	5.368E+14
Cs-134	1.4042E-05	6,078.13	12,156.27	0.00E+00	8.53E-02	1.71E-01	0.8500	5.454E+12
Cs-135	1.0066E-05	6,078.13	12,156.27	0.00E+00	6.12E-02	1.22E-01	1.2500	2.975E+12
Cs-137	1.1945E+00	6,078.13	12,156.27	0.00E+00	7.26E+03	1.45E+04	1.7500	1.509E+11
Eu-154	6.6451E-03	6,078.13	12,156.27	0.00E+00	4.04E+01	8.08E+01	2.2500	1.219E+07
Eu-155	2.9052E-04	6,078.13	12,156.27	0.00E+00	1.77E+00	3.53E+00	2.7500	2.902E+05
Fe-55	2.8807E-06	6,078.13	12,156.27	0.00E+00	1.75E-02	3.50E-02	3.5000	2.566E+05
H-3	2.1063E-03	6,078.13	12,156.27	0.00E+00	1.28E+01	2.56E+01	5.0000	1.084E+05
I-129	8.6006E-07	6,078.13	12,156.27	0.00E+00	5.23E-03	1.05E-02	7.0000	1.228E+04
Kr-85	2.6739E-02	6,078.13	12,156.27	0.00E+00	1.63E+02	3.25E+02	11.0000	1.399E+03
Np-237	8.5589E-06	6,078.13	12,156.27	0.00E+00	5.20E-02	1.04E-01		
Pa-231	1.2500E-09	6,078.13	12,156.27	0.00E+00	7.60E-06	1.52E-05		
Pb-210	2.3017E-11	6,078.13	12,156.27	0.00E+00	1.40E-07	2.80E-07		
Pm-147	5.9856E-04	6,078.13	12,156.27	0.00E+00	3.64E+00	7.28E+00		
Pu-238	2.0029E-02	6,078.13	12,156.27	0.00E+00	1.22E+02	2.43E+02		
Pu-239	2.8836E-02	6,078.13	12,156.27	0.00E+00	1.75E+02	3.51E+02		
Pu-240	2.2802E-02	6,078.13	12,156.27	0.00E+00	1.39E+02	2.77E+02		
Pu-241	6.1020E-01	6,078.13	12,156.27	0.00E+00	3.71E+03	7.42E+03		
Pu-242	1.4526E-05	6,078.13	12,156.27	0.00E+00	8.83E-02	1.77E-01		
Ra-226	9.7701E-11	6,078.13	12,156.27	0.00E+00	5.94E-07	1.19E-06		
Ra-228	1.1068E-14	6,078.13	12,156.27	0.00E+00	6.73E-11	1.35E-10		
Ru-106	5.9224E-10	6,078.13	12,156.27	0.00E+00	3.60E-06	7.20E-06		
Se-79	1.0899E-05	6,078.13	12,156.27	0.00E+00	6.62E-02	1.32E-01		
Sn-126	0.0000E+00	6,078.13	12,156.27	0.00E+00	0.00E+00	0.00E+00		
Sr-90	8.4899E-01	6,078.13	12,156.27	0.00E+00	5.16E+03	1.03E+04		
Tc-99	3.6494E-04	6,078.13	12,156.27	0.00E+00	2.22E+00	4.44E+00		
Th-229	1.2928E-12	6,078.13	12,156.27	0.00E+00	7.86E-09	1.57E-08		
Th-230	1.6293E-08	6,078.13	12,156.27	0.00E+00	9.90E-05	1.98E-04		
Th-232	1.6451E-14	6,078.13	12,156.27	0.00E+00	1.00E-10	2.00E-10		
Ti-208	3.4382E-15	6,078.13	12,156.27	0.00E+00	2.09E-11	4.18E-11		
U-232	0.0000E+00	6,078.13	12,156.27	0.00E+00	0.00E+00	0.00E+00		
U-233	9.9425E-10	6,078.13	12,156.27	0.00E+00	6.04E-06	1.21E-05		
U-234	6.5575E-05	6,078.13	12,156.27	0.00E+00	3.99E-01	7.97E-01		
U-235	-1.2944E-06	6,078.13	0.00	5.37E-03	0.00E+00	5.37E-03		
U-236	1.1951E-05	6,078.13	12,156.27	0.00E+00	7.26E-02	1.45E-01		
U-238	-3.0619E-07	6,078.13	0.00	9.71E-01	9.69E-01	9.71E-01		
Y-90	8.4928E-01	6,078.13	12,156.27	0.00E+00	5.16E+03	1.03E+04		
Other Radionuclides					6.97E+03	1.39E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	GRAPHITE	GRAPHITE	
Fuel Cladding	ALUM	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	0.086	0 to 5	

This Template was used for the following reasons:  
This fuel matches on all parameters except cladding

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	2.891 61	6.078 13	
Bounding		12.156 27	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.35	2.10	1.00
Bounding	0.70		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SINGLE PASS REACTOR FUEL  
SNF ID #: 197  
Fuel Units & Descr: 139 - TUBE  
Heavy Metal Mass: BOL=407 437kg, EOL=407 006kg  
ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date 1971  
Estimates as of 2010  
Template: N-React (Graphite Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 69600  
Template BOL Heavy Metal Mass (MT) 11.6  
Template Decay Time 35 years

Estimated  
Canister usage  
MCO  
0.14

II. Estimates	m	x <sub>n</sub>	x <sub>s</sub>	b	y <sub>n</sub>	y <sub>s</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.2184E-10	454.58	909.16	0.00E+00	1.92E-07	3.84E-07	Avg MeV	
Am-241	9.6379E-02	454.58	909.16	0.00E+00	4.38E+01	8.76E+01	0.0150	4.418E+13
Am-242m	5.8463E-05	454.58	909.16	0.00E+00	2.66E-02	5.32E-02	0.0250	9.029E+12
Am-243	4.6279E-05	454.58	909.16	0.00E+00	2.10E-02	4.21E-02	0.0375	8.352E+12
C-14	9.2026E-05	454.58	909.16	0.00E+00	4.18E-02	8.37E-02	0.0575	9.532E+12
Cl-36	0.0000E+00	454.58	909.16	0.00E+00	0.00E+00	0.00E+00	0.0850	5.013E+12
Cm-243	0.0000E+00	454.58	909.16	0.00E+00	0.00E+00	0.00E+00	0.1250	3.329E+12
Cm-244	4.5445E-04	454.58	909.16	0.00E+00	2.07E-01	4.13E-01	0.2250	4.301E+12
Co-60	6.3707E-05	454.58	909.16	0.00E+00	2.90E-02	5.79E-02	0.3750	1.861E+12
Cs-134	1.4042E-05	454.58	909.16	0.00E+00	6.38E-03	1.28E-02	0.5750	4.015E+13
Cs-135	1.0066E-05	454.58	909.16	0.00E+00	4.58E-03	9.15E-03	0.8500	4.079E+11
Cs-137	1.1945E+00	454.58	909.16	0.00E+00	5.43E+02	1.09E+03	1.2500	2.225E+11
Eu-154	6.6451E-03	454.58	909.16	0.00E+00	3.02E+00	6.04E+00	1.7500	1.128E+10
Eu-155	2.9052E-04	454.58	909.16	0.00E+00	1.32E-01	2.64E-01	2.2500	9.124E+05
Fe-55	2.8807E-06	454.58	909.16	0.00E+00	1.31E-03	2.62E-03	2.7500	2.208E+04
H-3	2.1063E-03	454.58	909.16	0.00E+00	9.57E-01	1.91E+00	3.5000	1.953E+04
I-129	8.6006E-07	454.58	909.16	0.00E+00	3.91E-04	7.82E-04	5.0000	8.247E+03
Kr-85	2.6739E-02	454.58	909.16	0.00E+00	1.22E+01	2.43E+01	7.0000	9.352E+02
Np-237	8.5589E-06	454.58	909.16	0.00E+00	3.89E-03	7.78E-03	11.0000	1.066E+02
Pa-231	1.2500E-09	454.58	909.16	0.00E+00	5.68E-07	1.14E-06		
Pb-210	2.3017E-11	454.58	909.16	0.00E+00	1.05E-08	2.09E-08		
Pm-147	5.9856E-04	454.58	909.16	0.00E+00	2.72E-01	5.44E-01		
Pu-238	2.0029E-02	454.58	909.16	0.00E+00	9.10E+00	1.82E+01		
Pu-239	2.8836E-02	454.58	909.16	0.00E+00	1.31E+01	2.62E+01		
Pu-240	2.2802E-02	454.58	909.16	0.00E+00	1.04E+01	2.07E+01		
Pu-241	6.1020E-01	454.58	909.16	0.00E+00	2.77E+02	5.55E+02		
Pu-242	1.4526E-05	454.58	909.16	0.00E+00	6.60E-03	1.32E-02		
Ra-226	9.7701E-11	454.58	909.16	0.00E+00	4.44E-08	8.88E-08		
Ra-228	1.1068E-14	454.58	909.16	0.00E+00	5.03E-12	1.01E-11		
Ru-106	5.9224E-10	454.58	909.16	0.00E+00	2.69E-07	5.38E-07		
Se-79	1.0899E-05	454.58	909.16	0.00E+00	4.95E-03	9.91E-03		
Sn-126	0.0000E+00	454.58	909.16	0.00E+00	0.00E+00	0.00E+00		
Sr-90	8.4899E-01	454.58	909.16	0.00E+00	3.86E+02	7.72E+02		
Tc-99	3.6494E-04	454.58	909.16	0.00E+00	1.66E-01	3.32E-01		
Th-229	1.2928E-12	454.58	909.16	0.00E+00	5.88E-10	1.18E-09		
Th-230	1.6293E-08	454.58	909.16	0.00E+00	7.41E-06	1.48E-05		
Th-232	1.6451E-14	454.58	909.16	0.00E+00	7.48E-12	1.50E-11		
Ti-208	3.4382E-15	454.58	909.16	0.00E+00	1.56E-12	3.13E-12		
U-232	0.0000E+00	454.58	909.16	0.00E+00	0.00E+00	0.00E+00		
U-233	9.9425E-10	454.58	909.16	0.00E+00	4.52E-07	9.04E-07		
U-234	6.5575E-05	454.58	909.16	0.00E+00	2.98E-02	5.96E-02		
U-235	-1.2944E-06	454.58	0.00	1.10E-02	1.04E-02	1.10E-02		
U-236	1.1951E-05	454.58	909.16	0.00E+00	5.43E-03	1.09E-02		
U-238	-3.0619E-07	454.58	0.00	1.35E-01	1.35E-01	1.35E-01		
Y-90	8.4928E-01	454.58	909.16	0.00E+00	3.86E+02	7.72E+02		
Other Radionuclides					5.21E+02	1.04E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	GRAPHITE	GRAPHITE	This Template was used for the following reasons:
Fuel Cladding	ALUM	ZIRC	This fuel matches on all parameters except cladding.
BOL HM Constituents	U		
BOL Enrichment %	1.252	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal	407.44	454.58	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		909.16	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.19	1.12	1.00
Bounding	0.37		

\* Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup> Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SP-100 FUEL  
SNF ID #: 777  
Fuel Units & Descr 2 - SCRAP  
Heavy Metal Mass BOL=2 711kg EOL=2 628kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1992  
Estimates as of 2010  
Template FERMI (Fast Zirc 10 to 40% U)  
<sup>2</sup>Template Burnup(MWd) 58 6725048  
Template BOL Heavy Metal Mass (MT) 0 018774  
Template Decay Time 15 years

Estimated  
Canister usage  
HIC  
2 00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.1509E-08	73.37	146.73	0.00E+00	1.58E-06	3.16E-06	Avg MeV	
Am-241	4.6529E-07	73.37	146.73	0.00E+00	3.41E-05	6.83E-05	0.0150	1.573E+13
Am-242m	0.0000E+00	73.37	146.73	0.00E+00	0.00E+00	0.00E+00	0.0250	3.335E+12
Am-243	8.3923E-15	73.37	146.73	0.00E+00	6.16E-13	1.23E-12	0.0375	2.899E+12
C-14	2.1765E-05	73.37	146.73	0.00E+00	1.60E-03	3.19E-03	0.0575	3.044E+12
Cl-36	5.5188E-08	73.37	146.73	0.00E+00	4.05E-06	8.10E-06	0.0850	1.871E+12
Cm-243	2.5208E-14	73.37	146.73	0.00E+00	1.85E-12	3.70E-12	0.1250	1.209E+12
Cm-244	1.1259E-15	73.37	146.73	0.00E+00	8.26E-14	1.65E-13	0.2250	1.579E+12
Co-60	2.9094E-02	73.37	146.73	0.00E+00	2.13E+00	4.27E+00	0.3750	7.230E+11
Cs-134	5.1932E-04	73.37	146.73	0.00E+00	3.81E-02	7.62E-02	0.5750	1.199E+13
Cs-135	4.4996E-05	73.37	146.73	0.00E+00	3.30E-03	6.60E-03	0.8500	1.157E+11
Cs-137	2.1867E+00	73.37	146.73	0.00E+00	1.60E+02	3.21E+02	1.2500	3.554E+11
Eu-154	9.2837E-04	73.37	146.73	0.00E+00	6.81E-02	1.36E-01	1.7500	2.942E+09
Eu-155	2.3180E-02	73.37	146.73	0.00E+00	1.70E+00	3.40E+00	2.2500	8.416E+06
Fe-55	2.9332E-03	73.37	146.73	0.00E+00	2.15E-01	4.30E-01	2.7500	3.845E+05
H-3	1.0871E-02	73.37	146.73	0.00E+00	7.98E-01	1.60E+00	3.5000	4.439E+04
I-129	1.1426E-06	73.37	146.73	0.00E+00	8.38E-05	1.68E-04	5.0000	9.910E+00
Kr-85	1.4068E-01	73.37	146.73	0.00E+00	1.03E+01	2.06E+01	7.0000	8.573E-01
Np-237	3.3099E-06	73.37	146.73	0.00E+00	2.43E-04	4.86E-04	11.0000	7.972E-02
Pa-231	7.8640E-08	73.37	146.73	0.00E+00	5.77E-06	1.15E-05		
Pb-210	7.4277E-13	73.37	146.73	0.00E+00	5.45E-11	1.09E-10		
Pm-147	2.2856E-01	73.37	146.73	0.00E+00	1.68E+01	3.35E+01		
Pu-238	2.0095E-04	73.37	146.73	0.00E+00	1.47E-02	2.95E-02		
Pu-239	1.9481E-02	73.37	146.73	0.00E+00	1.43E+00	2.86E+00		
Pu-240	6.8056E-05	73.37	146.73	0.00E+00	4.99E-03	9.99E-03		
Pu-241	1.0939E-05	73.37	146.73	0.00E+00	8.03E-04	1.61E-03		
Pu-242	4.3751E-13	73.37	146.73	0.00E+00	3.21E-11	6.42E-11		
Ra-226	4.0428E-12	73.37	146.73	0.00E+00	2.97E-10	5.93E-10		
Ra-228	2.1032E-11	73.37	146.73	0.00E+00	1.54E-09	3.09E-09		
Ru-106	2.9077E-04	73.37	146.73	0.00E+00	2.13E-02	4.27E-02		
Se-79	1.6492E-05	73.37	146.73	0.00E+00	1.21E-03	2.42E-03		
Sn-126	3.7564E-05	73.37	146.73	0.00E+00	2.76E-03	5.51E-03		
Sr-90	1.9396E+00	73.37	146.73	0.00E+00	1.42E+02	2.85E+02		
Tc-99	4.4842E-04	73.37	146.73	0.00E+00	3.29E-02	6.58E-02		
Th-229	1.8544E-11	73.37	146.73	0.00E+00	1.36E-09	2.72E-09		
Th-230	9.0605E-10	73.37	146.73	0.00E+00	6.65E-08	1.33E-07		
Th-232	2.3674E-11	73.37	146.73	0.00E+00	1.74E-09	3.47E-09		
Ti-208	7.0323E-09	73.37	146.73	0.00E+00	5.16E-07	1.03E-06		
U-232	1.9106E-08	73.37	146.73	0.00E+00	1.40E-06	2.80E-06		
U-233	9.6774E-09	73.37	146.73	0.00E+00	7.10E-07	1.42E-06		
U-234	4.8796E-06	73.37	146.73	0.00E+00	3.58E-04	7.16E-04		
U-235	-2.3191E-06	73.37	0.00	1.05E-03	8.84E-04	1.05E-03		
U-236	1.2633E-05	73.37	146.73	0.00E+00	9.27E-04	1.85E-03		
U-238	-9.5407E-08	73.37	0.00	7.47E-04	7.40E-04	7.47E-04		
Y-90	1.9396E+00	73.37	146.73	0.00E+00	1.42E+02	2.85E+02		
Other Radionuclides					1.59E+02	3.19E+02		

Other Radionuclides

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	UNKNOWN	ZIRC	This template is a good approximation since it is a FAST Uranium fuel
BOL HM Constituents	U	U	
BOL Enrichment %	18	10 to 40	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		73.37	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		146.73	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	8.66		1.01
Bounding	17.32		

\*Reactor shutdown core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA 8 5/20 FFCR (DORF)  
SNF ID #: 315  
Fuel Units & Descr. 2 - ELEMENT  
Heavy Metal Mass BOL=0.384kg EOL=0.383kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date: 1989  
Estimates as of: 2010  
Template: TRIGA-SS (LW/U-Zrx, SST, 10 to 20% U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
Template BOL Heavy Metal Mass (MT): 0.000195  
Template Decay Time: 20 years

Estimated  
Canister usage.  
18"x10"  
0.03

## II. Estimates

	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.6436E-09	3.74	7.48	0.00E+00	9.89E-09	1.98E-08	Avg MeV	
Am-241	3.1429E-03	3.74	7.48	0.00E+00	1.18E-02	2.35E-02	0.0150	7.501E+11
Am-242m	1.3195E-06	3.74	7.48	0.00E+00	4.94E-06	9.88E-06	0.0250	1.561E+11
Am-243	1.4753E-07	3.74	7.48	0.00E+00	5.52E-07	1.10E-06	0.0375	1.353E+11
C-14	1.2847E-04	3.74	7.48	0.00E+00	4.81E-04	9.62E-04	0.0575	1.455E+11
Cl-36	2.8120E-06	3.74	7.48	0.00E+00	1.05E-05	2.10E-05	0.0850	8.785E+10
Cm-243	1.2465E-07	3.74	7.48	0.00E+00	4.66E-07	9.33E-07	0.1250	5.742E+10
Cm-244	9.5564E-07	3.74	7.48	0.00E+00	3.58E-06	7.15E-06	0.2250	7.543E+10
Co-60	1.7880E-01	3.74	7.48	0.00E+00	6.69E-01	1.34E+00	0.3750	3.306E+10
Cs-134	5.8692E-04	3.74	7.48	0.00E+00	2.20E-03	4.39E-03	0.5750	5.437E+11
Cs-135	3.2195E-05	3.74	7.48	0.00E+00	1.20E-04	2.41E-04	0.8500	6.129E+09
Cs-137	1.9489E+00	3.74	7.48	0.00E+00	7.29E+00	1.46E+01	1.2500	1.018E+11
Eu-154	4.5895E-03	3.74	7.48	0.00E+00	1.72E-02	3.44E-02	1.7500	1.575E+08
Eu-155	3.6045E-03	3.74	7.48	0.00E+00	1.35E-02	2.70E-02	2.2500	5.424E+05
Fe-55	1.4185E-02	3.74	7.48	0.00E+00	5.31E-02	1.06E-01	2.7500	5.976E+03
H-3	4.7895E-03	3.74	7.48	0.00E+00	1.79E-02	3.58E-02	3.5000	3.360E+01
I-129	7.3684E-07	3.74	7.48	0.00E+00	2.76E-06	5.52E-06	5.0000	4.128E+00
Kr-85	9.5820E-02	3.74	7.48	0.00E+00	3.59E-01	7.17E-01	7.0000	4.667E-01
Np-237	1.2552E-06	3.74	7.48	0.00E+00	4.70E-06	9.39E-06	11.0000	5.312E-02
Pa-231	7.0406E-09	3.74	7.48	0.00E+00	2.63E-08	5.27E-08		
Pb-210	5.8000E-14	3.74	7.48	0.00E+00	2.17E-13	4.34E-13		
Pm-147	4.0075E-02	3.74	7.48	0.00E+00	1.50E-01	3.00E-01		
Pu-238	9.2256E-04	3.74	7.48	0.00E+00	3.45E-03	6.91E-03		
Pu-239	5.5278E-03	3.74	7.48	0.00E+00	2.07E-02	4.14E-02		
Pu-240	2.1248E-03	3.74	7.48	0.00E+00	7.95E-03	1.59E-02		
Pu-241	4.9549E-02	3.74	7.48	0.00E+00	1.85E-01	3.71E-01		
Pu-242	2.3128E-07	3.74	7.48	0.00E+00	8.66E-07	1.73E-06		
Ra-226	2.4526E-13	3.74	7.48	0.00E+00	9.18E-13	1.84E-12		
Ra-228	2.4015E-10	3.74	7.48	0.00E+00	8.99E-10	1.80E-09		
Ru-106	3.0602E-06	3.74	7.48	0.00E+00	1.15E-05	2.29E-05		
Se-79	1.3015E-05	3.74	7.48	0.00E+00	4.87E-05	9.74E-05		
Sn-126	1.2165E-05	3.74	7.48	0.00E+00	4.55E-05	9.11E-05		
Sr-90	1.8226E+00	3.74	7.48	0.00E+00	6.82E+00	1.36E+01		
Tc-99	4.4241E-04	3.74	7.48	0.00E+00	1.66E-03	3.31E-03		
Th-229	3.0962E-10	3.74	7.48	0.00E+00	1.16E-09	2.32E-09		
Th-230	4.2346E-11	3.74	7.48	0.00E+00	1.58E-10	3.17E-10		
Th-232	2.5278E-10	3.74	7.48	0.00E+00	9.46E-10	1.89E-09		
Ti-208	1.5820E-08	3.74	7.48	0.00E+00	5.92E-08	1.18E-07		
U-232	4.2647E-08	3.74	7.48	0.00E+00	1.60E-07	3.19E-07		
U-233	1.2211E-07	3.74	7.48	0.00E+00	4.57E-07	9.14E-07		
U-234	1.9955E-07	3.74	7.48	0.00E+00	7.47E-07	1.49E-06		
U-235	-2.6194E-06	3.74	0.00	1.64E-04	1.54E-04	1.64E-04		
U-236	1.2693E-05	3.74	7.48	0.00E+00	4.75E-05	9.50E-05		
U-238	-3.6331E-08	3.74	0.00	1.04E-04	1.03E-04	1.04E-04		
Y-90	1.8241E+00	3.74	7.48	0.00E+00	6.83E+00	1.37E+01		
Other Radionuclides					7.21E+00	1.44E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9.36E-02	1.87E-01
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	SST	SST
BOL HM Constituents	U	U
BOL Enrichment %	19.792	10 to 20.1

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	3.74	1.15
Bounding		7.48

Basis for burnup used in estimate:

Nominal burnup taken directly from SFD (converted to MWd)  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.29	0.31
Bounding	0.57	

Estimated EOL HM/Given EOL HM

0.99

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA STD (ALUM) HANFORD  
SNF ID # 314  
Fuel Units & Descr: 66 - ELEMENT  
Heavy Metal Mass: BOL=12.342kg EOL=12.203kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1987  
Estimates as of 2010  
Template TRIGA-AI (LW/U Zrx Alum 10 to 20% U)  
<sup>2</sup>Template Burnup(MWd) 6.65  
Template BOL Heavy Metal Mass (MT) 0.00018  
Template Decay Time 20 years

Estimated  
Canister usage  
18"x10"  
0.59

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	2.4556E-09	421.00	842.00	0.00E+00	1.03E-06	2.07E-06	0.0150	8.641E+13
Am-241	3.8752E-03	421.00	842.00	0.00E+00	1.63E+00	3.26E+00	0.0250	1.784E+13
Am-242m	1.8617E-06	421.00	842.00	0.00E+00	7.84E-04	1.57E-03	0.0375	1.868E+13
Am-243	2.3293E-07	421.00	842.00	0.00E+00	9.81E-05	1.96E-04	0.0575	1.726E+13
C-14	4.3233E-05	421.00	842.00	0.00E+00	1.82E-02	3.64E-02	0.0850	1.051E+13
Cl-36	4.3023E-08	421.00	842.00	0.00E+00	1.81E-05	3.62E-05	0.1250	1.180E+13
Cr-243	1.9053E-07	421.00	842.00	0.00E+00	8.02E-05	1.60E-04	0.2250	9.524E+12
Cr-244	1.7744E-06	421.00	842.00	0.00E+00	7.47E-04	1.49E-03	0.3750	3.914E+12
Co-60	4.3188E-03	421.00	842.00	0.00E+00	1.82E+00	3.64E+00	0.5750	6.235E+13
Cs-134	6.7188E-04	421.00	842.00	0.00E+00	2.83E-01	5.66E-01	0.8500	6.634E+12
Cs-135	3.1549E-05	421.00	842.00	0.00E+00	1.33E-02	2.66E-02	1.2500	7.146E+12
Cs-137	1.9489E+00	421.00	842.00	0.00E+00	8.20E+02	1.64E+03	1.7500	2.141E+11
Eu-154	4.0301E-01	421.00	842.00	0.00E+00	1.70E+02	3.39E+02	2.2500	3.393E+06
Eu-155	5.4000E-02	421.00	842.00	0.00E+00	2.27E+01	4.55E+01	2.7500	5.647E+05
Fe-55	1.5955E-04	421.00	842.00	0.00E+00	6.72E-02	1.34E-01	3.5000	3.881E+03
H-3	4.6571E-03	421.00	842.00	0.00E+00	1.96E+00	3.92E+00	5.0000	4.809E+02
I-129	7.3805E-07	421.00	842.00	0.00E+00	3.11E-04	6.21E-04	7.0000	5.430E+01
Kr-85	9.5684E-02	421.00	842.00	0.00E+00	4.03E+01	8.06E+01	11.0000	6.176E+00
Np-237	1.4618E-06	421.00	842.00	0.00E+00	6.15E-04	1.23E-03		
Pa-231	6.4782E-09	421.00	842.00	0.00E+00	2.73E-06	5.45E-06		
Pb-210	6.3158E-14	421.00	842.00	0.00E+00	2.66E-11	5.32E-11		
Pm-147	3.9564E-02	421.00	842.00	0.00E+00	1.67E+01	3.33E+01		
Pu-238	1.2008E-03	421.00	842.00	0.00E+00	5.06E-01	1.01E+00		
Pu-239	5.6917E-03	421.00	842.00	0.00E+00	2.40E+00	4.79E+00		
Pu-240	2.2617E-03	421.00	842.00	0.00E+00	9.52E-01	1.90E+00		
Pu-241	6.1113E-02	421.00	842.00	0.00E+00	2.57E+01	5.15E+01		
Pu-242	3.0602E-07	421.00	842.00	0.00E+00	1.29E-04	2.58E-04		
Ra-226	2.6707E-13	421.00	842.00	0.00E+00	1.12E-10	2.25E-10		
Ra-228	2.2556E-10	421.00	842.00	0.00E+00	9.50E-08	1.90E-07		
Ru-106	3.1293E-06	421.00	842.00	0.00E+00	1.32E-03	2.63E-03		
Se-79	1.2935E-05	421.00	842.00	0.00E+00	5.45E-03	1.09E-02		
Sn-126	1.2238E-05	421.00	842.00	0.00E+00	5.15E-03	1.03E-02		
Sr-90	1.8195E+00	421.00	842.00	0.00E+00	7.66E+02	1.53E+03		
Tc-99	4.4120E-04	421.00	842.00	0.00E+00	1.86E-01	3.71E-01		
Th-229	3.3308E-10	421.00	842.00	0.00E+00	1.40E-07	2.80E-07		
Th-230	4.6526E-11	421.00	842.00	0.00E+00	1.96E-08	3.92E-08		
Th-232	2.3744E-10	421.00	842.00	0.00E+00	1.00E-07	2.00E-07		
Ti-208	1.8195E-08	421.00	842.00	0.00E+00	7.66E-06	1.53E-05		
U-232	4.9098E-08	421.00	842.00	0.00E+00	2.07E-05	4.13E-05		
U-233	1.3140E-07	421.00	842.00	0.00E+00	5.53E-05	1.11E-04		
U-234	2.2571E-07	421.00	842.00	0.00E+00	9.50E-05	1.90E-04		
U-235	-2.6159E-06	421.00	0.00	5.28E-03	4.18E-03	5.28E-03		
U-236	1.2719E-05	421.00	842.00	0.00E+00	5.35E-03	1.07E-02		
U-238	-3.8857E-08	421.00	0.00	3.33E-03	3.31E-03	3.33E-03		
Y-90	1.8211E+00	421.00	842.00	0.00E+00	7.67E+02	1.53E+03		
Other Radionuclides					8.82E+02	1.76E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

Reactor Moderator	From SFD	Used	Basis for Parameter Differences
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
	Fuel Cladding	ALUM	
	BOL HM Constituents	U	
BOL Enrichment %	19.786	10 to 20.1	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
	Nominal	421.00	
Bounding		132.30	Nominal burnup taken directly from SFD (converted to MWd)
		842.00	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	Nominal	0.92	
Bounding	1.85	0.31	0.98

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA STD 8.5/20

SNF ID #: 233

Fuel Units & Descr: 90 - ELEMENT

Heavy Metal Mass: BOL=17.55kg, EOL=17.19kg

ROD Storage Site: HANFORD

<sup>1</sup>Fuel decay start date: 1989

Estimates as of: 2010

Template: TRIGA SS (LW/U Zrx SST, 10 to 20%, U)

<sup>2</sup>Template Burnup(MWd): 6.65

Template BOL Heavy Metal Mass (MT): 0.000195

Template Decay Time: 20 years

Estimated

Canister usage

18"x10"

0.81

## II. Estimates

	m	x <sub>m</sub>	x <sub>b</sub>	b	y <sub>m</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.6436E-09	343.66	687.32	0.00E+00	9.08E-07	1.82E-06	Avg. MeV	
Am-241	3.1429E-03	343.66	687.32	0.00E+00	1.08E+00	2.16E+00	0.0150	6.888E+13
Am-242m	1.3195E-06	343.66	687.32	0.00E+00	4.53E-04	9.07E-04	0.0250	1.434E+13
Am-243	1.4753E-07	343.66	687.32	0.00E+00	5.07E-05	1.01E-04	0.0375	1.242E+13
C-14	1.2847E-04	343.66	687.32	0.00E+00	4.41E-02	8.83E-02	0.0575	1.336E+13
Cl-36	2.8120E-06	343.66	687.32	0.00E+00	9.66E-04	1.93E-03	0.0850	8.067E+12
Cm-243	1.2465E-07	343.66	687.32	0.00E+00	4.28E-05	8.57E-05	0.1250	5.272E+12
Cm-244	9.5564E-07	343.66	687.32	0.00E+00	3.28E-04	6.57E-04	0.2250	6.927E+12
Co-60	1.7880E-01	343.66	687.32	0.00E+00	6.14E+01	1.23E+02	0.3750	3.036E+12
Cs-134	5.8692E-04	343.66	687.32	0.00E+00	2.02E-01	4.03E-01	0.5750	4.993E+13
Cs-135	3.2195E-05	343.66	687.32	0.00E+00	1.11E-02	2.21E-02	0.8500	5.628E+11
Cs-137	1.9489E+00	343.66	687.32	0.00E+00	6.70E+02	1.34E+03	1.2500	9.326E+12
Eu-154	4.5895E-03	343.66	687.32	0.00E+00	1.58E+00	3.15E+00	1.7500	1.446E+10
Eu-155	3.6045E-03	343.66	687.32	0.00E+00	1.24E+00	2.48E+00	2.2500	4.980E+07
Fe-55	1.4185E-02	343.66	687.32	0.00E+00	4.87E+00	9.75E+00	2.7500	5.487E+05
H-3	4.7895E-03	343.66	687.32	0.00E+00	1.65E+00	3.29E+00	3.5000	3.059E+03
I-129	7.3684E-07	343.66	687.32	0.00E+00	2.53E-04	5.06E-04	5.0000	3.680E+02
Kr-85	9.5820E-02	343.66	687.32	0.00E+00	3.29E+01	6.59E+01	7.0000	4.158E+01
Np-237	1.2552E-06	343.66	687.32	0.00E+00	4.31E-04	8.63E-04	11.0000	4.732E+00
Pa-231	7.0406E-09	343.66	687.32	0.00E+00	2.42E-06	4.84E-06		
Pb-210	5.8000E-14	343.66	687.32	0.00E+00	1.99E-11	3.99E-11		
Pm-147	4.0075E-02	343.66	687.32	0.00E+00	1.38E+01	2.75E+01		
Pu-238	9.2256E-04	343.66	687.32	0.00E+00	3.17E-01	6.34E-01		
Pu-239	5.5278E-03	343.66	687.32	0.00E+00	1.90E+00	3.80E+00		
Pu-240	2.1248E-03	343.66	687.32	0.00E+00	7.30E-01	1.46E+00		
Pu-241	4.9549E-02	343.66	687.32	0.00E+00	1.70E+01	3.41E+01		
Pu-242	2.3128E-07	343.66	687.32	0.00E+00	7.95E-05	1.59E-04		
Ra-226	2.4526E-13	343.66	687.32	0.00E+00	8.43E-11	1.69E-10		
Ra-228	2.4015E-10	343.66	687.32	0.00E+00	8.25E-08	1.65E-07		
Ru-106	3.0602E-06	343.66	687.32	0.00E+00	1.05E-03	2.10E-03		
Se-79	1.3015E-05	343.66	687.32	0.00E+00	4.47E-03	8.95E-03		
Sn-126	1.2165E-05	343.66	687.32	0.00E+00	4.18E-03	8.36E-03		
Sr-90	1.8226E+00	343.66	687.32	0.00E+00	6.26E+02	1.25E+03		
Tc-99	4.4241E-04	343.66	687.32	0.00E+00	1.52E-01	3.04E-01		
Th-229	3.0962E-10	343.66	687.32	0.00E+00	1.06E-07	2.13E-07		
Th-230	4.2346E-11	343.66	687.32	0.00E+00	1.46E-08	2.91E-08		
Th-232	2.5278E-10	343.66	687.32	0.00E+00	8.69E-08	1.74E-07		
Ti-208	1.5820E-08	343.66	687.32	0.00E+00	5.44E-06	1.09E-05		
U-232	4.2647E-08	343.66	687.32	0.00E+00	1.47E-05	2.93E-05		
U-233	1.2211E-07	343.66	687.32	0.00E+00	4.20E-05	8.39E-05		
U-234	1.9955E-07	343.66	687.32	0.00E+00	6.86E-05	1.37E-04		
U-235	-2.6194E-06	343.66	0.00	7.59E-03	6.68E-03	7.59E-03		
U-236	1.2693E-05	343.66	687.32	0.00E+00	4.36E-03	8.72E-03		
U-238	-3.6331E-08	343.66	0.00	4.72E-03	4.71E-03	4.72E-03		
Y-90	1.8241E+00	343.66	687.32	0.00E+00	6.27E+02	1.25E+03		
Other Radionuclides					6.62E+02	1.32E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator:	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	SST	SST
BOL HM Constituents	U	U
BOL Enrichment %	20.0000115	10 to 20.1

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated
Nominal	256.56	343.66
Bounding		687.32

Basis for burnup used in estimate:

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.57	1.34
Bounding	1.15	

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA STD 8 5/20 (HANFORD)  
SNF ID # 316  
Fuel Units & Descr 33 - ELEMENT  
Heavy Metal Mass BOL=6.336kg EOL=6.316kg  
ROD Storage Site HANFORD

<sup>1</sup>Fuel decay start date 1989  
Estimates as of 2010  
Template TRIGA-SS (LW/U Zrx SST 10 to 20% U)  
<sup>2</sup>Template Burnup(MWd) 6.65  
Template BOL Heavy Metal Mass (MT) 0.000195  
Template Decay Time 20 years

Estimated  
Canister usage  
18"x10"  
0.30

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.6436E-09	30.88	61.75	0.00E+00	8.16E-08	1.63E-07	Avg MeV	
Am-241	3.1429E-03	30.88	61.75	0.00E+00	9.70E-02	1.94E-01	0.0150	6.188E+12
Am-242m	1.3195E-06	30.88	61.75	0.00E+00	4.07E-05	8.15E-05	0.0250	1.288E+12
Am-243	1.4753E-07	30.88	61.75	0.00E+00	4.56E-06	9.11E-06	0.0375	1.116E+12
C-14	1.2847E-04	30.88	61.75	0.00E+00	3.97E-03	7.93E-03	0.0575	1.201E+12
Cl-36	2.8120E-06	30.88	61.75	0.00E+00	8.68E-05	1.74E-04	0.0850	7.248E+11
Cm-243	1.2465E-07	30.88	61.75	0.00E+00	3.85E-06	7.70E-06	0.1250	4.737E+11
Cm-244	9.5564E-07	30.88	61.75	0.00E+00	2.95E-05	5.90E-05	0.2250	6.223E+11
Co-60	1.7880E-01	30.88	61.75	0.00E+00	5.52E+00	1.10E+01	0.3750	2.728E+11
Cs-134	5.8692E-04	30.88	61.75	0.00E+00	1.81E-02	3.62E-02	0.5750	4.486E+12
Cs-135	3.2195E-05	30.88	61.75	0.00E+00	9.94E-04	1.99E-03	0.8500	5.056E+10
Cs-137	1.9489E+00	30.88	61.75	0.00E+00	6.02E+01	1.20E+02	1.2500	8.379E+11
Eu-154	4.5895E-03	30.88	61.75	0.00E+00	1.42E-01	2.83E-01	1.7500	1.299E+09
Eu-155	3.6045E-03	30.88	61.75	0.00E+00	1.11E-01	2.23E-01	2.2500	4.474E+06
Fe-55	1.4185E-02	30.88	61.75	0.00E+00	4.38E-01	8.76E-01	2.7500	4.931E+04
H-3	4.7895E-03	30.88	61.75	0.00E+00	1.48E-01	2.96E-01	3.5000	2.818E+02
I-129	7.3684E-07	30.88	61.75	0.00E+00	2.28E-05	4.55E-05	5.0000	3.602E+01
Kr-85	9.5820E-02	30.88	61.75	0.00E+00	2.96E+00	5.92E+00	7.0000	4.077E+00
Np-237	1.2552E-06	30.88	61.75	0.00E+00	3.88E-05	7.75E-05	11.0000	4.643E-01
Pa-231	7.0406E-09	30.88	61.75	0.00E+00	2.17E-07	4.35E-07		
Pb-210	5.8000E-14	30.88	61.75	0.00E+00	1.79E-12	3.58E-12		
Pm-147	4.0075E-02	30.88	61.75	0.00E+00	1.24E+00	2.47E+00		
Pu-238	9.2256E-04	30.88	61.75	0.00E+00	2.85E-02	5.70E-02		
Pu-239	5.5278E-03	30.88	61.75	0.00E+00	1.71E-01	3.41E-01		
Pu-240	2.1248E-03	30.88	61.75	0.00E+00	6.56E-02	1.31E-01		
Pu-241	4.9549E-02	30.88	61.75	0.00E+00	1.53E+00	3.06E+00		
Pu-242	2.3128E-07	30.88	61.75	0.00E+00	7.14E-06	1.43E-05		
Ra-226	2.4526E-13	30.88	61.75	0.00E+00	7.57E-12	1.51E-11		
Ra-228	2.4015E-10	30.88	61.75	0.00E+00	7.41E-09	1.48E-08		
Ru-106	3.0602E-06	30.88	61.75	0.00E+00	9.45E-05	1.89E-04		
Se-79	1.3015E-05	30.88	61.75	0.00E+00	4.02E-04	8.04E-04		
Sn-126	1.2165E-05	30.88	61.75	0.00E+00	3.76E-04	7.51E-04		
Sr-90	1.8226E+00	30.88	61.75	0.00E+00	5.63E+01	1.13E+02		
Tc-99	4.4241E-04	30.88	61.75	0.00E+00	1.37E-02	2.73E-02		
Th-229	3.0962E-10	30.88	61.75	0.00E+00	9.56E-09	1.91E-08		
Th-230	4.2346E-11	30.88	61.75	0.00E+00	1.31E-09	2.61E-09		
Th-232	2.5278E-10	30.88	61.75	0.00E+00	7.80E-09	1.56E-08		
Tl-208	1.5820E-08	30.88	61.75	0.00E+00	4.88E-07	9.77E-07		
U-232	4.2647E-08	30.88	61.75	0.00E+00	1.32E-06	2.63E-06		
U-233	1.2211E-07	30.88	61.75	0.00E+00	3.77E-06	7.54E-06		
U-234	1.9955E-07	30.88	61.75	0.00E+00	6.16E-06	1.23E-05		
U-235	-2.6194E-06	30.88	0.00	2.72E-03	2.64E-03	2.72E-03		
U-236	1.2693E-05	30.88	61.75	0.00E+00	3.92E-04	7.84E-04		
U-238	-3.6331E-08	30.88	0.00	1.71E-03	1.70E-03	1.71E-03		
Y-90	1.8241E+00	30.88	61.75	0.00E+00	5.63E+01	1.13E+02		
Other Radionuclides					5.95E+01	1.19E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.73E-01	1.54E+00
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	SST	SST
BOL HM Constituents	U	U
BOL Enrichment %	19.896	10 to 20.1

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	30.88	18.90
Bounding		61.75

Basis for burnup used in estimate:

Nominal burnup taken directly from SFD (converted to MWd)  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.14	0.61
Bounding	0.29	

Estimated EOL HM/ Given EOL HM  
1.00

<sup>1</sup>Reactor shutdown core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ACRR (PULSED CORE)  
SNF ID # 757  
Fuel Units & Descr 251 - ELEMENT  
Heavy Metal Mass BOL=120 831kg EOL=120 831kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 2035  
Estimates as of: 2010  
Template: Pathfinder (Light Water, SST 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 6 01  
Template BOL Heavy Metal Mass (MT): 0 00012882  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
2 26

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 9667E-09	2,282.86	4,565.72	0 00E+00	4 49E-06	8 98E-06	Avg. MeV	
Am-241	4 9468E-05	2,282.86	4,565.72	0 00E+00	1 13E-01	2 26E-01	0 0150	8 978E+14
Am-242m	9 7537E-09	2,282.86	4,565.72	0 00E+00	2 23E-05	4 45E-05	0 0250	1 915E+14
Am-243	9 8802E-10	2,282.86	4,565.72	0 00E+00	2 26E-06	4 51E-06	0 0375	1 709E+14
C-14	2 3095E-04	2,282.86	4,565.72	0 00E+00	5 27E-01	1 05E+00	0 0575	1 718E+14
Cl-36	1 2261E-06	2,282.86	4,565.72	0 00E+00	2 80E-03	5 60E-03	0 0850	1 089E+14
Cm-243	5 1581E-10	2,282.86	4,565.72	0 00E+00	1 18E-06	2 36E-06	0 1250	8 686E+13
Cm-244	7 3012E-09	2,282.86	4,565.72	0 00E+00	1 67E-05	3 33E-05	0 2250	9 015E+13
Co-60	3 6556E+00	2,282.86	4,565.72	0 00E+00	8 35E+03	1 67E+04	0 3750	4 376E+13
Cs-134	7 2063E-02	2,282.86	4,565.72	0 00E+00	1 65E+02	3 29E+02	0 5750	5 305E+14
Cs-135	3 0316E-05	2,282.86	4,565.72	0 00E+00	6 92E-02	1 38E-01	0 8500	2 569E+13
Cs-137	2 9002E+00	2,282.86	4,565.72	0 00E+00	6 62E+03	1 32E+04	1 2500	1 240E+15
Eu-154	7 5025E-03	2,282.86	4,565.72	0 00E+00	1 71E+01	3 43E+01	1 7500	4 378E+11
Eu-155	4 6123E-02	2,282.86	4,565.72	0 00E+00	1 05E+02	2 11E+02	2 2500	1 253E+12
Fe-55	3 6439E+00	2,282.86	4,565.72	0 00E+00	8 32E+03	1 66E+04	2 7500	7 109E+09
H-3	1 3524E-02	2,282.86	4,565.72	0 00E+00	3 09E+01	6 17E+01	3 5000	7 847E+08
I-129	7 3195E-07	2,282.86	4,565.72	0 00E+00	1 67E-03	3 34E-03	5 0000	1 891E+02
Kr-85	2 8686E-01	2,282.86	4,565.72	0 00E+00	6 55E+02	1 31E+03	7 0000	2 123E+01
Np-237	1 1478E-06	2,282.86	4,565.72	0 00E+00	2 62E-03	5 24E-03	11 0000	2 406E+00
Pa-231	1 0990E-08	2,282.86	4,565.72	0 00E+00	2 51E-05	5 02E-05		
Pb-210	8 0782E-15	2,282.86	4,565.72	0 00E+00	1 84E-11	3 69E-11		
Pm-147	3 2097E+00	2,282.86	4,565.72	0 00E+00	7 33E+03	1 47E+04		
Pu-238	3 7404E-04	2,282.86	4,565.72	0 00E+00	8 54E-01	1 71E+00		
Pu-239	6 6839E-04	2,282.86	4,565.72	0 00E+00	1 53E+00	3 05E+00		
Pu-240	8 7121E-05	2,282.86	4,565.72	0 00E+00	1 99E-01	3 98E-01		
Pu-241	3 0283E-03	2,282.86	4,565.72	0 00E+00	6 91E+00	1 38E+01		
Pu-242	1 9717E-09	2,282.86	4,565.72	0 00E+00	4 50E-06	9 00E-06		
Ra-226	7 3527E-14	2,282.86	4,565.72	0 00E+00	1 68E-10	3 36E-10		
Ra-228	6 0965E-12	2,282.86	4,565.72	0 00E+00	1 39E-08	2 78E-08		
Ru-106	1 6531E-01	2,282.86	4,565.72	0 00E+00	3 77E+02	7 55E+02		
Se-79	1 3228E-05	2,282.86	4,565.72	0 00E+00	3 02E-02	6 04E-02		
Sn-126	1 1494E-05	2,282.86	4,565.72	0 00E+00	2 62E-02	5 25E-02		
Sr-90	2 7854E+00	2,282.86	4,565.72	0 00E+00	6 36E+03	1 27E+04		
Tc-99	4 6656E-04	2,282.86	4,565.72	0 00E+00	1 07E+00	2 13E+00		
Th-229	2 9368E-12	2,282.86	4,565.72	0 00E+00	6 70E-09	1 34E-08		
Th-230	3 2662E-11	2,282.86	4,565.72	0 00E+00	7 46E-08	1 49E-07		
Th-232	8 3045E-12	2,282.86	4,565.72	0 00E+00	1 90E-08	3 79E-08		
Ti-208	2 6722E-08	2,282.86	4,565.72	0 00E+00	6 10E-05	1 22E-04		
U-232	7 7720E-08	2,282.86	4,565.72	0 00E+00	1 77E-04	3 55E-04		
U-233	2 9834E-09	2,282.86	4,565.72	0 00E+00	6 81E-06	1 36E-05		
U-234	3 5275E-07	2,282.86	4,565.72	0 00E+00	8 05E-04	1 61E-03		
U-235	2 7761E-06	2,282.86	0 00	5 51E-02	4 88E-02	5 51E-02		
U-236	1 6190E-05	2,282.86	4,565.72	0 00E+00	3 70E-02	7 39E-02		
U-238	2 8547E-09	2,282.86	0 00	3 20E-02	3 20E-02	3 20E-02		
Y-90	2 7870E+00	2,282.86	4,565.72	0 00E+00	6 36E+03	1 27E+04		
Other Radionuclides					1 20E+04	2 40E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment.
BOL HM Constituents	U	U	
BOL Enrichment %	21 10367543	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		2,282.86	Nominal burnup assumed to be 2% of BOL heavy metal mass.
Bounding		4,565.72	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 40		0 98
Bounding	0 81		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ANP  
SNF ID # 451  
Fuel Units & Descr 9 - CONCENTRIC TUBES  
Heavy Metal Mass BOL=1118kg EOL=1102kg  
ROD Storage Site INEEL

Fuel decay start date 1957  
Estimates as of 2010  
Template Pathfinder (Light Water, SST, 60 to 100% U)  
Template Burnup(MWd) 6.01  
Template BOL Heavy Metal Mass (MT) 0.00012882  
Template Decay Time 50 years

Estimated  
Canister usage  
18"x10"  
0.69

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.4276E-08	15.30	30.61	0.00E+00	5.25E-07	1.05E-06	Avg MeV	
Am-241	1.1458E-04	15.30	30.61	0.00E+00	1.75E-03	3.51E-03	0.0150	1.596E+12
Am-242m	7.9468E-09	15.30	30.61	0.00E+00	1.22E-07	2.43E-07	0.0250	3.317E+11
Am-243	9.8386E-10	15.30	30.61	0.00E+00	1.51E-08	3.01E-08	0.0375	2.875E+11
C-14	2.2978E-04	15.30	30.61	0.00E+00	3.52E-03	7.03E-03	0.0575	3.093E+11
Cl-36	1.2261E-06	15.30	30.61	0.00E+00	1.88E-05	3.75E-05	0.0850	1.868E+11
Cm-243	1.7271E-10	15.30	30.61	0.00E+00	2.64E-09	5.29E-09	0.1250	1.212E+11
Cm-244	1.3058E-09	15.30	30.61	0.00E+00	2.00E-08	4.00E-08	0.2250	1.610E+11
Co-60	9.8636E-03	15.30	30.61	0.00E+00	1.51E-01	3.02E-01	0.3750	7.023E+10
Cs-134	1.9617E-08	15.30	30.61	0.00E+00	3.00E-07	6.00E-07	0.5750	1.169E+12
Cs-135	3.0316E-05	15.30	30.61	0.00E+00	4.64E-04	9.28E-04	0.8500	1.154E+10
Cs-137	1.0263E+00	15.30	30.61	0.00E+00	1.57E+01	3.14E+01	1.2500	2.629E+10
Eu-154	2.0017E-04	15.30	30.61	0.00E+00	3.06E-03	6.13E-03	1.7500	2.972E+08
Eu-155	8.5957E-05	15.30	30.61	0.00E+00	1.32E-03	2.63E-03	2.2500	1.507E+05
Fe-55	2.2646E-05	15.30	30.61	0.00E+00	3.47E-04	6.93E-04	2.7500	2.052E+04
H-3	1.0835E-03	15.30	30.61	0.00E+00	1.66E-02	3.32E-02	3.5000	1.994E+00
I-129	7.3195E-07	15.30	30.61	0.00E+00	1.12E-05	2.24E-05	5.0000	8.245E-01
Kr-85	1.5661E-02	15.30	30.61	0.00E+00	2.40E-01	4.79E-01	7.0000	9.127E-02
Np-237	1.1494E-06	15.30	30.61	0.00E+00	1.76E-05	3.52E-05	11.0000	1.026E-02
Pa-231	5.8070E-08	15.30	30.61	0.00E+00	8.89E-07	1.78E-06		
Pb-210	1.2985E-12	15.30	30.61	0.00E+00	1.99E-11	3.97E-11		
Pm-147	2.2196E-05	15.30	30.61	0.00E+00	3.40E-04	6.79E-04		
Pu-238	2.6223E-04	15.30	30.61	0.00E+00	4.01E-03	8.03E-03		
Pu-239	6.6739E-04	15.30	30.61	0.00E+00	1.02E-02	2.04E-02		
Pu-240	8.6705E-05	15.30	30.61	0.00E+00	1.33E-03	2.65E-03		
Pu-241	3.4759E-04	15.30	30.61	0.00E+00	5.32E-03	1.06E-02		
Pu-242	1.9717E-09	15.30	30.61	0.00E+00	3.02E-08	6.03E-08		
Ra-226	3.0000E-12	15.30	30.61	0.00E+00	4.59E-11	9.18E-11		
Ra-228	8.3328E-12	15.30	30.61	0.00E+00	1.28E-10	2.55E-10		
Ru-106	6.1464E-15	15.30	30.61	0.00E+00	9.41E-14	1.88E-13		
Se-79	1.3221E-05	15.30	30.61	0.00E+00	2.02E-04	4.05E-04		
Sn-126	1.1491E-05	15.30	30.61	0.00E+00	1.76E-04	3.52E-04		
Sr-90	9.5541E-01	15.30	30.61	0.00E+00	1.46E+01	2.92E+01		
Tc-99	4.6656E-04	15.30	30.61	0.00E+00	7.14E-03	1.43E-02		
Th-229	1.9085E-11	15.30	30.61	0.00E+00	2.92E-10	5.84E-10		
Th-230	2.1913E-10	15.30	30.61	0.00E+00	3.35E-09	6.71E-09		
Th-232	8.3478E-12	15.30	30.61	0.00E+00	1.28E-10	2.55E-10		
Th-208	1.8752E-08	15.30	30.61	0.00E+00	2.87E-07	5.74E-07		
U-232	5.0782E-08	15.30	30.61	0.00E+00	7.77E-07	1.55E-06		
U-233	3.2596E-09	15.30	30.61	0.00E+00	4.99E-08	9.98E-08		
U-234	3.9817E-07	15.30	30.61	0.00E+00	6.09E-06	1.22E-05		
U-235	-2.7761E-06	15.30	0.00	2.25E-03	2.21E-03	2.25E-03		
U-236	1.6190E-05	15.30	30.61	0.00E+00	2.48E-04	4.96E-04		
U-238	-2.8547E-09	15.30	0.00	2.55E-05	2.55E-05	2.55E-05		
Y-90	9.5557E-01	15.30	30.61	0.00E+00	1.46E+01	2.92E+01		
Other Radionuclides					1.87E+01	3.73E+01		

Other Radionuclides

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
Fuel Cladding	NICHROME	SST	This fuel matches on all parameters except cladding (SST is conservative)
BOL HM Constituents	U	U	
BOL Enrichment %	93.20218125	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		15.30	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		30.61	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.29		1.00
Bounding	0.59		

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: APPR (AGE-2)  
 SNF ID # 6  
 Fuel Units & Descr 1 - CANISTER OF SCRAP  
 Heavy Metal Mass BOL=0.246kg, EOL=0.216kg  
 ROD Storage Site INEEL  
 Fuel decay start date: 1959  
 Estimates as of 2010  
 Template: Pathfinder (Light Water, SST, 60 to 100% U)  
 Template Burnup(MWd) 6.01  
 Template BOL Heavy Metal Mass (MT) 0.00012882  
 Template Decay Time 50 years

Estimated  
 Canister usage  
 18"x10"  
 0.08

II. Estimates	m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.4276E-08	28.72	57.43	0.00E+00	9.84E-07	1.97E-06	Avg MeV	
Am-241	1.1458E-04	28.72	57.43	0.00E+00	3.29E-03	6.58E-03	0.0150	2.995E+12
Am-242m	7.9468E-09	28.72	57.43	0.00E+00	2.28E-07	4.56E-07	0.0250	6.224E+11
Am-243	9.8386E-10	28.72	57.43	0.00E+00	2.83E-08	5.65E-08	0.0375	5.396E+11
C-14	2.2978E-04	28.72	57.43	0.00E+00	6.60E-03	1.32E-02	0.0575	5.804E+11
Cl-36	1.2261E-06	28.72	57.43	0.00E+00	3.52E-05	7.04E-05	0.0850	3.506E+11
Cm-243	1.7271E-10	28.72	57.43	0.00E+00	4.96E-09	9.92E-09	0.1250	2.274E+11
Cm-244	1.3058E-09	28.72	57.43	0.00E+00	3.75E-08	7.50E-08	0.2250	3.021E+11
Co-60	9.8636E-03	28.72	57.43	0.00E+00	2.83E-01	5.67E-01	0.3750	1.318E+11
Cs-134	1.9617E-08	28.72	57.43	0.00E+00	5.63E-07	1.13E-06	0.5750	2.194E+12
Cs-135	3.0316E-05	28.72	57.43	0.00E+00	8.71E-04	1.74E-03	0.8500	2.166E+10
Cs-137	1.0263E+00	28.72	57.43	0.00E+00	2.95E+01	5.89E+01	1.2500	4.934E+10
Eu-154	2.0017E-04	28.72	57.43	0.00E+00	5.75E-03	1.15E-02	1.7500	5.578E+08
Eu-155	8.5957E-05	28.72	57.43	0.00E+00	2.47E-03	4.94E-03	2.2500	2.827E+05
Fe-55	2.2646E-05	28.72	57.43	0.00E+00	6.50E-04	1.30E-03	2.7500	3.851E+04
H-3	1.0835E-03	28.72	57.43	0.00E+00	3.11E-02	6.22E-02	3.5000	3.391E+00
I-129	7.3195E-07	28.72	57.43	0.00E+00	2.10E-05	4.20E-05	5.0000	1.400E+00
Kr-85	1.5661E-02	28.72	57.43	0.00E+00	4.50E-01	8.99E-01	7.0000	1.547E-01
Np-237	1.1494E-06	28.72	57.43	0.00E+00	3.30E-05	6.60E-05	11.0000	1.736E-02
Pa-231	5.8070E-08	28.72	57.43	0.00E+00	1.67E-06	3.34E-06		
Pb-210	1.2985E-12	28.72	57.43	0.00E+00	3.73E-11	7.46E-11		
Pm-147	2.2196E-05	28.72	57.43	0.00E+00	6.37E-04	1.27E-03		
Pu-238	2.6223E-04	28.72	57.43	0.00E+00	7.53E-03	1.51E-02		
Pu-239	6.6739E-04	28.72	57.43	0.00E+00	1.92E-02	3.83E-02		
Pu-240	8.6705E-05	28.72	57.43	0.00E+00	2.49E-03	4.98E-03		
Pu-241	3.4759E-04	28.72	57.43	0.00E+00	9.98E-03	2.00E-02		
Pu-242	1.9717E-09	28.72	57.43	0.00E+00	5.66E-08	1.13E-07		
Ra-226	3.0000E-12	28.72	57.43	0.00E+00	8.62E-11	1.72E-10		
Ra-228	8.3328E-12	28.72	57.43	0.00E+00	2.39E-10	4.79E-10		
Ru-106	6.1464E-15	28.72	57.43	0.00E+00	1.77E-13	3.53E-13		
Sa-79	1.3221E-05	28.72	57.43	0.00E+00	3.80E-04	7.59E-04		
Sn-126	1.1491E-05	28.72	57.43	0.00E+00	3.30E-04	6.60E-04		
Sr-90	9.5541E-01	28.72	57.43	0.00E+00	2.74E+01	5.49E+01		
Tc-99	4.6656E-04	28.72	57.43	0.00E+00	1.34E-02	2.68E-02		
Th-229	1.9085E-11	28.72	57.43	0.00E+00	5.48E-10	1.10E-09		
Th-230	2.1913E-10	28.72	57.43	0.00E+00	6.29E-09	1.26E-08		
Th-232	8.3478E-12	28.72	57.43	0.00E+00	2.40E-10	4.79E-10		
Ti-208	1.8752E-08	28.72	57.43	0.00E+00	5.39E-07	1.08E-06		
U-232	5.0782E-08	28.72	57.43	0.00E+00	1.46E-06	2.92E-06		
U-233	3.2596E-09	28.72	57.43	0.00E+00	9.36E-08	1.87E-07		
U-234	3.9817E-07	28.72	57.43	0.00E+00	1.14E-05	2.29E-05		
U-235	-2.7761E-06	28.72	0.00	4.95E-04	4.15E-04	4.95E-04		
U-236	1.6190E-05	28.72	57.43	0.00E+00	4.65E-04	9.30E-04		
U-238	-2.8547E-09	28.72	0.00	5.81E-06	5.73E-06	5.81E-06		
Y-90	9.5557E-01	28.72	57.43	0.00E+00	2.74E+01	5.49E+01		
Other Radionuclides					3.50E+01	7.00E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	92.987	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		28.72	
Bounding		57.43	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	2.50		
Bounding	5.00		1.00

<sup>1</sup> Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup> Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ARKANSAS  
SNF ID # 7  
Fuel Units & Descr 3 - SCRAP  
Heavy Metal Mass BOL=12.6kg EOL=11.895kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1986  
Estimates as of 2010  
Template PWR (Light Water, Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 20 years

Estimated  
Canister usage  
18"x10"  
0.17

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	5.0630E-10	670.42	1,340.84	0.00E+00	3.39E-07	6.79E-07	Avg MeV	
Am-241	1.1489E-01	670.42	1,340.84	0.00E+00	7.70E+01	1.54E+02	0.0150	1.026E+14
Am-242m	3.0733E-04	670.42	1,340.84	0.00E+00	2.06E-01	4.12E-01	0.0250	2.089E+13
Am-243	6.2661E-04	670.42	1,340.84	0.00E+00	4.20E-01	8.40E-01	0.0375	2.041E+13
C-14	4.7997E-05	670.42	1,340.84	0.00E+00	3.22E-02	6.44E-02	0.0575	2.144E+13
Cl-36	8.0313E-07	670.42	1,340.84	0.00E+00	5.38E-04	1.08E-03	0.0850	1.175E+13
Cm-243	3.6127E-04	670.42	1,340.84	0.00E+00	2.42E-01	4.84E-01	0.1250	8.898E+12
Cm-244	8.6999E-02	670.42	1,340.84	0.00E+00	5.83E+01	1.17E+02	0.2250	1.007E+13
Co-60	1.8379E-02	670.42	1,340.84	0.00E+00	1.23E+01	2.46E+01	0.3750	4.342E+12
Cs-134	6.2548E-03	670.42	1,340.84	0.00E+00	4.19E+00	8.39E+00	0.5750	9.858E+13
Cs-135	1.4433E-05	670.42	1,340.84	0.00E+00	9.68E-03	1.94E-02	0.8500	2.555E+12
Cs-137	1.9767E+00	670.42	1,340.84	0.00E+00	1.33E+03	2.65E+03	1.2500	3.836E+12
Eu-154	6.7603E-02	670.42	1,340.84	0.00E+00	4.53E+01	9.06E+01	1.7500	7.062E+10
Eu-155	1.4373E-02	670.42	1,340.84	0.00E+00	9.64E+00	1.93E+01	2.2500	1.637E+07
Fe-55	2.3466E-03	670.42	1,340.84	0.00E+00	1.57E+00	3.15E+00	2.7500	1.149E+07
H-3	4.8143E-02	670.42	1,340.84	0.00E+00	3.23E+01	6.46E+01	3.5000	1.701E+06
I-129	9.8288E-07	670.42	1,340.84	0.00E+00	6.59E-04	1.32E-03	5.0000	7.164E+05
Kr-85	7.4386E-02	670.42	1,340.84	0.00E+00	4.99E+01	9.97E+01	7.0000	8.259E+04
Np-237	1.0145E-05	670.42	1,340.84	0.00E+00	6.80E-03	1.36E-02	11.0000	9.488E+03
Pa-231	1.0258E-09	670.42	1,340.84	0.00E+00	6.88E-07	1.38E-06		
Pb-210	1.4163E-11	670.42	1,340.84	0.00E+00	9.50E-09	1.90E-08		
Pm-147	1.9170E-02	670.42	1,340.84	0.00E+00	1.29E+01	2.57E+01		
Pu-238	8.3915E-02	670.42	1,340.84	0.00E+00	5.63E+01	1.13E+02		
Pu-239	1.1628E-02	670.42	1,340.84	0.00E+00	7.80E+00	1.56E+01		
Pu-240	1.5050E-02	670.42	1,340.84	0.00E+00	1.01E+01	2.02E+01		
Pu-241	1.8524E+00	670.42	1,340.84	0.00E+00	1.24E+03	2.48E+03		
Pu-242	6.4260E-05	670.42	1,340.84	0.00E+00	4.31E-02	8.62E-02		
Ra-226	6.0562E-11	670.42	1,340.84	0.00E+00	4.06E-08	8.12E-08		
Ra-228	4.9919E-12	670.42	1,340.84	0.00E+00	3.35E-09	6.69E-09		
Ru-106	1.8330E-05	670.42	1,340.84	0.00E+00	1.23E-02	2.46E-02		
Se-79	1.2379E-05	670.42	1,340.84	0.00E+00	8.30E-03	1.66E-02		
Sn-126	2.5210E-05	670.42	1,340.84	0.00E+00	1.69E-02	3.38E-02		
Sr-90	1.3098E+00	670.42	1,340.84	0.00E+00	8.78E+02	1.76E+03		
Tc-99	3.9357E-04	670.42	1,340.84	0.00E+00	2.64E-01	5.28E-01		
Th-229	6.2968E-11	670.42	1,340.84	0.00E+00	4.22E-08	8.44E-08		
Th-230	1.0362E-08	670.42	1,340.84	0.00E+00	6.95E-06	1.39E-05		
Th-232	5.2891E-12	670.42	1,340.84	0.00E+00	3.55E-09	7.09E-09		
Th-208	1.9977E-07	670.42	1,340.84	0.00E+00	1.34E-04	2.68E-04		
U-232	5.4490E-07	670.42	1,340.84	0.00E+00	3.65E-04	7.31E-04		
U-233	2.3934E-08	670.42	1,340.84	0.00E+00	1.60E-05	3.21E-05		
U-234	4.4816E-05	670.42	1,340.84	0.00E+00	3.00E-02	6.01E-02		
U-235	-1.4492E-06	670.42	0.00	7.90E-04	0.00E+00	7.90E-04		
U-236	7.5711E-06	670.42	1,340.84	0.00E+00	5.08E-03	1.02E-02		
U-238	-2.6129E-07	670.42	0.00	4.11E-03	3.94E-03	4.11E-03		
Y-90	1.3101E+00	670.42	1,340.84	0.00E+00	8.78E+02	1.76E+03		
Other Radionuclides					1.27E+03	2.54E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences.
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2.9	0 to 5	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	592.20	670.42	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		1,340.84	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.52	1.13	1.01
Bounding	3.04		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: ARMF (PLATES)  
 SNF ID #: 8  
 Fuel Units & Descr: 15 - FLAT PLATES IN CAN  
 Heavy Metal Mass: BOL=0 198kg EOL=0 198kg  
 ROD Storage Site: SRS  
 Fuel decay start date: 1987  
 Estimates as of: 2010  
 Template: ATR (Light Water, Alum, 60 to 100% U)  
 Template Burnup(MWd): 367.2  
 Template BOL Heavy Metal Mass (MT): 0.00116689  
 Template Decay Time: 20 years

Estimated  
 Canister usage:  
 18"x10"  
 1 00

II. Estimates	m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	0.02	0.05	0.00E+00	1.51E-11	3.02E-11	Avg. MeV	
Am-241	2.0060E-03	0.02	0.05	0.00E+00	4.57E-05	9.14E-05	0.0150	4.816E+09
Am-242m	4.2429E-07	0.02	0.05	0.00E+00	9.66E-09	1.93E-08	0.0250	9.996E+08
Am-243	1.4899E-06	0.02	0.05	0.00E+00	3.39E-08	6.79E-08	0.0375	8.719E+08
C-14	5.7135E-09	0.02	0.05	0.00E+00	1.30E-10	2.60E-10	0.0575	9.338E+08
Cl-36	1.3124E-32	0.02	0.05	0.00E+00	2.99E-34	5.98E-34	0.0850	5.655E+08
Cm-243	1.6443E-07	0.02	0.05	0.00E+00	3.74E-09	7.49E-09	0.1250	3.841E+08
Cm-244	2.9330E-05	0.02	0.05	0.00E+00	6.68E-07	1.34E-06	0.2250	4.948E+08
Co-60	5.3186E-06	0.02	0.05	0.00E+00	1.21E-07	2.42E-07	0.3750	2.120E+08
Cs-134	3.1563E-03	0.02	0.05	0.00E+00	7.19E-05	1.44E-04	0.5750	3.457E+09
Cs-135	3.4477E-06	0.02	0.05	0.00E+00	7.85E-08	1.57E-07	0.8500	5.845E+07
Cs-137	2.0313E+00	0.02	0.05	0.00E+00	4.63E-02	9.25E-02	1.2500	3.338E+07
Eu-154	2.4513E-02	0.02	0.05	0.00E+00	5.58E-04	1.12E-03	1.7500	1.532E+06
Eu-155	4.8175E-03	0.02	0.05	0.00E+00	1.10E-04	2.19E-04	2.2500	1.345E+02
Fe-55	1.2397E-04	0.02	0.05	0.00E+00	2.82E-06	5.65E-06	2.7500	7.602E+01
H-3	4.5697E-03	0.02	0.05	0.00E+00	1.04E-04	2.08E-04	3.5000	3.910E-01
I-129	7.5300E-07	0.02	0.05	0.00E+00	1.71E-08	3.43E-08	5.0000	3.743E-02
Kr-85	1.0850E-01	0.02	0.05	0.00E+00	2.47E-03	4.94E-03	7.0000	4.178E-03
Np-237	9.5561E-06	0.02	0.05	0.00E+00	2.18E-07	4.35E-07	11.0000	4.716E-04
Pa-231	2.0359E-09	0.02	0.05	0.00E+00	4.64E-11	9.27E-11		
Pb-210	4.9728E-11	0.02	0.05	0.00E+00	1.13E-12	2.26E-12		
Pm-147	4.8502E-02	0.02	0.05	0.00E+00	1.10E-03	2.21E-03		
Pu-238	1.8254E-02	0.02	0.05	0.00E+00	4.16E-04	8.31E-04		
Pu-239	4.2810E-04	0.02	0.05	0.00E+00	9.75E-06	1.95E-05		
Pu-240	2.4368E-04	0.02	0.05	0.00E+00	5.55E-06	1.11E-05		
Pu-241	3.3415E-02	0.02	0.05	0.00E+00	7.61E-04	1.52E-03		
Pu-242	3.6329E-07	0.02	0.05	0.00E+00	8.27E-09	1.65E-08		
Ra-226	2.2854E-10	0.02	0.05	0.00E+00	5.20E-12	1.04E-11		
Ra-228	1.2426E-14	0.02	0.05	0.00E+00	2.83E-16	5.66E-16		
Ru-106	6.3589E-06	0.02	0.05	0.00E+00	1.45E-07	2.90E-07		
Se-79	1.2933E-05	0.02	0.05	0.00E+00	2.94E-07	5.89E-07		
Sn-126	1.1574E-05	0.02	0.05	0.00E+00	2.64E-07	5.27E-07		
Sr-90	1.9248E+00	0.02	0.05	0.00E+00	4.38E-02	8.77E-02		
Tc-99	4.2239E-04	0.02	0.05	0.00E+00	9.62E-06	1.92E-05		
Th-229	5.0953E-12	0.02	0.05	0.00E+00	1.16E-13	2.32E-13		
Th-230	4.1885E-08	0.02	0.05	0.00E+00	9.54E-10	1.91E-09		
Th-232	1.9270E-14	0.02	0.05	0.00E+00	4.39E-16	8.78E-16		
Ti-208	4.6024E-08	0.02	0.05	0.00E+00	1.05E-09	2.10E-09		
U-232	1.2582E-07	0.02	0.05	0.00E+00	2.86E-09	5.73E-09		
U-233	2.5825E-09	0.02	0.05	0.00E+00	5.88E-11	1.18E-10		
U-234	1.8450E-04	0.02	0.05	0.00E+00	4.20E-06	8.40E-06		
U-235	-2.7235E-06	0.02	0.00	3.93E-04	3.93E-04	3.93E-04		
U-236	1.5493E-05	0.02	0.05	0.00E+00	3.53E-07	7.06E-07		
U-238	-4.2851E-09	0.02	0.00	5.39E-06	5.39E-06	5.39E-06		
Y-90	1.9254E+00	0.02	0.05	0.00E+00	4.38E-02	8.77E-02		
Other Radionuclides					4.40E-02	8.81E-02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	91.89393939	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:	0.02		
Bounding:		0.05	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal:	0.00	0.00	
Bounding:	0.00		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ARMF/CFRMF MARK I  
SNF ID # 9  
Fuel Units & Descr 56 15 FLAT PLATES  
Heavy Metal Mass BOL=11.29kg EOL=11.29kg  
ROD Storage Site SRS

<sup>1</sup>Fuel decay start date 1991  
Estimates as of 2010  
Template ATR (Light Water Alum, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 367.2  
Template BOL Heavy Metal Mass (MT) 0.00116689  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x10"  
2.33

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	4.5861E-10	1.30	13.74	0.00E+00	5.95E-10	6.30E-09	0.0150	1.639E+12
Am-241	1.7832E-03	1.30	13.74	0.00E+00	2.32E-03	2.45E-02	0.0250	3.418E+11
Am-242m	4.3410E-07	1.30	13.74	0.00E+00	5.64E-07	5.96E-06	0.0375	2.985E+11
Am-243	1.4907E-06	1.30	13.74	0.00E+00	1.94E-06	2.05E-05	0.0575	3.183E+11
C-14	5.7162E-09	1.30	13.74	0.00E+00	7.42E-09	7.85E-08	0.0850	1.928E+11
Cl-36	1.3124E-32	1.30	13.74	0.00E+00	1.70E-32	1.80E-31	0.1250	1.323E+11
Cm-243	1.8568E-07	1.30	13.74	0.00E+00	2.41E-07	2.55E-06	0.2250	1.665E+11
Cm-244	3.5512E-05	1.30	13.74	0.00E+00	4.61E-05	4.88E-04	0.3750	7.276E+10
Co-60	1.0261E-05	1.30	13.74	0.00E+00	1.33E-05	1.41E-04	0.5750	1.181E+12
Cs-134	1.6931E-02	1.30	13.74	0.00E+00	2.20E-02	2.33E-01	0.8500	2.805E+10
Cs-135	3.4477E-06	1.30	13.74	0.00E+00	4.48E-06	4.74E-05	1.2500	1.417E+10
Cs-137	2.2800E+00	1.30	13.74	0.00E+00	2.96E+00	3.13E+01	1.7500	5.938E+08
Eu-154	3.6656E-02	1.30	13.74	0.00E+00	4.76E-02	5.04E-01	2.2500	7.428E+05
Eu-155	9.6841E-03	1.30	13.74	0.00E+00	1.26E-02	1.33E-01	2.7500	4.465E+04
Fe-55	4.6977E-04	1.30	13.74	0.00E+00	6.10E-04	6.45E-03	3.5000	2.840E+03
H-3	6.0485E-03	1.30	13.74	0.00E+00	7.85E-03	8.31E-02	5.0000	7.537E+00
I-129	7.5300E-07	1.30	13.74	0.00E+00	9.78E-07	1.03E-05	7.0000	8.368E-01
Kr-85	1.4989E-01	1.30	13.74	0.00E+00	1.95E-01	2.06E+00	11.0000	9.412E-02
Np-237	9.5534E-06	1.30	13.74	0.00E+00	1.24E-05	1.31E-04		
Pa-231	1.6550E-09	1.30	13.74	0.00E+00	2.15E-09	2.27E-08		
Pb-210	2.6631E-11	1.30	13.74	0.00E+00	3.46E-11	3.66E-10		
Pm-147	1.8156E-01	1.30	13.74	0.00E+00	2.36E-01	2.49E+00		
Pu-238	1.8990E-02	1.30	13.74	0.00E+00	2.47E-02	2.61E-01		
Pu-239	4.2838E-04	1.30	13.74	0.00E+00	5.56E-04	5.89E-03		
Pu-240	2.4379E-04	1.30	13.74	0.00E+00	3.17E-04	3.35E-03		
Pu-241	4.2511E-02	1.30	13.74	0.00E+00	5.52E-02	5.84E-01		
Pu-242	3.6329E-07	1.30	13.74	0.00E+00	4.72E-07	4.99E-06		
Ra-226	1.4725E-10	1.30	13.74	0.00E+00	1.91E-10	2.02E-09		
Ra-228	8.9760E-15	1.30	13.74	0.00E+00	1.17E-14	1.23E-13		
Ru-106	1.9752E-04	1.30	13.74	0.00E+00	2.56E-04	2.71E-03		
Se-79	1.2933E-05	1.30	13.74	0.00E+00	1.68E-05	1.78E-04		
Sn-126	1.1574E-05	1.30	13.74	0.00E+00	1.50E-05	1.59E-04		
Sr-90	2.1680E+00	1.30	13.74	0.00E+00	2.81E+00	2.98E+01		
Tc-99	4.2239E-04	1.30	13.74	0.00E+00	5.48E-04	5.80E-03		
Th-229	3.9270E-12	1.30	13.74	0.00E+00	5.10E-12	5.40E-11		
Th-230	3.3578E-08	1.30	13.74	0.00E+00	4.36E-08	4.61E-07		
Th-232	1.5452E-14	1.30	13.74	0.00E+00	2.01E-14	2.12E-13		
Ti-208	4.6705E-08	1.30	13.74	0.00E+00	6.06E-08	6.42E-07		
U-232	1.3045E-07	1.30	13.74	0.00E+00	1.69E-07	1.79E-06		
U-233	2.3739E-09	1.30	13.74	0.00E+00	3.08E-09	3.26E-08		
U-234	1.8423E-04	1.30	13.74	0.00E+00	2.39E-04	2.53E-03		
U-235	-2.7235E-06	1.30	0.00	2.25E-02	2.25E-02	2.25E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.5493E-05	1.30	13.74	0.00E+00	2.01E-05	2.13E-04	3.57E-02	3.72E-01
U-238	-4.2851E-09	1.30	0.00	2.92E-04	2.92E-04	2.92E-04	Total	Total
Y-90	2.1686E+00	1.30	13.74	0.00E+00	2.82E+00	2.98E+01		
Other Radionuclides					2.82E+00	2.99E+01		

Other Radionuclides

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	92.29270621	60 to 100

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	1.30	
Bounding	13.74	

Basis for burnup used in estimate.

Nominal burnup taken directly from SFD (converted to MWd)  
Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.00	0.00
Bounding	0.00	0.00

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: ARMF/CFRMF MARK I LL  
 SNF ID #: 10  
 Fuel Units & Descr: 2 - 15 FLAT PLATES  
 Heavy Metal Mass BOL=0.236kg EOL=0.236kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date: 1991  
 Estimates as of: 2010  
 Template: ATR (Light Water, Alum, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 367.2  
 Template BOL Heavy Metal Mass (MT): 0.00116689  
 Template Decay Time: 15 years

Estimated  
 Canister usage  
 18"x10"  
 0.08

## II. Estimates

	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.5861E-10	0.03	0.29	0.00E+00	1.24E-11	1.32E-10	Avg. MeV	
Am-241	1.7832E-03	0.03	0.29	0.00E+00	4.84E-05	5.12E-04	0.0150	3.427E+10
Am-242m	4.3410E-07	0.03	0.29	0.00E+00	1.18E-08	1.25E-07	0.0250	7.145E+09
Am-243	1.4907E-06	0.03	0.29	0.00E+00	4.05E-08	4.28E-07	0.0375	6.239E+09
C-14	5.7162E-09	0.03	0.29	0.00E+00	1.55E-10	1.64E-09	0.0575	6.653E+09
Cl-36	1.3124E-32	0.03	0.29	0.00E+00	3.56E-34	3.77E-33	0.0850	4.031E+09
Cm-243	1.8568E-07	0.03	0.29	0.00E+00	5.04E-09	5.33E-08	0.1250	2.766E+09
Cm-244	3.5512E-05	0.03	0.29	0.00E+00	9.64E-07	1.02E-05	0.2250	3.481E+09
Co-60	1.0261E-05	0.03	0.29	0.00E+00	2.78E-07	2.95E-06	0.3750	1.521E+09
Cs-134	1.6931E-02	0.03	0.29	0.00E+00	4.60E-04	4.86E-03	0.5750	2.469E+10
Cs-135	3.4477E-06	0.03	0.29	0.00E+00	9.36E-08	9.90E-07	0.8500	5.864E+08
Cs-137	2.2800E+00	0.03	0.29	0.00E+00	6.19E-02	6.55E-01	1.2500	2.962E+08
Eu-154	3.6656E-02	0.03	0.29	0.00E+00	9.95E-04	1.05E-02	1.7500	1.241E+07
Eu-155	9.6841E-03	0.03	0.29	0.00E+00	2.63E-04	2.78E-03	2.2500	1.553E+04
Fe-55	4.6977E-04	0.03	0.29	0.00E+00	1.27E-05	1.35E-04	2.7500	9.333E+02
H-3	6.0485E-03	0.03	0.29	0.00E+00	1.64E-04	1.74E-03	3.5000	5.936E+01
I-129	7.5300E-07	0.03	0.29	0.00E+00	2.04E-08	2.16E-07	5.0000	1.559E-01
Kr-85	1.4899E-01	0.03	0.29	0.00E+00	4.07E-03	4.31E-02	7.0000	1.731E-02
Np-237	9.5534E-06	0.03	0.29	0.00E+00	2.59E-07	2.74E-06	11.0000	1.946E-03
Pa-231	1.6550E-09	0.03	0.29	0.00E+00	4.49E-11	4.75E-10		
Pb-210	2.6631E-11	0.03	0.29	0.00E+00	7.23E-13	7.65E-12		
Pm-147	1.8156E-01	0.03	0.29	0.00E+00	4.93E-03	5.21E-02		
Pu-238	1.8990E-02	0.03	0.29	0.00E+00	5.15E-04	5.45E-03		
Pu-239	4.2838E-04	0.03	0.29	0.00E+00	1.16E-05	1.23E-04		
Pu-240	2.4379E-04	0.03	0.29	0.00E+00	6.62E-06	7.00E-05		
Pu-241	4.2511E-02	0.03	0.29	0.00E+00	1.15E-03	1.22E-02		
Pu-242	3.6329E-07	0.03	0.29	0.00E+00	9.86E-09	1.04E-07		
Ra-226	1.4725E-10	0.03	0.29	0.00E+00	4.00E-12	4.23E-11		
Ra-228	8.9760E-15	0.03	0.29	0.00E+00	2.44E-16	2.58E-15		
Ru-106	1.9752E-04	0.03	0.29	0.00E+00	5.36E-06	5.67E-05		
Se-79	1.2933E-05	0.03	0.29	0.00E+00	3.51E-07	3.71E-06		
Sn-126	1.1574E-05	0.03	0.29	0.00E+00	3.14E-07	3.32E-06		
Sr-90	2.1680E+00	0.03	0.29	0.00E+00	5.88E-02	6.23E-01		
Tc-99	4.2239E-04	0.03	0.29	0.00E+00	1.15E-05	1.21E-04		
Th-229	3.9270E-12	0.03	0.29	0.00E+00	1.07E-13	1.13E-12		
Th-230	3.3578E-08	0.03	0.29	0.00E+00	9.11E-10	9.64E-09		
Th-232	1.5452E-14	0.03	0.29	0.00E+00	4.19E-16	4.44E-15		
Th-208	4.6705E-08	0.03	0.29	0.00E+00	1.27E-09	1.34E-08		
U-232	1.3045E-07	0.03	0.29	0.00E+00	3.54E-09	3.75E-08		
U-233	2.3739E-09	0.03	0.29	0.00E+00	6.44E-11	6.82E-10		
U-234	1.8423E-04	0.03	0.29	0.00E+00	5.00E-06	5.29E-05		
U-235	-2.7235E-06	0.03	0.00	4.75E-04	4.75E-04	4.75E-04		
U-236	1.5493E-05	0.03	0.29	0.00E+00	4.20E-07	4.45E-06		
U-238	-4.2851E-09	0.03	0.00	5.38E-06	5.38E-06	5.38E-06		
Y-90	2.1686E+00	0.03	0.29	0.00E+00	5.89E-02	6.23E-01		
Other Radionuclides					5.90E-02	6.25E-01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.47E-04	7.79E-03
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93.22	60 to 100

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>3</sup>

	From SFD	Estimated
Nominal	0.03	
Bounding	0.29	

Basis for burnup used in estimate:

Nominal burnup taken directly from SFD (converted to MWd)  
 Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.00	0.00
Bounding	0.00	0.00

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: ARMF/CFRMF MARK II  
SNF ID # 11  
Fuel Units & Descr: 8 - 15 FLAT PLATES  
Heavy Metal Mass BOL=1 164kg EOL=1 164kg  
ROD Storage Site SRS

<sup>1</sup>Fuel decay start date 1991  
Estimates as of: 2010  
Template ATR (Light Water Alum 60 to 100% U)  
<sup>2</sup>Template Burnup(MWd) 367.2  
Template BOL Heavy Metal Mass (MT) 0.00116689  
Template Decay Time 15 years

Estimated  
Canister usage:  
**18"x10"**  
0.33

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.5861E-10	0.13	1.42	0.00E+00	6.14E-11	6.50E-10	Avg MeV	
Am-241	1.7832E-03	0.13	1.42	0.00E+00	2.39E-04	2.53E-03	0.0150	1.690E+11
Am-242m	4.3410E-07	0.13	1.42	0.00E+00	5.81E-08	6.15E-07	0.0250	3.524E+10
Am-243	1.4907E-06	0.13	1.42	0.00E+00	2.00E-07	2.11E-06	0.0375	3.077E+10
C-14	5.7162E-09	0.13	1.42	0.00E+00	7.65E-10	8.10E-09	0.0575	3.281E+10
Cl-36	1.3124E-32	0.13	1.42	0.00E+00	1.76E-33	1.86E-32	0.0850	1.988E+10
Cm-243	1.8568E-07	0.13	1.42	0.00E+00	2.49E-08	2.63E-07	0.1250	1.364E+10
Cm-244	3.5512E-05	0.13	1.42	0.00E+00	4.75E-06	5.03E-05	0.2250	1.717E+10
Co-60	1.0261E-05	0.13	1.42	0.00E+00	1.37E-06	1.45E-05	0.3750	7.502E+09
Cs-134	1.6931E-02	0.13	1.42	0.00E+00	2.27E-03	2.40E-02	0.5750	1.218E+11
Cs-135	3.4477E-06	0.13	1.42	0.00E+00	4.62E-07	4.88E-06	0.8500	2.892E+09
Cs-137	2.2800E+00	0.13	1.42	0.00E+00	3.05E-01	3.23E+00	1.2500	1.461E+09
Eu-154	3.6656E-02	0.13	1.42	0.00E+00	4.91E-03	5.19E-02	1.7500	6.122E+07
Eu-155	9.6841E-03	0.13	1.42	0.00E+00	1.30E-03	1.37E-02	2.2500	7.659E+04
Fe-55	4.6977E-04	0.13	1.42	0.00E+00	6.29E-05	6.65E-04	2.7500	4.603E+03
H-3	6.0485E-03	0.13	1.42	0.00E+00	8.10E-04	8.57E-03	3.5000	2.928E+02
I-129	7.5300E-07	0.13	1.42	0.00E+00	1.01E-07	1.07E-06	5.0000	7.699E-01
Kr-85	1.4989E-01	0.13	1.42	0.00E+00	2.01E-02	2.12E-01	7.0000	8.545E-02
Np-237	9.5534E-06	0.13	1.42	0.00E+00	1.28E-06	1.35E-05	11.0000	9.608E-03
Pa-231	1.6550E-09	0.13	1.42	0.00E+00	2.22E-10	2.34E-09		
Pb-210	2.6631E-11	0.13	1.42	0.00E+00	3.56E-12	3.77E-11		
Pm-147	1.8156E-01	0.13	1.42	0.00E+00	2.43E-02	2.57E-01		
Pu-238	1.8990E-02	0.13	1.42	0.00E+00	2.54E-03	2.69E-02		
Pu-239	4.2838E-04	0.13	1.42	0.00E+00	5.73E-05	6.07E-04		
Pu-240	2.4379E-04	0.13	1.42	0.00E+00	3.26E-05	3.45E-04		
Pu-241	4.2511E-02	0.13	1.42	0.00E+00	5.69E-03	6.02E-02		
Pu-242	3.6329E-07	0.13	1.42	0.00E+00	4.86E-08	5.15E-07		
Ra-226	1.4725E-10	0.13	1.42	0.00E+00	1.97E-11	2.09E-10		
Ra-228	8.9760E-15	0.13	1.42	0.00E+00	1.20E-15	1.27E-14		
Ru-106	1.9752E-04	0.13	1.42	0.00E+00	2.64E-05	2.80E-04		
Se-79	1.2933E-05	0.13	1.42	0.00E+00	1.73E-06	1.83E-05		
Sn-126	1.1574E-05	0.13	1.42	0.00E+00	1.55E-06	1.64E-05		
Sr-90	2.1680E+00	0.13	1.42	0.00E+00	2.90E-01	3.07E+00		
Tc-99	4.2239E-04	0.13	1.42	0.00E+00	5.65E-05	5.98E-04		
Th-229	3.9270E-12	0.13	1.42	0.00E+00	5.26E-13	5.56E-12		
Th-230	3.3578E-08	0.13	1.42	0.00E+00	4.49E-09	4.76E-08		
Th-232	1.5452E-14	0.13	1.42	0.00E+00	2.07E-15	2.19E-14		
Ti-208	4.6705E-08	0.13	1.42	0.00E+00	6.25E-09	6.62E-08		
U-232	1.3045E-07	0.13	1.42	0.00E+00	1.75E-08	1.85E-07		
U-233	2.3739E-09	0.13	1.42	0.00E+00	3.18E-10	3.36E-09		
U-234	1.8423E-04	0.13	1.42	0.00E+00	2.47E-05	2.61E-04		
U-235	-2.7235E-06	0.13	0.00	2.34E-03	2.34E-03	2.34E-03		
U-236	1.5493E-05	0.13	1.42	0.00E+00	2.07E-06	2.19E-05		
U-238	-4.2851E-09	0.13	0.00	2.69E-05	2.69E-05	2.69E-05		
Y-90	2.1686E+00	0.13	1.42	0.00E+00	2.90E-01	3.07E+00		
Other Radionuclides					2.91E-01	3.08E+00		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.12714777	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	0.13		
Bounding	1.42		

Nominal burnup taken directly from SFD (converted to MWd)

Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.00	0.00	
Bounding	0.00	0.00	

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: ARMF/CFRMF MARK III  
SNF ID #: 12

Fuel Units & Descr: 4 - 15 FLAT PLATES

Heavy Metal Mass: BOL=0.096kg, EOL=0.096kg

ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date 1991

Estimates as of 2010

Template ATR (Light Water Alum, 60 to 100%, U)

<sup>2</sup>Template Burnup(MWd) 367.2

Template BOL Heavy Metal Mass (MT) 0.00116689

Template Decay Time: 15 years

Estimated  
Canister usage  
18"x10"  
0.17

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.5861E-10	0.01	0.12	0.00E+00	5.06E-12	5.36E-11	Avg MeV	
Am-241	1.7832E-03	0.01	0.12	0.00E+00	1.97E-05	2.08E-04	0.0150	1.394E+10
Am-242m	4.3410E-07	0.01	0.12	0.00E+00	4.79E-09	5.07E-08	0.0250	2.907E+09
Am-243	1.4907E-06	0.01	0.12	0.00E+00	1.65E-08	1.74E-07	0.0375	2.538E+09
C-14	5.7162E-09	0.01	0.12	0.00E+00	6.31E-11	6.68E-10	0.0575	2.706E+09
Cl-36	1.3124E-32	0.01	0.12	0.00E+00	1.45E-34	1.53E-33	0.0850	1.640E+09
Cm-243	1.8568E-07	0.01	0.12	0.00E+00	2.05E-09	2.17E-08	0.1250	1.125E+09
Cm-244	3.5512E-05	0.01	0.12	0.00E+00	3.92E-07	4.15E-06	0.2250	1.416E+09
Co-60	1.0261E-05	0.01	0.12	0.00E+00	1.13E-07	1.20E-06	0.3750	6.187E+08
Cs-134	1.6931E-02	0.01	0.12	0.00E+00	1.87E-04	1.98E-03	0.5750	1.004E+10
Cs-135	3.4477E-06	0.01	0.12	0.00E+00	3.81E-08	4.03E-07	0.8500	2.385E+08
Cs-137	2.2800E+00	0.01	0.12	0.00E+00	2.52E-02	2.66E-01	1.2500	1.205E+08
Eu-154	3.6656E-02	0.01	0.12	0.00E+00	4.05E-04	4.28E-03	1.7500	5.049E+06
Eu-155	9.6841E-03	0.01	0.12	0.00E+00	1.07E-04	1.13E-03	2.2500	6.317E+03
Fe-55	4.6977E-04	0.01	0.12	0.00E+00	5.19E-06	5.49E-05	2.7500	3.796E+02
H-3	6.0485E-03	0.01	0.12	0.00E+00	6.68E-05	7.07E-04	3.5000	2.415E+01
I-129	7.5300E-07	0.01	0.12	0.00E+00	8.31E-09	8.80E-08	5.0000	6.454E-02
Kr-85	1.4989E-01	0.01	0.12	0.00E+00	1.65E-03	1.75E-02	7.0000	7.167E-03
Np-237	9.5534E-06	0.01	0.12	0.00E+00	1.05E-07	1.12E-06	11.0000	8.062E-04
Pa-231	1.6550E-09	0.01	0.12	0.00E+00	1.83E-11	1.93E-10		
Pb-210	2.6631E-11	0.01	0.12	0.00E+00	2.94E-13	3.11E-12		
Pm-147	1.8156E-01	0.01	0.12	0.00E+00	2.00E-03	2.12E-02		
Pu-238	1.8990E-02	0.01	0.12	0.00E+00	2.10E-04	2.22E-03		
Pu-239	4.2838E-04	0.01	0.12	0.00E+00	4.73E-06	5.00E-05		
Pu-240	2.4379E-04	0.01	0.12	0.00E+00	2.69E-06	2.85E-05		
Pu-241	4.2511E-02	0.01	0.12	0.00E+00	4.69E-04	4.97E-03		
Pu-242	3.6329E-07	0.01	0.12	0.00E+00	4.01E-09	4.24E-08		
Ra-226	1.4725E-10	0.01	0.12	0.00E+00	1.63E-12	1.72E-11		
Ra-228	8.9760E-15	0.01	0.12	0.00E+00	9.91E-17	1.05E-15		
Ru-106	1.9752E-04	0.01	0.12	0.00E+00	2.18E-06	2.31E-05		
Se-79	1.2933E-05	0.01	0.12	0.00E+00	1.43E-07	1.51E-06		
Sn-126	1.1574E-05	0.01	0.12	0.00E+00	1.28E-07	1.35E-06		
Sr-90	2.1680E+00	0.01	0.12	0.00E+00	2.39E-02	2.53E-01		
Tc-99	4.2239E-04	0.01	0.12	0.00E+00	4.66E-06	4.93E-05		
Th-229	3.9270E-12	0.01	0.12	0.00E+00	4.34E-14	4.59E-13		
Th-230	3.3578E-08	0.01	0.12	0.00E+00	3.71E-10	3.92E-09		
Th-232	1.5452E-14	0.01	0.12	0.00E+00	1.71E-16	1.81E-15		
Th-208	4.6705E-08	0.01	0.12	0.00E+00	5.16E-10	5.46E-09		
U-232	1.3045E-07	0.01	0.12	0.00E+00	1.44E-09	1.52E-08		
U-233	2.3739E-09	0.01	0.12	0.00E+00	2.62E-11	2.77E-10		
U-234	1.8423E-04	0.01	0.12	0.00E+00	2.03E-06	2.15E-05		
U-235	-2.7235E-06	0.01	0.00	1.90E-04	1.90E-04	1.90E-04		
U-236	1.5493E-05	0.01	0.12	0.00E+00	1.71E-07	1.81E-06		
U-238	-4.2851E-09	0.01	0.00	2.69E-06	2.69E-06	2.69E-06		
Y-90	2.1686E+00	0.01	0.12	0.00E+00	2.39E-02	2.53E-01		
Other Radionuclides					2.40E-02	2.54E-01		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	91.6666667	60 to 100

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	0.01	
Bounding	0.12	

Basis for burnup used in estimate:

Nominal burnup taken directly from SFD (converted to MWd)  
Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.00	0.00
Bounding	0.00	0.00

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ATR  
 SNF ID # 15  
 Fuel Units & Descr 1576 - 19 CURVED PLATES  
 Heavy Metal Mass BOL=1818 704kg EOL=1313 754kg  
 ROD Storage Site SRS  
 1 Fuel decay start date. 1985  
 Estimates as of 2010  
 Template ATR (Light Water Alum 60 to 100% U)  
 2 Template Burnup (MWd) 367.2  
 Template BOL Heavy Metal Mass (MT) 0.00116689  
 Template Decay Time 25 years

Estimated  
 Canister usage  
 18"x10"  
 78.80

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	480,779.86	961,559.72	0.00E+00	5.51E-04	1.10E-03	Avg MeV	
Am-241	2.3056E-03	480,779.86	961,559.72	0.00E+00	1.11E+03	2.22E+03	0.0150	8.998E+16
Am-242m	4.1476E-07	480,779.86	961,559.72	0.00E+00	1.99E-01	3.99E-01	0.0250	1.869E+16
Am-243	1.4894E-06	480,779.86	961,559.72	0.00E+00	7.16E-01	1.43E+00	0.0375	1.628E+16
C-14	5.7108E-09	480,779.86	961,559.72	0.00E+00	2.75E-03	5.49E-03	0.0575	1.748E+16
Cl-36	1.3124E-32	480,779.86	961,559.72	0.00E+00	6.31E-27	1.26E-26	0.0850	1.055E+16
Cm-243	1.4562E-07	480,779.86	961,559.72	0.00E+00	7.00E-02	1.40E-01	0.1250	7.065E+15
Cm-244	2.4221E-05	480,779.86	961,559.72	0.00E+00	1.16E+01	2.33E+01	0.2250	9.106E+15
Co-60	2.7560E-06	480,779.86	961,559.72	0.00E+00	1.33E+00	2.65E+00	0.3750	3.959E+15
Cs-134	5.8851E-04	480,779.86	961,559.72	0.00E+00	2.83E+02	5.66E+02	0.5750	6.490E+16
Cs-135	3.4477E-06	480,779.86	961,559.72	0.00E+00	1.66E+00	3.32E+00	0.8500	9.352E+14
Cs-137	1.8099E+00	480,779.86	961,559.72	0.00E+00	8.70E+05	1.74E+06	1.2500	5.201E+14
Eu-154	1.6386E-02	480,779.86	961,559.72	0.00E+00	7.88E+03	1.58E+04	1.7500	2.569E+13
Eu-155	2.3957E-03	480,779.86	961,559.72	0.00E+00	1.15E+03	2.30E+03	2.2500	1.831E+09
Fe-55	3.2707E-05	480,779.86	961,559.72	0.00E+00	1.57E+01	3.14E+01	2.7500	1.500E+09
H-3	3.4504E-03	480,779.86	961,559.72	0.00E+00	1.66E+03	3.32E+03	3.5000	1.132E+06
I-129	7.5300E-07	480,779.86	961,559.72	0.00E+00	3.62E-01	7.24E-01	5.0000	3.806E+05
Kr-85	7.8540E-02	480,779.86	961,559.72	0.00E+00	3.78E+04	7.55E+04	7.0000	4.188E+04
Np-237	9.5615E-06	480,779.86	961,559.72	0.00E+00	4.60E+00	9.19E+00	11.0000	4.685E+03
Pa-231	2.7968E-09	480,779.86	961,559.72	0.00E+00	1.34E-03	2.69E-03		
Pb-210	1.2612E-10	480,779.86	961,559.72	0.00E+00	6.06E-05	1.21E-04		
Pm-147	1.2952E-02	480,779.86	961,559.72	0.00E+00	6.23E+03	1.25E+04		
Pu-238	1.7549E-02	480,779.86	961,559.72	0.00E+00	8.44E+03	1.69E+04		
Pu-239	4.2810E-04	480,779.86	961,559.72	0.00E+00	2.06E+02	4.12E+02		
Pu-240	2.4357E-04	480,779.86	961,559.72	0.00E+00	1.17E+02	2.34E+02		
Pu-241	2.6277E-02	480,779.86	961,559.72	0.00E+00	1.26E+04	2.53E+04		
Pu-242	3.6329E-07	480,779.86	961,559.72	0.00E+00	1.75E-01	3.49E-01		
Ra-226	4.4444E-10	480,779.86	961,559.72	0.00E+00	2.14E-04	4.27E-04		
Ra-228	1.9714E-14	480,779.86	961,559.72	0.00E+00	9.48E-09	1.90E-08		
Ru-106	2.0477E-07	480,779.86	961,559.72	0.00E+00	9.84E-02	1.97E-01		
Se-79	1.2933E-05	480,779.86	961,559.72	0.00E+00	6.22E+00	1.24E+01		
Sn-126	1.1574E-05	480,779.86	961,559.72	0.00E+00	5.56E+00	1.11E+01		
Sr-90	1.7092E+00	480,779.86	961,559.72	0.00E+00	8.22E+05	1.64E+06		
Tc-99	4.2239E-04	480,779.86	961,559.72	0.00E+00	2.03E+02	4.06E+02		
Th-229	7.7260E-12	480,779.86	961,559.72	0.00E+00	3.71E-06	7.43E-06		
Th-230	5.8497E-08	480,779.86	961,559.72	0.00E+00	2.81E-02	5.62E-02		
Th-232	2.6906E-14	480,779.86	961,559.72	0.00E+00	1.29E-08	2.59E-08		
Th-208	4.4336E-08	480,779.86	961,559.72	0.00E+00	2.13E-02	4.26E-02		
U-232	1.2037E-07	480,779.86	961,559.72	0.00E+00	5.79E-02	1.16E-01		
U-233	3.0011E-09	480,779.86	961,559.72	0.00E+00	1.44E-03	2.89E-03		
U-234	1.8497E-04	480,779.86	961,559.72	0.00E+00	8.89E+01	1.78E+02		
U-235	-2.7235E-06	480,779.86	0.00	3.66E+00	2.35E+00	3.66E+00		
U-236	1.5493E-05	480,779.86	961,559.72	0.00E+00	7.45E+00	1.49E+01		
U-238	-4.2851E-09	480,779.86	0.00	4.18E-02	3.98E-02	4.18E-02		
Y-90	1.7094E+00	480,779.86	961,559.72	0.00E+00	8.22E+05	1.64E+06		
Other Radionuclides					8.28E+05	1.66E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.154	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal	From SFD	Estimated	
	480,779.86	478,197.82	
Bounding		961,559.72	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.84	0.99	
Bounding	1.68		1.02

<sup>1</sup> Reactor shutdown, core removal, storage, shipping, or other date confirming that irradiation ceased for fuel

<sup>2</sup> Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ATR  
SNF ID #: 16  
Fuel Units & Descr 4132 - 19 CURVED PLATES  
Heavy Metal Mass: BOL=4768 328kg, EOL=3705 991kg  
ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date 2035  
Estimates as of 2010  
Template ATR (Light Water Alum, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 367.2  
Template BOL Heavy Metal Mass (MT) 0.00116689  
Template Decay Time<sup>3</sup> 5 years

Estimated  
Canister usage  
18"x10"  
206 60

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	1,017,446.76	2,034,893.51	0.00E+00	1.48E-04	2.96E-04	Avg. MeV	
Am-241	1.1190E-03	1,017,446.76	2,034,893.51	0.00E+00	1.14E+03	2.28E+03	0.0150	3.926E+17
Am-242m	4.5425E-07	1,017,446.76	2,034,893.51	0.00E+00	4.62E-01	9.24E-01	0.0250	8.458E+16
Am-243	1.4921E-06	1,017,446.76	2,034,893.51	0.00E+00	1.52E+00	3.04E+00	0.0375	7.805E+16
C-14	5.7244E-09	1,017,446.76	2,034,893.51	0.00E+00	5.82E-03	1.16E-02	0.0575	7.674E+16
Cl-36	1.3124E-32	1,017,446.76	2,034,893.51	0.00E+00	1.34E-26	2.67E-26	0.0850	4.892E+16
Cm-243	2.3676E-07	1,017,446.76	2,034,893.51	0.00E+00	2.41E-01	4.82E-01	0.1250	4.237E+16
Cm-244	5.2042E-05	1,017,446.76	2,034,893.51	0.00E+00	5.30E+01	1.06E+02	0.2250	4.147E+16
Co-60	3.8208E-05	1,017,446.76	2,034,893.51	0.00E+00	3.89E+01	7.77E+01	0.3750	2.007E+16
Cs-134	4.8693E-01	1,017,446.76	2,034,893.51	0.00E+00	4.95E+05	9.91E+05	0.5750	2.757E+17
Cs-135	3.4477E-06	1,017,446.76	2,034,893.51	0.00E+00	3.51E+00	7.02E+00	0.8500	3.861E+16
Cs-137	2.8731E+00	1,017,446.76	2,034,893.51	0.00E+00	2.92E+06	5.85E+06	1.2500	7.183E+15
Eu-154	8.2053E-02	1,017,446.76	2,034,893.51	0.00E+00	8.35E+04	1.67E+05	1.7500	3.012E+14
Eu-155	3.9134E-02	1,017,446.76	2,034,893.51	0.00E+00	3.98E+04	7.96E+04	2.2500	6.318E+14
Fe-55	6.7429E-03	1,017,446.76	2,034,893.51	0.00E+00	6.86E+03	1.37E+04	2.7500	3.635E+12
H-3	1.0599E-02	1,017,446.76	2,034,893.51	0.00E+00	1.08E+04	2.16E+04	3.5000	4.031E+11
I-129	7.5300E-07	1,017,446.76	2,034,893.51	0.00E+00	7.66E-01	1.53E+00	5.0000	1.206E+06
Kr-85	2.8595E-01	1,017,446.76	2,034,893.51	0.00E+00	2.91E+05	5.82E+05	7.0000	1.344E+05
Np-237	9.5479E-06	1,017,446.76	2,034,893.51	0.00E+00	9.71E+00	1.94E+01	11.0000	1.515E+04
Pa-231	8.9297E-10	1,017,446.76	2,034,893.51	0.00E+00	9.09E-04	1.82E-03		
Pb-210	3.7609E-12	1,017,446.76	2,034,893.51	0.00E+00	3.83E-06	7.65E-06		
Pm-147	2.5452E+00	1,017,446.76	2,034,893.51	0.00E+00	2.59E+06	5.18E+06		
Pu-238	2.0550E-02	1,017,446.76	2,034,893.51	0.00E+00	2.09E+04	4.18E+04		
Pu-239	4.2838E-04	1,017,446.76	2,034,893.51	0.00E+00	4.36E+02	8.72E+02		
Pu-240	2.4401E-04	1,017,446.76	2,034,893.51	0.00E+00	2.48E+02	4.97E+02		
Pu-241	6.8764E-02	1,017,446.76	2,034,893.51	0.00E+00	7.00E+04	1.40E+05		
Pu-242	3.6329E-07	1,017,446.76	2,034,893.51	0.00E+00	3.70E-01	7.39E-01		
Ra-226	3.8045E-11	1,017,446.76	2,034,893.51	0.00E+00	3.87E-05	7.74E-05		
Ra-228	2.9902E-15	1,017,446.76	2,034,893.51	0.00E+00	3.04E-09	6.08E-09		
Ru-106	1.9055E-01	1,017,446.76	2,034,893.51	0.00E+00	1.94E+05	3.88E+05		
Se-79	1.2936E-05	1,017,446.76	2,034,893.51	0.00E+00	1.32E+01	2.63E+01		
Sn-126	1.1574E-05	1,017,446.76	2,034,893.51	0.00E+00	1.18E+01	2.36E+01		
Sr-90	2.7505E+00	1,017,446.76	2,034,893.51	0.00E+00	2.80E+06	5.60E+06		
Tc-99	4.2239E-04	1,017,446.76	2,034,893.51	0.00E+00	4.30E+02	8.60E+02		
Th-229	1.8848E-12	1,017,446.76	2,034,893.51	0.00E+00	1.92E-06	3.84E-06		
Th-230	1.7042E-08	1,017,446.76	2,034,893.51	0.00E+00	1.73E-02	3.47E-02		
Th-232	7.8132E-15	1,017,446.76	2,034,893.51	0.00E+00	7.95E-09	1.59E-08		
Ti-208	4.4063E-08	1,017,446.76	2,034,893.51	0.00E+00	4.48E-02	8.97E-02		
U-232	1.3151E-07	1,017,446.76	2,034,893.51	0.00E+00	1.34E-01	2.68E-01		
U-233	1.9564E-09	1,017,446.76	2,034,893.51	0.00E+00	1.99E-03	3.98E-03		
U-234	1.8371E-04	1,017,446.76	2,034,893.51	0.00E+00	1.87E+02	3.74E+02		
U-235	-2.7235E-06	1,017,446.76	0.00	9.60E+00	6.83E+00	9.60E+00		
U-236	1.5493E-05	1,017,446.76	2,034,893.51	0.00E+00	1.58E+01	3.15E+01		
U-238	-4.2851E-09	1,017,446.76	0.00	1.10E-01	1.05E-01	1.10E-01		
Y-90	2.7505E+00	1,017,446.76	2,034,893.51	0.00E+00	2.80E+06	5.60E+06		
Other Radionuclides					5.23E+06	1.05E+07		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.154	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate.
	From SFD	Estimated	
Nominal	1.017 446.76	1.006 053.94	
Bounding		2.034 893.51	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.68	0.99	
Bounding	1.36		1.01

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ATR  
 SNF ID # 843  
 Fuel Units & Descr 128 - 19 CURVED PLATES  
 Heavy Metal Mass BOL=147 712kg EOL=99 392kg  
 ROD Storage Site SRS  
 Fuel decay start date 1985  
 Estimates as of 2010  
 Template ATR (Light Water Alum 60 to 100% U)  
 Template Burnup(MWd) 367.2  
 Template BOL Heavy Metal Mass (MT) 0.00116689  
 Template Decay Time 25 years

Estimated  
 Canister usage  
 18"x10"  
 6.40

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1.1465E-09	45,921.00	91,842.00	0.00E+00	5.26E-05	1.05E-04	0.0150	8.594E+15
Am-241	2.3056E-03	45,921.00	91,842.00	0.00E+00	1.06E+02	2.12E+02	0.0250	1.785E+15
Am-242m	4.1476E-07	45,921.00	91,842.00	0.00E+00	1.90E-02	3.81E-02	0.0375	1.555E+15
Am-243	1.4894E-06	45,921.00	91,842.00	0.00E+00	6.84E-02	1.37E-01	0.0575	1.670E+15
C-14	5.7108E-09	45,921.00	91,842.00	0.00E+00	2.62E-04	5.24E-04	0.0850	1.007E+15
Cl-36	1.3124E-32	45,921.00	91,842.00	0.00E+00	6.03E-28	1.21E-27	0.1250	6.748E+14
Cm-243	1.4562E-07	45,921.00	91,842.00	0.00E+00	6.69E-03	1.34E-02	0.2250	8.698E+14
Cm-244	2.4221E-05	45,921.00	91,842.00	0.00E+00	1.11E+00	2.22E+00	0.3750	3.781E+14
Co-60	2.7560E-06	45,921.00	91,842.00	0.00E+00	1.27E-01	2.53E-01	0.5750	6.199E+15
Cs-134	5.8851E-04	45,921.00	91,842.00	0.00E+00	2.70E+01	5.40E+01	0.8500	8.933E+13
Cs-135	3.4477E-06	45,921.00	91,842.00	0.00E+00	1.58E-01	3.17E-01	1.2500	4.968E+13
Cs-137	1.8099E+00	45,921.00	91,842.00	0.00E+00	8.31E+04	1.66E+05	1.7500	2.454E+12
Eu-154	1.6386E-02	45,921.00	91,842.00	0.00E+00	7.52E+02	1.50E+03	2.2500	1.749E+08
Eu-155	2.3957E-03	45,921.00	91,842.00	0.00E+00	1.10E+02	2.20E+02	2.7500	1.432E+08
Fe-55	3.2707E-05	45,921.00	91,842.00	0.00E+00	1.50E+00	3.00E+00	3.5000	1.081E+05
H-3	3.4504E-03	45,921.00	91,842.00	0.00E+00	1.58E+02	3.17E+02	5.0000	3.635E+04
I-129	7.5300E-07	45,921.00	91,842.00	0.00E+00	3.46E-02	6.92E-02	7.0000	4.000E+03
Kr-85	7.8540E-02	45,921.00	91,842.00	0.00E+00	3.61E+03	7.21E+03	11.0000	4.474E+02
Np-237	9.5615E-06	45,921.00	91,842.00	0.00E+00	4.39E-01	8.78E-01		
Pa-231	2.7968E-09	45,921.00	91,842.00	0.00E+00	1.28E-04	2.57E-04		
Pb-210	1.2612E-10	45,921.00	91,842.00	0.00E+00	5.79E-06	1.16E-05		
Pm-147	1.2952E-02	45,921.00	91,842.00	0.00E+00	5.95E+02	1.19E+03		
Pu-238	1.7549E-02	45,921.00	91,842.00	0.00E+00	8.06E+02	1.61E+03		
Pu-239	4.2810E-04	45,921.00	91,842.00	0.00E+00	1.97E+01	3.93E+01		
Pu-240	2.4357E-04	45,921.00	91,842.00	0.00E+00	1.12E+01	2.24E+01		
Pu-241	2.6277E-02	45,921.00	91,842.00	0.00E+00	1.21E+03	2.41E+03		
Pu-242	3.6329E-07	45,921.00	91,842.00	0.00E+00	1.67E-02	3.34E-02		
Ra-226	4.4444E-10	45,921.00	91,842.00	0.00E+00	2.04E-05	4.08E-05		
Ra-228	1.9714E-14	45,921.00	91,842.00	0.00E+00	9.05E-10	1.81E-09		
Ru-106	2.0477E-07	45,921.00	91,842.00	0.00E+00	9.40E-03	1.88E-02		
Se-79	1.2933E-05	45,921.00	91,842.00	0.00E+00	5.94E-01	1.19E+00		
Sn-126	1.1574E-05	45,921.00	91,842.00	0.00E+00	5.31E-01	1.06E+00		
Sr-90	1.7092E+00	45,921.00	91,842.00	0.00E+00	7.85E+04	1.57E+05		
Tc-99	4.2239E-04	45,921.00	91,842.00	0.00E+00	1.94E+01	3.88E+01		
Th-229	7.7260E-12	45,921.00	91,842.00	0.00E+00	3.55E-07	7.10E-07		
Th-230	5.8497E-08	45,921.00	91,842.00	0.00E+00	2.69E-03	5.37E-03		
Th-232	2.6906E-14	45,921.00	91,842.00	0.00E+00	1.24E-09	2.47E-09		
Ti-208	4.4336E-08	45,921.00	91,842.00	0.00E+00	2.04E-03	4.07E-03		
U-232	1.2037E-07	45,921.00	91,842.00	0.00E+00	5.53E-03	1.11E-02	Thermal Power	
U-233	3.0011E-09	45,921.00	91,842.00	0.00E+00	1.38E-04	2.76E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8497E-04	45,921.00	91,842.00	0.00E+00	8.49E+00	1.70E+01	9.71E+02	1.94E+03
U-235	-2.7235E-06	45,921.00	0.00	2.97E-01	1.72E-01	2.97E-01	Total	Total
U-236	1.5493E-05	45,921.00	91,842.00	0.00E+00	7.11E-01	1.42E+00		
U-238	-4.2851E-09	45,921.00	0.00	3.40E-03	3.20E-03	3.40E-03		
Y-90	1.7094E+00	45,921.00	91,842.00	0.00E+00	7.85E+04	1.57E+05		
Other Radionuclides					7.91E+04	1.58E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.1542461	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal	From SFD	Estimated	
	45.921.00	45.759.98	
Bounding		91.842.00	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.99	1.00	
Bounding	1.98		1.03

<sup>1</sup> Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup> Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BCD B-17 (TURKEY POINT 3)  
 SNF ID # 19  
 Fuel Units & Descr 1 - 15 X 15 ROD ARRAY  
 Heavy Metal Mass BOL=458 98kg EOL=411 809kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1975  
 Estimates as of 2010  
 Template PWR (Light Water, Zirc 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
 Template BOL Heavy Metal Mass (MT) 0 00176911  
 Template Decay Time 35 years

Estimated  
 Canister usage:  
 Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	44,857 39	89,714 78	0 00E+00	3 94E-05	7 87E-05	Avg. MeV	
Am-241	1 4352E-01	44,857 39	89,714 78	0 00E+00	6 44E+03	1 29E+04	0 0150	4 827E+15
Am-242m	2 8698E-04	44,857 39	89,714 78	0 00E+00	1 29E+01	2 57E+01	0 0250	9 734E+14
Am-243	6 2565E-04	44,857 39	89,714 78	0 00E+00	2 81E+01	5 61E+01	0 0375	9 284E+14
C-14	4 7901E-05	44,857 39	89,714 78	0 00E+00	2 15E+00	4 30E+00	0 0575	1 073E+15
Cl-36	8 0297E-07	44,857 39	89,714 78	0 00E+00	3 60E-02	7 20E-02	0 0850	5 401E+14
Cm-243	2 5081E-04	44,857 39	89,714 78	0 00E+00	1 13E+01	2 25E+01	0 1250	3 748E+14
Cm-244	4 9015E-02	44,857 39	89,714 78	0 00E+00	2 20E+03	4 40E+03	0 2250	4 632E+14
Co-60	2 5581E-03	44,857 39	89,714 78	0 00E+00	1 15E+02	2 30E+02	0 3750	1 992E+14
Cs-134	4 0536E-05	44,857 39	89,714 78	0 00E+00	1 82E+00	3 64E+00	0 5750	4 632E+15
Cs-135	1 4433E-05	44,857 39	89,714 78	0 00E+00	6 47E-01	1 29E+00	0 8500	6 408E+13
Cs-137	1 3979E+00	44,857 39	89,714 78	0 00E+00	6 27E+04	1 25E+05	1 2500	6 295E+13
Eu-154	2 0203E-02	44,857 39	89,714 78	0 00E+00	9 06E+02	1 81E+03	1 7500	1 885E+12
Eu-155	1 7684E-03	44,857 39	89,714 78	0 00E+00	7 93E+01	1 59E+02	2 2500	3 035E+08
Fe-55	4 3136E-05	44,857 39	89,714 78	0 00E+00	1 93E+00	3 87E+00	2 7500	6 219E+08
H-3	2 0769E-02	44,857 39	89,714 78	0 00E+00	9 32E+02	1 86E+03	3 5000	6 403E+07
I-129	9 8288E-07	44,857 39	89,714 78	0 00E+00	4 41E-02	8 82E-02	5 0000	2 738E+07
Kr-85	2 8214E-02	44,857 39	89,714 78	0 00E+00	1 27E+03	2 53E+03	7 0000	3 155E+06
Np-237	1 1218E-05	44,857 39	89,714 78	0 00E+00	5 03E-01	1 01E+00	11 0000	3 624E+05
Pa-231	1 3036E-09	44,857 39	89,714 78	0 00E+00	5 85E-05	1 17E-04		
Pb-210	8 5078E-11	44,857 39	89,714 78	0 00E+00	3 82E-06	7 63E-06		
Pm-147	3 6531E-04	44,857 39	89,714 78	0 00E+00	1 64E+01	3 28E+01		
Pu-238	7 4564E-02	44,857 39	89,714 78	0 00E+00	3 34E+03	6 69E+03		
Pu-239	1 1623E-02	44,857 39	89,714 78	0 00E+00	5 21E+02	1 04E+03		
Pu-240	1 5132E-02	44,857 39	89,714 78	0 00E+00	6 79E+02	1 36E+03		
Pu-241	9 0036E-01	44,857 39	89,714 78	0 00E+00	4 04E+04	8 08E+04		
Pu-242	6 4260E-05	44,857 39	89,714 78	0 00E+00	2 88E+00	5 77E+00		
Ra-226	2 2804E-10	44,857 39	89,714 78	0 00E+00	1 02E-05	2 05E-05		
Ra-228	5 2713E-12	44,857 39	89,714 78	0 00E+00	2 36E-07	4 73E-07		
Ru-106	6 1160E-10	44,857 39	89,714 78	0 00E+00	2 74E-05	5 49E-05		
Se-79	1 2377E-05	44,857 39	89,714 78	0 00E+00	5 55E-01	1 11E+00		
Sn-126	2 5210E-05	44,857 39	89,714 78	0 00E+00	1 13E+00	2 26E+00		
Sr-90	9 1667E-01	44,857 39	89,714 78	0 00E+00	4 11E+04	8 22E+04		
Tc-99	3 9357E-04	44,857 39	89,714 78	0 00E+00	1 77E+01	3 53E+01		
Th-229	1 2057E-10	44,857 39	89,714 78	0 00E+00	5 41E-06	1 08E-05		
Th-230	2 1043E-08	44,857 39	89,714 78	0 00E+00	9 44E-04	1 89E-03		
Th-232	5 2972E-12	44,857 39	89,714 78	0 00E+00	2 38E-07	4 75E-07		
Ti-208	1 7474E-07	44,857 39	89,714 78	0 00E+00	7 84E-03	1 57E-02		
U-232	4 7368E-07	44,857 39	89,714 78	0 00E+00	2 12E-02	4 25E-02		
U-233	2 5097E-08	44,857 39	89,714 78	0 00E+00	1 13E-03	2 25E-03		
U-234	5 0000E-05	44,857 39	89,714 78	0 00E+00	2 24E+00	4 49E+00		
U-235	-1 4489E-06	44,857 39	0 00	2 54E-02	0 00E+00	2 54E-02		
U-236	7 5824E-06	44,857 39	89,714 78	0 00E+00	3 40E-01	6 80E-01		
U-238	-2 6129E-07	44,857 39	0 00	1 50E-01	1 39E-01	1 50E-01		
Y-90	9 1699E-01	44,857 39	89,714 78	0 00E+00	4 11E+04	8 23E+04		
Other Radionuclides					6 02E+04	1 20E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	2 560002614	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
	11 779 72	44 857 39	
		89 714 78	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	2.79	3.81	
	5.58		1.05

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BER-II TRIGA (FLIP LEU 45/20) (GERMANY)  
 SNF ID # 236  
 Fuel Units & Descr 21 - 4 X 4 ROD ARRAY  
 Heavy Metal Mass BOL=9 196kg EOL=9 192kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1982  
 Estimates as of 2010  
 Template TRIGA-SS (LW/U-Zrx SST 10 to 20% U)  
<sup>2</sup>Template Burnup(MWd) 6 65  
 Template BOL Heavy Metal Mass (MT) 0 000195  
 Template Decay Time 25 years

Estimated  
 Canister usage  
 18"x10"  
 2 63

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	4 1459E-09	22 40	9 41	0 00E+00	9 29E-08	3 90E-08	0 0150	8 352E+11
Am-241	3 5850E-03	22 40	9 41	0 00E+00	8 03E-02	3 37E-02	0 0250	1 736E+11
Am-242m	1 2899E-06	22 40	9 41	0 00E+00	2 89E-05	1 21E-05	0 0375	1 506E+11
Am-243	1 4747E-07	22 40	9 41	0 00E+00	3 30E-06	1 39E-06	0 0575	1 622E+11
C-14	1 2839E-04	22 40	9 41	0 00E+00	2 88E-03	1 21E-03	0 0850	9 779E+10
Cl-36	2 8120E-06	22 40	9 41	0 00E+00	6 30E-05	2 65E-05	0 1250	6 383E+10
Cm-243	1 1038E-07	22 40	9 41	0 00E+00	2 47E-06	1 04E-06	0 2250	8 426E+10
Cm-244	7 8917E-07	22 40	9 41	0 00E+00	1 77E-05	7 42E-06	0 3750	3 672E+10
Co-60	9 2647E-02	22 40	9 41	0 00E+00	2 08E+00	8 72E-01	0 5750	6 087E+11
Cs-134	1 0940E-04	22 40	9 41	0 00E+00	2 45E-03	1 03E-03	0 8500	6 536E+09
Cs-135	3 2195E-05	22 40	9 41	0 00E+00	7 21E-04	3 03E-04	1 2500	6 711E+10
Cs-137	1 7368E+00	22 40	9 41	0 00E+00	3 89E+01	1 63E+01	1 7500	1 701E+08
Eu-154	3 0677E-03	22 40	9 41	0 00E+00	6 87E-02	2 89E-02	2 2500	3 587E+05
Eu-155	1 7925E-03	22 40	9 41	0 00E+00	4 02E-02	1 69E-02	2 7500	6 076E+03
Fe-55	3 7444E-03	22 40	9 41	0 00E+00	8 39E-02	3 52E-02	3 5000	2 206E+01
H-3	3 6180E-03	22 40	9 41	0 00E+00	8 10E-02	3 40E-02	5 0000	8 961E+00
I-129	7 3684E-07	22 40	9 41	0 00E+00	1 65E-05	6 93E-06	7 0000	1 020E+00
Kr-85	6 9368E-02	22 40	9 41	0 00E+00	1 55E+00	6 53E-01	11 0000	1 165E-01
Np-237	1 2662E-06	22 40	9 41	0 00E+00	2 84E-05	1 19E-05		
Pa-231	9 1654E-09	22 40	9 41	0 00E+00	2 05E-07	8 62E-08		
Pb-210	1 3728E-13	22 40	9 41	0 00E+00	3 08E-12	1 29E-12		
Pm-147	1 0702E-02	22 40	9 41	0 00E+00	2 40E-01	1 01E-01		
Pu-238	8 8692E-04	22 40	9 41	0 00E+00	1 99E-02	8 34E-03		
Pu-239	5 5263E-03	22 40	9 41	0 00E+00	1 24E-01	5 20E-02		
Pu-240	2 1233E-03	22 40	9 41	0 00E+00	4 76E-02	2 00E-02		
Pu-241	3 8962E-02	22 40	9 41	0 00E+00	8 73E-01	3 67E-01		
Pu-242	2 3128E-07	22 40	9 41	0 00E+00	5 18E-06	2 18E-06		
Ra-226	4 6752E-13	22 40	9 41	0 00E+00	1 05E-11	4 40E-12		
Ra-228	2 4827E-10	22 40	9 41	0 00E+00	5 56E-09	2 34E-09		
Ru-106	9 8526E-08	22 40	9 41	0 00E+00	2 21E-06	9 27E-07		
Se-79	1 3015E-05	22 40	9 41	0 00E+00	2 92E-04	1 22E-04		
Sn-126	1 2165E-05	22 40	9 41	0 00E+00	2 73E-04	1 14E-04		
Sr-90	1 6195E+00	22 40	9 41	0 00E+00	3 63E+01	1 52E+01		
Tc-99	4 4241E-04	22 40	9 41	0 00E+00	9 91E-03	4 16E-03		
Th-229	4 2451E-10	22 40	9 41	0 00E+00	9 51E-09	3 99E-09		
Th-230	6 1398E-11	22 40	9 41	0 00E+00	1 38E-09	5 78E-10		
Th-232	2 5278E-10	22 40	9 41	0 00E+00	5 66E-09	2 38E-09		
Th-208	1 5098E-08	22 40	9 41	0 00E+00	3 38E-07	1 42E-07		
U-232	4 0662E-08	22 40	9 41	0 00E+00	9 11E-07	3 83E-07	Thermal Power	
U-233	1 2217E-07	22 40	9 41	0 00E+00	2 74E-06	1 15E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	2 2391E-07	22 40	9 41	0 00E+00	5 02E-06	2 11E-06	4 76E-01	2 00E-01
U-235	-2 6194E-06	22 40	0 00	8 75E-03	8 69E-03	8 75E-03	Total	Total
U-236	1 2695E-05	22 40	9 41	0 00E+00	2 84E-04	1 19E-04		
U-238	-3 6331E-08	22 40	0 00	1 73E-03	1 73E-03	1 73E-03		
Y-90	1 6195E+00	22 40	9 41	0 00E+00	3 63E+01	1 52E+01		
Other Radionuclides					3 85E+01	1 62E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	This Template was used for the following reasons
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment.
BOL HM Constituents	U	U	
BOL Enrichment %	44 026	10 to 20 1	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal	22 40	4 01	Nominal burnup taken directly from SFD (converted to MWd)
Bounding	9 41	8 02	Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0 07	0 18	1 00
Bounding	0 03	0 85	

\*Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BMI (CPI-24)  
SNF ID # 774  
Fuel Units & Descr 2 - CANISTER OF SCRAP  
Heavy Metal Mass BOL= , EOL=0.559kg  
ROD Storage Site INEEL

Fuel decay start date: 1961  
Estimates as of 2010  
Template Pathfinder (Light Water, SST, 60 to 100%, U)  
Template Burnup(MWd): 6.01  
Template BOL Heavy Metal Mass (MT): 0.00012882  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x10"  
0.15

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	528.25	528.25	0.00E+00	1.23E-05	1.23E-05	Avg MeV	
Am-241	1.1135E-04	528.25	528.25	0.00E+00	5.88E-02	5.88E-02	0.0150	3.943E+13
Am-242m	8.5075E-09	528.25	528.25	0.00E+00	4.49E-06	4.49E-06	0.0250	8.193E+12
Am-243	9.8519E-10	528.25	528.25	0.00E+00	5.20E-07	5.20E-07	0.0375	7.087E+12
C-14	2.3012E-04	528.25	528.25	0.00E+00	1.22E-01	1.22E-01	0.0575	7.639E+12
Cl-36	1.2261E-06	528.25	528.25	0.00E+00	6.48E-04	6.48E-04	0.0850	4.615E+12
Cm-243	2.4875E-10	528.25	528.25	0.00E+00	1.31E-07	1.31E-07	0.1250	2.997E+12
Cm-244	2.3178E-09	528.25	528.25	0.00E+00	1.22E-06	1.22E-06	0.2250	3.973E+12
Co-60	7.0849E-02	528.25	528.25	0.00E+00	3.74E+01	3.74E+01	0.3750	1.733E+12
Cs-134	3.0266E-06	528.25	528.25	0.00E+00	1.60E-03	1.60E-03	0.5750	2.854E+13
Cs-135	3.0316E-05	528.25	528.25	0.00E+00	1.60E-02	1.60E-02	0.8500	2.889E+11
Cs-137	1.4511E+00	528.25	528.25	0.00E+00	7.67E+02	7.67E+02	1.2500	2.872E+12
Eu-154	6.6955E-04	528.25	528.25	0.00E+00	3.54E-01	3.54E-01	1.7500	7.453E+09
Eu-155	6.9850E-04	528.25	528.25	0.00E+00	3.69E-01	3.69E-01	2.2500	1.547E+07
Fe-55	1.2318E-03	528.25	528.25	0.00E+00	6.51E-01	6.51E-01	2.7500	4.473E+05
H-3	2.5141E-03	528.25	528.25	0.00E+00	1.33E+00	1.33E+00	3.5000	3.154E+01
I-129	7.3195E-07	528.25	528.25	0.00E+00	3.87E-04	3.87E-04	5.0000	1.297E+01
Kr-85	4.1281E-02	528.25	528.25	0.00E+00	2.18E+01	2.18E+01	7.0000	1.432E+00
Np-237	1.1489E-06	528.25	528.25	0.00E+00	6.07E-04	6.07E-04	11.0000	1.607E-01
Pa-231	4.5241E-08	528.25	528.25	0.00E+00	2.39E-05	2.39E-05		
Pb-210	6.4476E-13	528.25	528.25	0.00E+00	3.41E-10	3.41E-10		
Pm-147	1.1651E-03	528.25	528.25	0.00E+00	6.15E-01	6.15E-01		
Pu-238	2.9517E-04	528.25	528.25	0.00E+00	1.56E-01	1.56E-01		
Pu-239	6.6772E-04	528.25	528.25	0.00E+00	3.53E-01	3.53E-01		
Pu-240	8.6839E-05	528.25	528.25	0.00E+00	4.59E-02	4.59E-02		
Pu-241	7.1514E-04	528.25	528.25	0.00E+00	3.78E-01	3.78E-01		
Pu-242	1.9717E-09	528.25	528.25	0.00E+00	1.04E-06	1.04E-06		
Ra-226	1.7654E-12	528.25	528.25	0.00E+00	9.33E-10	9.33E-10		
Ra-228	8.2928E-12	528.25	528.25	0.00E+00	4.38E-09	4.38E-09		
Ru-106	1.8419E-10	528.25	528.25	0.00E+00	9.73E-08	9.73E-08		
Se-79	1.3223E-05	528.25	528.25	0.00E+00	6.98E-03	6.98E-03		
Sn-126	1.1493E-05	528.25	528.25	0.00E+00	6.07E-03	6.07E-03		
Sr-90	1.3649E+00	528.25	528.25	0.00E+00	7.21E+02	7.21E+02		
Tc-99	4.6656E-04	528.25	528.25	0.00E+00	2.46E-01	2.46E-01		
Th-229	1.4547E-11	528.25	528.25	0.00E+00	7.68E-09	7.68E-09		
Th-230	1.6617E-10	528.25	528.25	0.00E+00	8.78E-08	8.78E-08		
Th-232	8.3361E-12	528.25	528.25	0.00E+00	4.40E-09	4.40E-09		
Ti-208	2.1664E-08	528.25	528.25	0.00E+00	1.14E-05	1.14E-05		
U-232	5.8669E-08	528.25	528.25	0.00E+00	3.10E-05	3.10E-05		
U-233	3.1847E-09	528.25	528.25	0.00E+00	1.68E-06	1.68E-06		
U-234	3.8769E-07	528.25	528.25	0.00E+00	2.05E-04	2.05E-04		
U-235	-2.7761E-06	528.25	0.00	2.26E-03	7.92E-04	2.26E-03		
U-236	1.6190E-05	528.25	528.25	0.00E+00	8.55E-03	8.55E-03		
U-238	-2.8547E-09	528.25	0.00	2.44E-05	2.29E-05	2.44E-05		
Y-90	1.3652E+00	528.25	528.25	0.00E+00	7.21E+02	7.21E+02		
Other Radionuclides					8.72E+02	8.72E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	U	U	
BOL Enrichment %		60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		528.25	Nominal burnup set equal to bounding burnup
Bounding		528.25	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	10 12		1.02
Bounding	10 12		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BMI (CPI 38)  
SNF ID #: 20  
Fuel Units & Descr: 1 - CANISTER OF SCRAP  
Heavy Metal Mass BOL= EOL=1.286kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1961  
Estimates as of 2010  
Template Pathfinder (Light Water SST 60 to 100% U)  
<sup>2</sup>Template Burnup(MWd) 6 01  
Template BOL Heavy Metal Mass (MT) 0.00012882  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x10"  
0.08

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	1.215 10	1.215 10	0.00E+00	2.84E-05	2.84E-05	Avg MeV	
Am-241	1.1135E-04	1.215 10	1.215 10	0.00E+00	1.35E-01	1.35E-01	0.0150	9.069E+13
Am-242m	8.5075E-09	1.215 10	1.215 10	0.00E+00	1.03E-05	1.03E-05	0.0250	1.885E+13
Am-243	9.8519E-10	1.215 10	1.215 10	0.00E+00	1.20E-06	1.20E-06	0.0375	1.630E+13
C-14	2.3012E-04	1.215 10	1.215 10	0.00E+00	2.80E-01	2.80E-01	0.0575	1.757E+13
Cl-36	1.2261E-06	1.215 10	1.215 10	0.00E+00	1.49E-03	1.49E-03	0.0850	1.062E+13
Cm-243	2.4875E-10	1.215 10	1.215 10	0.00E+00	3.02E-07	3.02E-07	0.1250	6.893E+12
Cm-244	2.3178E-09	1.215 10	1.215 10	0.00E+00	2.82E-06	2.82E-06	0.2250	9.138E+12
Co-60	7.0849E-02	1.215 10	1.215 10	0.00E+00	8.61E+01	8.61E+01	0.3750	3.986E+12
Cs-134	3.0266E-06	1.215 10	1.215 10	0.00E+00	3.68E-03	3.68E-03	0.5750	6.566E+13
Cs-135	3.0316E-05	1.215 10	1.215 10	0.00E+00	3.68E-02	3.68E-02	0.8500	6.646E+11
Cs-137	1.4511E+00	1.215 10	1.215 10	0.00E+00	1.76E+03	1.76E+03	1.2500	6.606E+12
Eu-154	6.6955E-04	1.215 10	1.215 10	0.00E+00	8.14E-01	8.14E-01	1.7500	1.714E+10
Eu-155	6.9850E-04	1.215 10	1.215 10	0.00E+00	8.49E-01	8.49E-01	2.2500	3.559E+07
Fe-55	1.2318E-03	1.215 10	1.215 10	0.00E+00	1.50E+00	1.50E+00	2.7500	1.029E+06
H-3	2.5141E-03	1.215 10	1.215 10	0.00E+00	3.05E+00	3.05E+00	3.5000	7.255E+01
I-129	7.3195E-07	1.215 10	1.215 10	0.00E+00	8.89E-04	8.89E-04	5.0000	2.984E+01
Kr-85	4.1281E-02	1.215 10	1.215 10	0.00E+00	5.02E+01	5.02E+01	7.0000	3.295E+00
Np-237	1.1489E-06	1.215 10	1.215 10	0.00E+00	1.40E-03	1.40E-03	11.0000	3.697E-01
Pa-231	4.5241E-08	1.215 10	1.215 10	0.00E+00	5.50E-05	5.50E-05		
Pb-210	6.4476E-13	1.215 10	1.215 10	0.00E+00	7.83E-10	7.83E-10		
Pm-147	1.1651E-03	1.215 10	1.215 10	0.00E+00	1.42E+00	1.42E+00		
Pu-238	2.9517E-04	1.215 10	1.215 10	0.00E+00	3.59E-01	3.59E-01		
Pu-239	6.6772E-04	1.215 10	1.215 10	0.00E+00	8.11E-01	8.11E-01		
Pu-240	8.6839E-05	1.215 10	1.215 10	0.00E+00	1.06E-01	1.06E-01		
Pu-241	7.1514E-04	1.215 10	1.215 10	0.00E+00	8.69E-01	8.69E-01		
Pu-242	1.9717E-09	1.215 10	1.215 10	0.00E+00	2.40E-06	2.40E-06		
Ra-226	1.7654E-12	1.215 10	1.215 10	0.00E+00	2.15E-09	2.15E-09		
Ra-228	8.2928E-12	1.215 10	1.215 10	0.00E+00	1.01E-08	1.01E-08		
Ru-106	1.8419E-10	1.215 10	1.215 10	0.00E+00	2.24E-07	2.24E-07		
Se-79	1.3223E-05	1.215 10	1.215 10	0.00E+00	1.61E-02	1.61E-02		
Sn-126	1.1493E-05	1.215 10	1.215 10	0.00E+00	1.40E-02	1.40E-02		
Sr-90	1.3649E+00	1.215 10	1.215 10	0.00E+00	1.66E+03	1.66E+03		
Tc-99	4.6656E-04	1.215 10	1.215 10	0.00E+00	5.67E-01	5.67E-01		
Th-229	1.4547E-11	1.215 10	1.215 10	0.00E+00	1.77E-08	1.77E-08		
Th-230	1.6617E-10	1.215 10	1.215 10	0.00E+00	2.02E-07	2.02E-07		
Th-232	8.3361E-12	1.215 10	1.215 10	0.00E+00	1.01E-08	1.01E-08		
Ti-208	2.1664E-08	1.215 10	1.215 10	0.00E+00	2.63E-05	2.63E-05		
U-232	5.8669E-08	1.215 10	1.215 10	0.00E+00	7.13E-05	7.13E-05		
U-233	3.1847E-09	1.215 10	1.215 10	0.00E+00	3.87E-06	3.87E-06		
U-234	3.8769E-07	1.215 10	1.215 10	0.00E+00	4.71E-04	4.71E-04		
U-235	2.7761E-06	1.215 10	0.00	5.20E-03	1.82E-03	5.20E-03		
U-236	1.6190E-05	1.215 10	1.215 10	0.00E+00	1.97E-02	1.97E-02		
U-238	2.8547E-09	1.215 10	0.00	5.62E-05	5.27E-05	5.62E-05		
Y-90	1.3652E+00	1.215 10	1.215 10	0.00E+00	1.66E+03	1.66E+03		
Other Radionuclides					2.01E+03	2.01E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	HASTELLOY	SST	This fuel matches on all parameters except cladding (SST is conservative) and enrichment (unknown)
BOL HM Constituents	U	U	
BOL Enrichment %		60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		1.215 10	Nominal burnup set equal to bounding burnup
Bounding		1.215 10	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	10 12		1.02
Bounding	10 12		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BORAX V (SUPERHEATER)  
 SNF ID # 22  
 Fuel Units & Descr 36 - 20 FLAT PLATES  
 Heavy Metal Mass BOL=22 014kg EOL=20 833kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1964  
 Estimates as of: 2010  
 Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 6 01  
 Template BOL Heavy Metal Mass (MT): 0 00012882  
 Template Decay Time: 35 years

Estimated  
 Canister usage  
 18"x10"  
 2 00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 3344E-08	1,115 44	2,230 88	0 00E+00	2 60E-05	5,21E-05	Avg MeV	
Am-241	1 1135E-04	1,115 44	2,230 88	0 00E+00	1 24E-01	2 48E-01	0 0150	1 665E+14
Am-242m	8 5075E-09	1,115 44	2,230 88	0 00E+00	9 49E-06	1,90E-05	0 0250	3 460E+13
Am-243	9 8519E-10	1,115 44	2,230 88	0 00E+00	1 10E-06	2,20E-06	0 0375	2 993E+13
C-14	2 3012E-04	1,115 44	2,230 88	0 00E+00	2 57E-01	5,13E-01	0 0575	3,226E+13
Cl-36	1 2261E-06	1,115 44	2,230 88	0 00E+00	1 37E-03	2,74E-03	0 0850	1 949E+13
Cm-243	2 4875E-10	1,115 44	2,230 88	0 00E+00	2 77E-07	5 55E-07	0 1250	1,266E+13
Cm-244	2 3178E-09	1,115 44	2,230 88	0 00E+00	2 59E-06	5 17E-06	0 2250	1,678E+13
Co-60	7 0849E-02	1,115 44	2,230 88	0 00E+00	7 90E+01	1 58E+02	0 3750	7 318E+12
Cs-134	3 0266E-06	1,115 44	2,230 88	0 00E+00	3 38E-03	6 75E-03	0 5750	1,205E+14
Cs-135	3 0316E-05	1,115 44	2,230 88	0 00E+00	3 38E-02	6 76E-02	0 8500	1,220E+12
Cs-137	1 4511E+00	1,115 44	2,230 88	0 00E+00	1 62E+03	3 24E+03	1 2500	1,213E+13
Eu-154	6 6955E-04	1,115 44	2,230 88	0 00E+00	7 47E-01	1 49E+00	1 7500	3,147E+10
Eu-155	6 9850E-04	1,115 44	2,230 88	0 00E+00	7 79E-01	1 56E+00	2 2500	6 535E+07
Fe-55	1,2318E-03	1,115 44	2,230 88	0 00E+00	1,37E+00	2 75E+00	2 7500	1 889E+06
H-3	2 5141E-03	1,115 44	2,230 88	0 00E+00	2 80E+00	5 61E+00	3 5000	1 366E+02
I-129	7 3195E-07	1,115 44	2,230 88	0 00E+00	8,16E-04	1 63E-03	5 0000	5 621E+01
Kr-85	4 1281E-02	1,115 44	2,230 88	0 00E+00	4 60E+01	9 21E+01	7 0000	6 209E+00
Np-237	1 1489E-06	1,115 44	2,230 88	0 00E+00	1,28E-03	2 56E-03	11 0000	6 970E-01
Pa-231	4 5241E-08	1,115 44	2,230 88	0 00E+00	5 05E-05	1 01E-04		
Pb-210	6 4476E-13	1,115 44	2,230 88	0 00E+00	7 19E-10	1 44E-09		
Pm-147	1 1651E-03	1,115 44	2,230 88	0 00E+00	1 30E+00	2 60E+00		
Pu-238	2 9517E-04	1,115 44	2,230 88	0 00E+00	3 29E-01	6 58E-01		
Pu-239	6 6772E-04	1,115 44	2,230 88	0 00E+00	7 45E-01	1 49E+00		
Pu-240	8 6839E-05	1,115 44	2,230 88	0 00E+00	9 69E-02	1 94E-01		
Pu-241	7 1514E-04	1,115 44	2,230 88	0 00E+00	7 98E-01	1 60E+00		
Pu-242	1 9717E-09	1,115 44	2,230 88	0 00E+00	2 20E-06	4 40E-06		
Ra-226	1 7654E-12	1,115 44	2,230 88	0 00E+00	1 97E-09	3,94E-09		
Ra-228	8 2928E-12	1,115 44	2,230 88	0 00E+00	9 25E-09	1 85E-08		
Ru-106	1 8419E-10	1,115 44	2,230 88	0 00E+00	2 05E-07	4,11E-07		
Se-79	1 3223E-05	1,115 44	2,230 88	0 00E+00	1 47E-02	2 95E-02		
Sn-126	1,1493E-05	1,115 44	2,230 88	0 00E+00	1 28E-02	2 56E-02		
Sr-90	1 3849E+00	1,115 44	2,230 88	0 00E+00	1 52E+03	3 04E+03		
Tc-99	4 6656E-04	1,115 44	2,230 88	0 00E+00	5 20E-01	1 04E+00		
Th-229	1 4547E-11	1,115 44	2,230 88	0 00E+00	1 62E-08	3,25E-08		
Th-230	1 6617E-10	1,115 44	2,230 88	0 00E+00	1 85E-07	3 71E-07		
Th-232	8 3361E-12	1,115 44	2,230 88	0 00E+00	9 30E-09	1 86E-08		
Ti-208	2,1664E-08	1,115 44	2,230 88	0 00E+00	2,42E-05	4 83E-05		
U-232	5 8669E-08	1,115 44	2,230 88	0 00E+00	6,54E-05	1 31E-04		
U-233	3,1847E-09	1,115 44	2,230 88	0 00E+00	3 55E-06	7 10E-06		
U-234	3 8769E-07	1,115 44	2,230 88	0 00E+00	4 32E-04	8 65E-04		
U-235	-2,7761E-06	1,115 44	0 00	4 42E-02	4 11E-02	4 42E-02		
U-236	1 6190E-05	1,115 44	2,230 88	0 00E+00	1 81E-02	3 61E-02		
U-238	-2 8547E-09	1,115 44	0 00	5 18E-04	5 15E-04	5 18E-04		
Y-90	1 3652E+00	1,115 44	2,230 88	0 00E+00	1 52E+03	3 05E+03		
Other Radionuclides					1 84E+03	3 68E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93 00081766	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		1 115 44	
Bounding		2,230 88	

Nominal burnup calculated from the heavy metal mass destroyed.  
 Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1 09		
Bounding	2,17		

1 00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BR 3  
SNF ID # 927  
Fuel Units & Descr 16 ROD  
Heavy Metal Mass BOL=5.6kg EOL=5.11kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1981  
Estimates as of 2010  
Template PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
1.00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	465.59	931.17	0.00E+00	3.09E-07	6.18E-07	Avg MeV	
Am-241	1.3144E-01	465.59	931.17	0.00E+00	6.12E+01	1.22E+02	0.0150	6.332E+13
Am-242m	3.0039E-04	465.59	931.17	0.00E+00	1.40E-01	2.80E-01	0.0250	1.282E+13
Am-243	6.2629E-04	465.59	931.17	0.00E+00	2.92E-01	5.83E-01	0.0375	1.241E+13
C-14	4.7965E-05	465.59	931.17	0.00E+00	2.23E-02	4.47E-02	0.0575	1.354E+13
Cl-36	8.0297E-07	465.59	931.17	0.00E+00	3.74E-04	7.48E-04	0.0850	7.175E+12
Co-243	3.1993E-04	465.59	931.17	0.00E+00	1.49E-01	2.98E-01	0.1250	5.241E+12
Co-244	7.1851E-02	465.59	931.17	0.00E+00	3.35E+01	6.69E+01	0.2250	6.159E+12
Co-60	9.5220E-03	465.59	931.17	0.00E+00	4.43E+00	8.87E+00	0.3750	2.643E+12
Cs-134	1.1662E-03	465.59	931.17	0.00E+00	5.43E-01	1.09E+00	0.5750	6.073E+13
Cs-135	1.4433E-05	465.59	931.17	0.00E+00	6.72E-03	1.34E-02	0.8500	1.199E+12
Cs-137	1.7603E+00	465.59	931.17	0.00E+00	8.20E+02	1.64E+03	1.2500	1.619E+12
Eu-154	4.5203E-02	465.59	931.17	0.00E+00	2.10E+01	4.21E+01	1.7500	3.548E+10
Eu-155	7.1479E-03	465.59	931.17	0.00E+00	3.33E+00	6.66E+00	2.2500	6.552E+06
Fe-55	6.1919E-04	465.59	931.17	0.00E+00	2.88E-01	5.77E-01	2.7500	7.365E+06
H-3	3.6386E-02	465.59	931.17	0.00E+00	1.69E+01	3.39E+01	3.5000	9.650E+05
I-129	9.8288E-07	465.59	931.17	0.00E+00	4.58E-04	9.15E-04	5.0000	4.124E+05
Kr-85	5.3844E-02	465.59	931.17	0.00E+00	2.51E+01	5.01E+01	7.0000	4.755E+04
Np-237	1.0546E-05	465.59	931.17	0.00E+00	4.91E-03	9.82E-03	11.0000	5.462E+03
Pa-231	1.1370E-09	465.59	931.17	0.00E+00	5.29E-07	1.06E-06		
Pb-210	3.3624E-11	465.59	931.17	0.00E+00	1.57E-08	3.13E-08		
Pm-147	5.1211E-03	465.59	931.17	0.00E+00	2.38E+00	4.77E+00		
Pu-238	8.0669E-02	465.59	931.17	0.00E+00	3.76E+01	7.51E+01		
Pu-239	1.1626E-02	465.59	931.17	0.00E+00	5.41E+00	1.08E+01		
Pu-240	1.5097E-02	465.59	931.17	0.00E+00	7.03E+00	1.41E+01		
Pu-241	1.4567E+00	465.59	931.17	0.00E+00	6.78E+02	1.36E+03		
Pu-242	6.4260E-05	465.59	931.17	0.00E+00	2.99E-02	5.98E-02		
Ra-226	1.1392E-10	465.59	931.17	0.00E+00	5.30E-08	1.06E-07		
Ra-228	5.1841E-12	465.59	931.17	0.00E+00	2.41E-09	4.83E-09		
Ru-106	5.9012E-07	465.59	931.17	0.00E+00	2.75E-04	5.50E-04		
Se-79	1.2379E-05	465.59	931.17	0.00E+00	5.76E-03	1.15E-02		
Sn-126	2.5210E-05	465.59	931.17	0.00E+00	1.17E-02	2.35E-02		
Sr-90	1.1630E+00	465.59	931.17	0.00E+00	5.41E+02	1.08E+03		
Tc-99	3.9357E-04	465.59	931.17	0.00E+00	1.83E-01	3.66E-01		
Th-229	8.5691E-11	465.59	931.17	0.00E+00	3.99E-08	7.98E-08		
Th-230	1.4493E-08	465.59	931.17	0.00E+00	6.75E-06	1.35E-05		
Th-232	5.2923E-12	465.59	931.17	0.00E+00	2.46E-09	4.93E-09		
Th-208	1.9202E-07	465.59	931.17	0.00E+00	8.94E-05	1.79E-04		
U-232	5.2083E-07	465.59	931.17	0.00E+00	2.42E-04	4.85E-04		
U-233	2.4386E-08	465.59	931.17	0.00E+00	1.14E-05	2.27E-05		
U-234	4.7012E-05	465.59	931.17	0.00E+00	2.19E-02	4.38E-02		
U-235	-1.4492E-06	465.59	0.00	3.46E-03	2.78E-03	3.46E-03		
U-236	7.5759E-06	465.59	931.17	0.00E+00	3.53E-03	7.05E-03		
U-238	-2.6129E-07	465.59	0.00	1.34E-03	1.22E-03	1.34E-03		
Y-90	1.1631E+00	465.59	931.17	0.00E+00	5.42E+02	1.08E+03		
Other Radionuclides					7.87E+02	1.57E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.28E+01	2.55E+01
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	This Template was used for the following reasons:
Fuel Cladding	ZIRC	ZIRC	This fuel matches on all parameters except enrichment
BOL HM Constituents	U	U	
BOL Enrichment %	28.57142857	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		465.59	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		931.17	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	2.38		1.00
Bounding	4.75		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping, or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: BR-3 FUEL  
SNF ID #: 340  
Fuel Units & Descr: 16 - ROD  
Heavy Metal Mass: BOL=7 536kg EOL=7 064kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 1994  
Estimates as of 2010  
Template PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x10"  
0 12

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4 2135E-10	448 85	897 70	0 00E+00	1 89E-07	3 78E-07	Avg MeV	
Am-241	1 0257E-01	448 85	897 70	0 00E+00	4 60E+01	9 21E+01	0 0150	7 763E+13
Am-242m	3 1444E-04	448 85	897 70	0 00E+00	1 41E-01	2 82E-01	0 0250	1 599E+13
Am-243	6 2694E-04	448 85	897 70	0 00E+00	2 81E-01	5 63E-01	0 0375	1 575E+13
C-14	4 8030E-05	448 85	897 70	0 00E+00	2 16E-02	4 31E-02	0 0575	1 596E+13
Cl-36	8 0313E-07	448 85	897 70	0 00E+00	3 60E-04	7 21E-04	0 0850	9 022E+12
Cm-243	4 0795E-04	448 85	897 70	0 00E+00	1 83E-01	3 66E-01	0 1250	7 131E+12
Cm-244	1 0533E-01	448 85	897 70	0 00E+00	4 73E+01	9 46E+01	0 2250	7 690E+12
Co-60	3 5449E-02	448 85	897 70	0 00E+00	1 59E+01	3 18E+01	0 3750	3 388E+12
Cs-134	3 3543E-02	448 85	897 70	0 00E+00	1 51E+01	3 01E+01	0 5750	7 544E+13
Cs-135	1 4433E-05	448 85	897 70	0 00E+00	6 48E-03	1 30E-02	0 8500	3 098E+12
Cs-137	2 2190E+00	448 85	897 70	0 00E+00	9 96E+02	1 99E+03	1 2500	4 362E+12
Eu-154	1 0111E-01	448 85	897 70	0 00E+00	4 54E+01	9 08E+01	1 7500	6 645E+10
Eu-155	2 8892E-02	448 85	897 70	0 00E+00	1 30E+01	2 59E+01	2 2500	5 701E+07
Fe-55	8 8889E-03	448 85	897 70	0 00E+00	3 99E+00	7 98E+00	2 7500	1 205E+07
H-3	6 3727E-02	448 85	897 70	0 00E+00	2 86E+01	5 72E+01	3 5000	1 885E+06
I-129	9 8288E-07	448 85	897 70	0 00E+00	4 41E-04	8 82E-04	5 0000	5 789E+05
Kr-85	1 0276E-01	448 85	897 70	0 00E+00	4 61E+01	9 22E+01	7 0000	6 674E+04
Np-237	9 9693E-06	448 85	897 70	0 00E+00	4 47E-03	8 95E-03	11 0000	7 667E+03
Pa-231	9 7028E-10	448 85	897 70	0 00E+00	4 36E-07	8 71E-07		
Pb-210	8 0862E-12	448 85	897 70	0 00E+00	3 63E-09	7 26E-09		
Pm-147	7 1786E-02	448 85	897 70	0 00E+00	3 22E+01	6 44E+01		
Pu-238	8 7274E-02	448 85	897 70	0 00E+00	3 92E+01	7 83E+01		
Pu-239	1 1630E-02	448 85	897 70	0 00E+00	5 22E+00	1 04E+01		
Pu-240	1 5016E-02	448 85	897 70	0 00E+00	6 74E+00	1 35E+01		
Pu-241	2 3563E+00	448 85	897 70	0 00E+00	1 06E+03	2 12E+03		
Pu-242	6 4260E-05	448 85	897 70	0 00E+00	2 88E-02	5 77E-02		
Ra-226	4 0407E-11	448 85	897 70	0 00E+00	1 81E-08	3 63E-08		
Ra-228	4 7917E-12	448 85	897 70	0 00E+00	2 15E-09	4 30E-09		
Ru-106	5 6928E-04	448 85	897 70	0 00E+00	2 56E-01	5 11E-01		
Se-79	1 2380E-05	448 85	897 70	0 00E+00	5 56E-03	1 11E-02		
Sn-126	2 5210E-05	448 85	897 70	0 00E+00	1 13E-02	2 26E-02		
Sr-90	1 4751E+00	448 85	897 70	0 00E+00	6 62E+02	1 32E+03		
Tc-99	3 9357E-04	448 85	897 70	0 00E+00	1 77E-01	3 53E-01		
Th-229	5 1744E-11	448 85	897 70	0 00E+00	2 32E-08	4 65E-08		
Th-230	8 3721E-09	448 85	897 70	0 00E+00	3 76E-06	7 52E-06		
Th-232	5 2859E-12	448 85	897 70	0 00E+00	2 37E-09	4 75E-09		
Th-208	2 0397E-07	448 85	897 70	0 00E+00	9 16E-05	1 83E-04		
U-232	5 6638E-07	448 85	897 70	0 00E+00	2 54E-04	5 08E-04		
U-233	2 3708E-08	448 85	897 70	0 00E+00	1 06E-05	2 13E-05		
U-234	4 3653E-05	448 85	897 70	0 00E+00	1 96E-02	3 92E-02		
U-235	-1 4494E-06	448 85	0 00	1 35E-03	6 98E-04	1 35E-03		
U-236	7 5694E-06	448 85	897 70	0 00E+00	3 40E-03	6 80E-03		
U-238	-2 6129E-07	448 85	0 00	2 32E-03	2 21E-03	2 32E-03		
Y-90	1 4755E+00	448 85	897 70	0 00E+00	6 62E+02	1 32E+03		
Other Radionuclides					9 60E+02	1 92E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

Reactor Moderator	From SFD	Used	Basis for Parameter Differences
Fuel Cladding	LIGHT WATER	LIGHT WATER	
BOL HM Constituents	ZIRC	ZIRC	
BOL Enrichment %	U	U	
	8.280254777	0 to 5	This Template was used for the following reasons This fuel matches PWR Template on all but one parameter (enrichment) making PWR a reasonable match.

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	293 90	448 85	
Bounding	316 51	897 70	
			Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1 70	1 53	
Bounding	3 40	2 84	
			1 00

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: BRP-B  
SNF ID #: 23  
Fuel Units & Descr 2 - 11 X 11 ROD ARRAY  
Heavy Metal Mass BOL=262 681kg EOL=250 073kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
Estimates as of 2010  
Template PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time: 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	8 7758E-10	11,990 37	23,980 74	0 00E+00	1 05E-05	2 10E-05	Avg MeV	
Am-241	1 4352E-01	11,990 37	23,980 74	0 00E+00	1 72E+03	3 44E+03	0 0150	1 290E+15
Am-242m	2 8698E-04	11,990 37	23,980 74	0 00E+00	3 44E+00	6 88E+00	0 0250	2 602E+14
Am-243	6 2565E-04	11,990 37	23,980 74	0 00E+00	7 50E+00	1 50E+01	0 0375	2 482E+14
C-14	4 7901E-05	11,990 37	23,980 74	0 00E+00	5 74E-01	1 15E+00	0 0575	2 867E+14
Cl-36	8 0297E-07	11,990 37	23,980 74	0 00E+00	9 63E-03	1 93E-02	0 0850	1 444E+14
Cm-243	2 5081E-04	11,990 37	23,980 74	0 00E+00	3 01E+00	6 01E+00	0 1250	1 002E+14
Cm-244	4 9015E-02	11,990 37	23,980 74	0 00E+00	5 88E+02	1 18E+03	0 2250	1 238E+14
Co-60	2 5581E-03	11,990 37	23,980 74	0 00E+00	3 07E+01	6 13E+01	0 3750	5 324E+13
Cs-134	4 0536E-05	11,990 37	23,980 74	0 00E+00	4 86E-01	9 72E-01	0 5750	1 238E+15
Cs-135	1 4433E-05	11,990 37	23,980 74	0 00E+00	1 73E-01	3 46E-01	0 8500	1 713E+13
Cs-137	1 3979E+00	11,990 37	23,980 74	0 00E+00	1 68E+04	3 35E+04	1 2500	1 683E+13
Eu-154	2 0203E-02	11,990 37	23,980 74	0 00E+00	2 42E+02	4 84E+02	1 7500	5 039E+11
Eu-155	1 7684E-03	11,990 37	23,980 74	0 00E+00	2 12E+01	4 24E+01	2 2500	8 113E+07
Fe-55	4 3136E-05	11,990 37	23,980 74	0 00E+00	5 17E-01	1 03E+00	2 7500	1 662E+08
H-3	2 0769E-02	11,990 37	23,980 74	0 00E+00	2 49E+02	4 98E+02	3 5000	1 712E+07
I-129	9 8288E-07	11,990 37	23,980 74	0 00E+00	1 18E-02	2 36E-02	5 0000	7 318E+06
Kr-85	2 8214E-02	11,990 37	23,980 74	0 00E+00	3 38E+02	6 77E+02	7 0000	8 434E+05
Np-237	1 1218E-05	11,990 37	23,980 74	0 00E+00	1 35E-01	2 69E-01	11 0000	9 687E+04
Pa-231	1 3036E-09	11,990 37	23,980 74	0 00E+00	1 56E-05	3 13E-05		
Pb-210	8 5078E-11	11,990 37	23,980 74	0 00E+00	1 02E-06	2 04E-06		
Pm-147	3 6531E-04	11,990 37	23,980 74	0 00E+00	4 38E+00	8 76E+00		
Pu-238	7 4564E-02	11,990 37	23,980 74	0 00E+00	8 94E+02	1 79E+03		
Pu-239	1 1623E-02	11,990 37	23,980 74	0 00E+00	1 39E+02	2 79E+02		
Pu-240	1 5132E-02	11,990 37	23,980 74	0 00E+00	1 81E+02	3 63E+02		
Pu-241	9 0036E-01	11,990 37	23,980 74	0 00E+00	1 08E+04	2 16E+04		
Pu-242	6 4260E-05	11,990 37	23,980 74	0 00E+00	7 71E-01	1 54E+00		
Ra-226	2 2804E-10	11,990 37	23,980 74	0 00E+00	2 73E-06	5 47E-06		
Ra-228	5 2713E-12	11,990 37	23,980 74	0 00E+00	6 32E-08	1 26E-07		
Ru-106	6 1160E-10	11,990 37	23,980 74	0 00E+00	7 33E-06	1 47E-05		
Se-79	1 2377E-05	11,990 37	23,980 74	0 00E+00	1 48E-01	2 97E-01		
Sn-126	2 5210E-05	11,990 37	23,980 74	0 00E+00	3 02E-01	6 05E-01		
Sr-90	9 1667E-01	11,990 37	23,980 74	0 00E+00	1 10E+04	2 20E+04		
Tc-99	3 9357E-04	11,990 37	23,980 74	0 00E+00	4 72E+00	9 44E+00		
Th-229	1 2057E-10	11,990 37	23,980 74	0 00E+00	1 45E-06	2 89E-06		
Th-230	2 1043E-08	11,990 37	23,980 74	0 00E+00	2 52E-04	5 05E-04		
Th-232	5 2972E-12	11,990 37	23,980 74	0 00E+00	6 35E-08	1 27E-07		
Tl-208	1 7474E-07	11,990 37	23,980 74	0 00E+00	2 10E-03	4 19E-03		
U-232	4 7368E-07	11,990 37	23,980 74	0 00E+00	5 68E-03	1 14E-02	Thermal Power	
U-233	2 5097E-08	11,990 37	23,980 74	0 00E+00	3 01E-04	6 02E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	5 0000E-05	11,990 37	23,980 74	0 00E+00	6 00E-01	1 20E+00	2 76E+02	5 52E+02
U-235	-1 4489E-06	11,990 37	0 00	1 69E-02	0 00E+00	1 69E-02	Total	Total
U-236	7 5824E-06	11,990 37	23,980 74	0 00E+00	9 09E-02	1 82E-01		
U-238	-2 6129E-07	11,990 37	0 00	8 57E-02	8 25E-02	8 57E-02		
Y-90	9 1699E-01	11,990 37	23 980 74	0 00E+00	1 10E+04	2 20E+04		
Other Radionuclides					1 61E+04	3 22E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2 982	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	5 310 89	11 990 37	
Bounding	5 318 51	23 980 74	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1 30	2 26	
Bounding	2 61	4 51	1 00

<sup>1</sup>Reactor shutdown core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BRP-C  
SNF ID # 24  
Fuel Units & Descr 4 - 11 X 11 ROD ARRAY  
Heavy Metal Mass BOL=468 948kg EOL=459 844kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1968  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	11,298 83	11,722.29	0 00E+00	9 92E-06	1 03E-05	Avg MeV	
Am-241	1 4352E-01	11,298 83	11,722.29	0 00E+00	1 62E+03	1 68E+03	0 0150	6 307E+14
Am-242m	2 8698E-04	11,298 83	11,722.29	0 00E+00	3 24E+00	3 36E+00	0 0250	1 272E+14
Am-243	6 2565E-04	11,298 83	11,722.29	0 00E+00	7 07E+00	7 33E+00	0 0375	1 213E+14
C-14	4 7901E-05	11,298 83	11,722.29	0 00E+00	5 41E-01	5 62E-01	0 0575	1 402E+14
Cl-36	8 0297E-07	11,298 83	11,722.29	0 00E+00	9 07E-03	9 41E-03	0 0850	7 057E+13
Cm-243	2 5081E-04	11,298 83	11,722.29	0 00E+00	2 83E+00	2 94E+00	0 1250	4 897E+13
Cm-244	4 9015E-02	11,298 83	11,722.29	0 00E+00	5 54E+02	5 75E+02	0 2250	6 052E+13
Co-60	2 5581E-03	11,298 83	11,722.29	0 00E+00	2 89E+01	3 00E+01	0 3750	2 602E+13
Cs-134	4 0536E-05	11,298 83	11,722.29	0 00E+00	4 58E-01	4 75E-01	0 5750	6 053E+14
Cs-135	1 4433E-05	11,298 83	11,722.29	0 00E+00	1 63E-01	1 69E-01	0 8500	8 373E+12
Cs-137	1 3979E+00	11,298 83	11,722.29	0 00E+00	1 58E+04	1 64E+04	1 2500	8 225E+12
Eu-154	2 0203E-02	11,298 83	11,722.29	0 00E+00	2 28E+02	2 37E+02	1 7500	2 463E+11
Eu-155	1 7684E-03	11,298 83	11,722.29	0 00E+00	2 00E+01	2 07E+01	2 2500	3 966E+07
Fe-55	4 3136E-05	11,298 83	11,722.29	0 00E+00	4 87E-01	5 06E-01	2 7500	8 126E+07
H-3	2 0769E-02	11,298 83	11,722.29	0 00E+00	2 35E+02	2 43E+02	3 5000	8 367E+06
I-129	9 8288E-07	11,298 83	11,722.29	0 00E+00	1 11E-02	1 15E-02	5 0000	3 577E+06
Kr-85	2 8214E-02	11,298 83	11,722.29	0 00E+00	3 19E+02	3 31E+02	7 0000	4 123E+05
Np-237	1 1218E-05	11,298 83	11,722.29	0 00E+00	1 27E-01	1 31E-01	11 0000	4 736E+04
Pa-231	1 3036E-09	11,298 83	11,722.29	0 00E+00	1 47E-05	1 53E-05		
Pb-210	8 5078E-11	11,298 83	11,722.29	0 00E+00	9 61E-07	9 97E-07		
Pm-147	3 6531E-04	11,298 83	11,722.29	0 00E+00	4 13E+00	4 28E+00		
Pu-238	7 4564E-02	11,298 83	11,722.29	0 00E+00	8 42E+02	8 74E+02		
Pu-239	1 1623E-02	11,298 83	11,722.29	0 00E+00	1 31E+02	1 36E+02		
Pu-240	1 5132E-02	11,298 83	11,722.29	0 00E+00	1 71E+02	1 77E+02		
Pu-241	9 0036E-01	11,298 83	11,722.29	0 00E+00	1 02E+04	1 06E+04		
Pu-242	6 4260E-05	11,298 83	11,722.29	0 00E+00	7 26E-01	7 53E-01		
Ra-226	2 2804E-10	11,298 83	11,722.29	0 00E+00	2 58E-06	2 67E-06		
Ra-228	5 2713E-12	11,298 83	11,722.29	0 00E+00	5 96E-08	6 18E-08		
Ru-106	6 1160E-10	11,298 83	11,722.29	0 00E+00	6 91E-06	7 17E-06		
Se-79	1 2377E-05	11,298 83	11,722.29	0 00E+00	1 40E-01	1 45E-01		
Sn-126	2 5210E-05	11,298 83	11,722.29	0 00E+00	2 85E-01	2 96E-01		
Sr-90	9 1667E-01	11,298 83	11,722.29	0 00E+00	1 04E+04	1 07E+04		
Tc-99	3 9357E-04	11,298 83	11,722.29	0 00E+00	4 45E+00	4 61E+00		
Th-229	1 2057E-10	11,298 83	11,722.29	0 00E+00	1 36E-06	1 41E-06		
Th-230	2 1043E-08	11,298 83	11,722.29	0 00E+00	2 38E-04	2 47E-04		
Th-232	5 2972E-12	11,298 83	11,722.29	0 00E+00	5 99E-08	6 21E-08		
Ti-208	1 7474E-07	11,298 83	11,722.29	0 00E+00	1 97E-03	2 05E-03		
U-232	4 7368E-07	11,298 83	11,722.29	0 00E+00	5 35E-03	5 55E-03		
U-233	2 5097E-08	11,298 83	11,722.29	0 00E+00	2 84E-04	2 94E-04		
U-234	5 0000E-05	11,298 83	11,722.29	0 00E+00	5 65E-01	5 86E-01		
U-235	-1 4489E-06	11,298 83	0 00	3 67E-02	2 04E-02	3 67E-02		
U-236	7 5824E-06	11,298 83	11,722.29	0 00E+00	8 57E-02	8 89E-02		
U-238	-2 6129E-07	11,298 83	0 00	1 52E-01	1 49E-01	1 52E-01		
Y-90	9 1699E-01	11,298 83	11,722.29	0 00E+00	1 04E+04	1 07E+04		
Other Radionuclides					1 52E+04	1 57E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	3 626	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	11 298 83	8 657 09	
Bounding	11,722.29	17,314 19	Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup taken directly from SFD (converted to MWd).

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 69	0 77	
Bounding	0 71	1 48	0 99

<sup>1</sup>Reactor shutdown, core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BRP-D1  
SNF ID # 25  
Fuel Units & Descr 4 - 9 X 9 ROD ARRAY  
Heavy Metal Mass BOL=548.282kg EOL=508.336kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1968  
Estimates as of 2010  
Template PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	37,986.38	75,972.75	0.00E+00	3.33E-05	6.67E-05	Avg MeV	
Am-241	1.4352E-01	37,986.38	75,972.75	0.00E+00	5.45E+03	1.09E+04	0.0150	4.088E+15
Am-242m	2.8698E-04	37,986.38	75,972.75	0.00E+00	1.09E+01	2.18E+01	0.0250	8.243E+14
Am-243	6.2565E-04	37,986.38	75,972.75	0.00E+00	2.38E+01	4.75E+01	0.0375	7.862E+14
C-14	4.7901E-05	37,986.38	75,972.75	0.00E+00	1.82E+00	3.64E+00	0.0575	9.084E+14
Cl-36	8.0297E-07	37,986.38	75,972.75	0.00E+00	3.05E-02	6.10E-02	0.0850	4.574E+14
Cm-243	2.5081E-04	37,986.38	75,972.75	0.00E+00	9.53E+00	1.91E+01	0.1250	3.174E+14
Cm-244	4.9015E-02	37,986.38	75,972.75	0.00E+00	1.86E+03	3.72E+03	0.2250	3.922E+14
Co-60	2.5581E-02	37,986.38	75,972.75	0.00E+00	9.72E+01	1.94E+02	0.3750	1.687E+14
Cs-134	4.0636E-05	37,986.38	75,972.75	0.00E+00	1.54E+00	3.08E+00	0.5750	3.923E+15
Cs-135	1.4433E-05	37,986.38	75,972.75	0.00E+00	5.48E-01	1.10E+00	0.8500	5.427E+13
Cs-137	1.3979E+00	37,986.38	75,972.75	0.00E+00	5.31E+04	1.06E+05	1.2500	5.331E+13
Eu-154	2.0203E-02	37,986.38	75,972.75	0.00E+00	7.67E+02	1.53E+03	1.7500	1.596E+12
Eu-155	1.7684E-03	37,986.38	75,972.75	0.00E+00	6.72E+01	1.34E+02	2.2500	2.570E+08
Fe-55	4.3136E-05	37,986.38	75,972.75	0.00E+00	1.64E+00	3.28E+00	2.7500	5.266E+08
H-3	2.0769E-02	37,986.38	75,972.75	0.00E+00	7.89E+02	1.58E+03	3.5000	5.422E+07
I-129	9.8288E-07	37,986.38	75,972.75	0.00E+00	3.73E-02	7.47E-02	5.0000	2.318E+07
Kr-85	2.8214E-02	37,986.38	75,972.75	0.00E+00	1.07E+03	2.14E+03	7.0000	2.672E+06
Np-237	1.1218E-05	37,986.38	75,972.75	0.00E+00	4.26E-01	8.52E-01	11.0000	3.069E+05
Pa-231	1.3036E-09	37,986.38	75,972.75	0.00E+00	4.95E-05	9.90E-05		
Pb-210	8.5078E-11	37,986.38	75,972.75	0.00E+00	3.23E-06	6.46E-06		
Pm-147	3.6531E-04	37,986.38	75,972.75	0.00E+00	1.39E+01	2.78E+01		
Pu-238	7.4564E-02	37,986.38	75,972.75	0.00E+00	2.83E+03	5.66E+03		
Pu-239	1.1623E-02	37,986.38	75,972.75	0.00E+00	4.42E+02	8.83E+02		
Pu-240	1.5132E-02	37,986.38	75,972.75	0.00E+00	5.75E+02	1.15E+03		
Pu-241	9.0036E-01	37,986.38	75,972.75	0.00E+00	3.42E+04	6.84E+04		
Pu-242	6.4260E-05	37,986.38	75,972.75	0.00E+00	2.44E+00	4.88E+00		
Ra-226	2.2804E-10	37,986.38	75,972.75	0.00E+00	8.66E-06	1.73E-05		
Ra-228	5.2713E-12	37,986.38	75,972.75	0.00E+00	2.00E-07	4.00E-07		
Ru-106	6.1160E-10	37,986.38	75,972.75	0.00E+00	2.32E-05	4.65E-05		
Se-79	1.2377E-05	37,986.38	75,972.75	0.00E+00	4.70E-01	9.40E-01		
Sn-126	2.5210E-05	37,986.38	75,972.75	0.00E+00	9.58E-01	1.92E+00		
Sr-90	9.1667E-01	37,986.38	75,972.75	0.00E+00	3.48E+04	6.96E+04		
Tc-99	3.9357E-04	37,986.38	75,972.75	0.00E+00	1.50E+01	2.99E+01		
Th-229	1.2057E-10	37,986.38	75,972.75	0.00E+00	4.58E-06	9.16E-06		
Th-230	2.1043E-08	37,986.38	75,972.75	0.00E+00	7.99E-04	1.60E-03		
Th-232	5.2972E-12	37,986.38	75,972.75	0.00E+00	2.01E-07	4.02E-07		
Ti-208	1.7474E-07	37,986.38	75,972.75	0.00E+00	6.64E-03	1.33E-02		
U-232	4.7368E-07	37,986.38	75,972.75	0.00E+00	1.80E-02	3.60E-02	Thermal Power	
U-233	2.5097E-08	37,986.38	75,972.75	0.00E+00	9.53E-04	1.91E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	5.0000E-05	37,986.38	75,972.75	0.00E+00	1.90E+00	3.80E+00	8.74E+02	1.75E+03
U-235	-1.4489E-06	37,986.38	0.00	3.40E-02	0.00E+00	3.40E-02	Total	Total
U-236	7.5824E-06	37,986.38	75,972.75	0.00E+00	2.88E-01	5.76E-01		
U-238	-2.6129E-07	37,986.38	0.00	1.79E-01	1.69E-01	1.79E-01		
Y-90	9.1699E-01	37,986.38	75,972.75	0.00E+00	3.48E+04	6.97E+04		
Other Radionuclides					5.10E+04	1.02E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding		ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2.873	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal	900.83	37,986.38	
Bounding	926.60	75,972.75	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.98	42.17	
Bounding	3.96	81.99	1.02

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BRP-D2  
SNF ID # 26  
Fuel Units & Descr 2 - 7 X 7 ROD ARRAY  
Heavy Metal Mass BOL=233 593kg EOL=217 098kg  
ROD Storage Site INEEL

Fuel decay start date 1968  
Estimates as of: 2010  
Template PWR (Light Water, Zirc 0 to 5%, U)  
Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	15 685 20	31 370 41	0 00E+00	1 38E-05	2 75E-05	Avg MeV	
Am-241	1 4352E-01	15 685 20	31 370 41	0 00E+00	2 25E+03	4 50E+03	0 0150	1 688E+15
Am-242m	2 8698E-04	15 685 20	31 370 41	0 00E+00	4 50E+00	9 00E+00	0 0250	3 404E+14
Am-243	6 2565E-04	15 685 20	31 370 41	0 00E+00	9 81E+00	1 96E+01	0 0375	3 246E+14
C-14	4 7901E-05	15 685 20	31 370 41	0 00E+00	7 51E-01	1 50E+00	0 0575	3 751E+14
Cl-36	8 0297E-07	15 685 20	31 370 41	0 00E+00	1 26E-02	2 52E-02	0 0850	1 889E+14
Cm-243	2 5081E-04	15 685 20	31 370 41	0 00E+00	3 93E+00	7 87E+00	0 1250	1 311E+14
Cm-244	4 9015E-02	15 685 20	31 370 41	0 00E+00	7 69E+02	1 54E+03	0 2250	1 620E+14
Co-60	2 5581E-03	15 685 20	31 370 41	0 00E+00	4 01E+01	8 02E+01	0 3750	6 964E+13
Cs-134	4 0536E-05	15 685 20	31 370 41	0 00E+00	6 36E-01	1 27E+00	0 5750	1 620E+15
Cs-135	1 4433E-05	15 685 20	31 370 41	0 00E+00	2 26E-01	4 53E-01	0 8500	2 241E+13
Cs-137	1 3979E+00	15 685 20	31 370 41	0 00E+00	2 19E+04	4 39E+04	1 2500	2 201E+13
Eu-154	2 0203E-02	15 685 20	31 370 41	0 00E+00	3 17E+02	6 34E+02	1 7500	6 591E+11
Eu-155	1 7684E-03	15 685 20	31 370 41	0 00E+00	2 77E+01	5 55E+01	2 2500	1 061E+08
Fe-55	4 3136E-05	15 685 20	31 370 41	0 00E+00	6 77E-01	1 35E+00	2 7500	2 174E+08
H-3	2 0769E-02	15 685 20	31 370 41	0 00E+00	3 26E+02	6 52E+02	3 5000	2 239E+07
I-129	9 8288E-07	15 685 20	31 370 41	0 00E+00	1 54E-02	3 08E-02	5 0000	9 573E+06
Kr-85	2 8214E-02	15 685 20	31 370 41	0 00E+00	4 43E+02	8 85E+02	7 0000	1 103E+06
Np-237	1 1218E-05	15 685 20	31 370 41	0 00E+00	1 76E-01	3 52E-01	11 0000	1 267E+05
Pa-231	1 3036E-09	15 685 20	31 370 41	0 00E+00	2 04E-05	4 09E-05		
Pb-210	8 5078E-11	15 685 20	31 370 41	0 00E+00	1 33E-06	2 67E-06		
Pm-147	3 6531E-04	15 685 20	31 370 41	0 00E+00	5 73E+00	1 15E+01		
Pu-238	7 4564E-02	15 685 20	31 370 41	0 00E+00	1 17E+03	2 34E+03		
Pu-239	1 1623E-02	15 685 20	31 370 41	0 00E+00	1 82E+02	3 65E+02		
Pu-240	1 5132E-02	15 685 20	31 370 41	0 00E+00	2 37E+02	4 75E+02		
Pu-241	9 0036E-01	15 685 20	31 370 41	0 00E+00	1 41E+04	2 82E+04		
Pu-242	6 4260E-05	15 685 20	31 370 41	0 00E+00	1 01E+00	2 02E+00		
Ra-226	2 2804E-10	15 685 20	31 370 41	0 00E+00	3 58E-06	7 15E-06		
Ra-228	5 2713E-12	15 685 20	31 370 41	0 00E+00	8 27E-08	1 65E-07		
Ru-106	6 1160E-10	15 685 20	31 370 41	0 00E+00	9 59E-06	1 92E-05		
Se-79	1 2377E-05	15 685 20	31 370 41	0 00E+00	1 94E-01	3 88E-01		
Sn-126	2 5210E-05	15 685 20	31 370 41	0 00E+00	3 95E-01	7 91E-01		
Sr-90	9 1667E-01	15 685 20	31 370 41	0 00E+00	1 44E+04	2 88E+04		
Tc-99	3 9357E-04	15 685 20	31 370 41	0 00E+00	6 17E+00	1 23E+01		
Th-229	1 2057E-10	15 685 20	31 370 41	0 00E+00	1 89E-06	3 78E-06		
Th-230	2 1043E-08	15 685 20	31 370 41	0 00E+00	3 30E-04	6 60E-04		
Th-232	5 2972E-12	15 685 20	31 370 41	0 00E+00	8 31E-08	1 66E-07		
Ti-208	1 7474E-07	15 685 20	31 370 41	0 00E+00	2 74E-03	5 48E-03		
U-232	4 7368E-07	15 685 20	31 370 41	0 00E+00	7 43E-03	1 49E-02		
U-233	2 5097E-08	15 685 20	31 370 41	0 00E+00	3 94E-04	7 87E-04		
U-234	5 0000E-05	15 685 20	31 370 41	0 00E+00	7 84E-01	1 57E+00		
U-235	-1 4489E-06	15 685 20	0 00	1 42E-02	0 00E+00	1 42E-02		
U-236	7 5824E-06	15 685 20	31 370 41	0 00E+00	1 19E-01	2 38E-01		
U-238	-2 6129E-07	15 685 20	0 00	7 63E-02	7 22E-02	7 63E-02		
Y-90	9 1699E-01	15 685 20	31 370 41	0 00E+00	1 44E+04	2 88E+04		
Other Radionuclides					2 11E+04	4 21E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2 811	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	1 061 91	15 685 20	
Bounding	1 641 46	31 370 41	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 92	14 77	
Bounding	3 84	19 11	1 02

<sup>1</sup>Reactor shutdown, core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BRP-E  
 SNF ID # 27  
 Fuel Units & Descr 18 - 9 X 9 ROD ARRAY  
 Heavy Metal Mass BOL=2443 466kg EOL=2420 588kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
 Estimates as of 2010  
 Template PWR (Light Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
 Template BOL Heavy Metal Mass (MT) 0 00176911  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 Bare Fuel Transfer

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	29,160 32	33,700 28	0 00E+00	2 56E-05	2 96E-05	Avg MeV	
Am-241	1 4352E-01	29,160 32	33,700 28	0 00E+00	4 19E+03	4 84E+03	0 0150	1 813E+15
Am-242m	2 8698E-04	29,160 32	33,700 28	0 00E+00	8 37E+00	9 67E+00	0 0250	3 657E+14
Am-243	6 2565E-04	29,160 32	33,700 28	0 00E+00	1 82E+01	2 11E+01	0 0375	3 487E+14
C-14	4 7901E-05	29,160 32	33,700 28	0 00E+00	1 40E+00	1 61E+00	0 0575	4 029E+14
Cl-36	8 0297E-07	29,160 32	33,700 28	0 00E+00	2 34E-02	2 71E-02	0 0850	2 029E+14
Cm-243	2 5081E-04	29,160 32	33,700 28	0 00E+00	7 31E+00	8 45E+00	0 1250	1 408E+14
Cm-244	4 9015E-02	29,160 32	33,700 28	0 00E+00	1 43E+03	1 65E+03	0 2250	1 740E+14
Co-60	2 5581E-03	29,160 32	33,700 28	0 00E+00	7 46E+01	8 62E+01	0 3750	7 481E+13
Cs-134	4 0536E-05	29,160 32	33,700 28	0 00E+00	1 18E+00	1 37E+00	0 5750	1 740E+15
Cs-135	1 4433E-05	29,160 32	33,700 28	0 00E+00	4 21E-01	4 86E-01	0 8500	2 407E+13
Cs-137	1 3979E+00	29,160 32	33,700 28	0 00E+00	4 08E+04	4 71E+04	1 2500	2 365E+13
Eu-154	2 0203E-02	29,160 32	33,700 28	0 00E+00	5 89E+02	6 81E+02	1 7500	7 081E+11
Eu-155	1 7684E-03	29,160 32	33,700 28	0 00E+00	5 16E+01	5 96E+01	2 2500	1 140E+08
Fe-55	4 3136E-05	29,160 32	33,700 28	0 00E+00	1 26E+00	1 45E+00	2 7500	2 336E+08
H-3	2 0769E-02	29,160 32	33,700 28	0 00E+00	6 06E+02	7 00E+02	3 5000	2 406E+07
I-129	9 8288E-07	29,160 32	33,700 28	0 00E+00	2 87E-02	3 31E-02	5 0000	1 029E+07
Kr-85	2 8214E-02	29,160 32	33,700 28	0 00E+00	8 23E+02	9 51E+02	7 0000	1 185E+06
Np-237	1 1218E-05	29,160 32	33,700 28	0 00E+00	3 27E-01	3 78E-01	11 0000	1 362E+05
Pa-231	1 3036E-09	29,160 32	33,700 28	0 00E+00	3 80E-05	4 39E-05		
Pb-210	8 5078E-11	29,160 32	33,700 28	0 00E+00	2 48E-06	2 87E-06		
Pm-147	3 6531E-04	29,160 32	33,700 28	0 00E+00	1 07E+01	1 23E+01		
Pu-238	7 4564E-02	29,160 32	33,700 28	0 00E+00	2 17E+03	2 51E+03		
Pu-239	1 1623E-02	29,160 32	33,700 28	0 00E+00	3 39E+02	3 92E+02		
Pu-240	1 5132E-02	29,160 32	33,700 28	0 00E+00	4 41E+02	5 10E+02		
Pu-241	9 0036E-01	29,160 32	33,700 28	0 00E+00	2 63E+04	3 03E+04		
Pu-242	6 4260E-05	29,160 32	33,700 28	0 00E+00	1 87E+00	2 17E+00		
Ra-226	2 2804E-10	29,160 32	33,700 28	0 00E+00	6 65E-06	7 68E-06		
Ra-228	5 2713E-12	29,160 32	33,700 28	0 00E+00	1 54E-07	1 78E-07		
Ru-106	6 1160E-10	29,160 32	33,700 28	0 00E+00	1 78E-05	2 06E-05		
Se-79	1 2377E-05	29,160 32	33,700 28	0 00E+00	3 61E-01	4 17E-01		
Sn-126	2 5210E-05	29,160 32	33,700 28	0 00E+00	7 35E-01	8 50E-01		
Sr-90	9 1667E-01	29,160 32	33,700 28	0 00E+00	2 67E+04	3 09E+04		
Tc-99	3 9357E-04	29,160 32	33,700 28	0 00E+00	1 15E+01	1 33E+01		
Th-229	1 2057E-10	29,160 32	33,700 28	0 00E+00	3 52E-06	4 06E-06		
Th-230	2 1043E-08	29,160 32	33,700 28	0 00E+00	6 14E-04	7 09E-04		
Th-232	5 2972E-12	29,160 32	33,700 28	0 00E+00	1 54E-07	1 79E-07		
Ti-208	1 7474E-07	29,160 32	33,700 28	0 00E+00	5 10E-03	5 89E-03		
U-232	4 7368E-07	29,160 32	33,700 28	0 00E+00	1 38E-02	1 60E-02	Thermal Power	
U-233	2 5097E-08	29,160 32	33,700 28	0 00E+00	7 32E-04	8 46E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	5 0000E-05	29,160 32	33,700 28	0 00E+00	1 46E+00	1 69E+00	6 71E+02	7 75E+02
U-235	-1 4489E-06	29,160 32	0 00	1 58E-01	1 16E-01	1 58E-01	Total	Total
U-236	7 5824E-06	29,160 32	33,700 28	0 00E+00	2 21E-01	2 56E-01		
U-238	-2 6129E-07	29,160 32	0 00	7 97E-01	7 89E-01	7 97E-01		
Y-90	9 1699E-01	29,160 32	33,700 28	0 00E+00	2 67E+04	3 09E+04		
Other Radionuclides					3 91E+04	4 52E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2 995	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	29 160 32	21 755 90	
Bounding	33 700 28	43 511 79	

Nominal burnup taken directly from SFD (converted to MWd)  
 Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 34	0 75	
Bounding	0 39	1 29	

<sup>1</sup>Reactor shutdown, core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: BRP-EG  
SNF ID #: 28  
Fuel Units & Descr: 33 - 9 X 9 ROD ARRAY  
Heavy Metal Mass BOL=4566 956kg, EOL=4419.278kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1973  
Estimates as of: 2010  
Template: PWR (Light Water Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 61.92  
Template BOL Heavy Metal Mass (MT): 0.00176911  
Template Decay Time: 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	X <sub>n</sub>	X <sub>s</sub>	b	Y <sub>n</sub>	Y <sub>s</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	140,435 08	280,870 16	0.00E+00	1.23E-04	2.46E-04	Avg MeV	
Am-241	1.4352E-01	140,435 08	280,870 16	0.00E+00	2.02E+04	4.03E+04	0.0150	1.511E+16
Am-242m	2.8698E-04	140,435 08	280,870 16	0.00E+00	4.03E+01	8.06E+01	0.0250	3.047E+15
Am-243	6.2565E-04	140,435 08	280,870 16	0.00E+00	8.79E+01	1.76E+02	0.0375	2.907E+15
C-14	4.7901E-05	140,435 08	280,870 16	0.00E+00	6.73E+00	1.35E+01	0.0575	3.358E+15
Cl-36	8.0297E-07	140,435 08	280,870 16	0.00E+00	1.13E-01	2.26E-01	0.0850	1.691E+15
Cm-243	2.5081E-04	140,435 08	280,870 16	0.00E+00	3.52E+01	7.04E+01	0.1250	1.173E+15
Cm-244	4.9015E-02	140,435 08	280,870 16	0.00E+00	6.88E+03	1.38E+04	0.2250	1.450E+15
Co-60	2.5581E-03	140,435 08	280,870 16	0.00E+00	3.59E+02	7.19E+02	0.3750	6.235E+14
Cs-134	4.0536E-05	140,435 08	280,870 16	0.00E+00	5.69E+00	1.14E+01	0.5750	1.450E+16
Cs-135	1.4433E-05	140,435 08	280,870 16	0.00E+00	2.03E+00	4.05E+00	0.8500	2.006E+14
Cs-137	1.3979E+00	140,435 08	280,870 16	0.00E+00	1.96E+05	3.93E+05	1.2500	1.971E+14
Eu-154	2.0203E-02	140,435 08	280,870 16	0.00E+00	2.84E+03	5.67E+03	1.7500	5.902E+12
Eu-155	1.7684E-03	140,435 08	280,870 16	0.00E+00	2.48E+02	4.97E+02	2.2500	9.503E+08
Fe-55	4.3136E-05	140,435 08	280,870 16	0.00E+00	6.06E+00	1.21E+01	2.7500	1.947E+09
H-3	2.0769E-02	140,435 08	280,870 16	0.00E+00	2.92E+03	5.83E+03	3.5000	2.005E+08
I-129	9.8288E-07	140,435 08	280,870 16	0.00E+00	1.38E-01	2.76E-01	5.0000	8.571E+07
Kr-85	2.8214E-02	140,435 08	280,870 16	0.00E+00	3.96E+03	7.92E+03	7.0000	9.879E+06
Np-237	1.1218E-05	140,435 08	280,870 16	0.00E+00	1.58E+00	3.15E+00	11.0000	1.135E+06
Pa-231	1.3036E-09	140,435 08	280,870 16	0.00E+00	1.83E-04	3.66E-04		
Pb-210	8.5078E-11	140,435 08	280,870 16	0.00E+00	1.19E-05	2.39E-05		
Pm-147	3.6531E-04	140,435 08	280,870 16	0.00E+00	5.13E+01	1.03E+02		
Pu-238	7.4564E-02	140,435 08	280,870 16	0.00E+00	1.05E+04	2.09E+04		
Pu-239	1.1623E-02	140,435 08	280,870 16	0.00E+00	1.63E+03	3.26E+03		
Pu-240	1.5132E-02	140,435 08	280,870 16	0.00E+00	2.13E+03	4.25E+03		
Pu-241	9.0036E-01	140,435 08	280,870 16	0.00E+00	1.26E+05	2.53E+05		
Pu-242	6.4260E-05	140,435 08	280,870 16	0.00E+00	9.02E+00	1.80E+01		
Ra-226	2.2804E-10	140,435 08	280,870 16	0.00E+00	3.20E-05	6.40E-05		
Ra-228	5.2713E-12	140,435 08	280,870 16	0.00E+00	7.40E-07	1.48E-06		
Ru-106	6.1160E-10	140,435 08	280,870 16	0.00E+00	8.59E-05	1.72E-04		
Se-79	1.2377E-05	140,435 08	280,870 16	0.00E+00	1.74E+00	3.48E+00		
Sr-126	2.5210E-05	140,435 08	280,870 16	0.00E+00	3.54E+00	7.08E+00		
Sr-90	9.1667E-01	140,435 08	280,870 16	0.00E+00	1.29E+05	2.57E+05		
Tc-99	3.9357E-04	140,435 08	280,870 16	0.00E+00	5.53E+01	1.11E+02		
Th-229	1.2057E-10	140,435 08	280,870 16	0.00E+00	1.69E-05	3.39E-05		
Th-230	2.1043E-08	140,435 08	280,870 16	0.00E+00	2.96E-03	5.91E-03		
Th-232	5.2972E-12	140,435 08	280,870 16	0.00E+00	7.44E-07	1.49E-06		
Ti-208	1.7474E-07	140,435 08	280,870 16	0.00E+00	2.45E-02	4.91E-02		
U-232	4.7368E-07	140,435 08	280,870 16	0.00E+00	6.65E-02	1.33E-01		
U-233	2.5097E-08	140,435 08	280,870 16	0.00E+00	3.52E-03	7.05E-03		
U-234	5.0000E-05	140,435 08	280,870 16	0.00E+00	7.02E+00	1.40E+01		
U-235	-1.4489E-06	140,435 08	0.00	3.47E-01	1.43E-01	3.47E-01		
U-236	7.5824E-06	140,435 08	280,870 16	0.00E+00	1.06E+00	2.13E+00		
U-238	-2.6129E-07	140,435 08	0.00	1.48E+00	1.44E+00	1.48E+00		
Y-90	9.1699E-01	140,435 08	280,870 16	0.00E+00	1.29E+05	2.58E+05		
Other Radionuclides					1.89E+05	3.77E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	3.513	0 to 5	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	60,840.99	140,435.08	
Bounding	83,858.44	280,870.16	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.88	2.31	
Bounding	1.76	3.35	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BRP-EG/F  
SNF ID # 1081  
Fuel Units & Descr: 4 - 9 X 9 ROD ARRAY  
Heavy Metal Mass BOL=553 686kg EOL=541 107kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1973  
Estimates as of 2010  
Template PWR (Light Water Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 35 years

Estimated  
Canister usage:  
Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	11,962 22	23,924 45	0 00E+00	1 05E-05	2 10E-05	Avg MeV	
Am-241	1 4352E-01	11,962 22	23,924 45	0 00E+00	1 72E+03	3 43E+03	0 0150	1 287E+15
Am-242m	2 8698E-04	11,962 22	23,924 45	0 00E+00	3 43E+00	6 87E+00	0 0250	2 596E+14
Am-243	6 2565E-04	11,962 22	23,924 45	0 00E+00	7 48E+00	1 50E+01	0 0375	2 476E+14
C-14	4 7901E-05	11,962 22	23,924 45	0 00E+00	5 73E-01	1 15E+00	0 0575	2 861E+14
Cl-36	8 0297E-07	11,962 22	23,924 45	0 00E+00	9 61E-03	1 92E-02	0 0850	1 440E+14
Cm-243	2 5081E-04	11,962 22	23,924 45	0 00E+00	3 00E+00	6 00E+00	0 1250	9 995E+13
Cm-244	4 9015E-02	11,962 22	23,924 45	0 00E+00	5 86E+02	1 17E+03	0 2250	1 235E+14
Co-60	2 5581E-03	11,962 22	23,924 45	0 00E+00	3 06E+01	6 12E+01	0 3750	5 311E+13
Cs-134	4 0536E-05	11,962 22	23,924 45	0 00E+00	4 85E-01	9 70E-01	0 5750	1 235E+15
Cs-135	1 4433E-05	11,962 22	23,924 45	0 00E+00	1 73E-01	3 45E-01	0 8500	1 709E+13
Cs-137	1 3979E+00	11,962 22	23,924 45	0 00E+00	1 67E+04	3 34E+04	1 2500	1 679E+13
Eu-154	2 0203E-02	11,962 22	23,924 45	0 00E+00	2 42E+02	4 83E+02	1 7500	5 027E+11
Eu-155	1 7684E-03	11,962 22	23,924 45	0 00E+00	2 12E+01	4 23E+01	2 2500	8 094E+07
Fe-55	4 3136E-05	11,962 22	23,924 45	0 00E+00	5 16E-01	1 03E+00	2 7500	1 658E+08
H-3	2 0769E-02	11,962 22	23,924 45	0 00E+00	2 48E+02	4 97E+02	3 5000	1 708E+07
I-129	9 8288E-07	11,962 22	23,924 45	0 00E+00	1 18E-02	2 35E-02	5 0000	7 301E+06
Kr-85	2 8214E-02	11,962 22	23,924 45	0 00E+00	3 38E+02	6 75E+02	7 0000	8 415E+05
Np-237	1 1218E-05	11,962 22	23,924 45	0 00E+00	1 34E-01	2 68E-01	11 0000	9 665E+04
Pa-231	1 3036E-09	11,962 22	23,924 45	0 00E+00	1 56E-05	3 12E-05		
Pb-210	8 5078E-11	11,962 22	23,924 45	0 00E+00	1 02E-06	2 04E-06		
Pm-147	3 6531E-04	11,962 22	23,924 45	0 00E+00	4 37E+00	8 74E+00		
Pu-238	7 4564E-02	11,962 22	23,924 45	0 00E+00	8 92E+02	1 78E+03		
Pu-239	1 1623E-02	11,962 22	23,924 45	0 00E+00	1 39E+02	2 78E+02		
Pu-240	1 5132E-02	11,962 22	23,924 45	0 00E+00	1 81E+02	3 62E+02		
Pu-241	9 0036E-01	11,962 22	23,924 45	0 00E+00	1 08E+04	2 15E+04		
Pu-242	6 4260E-05	11,962 22	23,924 45	0 00E+00	7 69E-01	1 54E+00		
Ra-226	2 2804E-10	11,962 22	23,924 45	0 00E+00	2 73E-06	5 46E-06		
Ra-228	5 2713E-12	11,962 22	23,924 45	0 00E+00	6 31E-08	1 26E-07		
Ru-106	6 1160E-10	11,962 22	23,924 45	0 00E+00	7 32E-06	1 46E-05		
Se-79	1 2377E-05	11,962 22	23,924 45	0 00E+00	1 48E-01	2 96E-01		
Sn-126	2 5210E-05	11,962 22	23,924 45	0 00E+00	3 02E-01	6 03E-01		
Sr-90	9 1667E-01	11,962 22	23,924 45	0 00E+00	1 10E+04	2 19E+04		
Tc-99	3 9357E-04	11,962 22	23,924 45	0 00E+00	4 71E+00	9 42E+00		
Th-229	1 2057E-10	11,962 22	23,924 45	0 00E+00	1 44E-06	2 88E-06		
Th-230	2 1043E-08	11,962 22	23,924 45	0 00E+00	2 52E-04	5 03E-04		
Th-232	5 2972E-12	11,962 22	23,924 45	0 00E+00	6 34E-08	1 27E-07		
Ti-208	1 7474E-07	11,962 22	23,924 45	0 00E+00	2 09E-03	4 18E-03		
U-232	4 7368E-07	11,962 22	23,924 45	0 00E+00	5 67E-03	1 13E-02		
U-233	2 5097E-08	11,962 22	23,924 45	0 00E+00	3 00E-04	6 00E-04		
U-234	5 0000E-05	11,962 22	23,924 45	0 00E+00	5 98E-01	1 20E+00		
U-235	-1 4489E-06	11,962 22	0 00	4 16E-02	2 43E-02	4 16E-02		
U-236	7 5824E-06	11,962 22	23 924 45	0 00E+00	9 07E-02	1 81E-01		
U-238	-2 6129E-07	11,962 22	0 00	1 80E-01	1 76E-01	1 80E-01		
Y-90	9 1699E-01	11,962 22	23,924 45	0 00E+00	1 10E+04	2 19E+04		
Other Radionuclides					1 61E+04	3 21E+04		

Other Radionuclides

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
BOL HM Constituents	3 478	0 to 5	
BOL Enrichment %			

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal	From SFD	Estimated	
	8 552 79	11 962 22	
	8 583 24	23 924 45	
Bounding			Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0 62	1 40	
	1 23	2 79	
Bounding			1 00

<sup>1</sup>Reactor shutdown core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BRP EP  
SNF ID # 29  
Fuel Units & Descr 3 - 9 X 9 ROD ARRAY  
Heavy Metal Mass BOL=369 99kg EOL=351 853kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1974  
Estimates as of. 2010  
Template (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186865  
Template Decay Time 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3072E-06	17,236.64	34,473.28	0.00E+00	3.98E-02	7.95E-02	Avg. MeV	
Am-241	8.4448E+00	17,236.64	34,473.28	0.00E+00	1.46E+05	2.91E+05	0.0150	4.255E+16
Am-242m	1.6848E-02	17,236.64	34,473.28	0.00E+00	2.90E+02	5.81E+02	0.0250	8.407E+15
Am-243	1.6320E-02	17,236.64	34,473.28	0.00E+00	2.81E+02	5.63E+02	0.0375	7.344E+15
C-14	1.2090E-01	17,236.64	34,473.28	0.00E+00	2.08E+03	4.17E+03	0.0575	1.156E+16
Cl-36	2.2849E-03	17,236.64	34,473.28	0.00E+00	3.94E+01	7.88E+01	0.0850	4.510E+15
Cm-243	8.6624E-04	17,236.64	34,473.28	0.00E+00	1.49E+01	2.99E+01	0.1250	3.535E+15
Cm-244	1.6848E-01	17,236.64	34,473.28	0.00E+00	2.90E+03	5.81E+03	0.2250	3.907E+15
Co-60	2.8086E+01	17,236.64	34,473.28	0.00E+00	4.84E+05	9.68E+05	0.3750	1.671E+15
Cs-134	3.4148E-04	17,236.64	34,473.28	0.00E+00	5.89E+00	1.18E+01	0.5750	2.717E+16
Cs-135	4.3976E-04	17,236.64	34,473.28	0.00E+00	7.58E+00	1.52E+01	0.8500	1.038E+15
Cs-137	2.1049E+01	17,236.64	34,473.28	0.00E+00	3.63E+05	7.26E+05	1.2500	7.259E+16
Eu-154	1.2500E+00	17,236.64	34,473.28	0.00E+00	2.15E+04	4.31E+04	1.7500	3.211E+13
Eu-155	6.8986E-02	17,236.64	34,473.28	0.00E+00	1.19E+03	2.38E+03	2.2500	3.807E+11
Fe-55	2.9308E-01	17,236.64	34,473.28	0.00E+00	5.05E+03	1.01E+04	2.7500	1.073E+11
H-3	2.4311E-01	17,236.64	34,473.28	0.00E+00	4.19E+03	8.38E+03	3.5000	9.147E+07
I-129	1.0618E-05	17,236.64	34,473.28	0.00E+00	1.83E-01	3.66E-01	5.0000	3.883E+07
Kr-85	5.9882E-01	17,236.64	34,473.28	0.00E+00	1.03E+04	2.06E+04	7.0000	4.444E+06
Np-237	1.5668E-04	17,236.64	34,473.28	0.00E+00	2.70E+00	5.40E+00	11.0000	5.083E+05
Pa-231	2.8656E-06	17,236.64	34,473.28	0.00E+00	4.94E-02	9.88E-02		
Pb-210	2.3918E-08	17,236.64	34,473.28	0.00E+00	4.12E-04	8.25E-04		
Pm-147	1.6900E-02	17,236.64	34,473.28	0.00E+00	2.91E+02	5.83E+02		
Pu-238	-8.6120E-01	17,236.64	0.00	4.75E+04	3.27E+04	4.75E+04		
Pu-239	-4.8440E-02	17,236.64	0.00	5.75E+03	4.92E+03	5.75E+03		
Pu-240	-3.0095E-01	17,236.64	0.00	7.35E+03	2.16E+03	7.35E+03		
Pu-241	-1.0411E+02	17,236.64	0.00	1.89E+06	9.65E+04	1.89E+06		
Pu-242	-1.1381E-04	17,236.64	0.00	3.18E+01	2.98E+01	3.18E+01		
Ra-226	6.4400E-08	17,236.64	34,473.28	0.00E+00	1.11E-03	2.22E-03		
Ra-228	5.9952E-07	17,236.64	34,473.28	0.00E+00	1.03E-02	2.07E-02		
Ru-106	8.5526E-07	17,236.64	34,473.28	0.00E+00	1.47E-02	2.95E-02		
Se-79	1.9181E-04	17,236.64	34,473.28	0.00E+00	3.31E+00	6.61E+00		
Sn-126	1.6671E-04	17,236.64	34,473.28	0.00E+00	2.87E+00	5.75E+00		
Sr-90	1.9799E+01	17,236.64	34,473.28	0.00E+00	3.41E+05	6.83E+05		
Tc-99	6.7678E-03	17,236.64	34,473.28	0.00E+00	1.17E+02	2.33E+02		
Th-229	1.7488E-06	17,236.64	34,473.28	0.00E+00	3.01E-02	6.03E-02		
Th-230	5.8704E-06	17,236.64	34,473.28	0.00E+00	1.01E-01	2.02E-01		
Th-232	6.0208E-07	17,236.64	34,473.28	0.00E+00	1.04E-02	2.08E-02		
Ti-208	8.7573E-05	17,236.64	34,473.28	0.00E+00	1.51E+00	3.02E+00		
U-232	2.3706E-04	17,236.64	34,473.28	0.00E+00	4.09E+00	8.17E+00		
U-233	3.6128E-04	17,236.64	34,473.28	0.00E+00	6.23E+00	1.25E+01		
U-234	1.2788E-02	17,236.64	34,473.28	0.00E+00	2.20E+02	4.41E+02		
U-235	5.7486E-04	17,236.64	34,473.28	1.59E-01	1.01E+01	2.00E+01		
U-236	2.3485E-04	17,236.64	34,473.28	0.00E+00	4.05E+00	8.10E+00		
U-238	1.1581E-04	17,236.64	34,473.28	1.98E-02	2.02E+00	4.01E+00		
Y-90	1.9804E+01	17,236.64	34,473.28	0.00E+00	3.41E+05	6.83E+05		
Other Radionuclides					1.06E+06	2.13E+06		
							Thermal Power	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							1.83E+04	3.60E+04
							Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	(Worst Case)	This fuel didn't closely match any existing templates therefore the worst case template was used
Fuel Cladding	ZIRC	SST/Inconel	
BOL HM Constituents	Pu and U	U Th & Pu	
BOL Enrichment %	0.7	0 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	6.607.65	17,236.64	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding	7.131.56	34,473.28	Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.39	2.61	31.12
Bounding	2.79	4.83	

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name BRP-F  
SNF ID # 30  
Fuel Units & Descr 13 - 9 X 9 ROD ARRAY  
Heavy Metal Mass BOL=1799 104kg EOL=1756 759kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1974  
Estimates as of. 2010  
Template: PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Actvty (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	40,268.00	80,535.99	0.00E+00	3.53E-05	7.07E-05	Avg MeV	
Am-241	1.4352E-01	40,268.00	80,535.99	0.00E+00	5.78E+03	1.16E+04	0.0150	4.333E+15
Am-242m	2.8698E-04	40,268.00	80,535.99	0.00E+00	1.16E+01	2.31E+01	0.0250	8.738E+14
Am-243	6.2565E-04	40,268.00	80,535.99	0.00E+00	2.52E+01	5.04E+01	0.0375	8.334E+14
C-14	4.7901E-05	40,268.00	80,535.99	0.00E+00	1.93E+00	3.86E+00	0.0575	9.630E+14
Cl-36	8.0297E-07	40,268.00	80,535.99	0.00E+00	3.23E-02	6.47E-02	0.0850	4.849E+14
Co-243	2.5081E-04	40,268.00	80,535.99	0.00E+00	1.01E+01	2.02E+01	0.1250	3.365E+14
Co-244	4.9015E-02	40,268.00	80,535.99	0.00E+00	1.97E+03	3.95E+03	0.2250	4.158E+14
Co-60	2.5581E-03	40,268.00	80,535.99	0.00E+00	1.03E+02	2.06E+02	0.3750	1.788E+14
Cs-134	4.0536E-05	40,268.00	80,535.99	0.00E+00	1.63E+00	3.26E+00	0.5750	4.158E+15
Cs-135	1.4433E-05	40,268.00	80,535.99	0.00E+00	5.81E-01	1.16E+00	0.8500	5.753E+13
Cs-137	1.3979E+00	40,268.00	80,535.99	0.00E+00	5.63E+04	1.13E+05	1.2500	5.651E+13
Eu-154	2.0203E-02	40,268.00	80,535.99	0.00E+00	8.14E+02	1.63E+03	1.7500	1.692E+12
Eu-155	1.7684E-03	40,268.00	80,535.99	0.00E+00	7.12E+01	1.42E+02	2.2500	2.725E+08
Fe-55	4.3136E-05	40,268.00	80,535.99	0.00E+00	1.74E+00	3.47E+00	2.7500	5.583E+08
H-3	2.0769E-02	40,268.00	80,535.99	0.00E+00	8.36E+02	1.67E+03	3.5000	5.748E+07
I-129	9.8288E-07	40,268.00	80,535.99	0.00E+00	3.96E-02	7.92E-02	5.0000	2.458E+07
Kr-85	2.8214E-02	40,268.00	80,535.99	0.00E+00	1.14E+03	2.27E+03	7.0000	2.833E+06
Np-237	1.1218E-05	40,268.00	80,535.99	0.00E+00	4.52E-01	9.03E-01	11.0000	3.253E+05
Pa-231	1.3036E-09	40,268.00	80,535.99	0.00E+00	5.25E-05	1.05E-04		
Pb-210	8.5078E-11	40,268.00	80,535.99	0.00E+00	3.43E-06	6.85E-06		
Pm-147	3.6531E-04	40,268.00	80,535.99	0.00E+00	1.47E+01	2.94E+01		
Pu-238	7.4564E-02	40,268.00	80,535.99	0.00E+00	3.00E+03	6.01E+03		
Pu-239	1.1623E-02	40,268.00	80,535.99	0.00E+00	4.68E+02	9.36E+02		
Pu-240	1.5132E-02	40,268.00	80,535.99	0.00E+00	6.09E+02	1.22E+03		
Pu-241	9.0036E-01	40,268.00	80,535.99	0.00E+00	3.63E+04	7.25E+04		
Pu-242	6.4260E-05	40,268.00	80,535.99	0.00E+00	2.59E+00	5.18E+00		
Ra-226	2.2804E-10	40,268.00	80,535.99	0.00E+00	9.18E-06	1.84E-05		
Ra-228	5.2713E-12	40,268.00	80,535.99	0.00E+00	2.12E-07	4.25E-07		
Ru-106	6.1160E-10	40,268.00	80,535.99	0.00E+00	2.46E-05	4.93E-05		
Se-79	1.2377E-05	40,268.00	80,535.99	0.00E+00	4.98E-01	9.97E-01		
Sn-126	2.5210E-05	40,268.00	80,535.99	0.00E+00	1.02E+00	2.03E+00		
Sr-90	9.1667E-01	40,268.00	80,535.99	0.00E+00	3.69E+04	7.38E+04		
Tc-99	3.9357E-04	40,268.00	80,535.99	0.00E+00	1.58E+01	3.17E+01		
Th-229	1.2057E-10	40,268.00	80,535.99	0.00E+00	4.86E-06	9.71E-06		
Th-230	2.1043E-08	40,268.00	80,535.99	0.00E+00	8.47E-04	1.69E-03		
Th-232	5.2972E-12	40,268.00	80,535.99	0.00E+00	2.13E-07	4.27E-07		
Ti-208	1.7474E-07	40,268.00	80,535.99	0.00E+00	7.04E-03	1.41E-02		
U-232	4.7368E-07	40,268.00	80,535.99	0.00E+00	1.91E-02	3.81E-02	Thermal Power	
U-233	2.5097E-08	40,268.00	80,535.99	0.00E+00	1.01E-03	2.02E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	5.0000E-05	40,268.00	80,535.99	0.00E+00	2.01E+00	4.03E+00	9.26E+02	1.85E+03
U-235	-1.4489E-06	40,268.00	0.00	1.37E-01	7.83E-02	1.37E-01	Total	Total
U-236	7.5824E-06	40,268.00	80,535.99	0.00E+00	3.05E-01	6.11E-01		
U-238	-2.6129E-07	40,268.00	0.00	5.83E-01	5.73E-01	5.83E-01		
Y-90	9.1699E-01	40,268.00	80,535.99	0.00E+00	3.69E+04	7.39E+04		
Other Radionuclides					5.41E+04	1.08E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	3.515	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	18.908.58	40,268.00	
Bounding	25.797.35	80.535.99	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.64	2.13	
Bounding	1.28	3.12	

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: BRP-F-PU  
 SNF ID #: 1082  
 Fuel Units & Descr: 2 - 9 X 9 ROD ARRAY  
 Heavy Metal Mass: BOL=269 592kg, EOL=263 82kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1974  
 Estimates as of: 2010  
 Template: PWR (Light Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
 Template BOL Heavy Metal Mass (MT): 0 00176911  
 Template Decay Time: 35 years

Estimated  
 Canister usage  
 Bare Fuel Transfer

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	5,489 09	10,978 18	0 00E+00	4 82E-06	9 63E-06	Avg. MeV	
Am-241	1 4352E-01	5,489 09	10,978 18	0 00E+00	7 88E+02	1 58E+03	0 0150	5 907E+14
Am-242m	2 8698E-04	5,489 09	10,978 18	0 00E+00	1 58E+00	3 15E+00	0 0250	1 191E+14
Am-243	6 2565E-04	5,489 09	10,978 18	0 00E+00	3 43E+00	6 87E+00	0 0375	1 136E+14
C-14	4 7901E-05	5,489 09	10,978 18	0 00E+00	2 63E-01	5 26E-01	0 0575	1 313E+14
Cl-36	8 0297E-07	5,489 09	10,978 18	0 00E+00	4 41E-03	8 82E-03	0 0850	6 609E+13
Cm-243	2 5081E-04	5,489 09	10,978 18	0 00E+00	1 38E+00	2 75E+00	0 1250	4 586E+13
Cm-244	4 9015E-02	5,489 09	10,978 18	0 00E+00	2 69E+02	5 38E+02	0 2250	5 668E+13
Co-60	2 5581E-03	5,489 09	10,978 18	0 00E+00	1 40E+01	2 81E+01	0 3750	2 437E+13
Cs-134	4 0536E-05	5,489 09	10,978 18	0 00E+00	2 23E-01	4 45E-01	0 5750	5 668E+14
Cs-135	1 4433E-05	5,489 09	10,978 18	0 00E+00	7 92E-02	1 58E-01	0 8500	7 842E+12
Cs-137	1 3979E+00	5,489 09	10,978 18	0 00E+00	7 67E+03	1 53E+04	1 2500	7 703E+12
Eu-154	2 0203E-02	5,489 09	10,978 18	0 00E+00	1 11E+02	2 22E+02	1 7500	2 307E+11
Eu-155	1 7684E-03	5,489 09	10,978 18	0 00E+00	9 71E+00	1 94E+01	2 2500	3 714E+07
Fe-55	4 3136E-05	5,489 09	10,978 18	0 00E+00	2 37E-01	4 74E-01	2 7500	7 610E+07
H-3	2 0769E-02	5,489 09	10,978 18	0 00E+00	1 14E+02	2 28E+02	3 5000	7 836E+06
I-129	9 8288E-07	5,489 09	10,978 18	0 00E+00	5 40E-03	1 08E-02	5 0000	3 350E+06
Kr-85	2 8214E-02	5,489 09	10,978 18	0 00E+00	1 55E+02	3 10E+02	7 0000	3 861E+05
Np-237	1 1218E-05	5,489 09	10,978 18	0 00E+00	6 16E-02	1 23E-01	11 0000	4 435E+04
Pa-231	1 3036E-09	5,489 09	10,978 18	0 00E+00	7 16E-06	1 43E-05		
Pb-210	8 5078E-11	5,489 09	10,978 18	0 00E+00	4 67E-07	9 34E-07		
Pm-147	3 6531E-04	5,489 09	10,978 18	0 00E+00	2 01E+00	4 01E+00		
Pu-238	7 4564E-02	5,489 09	10,978 18	0 00E+00	4 09E+02	8 19E+02		
Pu-239	1 1623E-02	5,489 09	10,978 18	0 00E+00	6 38E+01	1 28E+02		
Pu-240	1 5132E-02	5,489 09	10,978 18	0 00E+00	8 31E+01	1 66E+02		
Pu-241	9 0036E-01	5,489 09	10,978 18	0 00E+00	4 94E+03	9 88E+03		
Pu-242	6 4260E-05	5,489 09	10,978 18	0 00E+00	3 53E-01	7 06E-01		
Ra-226	2 2804E-10	5,489 09	10,978 18	0 00E+00	1 25E-06	2 50E-06		
Ra-228	5 2713E-12	5,489 09	10,978 18	0 00E+00	2 89E-08	5 79E-08		
Ru-106	6 1160E-10	5,489 09	10,978 18	0 00E+00	3 36E-06	6 71E-06		
Se-79	1 2377E-05	5,489 09	10,978 18	0 00E+00	6 79E-02	1 36E-01		
Sn-126	2 5210E-05	5,489 09	10,978 18	0 00E+00	1 38E-01	2 77E-01		
Sr-90	9 1667E-01	5,489 09	10,978 18	0 00E+00	5 03E+03	1 01E+04		
Tc-99	3 9357E-04	5,489 09	10,978 18	0 00E+00	2 16E+00	4 32E+00		
Th-229	1 2057E-10	5,489 09	10,978 18	0 00E+00	6 62E-07	1 32E-06		
Th-230	2 1043E-08	5,489 09	10,978 18	0 00E+00	1 16E-04	2 31E-04		
Th-232	5 2972E-12	5,489 09	10,978 18	0 00E+00	2 91E-08	5 82E-08		
Ti-208	1 7474E-07	5,489 09	10,978 18	0 00E+00	9 59E-04	1 92E-03		
U-232	4 7368E-07	5,489 09	10,978 18	0 00E+00	2 60E-03	5 20E-03		
U-233	2 5097E-08	5,489 09	10,978 18	0 00E+00	1 38E-04	2 76E-04		
U-234	5 0000E-05	5,489 09	10,978 18	0 00E+00	2 74E-01	5 49E-01		
U-235	-1 4489E-06	5,489 09	0 00	2 05E-02	1 26E-02	2 05E-02		
U-236	7 5824E-06	5,489 09	10,978 18	0 00E+00	4 16E-02	8 32E-02		
U-238	-2 6129E-07	5,489 09	0 00	8 74E-02	8 60E-02	8 74E-02		
Y-90	9 1699E-01	5,489 09	10,978 18	0 00E+00	5 03E+03	1 01E+04		
Other Radionuclides					7 37E+03	1 47E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	3 525	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal Bounding	From SFD	Estimated	
	4,154 69	5 489 09	
	4 193.24	10 978 18	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0 58	1.32	
	1 16	2 62	1 00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name CONNECTICUT YANKEE (S004)  
 SNF ID # 34  
 Fuel Units & Descr 1 - 15 X 15 ROD ARRAY  
 Heavy Metal Mass BOL=407 843kg EOL=393 774kg  
 ROD Storage Site INEEL  
 Fuel decay start date 1975  
 Estimates as of 2010  
 Template Pathfinder (Light Water SST, 60 to 100% U)  
 Template Burnup(MWd) 6 01  
 Template BOL Heavy Metal Mass (MT) 0 00012882  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	13,290.34	26,580.68	0.00E+00	3.10E-04	6.21E-04	Avg MeV	
Am-241	1.1135E-04	13,290.34	26,580.68	0.00E+00	1.48E+00	2.96E+00	0.0150	1.984E+15
Am-242m	8.5075E-09	13,290.34	26,580.68	0.00E+00	1.13E-04	2.26E-04	0.0250	4.123E+14
Am-243	9.8519E-10	13,290.34	26,580.68	0.00E+00	1.31E-05	2.62E-05	0.0375	3.566E+14
C-14	2.3012E-04	13,290.34	26,580.68	0.00E+00	3.06E+00	6.12E+00	0.0575	3.844E+14
Cl-36	1.2261E-06	13,290.34	26,580.68	0.00E+00	1.63E-02	3.26E-02	0.0850	2.322E+14
Cr-243	2.4875E-10	13,290.34	26,580.68	0.00E+00	3.31E-06	6.61E-06	0.1250	1.508E+14
Cr-244	2.3178E-09	13,290.34	26,580.68	0.00E+00	3.08E-05	6.16E-05	0.2250	1.999E+14
Co-60	7.0849E-02	13,290.34	26,580.68	0.00E+00	9.42E+02	1.88E+03	0.3750	8.720E+13
Cs-134	3.0266E-06	13,290.34	26,580.68	0.00E+00	4.02E-02	8.04E-02	0.5750	1.436E+15
Cs-135	3.0316E-05	13,290.34	26,580.68	0.00E+00	4.03E-01	8.06E-01	0.8500	1.454E+13
Cs-137	1.4511E+00	13,290.34	26,580.68	0.00E+00	1.93E+04	3.86E+04	1.2500	1.445E+14
Eu-154	6.6955E-04	13,290.34	26,580.68	0.00E+00	8.90E+00	1.78E+01	1.7500	3.750E+11
Eu-155	6.9850E-04	13,290.34	26,580.68	0.00E+00	9.28E+00	1.86E+01	2.2500	7.786E+08
Fe-55	1.2318E-03	13,290.34	26,580.68	0.00E+00	1.64E+01	3.27E+01	2.7500	2.251E+07
H-3	2.5141E-03	13,290.34	26,580.68	0.00E+00	3.34E+01	6.68E+01	3.5000	2.279E+03
I-129	7.3195E-07	13,290.34	26,580.68	0.00E+00	9.73E-03	1.95E-02	5.0000	9.503E+02
Kr-85	4.1281E-02	13,290.34	26,580.68	0.00E+00	5.49E+02	1.10E+03	7.0000	1.063E+02
Np-237	1.1489E-06	13,290.34	26,580.68	0.00E+00	1.53E-02	3.05E-02	11.0000	1.203E+01
Pa-231	4.5241E-08	13,290.34	26,580.68	0.00E+00	6.01E-04	1.20E-03		
Pb-210	6.4476E-13	13,290.34	26,580.68	0.00E+00	8.57E-09	1.71E-08		
Pm-147	1.1651E-03	13,290.34	26,580.68	0.00E+00	1.55E+01	3.10E+01		
Pu-238	2.9517E-04	13,290.34	26,580.68	0.00E+00	3.92E+00	7.85E+00		
Pu-239	6.6772E-04	13,290.34	26,580.68	0.00E+00	8.87E+00	1.77E+01		
Pu-240	8.6839E-05	13,290.34	26,580.68	0.00E+00	1.15E+00	2.31E+00		
Pu-241	7.1514E-04	13,290.34	26,580.68	0.00E+00	9.50E+00	1.90E+01		
Pu-242	1.9717E-09	13,290.34	26,580.68	0.00E+00	2.62E-05	5.24E-05		
Ra-226	1.7654E-12	13,290.34	26,580.68	0.00E+00	2.35E-08	4.69E-08		
Ra-228	8.2928E-12	13,290.34	26,580.68	0.00E+00	1.10E-07	2.20E-07		
Ru-106	1.8419E-10	13,290.34	26,580.68	0.00E+00	2.45E-06	4.90E-06		
Se-79	1.3223E-05	13,290.34	26,580.68	0.00E+00	1.76E-01	3.51E-01		
Sn-126	1.1493E-05	13,290.34	26,580.68	0.00E+00	1.53E-01	3.05E-01		
Sr-90	1.3649E+00	13,290.34	26,580.68	0.00E+00	1.81E+04	3.63E+04		
Tc-99	4.6656E-04	13,290.34	26,580.68	0.00E+00	6.20E+00	1.24E+01		
Th-229	1.4547E-11	13,290.34	26,580.68	0.00E+00	1.93E-07	3.87E-07		
Th-230	1.6617E-10	13,290.34	26,580.68	0.00E+00	2.21E-06	4.42E-06		
Th-232	8.3361E-12	13,290.34	26,580.68	0.00E+00	1.11E-07	2.22E-07		
Ti-208	2.1664E-08	13,290.34	26,580.68	0.00E+00	2.88E-04	5.76E-04		
U-232	5.8669E-08	13,290.34	26,580.68	0.00E+00	7.80E-04	1.56E-03		
U-233	3.1847E-09	13,290.34	26,580.68	0.00E+00	4.23E-05	8.47E-05		
U-234	3.8769E-07	13,290.34	26,580.68	0.00E+00	5.15E-03	1.03E-02		
U-235	-2.7761E-06	13,290.34	0.00	3.53E-02	0.00E+00	3.53E-02		
U-236	1.6190E-05	13,290.34	26,580.68	0.00E+00	2.15E-01	4.30E-01		
U-238	-2.8547E-09	13,290.34	0.00	1.32E-01	1.32E-01	1.32E-01		
Y-90	1.3652E+00	13,290.34	26,580.68	0.00E+00	1.81E+04	3.63E+04		
Other Radionuclides					2.19E+04	4.39E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

Reactor Moderator	From SFD	Used	Basis for Parameter Differences
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	SST	SST	This Template was used for the following reasons: This fuel matches Pathfinder Template on all but one parameter (enrichment) making Pathfinder a reasonable match.
BOL HM Constituents	U	U	
BOL Enrichment %	4 000000037	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
	13 139.89	13,290.34	
Nominal			Nominal burnup calculated from the heavy metal mass destroyed
Bounding		26 580.68	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	0.70	1.01	
Nominal			1.00
Bounding	1.40		

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name CP-5 CONVERTER CYLINDERS  
SNF ID # 36  
Fuel Units & Descr. 2 - CONVERTER CYLINDERS  
Heavy Metal Mass, BOL=1.231kg EOL=1.206kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1979  
Estimates as of 2010  
Template HFBR (Heavy Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 5  
Template BOL Heavy Metal Mass (MT) 0.00034251  
Template Decay Time 25 years

Estimated  
Canister usage  
HIC  
1.00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.1940E-09	24.54	49.08	0.00E+00	7.84E-08	1.57E-07	Avg. MeV	
Am-241	2.0920E-02	24.54	49.08	0.00E+00	5.13E-01	1.03E+00	0.0150	4.362E+12
Am-242m	3.7060E-06	24.54	49.08	0.00E+00	9.09E-05	1.82E-04	0.0250	9.060E+11
Am-243	2.0600E-06	24.54	49.08	0.00E+00	5.06E-05	1.01E-04	0.0375	7.966E+11
C-14	1.1278E-03	24.54	49.08	0.00E+00	2.77E-02	5.54E-02	0.0575	8.552E+11
Cl-36	8.3760E-11	24.54	49.08	0.00E+00	2.06E-09	4.11E-09	0.0850	5.077E+11
Cm-243	6.4200E-07	24.54	49.08	0.00E+00	1.58E-05	3.15E-05	0.1250	3.395E+11
Cm-244	1.5322E-05	24.54	49.08	0.00E+00	3.76E-04	7.52E-04	0.2250	4.370E+11
Co-60	2.4000E-01	24.54	49.08	0.00E+00	5.89E+00	1.18E+01	0.3750	1.910E+11
Cs-134	2.2840E-04	24.54	49.08	0.00E+00	5.60E-03	1.12E-02	0.5750	3.296E+12
Cs-135	7.9140E-06	24.54	49.08	0.00E+00	1.94E-04	3.88E-04	0.8500	4.429E+10
Cs-137	1.8038E+00	24.54	49.08	0.00E+00	4.43E+01	8.85E+01	1.2500	8.963E+11
Eu-154	1.5200E-02	24.54	49.08	0.00E+00	3.73E-01	7.46E-01	1.7500	1.226E+09
Eu-155	2.5420E-03	24.54	49.08	0.00E+00	6.24E-02	1.25E-01	2.2500	4.708E+06
Fe-55	8.2660E-04	24.54	49.08	0.00E+00	2.03E-02	4.06E-02	2.7500	1.023E+05
H-3	4.1740E-02	24.54	49.08	0.00E+00	1.02E+00	2.05E+00	3.5000	2.724E+02
I-129	7.5020E-07	24.54	49.08	0.00E+00	1.84E-05	3.68E-05	5.0000	1.077E+02
Kr-85	7.2960E-02	24.54	49.08	0.00E+00	1.79E+00	3.58E+00	7.0000	1.212E+01
Np-237	5.4700E-06	24.54	49.08	0.00E+00	1.34E-04	2.68E-04	11.0000	1.376E+00
Pa-231	6.2740E-09	24.54	49.08	0.00E+00	1.54E-07	3.08E-07		
Pb-210	1.7004E-09	24.54	49.08	0.00E+00	4.17E-08	8.35E-08		
Pm-147	1.3972E-02	24.54	49.08	0.00E+00	3.43E-01	6.86E-01		
Pu-238	6.9520E-03	24.54	49.08	0.00E+00	1.71E-01	3.41E-01		
Pu-239	1.8748E-02	24.54	49.08	0.00E+00	4.60E-01	9.20E-01		
Pu-240	8.3640E-03	24.54	49.08	0.00E+00	2.05E-01	4.10E-01		
Pu-241	2.3640E-01	24.54	49.08	0.00E+00	5.80E+00	1.16E+01		
Pu-242	2.0400E-06	24.54	49.08	0.00E+00	5.01E-05	1.00E-04		
Ra-226	5.8960E-09	24.54	49.08	0.00E+00	1.45E-07	2.89E-07		
Ra-228	1.1638E-09	24.54	49.08	0.00E+00	2.86E-08	5.71E-08		
Ru-106	3.1580E-07	24.54	49.08	0.00E+00	7.75E-06	1.55E-05		
Se-79	1.2524E-05	24.54	49.08	0.00E+00	3.07E-04	6.15E-04		
Sn-126	1.2054E-05	24.54	49.08	0.00E+00	2.96E-04	5.92E-04		
Sr-90	1.6036E+00	24.54	49.08	0.00E+00	3.94E+01	7.87E+01		
Tc-99	4.4140E-04	24.54	49.08	0.00E+00	1.08E-02	2.17E-02		
Th-229	3.0560E-09	24.54	49.08	0.00E+00	7.50E-08	1.50E-07		
Th-230	7.5960E-07	24.54	49.08	0.00E+00	1.86E-05	3.73E-05		
Th-232	1.1926E-09	24.54	49.08	0.00E+00	2.93E-08	5.85E-08		
Ti-208	5.0820E-08	24.54	49.08	0.00E+00	1.25E-06	2.49E-06		
U-232	1.3656E-07	24.54	49.08	0.00E+00	3.35E-06	6.70E-06		
U-233	9.1580E-07	24.54	49.08	0.00E+00	2.25E-05	4.49E-05		
U-234	2.3440E-03	24.54	49.08	0.00E+00	5.75E-02	1.15E-01		
U-235	-2.3316E-06	24.54	0.00	2.47E-03	2.42E-03	2.47E-03		
U-236	2.6620E-05	24.54	49.08	0.00E+00	6.53E-04	1.31E-03		
U-238	-1.3291E-07	24.54	0.00	2.90E-05	2.57E-05	2.90E-05		
Y-90	1.6040E+00	24.54	49.08	0.00E+00	3.94E+01	7.87E+01		
Other Radionuclides					4.22E+01	8.44E+01		
							Thermal Power	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							6.20E+01	1.24E+02
							Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

Reactor Moderator:	From SFD	Used	Basis for Parameter Differences:
	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ZIRC	ZIRC	This Template was used for the following reasons. This fuel matches on all parameters except enrichment.
BOL HM Constituents:	U	U	
BOL Enrichment %:	93	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal:		24.54	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding:		49.08	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.37		1.01
Bounding	2.73		

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name DOE TEST & EXPERIMENTAL (ALUM)  
SNF ID # 42  
Fuel Units & Descr 10 - CANISTER OF SCRAP  
Heavy Metal Mass BOL= EOL=31.05kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1979  
Estimates as of 2010  
Template (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186865  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x10"  
0.08

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	1.9648E-06	29,508.45	29,508.45	0.00E+00	5.80E-02	5.80E-02	Avg MeV	
Am-241	7.8064E+00	29,508.45	29,508.45	0.00E+00	2.30E+05	2.30E+05	0.0150	4.941E+16
Am-242m	1.7632E-02	29,508.45	29,508.45	0.00E+00	5.20E+02	5.20E+02	0.0250	9.792E+15
Am-243	1.6336E-02	29,508.45	29,508.45	0.00E+00	4.82E+02	4.82E+02	0.0375	8.736E+15
C-14	1.2101E-01	29,508.45	29,508.45	0.00E+00	3.57E+03	3.57E+03	0.0575	1.192E+16
Cl-36	2.2849E-03	29,508.45	29,508.45	0.00E+00	6.74E+01	6.74E+01	0.0850	5.156E+15
Cm-243	1.1046E-03	29,508.45	29,508.45	0.00E+00	3.26E+01	3.26E+01	0.1250	4.484E+15
Cm-244	2.4704E-01	29,508.45	29,508.45	0.00E+00	7.29E+03	7.29E+03	0.2250	4.380E+15
Co-60	1.0466E+02	29,508.45	29,508.45	0.00E+00	3.09E+06	3.09E+06	0.3750	1.846E+15
Cs-134	9.8289E-03	29,508.45	29,508.45	0.00E+00	2.90E+02	2.90E+02	0.5750	2.945E+16
Cs-135	4.3976E-04	29,508.45	29,508.45	0.00E+00	1.30E+01	1.30E+01	0.8500	1.774E+15
Cs-137	2.6526E+01	29,508.45	29,508.45	0.00E+00	7.83E+05	7.83E+05	1.2500	2.303E+17
Eu-154	2.7975E+00	29,508.45	29,508.45	0.00E+00	8.26E+04	8.26E+04	1.7500	5.579E+13
Eu-155	2.7881E-01	29,508.45	29,508.45	0.00E+00	8.23E+03	8.23E+03	2.2500	1.212E+12
Fe-55	4.2151E+00	29,508.45	29,508.45	0.00E+00	1.24E+05	1.24E+05	2.7500	1.038E+11
H-3	4.2599E-01	29,508.45	29,508.45	0.00E+00	1.26E+04	1.26E+04	3.5000	1.061E+08
I-129	1.0618E-05	29,508.45	29,508.45	0.00E+00	3.13E-01	3.13E-01	5.0000	4.516E+07
Kr-85	1.1426E+00	29,508.45	29,508.45	0.00E+00	3.37E+04	3.37E+04	7.0000	5.185E+06
Np-237	1.5647E-04	29,508.45	29,508.45	0.00E+00	4.62E+00	4.62E+00	11.0000	5.941E+05
Pa-231	2.8624E-06	29,508.45	29,508.45	0.00E+00	8.45E-02	8.45E-02		
Pb-210	9.2770E-09	29,508.45	29,508.45	0.00E+00	2.74E-04	2.74E-04		
Pm-147	2.3690E-01	29,508.45	29,508.45	0.00E+00	6.99E+03	6.99E+03		
Pu-238	-6.1800E-01	29,508.45	0.00	7.98E+03	0.00E+00	7.98E+03		
Pu-239	-4.8280E-02	29,508.45	0.00	9.66E+02	0.00E+00	9.66E+02		
Pu-240	-3.0095E-01	29,508.45	0.00	1.23E+03	0.00E+00	1.23E+03		
Pu-241	-7.4000E+01	29,508.45	0.00	3.17E+05	0.00E+00	3.17E+05		
Pu-242	-1.1381E-04	29,508.45	0.00	5.34E+00	1.98E+00	5.34E+00		
Ra-226	3.2167E-08	29,508.45	29,508.45	0.00E+00	9.49E-04	9.49E-04		
Ra-228	5.9024E-07	29,508.45	29,508.45	0.00E+00	1.74E-02	1.74E-02		
Ru-106	3.9140E-06	29,508.45	29,508.45	0.00E+00	1.15E-01	1.15E-01		
Se-79	1.9184E-04	29,508.45	29,508.45	0.00E+00	5.66E+00	5.66E+00		
Sn-126	1.6671E-04	29,508.45	29,508.45	0.00E+00	4.92E+00	4.92E+00		
Sr-90	2.5126E+01	29,508.45	29,508.45	0.00E+00	7.41E+05	7.41E+05		
Tc-99	6.7678E-03	29,508.45	29,508.45	0.00E+00	2.00E+02	2.00E+02		
Th-229	1.2398E-06	29,508.45	29,508.45	0.00E+00	3.66E-02	3.66E-02		
Th-230	4.1442E-06	29,508.45	29,508.45	0.00E+00	1.22E-01	1.22E-01		
Th-232	-4.2431E-09	29,508.45	0.00	1.26E-03	1.13E-03	1.26E-03		
Ti-208	9.6478E-05	29,508.45	29,508.45	0.00E+00	2.85E+00	2.85E+00		
U-232	2.6103E-04	29,508.45	29,508.45	0.00E+00	7.70E+00	7.70E+00	Thermal Power	
U-233	3.6128E-04	29,508.45	29,508.45	0.00E+00	1.07E+01	1.07E+01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.2788E-02	29,508.45	29,508.45	0.00E+00	3.77E+02	3.77E+02	6.59E+04	6.62E+04
U-235	5.7486E-04	29,508.45	29,508.45	2.67E-02	1.70E+01	1.70E+01	Total	Total
U-236	2.3485E-04	29,508.45	29,508.45	0.00E+00	6.93E+00	6.93E+00		
U-238	1.1581E-04	29,508.45	29,508.45	3.32E-03	3.42E+00	3.42E+00		
Y-90	2.5126E+01	29,508.45	29,508.45	0.00E+00	7.41E+05	7.41E+05		
Other Radionuclides					2.07E+06	2.07E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
Fuel Cladding	FAST	(Worst Case)	This fuel didn't closely match any existing templates therefore the worst case template was used
BOL HM Constituents	ALUM	SST/Inconel	
BOL Enrichment %	Other	U, Th & Pu	
		0 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		29,508.45	Nominal burnup set equal to bounding burnup
Bounding		29,508.45	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	14.21		586.76
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: DOE TEST & EXPERIMENTAL (SST)  
 SNF ID #: 857  
 Fuel Units & Descr: 10 - CANISTER OF SCRAP  
 Heavy Metal Mass: BOL= , EOL=31 05kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 1979  
 Estimates as of. 2010  
 Template. (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 62.5  
 Template BOL Heavy Metal Mass (MT): 0.00186865  
 Template Decay Time: 25 years

Estimated  
 Canister usage  
 18"x10"  
 0.08

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9648E-06	29,508.45	29,508.45	0.00E+00	5.80E-02	5.80E-02	Avg. MeV	
Am-241	7.8064E+00	29,508.45	29,508.45	0.00E+00	2.30E+05	2.30E+05	0.0150	4.941E+16
Am-242m	1.7632E-02	29,508.45	29,508.45	0.00E+00	5.20E+02	5.20E+02	0.0250	9.792E+15
Am-243	1.6336E-02	29,508.45	29,508.45	0.00E+00	4.82E+02	4.82E+02	0.0375	8.736E+15
C-14	1.2101E-01	29,508.45	29,508.45	0.00E+00	3.57E+03	3.57E+03	0.0575	1.192E+16
Cl-36	2.2849E-03	29,508.45	29,508.45	0.00E+00	6.74E+01	6.74E+01	0.0850	5.156E+15
Cm-243	1.1046E-03	29,508.45	29,508.45	0.00E+00	3.26E+01	3.26E+01	0.1250	4.484E+15
Cm-244	2.4704E-01	29,508.45	29,508.45	0.00E+00	7.29E+03	7.29E+03	0.2250	4.380E+15
Co-60	1.0466E+02	29,508.45	29,508.45	0.00E+00	3.09E+06	3.09E+06	0.3750	1.846E+15
Cs-134	9.8289E-03	29,508.45	29,508.45	0.00E+00	2.90E+02	2.90E+02	0.5750	2.945E+16
Cs-135	4.3976E-04	29,508.45	29,508.45	0.00E+00	1.30E+01	1.30E+01	0.8500	1.774E+15
Cs-137	2.6526E+01	29,508.45	29,508.45	0.00E+00	7.83E+05	7.83E+05	1.2500	2.303E+17
Eu-154	2.7975E+00	29,508.45	29,508.45	0.00E+00	8.26E+04	8.26E+04	1.7500	5.579E+13
Eu-155	2.7881E-01	29,508.45	29,508.45	0.00E+00	8.23E+03	8.23E+03	2.2500	1.212E+12
Fe-55	4.2151E+00	29,508.45	29,508.45	0.00E+00	1.24E+05	1.24E+05	2.7500	1.038E+11
H-3	4.2599E-01	29,508.45	29,508.45	0.00E+00	1.26E+04	1.26E+04	3.5000	1.061E+08
I-129	1.0618E-05	29,508.45	29,508.45	0.00E+00	3.13E-01	3.13E-01	5.0000	4.516E+07
Kr-85	1.1426E+00	29,508.45	29,508.45	0.00E+00	3.37E+04	3.37E+04	7.0000	5.185E+06
Np-237	1.5647E-04	29,508.45	29,508.45	0.00E+00	4.62E+00	4.62E+00	11.0000	5.941E+05
Pa-231	2.8624E-06	29,508.45	29,508.45	0.00E+00	8.45E-02	8.45E-02		
Pb-210	9.2770E-09	29,508.45	29,508.45	0.00E+00	2.74E-04	2.74E-04		
Pm-147	2.3690E-01	29,508.45	29,508.45	0.00E+00	6.99E+03	6.99E+03		
Pu-238	-6.1800E-01	29,508.45	0.00	7.98E+03	0.00E+00	7.98E+03		
Pu-239	-4.8280E-02	29,508.45	0.00	9.66E+02	0.00E+00	9.66E+02		
Pu-240	-3.0095E-01	29,508.45	0.00	1.23E+03	0.00E+00	1.23E+03		
Pu-241	-7.4000E+01	29,508.45	0.00	3.17E+05	0.00E+00	3.17E+05		
Pu-242	-1.1381E-04	29,508.45	0.00	5.34E+00	1.98E+00	5.34E+00		
Ra-226	3.2167E-08	29,508.45	29,508.45	0.00E+00	9.49E-04	9.49E-04		
Ra-228	5.9024E-07	29,508.45	29,508.45	0.00E+00	1.74E-02	1.74E-02		
Ru-106	3.9140E-06	29,508.45	29,508.45	0.00E+00	1.15E-01	1.15E-01		
Se-79	1.9184E-04	29,508.45	29,508.45	0.00E+00	5.66E+00	5.66E+00		
Sn-126	1.6671E-04	29,508.45	29,508.45	0.00E+00	4.92E+00	4.92E+00		
Sr-90	2.5126E+01	29,508.45	29,508.45	0.00E+00	7.41E+05	7.41E+05		
Tc-99	6.7678E-03	29,508.45	29,508.45	0.00E+00	2.00E+02	2.00E+02		
Th-229	1.2398E-06	29,508.45	29,508.45	0.00E+00	3.66E-02	3.66E-02		
Th-230	4.1442E-06	29,508.45	29,508.45	0.00E+00	1.22E-01	1.22E-01		
Th-232	-4.2431E-09	29,508.45	0.00	1.26E-03	1.13E-03	1.26E-03		
Th-208	9.6478E-05	29,508.45	29,508.45	0.00E+00	2.85E+00	2.85E+00		
U-232	2.6103E-04	29,508.45	29,508.45	0.00E+00	7.70E+00	7.70E+00		
U-233	3.6128E-04	29,508.45	29,508.45	0.00E+00	1.07E+01	1.07E+01		
U-234	1.2788E-02	29,508.45	29,508.45	0.00E+00	3.77E+02	3.77E+02		
U-235	5.7486E-04	29,508.45	29,508.45	2.67E-02	1.70E+01	1.70E+01		
U-236	2.3485E-04	29,508.45	29,508.45	0.00E+00	6.93E+00	6.93E+00		
U-238	1.1581E-04	29,508.45	29,508.45	3.32E-03	3.42E+00	3.42E+00		
Y-90	2.5126E+01	29,508.45	29,508.45	0.00E+00	7.41E+05	7.41E+05		
Other Radionuclides					2.07E+06	2.07E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	FAST	(Worst Case)	
	Fuel Cladding	SST/Inconel	
	BOL HM Constituents	U, Th, & Pu	
BOL Enrichment %	Other	0 to 100	This fuel didn't closely match any existing templates therefore the worst case template was used

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
		29,508.45	
Bounding		29,508.45	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
	14.21		
Bounding	14.21		586.76

<sup>1</sup>Reactor shutdown, core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name DOE TEST & EXPERIMENTAL (ZIRC)  
SNF ID # 858  
Fuel Units & Descr 10 - CANISTER OF SCRAP  
Heavy Metal Mass BOL= EOL=31 05kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1979  
Estimates as of 2010  
Template: (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 62.5  
Template BOL Heavy Metal Mass (MT) 0 00186865  
Template Decay Time 25 years

Estimated  
Canister usage:  
18"x10"  
0 08

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 9648E-06	29,508 45	29 508 45	0 00E+00	5 80E-02	5 80E-02	Avg MeV	
Am-241	7 8064E+00	29,508 45	29 508 45	0 00E+00	2 30E+05	2 30E+05	0 0150	4 941E+16
Am-242m	1 7632E-02	29,508 45	29 508 45	0 00E+00	5 20E+02	5 20E+02	0 0250	9 792E+15
Am-243	1 6336E-02	29,508 45	29 508 45	0 00E+00	4 82E+02	4 82E+02	0 0375	8 736E+15
C-14	1 2101E-01	29 508 45	29 508 45	0 00E+00	3 57E+03	3 57E+03	0 0575	1 192E+16
Cl-36	2 2849E-03	29 508 45	29 508 45	0 00E+00	6 74E+01	6 74E+01	0 0850	5 156E+15
Cm-243	1 1046E-03	29 508 45	29 508 45	0 00E+00	3 26E+01	3 26E+01	0 1250	4 484E+15
Cm-244	2 4704E-01	29 508 45	29 508 45	0 00E+00	7 29E+03	7 29E+03	0 2250	4 380E+15
Co-60	1 0466E+02	29 508 45	29 508 45	0 00E+00	3 09E+06	3 09E+06	0 3750	1 846E+15
Cs-134	9 8289E-03	29 508 45	29 508 45	0 00E+00	2 90E+02	2 90E+02	0 5750	2 945E+16
Cs-135	4 3976E-04	29 508 45	29 508 45	0 00E+00	1 30E+01	1 30E+01	0 8500	1 774E+15
Cs-137	2 6526E+01	29 508 45	29 508 45	0 00E+00	7 83E+05	7 83E+05	1 2500	2 303E+17
Eu-154	2 7975E+00	29 508 45	29 508 45	0 00E+00	8 26E+04	8 26E+04	1 7500	5 579E+13
Eu-155	2 7881E-01	29 508 45	29 508 45	0 00E+00	8 23E+03	8 23E+03	2 2500	1 212E+12
Fe-55	4 2151E+00	29 508 45	29 508 45	0 00E+00	1 24E+05	1 24E+05	2 7500	1 038E+11
H-3	4 2599E-01	29 508 45	29 508 45	0 00E+00	1 26E+04	1 26E+04	3 5000	1 061E+08
I-129	1 0618E-05	29 508 45	29 508 45	0 00E+00	3 13E-01	3 13E-01	5 0000	4 516E+07
Kr-85	1 1426E+00	29 508 45	29 508 45	0 00E+00	3 37E+04	3 37E+04	7 0000	5 185E+06
Np-237	1 5647E-04	29 508 45	29 508 45	0 00E+00	4 62E+00	4 62E+00	11 0000	5 941E+05
Pa-231	2 8624E-06	29 508 45	29 508 45	0 00E+00	8 45E-02	8 45E-02		
Pb-210	9 2770E-09	29 508 45	29 508 45	0 00E+00	2 74E-04	2 74E-04		
Pm-147	2 3690E-01	29 508 45	29 508 45	0 00E+00	6 99E+03	6 99E+03		
Pu-238	-6 1800E-01	29 508 45	0 00	7 98E+03	0 00E+00	7 98E+03		
Pu-239	-4 8280E-02	29 508 45	0 00	9 66E+02	0 00E+00	9 66E+02		
Pu-240	-3 0095E-01	29 508 45	0 00	1 23E+03	0 00E+00	1 23E+03		
Pu-241	-7 4000E+01	29 508 45	0 00	3 17E+05	0 00E+00	3 17E+05		
Pu-242	-1 1381E-04	29 508 45	0 00	5 34E+00	1 98E+00	5 34E+00		
Ra-226	3 2167E-08	29 508 45	29 508 45	0 00E+00	9 49E-04	9 49E-04		
Ra-228	5 9024E-07	29 508 45	29 508 45	0 00E+00	1 74E-02	1 74E-02		
Ru-106	3 9140E-06	29 508 45	29 508 45	0 00E+00	1 15E-01	1 15E-01		
Se-79	1 9184E-04	29 508 45	29 508 45	0 00E+00	5 66E+00	5 66E+00		
Sn-126	1 6671E-04	29 508 45	29 508 45	0 00E+00	4 92E+00	4 92E+00		
Sr-90	2 5126E+01	29 508 45	29 508 45	0 00E+00	7 41E+05	7 41E+05		
Tc-99	6 7678E-03	29 508 45	29 508 45	0 00E+00	2 00E+02	2 00E+02		
Th-229	1 2398E-06	29 508 45	29 508 45	0 00E+00	3 66E-02	3 66E-02		
Th-230	4 1442E-06	29 508 45	29 508 45	0 00E+00	1 22E-01	1 22E-01		
Th-232	-4 2431E-09	29 508 45	0 00	1 26E-03	1 13E-03	1 26E-03		
Th-208	9 6478E-05	29 508 45	29 508 45	0 00E+00	2 85E+00	2 85E+00		
U-232	2 6103E-04	29 508 45	29 508 45	0 00E+00	7 70E+00	7 70E+00		
U-233	3 6128E-04	29 508 45	29 508 45	0 00E+00	1 07E+01	1 07E+01		
U-234	1 2788E-02	29 508 45	29 508 45	0 00E+00	3 77E+02	3 77E+02		
U-235	5 7486E-04	29 508 45	29 508 45	2 67E-02	1 70E+01	1 70E+01		
U-236	2 3485E-04	29 508 45	29 508 45	0 00E+00	6 93E+00	6 93E+00		
U-238	1 1581E-04	29 508 45	29 508 45	3 32E-03	3 42E+00	3 42E+00		
Y-90	2 5126E+01	29 508 45	29 508 45	0 00E+00	7 41E+05	7 41E+05		
Other Radionuclides					2 07E+06	2 07E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:  This fuel didn't closely match any existing templates, therefore the worst case template was used
Reactor Moderator	FAST	(Worst Case)	
Fuel Cladding	ZIRC	SST/Inconel	
BOL HM Constituents	Other	U Th & Pu	
BOL Enrichment %		0 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:  Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Nominal		29 508 45	
Bounding		29 508 45	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM  586 76
Nominal	14.21		
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: DRCT  
SNF ID #: 701  
Fuel Units & Descr: 2856 - ROD  
Heavy Metal Mass: BOL=6338 892kg EOL=6144 97kg  
ROD Storage Site: INEEL  
<sup>1</sup>Fuel decay start date: 1981  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x15"  
3 50

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6376E-10	185,919 70	224,650 33	0 00E+00	1 23E-04	1 49E-04	Avg. MeV	
Am-241	1 3144E-01	185,919 70	224,650 33	0 00E+00	2 44E+04	2 95E+04	0 0150	1 528E+16
Am-242m	3 0039E-04	185,919 70	224,650 33	0 00E+00	5 58E+01	6 75E+01	0 0250	3 094E+15
Am-243	6 2629E-04	185,919 70	224,650 33	0 00E+00	1 16E+02	1 41E+02	0 0375	2 994E+15
C-14	4 7965E-05	185,919 70	224,650 33	0 00E+00	8 92E+00	1 08E+01	0 0575	3 267E+15
Cl-36	8 0297E-07	185,919 70	224,650 33	0 00E+00	1 49E-01	1 80E-01	0 0850	1 731E+15
Cm-243	3 1993E-04	185,919 70	224,650 33	0 00E+00	5 95E+01	7 19E+01	0 1250	1 264E+15
Cm-244	7 1851E-02	185,919 70	224,650 33	0 00E+00	1 34E+04	1 61E+04	0 2250	1 486E+15
Co-60	9 5220E-03	185,919 70	224,650 33	0 00E+00	1 77E+03	2 14E+03	0 3750	6 376E+14
Cs-134	1 1662E-03	185,919 70	224,650 33	0 00E+00	2 17E+02	2 62E+02	0 5750	1 465E+16
Cs-135	1 4433E-05	185,919 70	224,650 33	0 00E+00	2 68E+00	3 24E+00	0 8500	2 892E+14
Cs-137	1 7603E+00	185,919 70	224,650 33	0 00E+00	3 27E+05	3 95E+05	1 2500	3 906E+14
Eu-154	4 5203E-02	185,919 70	224,650 33	0 00E+00	8 40E+03	1 02E+04	1 7500	8 559E+12
Eu-155	7 1479E-03	185,919 70	224,650 33	0 00E+00	1 33E+03	1 61E+03	2 2500	1 581E+09
Fe-55	6 1919E-04	185,919 70	224,650 33	0 00E+00	1 15E+02	1 39E+02	2 7500	1 777E+09
H-3	3 6386E-02	185,919 70	224,650 33	0 00E+00	6 76E+03	8 17E+03	3 5000	2 328E+08
I-129	9 8288E-07	185,919 70	224,650 33	0 00E+00	1 83E-01	2 21E-01	5 0000	9 951E+07
Kr-85	5 3844E-02	185,919 70	224,650 33	0 00E+00	1 00E+04	1 21E+04	7 0000	1 147E+07
Np-237	1 0546E-05	185,919 70	224,650 33	0 00E+00	1 96E+00	2 37E+00	11 0000	1 318E+06
Pa-231	1 1370E-09	185,919 70	224,650 33	0 00E+00	2 11E-04	2 55E-04		
Pb-210	3 3624E-11	185,919 70	224,650 33	0 00E+00	6 25E-06	7 55E-06		
Pm-147	5 1211E-03	185,919 70	224,650 33	0 00E+00	9 52E+02	1 15E+03		
Pu-238	8 0669E-02	185,919 70	224,650 33	0 00E+00	1 50E+04	1 81E+04		
Pu-239	1 1626E-02	185,919 70	224,650 33	0 00E+00	2 16E+03	2 61E+03		
Pu-240	1 5097E-02	185,919 70	224,650 33	0 00E+00	2 81E+03	3 39E+03		
Pu-241	1 4567E+00	185,919 70	224,650 33	0 00E+00	2 71E+05	3 27E+05		
Pu-242	6 4260E-05	185,919 70	224,650 33	0 00E+00	1 19E+01	1 44E+01		
Ra-226	1 1392E-10	185,919 70	224,650 33	0 00E+00	2 12E-05	2 56E-05		
Ra-228	5 1841E-12	185,919 70	224,650 33	0 00E+00	9 64E-07	1 16E-06		
Ru-106	5 9012E-07	185,919 70	224,650 33	0 00E+00	1 10E-01	1 33E-01		
Se-79	1 2379E-05	185,919 70	224,650 33	0 00E+00	2 30E+00	2 78E+00		
Sn-126	2 5210E-05	185,919 70	224,650 33	0 00E+00	4 69E+00	5 66E+00		
Sr-90	1 1630E+00	185,919 70	224,650 33	0 00E+00	2 16E+05	2 61E+05		
Tc-99	3 9357E-04	185,919 70	224,650 33	0 00E+00	7 32E+01	8 84E+01		
Th-229	8 5691E-11	185,919 70	224,650 33	0 00E+00	1 59E-05	1 93E-05		
Th-230	1 4493E-08	185,919 70	224,650 33	0 00E+00	2 69E-03	3 26E-03		
Th-232	5 2923E-12	185,919 70	224,650 33	0 00E+00	9 84E-07	1 19E-06		
Ti-208	1 9202E-07	185,919 70	224,650 33	0 00E+00	3 57E-02	4 31E-02		
U-232	5 2083E-07	185,919 70	224,650 33	0 00E+00	9 68E-02	1 17E-01		
U-233	2 4386E-08	185,919 70	224,650 33	0 00E+00	4 53E-03	5 48E-03		
U-234	4 7012E-05	185,919 70	224,650 33	0 00E+00	8 74E+00	1 06E+01		
U-235	-1 4492E-06	185,919 70	0 00	3 60E-01	9 10E-02	3 60E-01		
U-236	7 5759E-06	185,919 70	224,650 33	0 00E+00	1 41E+00	1 70E+00		
U-238	-2 6129E-07	185,919 70	0 00	2 07E+00	2 03E+00	2 07E+00		
Y-90	1 1631E+00	185,919 70	224,650 33	0 00E+00	2 16E+05	2 61E+05		
Other Radionuclides					3 14E+05	3 80E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	2 631414612	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal	185 919 70	184 411 03	
Bounding	224 650 33	368 822 06	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 84	0 99	
Bounding	1 01	1 64	1 00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name DRCT  
SNF ID # 756  
Fuel Units & Descr 6936 - ROD  
Heavy Metal Mass BOL=15512 364kg EOL=15006 036kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1981  
Estimates as of 2010  
Template PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
8 50

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6376E-10	481,493 98	962,987 96	0 00E+00	3 20E-04	6 39E-04	Avg MeV	
Am-241	1 3144E-01	481,493 98	962,987 96	0 00E+00	6 33E+04	1 27E+05	0 0150	6 549E+16
Am-242m	3 0039E-04	481,493 98	962,987 96	0 00E+00	1 45E+02	2 89E+02	0 0250	1 326E+16
Am-243	6 2629E-04	481,493 98	962,987 96	0 00E+00	3 02E+02	6 03E+02	0 0375	1 284E+16
C-14	4 7965E-05	481,493 98	962,987 96	0 00E+00	2 31E+01	4 62E+01	0 0575	1 400E+16
Cl-36	8 0297E-07	481,493 98	962,987 96	0 00E+00	3 87E-01	7 73E-01	0 0850	7 420E+15
Cm-243	3 1993E-04	481,493 98	962,987 96	0 00E+00	1 54E+02	3 08E+02	0 1250	5 420E+15
Cm-244	7 1851E-02	481,493 98	962,987 96	0 00E+00	3 46E+04	6 92E+04	0 2250	6 370E+15
Co-60	9 5220E-03	481,493 98	962,987 96	0 00E+00	4 58E+03	9 17E+03	0 3750	2 733E+15
Cs-134	1 1662E-03	481,493 98	962,987 96	0 00E+00	5 62E+02	1 12E+03	0 5750	6 280E+16
Cs-135	1 4433E-05	481,493 98	962,987 96	0 00E+00	6 95E+00	1 39E+01	0 8500	1 240E+15
Cs-137	1 7603E+00	481,493 98	962,987 96	0 00E+00	8 48E+05	1 70E+06	1 2500	1 674E+15
Eu-154	4 5203E-02	481,493 98	962,987 96	0 00E+00	2 18E+04	4 35E+04	1 7500	3 669E+13
Eu-155	7 1479E-03	481,493 98	962,987 96	0 00E+00	3 44E+03	6 88E+03	2 2500	6 776E+09
Fe-55	6 1919E-04	481,493 98	962,987 96	0 00E+00	2 98E+02	5 96E+02	2 7500	7 616E+09
H-3	3 6386E-02	481,493 98	962,987 96	0 00E+00	1 75E+04	3 50E+04	3 5000	9 980E+08
I-129	9 8288E-07	481,493 98	962,987 96	0 00E+00	4 73E-01	9 47E-01	5 0000	4 265E+08
Kr-85	5 3844E-02	481,493 98	962,987 96	0 00E+00	2 59E+04	5 19E+04	7 0000	4 917E+07
Np-237	1 0546E-05	481,493 98	962,987 96	0 00E+00	5 08E+00	1 02E+01	11 0000	5 648E+06
Pa-231	1 1370E-09	481,493 98	962,987 96	0 00E+00	5 47E-04	1 09E-03		
Pb-210	3 3624E-11	481,493 98	962,987 96	0 00E+00	1 62E-05	3 24E-05		
Pm-147	5 1211E-03	481,493 98	962,987 96	0 00E+00	2 47E+03	4 93E+03		
Pu-238	8 0669E-02	481,493 98	962,987 96	0 00E+00	3 88E+04	7 77E+04		
Pu-239	1 1626E-02	481,493 98	962,987 96	0 00E+00	5 60E+03	1 12E+04		
Pu-240	1 5097E-02	481,493 98	962,987 96	0 00E+00	7 27E+03	1 45E+04		
Pu-241	1 4567E+00	481,493 98	962,987 96	0 00E+00	7 01E+05	1 40E+06		
Pu-242	6 4260E-05	481,493 98	962,987 96	0 00E+00	3 09E+01	6 19E+01		
Ra-226	1 1392E-10	481,493 98	962,987 96	0 00E+00	5 49E-05	1 10E-04		
Ra-228	5 1841E-12	481,493 98	962,987 96	0 00E+00	2 50E-06	4 99E-06		
Ru-106	5 9012E-07	481,493 98	962,987 96	0 00E+00	2 84E-01	5 68E-01		
Se-79	1 2379E-05	481,493 98	962,987 96	0 00E+00	5 96E+00	1 19E+01		
Sn-126	2 5210E-05	481,493 98	962,987 96	0 00E+00	1 21E+01	2 43E+01		
Sr-90	1 1630E+00	481,493 98	962,987 96	0 00E+00	5 60E+05	1 12E+06		
Tc-99	3 9357E-04	481,493 98	962,987 96	0 00E+00	1 90E+02	3 79E+02		
Th-229	8 5691E-11	481,493 98	962,987 96	0 00E+00	4 13E-05	8 25E-05		
Th-230	1 4493E-08	481,493 98	962,987 96	0 00E+00	6 98E-03	1 40E-02		
Th-232	5 2923E-12	481,493 98	962,987 96	0 00E+00	2 55E-06	5 10E-06		
Ti-208	1 9202E-07	481,493 98	962,987 96	0 00E+00	9 25E-02	1 85E-01		
U-232	5 2083E-07	481,493 98	962,987 96	0 00E+00	2 51E-01	5 02E-01	Thermal Power	
U-233	2 4386E-08	481,493 98	962,987 96	0 00E+00	1 17E-02	2 35E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4 7012E-05	481,493 98	962,987 96	0 00E+00	2 26E+01	4 53E+01	1 32E+04	2 64E+04
U-235	-1 4492E-06	481,493 98	0 00	9 81E-01	2 83E-01	9 81E-01	Total	Total
U-236	7 5759E-06	481,493 98	962,987 96	0 00E+00	3 65E+00	7 30E+00		
U-238	-2 6129E-07	481,493 98	0 00	5 06E+00	4 94E+00	5 06E+00		
Y-90	1 1631E+00	481,493 98	962,987 96	0 00E+00	5 60E+05	1 12E+06		
Other Radionuclides					8 13E+05	1 63E+06		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences.
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2 925317534	0 to 5	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal	454 977 64	481 493 98	
Bounding	549 758 18	962 987 96	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 89	1 06	
Bounding	1 77	1 75	1 00

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: DRESDEN I (E00161)  
 SNF ID #: 928  
 Fuel Units & Descr: 1 - 6 X 6 ROD ARRAY  
 Heavy Metal Mass: BOL=111.5kg EOL=109 853kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1973  
 Estimates as of: 2010  
 Template: PWR (Light Water, Zinc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
 Template BOL Heavy Metal Mass (MT): 0 00176911  
 Template Decay Time: 35 years

Estimated  
 Canister usage  
 Bare Fuel Transfer

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	1,566.22	3,132.44	0 00E+00	1 37E-06	2 75E-06	Avg MeV	
Am-241	1.4352E-01	1,566.22	3,132.44	0 00E+00	2.25E+02	4.50E+02	0 0150	1 685E+14
Am-242m	2 8698E-04	1,566.22	3,132.44	0 00E+00	4 49E-01	8 99E-01	0 0250	3 399E+13
Am-243	6.2565E-04	1,566.22	3,132.44	0 00E+00	9 80E-01	1 96E+00	0 0375	3 242E+13
C-14	4 7901E-05	1,566.22	3,132.44	0 00E+00	7 50E-02	1 50E-01	0 0575	3 745E+13
Cl-36	8 0297E-07	1,566.22	3,132.44	0 00E+00	1 26E-03	2 52E-03	0 0850	1 886E+13
Cm-243	2 5081E-04	1,566.22	3,132.44	0 00E+00	3 93E-01	7 86E-01	0 1250	1 309E+13
Cm-244	4 9015E-02	1,566.22	3,132.44	0 00E+00	7 68E+01	1 54E+02	0 2250	1 617E+13
Co-60	2 5581E-03	1,566.22	3,132.44	0 00E+00	4 01E+00	8 01E+00	0 3750	6 954E+12
Cs-134	4 0536E-05	1,566.22	3,132.44	0 00E+00	6 35E-02	1 27E-01	0 5750	1 617E+14
Cs-135	1 4433E-05	1,566.22	3,132.44	0 00E+00	2 26E-02	4 52E-02	0 8500	2 238E+12
Cs-137	1 3979E+00	1,566.22	3,132.44	0 00E+00	2 19E+03	4 38E+03	1 2500	2 198E+12
Eu-154	2 0203E-02	1,566.22	3,132.44	0 00E+00	3 16E+01	6 33E+01	1 7500	6 582E+10
Eu-155	1 7684E-03	1,566.22	3,132.44	0 00E+00	2 77E+00	5 54E+00	2 2500	1 060E+07
Fe-55	4 3136E-05	1,566.22	3,132.44	0 00E+00	6 76E-02	1 35E-01	2 7500	2 171E+07
H-3	2 0769E-02	1,566.22	3,132.44	0 00E+00	3 25E+01	6 51E+01	3 5000	2 236E+06
I-129	9 8288E-07	1,566.22	3,132.44	0 00E+00	1 54E-03	3 08E-03	5 0000	9 560E+05
Kr-85	2 8214E-02	1,566.22	3,132.44	0 00E+00	4 42E+01	8 84E+01	7 0000	1 102E+05
Np-237	1 1218E-05	1,566.22	3,132.44	0 00E+00	1 76E-02	3 51E-02	11 0000	1 265E+04
Pa-231	1 3036E-09	1,566.22	3,132.44	0 00E+00	2 04E-06	4 08E-06		
Pb-210	8 5078E-11	1,566.22	3,132.44	0 00E+00	1 33E-07	2 67E-07		
Pm-147	3 6531E-04	1,566.22	3,132.44	0 00E+00	5 72E-01	1 14E+00		
Pu-238	7 4564E-02	1,566.22	3,132.44	0 00E+00	1 17E+02	2 34E+02		
Pu-239	1 1623E-02	1,566.22	3,132.44	0 00E+00	1 82E+01	3 64E+01		
Pu-240	1 5132E-02	1,566.22	3,132.44	0 00E+00	2 37E+01	4 74E+01		
Pu-241	9 0036E-01	1,566.22	3,132.44	0 00E+00	1 41E+03	2 82E+03		
Pu-242	6 4260E-05	1,566.22	3,132.44	0 00E+00	1 01E-01	2 01E-01		
Ra-226	2 2804E-10	1,566.22	3,132.44	0 00E+00	3 57E-07	7 14E-07		
Ra-228	5 2713E-12	1,566.22	3,132.44	0 00E+00	8 26E-09	1 65E-08		
Ru-106	6 1160E-10	1,566.22	3,132.44	0 00E+00	9 58E-07	1 92E-06		
Se-79	1 2377E-05	1,566.22	3,132.44	0 00E+00	1 94E-02	3 88E-02		
Sn-126	2 5210E-05	1,566.22	3,132.44	0 00E+00	3 95E-02	7 90E-02		
Sr-90	9 1667E-01	1,566.22	3,132.44	0 00E+00	1 44E+03	2 87E+03		
Tc-99	3 9357E-04	1,566.22	3,132.44	0 00E+00	6 16E-01	1 23E+00		
Th-229	1 2057E-10	1,566.22	3,132.44	0 00E+00	1 89E-07	3 78E-07		
Th-230	2 1043E-08	1,566.22	3,132.44	0 00E+00	3 30E-05	6 59E-05		
Th-232	5 2972E-12	1,566.22	3,132.44	0 00E+00	8 30E-09	1 66E-08		
Ti-208	1 7474E-07	1,566.22	3,132.44	0 00E+00	2 74E-04	5 47E-04		
U-232	4 7368E-07	1,566.22	3,132.44	0 00E+00	7 42E-04	1 48E-03		
U-233	2 5097E-08	1,566.22	3,132.44	0 00E+00	3 93E-05	7 86E-05		
U-234	5 0000E-05	1,566.22	3,132.44	0 00E+00	7 83E-02	1 57E-01		
U-235	-1 4489E-06	1,566.22	0 00	3 62E-03	1 35E-03	3 62E-03		
U-236	7 5824E-06	1,566.22	3,132.44	0 00E+00	1 19E-02	2 38E-02		
U-238	-2 6129E-07	1,566.22	0 00	3 69E-02	3 65E-02	3 69E-02		
Y-90	9 1699E-01	1,566.22	3,132.44	0 00E+00	1 44E+03	2 87E+03		
Other Radionuclides					2 10E+03	4 20E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding		ZIRC	
BOL HM Constituents		U	
BOL Enrichment %	1 50044843	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	1 533 13	1,566.22	
Bounding		3,132.44	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 40	1 02	
Bounding	0 80		1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name DRESDEN I (UN0064)  
SNF ID #: 47  
Fuel Units & Descr: 1 - 6 X 6 ROD ARRAY  
Heavy Metal Mass BOL=58 847kg EOL=57 281kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1973  
Estimates as of 2010  
Template PWR (Light Water Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 000176911  
Template Decay Time 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	1,489 19	2,978 38	0 00E+00	1 31E-06	2 61E-06	Avg MeV	
Am-241	1 4352E-01	1,489 19	2,978 38	0 00E+00	2 14E+02	4 27E+02	0 0150	1 603E+14
Am-242m	2 8698E-04	1,489 19	2,978 38	0 00E+00	4 27E-01	8 55E-01	0 0250	3 232E+13
Am-243	6 2565E-04	1,489 19	2,978 38	0 00E+00	9 32E-01	1 86E+00	0 0375	3 082E+13
C-14	4 7901E-05	1,489 19	2,978 38	0 00E+00	7 13E-02	1 43E-01	0 0575	3 561E+13
Cl-36	8 0297E-07	1,489 19	2,978 38	0 00E+00	1 20E-03	2 39E-03	0 0850	1 793E+13
Cm-243	2 5081E-04	1,489 19	2,978 38	0 00E+00	3 74E-01	7 47E-01	0 1250	1 244E+13
Cm-244	4 9015E-02	1,489 19	2,978 38	0 00E+00	7 30E+01	1 46E+02	0 2250	1 538E+13
Co-60	2 5581E-03	1,489 19	2,978 38	0 00E+00	3 81E+00	7 62E+00	0 3750	6 612E+12
Cs-134	4 0536E-05	1,489 19	2,978 38	0 00E+00	6 04E-02	1 21E-01	0 5750	1 538E+14
Cs-135	1 4433E-05	1,489 19	2,978 38	0 00E+00	2 15E-02	4 30E-02	0 8500	2 127E+12
Cs-137	1 3979E+00	1,489 19	2,978 38	0 00E+00	2 08E+03	4 16E+03	1 2500	2 090E+12
Eu-154	2 0203E-02	1,489 19	2,978 38	0 00E+00	3 01E+01	6 02E+01	1 7500	6 258E+10
Eu-155	1 7684E-03	1,489 19	2,978 38	0 00E+00	2 63E+00	5 27E+00	2 2500	1 008E+07
Fe-55	4 3136E-05	1,489 19	2,978 38	0 00E+00	6 42E-02	1 28E-01	2 7500	2 065E+07
H-3	2 0769E-02	1,489 19	2,978 38	0 00E+00	3 09E+01	6 19E+01	3 5000	2 126E+06
I-129	9 8288E-07	1,489 19	2,978 38	0 00E+00	1 46E-03	2 93E-03	5 0000	9 089E+05
Kr-85	2 8214E-02	1,489 19	2,978 38	0 00E+00	4 20E+01	8 40E+01	7 0000	1 048E+05
Np-237	1 1218E-05	1,489 19	2,978 38	0 00E+00	1 67E-02	3 34E-02	11 0000	1 203E+04
Pa-231	1 3036E-09	1,489 19	2,978 38	0 00E+00	1 94E-06	3 88E-06		
Pb-210	8 5078E-11	1,489 19	2,978 38	0 00E+00	1 27E-07	2 53E-07		
Pm-147	3 6531E-04	1,489 19	2,978 38	0 00E+00	5 44E-01	1 09E+00		
Pu-238	7 4564E-02	1,489 19	2,978 38	0 00E+00	1 11E+02	2 22E+02		
Pu-239	1 1623E-02	1,489 19	2,978 38	0 00E+00	1 73E+01	3 46E+01		
Pu-240	1 5132E-02	1,489 19	2,978 38	0 00E+00	2 25E+01	4 51E+01		
Pu-241	9 0036E-01	1,489 19	2,978 38	0 00E+00	1 34E+03	2 68E+03		
Pu-242	6 4260E-05	1,489 19	2,978 38	0 00E+00	9 57E-02	1 91E-01		
Ra-226	2 2804E-10	1,489 19	2,978 38	0 00E+00	3 40E-07	6 79E-07		
Ra-228	5 2713E-12	1,489 19	2,978 38	0 00E+00	7 85E-09	1 57E-08		
Ru-106	6 1160E-10	1,489 19	2,978 38	0 00E+00	9 11E-07	1 82E-06		
Se-79	1 2377E-05	1,489 19	2,978 38	0 00E+00	1 84E-02	3 69E-02		
Sn-126	2 5210E-05	1,489 19	2,978 38	0 00E+00	3 75E-02	7 51E-02		
Sr-90	9 1667E-01	1,489 19	2,978 38	0 00E+00	1 37E+03	2 73E+03		
Tc-99	3 9357E-04	1,489 19	2,978 38	0 00E+00	5 86E-01	1 17E+00		
Th-229	1 2057E-10	1,489 19	2,978 38	0 00E+00	1 80E-07	3 59E-07		
Th-230	2 1043E-08	1,489 19	2,978 38	0 00E+00	3 13E-05	6 27E-05		
Th-232	5 2972E-12	1,489 19	2,978 38	0 00E+00	7 89E-09	1 58E-08		
Ti-208	1 7474E-07	1,489 19	2,978 38	0 00E+00	2 60E-04	5 20E-04		
U-232	4 7368E-07	1,489 19	2,978 38	0 00E+00	7 05E-04	1 41E-03		
U-233	2 5097E-08	1,489 19	2,978 38	0 00E+00	3 74E-05	7 47E-05		
U-234	5 0000E-05	1,489 19	2,978 38	0 00E+00	7 45E-02	1 49E-01		
U-235	-1 4489E-06	1,489 19	0 00	1 91E-03	0 00E+00	1 91E-03		
U-236	7 5824E-06	1,489 19	2,978 38	0 00E+00	1 13E-02	2 26E-02		
U-238	-2 6129E-07	1,489 19	0 00	1 95E-02	1 91E-02	1 95E-02		
Y-90	9 1699E-01	1,489 19	2,978 38	0 00E+00	1 37E+03	2 73E+03		
Other Radionuclides					2 00E+03	4 00E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	1 5005013	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
	823 86	1 489 19	
		2,978 38	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0 72	1 81	
	1 45		1 00

<sup>1</sup>Reactor shutdown core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: DRESII, HBR, BR 3 BRP TMI  
SNF ID #: 50  
Fuel Units & Descr: 1 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL= EOL=19 608kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1979  
Estimates as of: 2010  
Template PWR (Light Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0.00176911  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x10"  
0.01

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	18,646.28	18,646.28	0.00E+00	1.24E-05	1.24E-05	Avg. MeV	
Am-241	1.3144E-01	18,646.28	18,646.28	0.00E+00	2.45E+03	2.45E+03	0.0150	1.268E+15
Am-242m	3.0039E-04	18,646.28	18,646.28	0.00E+00	5.60E+00	5.60E+00	0.0250	2.568E+14
Am-243	6.2629E-04	18,646.28	18,646.28	0.00E+00	1.17E+01	1.17E+01	0.0375	2.485E+14
C-14	4.7965E-05	18,646.28	18,646.28	0.00E+00	8.94E-01	8.94E-01	0.0575	2.711E+14
Cl-36	8.0297E-07	18,646.28	18,646.28	0.00E+00	1.50E-02	1.50E-02	0.0850	1.437E+14
Cm-243	3.1993E-04	18,646.28	18,646.28	0.00E+00	5.97E+00	5.97E+00	0.1250	1.050E+14
Cm-244	7.1851E-02	18,646.28	18,646.28	0.00E+00	1.34E+03	1.34E+03	0.2250	1.233E+14
Co-60	9.5220E-03	18,646.28	18,646.28	0.00E+00	1.78E+02	1.78E+02	0.3750	5.292E+13
Cs-134	1.1662E-03	18,646.28	18,646.28	0.00E+00	2.17E+01	2.17E+01	0.5750	1.216E+15
Cs-135	1.4433E-05	18,646.28	18,646.28	0.00E+00	2.69E-01	2.69E-01	0.8500	2.400E+13
Cs-137	1.7603E+00	18,646.28	18,646.28	0.00E+00	3.28E+04	3.28E+04	1.2500	3.242E+13
Eu-154	4.5203E-02	18,646.28	18,646.28	0.00E+00	8.43E+02	8.43E+02	1.7500	7.104E+11
Eu-155	7.1479E-03	18,646.28	18,646.28	0.00E+00	1.33E+02	1.33E+02	2.2500	1.312E+08
Fe-55	6.1919E-04	18,646.28	18,646.28	0.00E+00	1.15E+01	1.15E+01	2.7500	1.475E+08
H-3	3.6386E-02	18,646.28	18,646.28	0.00E+00	6.78E+02	6.78E+02	3.5000	1.932E+07
I-129	9.8288E-07	18,646.28	18,646.28	0.00E+00	1.83E-02	1.83E-02	5.0000	8.259E+06
Kr-85	5.3844E-02	18,646.28	18,646.28	0.00E+00	1.00E+03	1.00E+03	7.0000	9.521E+05
Np-237	1.0546E-05	18,646.28	18,646.28	0.00E+00	1.97E-01	1.97E-01	11.0000	1.094E+05
Pa-231	1.1370E-09	18,646.28	18,646.28	0.00E+00	2.12E-05	2.12E-05		
Pb-210	3.3624E-11	18,646.28	18,646.28	0.00E+00	6.27E-07	6.27E-07		
Pm-147	5.1211E-03	18,646.28	18,646.28	0.00E+00	9.55E+01	9.55E+01		
Pu-238	8.0669E-02	18,646.28	18,646.28	0.00E+00	1.50E+03	1.50E+03		
Pu-239	1.1626E-02	18,646.28	18,646.28	0.00E+00	2.17E+02	2.17E+02		
Pu-240	1.5097E-02	18,646.28	18,646.28	0.00E+00	2.82E+02	2.82E+02		
Pu-241	1.4567E+00	18,646.28	18,646.28	0.00E+00	2.72E+04	2.72E+04		
Pu-242	6.4260E-05	18,646.28	18,646.28	0.00E+00	1.20E+00	1.20E+00		
Ra-226	1.1392E-10	18,646.28	18,646.28	0.00E+00	2.12E-06	2.12E-06		
Ra-228	5.1841E-12	18,646.28	18,646.28	0.00E+00	9.67E-08	9.67E-08		
Ru-106	5.9012E-07	18,646.28	18,646.28	0.00E+00	1.10E-02	1.10E-02		
Se-79	1.2379E-05	18,646.28	18,646.28	0.00E+00	2.31E-01	2.31E-01		
Sn-126	2.5210E-05	18,646.28	18,646.28	0.00E+00	4.70E-01	4.70E-01		
Sr-90	1.1630E+00	18,646.28	18,646.28	0.00E+00	2.17E+04	2.17E+04		
Tc-99	3.9357E-04	18,646.28	18,646.28	0.00E+00	7.34E+00	7.34E+00		
Th-229	8.5691E-11	18,646.28	18,646.28	0.00E+00	1.60E-06	1.60E-06		
Th-230	1.4493E-08	18,646.28	18,646.28	0.00E+00	2.70E-04	2.70E-04		
Th-232	5.2923E-12	18,646.28	18,646.28	0.00E+00	9.87E-08	9.87E-08		
Th-208	1.9202E-07	18,646.28	18,646.28	0.00E+00	3.58E-03	3.58E-03		
U-232	5.2083E-07	18,646.28	18,646.28	0.00E+00	9.71E-03	9.71E-03		
U-233	2.4386E-08	18,646.28	18,646.28	0.00E+00	4.55E-04	4.55E-04		
U-234	4.7012E-05	18,646.28	18,646.28	0.00E+00	8.77E-01	8.77E-01		
U-235	-1.4492E-06	18,646.28	0.00	2.71E-03	0.00E+00	2.71E-03		
U-236	7.5759E-06	18,646.28	18,646.28	0.00E+00	1.41E-01	1.41E-01		
U-238	-2.6129E-07	18,646.28	0.00	1.28E-02	7.88E-03	1.28E-02		
Y-90	1.1631E+00	18,646.28	18,646.28	0.00E+00	2.17E+04	2.17E+04		
Other Radionuclides					3.15E+04	3.15E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
		0 to 5	This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		18 646.28 18 646.28	
			Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	13.58 13.58		
			1.59

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name EBR-II NITRIDE FUEL EXPR  
 SNF ID # 363  
 Fuel Units & Descr: 64 - ROD  
 Heavy Metal Mass BOL= EOL=9 587kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1994  
 Estimates as of. 2010  
 Template FFTF (FAST SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011 2  
 Template BOL Heavy Metal Mass (MT) 0 0329181  
 Template Decay Time 15 years

Estimated  
 Canister usage  
 18"x10"  
 0 32

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1 3735E-12	833 80	1,563 38	0 00E+00	1 15E-09	2 15E-09	0 0150	7 854E+13
Am-241	7 9527E-02	833 80	1,563 38	2 01E+01	8 64E+01	1 44E+02	0 0250	1 695E+13
Am-242m	2 1053E-03	833 80	1,563 38	0 00E+00	1 76E+00	3 29E+00	0 0375	1 939E+13
Am-243	1 0760E-04	833 80	1,563 38	0 00E+00	8 97E-02	1 68E-01	0 0575	1 647E+13
C-14	2 6141E-05	833 80	1,563 38	0 00E+00	2 18E-02	4 09E-02	0 0850	9 659E+12
Cl-36	3 4243E-10	833 80	1,563 38	0 00E+00	2 86E-07	5 35E-07	0 1250	7 213E+12
Cm-243	6 6092E-04	833 80	1,563 38	0 00E+00	5 51E-01	1 03E+00	0 2250	7 314E+12
Cm-244	2 9933E-03	833 80	1,563 38	0 00E+00	2 50E+00	4 68E+00	0 3750	3 760E+12
Co-60	1 5934E-02	833 80	1,563 38	0 00E+00	1 33E+01	2 49E+01	0 5750	1 256E+14
Cs-134	4 6356E-02	833 80	1,563 38	0 00E+00	3 87E+01	7 25E+01	0 8500	4 205E+12
Cs-135	4 7693E-05	833 80	1,563 38	0 00E+00	3 98E-02	7 46E-02	1 2500	3 661E+12
Cs-137	2 1113E+00	833 80	1,563 38	0 00E+00	1 76E+03	3 30E+03	1 7500	6 015E+10
Eu-154	4 8092E-02	833 80	1,563 38	0 00E+00	4 01E+01	7 52E+01	2 2500	2 024E+09
Eu-155	6 8447E-02	833 80	1,563 38	0 00E+00	5 71E+01	1 07E+02	2 7500	2 112E+08
Fe-55	5 8479E-03	833 80	1,563 38	0 00E+00	4 88E+00	9 14E+00	3 5000	2 384E+07
H-3	8 9300E-03	833 80	1,563 38	0 00E+00	7 45E+00	1 40E+01	5 0000	5 764E+04
I-129	1 2891E-06	833 80	1,563 38	0 00E+00	1 07E-03	2 02E-03	7 0000	6 595E+03
Kr-85	7 0941E-02	833 80	1,563 38	0 00E+00	5 92E+01	1 11E+02	11 0000	7 553E+02
Np-237	2 6541E-06	833 80	1,563 38	0 00E+00	2 21E-03	4 15E-03		
Pa-231	4 8970E-12	833 80	1,563 38	0 00E+00	4 08E-09	7 66E-09		
Pb-210	2 2170E-13	833 80	1,563 38	0 00E+00	1 85E-10	3 47E-10		
Pm-147	2 3617E-01	833 80	1,563 38	0 00E+00	1 97E+02	3 69E+02		
Pu-238	2 8636E-02	833 80	1,563 38	0 00E+00	2 39E+01	4 48E+01		
Pu-239	-3 5520E-02	833 80	0 00	1 65E+02	1 35E+02	1 65E+02		
Pu-240	2 0790E-02	833 80	1,563 38	8 38E+01	1 01E+02	1 16E+02		
Pu-241	-4 8316E-01	833 80	0 00	3 76E+03	3 36E+03	3 76E+03		
Pu-242	1 1052E-05	833 80	1,563 38	2 24E-02	3 16E-02	3 96E-02		
Ra-226	5 7471E-13	833 80	1,563 38	0 00E+00	4 79E-10	8 98E-10		
Ra-228	5 4957E-17	833 80	1,563 38	0 00E+00	4 58E-14	8 59E-14		
Ru-106	1 4582E-02	833 80	1,563 38	0 00E+00	1 22E+01	2 28E+01		
Se-79	1 0137E-05	833 80	1,563 38	0 00E+00	8 45E-03	1 58E-02		
Sn-126	4 3922E-05	833 80	1,563 38	0 00E+00	3 66E-02	6 87E-02		
Sr-90	7 6329E-01	833 80	1,563 38	0 00E+00	6 36E+02	1 19E+03		
Tc-99	3 9412E-04	833 80	1,563 38	0 00E+00	3 29E-01	6 16E-01		
Th-229	1 6457E-12	833 80	1,563 38	0 00E+00	1 37E-09	2 57E-09		
Th-230	1 8822E-10	833 80	1,563 38	0 00E+00	1 57E-07	2 94E-07		
Th-232	9 7601E-17	833 80	1,563 38	0 00E+00	8 14E-14	1 53E-13		
Ti-208	5 2722E-07	833 80	1,563 38	0 00E+00	4 40E-04	8 24E-04		
U-232	1 4925E-06	833 80	1,563 38	0 00E+00	1 24E-03	2 33E-03	Thermal Power	
U-233	2 1113E-10	833 80	1,563 38	0 00E+00	1 76E-07	3 30E-07	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 9528E-06	833 80	1,563 38	0 00E+00	1 63E-03	3 05E-03	2 54E+01	4 19E+01
U-235	-9 7920E-09	833 80	0 00	3 39E-05	2 57E-05	3 39E-05	Total	Total
U-236	1 1570E-07	833 80	1,563 38	0 00E+00	9 65E-05	1 81E-04		
U-238	-1 7914E-07	833 80	0 00	2 47E-03	2 32E-03	2 47E-03		
Y-90	7 6329E-01	833 80	1,563 38	0 00E+00	6 36E+02	1 19E+03		
Other Radionuclides					1 81E+03	3 39E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	FAST	FAST	This Template was used for the following reasons This fuel matches on all parameters except enrichment (unknown)
Fuel Cladding	SST	SST	
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment % <sup>2</sup>		10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		833 80	Nominal burnup taken from SFD and converted to MWd using BOL=10 423kg Bounding burnup taken from SFD and converted to MWd using BOL=10 423kg
Bounding		1,563 38	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 53		1 00
Bounding	0 99		

<sup>1</sup>Reactor shutdown core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: EBR-II OXIDE FUEL EXPR  
SNF ID #: 364  
Fuel Units & Descr: 992 - ROD  
Heavy Metal Mass: BOL= EOL=92 454kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 1994  
Estimates as of 2010  
Template FFTF (FAST, SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
Template BOL Heavy Metal Mass (MT). 0 0329181  
Template Decay Time 15 years

Estimated  
Canister usage  
18"x10"  
4 96

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 3735E-12	8,040 82	20,102 04	0 00E+00	1 10E-08	2 76E-08	Avg MeV	
Am-241	7 9527E-02	8,040 82	20,102 04	1 94E+02	8 33E+02	1 79E+03	0 0150	1 006E+15
Am-242m	2 1053E-03	8,040 82	20,102 04	0 00E+00	1 69E+01	4 23E+01	0 0250	2 179E+14
Am-243	1 0760E-04	8,040 82	20,102 04	0 00E+00	8 65E-01	2 16E+00	0 0375	2 493E+14
C-14	2 6141E-05	8,040 82	20,102 04	0 00E+00	2 10E-01	5 25E-01	0 0575	2 109E+14
Cl-36	3 4243E-10	8,040 82	20,102 04	0 00E+00	2 75E-06	6 88E-06	0 0850	1 242E+14
Cm-243	6 6092E-04	8,040 82	20,102 04	0 00E+00	5 31E+00	1 33E+01	0 1250	9 275E+13
Cm-244	2 9933E-03	8,040 82	20,102 04	0 00E+00	2 41E+01	6 02E+01	0 2250	9 405E+13
Co-60	1 5934E-02	8,040 82	20,102 04	0 00E+00	1 28E+02	3 20E+02	0 3750	4 835E+13
Cs-134	4 6356E-02	8,040 82	20,102 04	0 00E+00	3 73E+02	9 32E+02	0 5750	1 615E+15
Cs-135	4 7693E-05	8,040 82	20,102 04	0 00E+00	3 83E-01	9 59E-01	0 8500	5 407E+13
Cs-137	2 1113E+00	8,040 82	20,102 04	0 00E+00	1 70E+04	4 24E+04	1 2500	4 708E+13
Eu-154	4 8092E-02	8,040 82	20,102 04	0 00E+00	3 87E+02	9 67E+02	1 7500	7 733E+11
Eu-155	6 8447E-02	8,040 82	20,102 04	0 00E+00	5 50E+02	1 38E+03	2 2500	2 603E+10
Fe-55	5 8479E-03	8,040 82	20,102 04	0 00E+00	4 70E+01	1 18E+02	2 7500	2 715E+09
H-3	8 9300E-03	8,040 82	20,102 04	0 00E+00	7 18E+01	1 80E+02	3 5000	3 064E+08
I-129	1 2891E-06	8,040 82	20,102 04	0 00E+00	1 04E-02	2 59E-02	5 0000	6 771E+05
Kr-85	7 0941E-02	8,040 82	20,102 04	0 00E+00	5 70E+02	1 43E+03	7 0000	7 752E+04
Np-237	2 6541E-06	8,040 82	20,102 04	0 00E+00	2 13E-02	5 34E-02	11 0000	8 879E+03
Pa-231	4 8970E-12	8,040 82	20,102 04	0 00E+00	3 94E-08	9 84E-08		
Pb-210	2 2170E-13	8,040 82	20,102 04	0 00E+00	1 78E-09	4 46E-09		
Pm-147	2 3617E-01	8,040 82	20,102 04	0 00E+00	1 90E+03	4 75E+03		
Pu-238	2 8636E-02	8,040 82	20,102 04	0 00E+00	2 30E+02	5 76E+02		
Pu-239	3 5520E-02	8,040 82	0 00	1 59E+03	1 31E+03	1 59E+03		
Pu-240	2 0790E-02	8,040 82	20,102 04	8 09E+02	9 76E+02	1 23E+03		
Pu-241	4 8316E-01	8,040 82	0 00	3 63E+04	3 24E+04	3 63E+04		
Pu-242	1 1052E-05	8,040 82	20,102 04	2 16E-01	3 04E-01	4 38E-01		
Ra-226	5 7471E-13	8,040 82	20,102 04	0 00E+00	4 62E-09	1 16E-08		
Ra-228	5 4957E-17	8,040 82	20,102 04	0 00E+00	4 42E-13	1 10E-12		
Ru-106	1 4582E-02	8,040 82	20,102 04	0 00E+00	1 17E+02	2 93E+02		
Se-79	1 0137E-05	8,040 82	20,102 04	0 00E+00	8 15E-02	2 04E-01		
Sn-126	4 3922E-05	8,040 82	20,102 04	0 00E+00	3 53E-01	8 83E-01		
Sr-90	7 6329E-01	8,040 82	20,102 04	0 00E+00	6 14E+03	1 53E+04		
Tc-99	3 9412E-04	8,040 82	20,102 04	0 00E+00	3 17E+00	7 92E+00		
Th-229	1 6457E-12	8,040 82	20,102 04	0 00E+00	1 32E-08	3 31E-08		
Th-230	1 8822E-10	8,040 82	20,102 04	0 00E+00	1 51E-06	3 78E-06		
Th-232	9 7601E-17	8,040 82	20,102 04	0 00E+00	7 85E-13	1 96E-12		
Ti-208	5 2722E-07	8,040 82	20,102 04	0 00E+00	4 24E-03	1 06E-02		
U-232	1 4925E-06	8,040 82	20,102 04	0 00E+00	1 20E-02	3 00E-02		
U-233	2 1113E-10	8,040 82	20,102 04	0 00E+00	1 70E-06	4 24E-06		
U-234	1 9528E-06	8,040 82	20,102 04	0 00E+00	1 57E-02	3 93E-02		
U-235	9 7920E-09	8,040 82	0 00	3 27E-04	2 48E-04	3 27E-04		
U-236	1 1570E-07	8,040 82	20,102 04	0 00E+00	9 30E-04	2 33E-03		
U-238	1 7914E-07	8,040 82	0 00	2 38E-02	2 23E-02	2 38E-02		
Y-90	7 6329E-01	8,040 82	20,102 04	0 00E+00	6 14E+03	1 53E+04		
Other Radionuclides					1 74E+04	4 36E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	FAST	FAST
Fuel Cladding	SST	SST
BOL HM Constituents	Pu and U	Pu and U
BOL Enrichment %		10 to 30

### Basis for Parameter Differences:

This Template was used for the following reasons  
This fuel matches on all parameters except enrichment (unknown).

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal		8 040 82
Bounding		20 102 04

### Basis for burnup used in estimate:

Nominal burnup taken from SFD and converted to MWd using BOL=100.51kg  
Bounding burnup taken from SFD and converted to MWd using BOL=100.51kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.53	
Bounding	1.31	

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: EBR II OXIDE FUEL EXPR  
 SNF ID #: 345  
 Fuel Units & Descr: 571 - ROD  
 Heavy Metal Mass BOL= , EOL=56 986kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1994  
 Estimates as of 2010  
 Template FFTF (FAST SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
 Template BOL Heavy Metal Mass (MT) 0.0329181  
 Template Decay Time 15 years

Estimated  
 Canister usage  
 18"x10"  
 2.86

II. Estimates	m	x <sub>m</sub>	x <sub>b</sub>	b	y <sub>m</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	4.956 09	12,390.22	0.00E+00	6.81E-09	1.70E-08	Avg MeV	
Am-241	7.9527E-02	4.956 09	12,390.22	1.19E+02	5.14E+02	1.10E+03	0.0150	6.203E+14
Am-242m	2.1053E-03	4.956 09	12,390.22	0.00E+00	1.04E+01	2.61E+01	0.0250	1.343E+14
Am-243	1.0760E-04	4.956 09	12,390.22	0.00E+00	5.33E-01	1.33E+00	0.0375	1.536E+14
C-14	2.6141E-05	4.956 09	12,390.22	0.00E+00	1.30E-01	3.24E-01	0.0575	1.300E+14
Cl-36	3.4243E-10	4.956 09	12,390.22	0.00E+00	1.70E-06	4.24E-06	0.0850	7.655E+13
Cm-243	6.6092E-04	4.956 09	12,390.22	0.00E+00	3.28E+00	8.19E+00	0.1250	5.717E+13
Cm-244	2.9933E-03	4.956 09	12,390.22	0.00E+00	1.48E+01	3.71E+01	0.2250	5.797E+13
Co-60	1.5934E-02	4.956 09	12,390.22	0.00E+00	7.90E+01	1.97E+02	0.3750	2.980E+13
Cs-134	4.6356E-02	4.956 09	12,390.22	0.00E+00	2.30E+02	5.74E+02	0.5750	9.957E+14
Cs-135	4.7693E-05	4.956 09	12,390.22	0.00E+00	2.36E-01	5.91E-01	0.8500	3.333E+13
Cs-137	2.1113E+00	4.956 09	12,390.22	0.00E+00	1.05E+04	2.62E+04	1.2500	2.902E+13
Eu-154	4.8092E-02	4.956 09	12,390.22	0.00E+00	2.38E+02	5.96E+02	1.7500	4.767E+11
Eu-155	6.8447E-02	4.956 09	12,390.22	0.00E+00	3.39E+02	8.48E+02	2.2500	1.604E+10
Fe-55	5.8479E-03	4.956 09	12,390.22	0.00E+00	2.90E+01	7.25E+01	2.7500	1.674E+09
H-3	8.9300E-03	4.956 09	12,390.22	0.00E+00	4.43E+01	1.11E+02	3.5000	1.888E+08
I-129	1.2891E-06	4.956 09	12,390.22	0.00E+00	6.39E-03	1.60E-02	5.0000	4.173E+05
Kr-85	7.0941E-02	4.956 09	12,390.22	0.00E+00	3.52E+02	8.79E+02	7.0000	4.778E+04
Np-237	2.6541E-06	4.956 09	12,390.22	0.00E+00	1.32E-02	3.29E-02	11.0000	5.473E+03
Pa-231	4.8970E-12	4.956 09	12,390.22	0.00E+00	2.43E-08	6.07E-08		
Pb-210	2.2170E-13	4.956 09	12,390.22	0.00E+00	1.10E-09	2.75E-09		
Pm-147	2.3617E-01	4.956 09	12,390.22	0.00E+00	1.17E+03	2.93E+03		
Pu-238	2.8636E-02	4.956 09	12,390.22	0.00E+00	1.42E+02	3.55E+02		
Pu-239	-3.5520E-02	4.956 09	0.00	9.81E+02	8.04E+02	9.81E+02		
Pu-240	2.0790E-02	4.956 09	12,390.22	4.98E+02	6.01E+02	7.56E+02		
Pu-241	-4.8316E-01	4.956 09	0.00	2.24E+04	2.00E+04	2.24E+04		
Pu-242	1.1052E-05	4.956 09	12,390.22	1.33E-01	1.88E-01	2.70E-01		
Ra-226	5.7471E-13	4.956 09	12,390.22	0.00E+00	2.85E-09	7.12E-09		
Ra-228	5.4957E-17	4.956 09	12,390.22	0.00E+00	2.72E-13	6.81E-13		
Ru-106	1.4582E-02	4.956 09	12,390.22	0.00E+00	7.23E+01	1.81E+02		
Se-79	1.0137E-05	4.956 09	12,390.22	0.00E+00	5.02E-02	1.26E-01		
Sn-126	4.3922E-05	4.956 09	12,390.22	0.00E+00	2.18E-01	5.44E-01		
Sr-90	7.6329E-01	4.956 09	12,390.22	0.00E+00	3.78E+03	9.46E+03		
Tc-99	3.9412E-04	4.956 09	12,390.22	0.00E+00	1.95E+00	4.88E+00		
Th-229	1.6457E-12	4.956 09	12,390.22	0.00E+00	8.16E-09	2.04E-08		
Th-230	1.8822E-10	4.956 09	12,390.22	0.00E+00	9.33E-07	2.33E-06		
Th-232	9.7601E-17	4.956 09	12,390.22	0.00E+00	4.84E-13	1.21E-12		
Ti-208	5.2722E-07	4.956 09	12,390.22	0.00E+00	2.61E-03	6.53E-03		
U-232	1.4925E-06	4.956 09	12,390.22	0.00E+00	7.40E-03	1.85E-02		
U-233	2.1113E-10	4.956 09	12,390.22	0.00E+00	1.05E-06	2.62E-06		
U-234	1.9528E-06	4.956 09	12,390.22	0.00E+00	9.68E-03	2.42E-02		
U-235	-9.7920E-09	4.956 09	0.00	2.01E-04	1.53E-04	2.01E-04		
U-236	1.1570E-07	4.956 09	12,390.22	0.00E+00	5.73E-04	1.43E-03		
U-238	-1.7914E-07	4.956 09	0.00	1.47E-02	1.38E-02	1.47E-02		
Y-90	7.6329E-01	4.956 09	12,390.22	0.00E+00	3.78E+03	9.46E+03		
Other Radionuclides					1.07E+04	2.69E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	FAST	FAST	
	SST	SST	
	Pu and U	Pu and U	
BOL HM Constituents			This Template was used for the following reasons
BOL Enrichment %		10 to 30	This fuel matches on all parameters except enrichment (unknown)

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate <sup>2</sup>
Nominal	From SFD	Estimated	
		4.956 09	
Bounding		12,390.22	Nominal burnup taken from SFD and converted to MWd using BOL=61.951kg Bounding burnup taken from SFD and converted to MWd using BOL=61.951kg

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.53		
Bounding	1.31		1.00

<sup>1</sup>Reactor shutdown core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FAST REACTOR FUEL  
SNF ID # 906  
Fuel Units & Descr 1 - CANISTER OF SCRAP  
Heavy Metal Mass BOL=9.044kg EOL=5.812kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1985  
Estimates as of 2010  
Template (Worst Case)  
<sup>2</sup>Template Burnup(MWd): 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186865  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x10"  
0.08

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9648E-06	3,071.54	6,143.08	0.00E+00	6.03E-03	1.21E-02	Avg. MeV	
Am-241	7.8064E+00	3,071.54	6,143.08	0.00E+00	2.40E+04	4.80E+04	0.0150	1.042E+16
Am-242m	1.7632E-02	3,071.54	6,143.08	0.00E+00	5.42E+01	1.08E+02	0.0250	2.038E+15
Am-243	1.6336E-02	3,071.54	6,143.08	0.00E+00	5.02E+01	1.00E+02	0.0375	1.819E+15
C-14	1.2101E-01	3,071.54	6,143.08	0.00E+00	3.72E+02	7.43E+02	0.0575	2.482E+15
Cl-36	2.2849E-03	3,071.54	6,143.08	0.00E+00	7.02E+00	1.40E+01	0.0850	1.073E+15
Cm-243	1.1046E-03	3,071.54	6,143.08	0.00E+00	3.39E+00	6.79E+00	0.1250	9.336E+14
Cm-244	2.4704E-01	3,071.54	6,143.08	0.00E+00	7.59E+02	1.52E+03	0.2250	9.118E+14
Co-60	1.0466E+02	3,071.54	6,143.08	0.00E+00	3.21E+05	6.43E+05	0.3750	3.843E+14
Cs-134	9.8289E-03	3,071.54	6,143.08	0.00E+00	3.02E+01	6.04E+01	0.5750	6.130E+15
Cs-135	4.3976E-04	3,071.54	6,143.08	0.00E+00	1.35E+00	2.70E+00	0.8500	3.694E+14
Cs-137	2.6526E+01	3,071.54	6,143.08	0.00E+00	8.15E+04	1.63E+05	1.2500	4.794E+16
Eu-154	2.7975E+00	3,071.54	6,143.08	0.00E+00	8.59E+03	1.72E+04	1.7500	1.161E+13
Eu-155	2.7881E-01	3,071.54	6,143.08	0.00E+00	8.56E+02	1.71E+03	2.2500	2.524E+11
Fe-55	4.2151E+00	3,071.54	6,143.08	0.00E+00	1.29E+04	2.59E+04	2.7500	2.162E+10
H-3	4.2599E-01	3,071.54	6,143.08	0.00E+00	1.31E+03	2.62E+03	3.5000	2.421E+07
I-129	1.0618E-05	3,071.54	6,143.08	0.00E+00	3.26E-02	6.52E-02	5.0000	1.029E+07
Kr-85	1.1426E+00	3,071.54	6,143.08	0.00E+00	3.51E+03	7.02E+03	7.0000	1.179E+06
Np-237	1.5647E-04	3,071.54	6,143.08	0.00E+00	4.81E-01	9.61E-01	11.0000	1.350E+05
Pa-231	2.8624E-06	3,071.54	6,143.08	0.00E+00	8.79E-03	1.76E-02		
Pb-210	9.2770E-09	3,071.54	6,143.08	0.00E+00	2.85E-05	5.70E-05		
Pm-147	2.3690E-01	3,071.54	6,143.08	0.00E+00	7.28E+02	1.46E+03		
Pu-238	3.2240E+00	3,071.54	6,143.08	0.00E+00	9.90E+03	1.98E+04		
Pu-239	4.1664E-01	3,071.54	6,143.08	0.00E+00	1.28E+03	2.56E+03		
Pu-240	2.9264E-01	3,071.54	6,143.08	0.00E+00	8.99E+02	1.80E+03		
Pu-241	7.8816E+01	3,071.54	6,143.08	0.00E+00	2.42E+05	4.84E+05		
Pu-242	2.4560E-03	3,071.54	6,143.08	0.00E+00	7.54E+00	1.51E+01		
Ra-226	3.2167E-08	3,071.54	6,143.08	0.00E+00	9.88E-05	1.98E-04		
Ra-228	5.9024E-07	3,071.54	6,143.08	0.00E+00	1.81E-03	3.63E-03		
Ru-106	3.9140E-06	3,071.54	6,143.08	0.00E+00	1.20E-02	2.40E-02		
Se-79	1.9184E-04	3,071.54	6,143.08	0.00E+00	5.89E-01	1.18E+00		
Sn-126	1.6671E-04	3,071.54	6,143.08	0.00E+00	5.12E-01	1.02E+00		
Sr-90	2.5126E+01	3,071.54	6,143.08	0.00E+00	7.72E+04	1.54E+05		
Tc-99	6.7678E-03	3,071.54	6,143.08	0.00E+00	2.08E+01	4.16E+01		
Th-229	1.2398E-06	3,071.54	6,143.08	0.00E+00	3.81E-03	7.62E-03		
Th-230	4.1442E-06	3,071.54	6,143.08	0.00E+00	1.27E-02	2.55E-02		
Th-232	4.2431E-09	3,071.54	0.00	1.83E-04	1.70E-04	1.83E-04		
Ti-208	9.6478E-05	3,071.54	6,143.08	0.00E+00	2.96E-01	5.93E-01		
U-232	2.6103E-04	3,071.54	6,143.08	0.00E+00	8.02E-01	1.60E+00	Thermal Power	
U-233	3.6128E-04	3,071.54	6,143.08	0.00E+00	1.11E+00	2.22E+00	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.2788E-02	3,071.54	6,143.08	0.00E+00	3.93E+01	7.86E+01	7.26E+03	1.45E+04
U-235	5.7486E-04	3,071.54	6,143.08	3.89E-03	1.77E+00	3.54E+00	Total	Total
U-236	2.3485E-04	3,071.54	6,143.08	0.00E+00	7.21E-01	1.44E+00		
U-238	1.1581E-04	3,071.54	6,143.08	4.84E-04	3.56E-01	7.12E-01		
Y-90	2.5126E+01	3,071.54	6,143.08	0.00E+00	7.72E+04	1.54E+05		
Other Radionuclides					2.15E+05	4.31E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:  This fuel didn't closely match any existing templates, therefore the worst case template was used
Reactor Moderator	From SFD FAST	Used (Worst Case)	
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Th and U	U, Th, & Pu	
BOL Enrichment %	7.592	0 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate.  Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
	From SFD	Estimated	
Nominal	904.40	3,071.54	
Bounding		6,143.08	

Checks			Estimated EOL HM/Given EOL HM 331.59
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	10.15	3.40	
Bounding	20.31		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FAST REACTOR FUEL (U/PUC)  
 SNF ID # 1029  
 Fuel Units & Descr: 11 - CANISTER OF SCRAP  
 Heavy Metal Mass BOL=13.33kg EOL=11 095kg  
 ROD Storage Site INEEL  
 Fuel decay start date 1985  
 Estimates as of 2010  
 Template FFTF (FAST, SST 10 to 30% Pu & U)  
 Template Burnup(MWd) 5011.2  
 Template BOL Heavy Metal Mass (MT) 0.0329181  
 Template Decay Time 25 years

Estimated  
 Canister usage  
 18"x10"  
 0.85

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.4503E-12	3.998 94	7.997 88	0.00E+00	1.38E-08	2.76E-08	Avg MeV	
Am-241	9.5092E-02	3.998 94	7.997 88	2.57E+01	4.06E+02	7.86E+02	0.0150	3.149E+14
Am-242m	2.0118E-03	3.998 94	7.997 88	0.00E+00	8.05E+00	1.61E+01	0.0250	6.385E+13
Am-243	1.0750E-04	3.998 94	7.997 88	0.00E+00	4.30E-01	8.60E-01	0.0375	7.490E+13
C-14	2.6108E-05	3.998 94	7.997 88	0.00E+00	1.04E-01	2.09E-01	0.0575	6.858E+13
Cl-36	3.4243E-10	3.998 94	7.997 88	0.00E+00	1.37E-06	2.74E-06	0.0850	3.612E+13
Cm-243	5.1824E-04	3.998 94	7.997 88	0.00E+00	2.07E+00	4.14E+00	0.1250	2.597E+13
Cm-244	2.1572E-03	3.998 94	7.997 88	0.00E+00	8.63E+00	1.73E+01	0.2250	2.886E+13
Co-60	5.6258E-03	3.998 94	7.997 88	0.00E+00	2.25E+01	4.50E+01	0.3750	1.259E+13
Cs-134	2.5942E-03	3.998 94	7.997 88	0.00E+00	1.04E+01	2.07E+01	0.5750	5.020E+14
Cs-135	4.7693E-05	3.998 94	7.997 88	0.00E+00	1.91E-01	3.81E-01	0.8500	6.202E+12
Cs-137	1.7121E+00	3.998 94	7.997 88	0.00E+00	6.85E+03	1.37E+04	1.2500	7.999E+12
Eu-154	2.5217E-02	3.998 94	7.997 88	0.00E+00	1.01E+02	2.02E+02	1.7500	1.676E+11
Eu-155	2.2684E-02	3.998 94	7.997 88	0.00E+00	9.07E+01	1.81E+02	2.2500	3.570E+07
Fe-55	6.3362E-04	3.998 94	7.997 88	0.00E+00	2.53E+00	5.07E+00	2.7500	1.455E+08
H-3	5.6054E-03	3.998 94	7.997 88	0.00E+00	2.24E+01	4.48E+01	3.5000	6.264E+05
I-129	1.2891E-06	3.998 94	7.997 88	0.00E+00	5.16E-03	1.03E-02	5.0000	1.777E+05
Kr-85	4.1743E-02	3.998 94	7.997 88	0.00E+00	1.67E+02	3.34E+02	7.0000	2.034E+04
Np-237	3.2028E-06	3.998 94	7.997 88	0.00E+00	1.28E-02	2.56E-02	11.0000	2.329E+03
Pa-231	8.5429E-12	3.998 94	7.997 88	0.00E+00	3.42E-08	6.83E-08		
Pb-210	7.3535E-13	3.998 94	7.997 88	0.00E+00	2.94E-09	5.88E-09		
Pm-147	2.6110E-02	3.998 94	7.997 88	0.00E+00	1.04E+02	2.09E+02		
Pu-238	2.3318E-02	3.998 94	7.997 88	0.00E+00	9.32E+01	1.86E+02		
Pu-239	-3.5520E-02	3.998 94	0.00	2.11E+02	6.89E+01	2.11E+02		
Pu-240	2.0757E-02	3.998 94	7.997 88	1.07E+02	1.90E+02	2.73E+02		
Pu-241	-1.1127E+00	3.998 94	0.00	4.81E+03	3.63E+02	4.81E+03		
Pu-242	1.1152E-05	3.998 94	7.997 88	2.86E-02	7.32E-02	1.18E-01		
Ra-226	2.8297E-12	3.998 94	7.997 88	0.00E+00	1.13E-08	2.26E-08		
Ra-228	1.3510E-16	3.998 94	7.997 88	0.00E+00	5.40E-13	1.08E-12		
Ru-106	2.5110E-05	3.998 94	7.997 88	0.00E+00	1.00E-01	2.01E-01		
Se-79	1.0134E-05	3.998 94	7.997 88	0.00E+00	4.05E-02	8.11E-02		
Sn-126	4.3902E-05	3.998 94	7.997 88	0.00E+00	1.76E-01	3.51E-01		
Sr-90	6.1529E-01	3.998 94	7.997 88	0.00E+00	2.46E+03	4.92E+03		
Tc-99	3.9412E-04	3.998 94	7.997 88	0.00E+00	1.58E+00	3.15E+00		
Th-229	2.0554E-12	3.998 94	7.997 88	0.00E+00	8.22E-09	1.64E-08		
Th-230	5.3680E-10	3.998 94	7.997 88	0.00E+00	2.15E-06	4.29E-06		
Th-232	1.9522E-16	3.998 94	7.997 88	0.00E+00	7.81E-13	1.56E-12		
Ti-208	5.1046E-07	3.998 94	7.997 88	0.00E+00	2.04E-03	4.08E-03		
U-232	1.3883E-06	3.998 94	7.997 88	0.00E+00	5.55E-03	1.11E-02		
U-233	3.7516E-10	3.998 94	7.997 88	0.00E+00	1.50E-06	3.00E-06		
U-234	3.1909E-06	3.998 94	7.997 88	0.00E+00	1.28E-02	2.55E-02		
U-235	-8.7842E-09	3.998 94	0.00	4.33E-06	8.19E-06	4.33E-05		
U-236	1.4813E-07	3.998 94	7.997 88	0.00E+00	5.92E-04	1.18E-03		
U-238	-1.7914E-07	3.998 94	0.00	3.15E-03	2.44E-03	3.15E-03		
Y-90	6.1529E-01	3.998 94	7.997 88	0.00E+00	2.46E+03	4.92E+03		
Other Radionuclides					6.88E+03	1.38E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (very close to 30%)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %	31.101	10 to 30	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	3.998 94	2.231 05	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		7.997 88	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.97	0.56	0.83
Bounding	3.94		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FERMI CORE 1 & 2 (CORE FOIL)  
SNF ID #: 457  
Fuel Units & Descr: 136 - ROD  
Heavy Metal Mass: BOL=18.21kg; EOL=17.734kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1972  
Estimates as of: 2010  
Template: FERMI (Fast, Zirc, 10 to 40% U)  
<sup>2</sup>Template Burnup(MWd): 58 6725048  
Template BOL Heavy Metal Mass (MT): 0.018774  
Template Decay Time: 35 years

Estimated  
Canister usage:  
18"x10"  
0.04

## II. Estimates

	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.6110E-08	419.74	839.48	0.00E+00	4.03E-05	8.07E-05	Avg MeV	
Am-241	6.5601E-07	419.74	839.48	0.00E+00	2.75E-04	5.51E-04	0.0150	5.555E+13
Am-242m	0.0000E+00	419.74	839.48	0.00E+00	0.00E+00	0.00E+00	0.0250	1.154E+13
Am-243	8.3770E-15	419.74	839.48	0.00E+00	3.52E-12	7.03E-12	0.0375	1.015E+13
C-14	2.1714E-05	419.74	839.48	0.00E+00	9.11E-03	1.82E-02	0.0575	1.075E+13
Cl-36	5.5188E-08	419.74	839.48	0.00E+00	2.32E-05	4.63E-05	0.0850	6.503E+12
Cm-243	1.5496E-14	419.74	839.48	0.00E+00	6.50E-12	1.30E-11	0.1250	4.212E+12
Cm-244	5.2375E-16	419.74	839.48	0.00E+00	2.20E-13	4.40E-13	0.2250	5.582E+12
Co-60	2.0947E-03	419.74	839.48	0.00E+00	8.79E-01	1.76E+00	0.3750	2.432E+12
Cs-134	6.2448E-07	419.74	839.48	0.00E+00	2.62E-04	5.24E-04	0.5750	4.297E+13
Cs-135	4.4996E-05	419.74	839.48	0.00E+00	1.89E-02	3.78E-02	0.8500	3.968E+11
Cs-137	1.3775E+00	419.74	839.48	0.00E+00	5.78E+02	1.16E+03	1.2500	2.632E+11
Eu-154	1.8510E-04	419.74	839.48	0.00E+00	7.77E-02	1.55E-01	1.7500	1.024E+10
Eu-155	1.4163E-03	419.74	839.48	0.00E+00	5.94E-01	1.19E+00	2.2500	1.806E+06
Fe-55	1.4179E-05	419.74	839.48	0.00E+00	5.95E-03	1.19E-02	2.7500	1.741E+05
H-3	3.5383E-03	419.74	839.48	0.00E+00	1.49E+00	2.97E+00	3.5000	1.660E+02
I-129	1.1426E-06	419.74	839.48	0.00E+00	4.80E-04	9.59E-04	5.0000	5.707E+01
Kr-85	3.8604E-02	419.74	839.48	0.00E+00	1.62E+01	3.24E+01	7.0000	4.951E+00
Np-237	3.3099E-06	419.74	839.48	0.00E+00	1.39E-03	2.78E-03	11.0000	4.617E-01
Pa-231	1.8953E-07	419.74	839.48	0.00E+00	7.96E-05	1.59E-04		
Pb-210	8.9531E-12	419.74	839.48	0.00E+00	3.76E-09	7.52E-09		
Pm-147	1.1588E-03	419.74	839.48	0.00E+00	4.86E-01	9.73E-01		
Pu-238	1.7146E-04	419.74	839.48	0.00E+00	7.20E-02	1.44E-01		
Pu-239	1.9464E-02	419.74	839.48	0.00E+00	8.17E+00	1.63E+01		
Pu-240	6.7919E-05	419.74	839.48	0.00E+00	2.85E-02	5.70E-02		
Pu-241	4.1774E-06	419.74	839.48	0.00E+00	1.75E-03	3.51E-03		
Pu-242	4.3751E-13	419.74	839.48	0.00E+00	1.84E-10	3.67E-10		
Ra-226	2.4219E-11	419.74	839.48	0.00E+00	1.02E-08	2.03E-08		
Ra-228	2.3572E-11	419.74	839.48	0.00E+00	9.89E-09	1.98E-08		
Ru-106	3.0951E-10	419.74	839.48	0.00E+00	1.30E-07	2.60E-07		
Se-79	1.6488E-05	419.74	839.48	0.00E+00	6.92E-03	1.38E-02		
Sn-126	3.7564E-05	419.74	839.48	0.00E+00	1.58E-02	3.15E-02		
Sr-90	1.2052E+00	419.74	839.48	0.00E+00	5.06E+02	1.01E+03		
Tc-99	4.4825E-04	419.74	839.48	0.00E+00	1.88E-01	3.76E-01		
Th-229	4.6478E-11	419.74	839.48	0.00E+00	1.95E-08	3.90E-08		
Th-230	2.2259E-09	419.74	839.48	0.00E+00	9.34E-07	1.87E-06		
Th-232	2.3691E-11	419.74	839.48	0.00E+00	9.94E-09	1.99E-08		
Tl-208	5.8256E-09	419.74	839.48	0.00E+00	2.45E-06	4.89E-06		
U-232	1.5759E-08	419.74	839.48	0.00E+00	6.61E-06	1.32E-05		
U-233	1.0110E-08	419.74	839.48	0.00E+00	4.24E-06	8.49E-06		
U-234	4.9001E-06	419.74	839.48	0.00E+00	2.06E-03	4.11E-03		
U-235	-2.3191E-06	419.74	0.00	1.01E-02	9.14E-03	1.01E-02		
U-236	1.2633E-05	419.74	839.48	0.00E+00	5.30E-03	1.06E-02		
U-238	-9.5407E-08	419.74	0.00	4.55E-03	4.51E-03	4.55E-03		
Y-90	1.2053E+00	419.74	839.48	0.00E+00	5.06E+02	1.01E+03		
Other Radionuclides					5.75E+02	1.15E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	FAST	FAST	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	25.69081404	10 to 40	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate <sup>1</sup>
Nominal	29.14	419.74	
Bounding	50.35	839.48	

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	7.38	14.41	
Bounding	14.75	16.67	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FERMI CORE I & 2 (CORE SHIM)  
 SNF ID # 69  
 Fuel Units & Descr 280 - ROD  
 Heavy Metal Mass BOL=37 492kg EOL=36 82kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
 Estimates as of 2010  
 Template FERMI (Fast Zirc, 10 to 40% U)  
<sup>2</sup>Template Burnup(MWd) 58 6725048  
 Template BOL Heavy Metal Mass (MT) 0 018774  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 18"x10"  
 0 07

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9 6110E-08	592 57	1,185 14	0 00E+00	5 70E-05	1 14E-04	Avg MeV	
Am-241	6 5601E-07	592 57	1,185 14	0 00E+00	3 89E-04	7 77E-04	0 0150	7 842E+13
Am-242m	0 0000E+00	592 57	1,185 14	0 00E+00	0 00E+00	0 00E+00	0 0250	1 629E+13
Am-243	8 3770E-15	592 57	1,185 14	0 00E+00	4 96E-12	9 93E-12	0 0375	1 433E+13
C-14	2 1714E-05	592 57	1,185 14	0 00E+00	1 29E-02	2 57E-02	0 0575	1 518E+13
Cl-36	5 5188E-08	592 57	1,185 14	0 00E+00	3 27E-05	6 54E-05	0 0850	9 181E+12
Cm-243	1 5496E-14	592 57	1,185 14	0 00E+00	9 18E-12	1 84E-11	0 1250	5 946E+12
Cm-244	5 2375E-16	592 57	1,185 14	0 00E+00	3 10E-13	6 21E-13	0 2250	7 880E+12
Co-60	2 0947E-03	592 57	1,185 14	0 00E+00	1 24E+00	2 48E+00	0 3750	3 434E+12
Cs-134	6 2448E-07	592 57	1,185 14	0 00E+00	3 70E-04	7 40E-04	0 5750	6 066E+13
Cs-135	4 4996E-05	592 57	1,185 14	0 00E+00	2 67E-02	5 33E-02	0 8500	5 602E+11
Cs-137	1 3775E+00	592 57	1,185 14	0 00E+00	8 16E+02	1 63E+03	1 2500	3 716E+11
Eu-154	1 8510E-04	592 57	1,185 14	0 00E+00	1 10E-01	2 19E-01	1 7500	1 446E+10
Eu-155	1 4163E-03	592 57	1,185 14	0 00E+00	8 39E-01	1 68E+00	2 2500	2 549E+06
Fe-55	1 4179E-05	592 57	1,185 14	0 00E+00	8 40E-03	1 68E-02	2 7500	2 458E+05
H-3	3 5383E-03	592 57	1,185 14	0 00E+00	2 10E+00	4 19E+00	3 5000	2 580E+02
I-129	1 1426E-06	592 57	1,185 14	0 00E+00	6 77E-04	1 35E-03	5 0000	9 077E+01
Kr-85	3 8604E-02	592 57	1,185 14	0 00E+00	2 29E+01	4 58E+01	7 0000	8 165E+00
Np-237	3 3099E-06	592 57	1,185 14	0 00E+00	1 96E-03	3 92E-03	11 0000	7 869E-01
Pa-231	1 8953E-07	592 57	1,185 14	0 00E+00	1 12E-04	2 25E-04		
Pb-210	8 9531E-12	592 57	1,185 14	0 00E+00	5 31E-09	1 06E-08		
Pm-147	1 1588E-03	592 57	1,185 14	0 00E+00	6 87E-01	1 37E+00		
Pu-238	1 7146E-04	592 57	1,185 14	0 00E+00	1 02E-01	2 03E-01		
Pu-239	1 9464E-02	592 57	1,185 14	0 00E+00	1 15E+01	2 31E+01		
Pu-240	6 7919E-05	592 57	1,185 14	0 00E+00	4 02E-02	8 05E-02		
Pu-241	4 1774E-06	592 57	1,185 14	0 00E+00	2 48E-03	4 95E-03		
Pu-242	4 3751E-13	592 57	1,185 14	0 00E+00	2 59E-10	5 19E-10		
Ra-226	2 4219E-11	592 57	1,185 14	0 00E+00	1 44E-08	2 87E-08		
Ra-228	2 3572E-11	592 57	1,185 14	0 00E+00	1 40E-08	2 79E-08		
Ru-106	3 0951E-10	592 57	1,185 14	0 00E+00	1 83E-07	3 67E-07		
Se-79	1 6488E-05	592 57	1,185 14	0 00E+00	9 77E-03	1 95E-02		
Sn-126	3 7564E-05	592 57	1,185 14	0 00E+00	2 23E-02	4 45E-02		
Sr-90	1 2052E+00	592 57	1,185 14	0 00E+00	7 14E+02	1 43E+03		
Tc-99	4 4825E-04	592 57	1,185 14	0 00E+00	2 66E-01	5 31E-01		
Th-229	4 6478E-11	592 57	1,185 14	0 00E+00	2 75E-08	5 51E-08		
Th-230	2 2259E-09	592 57	1,185 14	0 00E+00	1 32E-06	2 64E-06		
Th-232	2 3691E-11	592 57	1,185 14	0 00E+00	1 40E-08	2 81E-08		
Th-208	5 8256E-09	592 57	1,185 14	0 00E+00	3 45E-06	6 90E-06		
U-232	1 5759E-08	592 57	1,185 14	0 00E+00	9 34E-06	1 87E-05		
U-233	1 0110E-08	592 57	1,185 14	0 00E+00	5 99E-06	1 20E-05		
U-234	4 9001E-06	592 57	1,185 14	0 00E+00	2 90E-03	5 81E-03		
U-235	-2 3191E-06	592 57	0 00	1 10E-02	9 61E-03	1 10E-02		
U-236	1 2633E-05	592 57	1,185 14	0 00E+00	7 49E-03	1 50E-02		
U-238	-9 5407E-08	592 57	0 00	1 09E-02	1 08E-02	1 09E-02		
Y-90	1 2053E+00	592 57	1,185 14	0 00E+00	7 14E+02	1 43E+03		
Other Radionuclides					8 11E+02	1 62E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator.	From SFD	Used	
	FAST	FAST	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	13 55265123	10 to 40	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	59 99	592 57	
Bounding	103 67	1 185 14	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	5 06	9 88	
Bounding	10 11	11 43	1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FERMI CORE I & 2 (DECLAD)  
 SNF ID # 453  
 Fuel Units & Descr 976 - ROD  
 Heavy Metal Mass BOL=130 686kg EOL=110 971kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
 Estimates as of 2010  
 Template FERMI (Fast, Zirc, 10 to 40%, U)  
<sup>2</sup>Template Burnup(MWd): 58 6725048  
 Template BOL Heavy Metal Mass (MT) 0.018774  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 18"x10"  
 0.25

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.6110E-08	17,384.91	34,769.81	0.00E+00	1.67E-03	3.34E-03	Avg MeV	
Am-241	6.5601E-07	17,384.91	34,769.81	0.00E+00	1.14E-02	2.28E-02	0.0150	2.301E+15
Am-242m	0.0000E+00	17,384.91	34,769.81	0.00E+00	0.00E+00	0.00E+00	0.0250	4.779E+14
Am-243	8.3770E-15	17,384.91	34,769.81	0.00E+00	1.46E-10	2.91E-10	0.0375	4.204E+14
C-14	2.1714E-05	17,384.91	34,769.81	0.00E+00	3.77E-01	7.55E-01	0.0575	4.453E+14
Cl-36	5.5188E-08	17,384.91	34,769.81	0.00E+00	9.59E-04	1.92E-03	0.0850	2.693E+14
Cm-243	1.5496E-14	17,384.91	34,769.81	0.00E+00	2.69E-10	5.39E-10	0.1250	1.745E+14
Cm-244	5.2375E-16	17,384.91	34,769.81	0.00E+00	9.11E-12	1.82E-11	0.2250	2.312E+14
Co-60	2.0947E-03	17,384.91	34,769.81	0.00E+00	3.64E+01	7.28E+01	0.3750	1.007E+14
Cs-134	6.2448E-07	17,384.91	34,769.81	0.00E+00	1.09E-02	2.17E-02	0.5750	1.780E+15
Cs-135	4.4996E-05	17,384.91	34,769.81	0.00E+00	7.82E-01	1.56E+00	0.8500	1.644E+13
Cs-137	1.3775E+00	17,384.91	34,769.81	0.00E+00	2.39E+04	4.79E+04	1.2500	1.090E+13
Eu-154	1.8510E-04	17,384.91	34,769.81	0.00E+00	3.22E+00	6.44E+00	1.7500	4.241E+11
Eu-155	1.4163E-03	17,384.91	34,769.81	0.00E+00	2.46E+01	4.92E+01	2.2500	7.479E+07
Fe-55	1.4179E-05	17,384.91	34,769.81	0.00E+00	2.46E-01	4.93E-01	2.7500	7.209E+06
H-3	3.5383E-03	17,384.91	34,769.81	0.00E+00	6.15E+01	1.23E+02	3.5000	6.033E+03
I-129	1.1426E-06	17,384.91	34,769.81	0.00E+00	1.99E-02	3.97E-02	5.0000	2.002E+03
Kr-85	3.8604E-02	17,384.91	34,769.81	0.00E+00	6.71E+02	1.34E+03	7.0000	1.635E+02
Np-237	3.3099E-06	17,384.91	34,769.81	0.00E+00	5.75E-02	1.15E-01	11.0000	1.434E+01
Pa-231	1.8953E-07	17,384.91	34,769.81	0.00E+00	3.29E-03	6.59E-03		
Pb-210	8.9531E-12	17,384.91	34,769.81	0.00E+00	1.56E-07	3.11E-07		
Pm-147	1.1588E-03	17,384.91	34,769.81	0.00E+00	2.01E+01	4.03E+01		
Pu-238	1.7146E-04	17,384.91	34,769.81	0.00E+00	2.98E+00	5.96E+00		
Pu-239	1.9464E-02	17,384.91	34,769.81	0.00E+00	3.38E+02	6.77E+02		
Pu-240	6.7919E-05	17,384.91	34,769.81	0.00E+00	1.18E+00	2.36E+00		
Pu-241	4.1774E-06	17,384.91	34,769.81	0.00E+00	7.26E-02	1.45E-01		
Pu-242	4.3751E-13	17,384.91	34,769.81	0.00E+00	7.61E-09	1.52E-08		
Ra-226	2.4219E-11	17,384.91	34,769.81	0.00E+00	4.21E-07	8.42E-07		
Ra-228	2.3572E-11	17,384.91	34,769.81	0.00E+00	4.10E-07	8.20E-07		
Ru-106	3.0951E-10	17,384.91	34,769.81	0.00E+00	5.38E-06	1.08E-05		
Se-79	1.6488E-05	17,384.91	34,769.81	0.00E+00	2.87E-01	5.73E-01		
Sn-126	3.7564E-05	17,384.91	34,769.81	0.00E+00	6.53E-01	1.31E+00		
Sr-90	1.2052E+00	17,384.91	34,769.81	0.00E+00	2.10E+04	4.19E+04		
Tc-99	4.4825E-04	17,384.91	34,769.81	0.00E+00	7.79E+00	1.56E+01		
Th-229	4.6478E-11	17,384.91	34,769.81	0.00E+00	8.08E-07	1.62E-06		
Th-230	2.2259E-09	17,384.91	34,769.81	0.00E+00	3.87E-05	7.74E-05		
Th-232	2.3691E-11	17,384.91	34,769.81	0.00E+00	4.12E-07	8.24E-07		
Th-208	5.8256E-09	17,384.91	34,769.81	0.00E+00	1.01E-04	2.03E-04		
U-232	1.5759E-08	17,384.91	34,769.81	0.00E+00	2.74E-04	5.48E-04		
U-233	1.0110E-08	17,384.91	34,769.81	0.00E+00	1.76E-04	3.52E-04		
U-234	4.9001E-06	17,384.91	34,769.81	0.00E+00	8.52E-02	1.70E-01		
U-235	-2.3191E-06	17,384.91	0.00	7.26E-02	3.22E-02	7.26E-02		
U-236	1.2633E-05	17,384.91	34,769.81	0.00E+00	2.20E-01	4.39E-01		
U-238	-9.5407E-08	17,384.91	0.00	3.26E-02	3.10E-02	3.26E-02		
Y-90	1.2053E+00	17,384.91	34,769.81	0.00E+00	2.10E+04	4.19E+04		
Other Radionuclides					2.38E+04	4.76E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	This Template was used for the following reasons
Fuel Cladding	NONE	ZIRC	This fuel matches on all parameters except cladding.
BOL HM Constituents	U	U	
BOL Enrichment %	25.69081404	10 to 40	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	209.10	17,384.91	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding	361.35	34,769.81	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	42.57	83.14	1.04
Bounding	85.13	96.22	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FERMI CORE I & 2 (SECTIONED)  
 SNF ID # 454  
 Fuel Units & Descr 980 - ROD  
 Heavy Metal Mass BOL=131.222kg EOL=125.048kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
 Estimates as of 2010  
 Template FERMI (Fast Zirc 10 to 40%, U)  
<sup>2</sup>Template Burnup(MWd) 58 6725048  
 Template BOL Heavy Metal Mass (MT) 0 018774  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 18"x10"  
 0 26

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9 6110E-08	5,444 25	10,888 49	0 00E+00	5 23E-04	1 05E-03	Avg MeV	
Am-241	6 5601E-07	5,444 25	10,888 49	0 00E+00	3 57E-03	7 14E-03	0 0150	7 205E+14
Am-242m	0 0000E+00	5,444 25	10,888 49	0 00E+00	0 00E+00	0 00E+00	0 0250	1 497E+14
Am-243	8 3770E-15	5,444 25	10 888 49	0 00E+00	4 56E-11	9 12E-11	0 0375	1 317E+14
C-14	2 1714E-05	5,444 25	10 888 49	0 00E+00	1 18E-01	2 36E-01	0 0575	1 395E+14
Cl-36	5 5188E-08	5,444 25	10,888 49	0 00E+00	3 00E-04	6 01E-04	0 0850	8 435E+13
Cm-243	1 5496E-14	5,444 25	10,888 49	0 00E+00	8 44E-11	1 69E-10	0 1250	5 463E+13
Cm-244	5 2375E-16	5,444 25	10,888 49	0 00E+00	2 85E-12	5 70E-12	0 2250	7 240E+13
Co-60	2 0947E-03	5,444 25	10,888 49	0 00E+00	1 14E+01	2 28E+01	0 3750	3 155E+13
Cs-134	6 2448E-07	5,444 25	10,888 49	0 00E+00	3 40E-03	6 80E-03	0 5750	5 573E+14
Cs-135	4 4996E-05	5,444 25	10,888 49	0 00E+00	2 45E-01	4 90E-01	0 8500	5 147E+12
Cs-137	1 3775E+00	5,444 25	10,888 49	0 00E+00	7 50E+03	1 50E+04	1 2500	3 414E+12
Eu-154	1 8510E-04	5,444 25	10,888 49	0 00E+00	1 01E+00	2 02E+00	1 7500	1 328E+11
Eu-155	1 4163E-03	5,444 25	10,888 49	0 00E+00	7 71E+00	1 54E+01	2 2500	2 342E+07
Fe-55	1 4179E-05	5,444 25	10,888 49	0 00E+00	7 72E-02	1 54E-01	2 7500	2 258E+06
H-3	3 5383E-03	5,444 25	10,888 49	0 00E+00	1 93E+01	3 85E+01	3 5000	2 011E+03
I-129	1 1426E-06	5,444 25	10,888 49	0 00E+00	6 22E-03	1 24E-02	5 0000	6 794E+02
Kr-85	3 8604E-02	5,444 25	10,888 49	0 00E+00	2 10E+02	4 20E+02	7 0000	5 722E+01
Np-237	3 3099E-06	5,444 25	10,888 49	0 00E+00	1 80E-02	3 60E-02	11 0000	5 183E+00
Pa-231	1 8953E-07	5 444 25	10,888 49	0 00E+00	1 03E-03	2 06E-03		
Pb-210	8 9531E-12	5,444 25	10,888 49	0 00E+00	4 87E-08	9 75E-08		
Pm-147	1 1588E-03	5 444 25	10,888 49	0 00E+00	6 31E+00	1 26E+01		
Pu-238	1 7146E-04	5,444 25	10,888 49	0 00E+00	9 33E-01	1 87E+00		
Pu-239	1 9464E-02	5,444 25	10,888 49	0 00E+00	1 06E+02	2 12E+02		
Pu-240	6 7919E-05	5,444 25	10,888 49	0 00E+00	3 70E-01	7 40E-01		
Pu-241	4 1774E-06	5 444 25	10,888 49	0 00E+00	2 27E-02	4 55E-02		
Pu-242	4 3751E-13	5,444 25	10,888 49	0 00E+00	2 38E-09	4 76E-09		
Ra-226	2 4219E-11	5,444 25	10,888 49	0 00E+00	1 32E-07	2 64E-07		
Ra-228	2 3572E-11	5,444 25	10,888 49	0 00E+00	1 28E-07	2 57E-07		
Ru-106	3 0951E-10	5,444 25	10,888 49	0 00E+00	1 69E-06	3 37E-06		
Se-79	1 6488E-05	5,444 25	10,888 49	0 00E+00	8 98E-02	1 80E-01		
Sn-126	3 7564E-05	5,444 25	10,888 49	0 00E+00	2 05E-01	4 09E-01		
Sr-90	1 2052E+00	5,444 25	10,888 49	0 00E+00	6 56E+03	1 31E+04		
Tc-99	4 4825E-04	5,444 25	10,888 49	0 00E+00	2 44E+00	4 88E+00		
Th-229	4 6478E-11	5,444 25	10,888 49	0 00E+00	2 53E-07	5 06E-07		
Th-230	2 2259E-09	5,444 25	10,888 49	0 00E+00	1 21E-05	2 42E-05		
Th-232	2 3691E-11	5,444 25	10,888 49	0 00E+00	1 29E-07	2 58E-07		
Tl-208	5 8256E-09	5,444 25	10,888 49	0 00E+00	3 17E-05	6 34E-05		
U-232	1 5759E-08	5 444 25	10,888 49	0 00E+00	8 58E-05	1 72E-04		
U-233	1 0110E-08	5,444 25	10,888 49	0 00E+00	5 50E-05	1 10E-04		
U-234	4 9001E-06	5,444 25	10,888 49	0 00E+00	2 67E-02	5 34E-02		
U-235	-2 3191E-06	5,444 25	0 00	7 29E-02	6 02E-02	7 29E-02		
U-236	1 2633E-05	5,444 25	10,888 49	0 00E+00	6 88E-02	1 38E-01		
U-238	-9 5407E-08	5 444 25	0 00	3 28E-02	3 23E-02	3 28E-02		
Y-90	1 2053E+00	5,444 25	10,888 49	0 00E+00	6 56E+03	1 31E+04		
Other Radionuclides					7 45E+03	1 49E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	FAST	FAST	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	25 69081404	10 to 40	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal	From SFD	Estimated	
	209 96	5 444 25	
Bounding	362 83	10 888 49	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
	13 28	25 93	
Bounding	26 55	30 01	1 01

<sup>1</sup>Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FERM CORE I & 2 (SODIUM WORTH)  
SNF ID # 455  
Fuel Units & Descr 420 - ROD  
Heavy Metal Mass BOL=56 238kg, EOL=55 398kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
Estimates as of 2010  
Template FERM (Fast, Zirc, 10 to 40% U)  
<sup>2</sup>Template Burnup(MWd) 58 6725048  
Template BOL Heavy Metal Mass (MT) 0 018774  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x10"  
0 11

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9 6110E-08	740 71	1,481 43	0 00E+00	7 12E-05	1 42E-04	Avg MeV	
Am-241	6 5601E-07	740 71	1,481 43	0 00E+00	4 86E-04	9 72E-04	0 0150	9 802E+13
Am-242m	0 0000E+00	740 71	1,481 43	0 00E+00	0 00E+00	0 00E+00	0 0250	2 036E+13
Am-243	8 3770E-15	740 71	1,481 43	0 00E+00	6 20E-12	1 24E-11	0 0375	1 791E+13
C-14	2 1714E-05	740 71	1,481 43	0 00E+00	1 61E-02	3 22E-02	0 0575	1 897E+13
Cl-36	5 5188E-08	740 71	1,481 43	0 00E+00	4 09E-05	8 18E-05	0 0850	1 148E+13
Cm-243	1 5496E-14	740 71	1,481 43	0 00E+00	1 15E-11	2 30E-11	0 1250	7 433E+12
Cm-244	5 2375E-16	740 71	1,481 43	0 00E+00	3 88E-13	7 76E-13	0 2250	9 851E+12
Co-60	2 0947E-03	740 71	1,481 43	0 00E+00	1 55E+00	3 10E+00	0 3750	4 292E+12
Cs-134	6 2448E-07	740 71	1,481 43	0 00E+00	4 63E-04	9 25E-04	0 5750	7 582E+13
Cs-135	4 4996E-05	740 71	1,481 43	0 00E+00	3 33E-02	6 67E-02	0 8500	7 002E+11
Cs-137	1 3775E+00	740 71	1,481 43	0 00E+00	1 02E+03	2 04E+03	1 2500	4 645E+11
Eu-154	1 8510E-04	740 71	1,481 43	0 00E+00	1 37E-01	2 74E-01	1 7500	1 807E+10
Eu-155	1 4163E-03	740 71	1,481 43	0 00E+00	1 05E+00	2 10E+00	2 2500	3 187E+06
Fe-55	1 4179E-05	740 71	1,481 43	0 00E+00	1 05E-02	2 10E-02	2 7500	3 072E+05
H-3	3 5383E-03	740 71	1,481 43	0 00E+00	2 62E+00	5 24E+00	3 5000	3 254E+02
I-129	1 1426E-06	740 71	1,481 43	0 00E+00	8 46E-04	1 69E-03	5 0000	1 147E+02
Kr-85	3 8604E-02	740 71	1,481 43	0 00E+00	2 86E+01	5 72E+01	7 0000	1 035E+01
Np-237	3 3099E-06	740 71	1,481 43	0 00E+00	2 45E-03	4 90E-03	11 0000	9 995E-01
Pa-231	1 8953E-07	740 71	1,481 43	0 00E+00	1 40E-04	2 81E-04		
Pb-210	8 9531E-12	740 71	1,481 43	0 00E+00	6 63E-09	1 33E-08		
Pm-147	1 1588E-03	740 71	1,481 43	0 00E+00	8 58E-01	1 72E+00		
Pu-238	1 7146E-04	740 71	1,481 43	0 00E+00	1 27E-01	2 54E-01		
Pu-239	1 9464E-02	740 71	1,481 43	0 00E+00	1 44E+01	2 88E+01		
Pu-240	6 7919E-05	740 71	1,481 43	0 00E+00	5 03E-02	1 01E-01		
Pu-241	4 1774E-06	740 71	1,481 43	0 00E+00	3 09E-03	6 19E-03		
Pu-242	4 3751E-13	740 71	1,481 43	0 00E+00	3 24E-10	6 48E-10		
Ra-226	2 4219E-11	740 71	1,481 43	0 00E+00	1 79E-08	3 59E-08		
Ra-228	2 3572E-11	740 71	1,481 43	0 00E+00	1 75E-08	3 49E-08		
Ru-106	3 0951E-10	740 71	1,481 43	0 00E+00	2 29E-07	4 59E-07		
Se-79	1 6488E-05	740 71	1,481 43	0 00E+00	1 22E-02	2 44E-02		
Sn-126	3 7564E-05	740 71	1,481 43	0 00E+00	2 78E-02	5 56E-02		
Sr-90	1 2052E+00	740 71	1,481 43	0 00E+00	8 93E+02	1 79E+03		
Tc-99	4 4825E-04	740 71	1,481 43	0 00E+00	3 32E-01	6 64E-01		
Th-229	4 6478E-11	740 71	1,481 43	0 00E+00	3 44E-08	6 89E-08		
Th-230	2 2259E-09	740 71	1,481 43	0 00E+00	1 65E-06	3 30E-06		
Th-232	2 3691E-11	740 71	1,481 43	0 00E+00	1 75E-08	3 51E-08		
Ti-208	5 8256E-09	740 71	1,481 43	0 00E+00	4 32E-06	8 63E-06		
U-232	1 5759E-08	740 71	1,481 43	0 00E+00	1 17E-05	2 33E-05		
U-233	1 0110E-08	740 71	1,481 43	0 00E+00	7 49E-06	1 50E-05		
U-234	4 9001E-06	740 71	1,481 43	0 00E+00	3 63E-03	7 26E-03		
U-235	-2 3191E-06	740 71	0 00	3 12E-02	2 95E-02	3 12E-02		
U-236	1 2633E-05	740 71	1,481 43	0 00E+00	9 36E-03	1 87E-02		
U-238	-9 5407E-08	740 71	0 00	1 40E-02	1 40E-02	1 40E-02		
Y-90	1 2053E+00	740 71	1,481 43	0 00E+00	8 93E+02	1 79E+03		
Other Radionuclides					1 01E+03	2 03E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	25 69081404	10 to 40	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	89 98	740 71	
Bounding	155 50	1 481 43	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	4.21	8.23	
Bounding	8.43	9.53	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FERMI CORE 1 & 2 (STD FUEL SUBASSEMBLY)  
 SNF ID # 456  
 Fuel Units & Descr 27160 - ROD  
 Heavy Metal Mass BOL=3636 724kg EOL=3566 108kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
 Estimates as of 2010  
 Template FERMI (Fast Zirc 10 to 40% U)  
<sup>2</sup>Template Burnup(MWd) 58 6725048  
 Template BOL Heavy Metal Mass (MT) 0 018774  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 18"x10"  
 7 07

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9 6110E-08	62,269 34	124,538 69	0 00E+00	5 98E-03	1 20E-02	Avg MeV	
Am-241	6 5601E-07	62,269 34	124,538 69	0 00E+00	4 08E-02	8 17E-02	0 0150	8 241E+15
Am-242m	0 0000E+00	62,269 34	124,538 69	0 00E+00	0 00E+00	0 00E+00	0 0250	1 712E+15
Am-243	8 3770E-15	62,269 34	124,538 69	0 00E+00	5 22E-10	1 04E-09	0 0375	1 506E+15
C-14	2 1714E-05	62,269 34	124,538 69	0 00E+00	1 35E+00	2 70E+00	0 0575	1 595E+15
Cl-36	5 5188E-08	62,269 34	124,538 69	0 00E+00	3 44E-03	6 87E-03	0 0850	9 647E+14
Cm-243	1 5496E-14	62,269 34	124,538 69	0 00E+00	9 65E-10	1 93E-09	0 1250	6 249E+14
Cm-244	5 2375E-16	62,269 34	124,538 69	0 00E+00	3 26E-11	6 52E-11	0 2250	8 281E+14
Co-60	2 0947E-03	62,269 34	124,538 69	0 00E+00	1 30E+02	2 61E+02	0 3750	3 608E+14
Cs-134	6 2448E-07	62,269 34	124,538 69	0 00E+00	3 89E-02	7 78E-02	0 5750	6 374E+15
Cs-135	4 4996E-05	62,269 34	124,538 69	0 00E+00	2 80E+00	5 60E+00	0 8500	5 887E+13
Cs-137	1 3775E+00	62,269 34	124,538 69	0 00E+00	8 58E+04	1 72E+05	1 2500	3 905E+13
Eu-154	1 8510E-04	62,269 34	124,538 69	0 00E+00	1 15E+01	2 31E+01	1 7500	1 519E+12
Eu-155	1 4163E-03	62,269 34	124,538 69	0 00E+00	8 82E+01	1 76E+02	2 2500	2 679E+08
Fe-55	1 4179E-05	62,269 34	124,538 69	0 00E+00	8 83E-01	1 77E+00	2 7500	2 582E+07
H-3	3 5383E-03	62,269 34	124,538 69	0 00E+00	2 20E+02	4 41E+02	3 5000	2 589E+04
I-129	1 1426E-06	62,269 34	124,538 69	0 00E+00	7 11E-02	1 42E-01	5 0000	9 009E+03
Kr-85	3 8604E-02	62,269 34	124,538 69	0 00E+00	2 40E+03	4 81E+03	7 0000	7 969E+02
Np-237	3 3099E-06	62,269 34	124,538 69	0 00E+00	2 06E-01	4 12E-01	11 0000	7 566E+01
Pa-231	1 8953E-07	62,269 34	124,538 69	0 00E+00	1 18E-02	2 36E-02		
Pb-210	8 9531E-12	62,269 34	124,538 69	0 00E+00	5 58E-07	1 12E-06		
Pm-147	1 1588E-03	62,269 34	124,538 69	0 00E+00	7 22E+01	1 44E+02		
Pu-238	1 7146E-04	62,269 34	124,538 69	0 00E+00	1 07E+01	2 14E+01		
Pu-239	1 9464E-02	62,269 34	124,538 69	0 00E+00	1 21E+03	2 42E+03		
Pu-240	6 7919E-05	62,269 34	124,538 69	0 00E+00	4 23E+00	8 46E+00		
Pu-241	4 1774E-06	62,269 34	124,538 69	0 00E+00	2 60E-01	5 20E-01		
Pu-242	4 3751E-13	62,269 34	124,538 69	0 00E+00	2 72E-08	5 45E-08		
Ra-226	2 4219E-11	62,269 34	124,538 69	0 00E+00	1 51E-06	3 02E-06		
Ra-228	2 3572E-11	62,269 34	124,538 69	0 00E+00	1 47E-06	2 94E-06		
Ru-106	3 0951E-10	62,269 34	124,538 69	0 00E+00	1 93E-05	3 85E-05		
Se-79	1 6488E-05	62,269 34	124,538 69	0 00E+00	1 03E+00	2 05E+00		
Sn-126	3 7564E-05	62,269 34	124,538 69	0 00E+00	2 34E+00	4 68E+00		
Sr-90	1 2052E+00	62,269 34	124,538 69	0 00E+00	7 50E+04	1 50E+05		
Tc-99	4 4825E-04	62,269 34	124,538 69	0 00E+00	2 79E+01	5 58E+01		
Th-229	4 6478E-11	62,269 34	124,538 69	0 00E+00	2 89E-06	5 79E-06		
Th-230	2 2259E-09	62,269 34	124,538 69	0 00E+00	1 39E-04	2 77E-04		
Th-232	2 3691E-11	62,269 34	124,538 69	0 00E+00	1 48E-06	2 95E-06		
Ti-208	5 8256E-09	62,269 34	124,538 69	0 00E+00	3 63E-04	7 26E-04		
U-232	1 5759E-08	62,269 34	124,538 69	0 00E+00	9 81E-04	1 96E-03		
U-233	1 0110E-08	62,269 34	124,538 69	0 00E+00	6 30E-04	1 26E-03		
U-234	4 9001E-06	62,269 34	124,538 69	0 00E+00	3 05E-01	6 10E-01		
U-235	2 3191E-06	62,269 34	0 00	2 02E+00	1 87E+00	2 02E+00		
U-236	1 2633E-05	62,269 34	124,538 69	0 00E+00	7 87E-01	1 57E+00		
U-238	9 5407E-08	62,269 34	0 00	9 08E-01	9 02E-01	9 08E-01		
Y-90	1 2053E+00	62,269 34	124,538 69	0 00E+00	7 51E+04	1 50E+05		
Other Radionuclides					8 53E+04	1 71E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	FAST	FAST	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	25 69081404	10 to 40	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal		62 269 34	
Bounding	5 818 76	124 538 69	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	5 48		
Bounding	10 96	21 40	1 01

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FFTF CARBIDE FUEL EXPER  
SNF ID #: 347  
Fuel Units & Descr: 15 - ELEMENT  
Heavy Metal Mass: BOL= , EOL=7.356kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1993  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd): 5011.2  
Template BOL Heavy Metal Mass (MT): 0.0329181  
Template Decay Time: 15 years

Estimated  
Canister usage  
18"x10"  
0.31

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	525.78	652.69	0.00E+00	7.22E-10	8.96E-10	Avg MeV	
Am-241	7.9527E-02	525.78	652.69	1.52E+01	5.70E+01	6.71E+01	0.0150	3.316E+13
Am-242m	2.1053E-03	525.78	652.69	0.00E+00	1.11E+00	1.37E+00	0.0250	7.084E+12
Am-243	1.0760E-04	525.78	652.69	0.00E+00	5.66E-02	7.02E-02	0.0375	8.094E+12
C-14	2.6141E-05	525.78	652.69	0.00E+00	1.37E-02	1.71E-02	0.0575	6.973E+12
Cl-36	3.4243E-10	525.78	652.69	0.00E+00	1.80E-07	2.24E-07	0.0850	4.032E+12
Cm-243	6.6092E-04	525.78	652.69	0.00E+00	3.47E-01	4.31E-01	0.1250	3.012E+12
Cm-244	2.9933E-03	525.78	652.69	0.00E+00	1.57E+00	1.95E+00	0.2250	3.054E+12
Co-60	1.5934E-02	525.78	652.69	0.00E+00	8.38E+00	1.04E+01	0.3750	1.570E+12
Cs-134	4.6356E-02	525.78	652.69	0.00E+00	2.44E+01	3.03E+01	0.5750	5.245E+13
Cs-135	4.7693E-05	525.78	652.69	0.00E+00	2.51E-02	3.11E-02	0.8500	1.756E+12
Cs-137	2.1113E+00	525.78	652.69	0.00E+00	1.11E+03	1.38E+03	1.2500	1.528E+12
Eu-154	4.8092E-02	525.78	652.69	0.00E+00	2.53E+01	3.14E+01	1.7500	2.511E+10
Eu-155	6.8447E-02	525.78	652.69	0.00E+00	3.60E+01	4.47E+01	2.2500	8.452E+08
Fe-55	5.8479E-03	525.78	652.69	0.00E+00	3.07E+00	3.82E+00	2.7500	8.818E+07
H-3	8.9300E-03	525.78	652.69	0.00E+00	4.70E+00	5.83E+00	3.5000	9.968E+06
I-129	1.2891E-06	525.78	652.69	0.00E+00	6.78E-04	8.41E-04	5.0000	3.081E+04
Kr-85	7.0941E-02	525.78	652.69	0.00E+00	3.73E+01	4.63E+01	7.0000	3.521E+03
Np-237	2.6541E-06	525.78	652.69	0.00E+00	1.40E-03	1.73E-03	11.0000	4.031E+02
Pa-231	4.8970E-12	525.78	652.69	0.00E+00	2.57E-09	3.20E-09		
Pb-210	2.2170E-13	525.78	652.69	0.00E+00	1.17E-10	1.45E-10		
Pm-147	2.3617E-01	525.78	652.69	0.00E+00	1.24E+02	1.54E+02		
Pu-238	2.8636E-02	525.78	652.69	0.00E+00	1.51E+01	1.87E+01		
Pu-239	-3.5520E-02	525.78	0.00	1.25E+02	1.06E+02	1.25E+02		
Pu-240	2.0790E-02	525.78	652.69	6.34E+01	7.43E+01	7.70E+01		
Pu-241	-4.8316E-01	525.78	0.00	2.85E+03	2.59E+03	2.85E+03		
Pu-242	1.1052E-05	525.78	652.69	1.69E-02	2.27E-02	2.41E-02		
Ra-226	5.7471E-13	525.78	652.69	0.00E+00	3.02E-10	3.75E-10		
Ra-228	5.4957E-17	525.78	652.69	0.00E+00	2.89E-14	3.59E-14		
Ru-106	1.4582E-02	525.78	652.69	0.00E+00	7.67E+00	9.52E+00		
Se-79	1.0137E-05	525.78	652.69	0.00E+00	5.33E-03	6.62E-03		
Sn-126	4.3922E-05	525.78	652.69	0.00E+00	2.31E-02	2.87E-02		
Sr-90	7.6329E-01	525.78	652.69	0.00E+00	4.01E+02	4.98E+02		
Tc-99	3.9412E-04	525.78	652.69	0.00E+00	2.07E-01	2.57E-01		
Th-229	1.6457E-12	525.78	652.69	0.00E+00	8.65E-10	1.07E-09		
Th-230	1.8822E-10	525.78	652.69	0.00E+00	9.90E-08	1.23E-07		
Th-232	9.7601E-17	525.78	652.69	0.00E+00	5.13E-14	6.37E-14		
Ti-208	5.2722E-07	525.78	652.69	0.00E+00	2.77E-04	3.44E-04		
U-232	1.4925E-06	525.78	652.69	0.00E+00	7.85E-04	9.74E-04		
U-233	2.1113E-10	525.78	652.69	0.00E+00	1.11E-07	1.38E-07		
U-234	1.9528E-06	525.78	652.69	0.00E+00	1.03E-03	1.27E-03		
U-235	-9.7920E-09	525.78	0.00	2.56E-05	2.05E-05	2.56E-05		
U-236	1.1570E-07	525.78	652.69	0.00E+00	6.08E-05	7.55E-05		
U-238	-1.7914E-07	525.78	0.00	1.86E-03	1.77E-03	1.86E-03		
Y-90	7.6329E-01	525.78	652.69	0.00E+00	4.01E+02	4.98E+02		
Other Radionuclides					1.14E+03	1.41E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	FAST	FAST	This Template was used for the following reasons:
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		525.78	Nominal burnup taken from SFD and converted to MWd using BOL=7.883kg
Bounding		652.69	Bounding burnup taken from SFD and converted to MWd using BOL=7.883kg

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.44		1.00
Bounding	0.54		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FFTF OXIDE EXPERIMENTS  
 SNF ID # 349  
 Fuel Units & Descr 1 - HEX ARRAY 91 ROD  
 Heavy Metal Mass BOL= , EOL=0.249kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1993  
 Estimates as of 2010  
 Template FFTF (FAST SST 10 to 30% Pu & U)  
<sup>2</sup>Template Burnup(MWd) 5011.2  
 Template BOL Heavy Metal Mass (MT) 0.0329181  
 Template Decay Time 15 years

Estimated  
 Canister usage  
 18"x10"  
 0 02

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	33 98	62.29	0.00E+00	4.67E-11	8.56E-11	Avg MeV	
Am-241	7.9527E-02	33 98	62.29	5.46E-01	3.25E+00	5.50E+00	0.0150	3.115E+12
Am-242m	2.1053E-03	33 98	62.29	0.00E+00	7.15E-02	1.31E-01	0.0250	6.752E+11
Am-243	1.0760E-04	33 98	62.29	0.00E+00	3.66E-03	6.70E-03	0.0375	7.724E+11
C-14	2.6141E-05	33 98	62.29	0.00E+00	8.88E-04	1.63E-03	0.0575	6.529E+11
Cl-36	3.4243E-10	33 98	62.29	0.00E+00	1.16E-08	2.13E-08	0.0850	3.848E+11
Cm-243	6.6092E-04	33 98	62.29	0.00E+00	2.25E-02	4.12E-02	0.1250	2.874E+11
Cm-244	2.9933E-03	33 98	62.29	0.00E+00	1.02E-01	1.86E-01	0.2250	2.914E+11
Co-60	1.5934E-02	33 98	62.29	0.00E+00	5.41E-01	9.93E-01	0.3750	1.498E+11
Cs-134	4.6356E-02	33 98	62.29	0.00E+00	1.58E+00	2.89E+00	0.5750	5.006E+12
Cs-135	4.7693E-05	33 98	62.29	0.00E+00	1.62E-03	2.97E-03	0.8500	1.675E+11
Cs-137	2.1113E+00	33 98	62.29	0.00E+00	7.17E+01	1.32E+02	1.2500	1.459E+11
Eu-154	4.8092E-02	33 98	62.29	0.00E+00	1.63E+00	3.00E+00	1.7500	2.396E+09
Eu-155	6.8447E-02	33 98	62.29	0.00E+00	2.33E+00	4.26E+00	2.2500	8.066E+07
Fe-55	5.8479E-03	33 98	62.29	0.00E+00	1.99E-01	3.64E-01	2.7500	8.413E+06
H-3	8.9300E-03	33 98	62.29	0.00E+00	3.03E-01	5.56E-01	3.5000	9.492E+05
I-129	1.2891E-06	33 98	62.29	0.00E+00	4.38E-05	8.03E-05	5.0000	2.044E+03
Kr-85	7.0941E-02	33 98	62.29	0.00E+00	2.41E+00	4.42E+00	7.0000	2.341E+02
Np-237	2.6541E-06	33 98	62.29	0.00E+00	9.02E-05	1.65E-04	11.0000	2.681E+01
Pa-231	4.8970E-12	33 98	62.29	0.00E+00	1.66E-10	3.05E-10		
Pb-210	2.2170E-13	33 98	62.29	0.00E+00	7.53E-12	1.38E-11		
Pm-147	2.3617E-01	33 98	62.29	0.00E+00	8.02E+00	1.47E+01		
Pu-238	2.8636E-02	33 98	62.29	0.00E+00	9.73E-01	1.78E+00		
Pu-239	-3.5520E-02	33 98	0.00	4.48E+00	3.27E+00	4.48E+00		
Pu-240	2.0790E-02	33 98	62.29	2.28E+00	2.98E+00	3.57E+00		
Pu-241	-4.8316E-01	33 98	0.00	1.02E+02	8.58E+01	1.02E+02		
Pu-242	1.1052E-05	33 98	62.29	6.07E-04	9.83E-04	1.30E-03		
Ra-226	5.7471E-13	33 98	62.29	0.00E+00	1.95E-11	3.58E-11		
Ra-228	5.4957E-17	33 98	62.29	0.00E+00	1.87E-15	3.42E-15		
Ru-106	1.4582E-02	33 98	62.29	0.00E+00	4.95E-01	9.08E-01		
Se-79	1.0137E-05	33 98	62.29	0.00E+00	3.44E-04	6.31E-04		
Sn-126	4.3922E-05	33 98	62.29	0.00E+00	1.49E-03	2.74E-03		
Sr-90	7.6329E-01	33 98	62.29	0.00E+00	2.59E+01	4.75E+01		
Tc-99	3.9412E-04	33 98	62.29	0.00E+00	1.34E-02	2.45E-02		
Th-229	1.6457E-12	33 98	62.29	0.00E+00	5.59E-11	1.03E-10		
Th-230	1.8822E-10	33 98	62.29	0.00E+00	6.40E-09	1.17E-08		
Th-232	9.7601E-17	33 98	62.29	0.00E+00	3.32E-15	6.08E-15		
Tl-208	5.2722E-07	33 98	62.29	0.00E+00	1.79E-05	3.28E-05		
U-232	1.4925E-06	33 98	62.29	0.00E+00	5.07E-05	9.30E-05	Thermal Power	
U-233	2.1113E-10	33 98	62.29	0.00E+00	7.17E-09	1.32E-08	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.9528E-06	33 98	62.29	0.00E+00	6.64E-05	1.22E-04	9.19E-01	1.56E+00
U-235	-9.7920E-09	33 98	0.00	9.20E-07	5.87E-07	9.20E-07	Total	Total
U-236	1.1570E-07	33 98	62.29	0.00E+00	3.93E-06	7.21E-06		
U-238	-1.7914E-07	33 98	0.00	6.70E-05	6.09E-05	6.70E-05		
Y-90	7.6329E-01	33 98	62.29	0.00E+00	2.59E+01	4.75E+01		
Other Radionuclides					7.36E+01	1.35E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
Reactor Moderator	From SFD FAST	Used FAST	This Template was used for the following reasons
Fuel Cladding	SST	SST	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	Pu and U	Pu and U	
BOL Enrichment %		10 to 30	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate <sup>3</sup>
	From SFD	Estimated	
Nominal		33 98	Nominal burnup taken from SFD and converted to MWd using BOL=0.283kg
Bounding		62.29	Bounding burnup taken from SFD and converted to MWd using BOL=0.283kg

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.79		1.00
Bounding	1.45		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: FSVR  
SNF ID #: 86  
Fuel Units & Descr: 1464 - CARBON COATED PART  
Heavy Metal Mass: BOL=15366 583kg EOL=14725 937kg  
ROD Storage Site: FSV

<sup>1</sup>Fuel decay start date: 1989  
Estimates as of: 2010  
Template: FSV (Graphite, Graphite 60 to 100%, Th & U)  
<sup>2</sup>Template Burnup(MWd): 1270 275  
Template BOL Heavy Metal Mass (MT): 0 012702752  
Template Decay Time: 20 years

Estimated  
Canister usage  
18"x15"  
292 80

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 8411E-06	605,875 77	722,229 41	0 00E+00	1 72E+00	2 05E+00	Avg MeV	
Am-241	2 5254E-03	605,875 77	722,229 41	0 00E+00	1 53E+03	1 82E+03	0 0150	7.252E+16
Am-242m	2 5664E-06	605,875 77	722,229 41	0 00E+00	1 55E+00	1 85E+00	0 0250	1.491E+16
Am-243	4 6132E-05	605,875 77	722,229 41	0 00E+00	2 80E+01	3 33E+01	0 0375	1.316E+16
C-14	2 3168E-05	605,875 77	722,229 41	0 00E+00	1 40E+01	1 67E+01	0.0575	1.398E+16
Cl-36	1 0667E-06	605,875 77	722,229 41	0 00E+00	6 46E-01	7 70E-01	0 0850	8.474E+15
Cm-243	3 6520E-05	605,875 77	722,229 41	0 00E+00	2 21E+01	2 64E+01	0 1250	6.033E+15
Cm-244	1 1446E-02	605,875 77	722,229 41	0 00E+00	6 94E+03	8 27E+03	0.2250	7.354E+15
Co-60	3 2379E-03	605,875 77	722,229 41	0 00E+00	1 96E+03	2 34E+03	0.3750	3.172E+15
Cs-134	5 8964E-03	605,875 77	722,229 41	0 00E+00	3 57E+03	4 26E+03	0 5750	5.090E+16
Cs-135	2 4711E-05	605,875 77	722,229 41	0 00E+00	1 50E+01	1 78E+01	0 8500	1.328E+15
Cs-137	1 8775E+00	605,875 77	722,229 41	0 00E+00	1 14E+06	1 36E+06	1.2500	1.094E+15
Eu-154	5 2619E-02	605,875 77	722,229 41	0 00E+00	3 19E+04	3 80E+04	1.7500	3.707E+13
Eu-155	8 4785E-03	605,875 77	722,229 41	0 00E+00	5 14E+03	6 12E+03	2.2500	2.677E+09
Fe-55	2 4381E-06	605,875 77	722,229 41	0 00E+00	1 48E+00	1 76E+00	2.7500	1.745E+13
H-3	9 0768E-03	605,875 77	722,229 41	0 00E+00	5 50E+03	6 56E+03	3 5000	1.242E+08
I-129	1 0092E-06	605,875 77	722,229 41	0 00E+00	6 11E-01	7.29E-01	5 0000	5.268E+07
Kr-85	1 0423E-01	605,875 77	722,229 41	0 00E+00	6 32E+04	7 53E+04	7 0000	6.062E+06
Np-237	1 2517E-05	605,875 77	722,229 41	0 00E+00	7 58E+00	9 04E+00	11 0000	6.955E+05
Pa-231	4 7391E-06	605,875 77	722,229 41	0 00E+00	2 87E+00	3 42E+00		
Pb-210	7 3244E-10	605,875 77	722,229 41	0 00E+00	4 44E-04	5.29E-04		
Pm-147	7 9747E-03	605,875 77	722,229 41	0 00E+00	4 83E+03	5 76E+03		
Pu-238	1 8295E-01	605,875 77	722,229 41	0 00E+00	1 11E+05	1 32E+05		
Pu-239	1 3580E-04	605,875 77	722,229 41	0 00E+00	8 23E+01	9 81E+01		
Pu-240	2 5601E-04	605,875 77	722,229 41	0 00E+00	1 55E+02	1 85E+02		
Pu-241	3 9810E-02	605,875 77	722,229 41	0 00E+00	2 41E+04	2 88E+04		
Pu-242	3 8866E-06	605,875 77	722,229 41	0 00E+00	2 35E+00	2 81E+00		
Ra-226	1 1163E-09	605,875 77	722,229 41	0 00E+00	6 76E-04	8 06E-04		
Ra-228	8 9587E-07	605,875 77	722,229 41	0 00E+00	5 43E-01	6 47E-01		
Ru-106	1 0628E-06	605,875 77	722,229 41	0 00E+00	6 44E-01	7 68E-01		
Se-79	2 1082E-05	605,875 77	722,229 41	0 00E+00	1 28E+01	1 52E+01		
Sn-126	2 2200E-05	605,875 77	722,229 41	0 00E+00	1 35E+01	1 60E+01		
Sr-90	1 8098E+00	605,875 77	722,229 41	0 00E+00	1 10E+06	1 31E+06		
Tc-99	3 3331E-04	605,875 77	722,229 41	0 00E+00	2 02E+02	2 41E+02		
Th-229	5 7665E-06	605,875 77	722,229 41	0 00E+00	3 49E+00	4 16E+00		
Th-230	1 2493E-07	605,875 77	722,229 41	0 00E+00	7 57E-02	9 02E-02		
Th-232	-6.9673E-08	605,875 77	0 00	1.52E+00	1 48E+00	1 52E+00		
Tl-208	6 8796E-04	605,875 77	722,229 41	0 00E+00	4 17E+02	4 97E+02		
U-232	1 8618E-03	605,875 77	722,229 41	0 00E+00	1 13E+03	1 34E+03		
U-233	2 0602E-03	605,875 77	722,229 41	0 00E+00	1 25E+03	1 49E+03		
U-234	2 7805E-04	605,875 77	722,229 41	0 00E+00	1 68E+02	2.01E+02		
U-235	-1.7343E-06	605,875 77	0 00	3 04E+00	1 99E+00	3 04E+00		
U-236	8 6281E-06	605,875 77	722,229 41	0 00E+00	5 23E+00	6.23E+00		
U-238	-5 6065E-09	605,875 77	0 00	3 02E-02	2 68E-02	3 02E-02		
Y-90	1 8098E+00	605,875 77	722,229 41	0 00E+00	1 10E+06	1.31E+06		
Other Radionuclides					1 09E+06	1.30E+06		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 76E+04	2.10E+04
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	GRAPHITE	GRAPHITE	
BOL Enrichment %	Th and U	Th and U	
	93 15	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	605 875 77		
Bounding	722,229 41	1,211,751 53	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.39		
Bounding	0.47	1.68	1.00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name FSVR  
SNF ID # 85  
Fuel Units & Descr. 744 - CARBON COATED PART  
Heavy Metal Mass: BOL=8780 018kg EOL=8626 159kg  
ROD Storage Site INEEL

Fuel decay start date 1980  
Estimates as of 2010  
Template FSV (Graphite Graphite 60 to 100% Th & U)  
Template Burnup(MWd) 1270.275  
Template BOL Heavy Metal Mass (MT) 0.012702752  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
148 80

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.3583E-06	145,508.60	412,660.86	0.00E+00	4.89E-01	1.39E+00	Avg MeV	
Am-241	2.8805E-03	145,508.60	412,660.86	0.00E+00	4.19E+02	1.19E+03	0.0150	3.674E+16
Am-242m	2.5089E-06	145,508.60	412,660.86	0.00E+00	3.65E-01	1.04E+00	0.0250	7.543E+15
Am-243	4.6116E-05	145,508.60	412,660.86	0.00E+00	6.71E+00	1.90E+01	0.0375	6.621E+15
C-14	2.3152E-05	145,508.60	412,660.86	0.00E+00	3.37E+00	9.55E+00	0.0575	7.074E+15
Cl-36	1.0667E-06	145,508.60	412,660.86	0.00E+00	1.55E-01	4.40E-01	0.0850	4.278E+15
Cm-243	3.2339E-05	145,508.60	412,660.86	0.00E+00	4.71E+00	1.33E+01	0.1250	2.978E+15
Cm-244	9.4546E-03	145,508.60	412,660.86	0.00E+00	1.38E+03	3.90E+03	0.2250	3.714E+15
Co-60	1.6776E-03	145,508.60	412,660.86	0.00E+00	2.44E+02	6.92E+02	0.3750	1.603E+15
Cs-134	1.0974E-03	145,508.60	412,660.86	0.00E+00	1.60E+02	4.53E+02	0.5750	2.581E+16
Cs-135	2.4711E-05	145,508.60	412,660.86	0.00E+00	3.60E+00	1.02E+01	0.8500	5.340E+14
Cs-137	1.6729E+00	145,508.60	412,660.86	0.00E+00	2.43E+05	6.90E+05	1.2500	4.217E+14
Eu-154	3.5166E-02	145,508.60	412,660.86	0.00E+00	5.12E+03	1.45E+04	1.7500	1.608E+13
Eu-155	4.2148E-03	145,508.60	412,660.86	0.00E+00	6.13E+02	1.74E+03	2.2500	1.117E+09
Fe-55	6.4301E-07	145,508.60	412,660.86	0.00E+00	9.36E-02	2.65E-01	2.7500	9.503E+12
H-3	6.8528E-03	145,508.60	412,660.86	0.00E+00	9.97E+02	2.83E+03	3.5000	5.886E+07
I-129	1.0092E-06	145,508.60	412,660.86	0.00E+00	1.47E-01	4.16E-01	5.0000	2.511E+07
Kr-85	7.5440E-02	145,508.60	412,660.86	0.00E+00	1.10E+04	3.11E+04	7.0000	2.889E+06
Np-237	1.2525E-05	145,508.60	412,660.86	0.00E+00	1.82E+00	5.17E+00	11.0000	3.314E+05
Pa-231	4.7383E-06	145,508.60	412,660.86	0.00E+00	6.89E-01	1.96E+00		
Pb-210	9.1476E-10	145,508.60	412,660.86	0.00E+00	1.33E-04	3.77E-04		
Pm-147	2.1271E-03	145,508.60	412,660.86	0.00E+00	3.10E+02	8.78E+02		
Pu-238	1.7587E-01	145,508.60	412,660.86	0.00E+00	2.56E+04	7.26E+04		
Pu-239	1.3580E-04	145,508.60	412,660.86	0.00E+00	1.98E+01	5.60E+01		
Pu-240	2.6404E-04	145,508.60	412,660.86	0.00E+00	3.84E+01	1.09E+02		
Pu-241	3.1300E-02	145,508.60	412,660.86	0.00E+00	4.55E+03	1.29E+04		
Pu-242	3.8866E-06	145,508.60	412,660.86	0.00E+00	5.66E-01	1.60E+00		
Ra-226	1.7059E-09	145,508.60	412,660.86	0.00E+00	2.48E-04	7.04E-04		
Ra-228	9.1083E-07	145,508.60	412,660.86	0.00E+00	1.33E-01	3.76E-01		
Ru-106	3.4126E-08	145,508.60	412,660.86	0.00E+00	4.97E-03	1.41E-02		
Se-79	2.1082E-05	145,508.60	412,660.86	0.00E+00	3.07E+00	8.70E+00		
Sn-126	2.2200E-05	145,508.60	412,660.86	0.00E+00	3.23E+00	9.16E+00		
Sr-90	1.6067E+00	145,508.60	412,660.86	0.00E+00	2.34E+05	6.63E+05		
Tc-99	3.3331E-04	145,508.60	412,660.86	0.00E+00	4.85E+01	1.38E+02		
Th-229	7.7062E-06	145,508.60	412,660.86	0.00E+00	1.12E+00	3.18E+00		
Th-230	1.5020E-07	145,508.60	412,660.86	0.00E+00	2.19E-02	6.20E-02		
Th-232	-6.9673E-08	145,508.60	0.00	8.68E-01	8.58E-01	8.68E-01		
Th-208	6.5584E-04	145,508.60	412,660.86	0.00E+00	9.54E+01	2.71E+02		
U-232	1.7744E-03	145,508.60	412,660.86	0.00E+00	2.58E+02	7.32E+02	Thermal Power	
U-233	2.0602E-03	145,508.60	412,660.86	0.00E+00	3.00E+02	8.50E+02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	2.8285E-04	145,508.60	412,660.86	0.00E+00	4.12E+01	1.17E+02	3.80E+03	1.08E+04
U-235	-1.7343E-06	145,508.60	0.00	1.74E+00	1.48E+00	1.74E+00	Total	Total
U-236	8.6281E-06	145,508.60	412,660.86	0.00E+00	1.26E+00	3.56E+00		
U-238	-5.6065E-09	145,508.60	0.00	1.73E-02	1.65E-02	1.73E-02		
Y-90	1.6067E+00	145,508.60	412,660.86	0.00E+00	2.34E+05	6.63E+05		
Other Radionuclides					2.33E+05	6.61E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	GRAPHITE	GRAPHITE	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	93.13638737	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal		145,508.60	
Bounding	412,660.86	291,017.20	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.17		
Bounding	0.47	0.71	1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name GA HTGR FUEL  
SNF ID # 89  
Fuel Units & Descr 2 - CANISTER OF SCRAP  
Heavy Metal Mass BOL=2 162kg, EOL=2 081kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1996  
Estimates as of 2010  
Template<sup>2</sup> FSV (Graphite, Graphite, 60 to 100%, Th & U)  
<sup>2</sup>Template Burnup(MWd). 1270.275  
Template BOL Heavy Metal Mass (MT) 0 012702752  
Template Decay Time 10 years

Estimated  
Canister usage  
HIC  
1.00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 1295E-06	76 23	152 45	0 00E+00	1 62E-04	3 25E-04	Avg MeV	
Am-241	1 9169E-03	76 23	152 45	0 00E+00	1 46E-01	2 92E-01	0 0150	1 962E+13
Am-242m	2 6860E-06	76 23	152 45	0 00E+00	2 05E-04	4 09E-04	0 0250	4 081E+12
Am-243	4 6179E-05	76 23	152 45	0 00E+00	3 52E-03	7 04E-03	0 0375	3 657E+12
C-14	2 3192E-05	76 23	152 45	0 00E+00	1 77E-03	3 54E-03	0 0575	3 794E+12
Cl-36	1 0667E-06	76 23	152 45	0 00E+00	8 13E-05	1 63E-04	0 0850	2 327E+12
Cm-243	4 6573E-05	76 23	152 45	0 00E+00	3 55E-03	7 10E-03	0 1250	1 765E+12
Cm-244	1 6784E-02	76 23	152 45	0 00E+00	1 28E+00	2 56E+00	0 2250	2 004E+12
Co-60	1 2606E-02	76 23	152 45	0 00E+00	9 19E-01	1 84E+00	0 3750	8 817E+11
Cs-134	1 7004E-01	76 23	152 45	0 00E+00	1 30E+01	2 59E+01	0 5750	1 477E+13
Cs-135	2 4711E-05	76 23	152 45	0 00E+00	1 88E-03	3 77E-03	0 8500	1 301E+12
Cs-137	2 3656E+00	76 23	152 45	0 00E+00	1 80E+02	3 61E+02	1 2500	5 885E+11
Eu-154	1 1785E-01	76 23	152 45	0 00E+00	8 98E+00	1 80E+01	1 7500	1 445E+10
Eu-155	3 4292E-02	76 23	152 45	0 00E+00	2 61E+00	5 23E+00	2 2500	7 140E+07
Fe-55	3 5071E-05	76 23	152 45	0 00E+00	2 67E-03	5 35E-03	2 7500	4 001E+09
H-3	1 5902E-02	76 23	152 45	0 00E+00	1 21E+00	2 42E+00	3 5000	2 009E+05
I-129	1 0092E-06	76 23	152 45	0 00E+00	7 69E-05	1 54E-04	5 0000	1 605E+04
Kr-85	1 9901E-01	76 23	152 45	0 00E+00	1 52E+01	3 03E+01	7 0000	1 848E+03
Np-237	1 2509E-05	76 23	152 45	0 00E+00	9 54E-04	1 91E-03	11 0000	2 121E+02
Pa-231	4 7399E-06	76 23	152 45	0 00E+00	3 61E-04	7 23E-04		
Pb-210	7 0481E-10	76 23	152 45	0 00E+00	5 37E-08	1 07E-07		
Pm-147	1 1194E-01	76 23	152 45	0 00E+00	8 53E+00	1 71E+01		
Pu-238	1 9799E-01	76 23	152 45	0 00E+00	1 51E+01	3 02E+01		
Pu-239	1 3580E-04	76 23	152 45	0 00E+00	1 04E-02	2 07E-02		
Pu-240	2 4404E-04	76 23	152 45	0 00E+00	1 86E-02	3 72E-02		
Pu-241	6 4427E-02	76 23	152 45	0 00E+00	4 91E+00	9 82E+00		
Pu-242	3 8866E-06	76 23	152 45	0 00E+00	2 96E-04	5 93E-04		
Ra-226	6 3223E-10	76 23	152 45	0 00E+00	4 82E-08	9 64E-08		
Ra-228	8 5178E-07	76 23	152 45	0 00E+00	6 49E-05	1 30E-04		
Ru-106	1 0305E-03	76 23	152 45	0 00E+00	7 85E-02	1 57E-01		
Se-79	2 1082E-05	76 23	152 45	0 00E+00	1 61E-03	3 21E-03		
Sn-126	2 2200E-05	76 23	152 45	0 00E+00	1 69E-03	3 38E-03		
Sr-90	2 2964E+00	76 23	152 45	0 00E+00	1 75E+02	3 50E+02		
Tc-99	3 3331E-04	76 23	152 45	0 00E+00	2 54E-02	5 08E-02		
Th-229	3 8252E-06	76 23	152 45	0 00E+00	2 92E-04	5 83E-04		
Th-230	1 0014E-07	76 23	152 45	0 00E+00	7 63E-06	1 53E-05		
Th-232	-6 9673E-08	76 23	0 00	2 14E-04	2 09E-04	2 14E-04		
Th-208	7 4724E-04	76 23	152 45	0 00E+00	5 70E-02	1 14E-01		
U-232	2 0499E-03	76 23	152 45	0 00E+00	1 56E-01	3 13E-01	Thermal Power	
U-233	2 0610E-03	76 23	152 45	0 00E+00	1 57E-01	3 14E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	2 7293E-04	76 23	152 45	0 00E+00	2 08E-02	4 16E-02	2 90E+00	5 79E+00
U-235	-1 7343E-06	76 23	0 00	4 28E-04	2 95E-04	4 28E-04	Total	Total
U-236	8 6281E-06	76 23	152 45	0 00E+00	6 58E-04	1 32E-03		
U-238	-5 6065E-09	76 23	0 00	4 25E-06	3 83E-06	4 25E-06		
Y-90	2 2964E+00	76 23	152 45	0 00E+00	1 75E+02	3 50E+02		
Other Radionuclides					1 74E+02	3 48E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	GRAPHITE	GRAPHITE	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	92 189	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		76 23	
Bounding		152 45	

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 35		
Bounding	0 71		

1.00

<sup>1</sup>Reactor shutdown, core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name GA RERTR  
SNF ID # 90  
Fuel Units & Descr 1 - CANISTER OF SCRAP  
Heavy Metal Mass BOL=3 851kg EOL=3 071kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 2035  
Estimates as of 2010  
Template TRIKA-SS (LW/U Zr SST 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd) 6 65  
Template BOL Heavy Metal Mass (MT) 0 000195  
Template Decay Time 5 years

Estimated  
Canister usage  
HIC  
0 50

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	744 21	1,488 42	0 00E+00	6 34E-07	1,27E-06	Avg MeV	
Am-241	1 8331E-03	744 21	1,488 42	0 00E+00	1,36E+00	2,73E+00	0 0150	2 406E+14
Am-242m	1 4129E-06	744 21	1,488 42	0 00E+00	1 05E-03	2 10E-03	0 0250	5,293E+13
Am-243	1 4774E-07	744 21	1,488 42	0 00E+00	1 10E-04	2 20E-04	0 0375	4 508E+13
C-14	1 2871E-04	744 21	1,488 42	0 00E+00	9 58E-02	1 92E-01	0 0575	4 627E+13
Cl-36	2 8120E-06	744 21	1,488 42	0 00E+00	2 09E-03	4 19E-03	0 0850	2 867E+13
Cm-243	1 7940E-07	744 21	1,488 42	0 00E+00	1 34E-04	2 67E-04	0 1250	2 082E+13
Cm-244	1 6962E-06	744 21	1,488 42	0 00E+00	1 26E-03	2 52E-03	0 2250	2 432E+13
Co-60	1 2839E+00	744 21	1,488 42	0 00E+00	9 56E+02	1 91E+03	0 3750	1,234E+13
Cs-134	9 0541E-02	744 21	1,488 42	0 00E+00	6 74E+01	1 35E+02	0 5750	1 641E+14
Cs-135	3 2195E-05	744 21	1,488 42	0 00E+00	2 40E-02	4 79E-02	0 8500	7 041E+12
Cs-137	2 7564E+00	744 21	1,488 42	0 00E+00	2 05E+03	4 10E+03	1,2500	1 430E+14
Eu-154	1 5368E-02	744 21	1,488 42	0 00E+00	1 14E+01	2 29E+01	1 7500	9 531E+10
Eu-155	2 9293E-02	744 21	1,488 42	0 00E+00	2 18E+01	4 36E+01	2,2500	1 536E+11
Fe-55	7 7158E-01	744 21	1,488 42	0 00E+00	5 74E+02	1 15E+03	2 7500	1 219E+09
H-3	1,1111E-02	744 21	1,488 42	0 00E+00	8 27E+00	1 65E+01	3,5000	1 419E+08
I-129	7,3684E-07	744 21	1,488 42	0 00E+00	5 48E-04	1 10E-03	5,0000	7 824E+02
Kr-85	2,5263E-01	744 21	1,488 42	0 00E+00	1 88E+02	3 76E+02	7 0000	8 856E+01
Np-237	1,2427E-06	744 21	1,488 42	0 00E+00	9 25E-04	1 85E-03	11 0000	1 009E+01
Pa-231	3 8511E-09	744 21	1,488 42	0 00E+00	2 87E-06	5 73E-06		
Pb-210	7 3880E-15	744 21	1,488 42	0 00E+00	5 50E-12	1,10E-11		
Pm-147	2 1023E+00	744 21	1,488 42	0 00E+00	1 56E+03	3 13E+03		
Pu-238	1 0383E-03	744 21	1,488 42	0 00E+00	7 73E-01	1 55E+00		
Pu-239	5 5293E-03	744 21	1,488 42	0 00E+00	4 11E+00	8 23E+00		
Pu-240	2 1278E-03	744 21	1,488 42	0 00E+00	1 58E+00	3 17E+00		
Pu-241	1 0195E-01	744 21	1,488 42	0 00E+00	7 59E+01	1 52E+02		
Pu-242	2 3128E-07	744 21	1,488 42	0 00E+00	1,72E-04	3 44E-04		
Ra-226	5 2782E-14	744 21	1,488 42	0 00E+00	3 93E-11	7,86E-11		
Ra-228	1 9338E-10	744 21	1,488 42	0 00E+00	1 44E-07	2 88E-07		
Ru-106	9 1684E-02	744 21	1,488 42	0 00E+00	6 82E+01	1,36E+02		
Se-79	1 3018E-05	744 21	1,488 42	0 00E+00	9 69E-03	1 94E-02		
Sn-126	1 2167E-05	744 21	1,488 42	0 00E+00	9 05E-03	1 81E-02		
Sr-90	2 6045E+00	744 21	1,488 42	0 00E+00	1,94E+03	3 88E+03		
Tc-99	4 4241E-04	744 21	1,488 42	0 00E+00	3,29E-01	6 58E-01		
Th-229	1 3713E-10	744 21	1,488 42	0 00E+00	1 02E-07	2 04E-07		
Th-230	1 8090E-11	744 21	1,488 42	0 00E+00	1 35E-08	2 69E-08		
Th-232	2 5278E-10	744 21	1,488 42	0 00E+00	1 88E-07	3 76E-07		
Ti-208	1 6947E-08	744 21	1,488 42	0 00E+00	1 26E-05	2 52E-05		
U-232	4 8737E-08	744 21	1,488 42	0 00E+00	3 63E-05	7,25E-05		
U-233	1,2203E-07	744 21	1,488 42	0 00E+00	9 08E-05	1 82E-04		
U-234	1,5925E-07	744 21	1 488 42	0 00E+00	1 19E-04	2 37E-04		
U-235	-2 6194E-06	744 21	0 00	1 65E-03	0 00E+00	1 65E-03		
U-236	1,2693E-05	744 21	1,488 42	0 00E+00	9 45E-03	1 89E-02		
U-238	-3 6331E-08	744 21	0 00	1 04E-03	1 01E-03	1 04E-03		
Y-90	2,6060E+00	744 21	1,488 42	0 00E+00	1 94E+03	3 88E+03		
Other Radionuclides					2 68E+03	5 37E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	This Template was used for the following reasons
Fuel Cladding	INCOLOY	SST	This fuel matches on all parameters except cladding (SST is conservative)
BOL HM Constituents	U	U	
BOL Enrichment %	19 787	10 to 20 1	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		744 21	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		1 488 42	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	5 67		1 05
Bounding	11 33		

<sup>1</sup>Reactor shutdown core removal storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name GCRE CAN (1B-BT 1&2)

SNF ID # 94

Fuel Units & Descr: 1 - CANISTER OF SCRAP

Heavy Metal Mass BOL=0.908kg EOL=0.908kg

ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1961

Estimates as of: 2010

Template: Pathfinder (Light Water, SST 60 to 100% U)

<sup>2</sup>Template Burnup(MWd): 6.01

Template BOL Heavy Metal Mass (MT) 0.00012882

Template Decay Time: 35 years

Estimated  
Canister usage:  
18"x10"  
0.08

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	17.15	34.31	0.00E+00	4.00E-07	8.01E-07	Avg MeV	
Am-241	1.1135E-04	17.15	34.31	0.00E+00	1.91E-03	3.82E-03	0.0150	2.561E+12
Am-242m	8.5075E-09	17.15	34.31	0.00E+00	1.46E-07	2.92E-07	0.0250	5.322E+11
Am-243	9.8519E-10	17.15	34.31	0.00E+00	1.69E-08	3.38E-08	0.0375	4.603E+11
C-14	2.3012E-04	17.15	34.31	0.00E+00	3.95E-03	7.90E-03	0.0575	4.961E+11
Cl-36	1.2261E-06	17.15	34.31	0.00E+00	2.10E-05	4.21E-05	0.0850	2.998E+11
Cm-243	2.4875E-10	17.15	34.31	0.00E+00	4.27E-09	8.53E-09	0.1250	1.948E+11
Cm-244	2.3178E-09	17.15	34.31	0.00E+00	3.98E-08	7.95E-08	0.2250	2.581E+11
Co-60	7.0849E-02	17.15	34.31	0.00E+00	1.22E+00	2.43E+00	0.3750	1.126E+11
Cs-134	3.0266E-06	17.15	34.31	0.00E+00	5.19E-05	1.04E-04	0.5750	1.854E+12
Cs-135	3.0316E-05	17.15	34.31	0.00E+00	5.20E-04	1.04E-03	0.8500	1.877E+10
Cs-137	1.4511E+00	17.15	34.31	0.00E+00	2.49E+01	4.98E+01	1.2500	1.865E+11
Eu-154	6.6955E-04	17.15	34.31	0.00E+00	1.15E-02	2.30E-02	1.7500	4.841E+08
Eu-155	6.9850E-04	17.15	34.31	0.00E+00	1.20E-02	2.40E-02	2.2500	1.005E+06
Fe-55	1.2318E-03	17.15	34.31	0.00E+00	2.11E-02	4.23E-02	2.7500	2.905E+04
H-3	2.5141E-03	17.15	34.31	0.00E+00	4.31E-02	8.63E-02	3.5000	2.206E+00
I-129	7.3195E-07	17.15	34.31	0.00E+00	1.26E-05	2.51E-05	5.0000	9.088E-01
Kr-85	4.1281E-02	17.15	34.31	0.00E+00	7.08E-01	1.42E+00	7.0000	1.005E-01
Np-237	1.1489E-06	17.15	34.31	0.00E+00	1.97E-05	3.94E-05	11.0000	1.129E-02
Pa-231	4.5241E-08	17.15	34.31	0.00E+00	7.76E-07	1.55E-06		
Pb-210	6.4476E-13	17.15	34.31	0.00E+00	1.11E-11	2.21E-11		
Pm-147	1.1651E-03	17.15	34.31	0.00E+00	2.00E-02	4.00E-02		
Pu-238	2.9517E-04	17.15	34.31	0.00E+00	5.06E-03	1.01E-02		
Pu-239	6.6772E-04	17.15	34.31	0.00E+00	1.15E-02	2.29E-02		
Pu-240	8.6839E-05	17.15	34.31	0.00E+00	1.49E-03	2.98E-03		
Pu-241	7.1514E-04	17.15	34.31	0.00E+00	1.23E-02	2.45E-02		
Pu-242	1.9717E-09	17.15	34.31	0.00E+00	3.38E-08	6.76E-08		
Ra-226	1.7654E-12	17.15	34.31	0.00E+00	3.03E-11	6.06E-11		
Ra-228	8.2928E-12	17.15	34.31	0.00E+00	1.42E-10	2.85E-10		
Ru-106	1.8419E-10	17.15	34.31	0.00E+00	3.16E-09	6.32E-09		
Se-79	1.3223E-05	17.15	34.31	0.00E+00	2.27E-04	4.54E-04		
Sn-126	1.1493E-05	17.15	34.31	0.00E+00	1.97E-04	3.94E-04		
Sr-90	1.3649E+00	17.15	34.31	0.00E+00	2.34E+01	4.68E+01		
Tc-99	4.6656E-04	17.15	34.31	0.00E+00	8.00E-03	1.60E-02		
Th-229	1.4547E-11	17.15	34.31	0.00E+00	2.50E-10	4.99E-10		
Th-230	1.6617E-10	17.15	34.31	0.00E+00	2.85E-09	5.70E-09		
Th-232	8.3361E-12	17.15	34.31	0.00E+00	1.43E-10	2.86E-10		
Ti-208	2.1664E-08	17.15	34.31	0.00E+00	3.72E-07	7.43E-07		
U-232	5.8669E-08	17.15	34.31	0.00E+00	1.01E-06	2.01E-06		
U-233	3.1847E-09	17.15	34.31	0.00E+00	5.46E-08	1.09E-07		
U-234	3.8769E-07	17.15	34.31	0.00E+00	6.65E-06	1.33E-05		
U-235	-2.7761E-06	17.15	0.00	1.83E-03	1.78E-03	1.83E-03		
U-236	1.6190E-05	17.15	34.31	0.00E+00	2.78E-04	5.55E-04		
U-238	-2.8547E-09	17.15	0.00	2.05E-05	2.05E-05	2.05E-05		
Y-90	1.3652E+00	17.15	34.31	0.00E+00	2.34E+01	4.68E+01		
Other Radionuclides					2.83E+01	5.66E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	NONE	SST	This fuel matches on all parameters except cladding (SST is conservative)
BOL HM Constituents	U	U	
BOL Enrichment %	93.282	60 to 100	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate.
Nominal		17.15	Nominal burnup assumed to be 2% of BOL heavy metal mass.
Bounding		34.31	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.40		0.98
Bounding	0.81		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: GCRC PELLETS (1B 7T-1)  
SNF ID #: 95  
Fuel Units & Descr: 1 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL=0.074kg EOL=0.074kg  
ROD Storage Site: INEEL  
<sup>1</sup>Fuel decay start date: 1961  
Estimates as of: 2010  
Template: Pathfinder (Light Water SST 60 to 100% U)  
<sup>2</sup>Template Burnup(MWd): 601  
Template BOL Heavy Metal Mass (MT): 0.00012882  
Template Decay Time: 35 years

Estimated  
Canister usage  
18"x10"  
0.08

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	1.40	2.79	0.00E+00	3.26E-08	6.52E-08	Avg MeV	
Am-241	1.1135E-04	1.40	2.79	0.00E+00	1.55E-04	3.11E-04	0.0150	2.084E+11
Am-242m	8.5075E-09	1.40	2.79	0.00E+00	1.19E-08	2.38E-08	0.0250	4.331E+10
Am-243	9.8519E-10	1.40	2.79	0.00E+00	1.38E-09	2.75E-09	0.0375	3.746E+10
C-14	2.3012E-04	1.40	2.79	0.00E+00	3.21E-04	6.43E-04	0.0575	4.038E+10
Ct-36	1.2261E-06	1.40	2.79	0.00E+00	1.71E-06	3.42E-06	0.0850	2.440E+10
Cm-243	2.4875E-10	1.40	2.79	0.00E+00	3.47E-10	6.95E-10	0.1250	1.584E+10
Cm-244	2.3178E-09	1.40	2.79	0.00E+00	3.24E-09	6.47E-09	0.2250	2.100E+10
Co-60	7.0849E-02	1.40	2.79	0.00E+00	9.89E-02	1.98E-01	0.3750	9.160E+09
Cs-134	3.0266E-06	1.40	2.79	0.00E+00	4.23E-06	8.45E-06	0.5750	1.509E+11
Cs-135	3.0316E-05	1.40	2.79	0.00E+00	4.23E-05	8.47E-05	0.8500	1.527E+09
Cs-137	1.4511E+00	1.40	2.79	0.00E+00	2.03E+00	4.05E+00	1.2500	1.518E+10
Eu-154	6.6955E-04	1.40	2.79	0.00E+00	9.35E-04	1.87E-03	1.7500	3.940E+07
Eu-155	6.9850E-04	1.40	2.79	0.00E+00	9.75E-04	1.95E-03	2.2500	8.180E+04
Fe-55	1.2318E-03	1.40	2.79	0.00E+00	1.72E-03	3.44E-03	2.7500	2.364E+03
H-3	2.5141E-03	1.40	2.79	0.00E+00	3.51E-03	7.02E-03	3.5000	1.798E-01
I-129	7.3195E-07	1.40	2.79	0.00E+00	1.02E-06	2.04E-06	5.0000	7.406E-02
Kr-85	4.1281E-02	1.40	2.79	0.00E+00	5.76E-02	1.15E-01	7.0000	8.190E-03
Np-237	1.1489E-06	1.40	2.79	0.00E+00	1.60E-06	3.21E-06	11.0000	9.199E-04
Pa-231	4.5241E-08	1.40	2.79	0.00E+00	6.32E-08	1.26E-07		
Pb-210	6.4476E-13	1.40	2.79	0.00E+00	9.00E-13	1.80E-12		
Pm-147	1.1651E-03	1.40	2.79	0.00E+00	1.63E-03	3.25E-03		
Pu-238	2.9517E-04	1.40	2.79	0.00E+00	4.12E-04	8.24E-04		
Pu-239	6.6772E-04	1.40	2.79	0.00E+00	9.32E-04	1.86E-03		
Pu-240	8.6839E-05	1.40	2.79	0.00E+00	1.21E-04	2.42E-04		
Pu-241	7.1514E-04	1.40	2.79	0.00E+00	9.98E-04	2.00E-03		
Pu-242	1.9717E-09	1.40	2.79	0.00E+00	2.75E-09	5.51E-09		
Ra-226	1.7654E-12	1.40	2.79	0.00E+00	2.46E-12	4.93E-12		
Ra-228	8.2928E-12	1.40	2.79	0.00E+00	1.16E-11	2.32E-11		
Ru-106	1.8419E-10	1.40	2.79	0.00E+00	2.57E-10	5.14E-10		
Se-79	1.3223E-05	1.40	2.79	0.00E+00	1.85E-05	3.69E-05		
Sn-126	1.1493E-05	1.40	2.79	0.00E+00	1.60E-05	3.21E-05		
Sr-90	1.3649E+00	1.40	2.79	0.00E+00	1.91E+00	3.81E+00		
Tc-99	4.6656E-04	1.40	2.79	0.00E+00	6.51E-04	1.30E-03		
Th-229	1.4547E-11	1.40	2.79	0.00E+00	2.03E-11	4.06E-11		
Th-230	1.6617E-10	1.40	2.79	0.00E+00	2.32E-10	4.64E-10		
Th-232	8.3361E-12	1.40	2.79	0.00E+00	1.16E-11	2.33E-11		
Ti-208	2.1664E-08	1.40	2.79	0.00E+00	3.02E-08	6.05E-08		
U-232	5.8669E-08	1.40	2.79	0.00E+00	8.19E-08	1.64E-07		
U-233	3.1847E-09	1.40	2.79	0.00E+00	4.45E-09	8.89E-09		
U-234	3.8769E-07	1.40	2.79	0.00E+00	5.41E-07	1.08E-06		
U-235	-2.7761E-06	1.40	0.00	1.49E-04	1.45E-04	1.49E-04		
U-236	1.6190E-05	1.40	2.79	0.00E+00	2.26E-05	4.52E-05		
U-238	-2.8547E-09	1.40	0.00	1.71E-06	1.71E-06	1.71E-06		
Y-90	1.3652E+00	1.40	2.79	0.00E+00	1.91E+00	3.81E+00		
Other Radionuclides					2.30E+00	4.61E+00		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	NONE	SST	This fuel matches on all parameters except cladding (SST is conservative)
BOL HM Constituents	U	U	
BOL Enrichment %	93.1	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal	From SFD	Estimated	
Bounding			

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Bounding			

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: GETR FILTERS  
SNF ID #: 98  
Fuel Units & Descr: 70 - FILTERS  
Heavy Metal Mass BOL=4 543kg EOL=4 417kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1977  
Estimates as of 2010  
Template Pathfinder (Light Water, SST 60 to 100% U)  
<sup>2</sup>Template Burnup(MWd) 6 01  
Template BOL Heavy Metal Mass (MT) 0 00012882  
Template Decay Time 25 years

Estimated  
Canister usage  
HIC  
1 56

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 3562E-08	119 03	238 05	0 00E+00	1 61E-06	3 23E-06	Avg MeV	
Am-241	1 0168E-04	119 03	238 05	0 00E+00	1 21E-02	2 42E-02	0 0150	2 265E+13
Am-242m	8 9052E-09	119 03	238 05	0 00E+00	1 06E-06	2 12E-06	0 0250	4 706E+12
Am-243	9 8602E-10	119 03	238 05	0 00E+00	1 17E-07	2 35E-07	0 0375	4 062E+12
C-14	2 3045E-04	119 03	238 05	0 00E+00	2 74E-02	5 49E-02	0 0575	4 382E+12
Cl-36	1 2261E-06	119 03	238 05	0 00E+00	1 46E-04	2 92E-04	0 0850	2 650E+12
Cm-243	3 1730E-10	119 03	238 05	0 00E+00	3 78E-08	7 55E-08	0 1250	1 722E+12
Cm-244	3 3977E-09	119 03	238 05	0 00E+00	4 04E-07	8 09E-07	0 2250	2 274E+12
Co-60	2 6373E-01	119 03	238 05	0 00E+00	3 14E+01	6 28E+01	0 3750	9 927E+11
Cs-134	8 7072E-05	119 03	238 05	0 00E+00	1 04E-02	2 07E-02	0 5750	1 621E+13
Cs-135	3 0316E-05	119 03	238 05	0 00E+00	3 61E-03	7 22E-03	0 8500	1 690E+11
Cs-137	1 8286E+00	119 03	238 05	0 00E+00	2 18E+02	4 35E+02	1 2500	4 708E+12
Eu-154	1 4982E-03	119 03	238 05	0 00E+00	1 78E-01	3 57E-01	1 7500	4 354E+09
Eu-155	2 8236E-03	119 03	238 05	0 00E+00	3 36E-01	6 72E-01	2 2500	2 508E+07
Fe-55	1 7687E-02	119 03	238 05	0 00E+00	2 11E+00	4 21E+00	2 7500	2 760E+05
H-3	4 4043E-03	119 03	238 05	0 00E+00	5 24E-01	1 05E+00	3 5000	5 907E+01
I-129	7 3195E-07	119 03	238 05	0 00E+00	8 71E-05	1 74E-04	5 0000	6 232E+00
Kr-85	7 8769E-02	119 03	238 05	0 00E+00	9 38E+00	1 88E+01	7 0000	6 887E-01
Np-237	1 1484E-06	119 03	238 05	0 00E+00	1 37E-04	2 73E-04	11 0000	7 733E-02
Pa-231	3 2396E-08	119 03	238 05	0 00E+00	3 86E-06	7 71E-06		
Pb-210	2 4409E-13	119 03	238 05	0 00E+00	2 91E-11	5 81E-11		
Pm-147	1 6331E-02	119 03	238 05	0 00E+00	1 94E+00	3 89E+00		
Pu-238	3 1947E-04	119 03	238 05	0 00E+00	3 80E-02	7 60E-02		
Pu-239	6 6789E-04	119 03	238 05	0 00E+00	7 95E-02	1 59E-01		
Pu-240	8 6922E-05	119 03	238 05	0 00E+00	1 03E-02	2 07E-02		
Pu-241	1 1567E-03	119 03	238 05	0 00E+00	1 38E-01	2 75E-01		
Pu-242	1 9717E-09	119 03	238 05	0 00E+00	2 35E-07	4 69E-07		
Ra-226	8 6190E-13	119 03	238 05	0 00E+00	1 03E-10	2 05E-10		
Ra-228	8 1498E-12	119 03	238 05	0 00E+00	9 70E-10	1 94E-09		
Ru-106	1 7770E-07	119 03	238 05	0 00E+00	2 12E-05	4 23E-05		
Se-79	1 3225E-05	119 03	238 05	0 00E+00	1 57E-03	3 15E-03		
Sn-126	1 1493E-05	119 03	238 05	0 00E+00	1 37E-03	2 74E-03		
Sr-90	1 7321E+00	119 03	238 05	0 00E+00	2 06E+02	4 12E+02		
Tc-99	4 6656E-04	119 03	238 05	0 00E+00	5 55E-02	1 11E-01		
Th-229	1 0110E-11	119 03	238 05	0 00E+00	1 20E-09	2 41E-09		
Th-230	1 1466E-10	119 03	238 05	0 00E+00	1 36E-08	2 73E-08		
Th-232	8 3245E-12	119 03	238 05	0 00E+00	9 91E-10	1 98E-09		
Ti-208	2 3860E-08	119 03	238 05	0 00E+00	2 84E-06	5 68E-06		
U-232	6 4576E-08	119 03	238 05	0 00E+00	7 69E-06	1 54E-05		
U-233	3 1082E-09	119 03	238 05	0 00E+00	3 70E-07	7 40E-07		
U-234	3 7587E-07	119 03	238 05	0 00E+00	4 47E-05	8 95E-05		
U-235	-2 7761E-06	119 03	0 00	9 14E-03	8 81E-03	9 14E-03		
U-236	1 6190E-05	119 03	238 05	0 00E+00	1 93E-03	3 85E-03		
U-238	-2 8547E-09	119 03	0 00	1 05E-04	1 04E-04	1 05E-04		
Y-90	1 7321E+00	119 03	238 05	0 00E+00	2 06E+02	4 12E+02		
Other Radionuclides					2 42E+02	4 83E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	NONE	SST	This fuel matches on all parameters except cladding (SST is conservative)
BOL HM Constituents	U	U	
BOL Enrichment %	93 14635987	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		119 03	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		238 05	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 56		1 00
Bounding	1 12		

\*Reactor shutdown core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name H B ROBINSON (ASSEMBLY)  
SNF ID # 383  
Fuel Units & Descr: 1 - ASSEMBLY  
Heavy Metal Mass: BOL=236.248kg EOL=229.168kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1974  
Estimates as of 2010  
Template PWR (Light Water, Zirc 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x15"  
1.00

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	8.7758E-10	6,732.94	13,465.87	0.00E+00	5.91E-06	1.18E-05	Avg MeV	
Am-241	1.4352E-01	6,732.94	13,465.87	0.00E+00	9.66E+02	1.93E+03	0.0150	7.245E+14
Am-242m	2.8698E-04	6,732.94	13,465.87	0.00E+00	1.93E+00	3.86E+00	0.0250	1.461E+14
Am-243	6.2565E-04	6,732.94	13,465.87	0.00E+00	4.21E+00	8.42E+00	0.0375	1.393E+14
C-14	4.7901E-05	6,732.94	13,465.87	0.00E+00	3.23E-01	6.45E-01	0.0575	1.610E+14
Cl-36	8.0297E-07	6,732.94	13,465.87	0.00E+00	5.41E-03	1.08E-02	0.0850	8.107E+13
Cm-243	2.5081E-04	6,732.94	13,465.87	0.00E+00	1.69E+00	3.38E+00	0.1250	5.626E+13
Cm-244	4.9015E-02	6,732.94	13,465.87	0.00E+00	3.30E+02	6.60E+02	0.2250	6.952E+13
Co-60	2.5581E-03	6,732.94	13,465.87	0.00E+00	1.72E+01	3.44E+01	0.3750	2.989E+13
Cs-134	4.0536E-05	6,732.94	13,465.87	0.00E+00	2.73E-01	5.46E-01	0.5750	6.953E+14
Cs-135	1.4433E-05	6,732.94	13,465.87	0.00E+00	9.72E-02	1.94E-01	0.8500	9.619E+12
Cs-137	1.3979E+00	6,732.94	13,465.87	0.00E+00	9.41E+03	1.88E+04	1.2500	9.448E+12
Eu-154	2.0203E-02	6,732.94	13,465.87	0.00E+00	1.36E+02	2.72E+02	1.7500	2.829E+11
Eu-155	1.7684E-03	6,732.94	13,465.87	0.00E+00	1.19E+01	2.38E+01	2.2500	4.556E+07
Fe-55	4.3136E-05	6,732.94	13,465.87	0.00E+00	2.90E-01	5.81E-01	2.7500	9.334E+07
H-3	2.0769E-02	6,732.94	13,465.87	0.00E+00	1.40E+02	2.80E+02	3.5000	9.611E+06
I-129	9.8288E-07	6,732.94	13,465.87	0.00E+00	6.62E-03	1.32E-02	5.0000	4.109E+06
Kr-85	2.8214E-02	6,732.94	13,465.87	0.00E+00	1.90E+02	3.80E+02	7.0000	4.736E+05
Np-237	1.1218E-05	6,732.94	13,465.87	0.00E+00	7.55E-02	1.51E-01	11.0000	5.440E+04
Pa-231	1.3036E-09	6,732.94	13,465.87	0.00E+00	8.78E-06	1.76E-05		
Pb-210	8.5078E-11	6,732.94	13,465.87	0.00E+00	5.73E-07	1.15E-06		
Pm-147	3.6531E-04	6,732.94	13,465.87	0.00E+00	2.46E+00	4.92E+00		
Pu-238	7.4564E-02	6,732.94	13,465.87	0.00E+00	5.02E+02	1.00E+03		
Pu-239	1.1623E-02	6,732.94	13,465.87	0.00E+00	7.83E+01	1.57E+02		
Pu-240	1.5132E-02	6,732.94	13,465.87	0.00E+00	1.02E+02	2.04E+02		
Pu-241	9.0036E-01	6,732.94	13,465.87	0.00E+00	6.06E+03	1.21E+04		
Pu-242	6.4260E-05	6,732.94	13,465.87	0.00E+00	4.33E-01	8.65E-01		
Ra-226	2.2804E-05	6,732.94	13,465.87	0.00E+00	1.54E-06	3.07E-06		
Ra-228	5.2713E-12	6,732.94	13,465.87	0.00E+00	3.55E-08	7.10E-08		
Ru-106	6.1160E-10	6,732.94	13,465.87	0.00E+00	4.12E-06	8.24E-06		
Se-79	1.2377E-05	6,732.94	13,465.87	0.00E+00	8.33E-02	1.67E-01		
Sn-126	2.5210E-05	6,732.94	13,465.87	0.00E+00	1.70E-01	3.39E-01		
Sr-90	9.1667E-01	6,732.94	13,465.87	0.00E+00	6.17E+03	1.23E+04		
Tc-99	3.9357E-04	6,732.94	13,465.87	0.00E+00	2.65E+00	5.30E+00		
Th-229	1.2057E-10	6,732.94	13,465.87	0.00E+00	8.12E-07	1.62E-06		
Th-230	2.1043E-08	6,732.94	13,465.87	0.00E+00	1.42E-04	2.83E-04		
Th-232	5.2972E-12	6,732.94	13,465.87	0.00E+00	3.57E-08	7.13E-08		
Tl-208	1.7474E-07	6,732.94	13,465.87	0.00E+00	1.18E-03	2.35E-03		
U-232	4.7368E-07	6,732.94	13,465.87	0.00E+00	3.19E-03	6.38E-03	Thermal Power	
U-233	2.5097E-08	6,732.94	13,465.87	0.00E+00	1.69E-04	3.38E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	5.0000E-05	6,732.94	13,465.87	0.00E+00	3.37E-01	6.73E-01	1.55E+02	3.10E+02
U-235	-1.4489E-06	6,732.94	0.00	1.48E-02	5.05E-03	1.48E-02	Total	Total
U-236	7.5824E-06	6,732.94	13,465.87	0.00E+00	5.11E-02	1.02E-01		
U-238	-2.6129E-07	6,732.94	0.00	7.71E-02	7.53E-02	7.71E-02		
Y-90	9.1699E-01	6,732.94	13,465.87	0.00E+00	6.17E+03	1.23E+04		
Other Radionuclides					9.04E+03	1.81E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding		ZIRC	
BOL HM Constituents		U	
BOL Enrichment %	2.900129144	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	6.617.31	6.732.94	
Bounding		13.465.87	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.81	1.02	
Bounding	1.63		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name, H B ROBINSON RODS

SNF ID # 864

Fuel Units & Descr 12 - CANISTER OF SCRAP

Heavy Metal Mass BOL=25 088kg EOL=20 86kg

ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1974

Estimates as of: 2010

Template: PWR (Light Water Zirc, 0 to 5%, U)

<sup>2</sup>Template Burnup(MWd) 61 92

Template BOL Heavy Metal Mass (MT): 0 00176911

Template Decay Time: 35 years

Estimated

Canister usage.

HIC

12 00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	4,021 39	8,042.78	0 00E+00	3 53E-06	7 06E-06	Avg MeV	
Am-241	1 4352E-01	4,021 39	8,042.78	0 00E+00	5 77E+02	1 15E+03	0 0150	4 327E+14
Am-242m	2 8698E-04	4,021 39	8 042 78	0 00E+00	1 15E+00	2 31E+00	0 0250	8 726E+13
Am-243	6 2565E-04	4,021 39	8,042 78	0 00E+00	2 52E+00	5 03E+00	0 0375	8 323E+13
C-14	4 7901E-05	4,021 39	8,042.78	0 00E+00	1 93E-01	3 85E-01	0 0575	9 617E+13
Cf-252	8 0297E-07	4,021 39	8,042.78	0 00E+00	3 23E-03	6 46E-03	0 0850	4 842E+13
Cm-243	2 5081E-04	4,021 39	8,042.78	0 00E+00	1 01E+00	2 02E+00	0 1250	3 360E+13
Cm-244	4 9015E-02	4,021 39	8,042.78	0 00E+00	1 97E+02	3 94E+02	0 2250	4 152E+13
Co-60	2 5581E-03	4,021 39	8,042.78	0 00E+00	1 03E+01	2 06E+01	0 3750	1 785E+13
Cs-134	4 0536E-05	4,021 39	8,042.78	0 00E+00	1 63E-01	3 26E-01	0 5750	4 153E+14
Cs-135	1 4433E-05	4,021 39	8,042.78	0 00E+00	5 80E-02	1 16E-01	0 8500	5 745E+12
Cs-137	1 3979E+00	4,021 39	8,042.78	0 00E+00	5 62E+03	1 12E+04	1 2500	5 643E+12
Eu-154	2 0203E-02	4,021 39	8,042.78	0 00E+00	8 12E+01	1 62E+02	1 7500	1 690E+11
Eu-155	1 7684E-03	4,021 39	8,042.78	0 00E+00	7 11E+00	1 42E+01	2 2500	2 721E+07
Fe-55	4 3136E-05	4,021 39	8,042.78	0 00E+00	1 73E-01	3 47E-01	2 7500	5 575E+07
H-3	2 0769E-02	4,021 39	8,042.78	0 00E+00	8 35E+01	1 67E+02	3 5000	5 740E+06
I-129	9 8288E-07	4,021 39	8,042.78	0 00E+00	3 95E-03	7 91E-03	5 0000	2 454E+06
Kr-85	2 8214E-02	4,021 39	8,042.78	0 00E+00	1 13E+02	2 27E+02	7 0000	2 829E+05
Np-237	1 1218E-05	4,021 39	8,042.78	0 00E+00	4 51E-02	9 02E-02	11 0000	3 249E+04
Pa-231	1 3036E-09	4,021 39	8,042.78	0 00E+00	5 24E-06	1 05E-05		
Pb-210	8 5078E-11	4,021 39	8,042.78	0 00E+00	3 42E-07	6 84E-07		
Pm-147	3 6531E-04	4,021 39	8,042.78	0 00E+00	1 47E+00	2 94E+00		
Pu-238	7 4564E-02	4,021 39	8,042.78	0 00E+00	3 00E+02	6 00E+02		
Pu-239	1 1623E-02	4 021 39	8,042.78	0 00E+00	4 67E+01	9 35E+01		
Pu-240	1 5132E-02	4,021 39	8,042.78	0 00E+00	6 09E+01	1 22E+02		
Pu-241	9 0036E-01	4,021 39	8,042 78	0 00E+00	3 62E+03	7 24E+03		
Pu-242	6 4260E-05	4 021 39	8,042.78	0 00E+00	2 58E-01	5 17E-01		
Ra-226	2 2804E-10	4,021 39	8,042 78	0 00E+00	9 17E-07	1 83E-06		
Ra-228	5 2713E-12	4,021 39	8,042.78	0 00E+00	2 12E-08	4 24E-08		
Ru-106	6 1160E-10	4,021 39	8,042.78	0 00E+00	2 46E-06	4 92E-06		
Se-79	1 2377E-05	4,021 39	8,042.78	0 00E+00	4 98E-02	9 95E-02		
Sn-126	2 5210E-05	4,021 39	8,042 78	0 00E+00	1 01E-01	2 03E-01		
Sr-90	9 1667E-01	4,021 39	8,042 78	0 00E+00	3 69E+03	7 37E+03		
Tc-99	3 9357E-04	4 021 39	8,042 78	0 00E+00	1 58E+00	3 17E+00		
Th-229	1 2057E-10	4,021 39	8,042.78	0 00E+00	4 85E-07	9 70E-07		
Th-230	2 1043E-08	4 021 39	8,042 78	0 00E+00	8 46E-05	1 69E-04		
Th-232	5 2972E-12	4,021 39	8,042.78	0 00E+00	2 13E-08	4 26E-08		
Ti-208	1 7474E-07	4,021 39	8,042.78	0 00E+00	7 03E-04	1 41E-03		
U-232	4 7368E-07	4,021 39	8,042.78	0 00E+00	1 90E-03	3 81E-03		
U-233	2 5097E-08	4,021 39	8,042.78	0 00E+00	1 01E-04	2 02E-04		
U-234	5 0000E-05	4,021 39	8,042.78	0 00E+00	2 01E-01	4 02E-01		
U-235	-1.4489E-06	4,021 39	0 00	1 57E-03	0 00E+00	1 57E-03		
U-236	7 5824E-06	4,021 39	8,042.78	0 00E+00	3 05E-02	6 10E-02		
U-238	-2 6129E-07	4,021 39	0 00	8 19E-03	7 14E-03	8 19E-03		
Y-90	9 1699E-01	4,021 39	8,042 78	0 00E+00	3 69E+03	7 38E+03		
Other Radionuclides					5 40E+03	1 08E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	Basis for Parameter Differences:
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	2 9	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
	702 48	4 021 39	
Nominal			Nominal burnup calculated from the heavy metal mass destroyed
Bounding		8 042 78	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	4 58	5 72	
Nominal			1 10
Bounding	9 16		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name HFBR  
 SNF ID # 102  
 Fuel Units & Descr 220 - 18 CURVED PLATES  
 Heavy Metal Mass BOL=82.72kg EOL=58 102kg  
 ROD Storage Site SRS  
 Fuel decay start date 1977  
 Estimates as of 2010  
 Template HFBR (Heavy Water, Alum, 40 to 100% U)  
 Template Burnup(MWd) 164.6  
 Template BOL Heavy Metal Mass (MT) 0.000377  
 Template Decay Time 25 years

Estimated  
 Canister usage  
 18"x10"  
 6 11

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	5.4520E-10	22,675.71	45,351.43	0.00E+00	1.24E-05	2.47E-05	0.0150	4.252E+15
Am-241	9.2284E-03	22,675.71	45,351.43	0.00E+00	2.09E+02	4.19E+02	0.0250	8.751E+14
Am-242m	1.3390E-06	22,675.71	45,351.43	0.00E+00	3.04E-02	6.07E-02	0.0375	7.727E+14
Am-243	3.7084E-05	22,675.71	45,351.43	0.00E+00	8.41E-01	1.68E+00	0.0575	8.241E+14
C-14	2.6452E-08	22,675.71	45,351.43	0.00E+00	6.00E-04	1.20E-03	0.0850	4.960E+14
Cl-36	4.4441E-31	22,675.71	45,351.43	0.00E+00	1.01E-26	2.02E-26	0.1250	3.442E+14
Cm-243	5.0498E-06	22,675.71	45,351.43	0.00E+00	1.15E-01	2.29E-01	0.2250	4.281E+14
Cm-244	3.8451E-03	22,675.71	45,351.43	0.00E+00	8.72E+01	1.74E+02	0.3750	1.854E+14
Co-60	2.5225E-05	22,675.71	45,351.43	0.00E+00	5.72E-01	1.14E+00	0.5750	3.073E+15
Cs-134	1.9830E-03	22,675.71	45,351.43	0.00E+00	4.50E+01	8.99E+01	0.8500	6.053E+13
Cs-135	4.2564E-06	22,675.71	45,351.43	0.00E+00	9.65E-02	1.93E-01	1.2500	4.085E+13
Cs-137	1.8141E+00	22,675.71	45,351.43	0.00E+00	4.11E+04	8.23E+04	1.7500	1.691E+12
Eu-154	3.4733E-02	22,675.71	45,351.43	0.00E+00	7.88E+02	1.58E+03	2.2500	9.114E+07
Eu-155	7.1081E-03	22,675.71	45,351.43	0.00E+00	1.61E+02	3.22E+02	2.7500	7.835E+07
Fe-55	3.5790E-04	22,675.71	45,351.43	0.00E+00	8.12E+00	1.62E+01	3.5000	2.690E+06
H-3	3.4945E-03	22,675.71	45,351.43	0.00E+00	7.92E+01	1.58E+02	5.0000	1.140E+06
I-129	6.6403E-07	22,675.71	45,351.43	0.00E+00	1.51E-02	3.01E-02	7.0000	1.308E+05
Kr-85	7.8250E-02	22,675.71	45,351.43	0.00E+00	1.77E+03	3.55E+03	11.0000	1.498E+04
Np-237	3.1567E-05	22,675.71	45,351.43	0.00E+00	7.16E-01	1.43E+00		
Pa-231	1.3372E-09	22,675.71	45,351.43	0.00E+00	3.03E-05	6.06E-05		
Pb-210	3.0644E-11	22,675.71	45,351.43	0.00E+00	6.95E-07	1.39E-06		
Pm-147	6.5188E-03	22,675.71	45,351.43	0.00E+00	1.48E+02	2.96E+02		
Pu-238	1.4769E-01	22,675.71	45,351.43	0.00E+00	3.35E+03	6.70E+03		
Pu-239	6.9502E-04	22,675.71	45,351.43	0.00E+00	1.58E+01	3.15E+01		
Pu-240	3.7928E-04	22,675.71	45,351.43	0.00E+00	8.60E+00	1.72E+01		
Pu-241	1.0565E-01	22,675.71	45,351.43	0.00E+00	2.40E+03	4.79E+03		
Pu-242	3.0911E-06	22,675.71	45,351.43	0.00E+00	7.01E-02	1.40E-01		
Ra-226	1.1081E-10	22,675.71	45,351.43	0.00E+00	2.51E-06	5.03E-06		
Ra-228	2.1185E-14	22,675.71	45,351.43	0.00E+00	4.80E-10	9.61E-10		
Ru-106	2.3621E-07	22,675.71	45,351.43	0.00E+00	5.36E-03	1.07E-02		
Se-79	1.2339E-05	22,675.71	45,351.43	0.00E+00	2.80E-01	5.60E-01		
Sn-126	1.0194E-05	22,675.71	45,351.43	0.00E+00	2.31E-01	4.62E-01		
Sr-90	1.6932E+00	22,675.71	45,351.43	0.00E+00	3.84E+04	7.68E+04		
Tc-99	3.8056E-04	22,675.71	45,351.43	0.00E+00	8.63E+00	1.73E+01		
Th-229	9.1252E-12	22,675.71	45,351.43	0.00E+00	2.07E-07	4.14E-07		
Th-230	1.5407E-08	22,675.71	45,351.43	0.00E+00	3.49E-04	6.99E-04		
Th-232	2.8937E-14	22,675.71	45,351.43	0.00E+00	6.56E-10	1.31E-09		
Ti-208	4.7272E-08	22,675.71	45,351.43	0.00E+00	1.07E-03	2.14E-03		
U-232	1.2855E-07	22,675.71	45,351.43	0.00E+00	2.92E-03	5.83E-03		
U-233	5.1470E-09	22,675.71	45,351.43	0.00E+00	1.17E-04	2.33E-04		
U-234	5.6069E-05	22,675.71	45,351.43	0.00E+00	1.27E+00	2.54E+00		
U-235	-2.8661E-06	22,675.71	0.00	1.66E-01	1.01E-01	1.66E-01		
U-236	1.6701E-05	22,675.71	45,351.43	0.00E+00	3.79E-01	7.57E-01		
U-238	-9.4194E-09	22,675.71	0.00	1.92E-03	1.71E-03	1.92E-03		
Y-90	1.6932E+00	22,675.71	45,351.43	0.00E+00	3.84E+04	7.68E+04		
Other Radionuclides					3.94E+04	7.87E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	HEAVY WATER	HEAVY WATER	
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	93.08510638	40 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		22,675.71	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		45,351.43	Bounding burnup assumed to be twice nominal burnup

  

Checks		
	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.63	
Bounding	1.26	
		Estimated EOL HM/ Given EOL HM
		1.01

<sup>1</sup>Reactor shutdown, core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: HFBR  
 SNF ID #: 961  
 Fuel Units & Descr: 20 - 18 CURVED PLATES  
 Heavy Metal Mass: BOL=7.52kg; EOL=5.282kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 1977  
 Estimates as of: 2010  
 Template: HFBR (Heavy Water, Alum., 40 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 164.6  
 Template BOL Heavy Metal Mass (MT): 0.000377  
 Template Decay Time: 25 years

Estimated  
 Canister usage  
 18"x10"  
 0.56

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	5.4520E-10	2.061 43	4.122 86	0.00E+00	1.12E-06	2.25E-06	Avg. MeV	
Am-241	9.2284E-03	2.061 43	4.122 86	0.00E+00	1.90E+01	3.80E+01	0.0150	3.865E+14
Am-242m	1.3390E-06	2.061 43	4.122 86	0.00E+00	2.76E-03	5.52E-03	0.0250	7.955E+13
Am-243	3.7084E-05	2.061 43	4.122 86	0.00E+00	7.64E-02	1.53E-01	0.0375	7.024E+13
C-14	2.6452E-08	2.061 43	4.122 86	0.00E+00	5.45E-05	1.09E-04	0.0575	7.492E+13
Cl-36	4.4441E-31	2.061 43	4.122 86	0.00E+00	9.16E-28	1.83E-27	0.0850	4.509E+13
Cm-243	5.0498E-06	2.061 43	4.122 86	0.00E+00	1.04E-02	2.08E-02	0.1250	3.129E+13
Cm-244	3.8451E-03	2.061 43	4.122 86	0.00E+00	7.93E+00	1.59E+01	0.2250	3.892E+13
Co-60	2.5225E-05	2.061 43	4.122 86	0.00E+00	5.20E-02	1.04E-01	0.3750	1.685E+13
Cs-134	1.9830E-03	2.061 43	4.122 86	0.00E+00	4.09E+00	8.18E+00	0.5750	2.794E+14
Cs-135	4.2564E-06	2.061 43	4.122 86	0.00E+00	8.77E-03	1.75E-02	0.8500	5.503E+12
Cs-137	1.8141E+00	2.061 43	4.122 86	0.00E+00	3.74E+03	7.48E+03	1.2500	3.714E+12
Eu-154	3.4733E-02	2.061 43	4.122 86	0.00E+00	7.16E+01	1.43E+02	1.7500	1.537E+11
Eu-155	7.1081E-03	2.061 43	4.122 86	0.00E+00	1.47E+01	2.93E+01	2.2500	8.285E+06
Fe-55	3.5790E-04	2.061 43	4.122 86	0.00E+00	7.38E-01	1.48E+00	2.7500	7.123E+06
H-3	3.4945E-03	2.061 43	4.122 86	0.00E+00	7.20E+00	1.44E+01	3.5000	2.445E+05
I-129	6.6403E-07	2.061 43	4.122 86	0.00E+00	1.37E-03	2.74E-03	5.0000	1.037E+05
Kr-85	7.8250E-02	2.061 43	4.122 86	0.00E+00	1.61E+02	3.23E+02	7.0000	1.189E+04
Np-237	3.1567E-05	2.061 43	4.122 86	0.00E+00	6.51E-02	1.30E-01	11.0000	1.362E+03
Pa-231	1.3372E-09	2.061 43	4.122 86	0.00E+00	2.76E-06	5.51E-06		
Pb-210	3.0644E-11	2.061 43	4.122 86	0.00E+00	6.32E-08	1.26E-07		
Pm-147	6.5188E-03	2.061 43	4.122 86	0.00E+00	1.34E+01	2.69E+01		
Pu-238	1.4769E-01	2.061 43	4.122 86	0.00E+00	3.04E+02	6.09E+02		
Pu-239	6.9502E-04	2.061 43	4.122 86	0.00E+00	1.43E+00	2.87E+00		
Pu-240	3.7928E-04	2.061 43	4.122 86	0.00E+00	7.82E-01	1.56E+00		
Pu-241	1.0565E-01	2.061 43	4.122 86	0.00E+00	2.18E+02	4.36E+02		
Pu-242	3.0911E-06	2.061 43	4.122 86	0.00E+00	6.37E-03	1.27E-02		
Ra-226	1.1081E-10	2.061 43	4.122 86	0.00E+00	2.28E-07	4.57E-07		
Ra-228	2.1185E-14	2.061 43	4.122 86	0.00E+00	4.37E-11	8.73E-11		
Ru-106	2.3621E-07	2.061 43	4.122 86	0.00E+00	4.87E-04	9.74E-04		
Se-79	1.2339E-05	2.061 43	4.122 86	0.00E+00	2.54E-02	5.09E-02		
Sn-126	1.0194E-05	2.061 43	4.122 86	0.00E+00	2.10E-02	4.20E-02		
Sr-90	1.6932E+00	2.061 43	4.122 86	0.00E+00	3.49E+03	6.98E+03		
Tc-99	3.8056E-04	2.061 43	4.122 86	0.00E+00	7.84E-01	1.57E+00		
Th-229	9.1252E-12	2.061 43	4.122 86	0.00E+00	1.88E-08	3.76E-08		
Th-230	1.5407E-08	2.061 43	4.122 86	0.00E+00	3.18E-05	6.35E-05		
Th-232	2.8937E-14	2.061 43	4.122 86	0.00E+00	5.97E-11	1.19E-10		
Th-208	4.7272E-08	2.061 43	4.122 86	0.00E+00	9.74E-05	1.95E-04		
U-232	1.2855E-07	2.061 43	4.122 86	0.00E+00	2.65E-04	5.30E-04		
U-233	5.1470E-09	2.061 43	4.122 86	0.00E+00	1.06E-05	2.12E-05		
U-234	5.6069E-05	2.061 43	4.122 86	0.00E+00	1.16E-01	2.31E-01		
U-235	-2.8661E-06	2.061 43	0.00	1.51E-02	9.22E-03	1.51E-02		
U-236	1.6701E-05	2.061 43	4.122 86	0.00E+00	3.44E-02	6.89E-02		
U-238	-9.4194E-09	2.061 43	0.00	1.75E-04	1.55E-04	1.75E-04		
Y-90	1.6932E+00	2.061 43	4.122 86	0.00E+00	3.49E+03	6.98E+03		
Other Radionuclides					3.58E+03	7.16E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.08510638	40 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		2.061 43	
Bounding		4.122.86	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.63		
Bounding	1.26		1.01

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name HFEF FISSION CHAMBERS (U METAL)  
 SNF ID # 894  
 Fuel Units & Descr: 1 - UNKNOWN  
 Heavy Metal Mass BOL= ; EOL=24.345kg  
 ROD Storage Site: INEEL  
 Fuel decay start date 1994  
 Estimates as of 2010  
 Template TRIGA-SS (LW/U-Zr, SST, 10 to 20%, U)  
 Template Burnup(MWd) 6.65  
 Template BOL Heavy Metal Mass (MT) 0.000195  
 Template Decay Time 15 years

Estimated  
 Canister usage  
 18"x10"  
 0.01

III. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9744E-09	23,240.11	23,240.11	0.00E+00	4.59E-05	4.59E-05	Avg MeV	
Am-241	2.8150E-03	23,240.11	23,240.11	0.00E+00	6.54E+01	6.54E+01	0.0150	2.636E+15
Am-242m	1.3501E-06	23,240.11	23,240.11	0.00E+00	3.14E-02	3.14E-02	0.0250	5.510E+14
Am-243	1.4761E-07	23,240.11	23,240.11	0.00E+00	3.43E-03	3.43E-03	0.0375	4.757E+14
C-14	1.2854E-04	23,240.11	23,240.11	0.00E+00	2.99E+00	2.99E+00	0.0575	5.104E+14
Cl-36	2.8120E-06	23,240.11	23,240.11	0.00E+00	6.54E-02	6.54E-02	0.0850	3.087E+14
Cm-243	1.4075E-07	23,240.11	23,240.11	0.00E+00	3.27E-03	3.27E-03	0.1250	2.022E+14
Cm-244	1.1570E-06	23,240.11	23,240.11	0.00E+00	2.69E-02	2.69E-02	0.2250	2.643E+14
Co-60	3.4481E-01	23,240.11	23,240.11	0.00E+00	8.01E+03	8.01E+03	0.3750	1.172E+14
Cs-134	3.1474E-03	23,240.11	23,240.11	0.00E+00	7.31E+01	7.31E+01	0.5750	1.901E+15
Cs-135	3.2195E-05	23,240.11	23,240.11	0.00E+00	7.48E-01	7.48E-01	0.8500	2.405E+13
Cs-137	2.1880E+00	23,240.11	23,240.11	0.00E+00	5.08E+04	5.08E+04	1.2500	6.028E+14
Eu-154	6.8647E-03	23,240.11	23,240.11	0.00E+00	1.60E+02	1.60E+02	1.7500	5.743E+11
Eu-155	7.2481E-03	23,240.11	23,240.11	0.00E+00	1.68E+02	1.68E+02	2.2500	3.625E+09
Fe-55	5.3744E-02	23,240.11	23,240.11	0.00E+00	1.25E+03	1.25E+03	2.7500	4.108E+07
H-3	6.3414E-03	23,240.11	23,240.11	0.00E+00	1.47E+02	1.47E+02	3.5000	2.325E+06
I-129	7.3684E-07	23,240.11	23,240.11	0.00E+00	1.71E-02	1.71E-02	5.0000	1.213E+04
Kr-85	1.3236E-01	23,240.11	23,240.11	0.00E+00	3.08E+03	3.08E+03	7.0000	1.370E+03
Np-237	1.2504E-06	23,240.11	23,240.11	0.00E+00	2.91E-02	2.91E-02	11.0000	1.559E+02
Pa-231	5.9774E-09	23,240.11	23,240.11	0.00E+00	1.39E-04	1.39E-04		
Pb-210	3.3534E-14	23,240.11	23,240.11	0.00E+00	7.79E-10	7.79E-10		
Pm-147	1.5002E-01	23,240.11	23,240.11	0.00E+00	3.49E+03	3.49E+03		
Pu-238	9.5970E-04	23,240.11	23,240.11	0.00E+00	2.23E+01	2.23E+01		
Pu-239	5.5278E-03	23,240.11	23,240.11	0.00E+00	1.28E+02	1.28E+02		
Pu-240	2.1248E-03	23,240.11	23,240.11	0.00E+00	4.94E+01	4.94E+01		
Pu-241	6.3023E-02	23,240.11	23,240.11	0.00E+00	1.46E+03	1.46E+03		
Pu-242	2.3128E-07	23,240.11	23,240.11	0.00E+00	5.37E-03	5.37E-03		
Ra-226	1.6346E-13	23,240.11	23,240.11	0.00E+00	3.80E-09	3.80E-09		
Ra-228	2.3173E-10	23,240.11	23,240.11	0.00E+00	5.39E-06	5.39E-06		
Ru-106	9.5038E-05	23,240.11	23,240.11	0.00E+00	2.21E+00	2.21E+00		
Se-79	1.3017E-05	23,240.11	23,240.11	0.00E+00	3.03E-01	3.03E-01		
Sn-126	1.2165E-05	23,240.11	23,240.11	0.00E+00	2.83E-01	2.83E-01		
Sr-90	2.0541E+00	23,240.11	23,240.11	0.00E+00	4.77E+04	4.77E+04		
Tc-99	4.4241E-04	23,240.11	23,240.11	0.00E+00	1.03E+01	1.03E+01		
Th-229	2.5218E-10	23,240.11	23,240.11	0.00E+00	5.86E-06	5.86E-06		
Th-230	3.3654E-11	23,240.11	23,240.11	0.00E+00	7.82E-07	7.82E-07		
Th-232	2.5278E-10	23,240.11	23,240.11	0.00E+00	5.87E-06	5.87E-06		
Ti-208	1.6511E-08	23,240.11	23,240.11	0.00E+00	3.84E-04	3.84E-04		
U-232	4.4722E-08	23,240.11	23,240.11	0.00E+00	1.04E-03	1.04E-03		
U-233	1.2209E-07	23,240.11	23,240.11	0.00E+00	2.84E-03	2.84E-03		
U-234	1.8662E-07	23,240.11	23,240.11	0.00E+00	4.34E-03	4.34E-03		
U-235	-2.6194E-06	23,240.11	0.00	2.10E-02	0.00E+00	2.10E-02		
U-236	1.2693E-05	23,240.11	23,240.11	0.00E+00	2.95E-01	2.95E-01		
U-238	-3.6331E-08	23,240.11	0.00	1.31E-02	1.22E-02	1.31E-02		
Y-90	2.0541E+00	23,240.11	23,240.11	0.00E+00	4.77E+04	4.77E+04		
Other Radionuclides					5.03E+04	5.03E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	UNKNOWN	SST	
BOL HM Constituents	U	U	This Template was used for the following reasons This fuel matches on all parameters except cladding (SST is conservative) and enrichment (unknown)
BOL Enrichment %		10 to 20.1	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		23,240.11	
Bounding		23,240.11	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	14.00		
Bounding	14.00		1.78

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: HTGR (PEACH BOTTOM SCRAP)  
 SNF ID #: 935  
 Fuel Units & Descr: 21 - CANISTER OF SCRAP  
 Heavy Metal Mass: BOL=18 722kg, EOL=16.34kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1967  
 Estimates as of: 2010  
 Template: FSV (Graphite, Graphite, 60 to 100% Th & U)  
<sup>2</sup>Template Burnup(MWd): 1270.275  
 Template BOL Heavy Metal Mass (MT): 0.012702752  
 Template Decay Time: 35 years

Estimated  
 Canister usage  
 18"x15"  
 1 62

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.8818E-06	2,252.15	4,504.30	0.00E+00	8.74E-03	1.75E-02	Avg. MeV	
Am-241	3.1387E-03	2,252.15	4,504.30	0.00E+00	7.07E+00	1.41E+01	0.0150	3.161E+14
Am-242m	2.3971E-06	2,252.15	4,504.30	0.00E+00	5.40E-03	1.08E-02	0.0250	6.475E+13
Am-243	4.6069E-05	2,252.15	4,504.30	0.00E+00	1.04E-01	2.08E-01	0.0375	5.643E+13
C-14	2.3121E-05	2,252.15	4,504.30	0.00E+00	5.21E-02	1.04E-01	0.0575	6.070E+13
Cl-36	1.0667E-06	2,252.15	4,504.30	0.00E+00	2.40E-03	4.80E-03	0.0850	3.665E+13
Cm-243	2.5357E-05	2,252.15	4,504.30	0.00E+00	5.71E-02	1.14E-01	0.1250	2.472E+13
Cm-244	6.4458E-03	2,252.15	4,504.30	0.00E+00	1.45E+01	2.90E+01	0.2250	3.179E+13
Co-60	4.5014E-04	2,252.15	4,504.30	0.00E+00	1.01E+00	2.03E+00	0.3750	1.375E+13
Cs-134	3.8086E-05	2,252.15	4,504.30	0.00E+00	8.58E-02	1.72E-01	0.5750	2.231E+14
Cs-135	2.4711E-05	2,252.15	4,504.30	0.00E+00	5.57E-02	1.11E-01	0.8500	3.525E+12
Cs-137	1.3273E+00	2,252.15	4,504.30	0.00E+00	2.99E+03	5.98E+03	1.2500	2.273E+12
Eu-154	1.5705E-02	2,252.15	4,504.30	0.00E+00	3.54E+01	7.07E+01	1.7500	1.079E+11
Eu-155	1.0415E-03	2,252.15	4,504.30	0.00E+00	2.35E+00	4.69E+00	2.2500	7.952E+06
Fe-55	4.4707E-08	2,252.15	4,504.30	0.00E+00	1.01E-04	2.01E-04	2.7500	9.415E+10
H-3	3.9094E-03	2,252.15	4,504.30	0.00E+00	8.80E+00	1.76E+01	3.5000	4.497E+05
I-129	1.0092E-06	2,252.15	4,504.30	0.00E+00	2.27E-03	4.55E-03	5.0000	1.918E+05
Kr-85	3.9519E-02	2,252.15	4,504.30	0.00E+00	8.90E+01	1.78E+02	7.0000	2.204E+04
Np-237	1.2541E-05	2,252.15	4,504.30	0.00E+00	2.82E-02	5.65E-02	11.0000	2.527E+03
Pa-231	4.7376E-06	2,252.15	4,504.30	0.00E+00	1.07E-02	2.13E-02		
Pb-210	1.4194E-09	2,252.15	4,504.30	0.00E+00	3.20E-06	6.39E-06		
Pm-147	1.5146E-04	2,252.15	4,504.30	0.00E+00	3.41E-01	6.82E-01		
Pu-238	1.6248E-01	2,252.15	4,504.30	0.00E+00	3.66E+02	7.32E+02		
Pu-239	1.3580E-04	2,252.15	4,504.30	0.00E+00	3.06E-01	6.12E-01		
Pu-240	2.7136E-04	2,252.15	4,504.30	0.00E+00	6.11E-01	1.22E+00		
Pu-241	1.9342E-02	2,252.15	4,504.30	0.00E+00	4.36E+01	8.71E+01		
Pu-242	3.8866E-06	2,252.15	4,504.30	0.00E+00	8.75E-03	1.75E-02		
Ra-226	2.7923E-09	2,252.15	4,504.30	0.00E+00	6.29E-06	1.26E-05		
Ra-228	9.1791E-07	2,252.15	4,504.30	0.00E+00	2.07E-03	4.13E-03		
Ru-106	3.5205E-11	2,252.15	4,504.30	0.00E+00	7.93E-08	1.59E-07		
Se-79	2.1082E-05	2,252.15	4,504.30	0.00E+00	4.75E-02	9.50E-02		
Sn-126	2.2192E-05	2,252.15	4,504.30	0.00E+00	5.00E-02	1.00E-01		
Sr-90	1.2667E+00	2,252.15	4,504.30	0.00E+00	2.85E+03	5.71E+03		
Tc-99	3.3331E-04	2,252.15	4,504.30	0.00E+00	7.51E-01	1.50E+00		
Th-229	1.0612E-05	2,252.15	4,504.30	0.00E+00	2.39E-02	4.78E-02		
Th-230	1.8878E-07	2,252.15	4,504.30	0.00E+00	4.25E-04	8.50E-04		
Th-232	-6.9673E-08	2,252.15	0.00	1.85E-03	1.69E-03	1.85E-03		
Ti-208	5.9530E-04	2,252.15	4,504.30	0.00E+00	1.34E+00	2.68E+00		
U-232	1.6115E-03	2,252.15	4,504.30	0.00E+00	3.63E+00	7.26E+00		
U-233	2.0602E-03	2,252.15	4,504.30	0.00E+00	4.64E+00	9.28E+00		
U-234	2.8939E-04	2,252.15	4,504.30	0.00E+00	6.52E-01	1.30E+00		
U-235	-1.7343E-06	2,252.15	0.00	3.70E-03	0.00E+00	3.70E-03		
U-236	8.6281E-06	2,252.15	4,504.30	0.00E+00	1.94E-02	3.89E-02		
U-238	-5.6065E-09	2,252.15	0.00	3.68E-05	2.42E-05	3.68E-05		
Y-90	1.2667E+00	2,252.15	4,504.30	0.00E+00	2.85E+03	5.71E+03		
Other Radionuclides					2.87E+03	5.74E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	GRAPHITE	GRAPHITE	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	80.231	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal	1,239.49	2,252.15	
Bounding	1,361.22	4,504.30	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.20	1.82	
Bounding	2.41	3.31	1.01

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name KEMA  
SNF ID # 861  
Fuel Units & Descr: 14 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL=243 783kg EOL=243 755kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 1979  
Estimates as of 2010  
Template LWBR (Light Water, Zirc, 60 to 100%, Th and U)  
<sup>2</sup>Template Burnup(MWd) 10269 14  
Template BOL Heavy Metal Mass (MT) 0 45991251  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x10"  
1 00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.3425E-05	27.25	54.50	0.00E+00	2.27E-03	4.55E-03	Avg MeV	
Am-241	2.2387E-04	27.25	54.50	0.00E+00	6.10E-03	1.22E-02	0.0150	5.963E+12
Am-242m	1.5512E-06	27.25	54.50	0.00E+00	4.23E-05	8.45E-05	0.0250	1.178E+12
Am-243	3.1181E-07	27.25	54.50	0.00E+00	8.50E-06	1.70E-05	0.0375	1.011E+12
C-14	9.2539E-05	27.25	54.50	0.00E+00	2.52E-03	5.04E-03	0.0575	1.100E+12
Cl-36	1.8103E-06	27.25	54.50	0.00E+00	4.93E-05	9.87E-05	0.0850	6.989E+11
Cm-243	3.9020E-07	27.25	54.50	0.00E+00	1.06E-05	2.13E-05	0.1250	4.479E+11
Cm-244	2.0742E-05	27.25	54.50	0.00E+00	5.65E-04	1.13E-03	0.2250	6.241E+11
Co-60	3.2554E-03	27.25	54.50	0.00E+00	8.87E-02	1.77E-01	0.3750	2.533E+11
Cs-134	7.3823E-04	27.25	54.50	0.00E+00	2.01E-02	4.02E-02	0.5750	3.828E+12
Cs-135	2.8639E-05	27.25	54.50	0.00E+00	7.80E-04	1.56E-03	0.8500	7.575E+10
Cs-137	1.8609E+00	27.25	54.50	0.00E+00	5.07E+01	1.01E+02	1.2500	4.791E+10
Eu-154	1.9262E-02	27.25	54.50	0.00E+00	5.25E-01	1.05E+00	1.7500	4.568E+09
Eu-155	2.6721E-03	27.25	54.50	0.00E+00	7.28E-02	1.46E-01	2.2500	1.854E+05
Fe-55	3.3099E-05	27.25	54.50	0.00E+00	9.02E-04	1.80E-03	2.7500	2.944E+10
H-3	3.7296E-03	27.25	54.50	0.00E+00	1.02E-01	2.03E-01	3.5000	6.749E+02
I-129	1.5853E-06	27.25	54.50	0.00E+00	4.32E-05	8.64E-05	5.0000	2.032E+02
Kr-85	1.1958E-01	27.25	54.50	0.00E+00	3.26E+00	6.52E+00	7.0000	1.358E+01
Np-237	1.2513E-07	27.25	54.50	0.00E+00	3.41E-06	6.82E-06	11.0000	9.047E-01
Pa-231	1.2017E-04	27.25	54.50	0.00E+00	3.27E-03	6.55E-03		
Pb-210	1.1939E-08	27.25	54.50	0.00E+00	3.25E-07	6.51E-07		
Pm-147	3.6819E-03	27.25	54.50	0.00E+00	1.00E-01	2.01E-01		
Pu-238	4.5953E-04	27.25	54.50	0.00E+00	1.25E-02	2.50E-02		
Pu-239	2.7529E-05	27.25	54.50	0.00E+00	7.50E-04	1.50E-03		
Pu-240	1.6184E-05	27.25	54.50	0.00E+00	4.41E-04	8.82E-04		
Pu-241	2.3780E-03	27.25	54.50	0.00E+00	6.48E-02	1.30E-01		
Pu-242	4.0821E-08	27.25	54.50	0.00E+00	1.11E-06	2.22E-06		
Ra-226	1.4471E-08	27.25	54.50	0.00E+00	3.94E-07	7.89E-07		
Ra-228	4.5651E-06	27.25	54.50	0.00E+00	1.24E-04	2.49E-04		
Ru-106	3.8971E-08	27.25	54.50	0.00E+00	1.06E-06	2.12E-06		
Se-79	3.5417E-05	27.25	54.50	0.00E+00	9.65E-04	1.93E-03		
Sn-126	3.9848E-05	27.25	54.50	0.00E+00	1.09E-03	2.17E-03		
Sr-90	1.8940E+00	27.25	54.50	0.00E+00	5.16E+01	1.03E+02		
Tc-99	3.2534E-04	27.25	54.50	0.00E+00	8.87E-03	1.77E-02		
Th-229	4.6839E-05	27.25	54.50	0.00E+00	1.28E-03	2.55E-03		
Th-230	1.0322E-06	27.25	54.50	0.00E+00	2.81E-05	5.63E-05		
Th-232	-9.0328E-08	27.25	0.00	2.57E-02	2.57E-02	2.57E-02		
Ti-208	1.5386E-02	27.25	54.50	0.00E+00	4.19E-01	8.38E-01		
U-232	4.1639E-02	27.25	54.50	0.00E+00	1.13E+00	2.27E+00		
U-233	-3.3244E-03	27.25	0.00	8.66E+01	8.65E+01	8.66E+01		
U-234	8.1769E-04	27.25	54.50	0.00E+00	2.23E-02	4.46E-02		
U-235	5.7813E-08	27.25	54.50	1.77E-05	1.93E-05	2.09E-05		
U-236	1.3273E-07	27.25	54.50	0.00E+00	3.62E-06	7.23E-06		
U-238	-3.1121E-10	27.25	0.00	1.13E-05	1.13E-05	1.13E-05		
Y-90	1.8940E+00	27.25	54.50	0.00E+00	5.16E+01	1.03E+02		
Other Radionuclides					5.61E+01	1.12E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	NONE	ZIRC	This fuel matches on all parameters except cladding
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	89.895	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		27.25	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		54.50	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.01		1.00
Bounding	0.01		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: LOFT CENTER FUEL MODULE (A1,A2,A3 F1)  
 SNF ID #: 127  
 Fuel Units & Descr: 4 - 15 X 15 ROD ARRAY  
 Heavy Metal Mass: BOL=814 001kg, EOL=813.286kg  
 ROD Storage Srtc: INEEL

Fuel decay start date: 1975  
 Estimates as of: 2010  
 Template: PWR (Light Water Zirc, 0 to 5%, U)  
 Template Burnup (MWd): 61 92  
 Template BOL Heavy Metal Mass (MT): 0 00176911  
 Template Decay Time: 35 years

Estimated  
 Canister usage:  
 18"x10"  
 4 00

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)		
Ac-227	8 7758E-10	803 42	1,108 67	0 00E+00	7 05E-07	9 73E-07	Avg MeV	
Am-241	1 4352E-01	803 42	1,108 67	0 00E+00	1.15E+02	1 59E+02	0 0150	5 966E+13
Am-242m	2 8698E-04	803 42	1,108 67	0 00E+00	2 31E-01	3 18E-01	0 0250	1.203E+13
Am-243	6 2565E-04	803 42	1,108 67	0 00E+00	5 03E-01	6 94E-01	0 0375	1 147E+13
C-14	4 7901E-05	803 42	1,108 67	0 00E+00	3 85E-02	5 31E-02	0 0575	1 326E+13
Cl-36	8 0297E-07	803 42	1,108 67	0 00E+00	6 45E-04	8 90E-04	0 0850	6 675E+12
Cm-243	2 5081E-04	803 42	1,108 67	0 00E+00	2 02E-01	2 78E-01	0 1250	4 632E+12
Cm-244	4 9015E-02	803 42	1,108 67	0 00E+00	3 94E+01	5 43E+01	0 2250	5 725E+12
Co-60	2 5581E-03	803 42	1,108 67	0 00E+00	2 06E+00	2 84E+00	0 3750	2 461E+12
Cs-134	4 0536E-05	803 42	1,108 67	0 00E+00	3 26E-02	4 49E-02	0 5750	5.724E+13
Cs-135	1 4433E-05	803 42	1,108 67	0 00E+00	1 16E-02	1 60E-02	0 8500	7 919E+11
Cs-137	1 3979E+00	803 42	1,108 67	0 00E+00	1.12E+03	1 55E+03	1.2500	7 779E+11
Eu-154	2 0203E-02	803 42	1,108 67	0 00E+00	1.62E+01	2 24E+01	1 7500	2.329E+10
Eu-155	1 7684E-03	803 42	1,108 67	0 00E+00	1.42E+00	1 96E+00	2.2500	3.754E+06
Fe-55	4 3136E-05	803 42	1,108 67	0 00E+00	3 47E-02	4 78E-02	2.7500	7 686E+06
H-3	2 0769E-02	803 42	1,108 67	0 00E+00	1.67E+01	2 30E+01	3.5000	7 927E+05
I-129	9 8288E-07	803 42	1,108 67	0 00E+00	7 90E-04	1 09E-03	5 0000	3.389E+05
Kr-85	2 8214E-02	803 42	1,108 67	0 00E+00	2.27E+01	3 13E+01	7 0000	3.906E+04
Np-237	1 1218E-05	803 42	1,108 67	0 00E+00	9 01E-03	1 24E-02	11 0000	4 486E+03
Pa-231	1 3036E-09	803 42	1,108 67	0 00E+00	1 05E-06	1 45E-06		
Pb-210	8 5078E-11	803 42	1,108 67	0 00E+00	6 84E-08	9 43E-08		
Pm-147	3 6531E-04	803 42	1,108 67	0 00E+00	2 93E-01	4 05E-01		
Pu-238	7 4564E-02	803 42	1,108 67	0 00E+00	5 99E+01	8.27E+01		
Pu-239	1 1623E-02	803 42	1,108 67	0 00E+00	9.34E+00	1.29E+01		
Pu-240	1 5132E-02	803 42	1,108 67	0 00E+00	1.22E+01	1 68E+01		
Pu-241	9 0036E-01	803 42	1,108 67	0 00E+00	7.23E+02	9 98E+02		
Pu-242	6 4260E-05	803 42	1,108 67	0 00E+00	5 16E-02	7 12E-02		
Ra-226	2 2804E-10	803 42	1,108 67	0 00E+00	1.83E-07	2 53E-07		
Ra-228	5.2713E-12	803 42	1,108 67	0 00E+00	4.24E-09	5 84E-09		
Ru-106	6 1160E-10	803 42	1,108 67	0 00E+00	4 91E-07	6 78E-07		
Se-79	1 2377E-05	803 42	1,108 67	0 00E+00	9 94E-03	1 37E-02		
Sn-126	2 5210E-05	803 42	1,108 67	0 00E+00	2.03E-02	2.79E-02		
Sr-90	9 1667E-01	803 42	1,108 67	0 00E+00	7.36E+02	1.02E+03		
Tc-99	3 9357E-04	803 42	1,108 67	0 00E+00	3.16E-01	4.36E-01		
Th-229	1 2057E-10	803 42	1,108 67	0 00E+00	9 69E-08	1.34E-07		
Th-230	2 1043E-08	803 42	1,108 67	0 00E+00	1.69E-05	2 33E-05		
Th-232	5 2972E-12	803 42	1,108 67	0 00E+00	4.26E-09	5 87E-09		
Ti-208	1 7474E-07	803 42	1,108 67	0 00E+00	1.40E-04	1 94E-04		
U-232	4 7368E-07	803 42	1,108 67	0 00E+00	3 81E-04	5.25E-04		
U-233	2 5097E-08	803 42	1,108 67	0 00E+00	2.02E-05	2.78E-05		
U-234	5 0000E-05	803 42	1,108 67	0 00E+00	4 02E-02	5 54E-02		
U-235	-1.4489E-06	803 42	0 00	7.12E-02	7.00E-02	7.12E-02		
U-236	7 5824E-06	803 42	1,108 67	0 00E+00	6 09E-03	8 41E-03		
U-238	-2.6129E-07	803 42	0 00	2.63E-01	2.62E-01	2 63E-01		
Y-90	9 1699E-01	803 42	1,108 67	0 00E+00	7.37E+02	1.02E+03		
Other Radionuclides					1 08E+03	1.49E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	4 046614577	0 to 5	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	803 42	679.36	
Bounding	1 108.67	1,358 72	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 03	0.85	
Bounding	0 04	1.23	1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name LOFT CENTER FUEL MODULE (FP-1)  
SNF ID # 1061  
Fuel Units & Descr. 1 - 15 X 15 ROD ARRAY  
Heavy Metal Mass BOL=203.5kg EOL=203.322kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1975  
Estimates as of 2010  
Template PWR (Light Water, Zinc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd)- 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x10"  
0.50

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	8.7758E-10	200.85	277.17	0.00E+00	1.76E-07	2.43E-07	0.0150	1.491E+13
Am-241	1.4352E-01	200.85	277.17	0.00E+00	2.88E+01	3.98E+01	0.0250	3.007E+12
Am-242m	2.8698E-04	200.85	277.17	0.00E+00	5.76E-02	7.95E-02	0.0375	2.868E+12
Am-243	6.2565E-04	200.85	277.17	0.00E+00	1.26E-01	1.73E-01	0.0575	3.314E+12
C-14	4.7901E-05	200.85	277.17	0.00E+00	9.62E-03	1.33E-02	0.0850	1.669E+12
Cf-253	8.0297E-07	200.85	277.17	0.00E+00	1.61E-04	2.23E-04	0.1250	1.158E+12
Cm-243	2.5081E-04	200.85	277.17	0.00E+00	5.04E-02	6.95E-02	0.2250	1.431E+12
Cm-244	4.9015E-02	200.85	277.17	0.00E+00	9.84E+00	1.36E+01	0.3750	6.153E+11
Co-60	2.5581E-03	200.85	277.17	0.00E+00	5.14E-01	7.09E-01	0.5750	1.431E+13
Cs-134	4.0536E-05	200.85	277.17	0.00E+00	8.14E-03	1.12E-02	0.8500	1.980E+11
Cs-135	1.4433E-05	200.85	277.17	0.00E+00	2.90E-03	4.00E-03	1.2500	1.945E+11
Cs-137	1.3979E+00	200.85	277.17	0.00E+00	2.81E+02	3.87E+02	1.7500	5.824E+09
Eu-154	2.0203E-02	200.85	277.17	0.00E+00	4.06E+00	5.60E+00	2.2500	9.384E+05
Eu-155	1.7684E-03	200.85	277.17	0.00E+00	3.55E-01	4.90E-01	2.7500	1.922E+06
Fe-55	4.3136E-05	200.85	277.17	0.00E+00	8.66E-03	1.20E-02	3.5000	1.982E+05
H-3	2.0769E-02	200.85	277.17	0.00E+00	4.17E+00	5.76E+00	5.0000	8.473E+04
I-129	9.8288E-07	200.85	277.17	0.00E+00	1.97E-04	2.72E-04	7.0000	9.766E+03
Kr-85	2.8214E-02	200.85	277.17	0.00E+00	5.67E+00	7.82E+00	11.0000	1.122E+03
Np-237	1.1218E-05	200.85	277.17	0.00E+00	2.25E-03	3.11E-03		
Pa-231	1.3036E-09	200.85	277.17	0.00E+00	2.62E-07	3.61E-07		
Pb-210	8.5078E-11	200.85	277.17	0.00E+00	1.71E-08	2.36E-08		
Pm-147	3.6531E-04	200.85	277.17	0.00E+00	7.34E-02	1.01E-01		
Pu-238	7.4564E-02	200.85	277.17	0.00E+00	1.50E+01	2.07E+01		
Pu-239	1.1623E-02	200.85	277.17	0.00E+00	2.33E+00	3.22E+00		
Pu-240	1.5132E-02	200.85	277.17	0.00E+00	3.04E+00	4.19E+00		
Pu-241	9.0036E-01	200.85	277.17	0.00E+00	1.81E+02	2.50E+02		
Pu-242	6.4260E-05	200.85	277.17	0.00E+00	1.29E-02	1.78E-02		
Ra-226	2.2804E-10	200.85	277.17	0.00E+00	4.58E-08	6.32E-08		
Ra-228	5.2713E-12	200.85	277.17	0.00E+00	1.06E-09	1.46E-09		
Ru-106	6.1160E-10	200.85	277.17	0.00E+00	1.23E-07	1.70E-07		
Se-79	1.2377E-05	200.85	277.17	0.00E+00	2.49E-03	3.43E-03		
Sn-126	2.5210E-05	200.85	277.17	0.00E+00	5.06E-03	6.99E-03		
Sr-90	9.1667E-01	200.85	277.17	0.00E+00	1.84E+02	2.54E+02		
Tc-99	3.9357E-04	200.85	277.17	0.00E+00	7.91E-02	1.09E-01		
Th-229	1.2057E-10	200.85	277.17	0.00E+00	2.42E-08	3.34E-08		
Th-230	2.1043E-08	200.85	277.17	0.00E+00	4.23E-06	5.83E-06		
Th-232	5.2972E-12	200.85	277.17	0.00E+00	1.06E-09	1.47E-09		
Ti-208	1.7474E-07	200.85	277.17	0.00E+00	3.51E-05	4.84E-05		
U-232	4.7368E-07	200.85	277.17	0.00E+00	9.51E-05	1.31E-04		
U-233	2.5097E-08	200.85	277.17	0.00E+00	5.04E-06	6.96E-06		
U-234	5.0000E-05	200.85	277.17	0.00E+00	1.00E-02	1.39E-02		
U-235	-1.4489E-06	200.85	0.00	1.78E-02	1.75E-02	1.78E-02		
U-236	7.5824E-06	200.85	277.17	0.00E+00	1.52E-03	2.10E-03		
U-238	-2.6129E-07	200.85	0.00	6.56E-02	6.56E-02	6.56E-02		
Y-90	9.1699E-01	200.85	277.17	0.00E+00	1.84E+02	2.54E+02		
Other Radionuclides					2.70E+02	3.72E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	4.047	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	200.85	169.84	
Bounding	277.17	339.68	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.03	0.85	
Bounding	0.04	1.23	1.00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: LOFT CENTER FUEL MODULE FP-2 REMAINS  
 SNF ID #: 923  
 Fuel Units & Descr: 10 - CANISTER OF SCRAP  
 Heavy Metal Mass, BOL=99 951kg, EOL=99 899kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1975  
 Estimates as of: 2010  
 Template: PWR (Light Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
 Template BOL Heavy Metal Mass (MT): 0 00176911  
 Template Decay Time: 35 years

Estimated  
 Canister usage  
 18"x10"  
 1 00

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg. MeV	
Ac-227	8.7758E-10	49 45	98 90	0 00E+00	4 34E-08	8 68E-08	0 0150	5 322E+12
Am-241	1 4352E-01	49 45	98 90	0 00E+00	7 10E+00	1 42E+01	0 0250	1 073E+12
Am-242m	2 8698E-04	49 45	98 90	0 00E+00	1 42E-02	2 84E-02	0 0375	1 023E+12
Am-243	6.2565E-04	49 45	98 90	0 00E+00	3 09E-02	6.19E-02	0 0575	1 183E+12
C-14	4 7901E-05	49 45	98 90	0 00E+00	2 37E-03	4.74E-03	0 0850	5.955E+11
Cl-36	8 0297E-07	49 45	98 90	0 00E+00	3 97E-05	7.94E-05	0 1250	4 133E+11
Cm-243	2 5081E-04	49 45	98 90	0 00E+00	1.24E-02	2 48E-02	0 2250	5 110E+11
Cm-244	4 9015E-02	49 45	98 90	0 00E+00	2 42E+00	4 85E+00	0 3750	2 196E+11
Co-60	2 5581E-03	49 45	98 90	0 00E+00	1 26E-01	2.53E-01	0 5750	5 106E+12
Cs-134	4 0536E-05	49 45	98 90	0 00E+00	2 00E-03	4 01E-03	0 8500	7 064E+10
Cs-135	1 4433E-05	49 45	98 90	0 00E+00	7 14E-04	1 43E-03	1 2500	6.939E+10
Cs-137	1 3979E+00	49 45	98 90	0 00E+00	6 91E+01	1 38E+02	1 7500	2 078E+09
Eu-154	2 0203E-02	49 45	98 90	0 00E+00	9 99E-01	2 00E+00	2 2500	3.349E+05
Eu-155	1 7684E-03	49 45	98 90	0 00E+00	8.74E-02	1 75E-01	2 7500	6.857E+05
Fe-55	4 3136E-05	49 45	98 90	0 00E+00	2 13E-03	4.27E-03	3 5000	7 075E+04
H-3	2 0769E-02	49 45	98 90	0 00E+00	1 03E+00	2 05E+00	5 0000	3 025E+04
I-129	9 8288E-07	49 45	98 90	0 00E+00	4 86E-05	9 72E-05	7 0000	3 486E+03
Kr-85	2 8214E-02	49 45	98 90	0 00E+00	1 40E+00	2.79E+00	11 0000	4 004E+02
Np-237	1 1218E-05	49 45	98 90	0 00E+00	5.55E-04	1 11E-03		
Pa-231	1 3036E-09	49 45	98 90	0 00E+00	6.45E-08	1 29E-07		
Pb-210	8 5078E-11	49 45	98 90	0 00E+00	4.21E-09	8 41E-09		
Pm-147	3 6531E-04	49 45	98 90	0 00E+00	1 81E-02	3 61E-02		
Pu-238	7 4564E-02	49 45	98 90	0 00E+00	3 69E+00	7 37E+00		
Pu-239	1 1623E-02	49 45	98 90	0 00E+00	5.75E-01	1 15E+00		
Pu-240	1 5132E-02	49 45	98 90	0 00E+00	7.48E-01	1 50E+00		
Pu-241	9 0036E-01	49 45	98 90	0 00E+00	4 45E+01	8 90E+01		
Pu-242	6.4260E-05	49 45	98 90	0 00E+00	3.18E-03	6 36E-03		
Ra-226	2 2804E-10	49 45	98 90	0 00E+00	1.13E-08	2 26E-08		
Ra-228	5 2713E-12	49 45	98 90	0 00E+00	2 61E-10	5 21E-10		
Ru-106	6.1160E-10	49 45	98 90	0 00E+00	3 02E-08	6 05E-08		
Se-79	1.2377E-05	49 45	98 90	0 00E+00	6.12E-04	1 22E-03		
Sn-126	2 5210E-05	49 45	98 90	0 00E+00	1.25E-03	2 49E-03		
Sr-90	9 1667E-01	49 45	98 90	0 00E+00	4 53E+01	9 07E+01		
Tc-99	3.9357E-04	49 45	98 90	0 00E+00	1.95E-02	3 89E-02		
Th-229	1.2057E-10	49 45	98 90	0 00E+00	5 96E-09	1 19E-08		
Th-230	2.1043E-08	49 45	98 90	0 00E+00	1 04E-06	2 08E-06		
Th-232	5.2972E-12	49 45	98 90	0 00E+00	2 62E-10	5 24E-10		
Th-208	1.7474E-07	49 45	98 90	0 00E+00	8 64E-06	1 73E-05		
U-232	4 7368E-07	49 45	98 90	0 00E+00	2.34E-05	4 68E-05		
U-233	2.5097E-08	49 45	98 90	0 00E+00	1.24E-06	2 48E-06		
U-234	5 0000E-05	49 45	98 90	0 00E+00	2 47E-03	4 94E-03		
U-235	-1 4489E-06	49 45	0 00	2.10E-02	2.10E-02	2.10E-02		
U-236	7.5824E-06	49 45	98 90	0.00E+00	3 75E-04	7 50E-04		
U-238	-2 6129E-07	49 45	0 00	3.03E-02	3 03E-02	3 03E-02		
Y-90	9 1699E-01	49 45	98 90	0.00E+00	4 53E+01	9 07E+01		
Other Radionuclides					6 64E+01	1 33E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	974	0 to 5	

This Template was used for the following reasons:  
 This fuel matches PWR Template on all but one parameter (enrichment) making PWR a reasonable match.

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
	47 48	49 45	
Bounding		98 90	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.01	1 04	
Bounding	0.03		1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name LOFT CORNER FUEL MODULE  
SNF ID # 128  
Fuel Units & Descr: 4 - 11 X 11 ROD ARRAY  
Heavy Metal Mass BOL=279 864kg EOL=279 053kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1975  
Estimates as of: 2010  
Template PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 35 years

Estimated  
Canister usage:  
18"x10"  
2 00

II. Estimates	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	780.26	1,560.52	0 00E+00	6 85E-07	1.37E-06	Avg MeV	
Am-241	1 4352E-01	780.26	1,560.52	0 00E+00	1 12E+02	2.24E+02	0.0150	8.397E+13
Am-242m	2.8698E-04	780.26	1,560.52	0 00E+00	2 24E-01	4 48E-01	0.0250	1.693E+13
Am-243	6.2565E-04	780.26	1,560.52	0 00E+00	4 88E-01	9 76E-01	0.0375	1.615E+13
C-14	4 7901E-05	780.26	1,560.52	0 00E+00	3 74E-02	7 47E-02	0.0575	1.866E+13
Cl-36	8 0297E-07	780.26	1,560.52	0 00E+00	6 27E-04	1 25E-03	0.0850	9.395E+12
Cm-243	2 5081E-04	780.26	1,560.52	0 00E+00	1 96E-01	3 91E-01	0.1250	6.520E+12
Cm-244	4 9015E-02	780.26	1,560.52	0 00E+00	3 82E+01	7 65E+01	0.2250	8.057E+12
Co-60	2 5581E-03	780.26	1,560.52	0 00E+00	2 00E+00	3 99E+00	0.3750	3.464E+12
Cs-134	4 0536E-05	780.26	1,560.52	0 00E+00	3 16E-02	6 33E-02	0.5750	8.057E+13
Cs-135	1 4433E-05	780.26	1,560.52	0 00E+00	1.13E-02	2 25E-02	0.8500	1.115E+12
Cs-137	1.3979E+00	780.26	1,560.52	0 00E+00	1 09E+03	2 18E+03	1.2500	1.095E+12
Eu-154	2 0203E-02	780.26	1,560.52	0 00E+00	1 58E+01	3 15E+01	1.7500	3.279E+10
Eu-155	1 7684E-03	780.26	1,560.52	0 00E+00	1 38E+00	2 76E+00	2.2500	5.281E+06
Fe-55	4 3136E-05	780.26	1,560.52	0 00E+00	3.37E-02	6 73E-02	2.7500	1.082E+07
H-3	2 0769E-02	780.26	1,560.52	0 00E+00	1 62E+01	3.24E+01	3.5000	1.114E+06
I-129	9 8288E-07	780.26	1,560.52	0 00E+00	7.67E-04	1.53E-03	5.0000	4.764E+05
Kr-85	2 8214E-02	780.26	1,560.52	0 00E+00	2.20E+01	4 40E+01	7.0000	5.491E+04
Np-237	1 1218E-05	780.26	1,560.52	0 00E+00	8 75E-03	1.75E-02	11.0000	6.306E+03
Pa-231	1.3036E-09	780.26	1,560.52	0 00E+00	1 02E-06	2 03E-06		
Pb-210	8 5078E-11	780.26	1,560.52	0 00E+00	6 64E-08	1.33E-07		
Pm-147	3 6531E-04	780.26	1,560.52	0 00E+00	2 85E-01	5 70E-01		
Pu-238	7 4564E-02	780.26	1,560.52	0 00E+00	5 82E+01	1 16E+02		
Pu-239	1.1623E-02	780.26	1,560.52	0 00E+00	9 07E+00	1 81E+01		
Pu-240	1.5132E-02	780.26	1,560.52	0 00E+00	1 18E+01	2.36E+01		
Pu-241	9 0036E-01	780.26	1,560.52	0 00E+00	7 03E+02	1 41E+03		
Pu-242	6 4260E-05	780.26	1,560.52	0 00E+00	5 01E-02	1 00E-01		
Ra-226	2.2804E-10	780.26	1,560.52	0 00E+00	1 78E-07	3 56E-07		
Ra-228	5.2713E-12	780.26	1,560.52	0 00E+00	4 11E-09	8 23E-09		
Ru-106	6 1160E-10	780.26	1,560.52	0 00E+00	4 77E-07	9 54E-07		
Se-79	1.2377E-05	780.26	1,560.52	0 00E+00	9 66E-03	1 93E-02		
Sn-126	2 5210E-05	780.26	1,560.52	0 00E+00	1 97E-02	3 93E-02		
Sr-90	9 1667E-01	780.26	1,560.52	0 00E+00	7 15E+02	1 43E+03		
Tc-99	3 9357E-04	780.26	1,560.52	0 00E+00	3 07E-01	6 14E-01		
Th-229	1.2057E-10	780.26	1,560.52	0 00E+00	9 41E-08	1 88E-07		
Th-230	2 1043E-08	780.26	1,560.52	0 00E+00	1 64E-05	3.28E-05		
Th-232	5 2972E-12	780.26	1,560.52	0 00E+00	4.13E-09	8.27E-09		
Ti-208	1 7474E-07	780.26	1,560.52	0 00E+00	1.36E-04	2.73E-04		
U-232	4 7368E-07	780.26	1,560.52	0 00E+00	3 70E-04	7.39E-04		
U-233	2 5097E-08	780.26	1,560.52	0 00E+00	1.96E-05	3 92E-05		
U-234	5 0000E-05	780.26	1,560.52	0 00E+00	3.90E-02	7.80E-02		
U-235	-1.4489E-06	780.26	0.00	2 42E-02	2.31E-02	2 42E-02		
U-236	7.5824E-06	780.26	1,560.52	0 00E+00	5.92E-03	1 18E-02		
U-238	-2.6129E-07	780.26	0.00	9 03E-02	9 01E-02	9 03E-02		
Y-90	9 1699E-01	780.26	1,560.52	0 00E+00	7.15E+02	1.43E+03		
Other Radionuclides					1 05E+03	2 09E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	4 000514536	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	780.26	771.41	
Bounding		1,560.52	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.08	0.99	
Bounding	0.16		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: LOFT FUEL RODS  
SNF ID #: 924  
Fuel Units & Descr: 2 - ROD  
Heavy Metal Mass: BOL= , EOL=1 895kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1975  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 35 years

Estimated  
Canister usage  
18"x10"  
0 67

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	11.83	23 65	0 00E+00	1 04E-08	2 08E-08	Avg. MeV	
Am-241	1 4352E-01	11.83	23 65	0 00E+00	1 70E+00	3 39E+00	0 0150	1.273E+12
Am-242m	2 8698E-04	11.83	23 65	0 00E+00	3 39E-03	6 79E-03	0 0250	2.566E+11
Am-243	6 2565E-04	11.83	23 65	0 00E+00	7 40E-03	1 48E-02	0 0375	2 448E+11
C-14	4 7901E-05	11.83	23 65	0 00E+00	5 66E-04	1 13E-03	0 0575	2 828E+11
Cl-36	8 0297E-07	11.83	23 65	0 00E+00	9 50E-06	1 90E-05	0 0850	1 424E+11
Cm-243	2 5081E-04	11.83	23 65	0 00E+00	2 97E-03	5 93E-03	0 1250	9 882E+10
Cm-244	4 9015E-02	11 83	23 65	0 00E+00	5 80E-01	1 16E+00	0 2250	1.221E+11
Co-60	2 5581E-03	11 83	23 65	0 00E+00	3 03E-02	6 05E-02	0 3750	5 251E+10
Cs-134	4 0536E-05	11 83	23 65	0 00E+00	4 79E-04	9 59E-04	0 5750	1.221E+12
Cs-135	1 4433E-05	11 83	23 65	0 00E+00	1 71E-04	3 41E-04	0 8500	1 689E+10
Cs-137	1 3979E+00	11 83	23 65	0 00E+00	1 65E+01	3 31E+01	1 2500	1 660E+10
Eu-154	2 0203E-02	11 83	23 65	0 00E+00	2 39E-01	4 78E-01	1 7500	4 970E+08
Eu-155	1 7684E-03	11 83	23 65	0 00E+00	2 09E-02	4 18E-02	2.2500	8 003E+04
Fe-55	4 3136E-05	11 83	23 65	0 00E+00	5 10E-04	1 02E-03	2.7500	1 640E+05
H-3	2 0769E-02	11 83	23 65	0 00E+00	2 46E-01	4 91E-01	3.5000	1 688E+04
I-129	9 8288E-07	11 83	23 65	0 00E+00	1 16E-05	2 32E-05	5 0000	7.219E+03
Kr-85	2 8214E-02	11 83	23 65	0 00E+00	3 34E-01	6 67E-01	7 0000	8 320E+02
Np-237	1 1218E-05	11 83	23 65	0 00E+00	1 33E-04	2 65E-04	11 0000	9 556E+01
Pa-231	1 3036E-09	11 83	23 65	0 00E+00	1 54E-08	3 08E-08		
Pb-210	8 5078E-11	11 83	23 65	0 00E+00	1 01E-09	2 01E-09		
Pm-147	3 6531E-04	11 83	23 65	0 00E+00	4 32E-03	8 64E-03		
Pu-238	7 4564E-02	11 83	23 65	0 00E+00	8 82E-01	1 76E+00		
Pu-239	1 1623E-02	11 83	23 65	0 00E+00	1 37E-01	2 75E-01		
Pu-240	1 5132E-02	11 83	23 65	0 00E+00	1 79E-01	3 58E-01		
Pu-241	9 0036E-01	11 83	23 65	0 00E+00	1 06E+01	2 13E+01		
Pu-242	6 4260E-05	11 83	23 65	0 00E+00	7 60E-04	1 52E-03		
Ra-226	2 2804E-10	11 83	23.65	0 00E+00	2 70E-09	5 39E-09		
Ra-228	5 2713E-12	11 83	23 65	0 00E+00	6 23E-11	1 25E-10		
Ru-106	6 1160E-10	11 83	23 65	0 00E+00	7 23E-09	1 45E-08		
Se-79	1 2377E-05	11 83	23 65	0 00E+00	1 46E-04	2 93E-04		
Sn-126	2 5210E-05	11 83	23 65	0 00E+00	2 98E-04	5 96E-04		
Sr-90	9 1667E-01	11 83	23 65	0 00E+00	1 08E+01	2 17E+01		
Tc-99	3 9357E-04	11 83	23 65	0 00E+00	4 65E-03	9 31E-03		
Th-229	1 2057E-10	11 83	23 65	0 00E+00	1 43E-09	2 85E-09		
Th-230	2 1043E-08	11 83	23.65	0 00E+00	2 49E-07	4 98E-07		
Th-232	5 2972E-12	11 83	23.65	0 00E+00	6 26E-11	1 25E-10		
Ti-208	1 7474E-07	11 83	23.65	0 00E+00	2 07E-06	4 13E-06		
U-232	4 7368E-07	11 83	23.65	0 00E+00	5 60E-06	1 12E-05		
U-233	2 5097E-08	11 83	23 65	0 00E+00	2 97E-07	5 94E-07		
U-234	5 0000E-05	11 83	23 65	0 00E+00	5 91E-04	1 18E-03		
U-235	-1 4489E-06	11 83	0 00	1 32E-04	1 15E-04	1 32E-04		
U-236	7 5824E-06	11 83	23 65	0 00E+00	8 97E-05	1 79E-04		
U-238	-2 6129E-07	11 83	0 00	6 20E-04	6 17E-04	6 20E-04		
Y-90	9 1699E-01	11 83	23 65	0 00E+00	1 08E+01	2 17E+01		
Other Radionuclides					1 59E+01	3 17E+01		

Thermal Power  
Nominal Heat Output (Watts)  
Bounding Heat Output (Watts)  
2.72E-01  
5.44E-01  
Total  
Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	ZIRC	ZIRC	This fuel matches on all parameters except enrichment (unknown).
BOL HM Constituents	U	U	
BOL Enrichment %		0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		11 83	Nominal burnup taken from SFD and converted to MWd using BOL=1.907kg
Bounding		23 65	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.18		1 00
Bounding	0.35		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name LOFT SQUARE FUEL MODULE  
SNF ID # 129  
Fuel Units & Descr 4 - 15 X 15 ROD ARRAY  
Heavy Metal Mass BOL=815 6kg EOL=813 026kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1975  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 35 years

Estimated  
Canister usage:  
18"x10"  
4 00

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	8 7758E-10	2,447.37	4,894.74	0 00E+00	2.15E-06	4.30E-06	Avg MeV	
Am-241	1 4352E-01	2,447.37	4,894.74	0 00E+00	3 51E+02	7.03E+02	0 0150	2.634E+14
Am-242m	2 8698E-04	2,447.37	4,894.74	0.00E+00	7.02E-01	1.40E+00	0 0250	5.311E+13
Am-243	6.2565E-04	2,447.37	4,894.74	0.00E+00	1.53E+00	3.06E+00	0 0375	5.065E+13
C-14	4 7901E-05	2,447.37	4,894.74	0 00E+00	1.17E-01	2.34E-01	0 0575	5.853E+13
Cf-252	8 0297E-07	2,447.37	4,894.74	0 00E+00	1.97E-03	3 93E-03	0 0850	2.947E+13
Cm-243	2.5081E-04	2,447.37	4,894.74	0.00E+00	6.14E-01	1.23E+00	0 1250	2.045E+13
Cm-244	4 9015E-02	2,447.37	4,894.74	0 00E+00	1.20E+02	2.40E+02	0 2250	2.527E+13
Co-60	2.5581E-03	2,447.37	4,894.74	0 00E+00	6.26E+00	1.25E+01	0 3750	1.087E+13
Cs-134	4.0536E-05	2,447.37	4,894.74	0 00E+00	9.92E-02	1 98E-01	0 5750	2.527E+14
Cs-135	1.4433E-05	2,447.37	4,894.74	0 00E+00	3.53E-02	7 06E-02	0 8500	3 496E+12
Cs-137	1.3979E+00	2,447.37	4,894.74	0 00E+00	3 42E+03	6 84E+03	1.2500	3 434E+12
Eu-154	2 0203E-02	2,447.37	4,894.74	0 00E+00	4 94E+01	9 89E+01	1 7500	1.028E+11
Eu-155	1.7684E-03	2,447.37	4,894.74	0 00E+00	4 33E+00	8 66E+00	2.2500	1.656E+07
Fe-55	4.3136E-05	2,447.37	4,894.74	0 00E+00	1.06E-01	2 11E-01	2.7500	3.393E+07
H-3	2 0769E-02	2,447.37	4,894.74	0 00E+00	5 08E+01	1 02E+02	3.5000	3 495E+06
I-129	9 8288E-07	2,447.37	4,894.74	0 00E+00	2.41E-03	4 81E-03	5 0000	1.494E+06
Kr-85	2 8214E-02	2,447.37	4,894.74	0 00E+00	6.90E+01	1.38E+02	7 0000	1 722E+05
Np-237	1 1218E-05	2,447.37	4,894.74	0 00E+00	2 75E-02	5 49E-02	11 0000	1.978E+04
Pa-231	1.3036E-09	2,447.37	4,894.74	0 00E+00	3 19E-06	6 38E-06		
Pb-210	8 5078E-11	2,447.37	4,894.74	0 00E+00	2 08E-07	4 16E-07		
Pm-147	3 6531E-04	2,447.37	4,894.74	0 00E+00	8 94E-01	1 79E+00		
Pu-238	7 4564E-02	2,447.37	4,894.74	0 00E+00	1.82E+02	3 65E+02		
Pu-239	1 1623E-02	2,447.37	4,894.74	0 00E+00	2.84E+01	5 69E+01		
Pu-240	1.5132E-02	2,447.37	4,894.74	0 00E+00	3.70E+01	7 41E+01		
Pu-241	9 0036E-01	2,447.37	4,894.74	0 00E+00	2.20E+03	4 41E+03		
Pu-242	6 4260E-05	2,447.37	4,894.74	0 00E+00	1 57E-01	3 15E-01		
Ra-226	2.2804E-10	2,447.37	4,894.74	0 00E+00	5 58E-07	1 12E-06		
Ra-228	5 2713E-12	2,447.37	4,894.74	0 00E+00	1 29E-08	2 58E-08		
Ru-106	6 1160E-10	2,447.37	4,894.74	0 00E+00	1 50E-06	2 99E-06		
Se-79	1.2377E-05	2,447.37	4,894.74	0 00E+00	3 03E-02	6 06E-02		
Sn-126	2 5210E-05	2,447.37	4,894.74	0 00E+00	6 17E-02	1.23E-01		
Sr-90	9 1667E-01	2,447.37	4,894.74	0 00E+00	2.24E+03	4 49E+03		
Tc-99	3 9357E-04	2,447.37	4,894.74	0 00E+00	9 63E-01	1 93E+00		
Th-229	1 2057E-10	2,447.37	4,894.74	0 00E+00	2 95E-07	5 90E-07		
Th-230	2 1043E-08	2,447.37	4,894.74	0 00E+00	5 15E-05	1.03E-04		
Th-232	5 2972E-12	2,447.37	4,894.74	0 00E+00	1 30E-08	2.59E-08		
Ti-208	1 7474E-07	2,447.37	4,894.74	0 00E+00	4 28E-04	8.55E-04		
U-232	4 7368E-07	2,447.37	4,894.74	0 00E+00	1 16E-03	2.32E-03	Thermal Power	
U-233	2 5097E-08	2,447.37	4,894.74	0 00E+00	6 14E-05	1.23E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	5 0000E-05	2,447.37	4,894.74	0 00E+00	1.22E-01	2.45E-01	5.63E+01	1 13E+02
U-235	-1.4489E-06	2,447.37	0 00	7 05E-02	6 70E-02	7.05E-02	Total	Total
U-236	7 5824E-06	2,447.37	4,894.74	0 00E+00	1 86E-02	3 71E-02		
U-238	-2.6129E-07	2,447.37	0 00	2 63E-01	2 63E-01	2 63E-01		
Y-90	9 1699E-01	2,447.37	4,894.74	0 00E+00	2 24E+03	4 49E+03		
Other Radionuclides					3 29E+03	6.57E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	4	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
	2,418.25	2,447.37	
Bounding		4 894 74	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
	0 09	1 01	
Bounding	0 17	-	1.00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: LOOSE FUEL ROD STORAGE BASKET (LFRSB)  
SNF ID #: 126  
Fuel Units & Descr: 1 - SCRAP  
Heavy Metal Mass: BOL= , EOL=311 112kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1983  
Estimates as of: 2010  
Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 6 01  
Template BOL Heavy Metal Mass (MT): 0 00012882  
Template Decay Time: 25 years

Estimated  
Canister usage:  
18"x15"  
1 00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3562E-08	293,891.20	293,891.20	0 00E+00	3 99E-03	3 99E-03	Avg MeV	
Am-241	1 0168E-04	293,891.20	293,891.20	0 00E+00	2 99E+01	2 99E+01	0 0150	2 796E+16
Am-242m	8 9052E-09	293,891.20	293,891.20	0 00E+00	2.62E-03	2 62E-03	0 0250	5 810E+15
Am-243	9 8602E-10	293,891.20	293,891.20	0 00E+00	2.90E-04	2 90E-04	0 0375	5 015E+15
C-14	2.3045E-04	293,891.20	293,891.20	0 00E+00	6 77E+01	6 77E+01	0 0575	5 410E+15
Cl-36	1.2261E-06	293,891.20	293,891.20	0 00E+00	3 60E-01	3 60E-01	0 0850	3 272E+15
Cm-243	3 1730E-10	293,891.20	293,891.20	0 00E+00	9 33E-05	9.33E-05	0 1250	2 126E+15
Cm-244	3.3977E-09	293,891.20	293,891.20	0 00E+00	9 99E-04	9 99E-04	0.2250	2 807E+15
Co-60	2 6373E-01	293,891.20	293,891.20	0 00E+00	7 75E+04	7 75E+04	0 3750	1.225E+15
Cs-134	8 7072E-05	293,891.20	293 891.20	0 00E+00	2 56E+01	2 56E+01	0.5750	2 001E+16
Cs-135	3 0316E-05	293,891.20	293,891.20	0 00E+00	8 91E+00	8 91E+00	0 8500	2 087E+14
Cs-137	1 8286E+00	293,891.20	293,891.20	0 00E+00	5 37E+05	5 37E+05	1.2500	5 812E+15
Eu-154	1 4982E-03	293,891.20	293,891.20	0 00E+00	4 40E+02	4 40E+02	1 7500	5 375E+12
Eu-155	2 8236E-03	293,891.20	293,891.20	0 00E+00	8 30E+02	8 30E+02	2.2500	3 096E+10
Fe-55	1 7687E-02	293,891.20	293,891.20	0 00E+00	5.20E+03	5.20E+03	2.7500	3 407E+08
H-3	4 4043E-03	293,891.20	293,891.20	0 00E+00	1 29E+03	1.29E+03	3 5000	7 197E+04
I-129	7 3195E-07	293,891.20	293,891.20	0 00E+00	2.15E-01	2.15E-01	5 0000	7 292E+03
Kr-85	7 8769E-02	293,891.20	293,891.20	0 00E+00	2 31E+04	2.31E+04	7 0000	8 051E+02
Np-237	1 1484E-06	293,891.20	293,891.20	0 00E+00	3 38E-01	3.38E-01	11 0000	9 033E+01
Pa-231	3 2396E-08	293,891.20	293,891.20	0 00E+00	9 52E-03	9.52E-03		
Pb-210	2 4409E-13	293,891.20	293,891.20	0 00E+00	7.17E-08	7.17E-08		
Pm-147	1 6331E-02	293,891.20	293,891.20	0 00E+00	4 80E+03	4 80E+03		
Pu-238	3 1947E-04	293,891.20	293,891.20	0 00E+00	9 39E+01	9 39E+01		
Pu-239	6 6789E-04	293,891.20	293,891.20	0 00E+00	1 96E+02	1 96E+02		
Pu-240	8 6922E-05	293,891.20	293,891.20	0 00E+00	2 55E+01	2 55E+01		
Pu-241	1 1567E-03	293,891.20	293,891.20	0 00E+00	3 40E+02	3 40E+02		
Pu-242	1 9717E-09	293,891.20	293 891.20	0 00E+00	5.79E-04	5.79E-04		
Ra-226	8 6190E-13	293,891.20	293,891.20	0 00E+00	2 53E-07	2.53E-07		
Ra-228	8 1498E-12	293,891.20	293,891.20	0 00E+00	2.40E-06	2.40E-06		
Ru-106	1 7770E-07	293,891.20	293,891.20	0 00E+00	5 22E-02	5.22E-02		
Se-79	1 3225E-05	293,891.20	293,891.20	0 00E+00	3 89E+00	3 89E+00		
Sn-126	1 1493E-05	293,891.20	293,891.20	0 00E+00	3 38E+00	3 38E+00		
Sr-90	1 7321E+00	293,891.20	293,891.20	0 00E+00	5 09E+05	5 09E+05		
Tc-99	4 6656E-04	293,891.20	293,891.20	0 00E+00	1 37E+02	1 37E+02		
Th-229	1 0110E-11	293,891.20	293,891.20	0 00E+00	2.97E-06	2.97E-06		
Th-230	1 1466E-10	293,891.20	293,891.20	0 00E+00	3.37E-05	3.37E-05		
Th-232	8 3245E-12	293,891.20	293,891.20	0 00E+00	2.45E-06	2 45E-06		
Ti-208	2 3860E-08	293,891.20	293,891.20	0 00E+00	7.01E-03	7.01E-03		
U-232	6 4576E-08	293,891.20	293,891.20	0 00E+00	1.90E-02	1.90E-02	Thermal Power	
U-233	3 1082E-09	293,891.20	293,891.20	0 00E+00	9.13E-04	9.13E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	3 7587E-07	293,891.20	293,891.20	0 00E+00	1.10E-01	1.10E-01	7.29E+03	7.29E+03
U-235	-2 7761E-06	293,891.20	0 00	1.26E+00	4.41E-01	1.26E+00	Total	Total
U-236	1 6190E-05	293,891.20	293,891.20	0 00E+00	4 76E+00	4 76E+00		
U-238	-2 8547E-09	293,891.20	0 00	1 36E-02	1.27E-02	1.36E-02		
Y-90	1 7321E+00	293,891.20	293,891.20	0 00E+00	5 09E+05	5 09E+05		
Other Radionuclides					5 96E+05	5 96E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
Fuel Cladding	UNKNOWN	SST	This fuel matches on all parameters except cladding (SST is conservative) and enrichment (unknown).
BOL HM Constituents	U	U	
BOL Enrichment %		60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		293 891.20	Nominal burnup set equal to bounding burnup.
Bounding		293 891.20	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	10 12		1 02
Bounding	10 12		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: LWR SNF SCRAP (ZRSST)  
SNF ID #: 940  
Fuel Units & Descr: 9 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL=161.862kg, EOL=154.224kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 1983  
Estimates as of 2010  
Template PWR (Light Water, Zinc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 25 years

Estimated  
Canister usage:  
18"x10"  
0.69

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	7.263 66	14,527.32	0.00E+00	4.82E-06	9.64E-06	Avg MeV	
Am-241	1.3144E-01	7.263 66	14,527.32	0.00E+00	9.55E+02	1.91E+03	0.0150	9.879E+14
Am-242m	3.0039E-04	7.263 66	14,527.32	0.00E+00	2.18E+00	4.36E+00	0.0250	2.001E+14
Am-243	6.2629E-04	7.263 66	14,527.32	0.00E+00	4.55E+00	9.10E+00	0.0375	1.936E+14
C-14	4.7965E-05	7.263 66	14,527.32	0.00E+00	3.48E-01	6.97E-01	0.0575	2.112E+14
Cl-36	8.0297E-07	7.263 66	14,527.32	0.00E+00	5.83E-03	1.17E-02	0.0850	1.119E+14
Cm-243	3.1993E-04	7.263 66	14,527.32	0.00E+00	2.32E+00	4.65E+00	0.1250	8.177E+13
Cm-244	7.1851E-02	7.263 66	14,527.32	0.00E+00	5.22E+02	1.04E+03	0.2250	9.609E+13
Co-60	9.5220E-03	7.263 66	14,527.32	0.00E+00	6.92E+01	1.38E+02	0.3750	4.123E+13
Cs-134	1.1662E-03	7.263 66	14,527.32	0.00E+00	8.47E+00	1.69E+01	0.5750	9.474E+14
Cs-135	1.4433E-05	7.263 66	14,527.32	0.00E+00	1.05E-01	2.10E-01	0.8500	1.870E+13
Cs-137	1.7603E+00	7.263 66	14,527.32	0.00E+00	1.28E+04	2.56E+04	1.2500	2.526E+13
Eu-154	4.5203E-02	7.263 66	14,527.32	0.00E+00	3.28E+02	6.57E+02	1.7500	5.535E+11
Eu-155	7.1479E-03	7.263 66	14,527.32	0.00E+00	5.19E+01	1.04E+02	2.2500	1.022E+08
Fe-55	6.1919E-04	7.263 66	14,527.32	0.00E+00	4.50E+00	9.00E+00	2.7500	1.149E+08
H-3	3.6386E-02	7.263 66	14,527.32	0.00E+00	2.64E+02	5.29E+02	3.5000	1.506E+07
I-129	9.8288E-07	7.263 66	14,527.32	0.00E+00	7.14E-03	1.43E-02	5.0000	6.434E+06
Kr-85	5.3844E-02	7.263 66	14,527.32	0.00E+00	3.91E+02	7.82E+02	7.0000	7.418E+05
Np-237	1.0546E-05	7.263 66	14,527.32	0.00E+00	7.66E-02	1.53E-01	11.0000	8.521E+04
Pa-231	1.1370E-09	7.263 66	14,527.32	0.00E+00	8.26E-06	1.65E-05		
Pb-210	3.3624E-11	7.263 66	14,527.32	0.00E+00	2.44E-07	4.88E-07		
Pm-147	5.1211E-03	7.263 66	14,527.32	0.00E+00	3.72E+01	7.44E+01		
Pu-238	8.0669E-02	7.263 66	14,527.32	0.00E+00	5.86E+02	1.17E+03		
Pu-239	1.1626E-02	7.263 66	14,527.32	0.00E+00	8.44E+01	1.69E+02		
Pu-240	1.5097E-02	7.263 66	14,527.32	0.00E+00	1.10E+02	2.19E+02		
Pu-241	1.4567E+00	7.263 66	14,527.32	0.00E+00	1.06E+04	2.12E+04		
Pu-242	6.4260E-05	7.263 66	14,527.32	0.00E+00	4.67E-01	9.34E-01		
Ra-226	1.1392E-10	7.263 66	14,527.32	0.00E+00	8.27E-07	1.65E-06		
Ra-228	5.1841E-12	7.263 66	14,527.32	0.00E+00	3.77E-08	7.53E-08		
Ru-106	5.9012E-07	7.263 66	14,527.32	0.00E+00	4.29E-03	8.57E-03		
Se-79	1.2379E-05	7.263 66	14,527.32	0.00E+00	8.99E-02	1.80E-01		
Sn-126	2.5210E-05	7.263 66	14,527.32	0.00E+00	1.83E-01	3.66E-01		
Sr-90	1.1630E+00	7.263 66	14,527.32	0.00E+00	8.45E+03	1.69E+04		
Tc-99	3.9357E-04	7.263 66	14,527.32	0.00E+00	2.86E+00	5.72E+00		
Th-229	8.5691E-11	7.263 66	14,527.32	0.00E+00	6.22E-07	1.24E-06		
Th-230	1.4493E-08	7.263 66	14,527.32	0.00E+00	1.05E-04	2.11E-04		
Th-232	5.2923E-12	7.263 66	14,527.32	0.00E+00	3.84E-08	7.69E-08		
Ti-208	1.9202E-07	7.263 66	14,527.32	0.00E+00	1.39E-03	2.79E-03		
U-232	5.2083E-07	7.263 66	14,527.32	0.00E+00	3.78E-03	7.57E-03		
U-233	2.4386E-08	7.263 66	14,527.32	0.00E+00	1.77E-04	3.54E-04		
U-234	4.7012E-05	7.263 66	14,527.32	0.00E+00	3.41E-01	6.83E-01		
U-235	-1.4492E-06	7.263 66	0.00	1.37E-02	3.20E-03	1.37E-02		
U-236	7.5759E-06	7.263 66	14,527.32	0.00E+00	5.50E-02	1.10E-01		
U-238	-2.6129E-07	7.263 66	0.00	5.23E-02	5.04E-02	5.23E-02		
Y-90	1.1631E+00	7.263 66	14,527.32	0.00E+00	8.45E+03	1.69E+04		
Other Radionuclides					1.23E+04	2.45E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC OR SST	ZIRC	This Template was used for the following reasons
BOL HM Constituents	U	U	This fuel matches on all parameters except possibly cladding
BOL Enrichment %	3.923	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		7.263 66	
Bounding		14,527.32	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.28		1.00
Bounding	2.56		

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other data confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: MISCELLANEOUS RSWF FUEL  
SNF ID #: 366  
Fuel Units & Descr: 1 - UNKNOWN  
Heavy Metal Mass, BOL = : EOL=4161.515kg  
ROD Storage Site: INEEL

Fuel decay start date: 1994  
Estimates as of: 2010  
Template: FFTF (FAST, SST, 10 to 30%, Pu & U)  
Template Burnup (MWd): 5011.2  
Template BOL Heavy Metal Mass (MT): 0.0329181  
Template Decay Time: 15 years

Estimated  
Canister usage:  
18"x10"  
2.00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3735E-12	12,522.18	28,967.98	0.00E+00	1.72E-08	3.98E-08	Avg. MeV	
Am-241	7.9527E-02	12,522.18	28,967.98	8.05E+03	9.04E+03	1.04E+04	0.0150	1.869E+15
Am-242m	2.1053E-03	12,522.18	28,967.98	0.00E+00	2.64E+01	6.10E+01	0.0250	3.213E+14
Am-243	1.0760E-04	12,522.18	28,967.98	0.00E+00	1.35E+00	3.12E+00	0.0375	3.599E+14
C-14	2.6141E-05	12,522.18	28,967.98	0.00E+00	3.27E-01	7.57E-01	0.0575	4.118E+14
Cl-36	3.4243E-10	12,522.18	28,967.98	0.00E+00	4.29E-06	9.92E-06	0.0850	1.791E+14
Cm-243	6.6092E-04	12,522.18	28,967.98	0.00E+00	8.28E+00	1.91E+01	0.1250	1.340E+14
Cm-244	2.9933E-03	12,522.18	28,967.98	0.00E+00	3.75E+01	8.67E+01	0.2250	1.356E+14
Co-60	1.5934E-02	12,522.18	28,967.98	0.00E+00	2.00E+02	4.62E+02	0.3750	6.983E+13
Cs-134	4.6356E-02	12,522.18	28,967.98	0.00E+00	5.80E+02	1.34E+03	0.5750	2.328E+15
Cs-135	4.7693E-05	12,522.18	28,967.98	0.00E+00	5.97E-01	1.38E+00	0.8500	7.792E+13
Cs-137	2.1113E+00	12,522.18	28,967.98	0.00E+00	2.64E+04	6.12E+04	1.2500	6.784E+13
Eu-154	4.8092E-02	12,522.18	28,967.98	0.00E+00	6.02E+02	1.39E+03	1.7500	1.114E+12
Eu-155	6.8447E-02	12,522.18	28,967.98	0.00E+00	8.57E+02	1.98E+03	2.2500	3.755E+10
Fe-55	5.8479E-03	12,522.18	28,967.98	0.00E+00	7.32E+01	1.69E+02	2.7500	3.933E+09
H-3	8.9300E-03	12,522.18	28,967.98	0.00E+00	1.12E+02	2.59E+02	3.5000	4.596E+08
I-129	1.2891E-06	12,522.18	28,967.98	0.00E+00	1.61E-02	3.73E-02	5.0000	8.673E+06
Kr-85	7.0941E-02	12,522.18	28,967.98	0.00E+00	8.88E+02	2.06E+03	7.0000	9.878E+05
Np-237	2.6541E-06	12,522.18	28,967.98	0.00E+00	3.32E-02	7.69E-02	11.0000	1.129E+05
Pa-231	4.8970E-12	12,522.18	28,967.98	0.00E+00	6.13E-08	1.42E-07		
Pb-210	2.2170E-13	12,522.18	28,967.98	0.00E+00	2.78E-09	6.42E-09		
Pm-147	2.3617E-01	12,522.18	28,967.98	0.00E+00	2.96E+03	6.84E+03		
Pu-238	2.8636E-02	12,522.18	28,967.98	0.00E+00	3.59E+02	8.30E+02		
Pu-239	-3.5520E-02	12,522.18	0.00	6.61E+04	6.56E+04	6.61E+04		
Pu-240	2.0790E-02	12,522.18	28,967.98	3.36E+04	3.38E+04	3.42E+04		
Pu-241	-4.8316E-01	12,522.18	0.00	1.51E+06	1.50E+06	1.51E+06		
Pu-242	1.1052E-05	12,522.18	28,967.98	8.95E+00	9.09E+00	9.27E+00		
Ra-226	5.7471E-13	12,522.18	28,967.98	0.00E+00	7.20E-09	1.66E-08		
Ra-228	5.4957E-17	12,522.18	28,967.98	0.00E+00	6.88E-13	1.59E-12		
Ru-106	1.4582E-02	12,522.18	28,967.98	0.00E+00	1.83E+02	4.22E+02		
Se-79	1.0137E-05	12,522.18	28,967.98	0.00E+00	1.27E-01	2.94E-01		
Sn-126	4.3922E-05	12,522.18	28,967.98	0.00E+00	5.50E-01	1.27E+00		
Sr-90	7.6329E-01	12,522.18	28,967.98	0.00E+00	9.56E+03	2.21E+04		
Tc-99	3.9412E-04	12,522.18	28,967.98	0.00E+00	4.94E+00	1.14E+01		
Th-229	1.6457E-12	12,522.18	28,967.98	0.00E+00	2.06E-08	4.77E-08		
Th-230	1.8822E-10	12,522.18	28,967.98	0.00E+00	2.36E-06	5.45E-06		
Th-232	9.7601E-17	12,522.18	28,967.98	0.00E+00	1.22E-12	2.83E-12		
Th-208	5.2722E-07	12,522.18	28,967.98	0.00E+00	6.60E-03	1.53E-02		
U-232	1.4925E-06	12,522.18	28,967.98	0.00E+00	1.87E-02	4.32E-02		
U-233	2.1113E-10	12,522.18	28,967.98	0.00E+00	2.64E-06	6.12E-06		
U-234	1.9528E-06	12,522.18	28,967.98	0.00E+00	2.45E-02	5.66E-02		
U-235	-9.7920E-09	12,522.18	0.00	1.36E-02	1.34E-02	1.36E-02		
U-236	1.1570E-07	12,522.18	28,967.98	0.00E+00	1.45E-03	3.35E-03		
U-238	-1.7914E-07	12,522.18	0.00	9.87E-01	9.85E-01	9.87E-01		
Y-90	7.6329E-01	12,522.18	28,967.98	0.00E+00	9.56E+03	2.21E+04		
Other Radionuclides					2.71E+04	6.28E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown) and BOL heavy metal (it is mostly U with a little Pu).
Reactor Moderator:	From SFD FAST	Used FAST	
Fuel Cladding:	SST	SST	
BOL HM Constituents:	UNKNOWN	Pu and U	
BOL Enrichment %:		10 to 30	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate: Nominal burnup taken from SFD and converted to MWd using BOL=4174.061kg Bounding burnup taken from SFD and converted to MWd using BOL=4174.061kg
Nominal	From SFD	Estimated	
Bounding		28,967.98	

Checks			Estimated EOL HM/Given EOL HM 1.00
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Bounding	0.02 0.05		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name MISCELLANEOUS TREAT FUEL (MOX)  
SNF ID #: 369  
Fuel Units & Descr: 1 - UNKNOWN  
Heavy Metal Mass BOL= , EOL=0 12kg  
ROD Storage Site INEEL

Fuel decay start date: 1994  
Estimates as of: 2010  
Template (Worst Case)  
Template Burnup(MWd): 62.5  
Template BOL Heavy Metal Mass (MT): 0 00186865  
Template Decay Time: 15 years

Estimated  
Canister usage:  
18"x10"  
0 01

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	1 4157E-06	114 14	114 14	0 00E+00	1 62E-04	1 62E-04	Avg MeV	
Am-241	6 2608E+00	114 14	114 14	0 00E+00	7 15E+02	7 15E+02	0 0150	2 995E+14
Am-242m	1 8448E-02	114 14	114 14	0 00E+00	2 11E+00	2 11E+00	0 0250	5 846E+13
Am-243	1 6352E-02	114 14	114 14	0 00E+00	1 87E+00	1 87E+00	0 0375	5 221E+13
C-14	1 2112E-01	114 14	114 14	0 00E+00	1 38E+01	1 38E+01	0 0575	6 027E+13
Cl-36	2 2860E-03	114 14	114 14	0 00E+00	2 61E-01	2 61E-01	0 0850	2 903E+13
Cm-243	1 4088E-03	114 14	114 14	0 00E+00	1 61E-01	1 61E-01	0 1250	2 823E+13
Cm-244	3 6224E-01	114 14	114 14	0 00E+00	4 13E+01	4 13E+01	0 2250	2 283E+13
Co-60	3 8998E-02	114 14	114 14	0 00E+00	4 45E+04	4 45E+04	0 3750	9 530E+12
Cs-134	2 8276E-01	114 14	114 14	0 00E+00	3 23E+01	3 23E+01	0 5750	1 464E+14
Cs-135	4 3976E-04	114 14	114 14	0 00E+00	5 02E-02	5 02E-02	0 8500	1 526E+13
Cs-137	3 3405E+01	114 14	114 14	0 00E+00	3 81E+03	3 81E+03	1 2500	3 308E+15
Eu-154	6 2585E+00	114 14	114 14	0 00E+00	7 14E+02	7 14E+02	1 7500	4 548E+11
Eu-155	1 1271E+00	114 14	114 14	0 00E+00	1 29E+02	1 29E+02	2 2500	1 755E+10
Fe-55	6 0624E+01	114 14	114 14	0 00E+00	6 92E+03	6 92E+03	2 7500	4 829E+08
H-3	7 4678E-01	114 14	114 14	0 00E+00	8 52E+01	8 52E+01	3 5000	1 045E+06
I-129	1 0618E-05	114 14	114 14	0 00E+00	1 21E-03	1 21E-03	5 0000	2 536E+05
Kr-85	2 1802E+00	114 14	114 14	0 00E+00	2 49E+02	2 49E+02	7 0000	2 918E+04
Np-237	1 5626E-04	114 14	114 14	0 00E+00	1 78E-02	1 78E-02	11 0000	3 348E+03
Pa-231	2 8608E-06	114 14	114 14	0 00E+00	3 27E-04	3 27E-04		
Pb-210	2 0448E-09	114 14	114 14	0 00E+00	2 33E-07	2 33E-07		
Pm-147	3 3212E+00	114 14	114 14	0 00E+00	3 79E+02	3 79E+02		
Pu-238	-3 5400E-01	114 14	0 00	3 09E+01	0 00E+00	3 09E+01		
Pu-239	-4 8280E-02	114 14	0 00	3 74E+00	0 00E+00	3 74E+00		
Pu-240	-3 0095E-01	114 14	0 00	4 77E+00	0 00E+00	4 77E+00		
Pu-241	-2 5280E+01	114 14	0 00	1 23E+03	0 00E+00	1 23E+03		
Pu-242	-1 1381E-04	114 14	0 00	2 06E-02	7 66E-03	2 06E-02		
Ra-226	1 0977E-08	114 14	114 14	0 00E+00	1 25E-06	1 25E-06		
Ra-228	5 4624E-07	114 14	114 14	0 00E+00	6 23E-05	6 23E-05		
Ru-106	3 7939E-03	114 14	114 14	0 00E+00	4 33E-01	4 33E-01		
Se-79	1 9186E-04	114 14	114 14	0 00E+00	2 19E-02	2 19E-02		
Sn-126	1 6673E-04	114 14	114 14	0 00E+00	1 90E-02	1 90E-02		
Sr-90	3 1860E+01	114 14	114 14	0 00E+00	3 64E+03	3 64E+03		
Tc-99	6 7678E-03	114 14	114 14	0 00E+00	7 72E-01	7 72E-01		
Th-229	7 2928E-07	114 14	114 14	0 00E+00	8 32E-05	8 32E-05		
Th-230	2 4191E-06	114 14	114 14	0 00E+00	2 76E-04	2 76E-04		
Th-232	6 0208E-07	114 14	114 14	0 00E+00	6 87E-05	6 87E-05		
Ti-208	1 0599E-04	114 14	114 14	0 00E+00	1 21E-02	1 21E-02		
U-232	2 8743E-04	114 14	114 14	0 00E+00	3 28E-02	3 28E-02	Thermal Power	
U-233	3 6128E-04	114 14	114 14	0 00E+00	4 12E-02	4 12E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 2788E-02	114 14	114 14	0 00E+00	1 46E+00	1 46E+00	7 74E+02	7 75E+02
U-235	5 7486E-04	114 14	114 14	1 03E-04	6 57E-02	6 57E-02	Total	Total
U-236	2 3485E-04	114 14	114 14	0 00E+00	2 68E-02	2 68E-02		
U-238	1 1581E-04	114 14	114 14	1 29E-05	1 32E-02	1 32E-02		
Y-90	3 1860E+01	114 14	114 14	0 00E+00	3 64E+03	3 64E+03		
Other Radionuclides					9 17E+03	9 17E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	GRAPHITE	(Worst Case)	
Fuel Cladding	UNKNOWN	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	

This fuel didn't closely match any existing templates therefore the worst case template was used.

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		114 14	
Bounding		114 14	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	14 21		
Bounding	14 21		591 64

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: MISCELLANEOUS TREAT FUEL (U-METAL)  
 SNF ID #: 905  
 Fuel Units & Descr.: 1 - UNKNOWN  
 Heavy Metal Mass: BOL= , EOL=0.12kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1994  
 Estimates as of: 2010  
 Template: N-Reactor (Graphite, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 69600  
 Template BOL Heavy Metal Mass (MT): 11.6  
 Template Decay Time: 15 years

Estimated  
 Canister usage:  
 18"x10"  
 0.01

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00	Avg. MeV	
Am-241	7.2313E-02	126.70	126.70	0.00E+00	9.16E+00	9.16E+00	0.0150	8.322E+12
Am-242m	6.2011E-05	126.70	126.70	0.00E+00	7.86E-03	7.86E-03	0.0250	1.708E+12
Am-243	4.6336E-05	126.70	126.70	0.00E+00	5.87E-03	5.87E-03	0.0375	1.593E+12
C-14	9.2170E-05	126.70	126.70	0.00E+00	1.17E-02	1.17E-02	0.0575	1.710E+12
Cl-36	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00	0.0850	9.536E+11
Cm-243	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00	0.1250	6.513E+11
Cm-244	7.4511E-04	126.70	126.70	0.00E+00	9.44E-02	9.44E-02	0.2250	8.195E+11
Co-60	3.4842E-04	126.70	126.70	0.00E+00	4.41E-02	4.41E-02	0.3750	3.536E+11
Cs-134	1.0795E-03	126.70	126.70	0.00E+00	1.37E-01	1.37E-01	0.5750	7.554E+12
Cs-135	1.0666E-05	126.70	126.70	0.00E+00	1.28E-03	1.28E-03	0.8500	1.036E+11
Cs-137	1.6092E+00	126.70	126.70	0.00E+00	2.04E+02	2.04E+02	1.2500	6.918E+10
Eu-154	1.8822E-02	126.70	126.70	0.00E+00	2.38E+00	2.38E+00	1.7500	2.863E+09
Eu-155	1.7672E-03	126.70	126.70	0.00E+00	2.24E-01	2.24E-01	2.2500	2.188E+05
Fe-55	9.0172E-05	126.70	126.70	0.00E+00	1.14E-02	1.14E-02	2.7500	7.870E+03
H-3	4.3506E-03	126.70	126.70	0.00E+00	5.51E-01	5.51E-01	3.5000	3.692E+03
I-129	8.6006E-07	126.70	126.70	0.00E+00	1.09E-04	1.09E-04	5.0000	1.326E+03
Kr-85	6.1652E-02	126.70	126.70	0.00E+00	7.81E+00	7.81E+00	7.0000	1.510E+02
Np-237	7.7672E-06	126.70	126.70	0.00E+00	9.84E-04	9.84E-04	11.0000	1.724E+01
Pa-231	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Pb-210	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Pm-147	1.8175E-02	126.70	126.70	0.00E+00	2.30E+00	2.30E+00		
Pu-238	2.2170E-02	126.70	126.70	0.00E+00	2.81E+00	2.81E+00		
Pu-239	2.8836E-02	126.70	126.70	0.00E+00	3.65E+00	3.65E+00		
Pu-240	2.2830E-02	126.70	126.70	0.00E+00	2.89E+00	2.89E+00		
Pu-241	1.1362E+00	126.70	126.70	0.00E+00	1.44E+02	1.44E+02		
Pu-242	1.4526E-05	126.70	126.70	0.00E+00	1.84E-03	1.84E-03		
Ra-226	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Ra-228	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Ru-106	4.2672E-06	126.70	126.70	0.00E+00	5.41E-04	5.41E-04		
Se-79	1.0901E-05	126.70	126.70	0.00E+00	1.38E-03	1.38E-03		
Sn-126	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Sr-90	1.1546E+00	126.70	126.70	0.00E+00	1.46E+02	1.46E+02		
Tc-99	3.6494E-04	126.70	126.70	0.00E+00	4.62E-02	4.62E-02		
Th-229	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Th-230	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Th-232	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
Ti-208	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
U-232	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
U-233	0.0000E+00	126.70	126.70	0.00E+00	0.00E+00	0.00E+00		
U-234	6.3994E-05	126.70	126.70	0.00E+00	8.11E-03	8.11E-03		
U-235	-1.2944E-06	126.70	0.00	4.92E-06	0.00E+00	4.92E-06		
U-236	1.1932E-05	126.70	126.70	0.00E+00	1.51E-03	1.51E-03		
U-238	-3.0619E-07	126.70	0.00	7.99E-05	4.11E-05	7.99E-05		
Y-90	1.1550E+00	126.70	126.70	0.00E+00	1.46E+02	1.46E+02		
Other Radionuclides					1.95E+02	1.95E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.61E+00	2.61E+00
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	GRAPHITE	GRAPHITE	This Template was used for the following reasons:
Fuel Cladding	UNKNOWN	ZIRC	This fuel matches on all parameters except cladding (unknown) and enrichment (unknown).
BOL HM Constituents	U	U	
BOL Enrichment %		0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		126.70	Nominal burnup set equal to bounding burnup.
Bounding		126.70	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	87.91		1.84
Bounding	87.91		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name MTR CANAL SCRAP  
SNF ID # 1062  
Fuel Units & Descr. 105 - CANISTER OF SCRAP  
Heavy Metal Mass BOL = 265.975kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1979  
Estimates as of. 2010  
Template PWR (Light Water, Zinc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 25 years

Estimated  
Canister usage  
HIC  
105 00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	266.26	532.51	0.00E+00	1.77E-07	3.53E-07	Avg MeV	
Am-241	1.3144E-01	266.26	532.51	0.00E+00	3.50E+01	7.00E+01	0.0150	3.621E+13
Am-242m	3.0039E-04	266.26	532.51	0.00E+00	8.00E-02	1.60E-01	0.0250	7.334E+12
Am-243	6.2629E-04	266.26	532.51	0.00E+00	1.67E-01	3.34E-01	0.0375	7.098E+12
C-14	4.7965E-05	266.26	532.51	0.00E+00	1.28E-02	2.55E-02	0.0575	7.744E+12
Cf-253	8.0297E-07	266.26	532.51	0.00E+00	2.14E-04	4.28E-04	0.0850	4.103E+12
Cm-243	3.1993E-04	266.26	532.51	0.00E+00	8.52E-02	1.70E-01	0.1250	2.997E+12
Cm-244	7.1851E-02	266.26	532.51	0.00E+00	1.91E+01	3.83E+01	0.2250	3.523E+12
Co-60	9.5220E-03	266.26	532.51	0.00E+00	2.54E+00	5.07E+00	0.3750	1.511E+12
Cs-134	1.1662E-03	266.26	532.51	0.00E+00	3.11E-01	6.21E-01	0.5750	3.473E+13
Cs-135	1.4433E-05	266.26	532.51	0.00E+00	3.84E-03	7.69E-03	0.8500	6.855E+11
Cs-137	1.7603E+00	266.26	532.51	0.00E+00	4.69E+02	9.37E+02	1.2500	9.259E+11
Eu-154	4.5203E-02	266.26	532.51	0.00E+00	1.20E+01	2.41E+01	1.7500	2.029E+10
Eu-155	7.1479E-03	266.26	532.51	0.00E+00	1.90E+00	3.81E+00	2.2500	3.748E+06
Fe-55	6.1919E-04	266.26	532.51	0.00E+00	1.65E-01	3.30E-01	2.7500	4.212E+06
H-3	3.6386E-02	266.26	532.51	0.00E+00	9.69E+00	1.94E+01	3.5000	5.523E+05
I-129	9.8288E-07	266.26	532.51	0.00E+00	2.62E-04	5.23E-04	5.0000	2.361E+05
Kr-85	5.3844E-02	266.26	532.51	0.00E+00	1.43E+01	2.87E+01	7.0000	2.721E+04
Np-237	1.0546E-05	266.26	532.51	0.00E+00	2.81E-03	5.62E-03	11.0000	3.126E+03
Pa-231	1.1370E-09	266.26	532.51	0.00E+00	3.03E-07	6.05E-07		
Pb-210	3.3624E-11	266.26	532.51	0.00E+00	8.95E-09	1.79E-08		
Pm-147	5.1211E-03	266.26	532.51	0.00E+00	1.36E+00	2.73E+00		
Pu-238	8.0669E-02	266.26	532.51	0.00E+00	2.15E+01	4.30E+01		
Pu-239	1.1626E-02	266.26	532.51	0.00E+00	3.10E+00	6.19E+00		
Pu-240	1.5097E-02	266.26	532.51	0.00E+00	4.02E+00	8.04E+00		
Pu-241	1.4567E+00	266.26	532.51	0.00E+00	3.88E+02	7.76E+02		
Pu-242	6.4260E-05	266.26	532.51	0.00E+00	1.71E-02	3.42E-02		
Ra-226	1.1392E-10	266.26	532.51	0.00E+00	3.03E-08	6.07E-08		
Ra-228	5.1841E-12	266.26	532.51	0.00E+00	1.38E-09	2.76E-09		
Ru-106	5.9012E-07	266.26	532.51	0.00E+00	1.57E-04	3.14E-04		
Se-79	1.2379E-05	266.26	532.51	0.00E+00	3.30E-03	6.59E-03		
Sn-126	2.5210E-05	266.26	532.51	0.00E+00	6.71E-03	1.34E-02		
Sr-90	1.1630E+00	266.26	532.51	0.00E+00	3.10E+02	6.19E+02		
Tc-99	3.9357E-04	266.26	532.51	0.00E+00	1.05E-01	2.10E-01		
Th-229	8.5691E-11	266.26	532.51	0.00E+00	2.28E-08	4.56E-08		
Th-230	1.4493E-08	266.26	532.51	0.00E+00	3.86E-06	7.72E-06		
Th-232	5.2923E-12	266.26	532.51	0.00E+00	1.41E-09	2.82E-09		
Ti-208	1.9202E-07	266.26	532.51	0.00E+00	5.11E-05	1.02E-04		
U-232	5.2083E-07	266.26	532.51	0.00E+00	1.39E-04	2.77E-04	Thermal Power	
U-233	2.4386E-08	266.26	532.51	0.00E+00	6.49E-06	1.30E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4.7012E-05	266.26	532.51	0.00E+00	1.25E-02	2.50E-02	7.30E+00	1.46E+01
U-235	1.4492E-06	266.26	0.00	1.84E-02	1.80E-02	1.84E-02	Total	Total
U-236	7.5759E-06	266.26	532.51	0.00E+00	2.02E-03	4.03E-03		
U-238	2.6129E-07	266.26	0.00	8.66E-02	8.65E-02	8.66E-02		
Y-90	1.1631E+00	266.26	532.51	0.00E+00	3.10E+02	6.19E+02		
Other Radionuclides					4.50E+02	9.00E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %		0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup taken from SFD and converted to MWd using BOL=266.255kg Bounding burnup assumed to be twice nominal burnup
Nominal		266.26	
Bounding		532.51	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.03		
Bounding	0.06		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: MURR (UALX) COLUMBIA

SNF ID #: 142

Fuel Units & Descr: 32 - 24 CURVED PLATES

Heavy Metal Mass: BOL=25.12kg; EOL=21.725kg

ROD Storage Site: SRS

Fuel decay start date: 1985

Estimates as of: 2010

Template: ATR (Light Water, Alum., 60 to 100% U)

Template Burnup(MWd): 367.2

Template BOL Heavy Metal Mass (MT): 0.00116689

Template Decay Time: 25 years

Estimated

Canister usage

18"x10"

1.33

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	4,521.60	9,043.20	0.00E+00	5.18E-06	1.04E-05	Avg. MeV	
Am-241	2.3056E-03	4,521.60	9,043.20	0.00E+00	1.04E+01	2.08E+01	0.0150	8.462E+14
Am-242m	4.1476E-07	4,521.60	9,043.20	0.00E+00	1.88E-03	3.75E-03	0.0250	1.758E+14
Am-243	1.4894E-06	4,521.60	9,043.20	0.00E+00	6.73E-03	1.35E-02	0.0375	1.531E+14
C-14	5.7108E-09	4,521.60	9,043.20	0.00E+00	2.58E-05	5.16E-05	0.0575	1.644E+14
Cl-36	1.3124E-32	4,521.60	9,043.20	0.00E+00	5.93E-29	1.19E-28	0.0850	9.920E+13
Cm-243	1.4562E-07	4,521.60	9,043.20	0.00E+00	6.58E-04	1.32E-03	0.1250	6.644E+13
Cm-244	2.4221E-05	4,521.60	9,043.20	0.00E+00	1.10E-01	2.19E-01	0.2250	8.564E+13
Co-60	2.7560E-06	4,521.60	9,043.20	0.00E+00	1.25E-02	2.49E-02	0.3750	3.723E+13
Cs-134	5.8851E-04	4,521.60	9,043.20	0.00E+00	2.66E+00	5.32E+00	0.5750	6.104E+14
Cs-135	3.4477E-06	4,521.60	9,043.20	0.00E+00	1.56E-02	3.12E-02	0.8500	8.796E+12
Cs-137	1.8099E+00	4,521.60	9,043.20	0.00E+00	8.18E+03	1.64E+04	1.2500	4.891E+12
Eu-154	1.6386E-02	4,521.60	9,043.20	0.00E+00	7.41E+01	1.48E+02	1.7500	2.417E+11
Eu-155	2.3957E-03	4,521.60	9,043.20	0.00E+00	1.08E+01	2.17E+01	2.2500	1.722E+07
Fe-55	3.2707E-05	4,521.60	9,043.20	0.00E+00	1.48E-01	2.96E-01	2.7500	1.410E+07
H-3	3.4504E-03	4,521.60	9,043.20	0.00E+00	1.56E+01	3.12E+01	3.5000	1.064E+04
I-129	7.5300E-07	4,521.60	9,043.20	0.00E+00	3.40E-03	6.81E-03	5.0000	3.580E+03
Kr-85	7.8540E-02	4,521.60	9,043.20	0.00E+00	3.55E+02	7.10E+02	7.0000	3.940E+02
Np-237	9.5815E-06	4,521.60	9,043.20	0.00E+00	4.32E-02	8.65E-02	11.0000	4.407E+01
Pa-231	2.7968E-09	4,521.60	9,043.20	0.00E+00	1.26E-05	2.53E-05		
Pb-210	1.2612E-10	4,521.60	9,043.20	0.00E+00	5.70E-07	1.14E-06		
Pm-147	1.2952E-02	4,521.60	9,043.20	0.00E+00	5.86E+01	1.17E+02		
Pu-238	1.7549E-02	4,521.60	9,043.20	0.00E+00	7.93E+01	1.59E+02		
Pu-239	4.2810E-04	4,521.60	9,043.20	0.00E+00	1.94E+00	3.87E+00		
Pu-240	2.4357E-04	4,521.60	9,043.20	0.00E+00	1.10E+00	2.20E+00		
Pu-241	2.6277E-02	4,521.60	9,043.20	0.00E+00	1.19E+02	2.38E+02		
Pu-242	3.6329E-07	4,521.60	9,043.20	0.00E+00	1.64E-03	3.29E-03		
Ra-226	4.4444E-10	4,521.60	9,043.20	0.00E+00	2.01E-06	4.02E-06		
Ra-228	1.9714E-14	4,521.60	9,043.20	0.00E+00	8.91E-11	1.78E-10		
Ru-106	2.0477E-07	4,521.60	9,043.20	0.00E+00	9.26E-04	1.85E-03		
Se-79	1.2933E-05	4,521.60	9,043.20	0.00E+00	5.85E-02	1.17E-01		
Sn-126	1.1574E-05	4,521.60	9,043.20	0.00E+00	5.23E-02	1.05E-01		
Sr-90	1.7092E+00	4,521.60	9,043.20	0.00E+00	7.73E+03	1.55E+04		
Tc-99	4.2239E-04	4,521.60	9,043.20	0.00E+00	1.91E+00	3.82E+00		
Th-229	7.7260E-12	4,521.60	9,043.20	0.00E+00	3.49E-08	6.99E-08		
Th-230	5.8497E-08	4,521.60	9,043.20	0.00E+00	2.64E-04	5.29E-04		
Th-232	2.6906E-14	4,521.60	9,043.20	0.00E+00	1.22E-10	2.43E-10		
Th-208	4.4336E-08	4,521.60	9,043.20	0.00E+00	2.00E-04	4.01E-04		
U-232	1.2037E-07	4,521.60	9,043.20	0.00E+00	5.44E-04	1.09E-03		
U-233	3.0011E-09	4,521.60	9,043.20	0.00E+00	1.36E-05	2.71E-05		
U-234	1.8497E-04	4,521.60	9,043.20	0.00E+00	8.36E-01	1.67E+00		
U-235	-2.7235E-06	4,521.60	0.00	5.08E-02	3.84E-02	5.08E-02		
U-236	1.5493E-05	4,521.60	9,043.20	0.00E+00	7.01E-02	1.40E-01		
U-238	-4.2851E-09	4,521.60	0.00	5.49E-04	5.29E-04	5.49E-04		
Y-90	1.7094E+00	4,521.60	9,043.20	0.00E+00	7.73E+03	1.55E+04		
Other Radionuclides					7.79E+03	1.56E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	93.5	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	4,521.60	3,215.32	
Bounding		9,043.20	

Nominal burnup taken directly from SFD (converted to MWd)

Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.57	0.71	
Bounding	1.14		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name MURR (UALX) COLUMBIA  
SNF ID # 962  
Fuel Units & Descr. 24 - 24 CURVED PLATES  
Heavy Metal Mass BOL=18.84kg EOL=16.294kg  
ROD Storage Site SRS

<sup>1</sup>Fuel decay start date: 1985  
Estimates as of 2010  
Template: ATR (Light Water, Alum, 60 to 100% U)  
<sup>2</sup>Template Burnup(MWd) 367.2  
Template BOL Heavy Metal Mass (MT): 0.00116689  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x10"  
1.00

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	1.1465E-09	3,391.20	6,782.40	0.00E+00	3.89E-06	7.78E-06	Avg MeV	
Am-241	2.3056E-03	3,391.20	6,782.40	0.00E+00	7.82E+00	1.56E+01	0.0150	6.347E+14
Am-242m	4.1476E-07	3,391.20	6,782.40	0.00E+00	1.41E-03	2.81E-03	0.0250	1.318E+14
Am-243	1.4894E-06	3,391.20	6,782.40	0.00E+00	5.05E-03	1.01E-02	0.0375	1.148E+14
C-14	5.7108E-09	3,391.20	6,782.40	0.00E+00	1.94E-05	3.87E-05	0.0575	1.233E+14
Cl-36	1.3124E-32	3,391.20	6,782.40	0.00E+00	4.45E-29	8.90E-29	0.0850	7.440E+13
Cm-243	1.4562E-07	3,391.20	6,782.40	0.00E+00	4.94E-04	9.88E-04	0.1250	4.983E+13
Cm-244	2.4221E-05	3,391.20	6,782.40	0.00E+00	8.21E-02	1.64E-01	0.2250	6.423E+13
Co-60	2.7560E-06	3,391.20	6,782.40	0.00E+00	9.35E-03	1.87E-02	0.3750	2.792E+13
Cs-134	5.8851E-04	3,391.20	6,782.40	0.00E+00	2.00E+00	3.99E+00	0.5750	4.578E+14
Cs-135	3.4477E-06	3,391.20	6,782.40	0.00E+00	1.17E-02	2.34E-02	0.8500	6.597E+12
Cs-137	1.8099E+00	3,391.20	6,782.40	0.00E+00	6.14E+03	1.23E+04	1.2500	3.668E+12
Eu-154	1.6386E-02	3,391.20	6,782.40	0.00E+00	5.56E+01	1.11E+02	1.7500	1.812E+11
Eu-155	2.3957E-03	3,391.20	6,782.40	0.00E+00	8.12E+00	1.62E+01	2.2500	1.292E+07
Fe-55	3.2707E-05	3,391.20	6,782.40	0.00E+00	1.11E-01	2.22E-01	2.7500	1.058E+07
H-3	3.4504E-03	3,391.20	6,782.40	0.00E+00	1.17E+01	2.34E+01	3.5000	7.983E+03
I-129	7.5300E-07	3,391.20	6,782.40	0.00E+00	2.55E-03	5.11E-03	5.0000	2.685E+03
Kr-85	7.8540E-02	3,391.20	6,782.40	0.00E+00	2.66E+02	5.33E+02	7.0000	2.955E+02
Np-237	9.5615E-06	3,391.20	6,782.40	0.00E+00	3.24E-02	6.49E-02	11.0000	3.305E+01
Pa-231	2.7968E-09	3,391.20	6,782.40	0.00E+00	9.48E-06	1.90E-05		
Pb-210	1.2612E-10	3,391.20	6,782.40	0.00E+00	4.28E-07	8.55E-07		
Pm-147	1.2952E-02	3,391.20	6,782.40	0.00E+00	4.39E+01	8.78E+01		
Pu-238	1.7549E-02	3,391.20	6,782.40	0.00E+00	5.95E+01	1.19E+02		
Pu-239	4.2810E-04	3,391.20	6,782.40	0.00E+00	1.45E+00	2.90E+00		
Pu-240	2.4357E-04	3,391.20	6,782.40	0.00E+00	8.26E-01	1.65E+00		
Pu-241	2.6277E-02	3,391.20	6,782.40	0.00E+00	8.91E+01	1.78E+02		
Pu-242	3.6329E-07	3,391.20	6,782.40	0.00E+00	1.23E-03	2.46E-03		
Ra-226	4.4444E-10	3,391.20	6,782.40	0.00E+00	1.51E-06	3.01E-06		
Ra-228	1.9714E-14	3,391.20	6,782.40	0.00E+00	6.69E-11	1.34E-10		
Ru-106	2.0477E-07	3,391.20	6,782.40	0.00E+00	6.94E-04	1.39E-03		
Se-79	1.2933E-05	3,391.20	6,782.40	0.00E+00	4.39E-02	8.77E-02		
Sn-126	1.1574E-05	3,391.20	6,782.40	0.00E+00	3.93E-02	7.85E-02		
Sr-90	1.7092E+00	3,391.20	6,782.40	0.00E+00	5.80E+03	1.16E+04		
Tc-99	4.2239E-04	3,391.20	6,782.40	0.00E+00	1.43E+00	2.86E+00		
Th-229	7.7260E-12	3,391.20	6,782.40	0.00E+00	2.62E-08	5.24E-08		
Th-230	5.8497E-08	3,391.20	6,782.40	0.00E+00	1.98E-04	3.97E-04		
Th-232	2.6906E-14	3,391.20	6,782.40	0.00E+00	9.12E-11	1.82E-10		
Ti-208	4.4336E-08	3,391.20	6,782.40	0.00E+00	1.50E-04	3.01E-04		
U-232	1.2037E-07	3,391.20	6,782.40	0.00E+00	4.08E-04	8.16E-04		
U-233	3.0011E-09	3,391.20	6,782.40	0.00E+00	1.02E-05	2.04E-05		
U-234	1.8497E-04	3,391.20	6,782.40	0.00E+00	6.27E-01	1.25E+00		
U-235	-2.7235E-06	3,391.20	0.00	3.81E-02	2.88E-02	3.81E-02		
U-236	1.5493E-05	3,391.20	6,782.40	0.00E+00	5.25E-02	1.05E-01		
U-238	-4.2851E-09	3,391.20	0.00	4.12E-04	3.97E-04	4.12E-04		
Y-90	1.7094E+00	3,391.20	6,782.40	0.00E+00	5.80E+03	1.16E+04		
Other Radionuclides					5.84E+03	1.17E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.5	60 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	3,391.20	2,411.49	
Bounding		6,782.40	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.57	0.71	
Bounding	1.14		0.95

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: OCONEE  
SNF ID #: 156  
Fuel Units & Descr: 14 - ROD  
Heavy Metal Mass: BOL=39.2kg; EOL=31 983kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1986  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 20 years

Estimated  
Canister usage,  
18"x10"  
0 78

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	5 0630E-10	6,863 03	13,726 05	0 00E+00	3 47E-06	6 95E-06	Avg. MeV	
Am-241	1 1489E-01	6,863 03	13,726 05	0 00E+00	7 88E+02	1 58E+03	0 0150	1 051E+15
Am-242m	3 0733E-04	6,863 03	13,726 05	0 00E+00	2 11E+00	4 22E+00	0 0250	2 138E+14
Am-243	6 2661E-04	6,863 03	13,726 05	0 00E+00	4 30E+00	8 60E+00	0 0375	2 090E+14
C-14	4 7997E-05	6,863 03	13,726 05	0 00E+00	3 29E-01	6 59E-01	0 0575	2 195E+14
Cl-36	8 0313E-07	6,863 03	13,726 05	0 00E+00	5 51E-03	1 10E-02	0 0850	1 203E+14
Cm-243	3 6127E-04	6,863 03	13,726 05	0 00E+00	2 48E+00	4 96E+00	0 1250	9 109E+13
Cm-244	8 6999E-02	6,863 03	13,726 05	0 00E+00	5 97E+02	1 19E+03	0 2250	1 031E+14
Co-60	1 8379E-02	6,863 03	13,726 05	0 00E+00	1 26E+02	2 52E+02	0 3750	4 444E+13
Cs-134	6 2548E-03	6,863 03	13,726 05	0 00E+00	4 29E+01	8 59E+01	0 5750	1 009E+15
Cs-135	1 4433E-05	6,863 03	13,726 05	0 00E+00	9 91E-02	1 98E-01	0 8500	2 615E+13
Cs-137	1 9767E+00	6,863 03	13,726 05	0 00E+00	1 36E+04	2 71E+04	1 2500	3 927E+13
Eu-154	6 7603E-02	6,863 03	13,726 05	0 00E+00	4 64E+02	9 28E+02	1 7500	7 230E+11
Eu-155	1 4373E-02	6,863 03	13,726 05	0 00E+00	9 86E+01	1 97E+02	2 2500	1 676E+08
Fe-55	2 3466E-03	6,863 03	13,726 05	0 00E+00	1 61E+01	3 22E+01	2 7500	1 176E+08
H-3	4 8143E-02	6,863 03	13,726 05	0 00E+00	3 30E+02	6 61E+02	3 5000	1 741E+07
I-129	9 8288E-07	6,863 03	13,726 05	0 00E+00	6 75E-03	1 35E-02	5 0000	7 333E+06
Kr-85	7 4386E-02	6,863 03	13,726 05	0 00E+00	5 11E+02	1 02E+03	7 0000	8 455E+05
Np-237	1 0145E-05	6,863 03	13,726 05	0 00E+00	6 96E-02	1 39E-01	11 0000	9 713E+04
Pa-231	1 0258E-09	6,863 03	13,726 05	0 00E+00	7 04E-06	1 41E-05		
Pb-210	1 4163E-11	6,863 03	13,726 05	0 00E+00	9 72E-08	1 94E-07		
Pm-147	1 9170E-02	6,863 03	13,726 05	0 00E+00	1 32E+02	2 63E+02		
Pu-238	8 3915E-02	6,863 03	13,726 05	0 00E+00	5 76E+02	1 15E+03		
Pu-239	1 1628E-02	6,863 03	13,726 05	0 00E+00	7 98E+01	1 60E+02		
Pu-240	1 5050E-02	6,863 03	13,726 05	0 00E+00	1 03E+02	2 07E+02		
Pu-241	1 8524E+00	6,863 03	13,726 05	0 00E+00	1 27E+04	2 54E+04		
Pu-242	6 4260E-05	6,863 03	13,726 05	0 00E+00	4 41E-01	8 82E-01		
Ra-226	6 0562E-11	6,863 03	13,726 05	0 00E+00	4 16E-07	8 31E-07		
Ra-228	4 9919E-12	6,863 03	13,726 05	0 00E+00	3 43E-08	6 85E-08		
Ru-106	1 8330E-05	6,863 03	13,726 05	0 00E+00	1 26E-01	2 52E-01		
Sa-79	1 2379E-05	6,863 03	13,726 05	0 00E+00	8 50E-02	1 70E-01		
Sn-126	2 5210E-05	6,863 03	13,726 05	0 00E+00	1 73E-01	3 46E-01		
Sr-90	1 3098E+00	6,863 03	13,726 05	0 00E+00	8 99E+03	1 80E+04		
Tc-99	3 9357E-04	6,863 03	13,726 05	0 00E+00	2 70E+00	5 40E+00		
Th-229	6 2968E-11	6,863 03	13,726 05	0 00E+00	4 32E-07	8 64E-07		
Th-230	1 0362E-08	6,863 03	13,726 05	0 00E+00	7 11E-05	1 42E-04		
Th-232	5 2891E-12	6,863 03	13,726 05	0 00E+00	3 63E-08	7 26E-08		
Th-208	1 9977E-07	6,863 03	13,726 05	0 00E+00	1 37E-03	2 74E-03		
U-232	5 4490E-07	6,863 03	13,726 05	0 00E+00	3 74E-03	7 48E-03		
U-233	2 3934E-08	6,863 03	13,726 05	0 00E+00	1 64E-04	3 29E-04		
U-234	4 4816E-05	6,863 03	13,726 05	0 00E+00	3 08E-01	6 15E-01		
U-235	-1 4492E-06	6 863 03	0 00	1 75E-03	0 00E+00	1 75E-03		
U-236	7 5711E-06	6,863 03	13,726 05	0 00E+00	5 20E-02	1 04E-01		
U-238	-2 6129E-07	6,863 03	0 00	1 29E-02	1 11E-02	1 29E-02		
Y-90	1 3101E+00	6,863 03	13,726 05	0 00E+00	8 99E+03	1 80E+04		
Other Radionuclides					1 30E+04	2 60E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ZIRC	ZIRC	
BOL HM Constituents:	U	U	
BOL Enrichment %:	2 0625	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	1 326 33	6 863 03	
Bounding	1 960 00	13 726 05	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	5 00	5 17	
Bounding	10 00	7 00	1 12

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ORR  
 SNF ID # 461  
 Fuel Units & Descr 17 - 19 CURVED PLATES  
 Heavy Metal Mass BOL=4 981kg, EOL=3.252kg  
 ROD Storage Site SRS  
<sup>1</sup>Fuel decay start date 1985  
 Estimates as of 2010  
 Template ATR (Light Water, Alum, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 367.2  
 Template BOL Heavy Metal Mass (MT) 0 00116689  
 Template Decay Time 25 years

Estimated  
 Canister usage  
 18"x10"  
 0 47

II. Estimates							Gamma Sources	
	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	1 1465E-09	1,637.30	3,274.60	0 00E+00	1 88E-06	3 75E-06	Avg MeV	
Am-241	2 3066E-03	1,637.30	3,274.60	0 00E+00	3 77E+00	7 55E+00	0 0150	3 064E+14
Am-242m	4 1476E-07	1,637.30	3,274.60	0 00E+00	6 79E-04	1.36E-03	0 0250	6.366E+13
Am-243	1 4894E-06	1,637.30	3,274.60	0 00E+00	2 44E-03	4 88E-03	0 0375	5.544E+13
C-14	5 7108E-09	1,637.30	3,274.60	0 00E+00	9 35E-06	1 87E-05	0 0575	5.953E+13
Cl-36	1.3124E-32	1,637.30	3,274.60	0 00E+00	2.15E-29	4 30E-29	0 0850	3.592E+13
Cm-243	1 4562E-07	1,637.30	3,274.60	0 00E+00	2.38E-04	4.77E-04	0 1250	2.406E+13
Cm-244	2 4221E-05	1,637.30	3,274.60	0 00E+00	3 97E-02	7.93E-02	0 2250	3 101E+13
Co-60	2.7560E-06	1,637.30	3,274.60	0 00E+00	4.51E-03	9 02E-03	0 3750	1.348E+13
Cs-134	5.8851E-04	1,637.30	3,274.60	0 00E+00	9 64E-01	1.93E+00	0 5750	2.210E+14
Cs-135	3 4477E-06	1,637.30	3,274.60	0 00E+00	5 64E-03	1 13E-02	0 8500	3 185E+12
Cs-137	1 8099E+00	1,637.30	3,274.60	0 00E+00	2 96E+03	5 93E+03	1.2500	1 771E+12
Eu-154	1 6386E-02	1,637.30	3,274.60	0 00E+00	2 68E+01	5 37E+01	1 7500	8 750E+10
Eu-155	2 3957E-03	1,637.30	3,274.60	0 00E+00	3 92E+00	7 84E+00	2.2500	6 237E+06
Fe-55	3 2707E-05	1,637.30	3,274.60	0 00E+00	5 36E-02	1 07E-01	2.7500	5 107E+06
H-3	3 4504E-03	1,637.30	3,274.60	0 00E+00	5 65E+00	1 13E+01	3.5000	3.854E+03
I-129	7 5300E-07	1,637.30	3,274.60	0 00E+00	1 23E-03	2 47E-03	5 0000	1.296E+03
Kr-85	7 8540E-02	1,637.30	3,274.60	0 00E+00	1 29E+02	2 57E+02	7.0000	1 426E+02
Np-237	9 5615E-06	1,637.30	3,274.60	0 00E+00	1 57E-02	3 13E-02	11.0000	1.595E+01
Pa-231	2 7968E-09	1,637.30	3,274.60	0 00E+00	4 58E-06	9 16E-06		
Pb-210	1.2612E-10	1,637.30	3,274.60	0 00E+00	2 06E-07	4 13E-07		
Pm-147	1.2952E-02	1,637.30	3,274.60	0 00E+00	2 12E+01	4.24E+01		
Pu-238	1.7549E-02	1,637.30	3,274.60	0 00E+00	2 87E+01	5 75E+01		
Pu-239	4.2810E-04	1,637.30	3,274.60	0 00E+00	7.01E-01	1.40E+00		
Pu-240	2 4357E-04	1,637.30	3,274.60	0 00E+00	3 99E-01	7 98E-01		
Pu-241	2 6277E-02	1,637.30	3,274.60	0 00E+00	4.30E+01	8 60E+01		
Pu-242	3 6329E-07	1,637.30	3,274.60	0 00E+00	5 95E-04	1 19E-03		
Ra-226	4 4444E-10	1,637.30	3,274.60	0 00E+00	7.28E-07	1 46E-06		
Ra-228	1 9714E-14	1,637.30	3,274.60	0 00E+00	3 23E-11	6 46E-11		
Ru-106	2 0477E-07	1,637.30	3,274.60	0 00E+00	3 35E-04	6 71E-04		
Se-79	1 2933E-05	1,637.30	3,274.60	0 00E+00	2 12E-02	4 24E-02		
Sn-126	1 1574E-05	1,637.30	3,274.60	0 00E+00	1 90E-02	3 79E-02		
Sr-90	1 7092E+00	1,637.30	3,274.60	0 00E+00	2 80E+03	5 60E+03		
Tc-99	4.2239E-04	1,637.30	3,274.60	0 00E+00	6 92E-01	1.38E+00		
Th-229	7 7260E-12	1,637.30	3,274.60	0 00E+00	1.26E-08	2.53E-08		
Th-230	5 8497E-08	1,637.30	3,274.60	0 00E+00	9 58E-05	1 92E-04		
Th-232	2 6906E-14	1,637.30	3,274.60	0 00E+00	4 41E-11	8 81E-11		
Ti-208	4 4336E-08	1,637.30	3,274.60	0 00E+00	7.26E-05	1 45E-04		
U-232	1.2037E-07	1,637.30	3,274.60	0 00E+00	1 97E-04	3 94E-04	Thermal Power	
U-233	3 0011E-09	1,637.30	3,274.60	0 00E+00	4 91E-06	9 83E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8497E-04	1,637.30	3,274.60	0 00E+00	3 03E-01	6 06E-01		
U-235	-2.7235E-06	1,637.30	0 00	1 00E-02	5 57E-03	1 00E-02		
U-236	1.5493E-05	1,637.30	3,274.60	0 00E+00	2 54E-02	5 07E-02		
U-238	-4.2851E-09	1,637.30	0 00	1 14E-04	1 07E-04	1 14E-04		
Y-90	1 7094E+00	1,637.30	3,274.60	0 00E+00	2 80E+03	5 60E+03	Total	Total
Other Radionuclides					2 82E+03	5 64E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93 19412969	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	0 47	1,637.30	
Bounding		3,274.60	

Nominal burnup calculated from the heavy metal mass destroyed  
 Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1 04	3 460 10	1 03
Bounding	2.09		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PATHFINDER (SUPERHEATER)  
 SNF ID #: 166  
 Fuel Units & Descr: 411 - ROD  
 Heavy Metal Mass: BOL=54 54kg; EOL=52.608kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1967  
 Estimates as of: 2010  
 Template Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 6 01  
 Template BOL Heavy Metal Mass (MT): 0 00012882  
 Template Decay Time 35 years

Estimated  
 Canister usage:  
 18"x10"  
 3 57

## II. Estimates

	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 3344E-08	1,824.78	3,649.55	0 00E+00	4 26E-05	8 52E-05	Avg. MeV	
Am-241	1 1135E-04	1,824.78	3,649.55	0 00E+00	2 03E-01	4 06E-01	0 0150	2.724E+14
Am-242m	8 5075E-09	1,824.78	3,649.55	0 00E+00	1 55E-05	3 10E-05	0 0250	5 661E+13
Am-243	9 8519E-10	1,824.78	3,649.55	0 00E+00	1 80E-06	3 60E-06	0 0375	4 896E+13
C-14	2 3012E-04	1,824.78	3,649.55	0 00E+00	4 20E-01	8 40E-01	0 0575	5.277E+13
Cl-36	1 2261E-06	1,824.78	3,649.55	0 00E+00	2 24E-03	4 47E-03	0 0850	3 189E+13
Cm-243	2 4875E-10	1,824.78	3,649.55	0 00E+00	4 54E-07	9 08E-07	0 1250	2.070E+13
Cm-244	2 3178E-09	1,824.78	3,649.55	0 00E+00	4 23E-06	8 46E-06	0 2250	2.745E+13
Co-60	7 0849E-02	1,824.78	3,649.55	0 00E+00	1 29E+02	2 59E+02	0.3750	1 197E+13
Cs-134	3 0266E-06	1,824.78	3,649.55	0 00E+00	5 52E-03	1 10E-02	0.5750	1 972E+14
Cs-135	3 0316E-05	1,824.78	3,649.55	0 00E+00	5 53E-02	1 11E-01	0.8500	1 996E+12
Cs-137	1 4511E+00	1,824.78	3,649.55	0 00E+00	2 65E+03	5 30E+03	1.2500	1 984E+13
Eu-154	6 6955E-04	1,824.78	3,649.55	0 00E+00	1.22E+00	2 44E+00	1 7500	5 149E+10
Eu-155	6 9850E-04	1,824.78	3,649.55	0 00E+00	1.27E+00	2.55E+00	2.2500	1 069E+08
Fe-55	1 2318E-03	1,824.78	3,649.55	0 00E+00	2.25E+00	4 50E+00	2.7500	3 090E+06
H-3	2 5141E-03	1,824.78	3 649.55	0 00E+00	4.59E+00	9 18E+00	3.5000	2.269E+02
I-129	7 3195E-07	1,824.78	3,649.55	0 00E+00	1 34E-03	2 67E-03	5 0000	9 340E+01
Kr-85	4 1281E-02	1,824.78	3,649.55	0 00E+00	7 53E+01	1 51E+02	7 0000	1 032E+01
Np-237	1 1489E-06	1,824.78	3,649.55	0 00E+00	2.10E-03	4 19E-03	11 0000	1 159E+00
Pa-231	4 5241E-08	1,824.78	3,649.55	0 00E+00	8.26E-05	1 65E-04		
Pb-210	6 4476E-13	1,824.78	3,649.55	0 00E+00	1.18E-09	2 35E-09		
Pm-147	1 1651E-03	1,824.78	3,649.55	0 00E+00	2 13E+00	4.25E+00		
Pu-238	2 9517E-04	1,824.78	3,649.55	0 00E+00	5.39E-01	1.08E+00		
Pu-239	6 6772E-04	1,824.78	3,649.55	0 00E+00	1 22E+00	2 44E+00		
Pu-240	8 6839E-05	1,824.78	3,649.55	0 00E+00	1.58E-01	3 17E-01		
Pu-241	7.1514E-04	1,824.78	3,649.55	0 00E+00	1 30E+00	2 61E+00		
Pu-242	1 9717E-09	1,824.78	3,649.55	0 00E+00	3 60E-06	7.20E-06		
Ra-226	1 7654E-12	1,824.78	3,649.55	0 00E+00	3 22E-09	6 44E-09		
Ra-228	8.2928E-12	1,824.78	3,649.55	0 00E+00	1 51E-08	3.03E-08		
Ru-106	1 8419E-10	1,824.78	3,649.55	0 00E+00	3 36E-07	6.72E-07		
Se-79	1.3223E-05	1,824.78	3,649.55	0 00E+00	2 41E-02	4.83E-02		
Sn-126	1.1493E-05	1,824.78	3,649.55	0 00E+00	2 10E-02	4.19E-02		
Sr-90	1 3649E+00	1,824.78	3,649.55	0 00E+00	2 49E+03	4 98E+03		
Tc-99	4 6656E-04	1,824.78	3,649.55	0 00E+00	8 51E-01	1 70E+00		
Th-229	1.4547E-11	1,824.78	3,649.55	0 00E+00	2 65E-08	5.31E-08		
Th-230	1 6617E-10	1,824.78	3,649.55	0 00E+00	3 03E-07	6 06E-07		
Th-232	8.3361E-12	1,824.78	3,649.55	0 00E+00	1 52E-08	3 04E-08		
Ti-208	2.1664E-08	1,824.78	3,649.55	0 00E+00	3 95E-05	7 91E-05		
U-232	5 8669E-08	1,824.78	3,649.55	0 00E+00	1 07E-04	2.14E-04	Thermal Power	
U-233	3.1847E-09	1,824.78	3 649.55	0 00E+00	5 81E-06	1 16E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	3 8769E-07	1,824.78	3,649.55	0 00E+00	7 07E-04	1 41E-03	3 19E+01	6.37E+01
U-235	-2.7761E-06	1,824.78	0 00	1 10E-01	1 05E-01	1.10E-01	Total	Total
U-236	1 6190E-05	1,824.78	3,649.55	0 00E+00	2 95E-02	5 91E-02		
U-238	-2 8547E-09	1,824.78	0 00	1 26E-03	1 25E-03	1 26E-03		
Y-90	1 3652E+00	1,824.78	3,649.55	0 00E+00	2 49E+03	4 98E+03		
Other Radionuclides					3 01E+03	6 02E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences*
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	SST	SST	
BOL HM Constituents:	U	U	
BOL Enrichment %:	93 14242653	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1 824.78	
Bounding		3,649.55	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.72		
Bounding	1.43		1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PATHFINDER (SUPERHEATER)  
SNF ID # 814  
Fuel Units & Descr 6 - ROD  
Heavy Metal Mass BOL=0.796kg EOL=0.796kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1967  
Estimates as of: 2010  
Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 6.01  
Template BOL Heavy Metal Mass (MT) 0.00012882  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x10"  
0.05

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	15.04	30.09	0.00E+00	3.51E-07	7.02E-07	Avg MeV	
Am-241	1.1135E-04	15.04	30.09	0.00E+00	1.67E-03	3.35E-03	0.0150	2.246E+12
Am-242m	8.5075E-09	15.04	30.09	0.00E+00	1.28E-07	2.56E-07	0.0250	4.666E+11
Am-243	9.8519E-10	15.04	30.09	0.00E+00	1.48E-08	2.96E-08	0.0375	4.036E+11
C-14	2.3012E-04	15.04	30.09	0.00E+00	3.46E-03	6.92E-03	0.0575	4.351E+11
Cl-36	1.2261E-06	15.04	30.09	0.00E+00	1.84E-05	3.69E-05	0.0850	2.629E+11
Cm-243	2.4875E-10	15.04	30.09	0.00E+00	3.74E-09	7.48E-09	0.1250	1.707E+11
Cm-244	2.3178E-09	15.04	30.09	0.00E+00	3.49E-08	6.97E-08	0.2250	2.263E+11
Co-60	7.0849E-02	15.04	30.09	0.00E+00	1.07E+00	2.13E+00	0.3750	9.869E+10
Cs-134	3.0266E-06	15.04	30.09	0.00E+00	4.55E-05	9.11E-05	0.5750	1.626E+12
Cs-135	3.0316E-05	15.04	30.09	0.00E+00	4.56E-04	9.12E-04	0.8500	1.646E+10
Cs-137	1.4511E+00	15.04	30.09	0.00E+00	2.18E+01	4.37E+01	1.2500	1.636E+11
Eu-154	6.6955E-04	15.04	30.09	0.00E+00	1.01E-02	2.01E-02	1.7500	4.245E+08
Eu-155	6.9850E-04	15.04	30.09	0.00E+00	1.05E-02	2.10E-02	2.2500	8.813E+05
Fe-55	1.2318E-03	15.04	30.09	0.00E+00	1.85E-02	3.71E-02	2.7500	2.547E+04
H-3	2.5141E-03	15.04	30.09	0.00E+00	3.78E-02	7.56E-02	3.5000	1.936E+00
I-129	7.3195E-07	15.04	30.09	0.00E+00	1.10E-05	2.20E-05	5.0000	7.977E-01
Kr-85	4.1281E-02	15.04	30.09	0.00E+00	6.21E-01	1.24E+00	7.0000	8.821E-02
Np-237	1.1489E-06	15.04	30.09	0.00E+00	1.73E-05	3.46E-05	11.0000	9.907E-03
Pa-231	4.5241E-08	15.04	30.09	0.00E+00	6.81E-07	1.36E-06		
Pb-210	6.4476E-13	15.04	30.09	0.00E+00	9.70E-12	1.94E-11		
Pm-147	1.1651E-03	15.04	30.09	0.00E+00	1.75E-02	3.51E-02		
Pu-238	2.9517E-04	15.04	30.09	0.00E+00	4.44E-03	8.88E-03		
Pu-239	6.6772E-04	15.04	30.09	0.00E+00	1.00E-02	2.01E-02		
Pu-240	8.6839E-05	15.04	30.09	0.00E+00	1.31E-03	2.61E-03		
Pu-241	7.1514E-04	15.04	30.09	0.00E+00	1.08E-02	2.15E-02		
Pu-242	1.9717E-09	15.04	30.09	0.00E+00	2.97E-08	5.93E-08		
Ra-226	1.7654E-12	15.04	30.09	0.00E+00	2.66E-11	5.31E-11		
Ra-228	8.2928E-12	15.04	30.09	0.00E+00	1.25E-10	2.49E-10		
Ru-106	1.8419E-10	15.04	30.09	0.00E+00	2.77E-09	5.54E-09		
Se-79	1.3223E-05	15.04	30.09	0.00E+00	1.99E-04	3.98E-04		
Sn-126	1.1493E-05	15.04	30.09	0.00E+00	1.73E-04	3.46E-04		
Sr-90	1.3649E+00	15.04	30.09	0.00E+00	2.05E+01	4.11E+01		
Tc-99	4.6856E-04	15.04	30.09	0.00E+00	7.02E-03	1.40E-02		
Th-229	1.4547E-11	15.04	30.09	0.00E+00	2.19E-10	4.38E-10		
Th-230	1.6617E-10	15.04	30.09	0.00E+00	2.50E-09	5.00E-09		
Th-232	8.3361E-12	15.04	30.09	0.00E+00	1.25E-10	2.51E-10		
Tl-208	2.1664E-08	15.04	30.09	0.00E+00	3.26E-07	6.52E-07		
U-232	5.8669E-08	15.04	30.09	0.00E+00	8.63E-07	1.77E-06		
U-233	3.1847E-09	15.04	30.09	0.00E+00	4.79E-08	9.58E-08		
U-234	3.8769E-07	15.04	30.09	0.00E+00	5.83E-06	1.17E-05		
U-235	-2.7761E-06	15.04	0.00	1.60E-03	1.56E-03	1.60E-03		
U-236	1.6190E-05	15.04	30.09	0.00E+00	2.44E-04	4.87E-04		
U-238	-2.8547E-09	15.04	0.00	1.84E-05	1.83E-05	1.84E-05		
Y-90	1.3652E+00	15.04	30.09	0.00E+00	2.05E+01	4.11E+01		
Other Radonucleides					2.48E+01	4.97E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding:	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93.14242815	60 to 100	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		15.04	Nominal burnup assumed to be 2% of BOL heavy metal mass.
		30.09	Bounding burnup assumed to be twice nominal burnup
Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
Bounding	0.40	0.98	
	0.81		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PBF DRIVER CORE

SNF ID #: 167

Fuel Units & Descr: 2425 - ROD

Heavy Metal Mass: BOL=571 815kg; EOL=561 63kg

ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1985

Estimates as of: 2010

Template: Pathfinder (Light Water, SST 60 to 100%, U)

<sup>2</sup>Template Burnup(MWd): 6 01

Template BOL Heavy Metal Mass (MT): 0 00012882

Template Decay Time: 25 years

Estimated

Canister usage:

18"x15"

8 98

## II. Estimates

Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources
Ac-227	1 3562E-08	9,621.24	19,242.47	0 00E+00	1 30E-04	2 61E-04	Photon Energy Group
Am-241	1 0168E-04	9,621.24	19,242.47	0 00E+00	9 78E-01	1 96E+00	Total Photons/sec (bounding)
Am-242m	8 9052E-09	9,621.24	19,242.47	0 00E+00	8 57E-05	1 71E-04	Avg. MeV
Am-243	9 8602E-10	9,621.24	19,242.47	0 00E+00	9 49E-06	1 90E-05	
C-14	2 3045E-04	9,621.24	19,242.47	0 00E+00	2 22E+00	4 43E+00	
Cl-36	1 2261E-06	9,621.24	19,242.47	0 00E+00	1 18E-02	2 36E-02	
Cm-243	3 1730E-10	9,621.24	19,242.47	0 00E+00	3 05E-06	6 11E-06	
Cm-244	3 3977E-09	9,621.24	19,242.47	0 00E+00	3 27E-05	6 54E-05	
Co-60	2 6373E-01	9,621.24	19,242.47	0 00E+00	2 54E+03	5 07E+03	
Cs-134	8 7072E-05	9,621.24	19,242.47	0 00E+00	8 38E-01	1 68E+00	
Cs-135	3 0316E-05	9,621.24	19,242.47	0 00E+00	2 92E-01	5 83E-01	
Cs-137	1 8286E+00	9,621.24	19,242.47	0 00E+00	1 76E+04	3 52E+04	
Eu-154	1 4982E-03	9,621.24	19,242.47	0 00E+00	1 44E+01	2 88E+01	
Eu-155	2 8236E-03	9,621.24	19,242.47	0 00E+00	2 72E+01	5 43E+01	
Fe-55	1 7687E-02	9,621.24	19,242.47	0 00E+00	1 70E+02	3 40E+02	
H-3	4 4043E-03	9,621.24	19,242.47	0 00E+00	4 24E+01	8 48E+01	
I-129	7 3195E-07	9,621.24	19,242.47	0 00E+00	7 04E-03	1 41E-02	
Kr-85	7 8769E-02	9,621.24	19,242.47	0 00E+00	7 58E+02	1 52E+03	
Np-237	1 1484E-06	9,621.24	19,242.47	0 00E+00	1 10E-02	2 21E-02	
Pa-231	3 2396E-08	9,621.24	19,242.47	0 00E+00	3 12E-04	6 23E-04	
Pb-210	2 4409E-13	9,621.24	19,242.47	0 00E+00	2 35E-09	4 70E-09	
Pm-147	1 6331E-02	9,621.24	19,242.47	0 00E+00	1 57E+02	3 14E+02	
Pu-238	3 1947E-04	9,621.24	19,242.47	0 00E+00	3 07E+00	6 15E+00	
Pu-239	6 6789E-04	9,621.24	19,242.47	0 00E+00	6 43E+00	1 29E+01	
Pu-240	8 6922E-05	9,621.24	19,242.47	0 00E+00	8 36E-01	1 67E+00	
Pu-241	1 1567E-03	9,621.24	19,242.47	0 00E+00	1 11E+01	2 23E+01	
Pu-242	1 9717E-09	9,621.24	19,242.47	0 00E+00	1 90E-05	3 79E-05	
Ra-226	8 6190E-13	9,621.24	19,242.47	0 00E+00	8 29E-09	1 66E-08	
Ra-228	8 1498E-12	9,621.24	19,242.47	0 00E+00	7 84E-08	1 57E-07	
Ru-106	1 7770E-07	9,621.24	19,242.47	0 00E+00	1 71E-03	3 42E-03	
Se-79	1 3225E-05	9,621.24	19,242.47	0 00E+00	1 27E-01	2 54E-01	
Sn-126	1 1493E-05	9,621.24	19,242.47	0 00E+00	1 11E-01	2 21E-01	
Sr-90	1 7321E+00	9,621.24	19,242.47	0 00E+00	1 67E+04	3 33E+04	
Tc-99	4 6656E-04	9,621.24	19,242.47	0 00E+00	4 49E+00	8 98E+00	
Th-229	1 0110E-11	9,621.24	19,242.47	0 00E+00	9 73E-08	1 95E-07	
Th-230	1 1466E-10	9,621.24	19,242.47	0 00E+00	1 10E-06	2 21E-06	
Th-232	8 3245E-12	9,621.24	19,242.47	0 00E+00	8 01E-08	1 60E-07	
Th-208	2 3860E-08	9,621.24	19,242.47	0 00E+00	2 30E-04	4 59E-04	
U-232	6 4576E-08	9,621.24	19,242.47	0 00E+00	6 21E-04	1 24E-03	
U-233	3 1082E-09	9,621.24	19,242.47	0 00E+00	2 99E-05	5 98E-05	
U-234	3 7587E-07	9,621.24	19,242.47	0 00E+00	3 62E-03	7 23E-03	
U-235	-2 7761E-06	9,621.24	0 00	2 28E-01	2 02E-01	2 28E-01	
U-236	1 6190E-05	9,621.24	19,242.47	0 00E+00	1 56E-01	3 12E-01	
U-238	-2 8547E-09	9,621.24	0 00	1 57E-01	1 57E-01	1 57E-01	
Y-90	1 7321E+00	9,621.24	19,242.47	0 00E+00	1 67E+04	3 33E+04	
Other Radionuclides					1 95E+04	3 90E+04	

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
Fuel Cladding	SST	SST	This fuel matches Pathfinder Template on all but one parameter (enrichment) making Pathfinder a reasonable match.
BOL HM Constituents	U	U	
BOL Enrichment %	18 49024597	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	297.34	9 621.24	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding	623.26	19,242.47	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.36	32.36	1 00
Bounding	0.72	30.87	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PEACH BOTTOM (ASSEMBLY)  
SNF ID # 385  
Fuel Units & Descr. 2 - 7 X 7 ROD ARRAY  
Heavy Metal Mass BOL=288.335kg EOL=285.305kg  
ROD Storage Site INEEL

Fuel decay start date 1976  
Estimates as of 2010  
Template PWR (Light Water, Zirc. 0 to 5% U)  
Template Burnup (MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
1.00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	2,881.39	5,762.77	0.00E+00	1.91E-06	3.83E-06	Avg MeV	
Am-241	1.3144E-01	2,881.39	5,762.77	0.00E+00	3.79E+02	7.57E+02	0.0150	3.919E+14
Am-242m	3.0039E-04	2,881.39	5,762.77	0.00E+00	8.66E-01	1.73E+00	0.0250	7.937E+13
Am-243	6.2629E-04	2,881.39	5,762.77	0.00E+00	1.80E+00	3.61E+00	0.0375	7.681E+13
C-14	4.7965E-05	2,881.39	5,762.77	0.00E+00	1.38E-01	2.76E-01	0.0575	8.380E+13
Cl-36	8.0297E-07	2,881.39	5,762.77	0.00E+00	2.31E-03	4.63E-03	0.0850	4.440E+13
Cm-243	3.1993E-04	2,881.39	5,762.77	0.00E+00	9.22E-01	1.84E+00	0.1250	3.244E+13
Cm-244	7.1851E-02	2,881.39	5,762.77	0.00E+00	2.07E+02	4.14E+02	0.2250	3.812E+13
Co-60	9.5220E-03	2,881.39	5,762.77	0.00E+00	2.74E+01	5.49E+01	0.3750	1.636E+13
Cs-134	1.1662E-03	2,881.39	5,762.77	0.00E+00	3.36E+00	6.72E+00	0.5750	3.758E+14
Cs-135	1.4433E-05	2,881.39	5,762.77	0.00E+00	4.16E-02	8.32E-02	0.8500	7.418E+12
Cs-137	1.7603E+00	2,881.39	5,762.77	0.00E+00	5.07E+03	1.01E+04	1.2500	1.002E+13
Eu-154	4.5203E-02	2,881.39	5,762.77	0.00E+00	1.30E+02	2.60E+02	1.7500	2.195E+11
Eu-155	7.1479E-03	2,881.39	5,762.77	0.00E+00	2.06E+01	4.12E+01	2.2500	4.055E+07
Fe-55	6.1919E-04	2,881.39	5,762.77	0.00E+00	1.78E+00	3.57E+00	2.7500	4.558E+07
H-3	3.6386E-02	2,881.39	5,762.77	0.00E+00	1.05E+02	2.10E+02	3.5000	5.973E+06
I-129	9.8288E-07	2,881.39	5,762.77	0.00E+00	2.83E-03	5.66E-03	5.0000	2.553E+06
Kr-85	5.3844E-02	2,881.39	5,762.77	0.00E+00	1.55E+02	3.10E+02	7.0000	2.943E+06
Np-237	1.0546E-05	2,881.39	5,762.77	0.00E+00	3.04E-02	6.08E-02	11.0000	3.380E+04
Pa-231	1.1370E-09	2,881.39	5,762.77	0.00E+00	3.28E-06	6.55E-06		
Pb-210	3.3624E-11	2,881.39	5,762.77	0.00E+00	9.69E-08	1.94E-07		
Pm-147	5.1211E-03	2,881.39	5,762.77	0.00E+00	1.48E+01	2.95E+01		
Pu-238	8.0669E-02	2,881.39	5,762.77	0.00E+00	2.32E+02	4.65E+02		
Pu-239	1.1626E-02	2,881.39	5,762.77	0.00E+00	3.35E+01	6.70E+01		
Pu-240	1.5097E-02	2,881.39	5,762.77	0.00E+00	4.35E+01	8.70E+01		
Pu-241	1.4567E+00	2,881.39	5,762.77	0.00E+00	4.20E+03	8.39E+03		
Pu-242	6.4260E-05	2,881.39	5,762.77	0.00E+00	1.85E-01	3.70E-01		
Ra-226	1.1392E-10	2,881.39	5,762.77	0.00E+00	3.28E-07	6.57E-07		
Ra-228	5.1841E-12	2,881.39	5,762.77	0.00E+00	1.49E-08	2.99E-08		
Ru-106	5.9012E-07	2,881.39	5,762.77	0.00E+00	1.70E-03	3.40E-03		
Se-79	1.2379E-05	2,881.39	5,762.77	0.00E+00	3.57E-02	7.13E-02		
Sn-126	2.5210E-05	2,881.39	5,762.77	0.00E+00	7.26E-02	1.45E-01		
Sr-90	1.1630E+00	2,881.39	5,762.77	0.00E+00	3.35E+03	6.70E+03		
Tc-99	3.9357E-04	2,881.39	5,762.77	0.00E+00	1.13E+00	2.27E+00		
Th-229	8.5691E-11	2,881.39	5,762.77	0.00E+00	2.47E-07	4.94E-07		
Th-230	1.4493E-08	2,881.39	5,762.77	0.00E+00	4.18E-05	8.35E-05		
Th-232	5.2923E-12	2,881.39	5,762.77	0.00E+00	1.52E-08	3.05E-08		
Ti-208	1.9202E-07	2,881.39	5,762.77	0.00E+00	5.53E-04	1.11E-03		
U-232	5.2083E-07	2,881.39	5,762.77	0.00E+00	1.50E-03	3.00E-03	Thermal Power	
U-233	2.4386E-08	2,881.39	5,762.77	0.00E+00	7.03E-05	1.41E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4.7012E-05	2,881.39	5,762.77	0.00E+00	1.35E-01	2.71E-01	7.90E+01	1.58E+02
U-235	-1.4492E-06	2,881.39	0.00	1.51E-02	1.10E-02	1.51E-02	Total	Total
U-236	7.5759E-06	2,881.39	5,762.77	0.00E+00	2.18E-02	4.37E-02		
U-238	-2.6129E-07	2,881.39	0.00	9.46E-02	9.38E-02	9.46E-02		
Y-90	1.1631E+00	2,881.39	5,762.77	0.00E+00	3.35E+03	6.70E+03		
Other Radionuclides					4.87E+03	9.74E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding		ZIRC	
BOL HM Constituents		U	
BOL Enrichment %	2.429812544	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal	2,476.80	2,881.39	
Bounding	2,479.97	5,762.77	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.29	1.16	
Bounding	0.57	2.32	1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PEACH BOTTOM RODS  
SNF ID #: 386  
Fuel Units & Descr: 20 - ROD  
Heavy Metal Mass: BOL=79kg, EOL=71 12kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1976  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 25 years

Estimated  
Canister usage  
HIC  
0 57

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6376E-10	7,493 51	14,987 01	0 00E+00	4 97E-06	9.95E-06	Avg MeV	
Am-241	1 3144E-01	7,493 51	14,987 01	0 00E+00	9 85E+02	1 97E+03	0 0150	1 019E+15
Am-242m	3 0039E-04	7,493 51	14,987 01	0 00E+00	2 25E+00	4 50E+00	0 0250	2 064E+14
Am-243	6 2629E-04	7,493 51	14,987 01	0 00E+00	4 69E+00	9 39E+00	0 0375	1 998E+14
C-14	4 7965E-05	7,493 51	14,987 01	0 00E+00	3 59E-01	7.19E-01	0 0575	2 179E+14
Cl-36	8 0297E-07	7,493 51	14,987 01	0 00E+00	6 02E-03	1.20E-02	0 0850	1 155E+14
Cm-243	3 1993E-04	7,493 51	14,987 01	0 00E+00	2 40E+00	4 79E+00	0 1250	8 436E+13
Cm-244	7 1851E-02	7,493 51	14,987 01	0 00E+00	5 38E+02	1 08E+03	0 2250	9 913E+13
Co-60	9 5220E-03	7,493 51	14,987 01	0 00E+00	7 14E+01	1 43E+02	0.3750	4 254E+13
Cs-134	1 1662E-03	7,493 51	14,987 01	0 00E+00	8 74E+00	1 75E+01	0 5750	9 774E+14
Cs-135	1 4433E-05	7,493 51	14,987 01	0 00E+00	1 08E-01	2 16E-01	0 8500	1 929E+13
Cs-137	1 7603E+00	7,493 51	14,987 01	0 00E+00	1 32E+04	2 64E+04	1.2500	2 606E+13
Cu-154	4 5203E-02	7,493 51	14,987 01	0 00E+00	3 39E+02	6 77E+02	1 7500	5 710E+11
Eu-155	7 1479E-03	7,493 51	14,987 01	0 00E+00	5 36E+01	1 07E+02	2.2500	1 055E+08
Fe-55	6 1919E-04	7,493 51	14,987 01	0 00E+00	4 64E+00	9 28E+00	2.7500	1 185E+08
H-3	3 6386E-02	7,493 51	14,987 01	0 00E+00	2 73E+02	5 45E+02	3 5000	1 553E+07
I-129	9 8288E-07	7,493 51	14,987 01	0 00E+00	7 37E-03	1 47E-02	5 0000	6 636E+06
Kr-85	5 3844E-02	7,493 51	14,987 01	0 00E+00	4 03E+02	8 07E+02	7 0000	7 753E+05
Np-237	1 0546E-05	7,493 51	14,987 01	0 00E+00	7 90E-02	1 58E-01	11 0000	8 790E+04
Pa-231	1 1370E-09	7,493 51	14,987 01	0 00E+00	8 52E-06	1 70E-05		
Pb-210	3 3624E-11	7,493 51	14,987 01	0 00E+00	2 52E-07	5 04E-07		
Pm-147	5 1211E-03	7,493 51	14,987 01	0 00E+00	3 84E+01	7 68E+01		
Pu-238	8 0669E-02	7,493 51	14,987 01	0 00E+00	6 04E+02	1 21E+03		
Pu-239	1 1626E-02	7,493 51	14,987 01	0 00E+00	8 71E+01	1 74E+02		
Pu-240	1 5097E-02	7,493 51	14,987 01	0 00E+00	1 13E+02	2 26E+02		
Pu-241	1 4567E+00	7,493 51	14,987 01	0 00E+00	1 09E+04	2.18E+04		
Pu-242	6 4260E-05	7,493 51	14,987 01	0 00E+00	4 82E-01	9 63E-01		
Ra-226	1 1392E-10	7,493 51	14,987 01	0 00E+00	8 54E-07	1 71E-06		
Ra-228	5 1841E-12	7,493 51	14,987 01	0 00E+00	3 88E-08	7 77E-08		
Ru-106	5 9012E-07	7,493 51	14,987 01	0 00E+00	4 42E-03	8 84E-03		
Se-79	1 2379E-05	7,493 51	14,987 01	0 00E+00	9 28E-02	1 86E-01		
Sn-126	2 5210E-05	7,493 51	14,987 01	0 00E+00	1 89E-01	3 78E-01		
Sr-90	1.1630E+00	7,493 51	14,987 01	0 00E+00	8 71E+03	1 74E+04		
Tc-99	3.9357E-04	7,493 51	14,987 01	0 00E+00	2 96E+00	5 90E+00		
Th-229	8 5691E-11	7,493 51	14,987 01	0 00E+00	6 42E-07	1 28E-06		
Th-230	1 4493E-08	7,493 51	14,987 01	0 00E+00	1 09E-04	2 17E-04		
Th-232	5.2923E-12	7,493 51	14,987 01	0 00E+00	3 97E-08	7 93E-08		
Th-208	1 9202E-07	7,493 51	14,987 01	0 00E+00	1 44E-03	2 88E-03		
U-232	5.2083E-07	7,493 51	14,987 01	0 00E+00	3 90E-03	7 81E-03		
U-233	2 4386E-08	7,493 51	14,987 01	0 00E+00	1 83E-04	3 65E-04		
U-234	4 7012E-05	7,493 51	14,987 01	0 00E+00	3 52E-01	7 05E-01		
U-235	-1 4492E-06	7,493 51	0 00	4 15E-03	0 00E+00	4 15E-03		
U-236	7.5759E-06	7,493 51	14,987 01	0 00E+00	5 68E-02	1.14E-01		
U-238	-2 6129E-07	7,493 51	0 00	2 59E-02	2 39E-02	2 59E-02		
Y-90	1.1631E+00	7,493 51	14,987.01	0 00E+00	8 72E+03	1.74E+04		
Other Radionuclides					1.27E+04	2.53E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	2 43	0 to 5	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
	809 75 943.26	7,493.51 14,987 01	

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	2.71 5 42	9.25 15 89	

1.05

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PEACH BOTTOM UNIT 1 CORE 1  
SNF ID #: 169  
Fuel Units & Descr: 2 - SCRAP  
Heavy Metal Mass BOL=3 746kg, EOL=3 56kg  
ROD Storage Site INEEL

Fuel decay start date 1969  
Estimates as of 2010  
Template FSV (Graphite Graphite, 60 to 100%, Th & U)  
Template Burnup(MWd) 1270.275  
Template BOL Heavy Metal Mass (MT) 0.012702752  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x15"  
0.15

II. Estimates		m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.8818E-06	176.28	352.57	0.00E+00	6.84E-04	1.37E-03	0.0150	2.474E+13	
Am-241	3.1387E-03	176.28	352.57	0.00E+00	5.53E-01	1.11E+00	0.0250	5.068E+12	
Am-242m	2.3971E-06	176.28	352.57	0.00E+00	4.23E-04	8.45E-04	0.0375	4.417E+12	
Am-243	4.6069E-05	176.28	352.57	0.00E+00	8.12E-03	1.62E-02	0.0575	4.751E+12	
C-14	2.3121E-05	176.28	352.57	0.00E+00	4.08E-03	8.15E-03	0.0850	2.869E+12	
Cl-36	1.0667E-06	176.28	352.57	0.00E+00	1.88E-04	3.76E-04	0.1250	1.935E+12	
Cm-243	2.5357E-05	176.28	352.57	0.00E+00	4.47E-03	8.94E-03	0.2250	2.489E+12	
Cm-244	6.4458E-03	176.28	352.57	0.00E+00	1.14E+00	2.27E+00	0.3750	1.076E+12	
Co-60	4.5014E-04	176.28	352.57	0.00E+00	7.94E-02	1.59E-01	0.5750	1.746E+13	
Cs-134	3.8086E-05	176.28	352.57	0.00E+00	6.71E-03	1.34E-02	0.8500	2.759E+11	
Cs-135	2.4711E-05	176.28	352.57	0.00E+00	4.36E-03	8.71E-03	1.2500	1.779E+11	
Cs-137	1.3273E+00	176.28	352.57	0.00E+00	2.34E+02	4.68E+02	1.7500	8.449E+09	
Eu-154	1.5705E-02	176.28	352.57	0.00E+00	2.77E+00	5.54E+00	2.2500	6.224E+05	
Eu-155	1.0415E-03	176.28	352.57	0.00E+00	1.84E-01	3.67E-01	2.7500	7.370E+09	
Fe-55	4.4707E-08	176.28	352.57	0.00E+00	7.88E-06	1.58E-05	3.5000	3.529E+04	
H-3	3.9094E-03	176.28	352.57	0.00E+00	6.89E-01	1.38E+00	5.0000	1.501E+04	
I-129	1.0092E-06	176.28	352.57	0.00E+00	1.78E-04	3.56E-04	7.0000	1.725E+03	
Kr-85	3.9519E-02	176.28	352.57	0.00E+00	6.97E+00	1.39E+01	11.0000	1.978E+02	
Np-237	1.2541E-05	176.28	352.57	0.00E+00	2.21E-03	4.42E-03			
Pa-231	4.7376E-06	176.28	352.57	0.00E+00	8.35E-04	1.67E-03			
Pb-210	1.4194E-09	176.28	352.57	0.00E+00	2.50E-07	5.00E-07			
Pm-147	1.5146E-04	176.28	352.57	0.00E+00	2.67E-02	5.34E-02			
Pu-238	1.6248E-01	176.28	352.57	0.00E+00	2.86E+01	5.73E+01			
Pu-239	1.3580E-04	176.28	352.57	0.00E+00	2.39E-02	4.79E-02			
Pu-240	2.7136E-04	176.28	352.57	0.00E+00	4.78E-02	9.57E-02			
Pu-241	1.9342E-02	176.28	352.57	0.00E+00	3.41E+00	6.82E+00			
Pu-242	3.8866E-06	176.28	352.57	0.00E+00	6.85E-04	1.37E-03			
Ra-226	2.7923E-09	176.28	352.57	0.00E+00	4.92E-07	9.84E-07			
Ra-228	9.1791E-07	176.28	352.57	0.00E+00	1.62E-04	3.24E-04			
Ru-106	3.5205E-11	176.28	352.57	0.00E+00	6.21E-09	1.24E-08			
Se-79	2.1082E-05	176.28	352.57	0.00E+00	3.72E-03	7.43E-03			
Sn-126	2.2192E-05	176.28	352.57	0.00E+00	3.91E-03	7.82E-03			
Sr-90	1.2667E+00	176.28	352.57	0.00E+00	2.23E+02	4.47E+02			
Tc-99	3.3331E-04	176.28	352.57	0.00E+00	5.88E-02	1.18E-01			
Th-229	1.0612E-05	176.28	352.57	0.00E+00	1.87E-03	3.74E-03			
Th-230	1.8878E-07	176.28	352.57	0.00E+00	3.33E-05	6.66E-05			
Th-232	-6.9673E-08	176.28	0.00	3.71E-04	3.58E-04	3.71E-04			
Ti-208	5.9530E-04	176.28	352.57	0.00E+00	1.05E-01	2.10E-01			
U-232	1.6115E-03	176.28	352.57	0.00E+00	2.84E-01	5.68E-01			
U-233	2.0602E-03	176.28	352.57	0.00E+00	3.63E-01	7.26E-01			
U-234	2.8939E-04	176.28	352.57	0.00E+00	5.10E-02	1.02E-01			
U-235	-1.7343E-06	176.28	0.00	7.41E-04	4.35E-04	7.41E-04			
U-236	8.6281E-06	176.28	352.57	0.00E+00	1.52E-03	3.04E-03			
U-238	-5.6065E-09	176.28	0.00	7.37E-06	6.39E-06	7.37E-06			
Y-90	1.2667E+00	176.28	352.57	0.00E+00	2.23E+02	4.47E+02			
Other Radionuclides					2.25E+02	4.49E+02			

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	GRAPHITE	GRAPHITE	
BOL Enrichment %	Th and U	Th and U	
	93.333	60 to 100	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal	From SFD	Estimated	
Bounding	115.37	176.28	
		352.57	
			Nominal burnup calculated from the heavy metal mass destroyed.
			Bounding burnup assumed to be twice nominal burnup
Checks			
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM - 1.00
Bounding	0.47	3.06	
	0.94		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PEACH BOTTOM UNIT 1 CORE 1  
SNF ID #: 170  
Fuel Units & Descr: 814 - CONCENTRIC TUBES  
Heavy Metal Mass: BOL=1707 365kg; EOL=1660 153kg  
ROD Storage Site: INEEL

Fuel decay start date: 1969  
Estimates as of: 2010  
Template: FSV (Graphite, Graphite, 60 to 100%, Th & U)  
Template Burnup(MWd): 1270.275  
Template BOL Heavy Metal Mass (MT): 0 012702752  
Template Decay Time: 35 years

Estimated  
Canister usage  
18"x15"  
62 62

II. Estimates	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3 8818E-06	44,649 60	52,578 31	0 00E+00	1.73E-01	2.04E-01	Avg. MeV	
Am-241	3 1387E-03	44,649 60	52,578 31	0 00E+00	1 40E+02	1 65E+02	0 0150	3 690E+15
Am-242m	2 3971E-06	44,649 60	52,578 31	0 00E+00	1.07E-01	1.26E-01	0 0250	7 558E+14
Am-243	4 6069E-05	44,649 60	52,578 31	0 00E+00	2 06E+00	2 42E+00	0 0375	6 587E+14
C-14	2 3121E-05	44,649 60	52,578 31	0 00E+00	1 03E+00	1.22E+00	0 0575	7 086E+14
Cl-36	1 0667E-06	44,649 60	52,578 31	0 00E+00	4.76E-02	5 61E-02	0 0850	4 278E+14
Cm-243	2 5357E-05	44,649 60	52,578 31	0 00E+00	1 13E+00	1.33E+00	0 1250	2.886E+14
Cm-244	6 4458E-03	44,649 60	52,578 31	0 00E+00	2 88E+02	3.39E+02	0.2250	3.711E+14
Co-60	4 5014E-04	44,649 60	52,578 31	0 00E+00	2 01E+01	2.37E+01	0.3750	1 605E+14
Cs-134	3 8086E-05	44,649 60	52,578 31	0 00E+00	1 70E+00	2 00E+00	0 5750	2 604E+15
Cs-135	2 4711E-05	44,649 60	52,578 31	0 00E+00	1 10E+00	1 30E+00	0 8500	4 115E+13
Cs-137	1 3273E+00	44,649 60	52,578 31	0 00E+00	5 93E+04	6 98E+04	1.2500	2.653E+13
Eu-154	1 5705E-02	44,649 60	52,578 31	0 00E+00	7 01E+02	8.26E+02	1 7500	1 605E+12
Eu-155	1 0415E-03	44,649 60	52,578 31	0 00E+00	4 65E+01	5 48E+01	2.2500	9 283E+07
Fe-55	4 4707E-08	44,649 60	52,578 31	0 00E+00	2.00E-03	2.35E-03	2 7500	1 099E+12
H-3	3 9094E-03	44,649 60	52,578 31	0 00E+00	1 75E+02	2.06E+02	3.5000	5.249E+06
I-129	1 0092E-06	44,649 60	52,578 31	0 00E+00	4.51E-02	5.31E-02	5 0000	2.238E+06
Kr-85	3 9519E-02	44,649 60	52,578 31	0 00E+00	1 76E+03	2 08E+03	7 0000	2.572E+05
Np-237	1 2541E-05	44,649 60	52,578 31	0 00E+00	5 60E-01	6 59E-01	11 0000	2.950E+04
Pa-231	4 7376E-06	44,649 60	52,578 31	0 00E+00	2.12E-01	2 49E-01		
Pb-210	1 4194E-09	44,649 60	52,578 31	0 00E+00	6.34E-05	7 46E-05		
Pm-147	1 5146E-04	44,649 60	52,578 31	0 00E+00	6.76E+00	7.96E+00		
Pu-238	1 6248E-01	44,649 60	52,578 31	0 00E+00	7.25E+03	8.54E+03		
Pu-239	1 3580E-04	44,649 60	52,578 31	0 00E+00	6 06E+00	7.14E+00		
Pu-240	2 7136E-04	44,649 60	52,578 31	0 00E+00	1.21E+01	1 43E+01		
Pu-241	1 9342E-02	44,649 60	52,578 31	0 00E+00	8 64E+02	1 02E+03		
Pu-242	3 8866E-06	44,649 60	52,578 31	0 00E+00	1.74E-01	2 04E-01		
Ra-226	2 7923E-09	44,649 60	52,578 31	0 00E+00	1.25E-04	1.47E-04		
Ra-228	9 1791E-07	44,649 60	52,578 31	0 00E+00	4.10E-02	4 83E-02		
Ru-106	3 5205E-11	44,649 60	52,578 31	0 00E+00	1.57E-06	1.85E-06		
Se-79	2 1082E-05	44,649 60	52,578 31	0 00E+00	9 41E-01	1.11E+00		
Sn-126	2 2192E-05	44,649 60	52,578 31	0 00E+00	9 91E-01	1.17E+00		
Sr-90	1 2667E+00	44,649 60	52,578 31	0 00E+00	5 66E+04	6 66E+04		
Tc-99	3 3331E-04	44,649 60	52,578 31	0 00E+00	1 49E+01	1 75E+01		
Th-229	1 0612E-05	44,649 60	52,578 31	0 00E+00	4.74E-01	5.58E-01		
Th-230	1 8878E-07	44,649 60	52,578 31	0 00E+00	8.43E-03	9 93E-03		
Th-232	-6 9673E-08	44,649 60	0 00	1 69E-01	1 66E-01	1 69E-01		
Th-208	5 9530E-04	44,649 60	52,578 31	0 00E+00	2 66E+01	3.13E+01		
U-232	1 6115E-03	44,649 60	52,578 31	0 00E+00	7.20E+01	8.47E+01	Thermal Power	
U-233	2 0602E-03	44,649 60	52,578 31	0 00E+00	9.20E+01	1.08E+02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	2 8939E-04	44,649 60	52,578 31	0 00E+00	1.29E+01	1.52E+01		
U-235	-1.7343E-06	44,649 60	0 00	3 38E-01	2 60E-01	3.38E-01		
U-236	8 6281E-06	44,649 60	52,578 31	0 00E+00	3.85E-01	4 54E-01	9.51E+02	1.12E+03
U-238	-5 6065E-09	44,649 60	0 00	3.36E-03	3.11E-03	3.36E-03	Total	Total
Y-90	1 2667E+00	44,649 60	52,578 31	0 00E+00	5 66E+04	6 66E+04		
Other Radionuclides					5 69E+04	6.70E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	GRAPHITE	GRAPHITE	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	93 1525882	60 to 100	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	52,578.31	44 649 60	
Bounding		89,299.20	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.26		
Bounding	0.31	1 70	1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PEACH BOTTOM UNIT I CORE II

SNF ID # 171

Fuel Units & Descr 787 - CONCENTRIC TUBES

Heavy Metal Mass BOL=1389 055kg, EOL=1289 657kg

ROD Storage Site INEEL

Fuel decay start date 1973

Estimates as of 2010

Template

FSV (Graphite, Graphite, 60 to 100%, Th & U)

Template Burnup(MWd)

1270.275

Template BOL Heavy Metal Mass (MT)

0 012702752

Template Decay Time

35 years

Estimated

Canister usage:

18"x15"

60 54

## II. Estimates

	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.8818E-06	94,003.34	101,007.91	0 00E+00	3 65E-01	3 92E-01	Avg MeV	
Am-241	3 1387E-03	94,003.34	101,007.91	0 00E+00	2 95E+02	3 17E+02	0 0150	7 088E+15
Am-242m	2.3971E-06	94,003.34	101,007.91	0 00E+00	2 25E-01	2 42E-01	0 0250	1 452E+15
Am-243	4 6069E-05	94,003.34	101,007.91	0 00E+00	4 33E+00	4 65E+00	0 0375	1 265E+15
C-14	2 3121E-05	94,003.34	101,007.91	0 00E+00	2 17E+00	2 34E+00	0 0575	1 361E+15
Cl-36	1 0667E-06	94,003.34	101,007.91	0 00E+00	1 00E-01	1 08E-01	0 0850	8 218E+14
Cm-243	2 5357E-05	94,003.34	101,007.91	0 00E+00	2 38E+00	2 56E+00	0 1250	5 544E+14
Cm-244	6 4458E-03	94,003.34	101,007.91	0 00E+00	6 06E+02	6 51E+02	0 2250	7 129E+14
Co-60	4 5014E-04	94,003.34	101,007.91	0 00E+00	4 23E+01	4 55E+01	0 3750	3 082E+14
Cs-134	3 8086E-05	94,003.34	101,007.91	0 00E+00	3 58E+00	3 85E+00	0 5750	5 003E+15
Cs-135	2 4711E-05	94,003.34	101,007.91	0 00E+00	2 32E+00	2 50E+00	0 8500	7 905E+13
Cs-137	1 3273E+00	94,003.34	101,007.91	0 00E+00	1 25E+05	1 34E+05	1 2500	5 096E+13
Eu-154	1 5705E-02	94,003.34	101,007.91	0 00E+00	1 48E+03	1 59E+03	1 7500	2 420E+12
Eu-155	1 0415E-03	94,003.34	101,007.91	0 00E+00	9 79E+01	1 05E+02	2 2500	1 783E+08
Fe-55	4 4707E-08	94,003.34	101,007.91	0 00E+00	4 20E-03	4 52E-03	2 7500	2 111E+12
H-3	3 9094E-03	94,003.34	101,007.91	0 00E+00	3 67E+02	3 95E+02	3 5000	1 008E+07
I-129	1 0092E-06	94,003.34	101,007.91	0 00E+00	9 49E-02	1 02E-01	5 0000	4 300E+06
Kr-85	3 9519E-02	94,003.34	101,007.91	0 00E+00	3 71E+03	3 99E+03	7 0000	4 942E+05
Np-237	1 2541E-05	94,003.34	101,007.91	0 00E+00	1 18E+00	1 27E+00	11 0000	5 667E+04
Pa-231	4 7376E-06	94,003.34	101,007.91	0 00E+00	4 45E-01	4 79E-01		
Pb-210	1 4194E-09	94,003.34	101,007.91	0 00E+00	1 33E-04	1 43E-04		
Pm-147	1 5146E-04	94,003.34	101,007.91	0 00E+00	1 42E+01	1 53E+01		
Pu-238	1 6248E-01	94,003.34	101,007.91	0 00E+00	1 53E+04	1 64E+04		
Pu-239	1 3580E-04	94,003.34	101,007.91	0 00E+00	1 28E+01	1 37E+01		
Pu-240	2 7136E-04	94,003.34	101,007.91	0 00E+00	2 55E+01	2 74E+01		
Pu-241	1 9342E-02	94,003.34	101,007.91	0 00E+00	1 82E+03	1 95E+03		
Pu-242	3 8866E-06	94,003.34	101,007.91	0 00E+00	3 65E-01	3 93E-01		
Ra-226	2 7923E-09	94,003.34	101,007.91	0 00E+00	2 62E-04	2 82E-04		
Ra-228	9 1791E-07	94,003.34	101,007.91	0 00E+00	8 63E-02	9 27E-02		
Ru-106	3 5205E-11	94,003.34	101,007.91	0 00E+00	3 31E-06	3 56E-06		
Se-79	2 1082E-05	94,003.34	101,007.91	0 00E+00	1 98E+00	2 13E+00		
Sn-126	2 2192E-05	94,003.34	101,007.91	0 00E+00	2 09E+00	2 24E+00		
Sr-90	1 2667E+00	94,003.34	101,007.91	0 00E+00	1 19E+05	1 28E+05		
Tc-99	3 3331E-04	94,003.34	101,007.91	0 00E+00	3 13E+01	3 37E+01		
Th-229	1 0612E-05	94,003.34	101,007.91	0 00E+00	9 98E-01	1 07E+00		
Th-230	1 8878E-07	94,003.34	101,007.91	0 00E+00	1 77E-02	1 91E-02		
Th-232	-6.9673E-08	94,003.34	0 00	1 37E-01	1 31E-01	1 37E-01		
Th-208	5 9530E-04	94,003.34	101,007.91	0 00E+00	5 60E+01	6 01E+01		
U-232	1 6115E-03	94,003.34	101,007.91	0 00E+00	1 51E+02	1 63E+02	Thermal Power	
U-233	2 0602E-03	94,003.34	101,007.91	0 00E+00	1 94E+02	2 08E+02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	2 8939E-04	94,003.34	101,007.91	0 00E+00	2 72E+01	2 92E+01	2 00E+03	2 15E+03
U-235	-1 7343E-06	94,003.34	0 00	2 75E-01	1 12E-01	2 75E-01	Total	Total
U-236	8 6281E-06	94,003.34	101,007.91	0 00E+00	8 11E-01	8 72E-01		
U-238	-5 6065E-09	94,003.34	0 00	2 73E-03	2 21E-03	2 73E-03		
Y-90	1 2667E+00	94,003.34	101,007.91	0 00E+00	1 19E+05	1 28E+05		
Other Radionuclides					1 20E+05	1 29E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	GRAPHITE	GRAPHITE	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	93 15000286	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		94,003.34	
Bounding	101 007.91	188 006.68	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 68		
Bounding	0 73	1 86	1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PEACH BOTTOM UNIT I CORE II (INTACT)  
 SNF ID #: 206  
 Fuel Units & Descr: 9 - CONCENTRIC TUBES  
 Heavy Metal Mass BOL=11 925kg; EOL=11 977kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1974  
 Estimates as of: 2010  
 Template: FSV (Graphite, Graphite, 60 to 100%, Th & U)  
<sup>2</sup>Template Burnup(MWd): 1270.275  
 Template BOL Heavy Metal Mass (MT): 0 012702752  
 Template Decay Time: 35 years

Estimated  
 Canister usage:  
 18"x15"  
 0 69

II. Estimates	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.8818E-06	674.97	867.05	0.00E+00	2.62E-03	3.37E-03	Avg. MeV	
Am-241	3.1387E-03	674.97	867.05	0.00E+00	2.12E+00	2.72E+00	0.0150	6.084E+13
Am-242m	2.3971E-06	674.97	867.05	0.00E+00	1.62E-03	2.08E-03	0.0250	1.246E+13
Am-243	4.6069E-05	674.97	867.05	0.00E+00	3.11E-02	3.99E-02	0.0375	1.066E+13
C-14	2.3121E-05	674.97	867.05	0.00E+00	1.56E-02	2.00E-02	0.0575	1.169E+13
Cl-36	1.0667E-06	674.97	867.05	0.00E+00	7.20E-04	9.25E-04	0.0850	7.055E+12
Cm-243	2.5357E-05	674.97	867.05	0.00E+00	1.71E-02	2.20E-02	0.1250	4.759E+12
Cm-244	6.4458E-03	674.97	867.05	0.00E+00	4.35E+00	5.59E+00	0.2250	6.120E+12
Co-60	4.5014E-04	674.97	867.05	0.00E+00	3.04E-01	3.90E-01	0.3750	2.646E+12
Cs-134	3.8086E-05	674.97	867.05	0.00E+00	2.57E-02	3.30E-02	0.5750	4.295E+13
Cs-135	2.4711E-05	674.97	867.05	0.00E+00	1.67E-02	2.14E-02	0.8500	6.786E+11
Cs-137	1.3273E+00	674.97	867.05	0.00E+00	8.96E+02	1.15E+03	1.2500	4.375E+11
Eu-154	1.5705E-02	674.97	867.05	0.00E+00	1.06E+01	1.36E+01	1.7500	2.078E+10
Eu-155	1.0415E-03	674.97	867.05	0.00E+00	7.03E-01	9.03E-01	2.2500	1.531E+06
Fe-55	4.4707E-08	674.97	867.05	0.00E+00	3.02E-05	3.88E-05	2.7500	1.812E+10
H-3	3.9094E-03	674.97	867.05	0.00E+00	2.64E+00	3.39E+00	3.5000	8.657E+04
I-129	1.0092E-06	674.97	867.05	0.00E+00	6.81E-04	8.75E-04	5.0000	3.691E+04
Kr-85	3.9519E-02	674.97	867.05	0.00E+00	2.67E+01	3.43E+01	7.0000	4.242E+03
Np-237	1.2541E-05	674.97	867.05	0.00E+00	8.46E-03	1.09E-02	11.0000	4.864E+02
Pa-231	4.7376E-06	674.97	867.05	0.00E+00	3.20E-03	4.11E-03		
Pb-210	1.4194E-09	674.97	867.05	0.00E+00	9.58E-07	1.23E-06		
Pm-147	1.5146E-04	674.97	867.05	0.00E+00	1.02E-01	1.31E-01		
Pu-238	1.6248E-01	674.97	867.05	0.00E+00	1.10E+02	1.41E+02		
Pu-239	1.3580E-04	674.97	867.05	0.00E+00	9.17E-02	1.18E-01		
Pu-240	2.7136E-04	674.97	867.05	0.00E+00	1.83E-01	2.35E-01		
Pu-241	1.9342E-02	674.97	867.05	0.00E+00	1.31E+01	1.68E+01		
Pu-242	3.8866E-06	674.97	867.05	0.00E+00	2.62E-03	3.37E-03		
Ra-226	2.7923E-09	674.97	867.05	0.00E+00	1.88E-06	2.42E-06		
Ra-228	9.1791E-07	674.97	867.05	0.00E+00	6.20E-04	7.96E-04		
Ru-106	3.5205E-11	674.97	867.05	0.00E+00	2.38E-08	3.05E-08		
Se-79	2.1082E-05	674.97	867.05	0.00E+00	1.42E-02	1.83E-02		
Sn-126	2.2192E-05	674.97	867.05	0.00E+00	1.50E-02	1.92E-02		
Sr-90	1.2667E+00	674.97	867.05	0.00E+00	8.55E+02	1.10E+03		
Tc-99	3.3331E-04	674.97	867.05	0.00E+00	2.25E-01	2.89E-01		
Th-229	1.0612E-05	674.97	867.05	0.00E+00	7.16E-03	9.20E-03		
Th-230	1.8878E-07	674.97	867.05	0.00E+00	1.27E-04	1.64E-04		
Th-232	6.9673E-08	674.97	0.00	1.18E-03	1.13E-03	1.18E-03		
Th-208	5.9530E-04	674.97	867.05	0.00E+00	4.02E-01	5.16E-01		
U-232	1.6115E-03	674.97	867.05	0.00E+00	1.09E+00	1.40E+00		
U-233	2.0602E-03	674.97	867.05	0.00E+00	1.39E+00	1.79E+00		
U-234	2.8939E-04	674.97	867.05	0.00E+00	1.95E-01	2.51E-01		
U-235	1.7343E-06	674.97	0.00	2.36E-03	1.19E-03	2.36E-03		
U-236	8.6281E-06	674.97	867.05	0.00E+00	5.82E-03	7.48E-03		
U-238	5.6065E-09	674.97	0.00	2.35E-05	1.97E-05	2.35E-05		
Y-90	1.2667E+00	674.97	867.05	0.00E+00	8.55E+02	1.10E+03		
Other Radionuclides					8.60E+02	1.10E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.44E+01	1.85E+01
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	GRAPHITE	GRAPHITE	
Fuel Cladding	GRAPHITE	GRAPHITE	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	93.152	60 to 100	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	674.97	-49.37	
Bounding	867.05	-98.73	

Nominal burnup taken directly from SFD (converted to MWd)  
 Bounding burnup taken directly from SFD (converted to MWd).

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.57	-0.07	
Bounding	0.73	-0.11	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MIXED MATERIAL EXP DCC-1  
SNF ID #: 430  
Fuel Units & Descr: 1 - EXPERIMENT CAPSULE  
Heavy Metal Mass BOL = , EOL=23 628kg  
ROD Storage Site INEEL

Fuel decay start date 1983  
Estimates as of 2010  
Template Pathfinder (Light Water, SST, 60 to 100%, U)  
\*Template Burnup(MWd) 6.01  
Template BOL Heavy Metal Mass (MT) 0.00012882  
Template Decay Time 25 years

Estimated  
Canister usage:  
18"x15"  
0.07

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3562E-08	22,320 13	22,320 13	0.00E+00	3.03E-04	3.03E-04	Avg MeV	
Am-241	1.0168E-04	22,320 13	22,320 13	0.00E+00	2.27E+00	2.27E+00	0.0150	2.124E+15
Am-242m	8.9052E-09	22,320 13	22,320 13	0.00E+00	1.99E-04	1.99E-04	0.0250	4.413E+14
Am-243	9.8602E-10	22,320 13	22,320 13	0.00E+00	2.20E-05	2.20E-05	0.0375	3.809E+14
C-14	2.3045E-04	22,320 13	22,320 13	0.00E+00	5.14E+00	5.14E+00	0.0675	4.109E+14
Cl-36	1.2261E-06	22,320 13	22,320 13	0.00E+00	2.74E-02	2.74E-02	0.0850	2.485E+14
Cm-243	3.1730E-10	22,320 13	22,320 13	0.00E+00	7.08E-06	7.08E-06	0.1250	1.614E+14
Cm-244	3.3977E-09	22,320 13	22,320 13	0.00E+00	7.58E-05	7.58E-05	0.2250	2.132E+14
Co-60	2.6373E-01	22,320 13	22,320 13	0.00E+00	5.89E+03	5.89E+03	0.3750	9.307E+13
Cs-134	8.7072E-05	22,320 13	22,320 13	0.00E+00	1.94E+00	1.94E+00	0.5750	1.520E+15
Cs-135	3.0316E-05	22,320 13	22,320 13	0.00E+00	6.77E-01	6.77E-01	0.8500	1.585E+13
Cs-137	1.8286E+00	22,320 13	22,320 13	0.00E+00	4.08E+04	4.08E+04	1.2500	4.414E+14
Eu-154	1.4982E-03	22,320 13	22,320 13	0.00E+00	3.34E+01	3.34E+01	1.7500	4.082E+11
Eu-155	2.8236E-03	22,320 13	22,320 13	0.00E+00	6.30E+01	6.30E+01	2.2500	2.352E+09
Fe-55	1.7687E-02	22,320 13	22,320 13	0.00E+00	3.95E+02	3.95E+02	2.7500	2.588E+07
H-3	4.4043E-03	22,320 13	22,320 13	0.00E+00	9.83E+01	9.83E+01	3.5000	5.466E+03
I-129	7.3195E-07	22,320 13	22,320 13	0.00E+00	1.63E-02	1.63E-02	5.0000	5.538E+02
Kr-85	7.8769E-02	22,320 13	22,320 13	0.00E+00	1.76E+03	1.76E+03	7.0000	6.114E+01
Np-237	1.1484E-06	22,320 13	22,320 13	0.00E+00	2.56E-02	2.56E-02	11.0000	6.860E+00
Pa-231	3.2396E-08	22,320 13	22,320 13	0.00E+00	7.23E-04	7.23E-04		
Pb-210	2.4409E-13	22,320 13	22,320 13	0.00E+00	5.45E-09	5.45E-09		
Pm-147	1.6331E-02	22,320 13	22,320 13	0.00E+00	3.65E+02	3.65E+02		
Pu-238	3.1947E-04	22,320 13	22,320 13	0.00E+00	7.13E+00	7.13E+00		
Pu-239	6.6789E-04	22,320 13	22,320 13	0.00E+00	1.49E+01	1.49E+01		
Pu-240	8.6922E-05	22,320 13	22,320 13	0.00E+00	1.94E+00	1.94E+00		
Pu-241	1.1567E-03	22,320 13	22,320 13	0.00E+00	2.58E+01	2.58E+01		
Pu-242	1.9717E-09	22,320 13	22,320 13	0.00E+00	4.40E-05	4.40E-05		
Ra-226	8.6190E-13	22,320 13	22,320 13	0.00E+00	1.92E-08	1.92E-08		
Ra-228	8.1498E-12	22,320 13	22,320 13	0.00E+00	1.82E-07	1.82E-07		
Ru-106	1.7770E-07	22,320 13	22,320 13	0.00E+00	3.97E-03	3.97E-03		
Se-79	1.3225E-05	22,320 13	22,320 13	0.00E+00	2.95E-01	2.95E-01		
Sn-126	1.1493E-05	22,320 13	22,320 13	0.00E+00	2.57E-01	2.57E-01		
Sr-90	1.7321E+00	22,320 13	22,320 13	0.00E+00	3.87E+04	3.87E+04		
Tc-99	4.6656E-04	22,320 13	22,320 13	0.00E+00	1.04E+01	1.04E+01		
Th-229	1.0110E-11	22,320 13	22,320 13	0.00E+00	2.26E-07	2.26E-07		
Th-230	1.1466E-10	22,320 13	22,320 13	0.00E+00	2.56E-06	2.56E-06		
Th-232	8.3245E-12	22,320 13	22,320 13	0.00E+00	1.86E-07	1.86E-07		
Ti-208	2.3860E-08	22,320 13	22,320 13	0.00E+00	5.33E-04	5.33E-04		
U-232	6.4576E-08	22,320 13	22,320 13	0.00E+00	1.44E-03	1.44E-03	Thermal Power	
U-233	3.1082E-09	22,320 13	22,320 13	0.00E+00	6.94E-05	6.94E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	3.7587E-07	22,320 13	22,320 13	0.00E+00	8.39E-03	8.39E-03	5.54E+02	5.54E+02
U-235	-2.7761E-06	22,320 13	0.00	9.54E-02	3.35E-02	9.54E-02	Total	Total
U-236	1.6190E-05	22,320 13	22,320 13	0.00E+00	3.61E-01	3.61E-01		
U-238	-2.8547E-09	22,320 13	0.00	1.03E-03	9.68E-04	1.03E-03		
Y-90	1.7321E+00	22,320 13	22,320 13	0.00E+00	3.87E+04	3.87E+04		
Other Radionuclides					4.53E+04	4.53E+04		

Other Radionuclides

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	NONE	SST	This fuel matches on all parameters except cladding (SST is conservative) and enrichment (unknown)
BOL HM Constituents	U	U	
BOL Enrichment %		60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		22,320 13	Nominal burnup set equal to bounding burnup
Bounding		22,320 13	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	10 12		1.02
Bounding	10 12		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MIXED MATERIAL EXP DCC-2  
 SNF ID #: 431  
 Fuel Units & Descr: 1 - EXPERIMENT CAPSULE  
 Heavy Metal Mass: BOL = , EOL=20 631kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1984  
 Estimates as of: 2010  
 Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 6.01  
 Template BOL Heavy Metal Mass (MT): 0.00012882  
 Template Decay Time: 25 years

Estimated  
 Canister usage  
 18"x15"  
 0.07

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3562E-08	19,489 03	19,489 03	0.00E+00	2.64E-04	2.64E-04	Avg MeV	
Am-241	1.0168E-04	19,489 03	19,489 03	0.00E+00	1.98E+00	1.98E+00	0.0150	1.854E+15
Am-242m	8.9052E-09	19,489 03	19,489 03	0.00E+00	1.74E-04	1.74E-04	0.0250	3.853E+14
Am-243	9.8602E-10	19,489 03	19,489 03	0.00E+00	1.92E-05	1.92E-05	0.0375	3.326E+14
C-14	2.3045E-04	19,489 03	19,489 03	0.00E+00	4.49E+00	4.49E+00	0.0575	3.588E+14
Cl-36	1.2261E-06	19,489 03	19,489 03	0.00E+00	2.39E-02	2.39E-02	0.0850	2.170E+14
Cm-243	3.1730E-10	19,489 03	19,489 03	0.00E+00	6.18E-06	6.18E-06	0.1250	1.410E+14
Cm-244	3.3977E-09	19,489 03	19,489 03	0.00E+00	6.62E-05	6.62E-05	0.2250	1.862E+14
Co-60	2.6373E-01	19,489 03	19,489 03	0.00E+00	5.14E+03	5.14E+03	0.3750	8.127E+13
Cs-134	8.7072E-05	19,489 03	19,489 03	0.00E+00	1.70E+00	1.70E+00	0.5750	1.327E+15
Cs-135	3.0316E-05	19,489 03	19,489 03	0.00E+00	5.91E-01	5.91E-01	0.8500	1.384E+13
Cs-137	1.8286E+00	19,489 03	19,489 03	0.00E+00	3.56E+04	3.56E+04	1.2500	3.854E+14
Eu-154	1.4982E-03	19,489 03	19,489 03	0.00E+00	2.92E+01	2.92E+01	1.7500	3.565E+11
Eu-155	2.8236E-03	19,489 03	19,489 03	0.00E+00	5.50E+01	5.50E+01	2.2500	2.053E+09
Fe-55	1.7687E-02	19,489 03	19,489 03	0.00E+00	3.45E+02	3.45E+02	2.7500	2.259E+07
H-3	4.4043E-03	19,489 03	19,489 03	0.00E+00	8.58E+01	8.58E+01	3.5000	4.773E+03
I-129	7.3195E-07	19,489 03	19,489 03	0.00E+00	1.43E-02	1.43E-02	5.0000	4.836E+02
Kr-85	7.8769E-02	19,489 03	19,489 03	0.00E+00	1.54E+03	1.54E+03	7.0000	5.339E+01
Np-237	1.1484E-06	19,489 03	19,489 03	0.00E+00	2.24E-02	2.24E-02	11.0000	5.990E+00
Pa-231	3.2396E-08	19,489 03	19,489 03	0.00E+00	6.31E-04	6.31E-04		
Pb-210	2.4409E-13	19,489 03	19,489 03	0.00E+00	4.76E-09	4.76E-09		
Pm-147	1.6331E-02	19,489 03	19,489 03	0.00E+00	3.18E+02	3.18E+02		
Pu-238	3.1947E-04	19,489 03	19,489 03	0.00E+00	6.23E+00	6.23E+00		
Pu-239	6.6789E-04	19,489 03	19,489 03	0.00E+00	1.30E+01	1.30E+01		
Pu-240	8.6922E-05	19,489 03	19,489 03	0.00E+00	1.69E+00	1.69E+00		
Pu-241	1.1567E-03	19,489 03	19,489 03	0.00E+00	2.25E+01	2.25E+01		
Pu-242	1.9717E-09	19,489 03	19,489 03	0.00E+00	3.84E-05	3.84E-05		
Ra-226	8.6190E-13	19,489 03	19,489 03	0.00E+00	1.68E-08	1.68E-08		
Ra-228	8.1498E-12	19,489 03	19,489 03	0.00E+00	1.59E-07	1.59E-07		
Ru-106	1.7770E-07	19,489 03	19,489 03	0.00E+00	3.46E-03	3.46E-03		
Se-79	1.3225E-05	19,489 03	19,489 03	0.00E+00	2.58E-01	2.58E-01		
Sn-126	1.1493E-05	19,489 03	19,489 03	0.00E+00	2.24E-01	2.24E-01		
Sr-90	1.7321E+00	19,489 03	19,489 03	0.00E+00	3.38E+04	3.38E+04		
Tc-99	4.6656E-04	19,489 03	19,489 03	0.00E+00	9.09E+00	9.09E+00		
Th-229	1.0110E-11	19,489 03	19,489 03	0.00E+00	1.97E-07	1.97E-07		
Th-230	1.1466E-10	19,489 03	19,489 03	0.00E+00	2.23E-06	2.23E-06		
Th-232	8.3245E-12	19,489 03	19,489 03	0.00E+00	1.62E-07	1.62E-07		
Ti-208	2.3860E-08	19,489 03	19,489 03	0.00E+00	4.65E-04	4.65E-04		
U-232	6.4576E-08	19,489 03	19,489 03	0.00E+00	1.26E-03	1.26E-03		
U-233	3.1082E-09	19,489 03	19,489 03	0.00E+00	6.06E-05	6.06E-05		
U-234	3.7587E-07	19,489 03	19,489 03	0.00E+00	7.33E-03	7.33E-03		
U-235	-2.7761E-06	19,489 03	0.00	8.33E-02	2.92E-02	8.33E-02		
U-236	1.6190E-05	19,489 03	19,489 03	0.00E+00	3.16E-01	3.16E-01		
U-238	-2.8547E-09	19,489 03	0.00	9.01E-04	8.45E-04	9.01E-04		
Y-90	1.7321E+00	19,489 03	19,489 03	0.00E+00	3.38E+04	3.38E+04		
Other Radionuclides					3.95E+04	3.95E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	NONE	SST	
	U	U	
		60 to 100	This fuel matches on all parameters except cladding (SST is conservative) and enrichment (unknown).

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		19,489 03 19,489 03	
			Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	10 12 10 12		
			1.02

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MIXED MATERIAL EXP DCC-3  
SNF ID #: 432  
Fuel Units & Descr: 1 - FUEL MELTED IN EXP  
Heavy Metal Mass BOL = ; EOL=20.365kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 1985  
Estimates as of 2010  
Template Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 6 01  
Template BOL Heavy Metal Mass (MT) 0 00012882  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
0 07

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1.3562E-08	19,237.75	19,237.75	0 00E+00	2 61E-04	2 61E-04	0 0150	1.831E+15
Am-241	1.0168E-04	19,237.75	19,237.75	0 00E+00	1 96E+00	1 96E+00	0 0250	3 803E+14
Am-242m	8 9052E-09	19,237.75	19,237.75	0 00E+00	1 71E-04	1 71E-04	0 0375	3.283E+14
Am-243	9 8602E-10	19,237.75	19,237.75	0 00E+00	1 90E-05	1 90E-05	0 0575	3.542E+14
C-14	2.3045E-04	19,237.75	19,237.75	0 00E+00	4 43E+00	4 43E+00	0 0850	2 142E+14
Cl-36	1.2261E-06	19,237.75	19,237.75	0 00E+00	2 36E-02	2 36E-02	0 1250	1.391E+14
Cm-243	3.1730E-10	19,237.75	19,237.75	0 00E+00	6 10E-06	6 10E-06	0 2250	1.838E+14
Cm-244	3.3977E-09	19,237.75	19,237.75	0 00E+00	6 54E-05	6 54E-05	0 3750	8.022E+13
Co-60	2 6373E-01	19,237.75	19,237.75	0 00E+00	5 07E+03	5 07E+03	0 5750	1.310E+15
Cs-134	8.7072E-05	19,237.75	19,237.75	0 00E+00	1.68E+00	1.68E+00	0 8500	1.366E+13
Cs-135	3.0316E-05	19,237.75	19,237.75	0 00E+00	5 83E-01	5 83E-01	1.2500	3.805E+14
Cs-137	1 8286E+00	19,237.75	19,237.75	0 00E+00	3 52E+04	3 52E+04	1 7500	3 519E+11
Eu-154	1.4982E-03	19,237.75	19,237.75	0 00E+00	2 88E+01	2 88E+01	2 2500	2 027E+09
Eu-155	2.8236E-03	19,237.75	19,237.75	0 00E+00	5 43E+01	5 43E+01	2 7500	2 230E+07
Fe-55	1.7687E-02	19,237.75	19,237.75	0 00E+00	3 40E+02	3 40E+02	3 5000	4 711E+03
H-3	4 4043E-03	19,237.75	19,237.75	0 00E+00	8 47E+01	8 47E+01	5 0000	4 773E+02
I-129	7.3195E-07	19,237.75	19,237.75	0 00E+00	1 41E-02	1 41E-02	7 0000	5 270E+01
Kr-85	7.8769E-02	19,237.75	19,237.75	0 00E+00	1.52E+03	1.52E+03	11.0000	5 913E+00
Np-237	1.1484E-06	19,237.75	19,237.75	0 00E+00	2 21E-02	2 21E-02		
Pa-231	3.2396E-08	19,237.75	19,237.75	0 00E+00	6 23E-04	6 23E-04		
Pb-210	2.4409E-13	19,237.75	19,237.75	0 00E+00	4 70E-09	4 70E-09		
Pm-147	1 6331E-02	19,237.75	19,237.75	0 00E+00	3 14E+02	3 14E+02		
Pu-238	3.1947E-04	19,237.75	19,237.75	0 00E+00	6 15E+00	6 15E+00		
Pu-239	6 6789E-04	19,237.75	19,237.75	0 00E+00	1.28E+01	1.28E+01		
Pu-240	8 6922E-05	19,237.75	19,237.75	0 00E+00	1 67E+00	1 67E+00		
Pu-241	1.1567E-03	19,237.75	19,237.75	0 00E+00	2 23E+01	2 23E+01		
Pu-242	1.9717E-09	19,237.75	19,237.75	0 00E+00	3 79E-05	3 79E-05		
Ra-226	8 6190E-13	19,237.75	19,237.75	0 00E+00	1 66E-08	1 66E-08		
Ra-228	8 1498E-12	19,237.75	19,237.75	0 00E+00	1 57E-07	1 57E-07		
Ru-106	1.7770E-07	19,237.75	19,237.75	0 00E+00	3 42E-03	3 42E-03		
Se-79	1.3225E-05	19,237.75	19,237.75	0 00E+00	2 54E-01	2 54E-01		
Sn-126	1.1493E-05	19,237.75	19,237.75	0 00E+00	2 21E-01	2 21E-01		
Sr-90	1.7321E+00	19,237.75	19,237.75	0 00E+00	3 33E+04	3 33E+04		
Tc-99	4 6656E-04	19,237.75	19,237.75	0 00E+00	8 98E+00	8 98E+00		
Th-229	1.0110E-11	19,237.75	19,237.75	0 00E+00	1 94E-07	1 94E-07		
Th-230	1.1466E-10	19,237.75	19,237.75	0 00E+00	2 21E-06	2 21E-06		
Th-232	8.3245E-12	19,237.75	19,237.75	0 00E+00	1 60E-07	1 60E-07		
Ti-208	2.3860E-08	19,237.75	19,237.75	0 00E+00	4 59E-04	4 59E-04		
U-232	6 4576E-08	19,237.75	19,237.75	0 00E+00	1 24E-03	1 24E-03		
U-233	3 1082E-09	19,237.75	19,237.75	0 00E+00	5 98E-05	5 98E-05		
U-234	3 7587E-07	19,237.75	19,237.75	0 00E+00	7 23E-03	7 23E-03		
U-235	-2 7761E-06	19,237.75	0 00	8 23E-02	2 89E-02	8 23E-02		
U-236	1 6190E-05	19,237.75	19,237.75	0 00E+00	3 11E-01	3 11E-01		
U-238	-2 8547E-09	19,237.75	0 00	8 89E-04	8 35E-04	8 89E-04		
Y-90	1 7321E+00	19,237.75	19,237.75	0 00E+00	3 33E+04	3 33E+04		
Other Radionuclides					3 90E+04	3 90E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except cladding (SST is conservative) and enrichment (unknown)
Reactor Moderator:	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding:	NONE	SST	
BOL HM Constituents:	U	U	
BOL Enrichment %:		60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate: Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
	From SFD	Estimated	
Nominal:		19,237.75	
Bounding:		19,237.75	

Checks			Estimated EOL HM/Given EOL HM 1 02
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	10 12		
Bounding	10 12		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MOX FUEL  
SNF ID #: 414  
Fuel Units & Descr: 5 - SCRAP  
Heavy Metal Mass: BOL= , EOL=0.23kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1988  
Estimates as of: 2010  
Template: (Worst Case)  
<sup>2</sup>Template Burnup(MWd): 62.5  
Template BOL Heavy Metal Mass (MT): 0.00186865  
Template Decay Time: 20 years

Estimated  
Canister usage:  
18"x15"  
0.36

## II. Estimates

	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.6288E-06	218.58	218.58	0.00E+00	3.56E-04	3.56E-04	Avg. MeV	
Am-241	6.9216E+00	218.58	218.58	0.00E+00	1.51E+03	1.51E+03	0.0150	4.467E+14
Am-242m	1.8032E-02	218.58	218.58	0.00E+00	3.94E+00	3.94E+00	0.0250	8.798E+13
Am-243	1.6336E-02	218.58	218.58	0.00E+00	3.57E+00	3.57E+00	0.0375	7.895E+13
C-14	1.2112E-01	218.58	218.58	0.00E+00	2.65E+01	2.65E+01	0.0575	9.858E+13
Cl-36	2.2860E-03	218.58	218.58	0.00E+00	5.00E-01	5.00E-01	0.0850	4.533E+13
Cm-243	1.2475E-03	218.58	218.58	0.00E+00	2.73E-01	2.73E-01	0.1250	4.178E+13
Cm-244	2.9920E-01	218.58	218.58	0.00E+00	6.54E+01	6.54E+01	0.2250	3.746E+13
Co-60	2.0197E+02	218.58	218.58	0.00E+00	4.41E+04	4.41E+04	0.3750	1.567E+13
Cs-134	5.2728E-02	218.58	218.58	0.00E+00	1.15E+01	1.15E+01	0.5750	2.462E+14
Cs-135	4.3976E-01	218.58	218.58	0.00E+00	9.61E-02	9.61E-02	0.8500	1.914E+13
Cs-137	2.9760E+01	218.58	218.58	0.00E+00	6.50E+03	6.50E+03	1.2500	3.286E+15
Eu-154	4.1836E+00	218.58	218.58	0.00E+00	9.14E+02	9.14E+02	1.7500	5.975E+11
Eu-155	5.6060E-01	218.58	218.58	0.00E+00	1.23E+02	1.23E+02	2.2500	1.733E+10
Fe-55	1.5985E+01	218.58	218.58	0.00E+00	3.49E+03	3.49E+03	2.7500	8.316E+08
H-3	5.6412E-01	218.58	218.58	0.00E+00	1.23E+02	1.23E+02	3.5000	9.726E+05
I-129	1.0618E-05	218.58	218.58	0.00E+00	2.32E-03	2.32E-03	5.0000	4.029E+05
Kr-85	1.5783E+00	218.58	218.58	0.00E+00	3.45E+02	3.45E+02	7.0000	4.631E+04
Np-237	1.5632E-04	218.58	218.58	0.00E+00	3.42E-02	3.42E-02	11.0000	5.311E+03
Pa-231	2.8608E-06	218.58	218.58	0.00E+00	6.25E-04	6.25E-04		
Pb-210	3.7448E-09	218.58	218.58	0.00E+00	8.19E-07	8.19E-07		
Pm-147	8.8701E-01	218.58	218.58	0.00E+00	1.94E+02	1.94E+02		
Pu-238	-4.8840E-01	218.58	0.00	5.91E+01	0.00E+00	5.91E+01		
Pu-239	-4.8280E-02	218.58	0.00	7.15E+00	0.00E+00	7.15E+00		
Pu-240	-3.0095E-01	218.58	0.00	9.13E+00	0.00E+00	9.13E+00		
Pu-241	-5.2560E+01	218.58	0.00	2.35E+03	0.00E+00	2.35E+03		
Pu-242	-1.1381E-04	218.58	0.00	3.95E-02	1.47E-02	3.95E-02		
Ra-226	1.6815E-08	218.58	218.58	0.00E+00	3.68E-06	3.68E-06		
Ra-228	5.6880E-07	218.58	218.58	0.00E+00	1.24E-04	1.24E-04		
Ru-106	1.2188E-04	218.58	218.58	0.00E+00	2.66E-02	2.66E-02		
Se-79	1.9186E-04	218.58	218.58	0.00E+00	4.19E-02	4.19E-02		
Sn-126	1.6671E-04	218.58	218.58	0.00E+00	3.64E-02	3.64E-02		
Sr-90	2.8288E+01	218.58	218.58	0.00E+00	6.18E+03	6.18E+03		
Tc-99	6.7678E-03	218.58	218.58	0.00E+00	1.48E+00	1.48E+00		
Th-229	8.9952E-07	218.58	218.58	0.00E+00	1.97E-04	1.97E-04		
Th-230	2.9941E-06	218.58	218.58	0.00E+00	6.54E-04	6.54E-04		
Th-232	6.0208E-07	218.58	218.58	0.00E+00	1.32E-04	1.32E-04		
Ti-208	1.0120E-04	218.58	218.58	0.00E+00	2.21E-02	2.21E-02		
U-232	2.7388E-04	218.58	218.58	0.00E+00	5.99E-02	5.99E-02		
U-233	3.6128E-04	218.58	218.58	0.00E+00	7.90E-02	7.90E-02		
U-234	1.2788E-02	218.58	218.58	0.00E+00	2.80E+00	2.80E+00		
U-235	5.7486E-04	218.58	218.58	1.98E-04	1.26E-01	1.26E-01		
U-236	2.3485E-04	218.58	218.58	0.00E+00	5.13E-02	5.13E-02		
U-238	1.1581E-04	218.58	218.58	2.46E-05	2.53E-02	2.53E-02		
Y-90	2.8288E+01	218.58	218.58	0.00E+00	6.18E+03	6.18E+03		
Other Radionuclides					1.64E+04	1.64E+04		

Thermal Power  
Nominal Heat : Bounding  
Output : Heat Output  
(Watts) : (Watts)  
8.25E+02 8.27E+02  
Total Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	(Worst Case)	This fuel didn't closely match any existing templates, therefore the worst case template was used.
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		218.58	Nominal burnup set equal to bounding burnup
Bounding		218.58	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	14.21		591.64
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PNL MOX FUEL  
SNF ID # 415  
Fuel Units & Descr 7 - FUEL MELTED IN EXP  
Heavy Metal Mass BOL= , EOL=0.01kg  
ROD Storage Site INEEL

Fuel decay start date 1988  
Estimates as of 2010

Template (Worst Case)  
Template Burnup (MWd) 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186865  
Template Decay Time 20 years

Estimated  
Canister usage:  
18"x15"  
0.51

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.6288E-06	9.31	9.31	0.00E+00	1.52E-05	1.52E-05	Avg MeV	
Am-241	6.9216E+00	9.31	9.31	0.00E+00	6.45E+01	6.45E+01	0.0150	1.903E+13
Am-242m	1.8032E-02	9.31	9.31	0.00E+00	1.68E-01	1.68E-01	0.0250	3.749E+12
Am-243	1.6336E-02	9.31	9.31	0.00E+00	1.52E-01	1.52E-01	0.0375	3.364E+12
C-14	1.2112E-01	9.31	9.31	0.00E+00	1.13E+00	1.13E+00	0.0575	4.201E+12
Cl-36	2.2860E-03	9.31	9.31	0.00E+00	2.13E-02	2.13E-02	0.0850	1.932E+12
Cm-243	1.2475E-03	9.31	9.31	0.00E+00	1.16E-02	1.16E-02	0.1250	1.780E+12
Cm-244	2.9920E-01	9.31	9.31	0.00E+00	2.79E+00	2.79E+00	0.2250	1.596E+12
Co-60	2.0197E+02	9.31	9.31	0.00E+00	1.88E+03	1.88E+03	0.3750	6.675E+11
Cs-134	5.2728E-02	9.31	9.31	0.00E+00	4.91E-01	4.91E-01	0.5750	1.049E+13
Cs-135	4.3976E-04	9.31	9.31	0.00E+00	4.10E-03	4.10E-03	0.8500	8.155E+11
Cs-137	2.9760E+01	9.31	9.31	0.00E+00	2.77E+02	2.77E+02	1.2500	1.400E+14
Eu-154	4.1838E+00	9.31	9.31	0.00E+00	3.90E+01	3.90E+01	1.7500	2.546E+10
Eu-155	5.6060E-01	9.31	9.31	0.00E+00	5.22E+00	5.22E+00	2.2500	7.382E+08
Fe-55	1.5985E+01	9.31	9.31	0.00E+00	1.49E+02	1.49E+02	2.7500	3.543E+07
H-3	5.6412E-01	9.31	9.31	0.00E+00	5.25E+00	5.25E+00	3.5000	4.144E+04
I-129	1.0618E-05	9.31	9.31	0.00E+00	9.89E-05	9.89E-05	5.0000	1.717E+04
Kr-85	1.5783E+00	9.31	9.31	0.00E+00	1.47E+01	1.47E+01	7.0000	1.973E+03
Np-237	1.5632E-04	9.31	9.31	0.00E+00	1.46E-03	1.46E-03	11.0000	2.263E+02
Pa-231	2.8608E-06	9.31	9.31	0.00E+00	2.66E-05	2.66E-05		
Pb-210	3.7448E-09	9.31	9.31	0.00E+00	3.49E-08	3.49E-08		
Pm-147	8.8701E-01	9.31	9.31	0.00E+00	8.26E+00	8.26E+00		
Pu-238	-4.8840E-01	9.31	0.00	2.52E+00	0.00E+00	2.52E+00		
Pu-239	-4.8280E-02	9.31	0.00	3.05E-01	0.00E+00	3.05E-01		
Pu-240	-3.0095E-01	9.31	0.00	3.89E-01	0.00E+00	3.89E-01		
Pu-241	-5.2560E+01	9.31	0.00	1.00E+02	0.00E+00	1.00E+02		
Pu-242	-1.1381E-04	9.31	0.00	1.68E-03	6.25E-04	1.68E-03		
Ra-226	1.6815E-08	9.31	9.31	0.00E+00	1.57E-07	1.57E-07		
Ra-228	5.6880E-07	9.31	9.31	0.00E+00	5.30E-06	5.30E-06		
Ru-106	1.2188E-04	9.31	9.31	0.00E+00	1.14E-03	1.14E-03		
Se-79	1.9186E-04	9.31	9.31	0.00E+00	1.79E-03	1.79E-03		
Sn-126	1.6671E-04	9.31	9.31	0.00E+00	1.55E-03	1.55E-03		
Sr-90	2.8288E+01	9.31	9.31	0.00E+00	2.63E+02	2.63E+02		
Tc-99	6.7678E-03	9.31	9.31	0.00E+00	6.30E-02	6.30E-02		
Th-229	8.9952E-07	9.31	9.31	0.00E+00	8.38E-06	8.38E-06		
Th-230	2.9941E-06	9.31	9.31	0.00E+00	2.79E-05	2.79E-05		
Th-232	6.0208E-07	9.31	9.31	0.00E+00	5.61E-06	5.61E-06		
Ti-208	1.0120E-04	9.31	9.31	0.00E+00	9.43E-04	9.43E-04		
U-232	2.7388E-04	9.31	9.31	0.00E+00	2.55E-03	2.55E-03		
U-233	3.6128E-04	9.31	9.31	0.00E+00	3.36E-03	3.36E-03		
U-234	1.2788E-02	9.31	9.31	0.00E+00	1.19E-01	1.19E-01		
U-235	5.7486E-04	9.31	9.31	8.43E-06	5.36E-03	5.36E-03		
U-236	2.3485E-04	9.31	9.31	0.00E+00	2.19E-03	2.19E-03		
U-238	1.1581E-04	9.31	9.31	1.05E-06	1.08E-03	1.08E-03		
Y-90	2.8288E+01	9.31	9.31	0.00E+00	2.63E+02	2.63E+02		
Other Radionuclides					6.98E+02	6.98E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
Fuel Cladding:	LIGHT WATER	(Worst Case)	This fuel didn't closely match any existing templates, therefore the worst case template was used.
BOL HM Constituents:	SST	SST/Inconel	
BOL Enrichment %:	Pu and U	U, Th, & Pu	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		9.31	Nominal burnup set equal to bounding burnup
Bounding		9.31	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	14.21		591.64
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MOX FUEL 7055  
 SNF ID #: 416  
 Fuel Units & Descr: 12 - SCRAP  
 Heavy Metal Mass BOL= , EOL=0.058kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1988  
 Estimates as of: 2010  
 Template: (Worst Case)  
<sup>2</sup>Template Burnup(MWd): 62.5  
 Template BOL Heavy Metal Mass (MT): 0.00186865  
 Template Decay Time: 20 years

Estimated  
 Canister usage:  
 18"x15"  
 0.88

## II. Estimates

	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.6288E-06	54.74	54.74	0.00E+00	8.92E-05	8.92E-05	Avg MeV	
Am-241	6.9216E+00	54.74	54.74	0.00E+00	3.79E+02	3.79E+02	0.0150	1.119E+14
Am-242m	1.8032E-02	54.74	54.74	0.00E+00	9.87E-01	9.87E-01	0.0250	2.203E+13
Am-243	1.6336E-02	54.74	54.74	0.00E+00	8.94E-01	8.94E-01	0.0375	1.977E+13
C-14	1.2112E-01	54.74	54.74	0.00E+00	6.63E+00	6.63E+00	0.0575	2.469E+13
Cl-36	2.2860E-03	54.74	54.74	0.00E+00	1.25E-01	1.25E-01	0.0850	1.135E+13
Cm-243	1.2475E-03	54.74	54.74	0.00E+00	6.83E-02	6.83E-02	0.1250	1.046E+13
Cm-244	2.9920E-01	54.74	54.74	0.00E+00	1.64E+01	1.64E+01	0.2250	9.382E+12
Co-60	2.0197E+02	54.74	54.74	0.00E+00	1.11E+04	1.11E+04	0.3750	3.924E+12
Cs-134	5.2728E-02	54.74	54.74	0.00E+00	2.89E+00	2.89E+00	0.5750	6.165E+13
Cs-135	4.3976E-04	54.74	54.74	0.00E+00	2.41E-02	2.41E-02	0.8500	4.793E+12
Cs-137	2.9760E+01	54.74	54.74	0.00E+00	1.63E+03	1.63E+03	1.2500	8.229E+14
Eu-154	4.1838E+00	54.74	54.74	0.00E+00	2.29E+02	2.29E+02	1.7500	1.496E+11
Eu-155	5.6060E-01	54.74	54.74	0.00E+00	3.07E+01	3.07E+01	2.2500	4.339E+09
Fe-55	1.5985E+01	54.74	54.74	0.00E+00	8.75E+02	8.75E+02	2.7500	2.083E+08
H-3	5.6412E-01	54.74	54.74	0.00E+00	3.09E+01	3.09E+01	3.5000	2.436E+05
I-129	1.0618E-05	54.74	54.74	0.00E+00	5.81E-04	5.81E-04	5.0000	1.009E+05
Kr-85	1.5783E+00	54.74	54.74	0.00E+00	8.64E+01	8.64E+01	7.0000	1.160E+04
Np-237	1.5632E-04	54.74	54.74	0.00E+00	8.56E-03	8.56E-03	11.0000	1.330E+03
Pa-231	2.8608E-06	54.74	54.74	0.00E+00	1.57E-04	1.57E-04		
Pb-210	3.7448E-09	54.74	54.74	0.00E+00	2.05E-07	2.05E-07		
Pm-147	8.8701E-01	54.74	54.74	0.00E+00	4.86E+01	4.86E+01		
Pu-238	-4.8840E-01	54.74	0.00	1.48E+01	0.00E+00	1.48E+01		
Pu-239	-4.8280E-02	54.74	0.00	1.79E+00	0.00E+00	1.79E+00		
Pu-240	-3.0095E-01	54.74	0.00	2.29E+00	0.00E+00	2.29E+00		
Pu-241	-5.2560E+01	54.74	0.00	5.89E+02	0.00E+00	5.89E+02		
Pu-242	-1.1381E-04	54.74	0.00	9.90E-03	3.67E-03	9.90E-03		
Ra-226	1.6815E-08	54.74	54.74	0.00E+00	9.20E-07	9.20E-07		
Ra-228	5.6880E-07	54.74	54.74	0.00E+00	3.11E-05	3.11E-05		
Ru-106	1.2188E-04	54.74	54.74	0.00E+00	6.67E-03	6.67E-03		
Se-79	1.9186E-04	54.74	54.74	0.00E+00	1.05E-02	1.05E-02		
Sn-128	1.6671E-04	54.74	54.74	0.00E+00	9.13E-03	9.13E-03		
Sr-90	2.8288E+01	54.74	54.74	0.00E+00	1.55E+03	1.55E+03		
Tc-99	6.7678E-03	54.74	54.74	0.00E+00	3.70E-01	3.70E-01		
Th-229	8.9952E-07	54.74	54.74	0.00E+00	4.92E-05	4.92E-05		
Th-230	2.9941E-06	54.74	54.74	0.00E+00	1.64E-04	1.64E-04		
Th-232	6.0208E-07	54.74	54.74	0.00E+00	3.30E-05	3.30E-05		
Ti-208	1.0120E-04	54.74	54.74	0.00E+00	5.54E-03	5.54E-03		
U-232	2.7388E-04	54.74	54.74	0.00E+00	1.50E-02	1.50E-02		
U-233	3.6128E-04	54.74	54.74	0.00E+00	1.98E-02	1.98E-02		
U-234	1.2788E-02	54.74	54.74	0.00E+00	7.00E-01	7.00E-01		
U-235	5.7486E-04	54.74	54.74	4.96E-05	3.15E-02	3.15E-02		
U-236	2.3485E-04	54.74	54.74	0.00E+00	1.29E-02	1.29E-02		
U-238	1.1581E-04	54.74	54.74	6.17E-06	6.35E-03	6.35E-03		
Y-90	2.8288E+01	54.74	54.74	0.00E+00	1.55E+03	1.55E+03		
Other Radionuclides					4.10E+03	4.10E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:  This fuel didn't closely match any existing templates, therefore the worst case template was used.
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:  Nominal burnup set equal to bounding burnup. Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.
Nominal		54.74	
Bounding		54.74	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM  591.64
Nominal	14.21		
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

**I. Fuel and Template Information**  
 Fuel Name: PNL MOX FUEL 7057  
 SNF ID #: 417  
 Fuel Units & Descr: 4 - SCRAP  
 Heavy Metal Mass: BOL = ; EOL = 2.44kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1988  
 Estimates as of: 2010  
 Template (Worst Case)  
<sup>2</sup>Template Burnup (MWd): 62.5  
 Template BOL Heavy Metal Mass (MT): 0.00186865  
 Template Decay Time: 20 years

Estimated  
 Canister usage  
 18"x15"  
 0.29

II. Estimates							Gamma Sources	
Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	1.6288E-06	2,318.86	2,318.86	0.00E+00	3.78E-03	3.78E-03	0.0150	4.739E+15
Am-241	6.9216E+00	2,318.86	2,318.86	0.00E+00	1.61E+04	1.61E+04	0.0250	9.334E+14
Am-242m	1.8032E-02	2,318.86	2,318.86	0.00E+00	4.18E+01	4.18E+01	0.0375	8.376E+14
Am-243	1.6336E-02	2,318.86	2,318.86	0.00E+00	3.79E+01	3.79E+01	0.0575	1.046E+15
C-14	1.2112E-01	2,318.86	2,318.86	0.00E+00	2.81E+02	2.81E+02	0.0850	4.809E+14
Cf-252	2.2860E-03	2,318.86	2,318.86	0.00E+00	5.30E+00	5.30E+00	0.1250	4.432E+14
Cm-243	1.2475E-03	2,318.86	2,318.86	0.00E+00	2.89E+00	2.89E+00	0.2250	3.974E+14
Cm-244	2.9920E-01	2,318.86	2,318.86	0.00E+00	6.94E+02	6.94E+02	0.3750	1.662E+14
Co-60	2.0197E+02	2,318.86	2,318.86	0.00E+00	4.68E+05	4.68E+05	0.5750	2.612E+15
Cs-134	5.2728E-02	2,318.86	2,318.86	0.00E+00	1.22E+02	1.22E+02	0.8500	2.030E+14
Cs-135	4.3976E-04	2,318.86	2,318.86	0.00E+00	1.02E+00	1.02E+00	1.2500	3.486E+16
Cs-137	2.9760E+01	2,318.86	2,318.86	0.00E+00	6.90E+04	6.90E+04	1.7500	6.339E+12
Eu-154	4.1838E+00	2,318.86	2,318.86	0.00E+00	9.70E+03	9.70E+03	2.2500	1.838E+11
Eu-155	5.6060E-01	2,318.86	2,318.86	0.00E+00	1.30E+03	1.30E+03	2.7500	8.822E+09
Fe-55	1.5985E+01	2,318.86	2,318.86	0.00E+00	3.71E+04	3.71E+04	3.5000	1.032E+07
H-3	5.6412E-01	2,318.86	2,318.86	0.00E+00	1.31E+03	1.31E+03	5.0000	4.274E+06
I-129	1.0618E-05	2,318.86	2,318.86	0.00E+00	2.46E-02	2.46E-02	7.0000	4.913E+05
Kr-85	1.5783E+00	2,318.86	2,318.86	0.00E+00	3.66E+03	3.66E+03	11.0000	5.634E+04
Np-237	1.5632E-04	2,318.86	2,318.86	0.00E+00	3.62E-01	3.62E-01		
Pa-231	2.8608E-06	2,318.86	2,318.86	0.00E+00	6.63E-03	6.63E-03		
Pb-210	3.7448E-09	2,318.86	2,318.86	0.00E+00	8.68E-06	8.68E-06		
Pm-147	8.8701E-01	2,318.86	2,318.86	0.00E+00	2.06E+03	2.06E+03		
Pu-238	-4.8840E-01	2,318.86	0.00	6.27E+02	-0.00E+00	6.27E+02		
Pu-239	-4.8280E-02	2,318.86	0.00	7.59E+01	0.00E+00	7.59E+01		
Pu-240	-3.0095E-01	2,318.86	0.00	9.69E+01	0.00E+00	-9.69E+01		
Pu-241	-5.2560E+01	2,318.86	0.00	2.49E+04	0.00E+00	2.49E+04		
Pu-242	-1.1381E-04	2,318.86	0.00	4.19E-01	1.56E-01	4.19E-01		
Ra-226	1.6815E-08	2,318.86	2,318.86	0.00E+00	-3.90E-05	3.90E-05		
Ra-228	5.6880E-07	2,318.86	2,318.86	0.00E+00	1.32E-03	1.32E-03		
Ru-106	1.2188E-04	2,318.86	2,318.86	0.00E+00	2.83E-01	2.83E-01		
Se-79	1.9186E-04	2,318.86	2,318.86	0.00E+00	4.45E-01	4.45E-01		
Sn-126	1.6671E-04	2,318.86	2,318.86	0.00E+00	3.87E-01	3.87E-01		
Sr-90	2.8288E+01	2,318.86	2,318.86	0.00E+00	6.56E+04	6.56E+04		
Tc-99	6.7678E-03	2,318.86	2,318.86	0.00E+00	1.57E+01	1.57E+01		
Th-229	8.9952E-07	2,318.86	2,318.86	0.00E+00	2.09E-03	2.09E-03		
Th-230	2.9941E-06	2,318.86	2,318.86	0.00E+00	6.94E-03	6.94E-03		
Th-232	6.0208E-07	2,318.86	2,318.86	0.00E+00	1.40E-03	1.40E-03		
Ti-208	1.0120E-04	2,318.86	2,318.86	0.00E+00	2.35E-01	2.35E-01		
U-232	2.7388E-04	2,318.86	2,318.86	0.00E+00	6.35E-01	6.35E-01		
U-233	3.6128E-04	2,318.86	2,318.86	0.00E+00	8.38E-01	8.38E-01		
U-234	1.2788E-02	2,318.86	2,318.86	0.00E+00	2.97E+01	2.97E+01		
U-235	5.7486E-04	2,318.86	2,318.86	2.10E-03	1.34E+00	1.34E+00		
U-236	2.3485E-04	2,318.86	2,318.86	0.00E+00	5.45E-01	5.45E-01		
U-238	1.1581E-04	2,318.86	2,318.86	2.61E-04	-2.69E-01	2.69E-01		
Y-90	2.8288E+01	2,318.86	2,318.86	0.00E+00	6.56E+04	6.56E+04		
Other Radionuclides					1.74E+05	1.74E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	UNKNOWN	SST/Inconel	
BOL HM Constituents	Pu and U	U Th, & Pu	
BOL Enrichment %		0 to 100	

This fuel didn't closely match any existing templates, therefore the worst case template was used

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		2,318.86	
Bounding		2,318.86	

Nominal burnup set equal to bounding burnup

Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	14.21		
Bounding	14.21		

591.64

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MOX PELLETS 7057  
SNF ID #: 418  
Fuel Units & Descr: 1 - SCRAP  
Heavy Metal Mass: BOL= , EOL=0.647kg  
ROD Storage Site: INEEL

Fuel decay start date: 1988  
Estimates as of: 2010  
Template (Worst Case)  
Template Burnup (MWd): 62.5  
Template BOL Heavy Metal Mass (MT): 0.00186865  
Template Decay Time: 20 years

Estimated  
Canister usage  
18"x15"  
0.07

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.6288E-06	614.88	614.88	0.00E+00	1.00E-03	1.00E-03	Avg MeV	
Am-241	6.9216E+00	614.88	614.88	0.00E+00	4.26E+03	4.26E+03	0.0150	1.257E+15
Am-242m	1.8032E-02	614.88	614.88	0.00E+00	1.11E+01	1.11E+01	0.0250	2.475E+14
Am-243	1.6336E-02	614.88	614.88	0.00E+00	1.00E+01	1.00E+01	0.0375	2.221E+14
C-14	1.2112E-01	614.88	614.88	0.00E+00	7.45E+01	7.45E+01	0.0575	2.773E+14
Cl-36	2.2860E-03	614.88	614.88	0.00E+00	1.41E+00	1.41E+00	0.0850	1.275E+14
Cm-243	1.2475E-03	614.88	614.88	0.00E+00	7.67E-01	7.67E-01	0.1250	1.175E+14
Cm-244	2.9920E-01	614.88	614.88	0.00E+00	1.84E+02	1.84E+02	0.2250	1.054E+14
Co-60	2.0197E+02	614.88	614.88	0.00E+00	1.24E+05	1.24E+05	0.3750	4.407E+13
Cs-134	5.2728E-02	614.88	614.88	0.00E+00	3.24E+01	3.24E+01	0.5750	6.925E+14
Cs-135	4.3976E-04	614.88	614.88	0.00E+00	2.70E-01	2.70E-01	0.8500	5.384E+13
Cs-137	2.9760E+01	614.88	614.88	0.00E+00	1.83E+04	1.83E+04	1.2500	9.243E+15
Eu-154	4.1838E+00	614.88	614.88	0.00E+00	2.57E+03	2.57E+03	1.7500	1.681E+12
Eu-155	5.6060E-01	614.88	614.88	0.00E+00	3.45E+02	3.45E+02	2.2500	4.874E+10
Fe-55	1.5985E+01	614.88	614.88	0.00E+00	9.83E+03	9.83E+03	2.7500	2.339E+09
H-3	5.6412E-01	614.88	614.88	0.00E+00	3.47E+02	3.47E+02	3.5000	2.736E+06
I-129	1.0618E-05	614.88	614.88	0.00E+00	6.53E-03	6.53E-03	5.0000	1.133E+06
Kr-85	1.5783E+00	614.88	614.88	0.00E+00	9.70E+02	9.70E+02	7.0000	1.303E+05
Ni-237	1.5632E-04	614.88	614.88	0.00E+00	9.61E-02	9.61E-02	11.0000	1.494E+04
Pa-231	2.8608E-06	614.88	614.88	0.00E+00	1.76E-03	1.76E-03		
Pb-210	3.7448E-09	614.88	614.88	0.00E+00	2.30E-06	2.30E-06		
Pm-147	8.8701E-01	614.88	614.88	0.00E+00	5.45E+02	5.45E+02		
Pu-238	-4.8840E-01	614.88	0.00	1.66E+02	0.00E+00	1.66E+02		
Pu-239	-4.8280E-02	614.88	0.00	2.01E+01	0.00E+00	2.01E+01		
Pu-240	-3.0095E-01	614.88	0.00	2.57E+01	0.00E+00	2.57E+01		
Pu-241	-5.2560E+01	614.88	0.00	6.61E+03	0.00E+00	6.61E+03		
Pu-242	-1.1381E-04	614.88	0.00	1.11E-01	4.12E-02	1.11E-01		
Ra-226	1.6815E-08	614.88	614.88	0.00E+00	1.03E-05	1.03E-05		
Ra-228	5.6880E-07	614.88	614.88	0.00E+00	3.50E-04	3.50E-04		
Ru-106	1.2188E-04	614.88	614.88	0.00E+00	7.49E-02	7.49E-02		
Se-79	1.9186E-04	614.88	614.88	0.00E+00	1.18E-01	1.18E-01		
Sn-126	1.6671E-04	614.88	614.88	0.00E+00	1.03E-01	1.03E-01		
Sr-90	2.8288E+01	614.88	614.88	0.00E+00	1.74E+04	1.74E+04		
Tc-99	6.7678E-03	614.88	614.88	0.00E+00	4.16E+00	4.16E+00		
Th-229	8.9952E-07	614.88	614.88	0.00E+00	5.53E-04	5.53E-04		
Th-230	2.9941E-06	614.88	614.88	0.00E+00	1.84E-03	1.84E-03		
Th-232	6.0208E-07	614.88	614.88	0.00E+00	3.70E-04	3.70E-04		
Ti-208	1.0120E-04	614.88	614.88	0.00E+00	6.22E-02	6.22E-02		
U-232	2.7388E-04	614.88	614.88	0.00E+00	1.68E-01	1.68E-01		
U-233	3.6128E-04	614.88	614.88	0.00E+00	2.22E-01	2.22E-01		
U-234	1.2788E-02	614.88	614.88	0.00E+00	7.86E+00	7.86E+00		
U-235	5.7486E-04	614.88	614.88	5.57E-04	3.54E-01	3.54E-01		
U-236	2.3485E-04	614.88	614.88	0.00E+00	1.44E-01	1.44E-01		
U-238	1.1581E-04	614.88	614.88	6.93E-05	7.13E-02	7.13E-02		
Y-90	2.8288E+01	614.88	614.88	0.00E+00	1.74E+04	1.74E+04		
Other Radionuclides					4.61E+04	4.61E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:  This fuel didn't closely match any existing templates, therefore the worst case template was used.
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	UNKNOWN	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:  Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.
Nominal		614.88	
Bounding		614.88	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM  591.64
Nominal	14.21		
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PNL MOX PINS 7057  
SNF ID #: 419  
Fuel Units & Descr: 1 - SCRAP  
Heavy Metal Mass BOL= , EOL=0.005kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1988  
Estimates as of 2010

Template (Worst Case)

<sup>2</sup>Template Burnup(MWd) 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186865  
Template Decay Time 20 years

Estimated  
Canister usage  
18"x15"  
0.07

II. Estimates	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.6288E-06	4.75	4.75	0.00E+00	7.74E-06	7.74E-06	Avg MeV	
Am-241	6.9216E+00	4.75	4.75	0.00E+00	3.29E+01	3.29E+01	0.0150	9.711E+12
Am-242m	1.8032E-02	4.75	4.75	0.00E+00	8.57E-02	8.57E-02	0.0250	1.913E+12
Am-243	1.6336E-02	4.75	4.75	0.00E+00	7.76E-02	7.76E-02	0.0375	1.716E+12
C-14	1.2112E-01	4.75	4.75	0.00E+00	5.76E-01	5.76E-01	0.0575	2.143E+12
Cl-36	2.2860E-03	4.75	4.75	0.00E+00	1.09E-02	1.09E-02	0.0850	9.855E+11
Cm-243	1.2475E-03	4.75	4.75	0.00E+00	5.93E-03	5.93E-03	0.1250	9.082E+11
Cm-244	2.9920E-01	4.75	4.75	0.00E+00	1.42E+00	1.42E+00	0.2250	8.144E+11
Co-60	2.0197E+02	4.75	4.75	0.00E+00	9.60E+02	9.60E+02	0.3750	3.406E+11
Cs-134	5.2728E-02	4.75	4.75	0.00E+00	2.51E-01	2.51E-01	0.5750	5.352E+12
Cs-135	4.3976E-04	4.75	4.75	0.00E+00	2.09E-03	2.09E-03	0.8500	4.161E+11
Cs-137	2.9760E+01	4.75	4.75	0.00E+00	1.41E+02	1.41E+02	1.2500	7.143E+13
Eu-154	4.1838E+00	4.75	4.75	0.00E+00	1.99E+01	1.99E+01	1.7500	1.299E+10
Eu-155	5.6060E-01	4.75	4.75	0.00E+00	2.66E+00	2.66E+00	2.2500	3.767E+08
Fe-55	1.5985E+01	4.75	4.75	0.00E+00	7.60E+01	7.60E+01	2.7500	1.808E+07
H-3	5.6412E-01	4.75	4.75	0.00E+00	2.68E+00	2.68E+00	3.5000	2.114E+04
I-129	1.0618E-05	4.75	4.75	0.00E+00	5.05E-05	5.05E-05	5.0000	8.759E+03
Kr-85	1.6783E+00	4.75	4.75	0.00E+00	7.50E+00	7.50E+00	7.0000	1.007E+03
Np-237	1.5632E-04	4.75	4.75	0.00E+00	7.43E-04	7.43E-04	11.0000	1.155E+02
Pa-231	2.8608E-06	4.75	4.75	0.00E+00	1.36E-05	1.36E-05		
Pb-210	3.7448E-09	4.75	4.75	0.00E+00	1.78E-08	1.78E-08		
Pm-147	8.8701E-01	4.75	4.75	0.00E+00	4.21E+00	4.21E+00		
Pu-238	-4.8840E-01	4.75	0.00	1.29E+00	0.00E+00	1.29E+00		
Pu-239	-4.8280E-02	4.75	0.00	1.55E-01	0.00E+00	1.55E-01		
Pu-240	-3.0095E-01	4.75	0.00	1.99E-01	0.00E+00	1.99E-01		
Pu-241	-5.2560E+01	4.75	0.00	5.11E+01	0.00E+00	5.11E+01		
Pu-242	-1.1381E-04	4.75	0.00	8.60E-04	3.19E-04	8.60E-04		
Ra-226	1.6815E-08	4.75	4.75	0.00E+00	7.99E-08	7.99E-08		
Ra-228	5.6880E-07	4.75	4.75	0.00E+00	2.70E-06	2.70E-06		
Ru-106	1.2188E-04	4.75	4.75	0.00E+00	5.79E-04	5.79E-04		
Se-79	1.9186E-04	4.75	4.75	0.00E+00	9.12E-04	9.12E-04		
Sn-126	1.6671E-04	4.75	4.75	0.00E+00	7.92E-04	7.92E-04		
Sr-90	2.8288E+01	4.75	4.75	0.00E+00	1.34E+02	1.34E+02		
Tc-99	6.7678E-03	4.75	4.75	0.00E+00	3.22E-02	3.22E-02		
Th-229	8.9952E-07	4.75	4.75	0.00E+00	4.27E-06	4.27E-06		
Th-230	2.9941E-06	4.75	4.75	0.00E+00	1.42E-05	1.42E-05		
Th-232	6.0208E-07	4.75	4.75	0.00E+00	2.86E-06	2.86E-06		
Th-208	1.0120E-04	4.75	4.75	0.00E+00	4.81E-04	4.81E-04		
U-232	2.7388E-04	4.75	4.75	0.00E+00	1.30E-03	1.30E-03		
U-233	3.6128E-04	4.75	4.75	0.00E+00	1.72E-03	1.72E-03		
U-234	1.2788E-02	4.75	4.75	0.00E+00	6.08E-02	6.08E-02		
U-235	5.7486E-04	4.75	4.75	4.30E-06	2.74E-03	2.74E-03		
U-236	2.3485E-04	4.75	4.75	0.00E+00	1.12E-03	1.12E-03		
U-238	1.1581E-04	4.75	4.75	5.35E-07	5.51E-04	5.51E-04		
Y-90	2.8288E+01	4.75	4.75	0.00E+00	1.34E+02	1.34E+02		
Other Radionuclides					3.56E+02	3.56E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	UNKNOWN	SST/Inconel	This fuel didn't closely match any existing templates, therefore the worst case template was used.
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		4.75	Nominal burnup set equal to bounding burnup
Bounding		4.75	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	14.21		591.64
Bounding	14.21		

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name, PNL MOX STAR 3  
SNF ID # 433  
Fuel Units & Descr: 1 - SCRAP  
Heavy Metal Mass BOL= , EOL=0.055kg  
ROD Storage Site INEEL

Fuel decay start date: 1984  
Estimates as of: 2010  
Template: (Worst Case)  
Template Burnup (MWd): 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186865  
Template Decay Time: 25 years

Estimated  
Canister usage:  
18"x15"  
0.07

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9648E-06	52.27	52.27	0.00E+00	1.03E-04	1.03E-04	Avg MeV	
Am-241	7.8064E+00	52.27	52.27	0.00E+00	4.08E+02	4.08E+02	0.0150	8.753E+13
Am-242m	1.7632E-02	52.27	52.27	0.00E+00	9.22E-01	9.22E-01	0.0250	1.734E+13
Am-243	1.6336E-02	52.27	52.27	0.00E+00	8.54E-01	8.54E-01	0.0375	1.547E+13
C-14	1.2101E-01	52.27	52.27	0.00E+00	6.33E+00	6.33E+00	0.0575	2.112E+13
Ci-36	2.2849E-03	52.27	52.27	0.00E+00	1.19E-01	1.19E-01	0.0850	9.133E+12
Cm-243	1.1046E-03	52.27	52.27	0.00E+00	5.77E-02	5.77E-02	0.1250	7.943E+12
Cm-244	2.4704E-01	52.27	52.27	0.00E+00	1.29E+01	1.29E+01	0.2250	7.759E+12
Co-60	1.0466E+02	52.27	52.27	0.00E+00	5.47E+03	5.47E+03	0.3750	3.270E+12
Cs-134	9.8289E-03	52.27	52.27	0.00E+00	5.14E-01	5.14E-01	0.5750	5.216E+13
Cs-135	4.3976E-04	52.27	52.27	0.00E+00	2.30E-02	2.30E-02	0.8500	3.143E+12
Cs-137	2.6526E+01	52.27	52.27	0.00E+00	1.39E+03	1.39E+03	1.2500	4.079E+14
Eu-154	2.7975E+00	52.27	52.27	0.00E+00	1.46E+02	1.46E+02	1.7500	9.883E+10
Eu-155	2.7881E-01	52.27	52.27	0.00E+00	1.46E+01	1.46E+01	2.2500	2.147E+09
Fe-55	4.2151E+00	52.27	52.27	0.00E+00	2.20E+02	2.20E+02	2.7500	1.839E+08
H-3	4.2599E-01	52.27	52.27	0.00E+00	2.23E+01	2.23E+01	3.5000	1.880E+05
I-129	1.0618E-05	52.27	52.27	0.00E+00	5.55E-04	5.55E-04	5.0000	7.999E+04
Kr-85	1.1426E+00	52.27	52.27	0.00E+00	5.97E+01	5.97E+01	7.0000	9.184E+03
Np-237	1.5647E-04	52.27	52.27	0.00E+00	8.18E-03	8.18E-03	11.0000	1.052E+03
Pa-231	2.8624E-06	52.27	52.27	0.00E+00	1.50E-04	1.50E-04		
Pb-210	9.2770E-09	52.27	52.27	0.00E+00	4.85E-07	4.85E-07		
Pm-147	2.3690E-01	52.27	52.27	0.00E+00	1.24E+01	1.24E+01		
Pu-238	-6.1800E-01	52.27	0.00	1.41E+01	0.00E+00	1.41E+01		
Pu-239	-4.8280E-02	52.27	0.00	1.71E+00	0.00E+00	1.71E+00		
Pu-240	-3.0095E-01	52.27	0.00	2.18E+00	0.00E+00	2.18E+00		
Pu-241	-7.4000E+01	52.27	0.00	5.62E+02	0.00E+00	5.62E+02		
Pu-242	-1.1381E-04	52.27	0.00	9.45E-03	3.51E-03	9.45E-03		
Ra-226	3.2167E-08	52.27	52.27	0.00E+00	1.68E-06	1.68E-06		
Ra-228	5.9024E-07	52.27	52.27	0.00E+00	3.09E-05	3.09E-05		
Ru-106	3.9140E-06	52.27	52.27	0.00E+00	2.05E-04	2.05E-04		
Se-79	1.9184E-04	52.27	52.27	0.00E+00	1.00E-02	1.00E-02		
Sn-126	1.6671E-04	52.27	52.27	0.00E+00	8.71E-03	8.71E-03		
Sr-90	2.5126E+01	52.27	52.27	0.00E+00	1.31E+03	1.31E+03		
Tc-99	6.7678E-03	52.27	52.27	0.00E+00	3.54E-01	3.54E-01		
Th-229	1.2398E-06	52.27	52.27	0.00E+00	6.48E-05	6.48E-05		
Th-230	4.1442E-06	52.27	52.27	0.00E+00	2.17E-04	2.17E-04		
Th-232	6.0208E-07	52.27	52.27	0.00E+00	3.15E-05	3.15E-05		
Th-208	9.6478E-05	52.27	52.27	0.00E+00	5.04E-03	5.04E-03		
U-232	2.6103E-04	52.27	52.27	0.00E+00	1.36E-02	1.36E-02		
U-233	3.6128E-04	52.27	52.27	0.00E+00	1.89E-02	1.89E-02		
U-234	1.2788E-02	52.27	52.27	0.00E+00	6.68E-01	6.68E-01		
U-235	5.7486E-04	52.27	52.27	4.73E-05	3.01E-02	3.01E-02		
U-236	2.3485E-04	52.27	52.27	0.00E+00	1.23E-02	1.23E-02		
U-238	1.1581E-04	52.27	52.27	5.89E-06	6.06E-03	6.06E-03		
Y-90	2.5126E+01	52.27	52.27	0.00E+00	1.31E+03	1.31E+03		
Other Radionuclides					3.66E+03	3.66E+03		

Thermal Power  
Nominal Heat Output (Watts)  
Bounding Heat Output (Watts)  
1.17E+02  
1.17E+02  
Total  
Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

Reactor Moderator:	From SFD	Used	Basis for Parameter Differences:  This fuel didn't closely match any existing templates, therefore the worst case template was used.
Fuel Cladding	LIGHT WATER	(Worst Case)	
BOL HM Constituents	SST	SST/Inconel	
BOL Enrichment %	Pu and U	U, Th, & Pu	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:  Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.
Nominal		52.27	
Bounding		52.27	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM  591.64
Nominal	14.21		
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MOX STAR 4  
SNF ID #: 434  
Fuel Units & Descr: 1 - SCRAP  
Heavy Metal Mass BOL= , EOL=0.06kg  
ROD Storage Site INEEL

Fuel decay start date: 1984  
Estimates as of 2010

Template (Worst Case)

\*Template Burnup(MWd) 62.5

Template BOL Heavy Metal Mass (MT): 0.00186865

Template Decay Time: 25 years

Estimated  
Canister usage  
18"x15"  
0.07

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9648E-06	57.02	57.02	0.00E+00	1.12E-04	1.12E-04	Avg MeV	
Am-241	7.8064E+00	57.02	57.02	0.00E+00	4.45E+02	4.45E+02	0.0150	9.548E+13
Am-242m	1.7632E-02	57.02	57.02	0.00E+00	1.01E+00	1.01E+00	0.0250	1.892E+13
Am-243	1.6336E-02	57.02	57.02	0.00E+00	9.31E-01	9.31E-01	0.0375	1.688E+13
C-14	1.2101E-01	57.02	57.02	0.00E+00	6.90E+00	6.90E+00	0.0575	2.304E+13
Ct-36	2.2849E-03	57.02	57.02	0.00E+00	1.30E-01	1.30E-01	0.0850	9.963E+12
Cm-243	1.1046E-03	57.02	57.02	0.00E+00	6.30E-02	6.30E-02	0.1250	8.665E+12
Cm-244	2.4704E-01	57.02	57.02	0.00E+00	1.41E+01	1.41E+01	0.2250	8.464E+12
Co-60	1.0466E+02	57.02	57.02	0.00E+00	5.97E+03	5.97E+03	0.3750	3.567E+12
Cs-134	9.8289E-03	57.02	57.02	0.00E+00	5.60E-01	5.60E-01	0.5750	5.690E+12
Cs-135	4.9976E-04	57.02	57.02	0.00E+00	2.51E-02	2.51E-02	0.8500	3.429E+12
Cs-137	2.6526E+01	57.02	57.02	0.00E+00	1.51E+03	1.51E+03	1.2500	4.450E+14
Eu-154	2.7975E+00	57.02	57.02	0.00E+00	1.60E+02	1.60E+02	1.7500	1.078E+11
Eu-155	2.7881E-01	57.02	57.02	0.00E+00	1.59E+01	1.59E+01	2.2500	2.343E+09
Fe-55	4.2151E+00	57.02	57.02	0.00E+00	2.40E+02	2.40E+02	2.7500	2.006E+08
H-3	4.2599E-01	57.02	57.02	0.00E+00	2.43E+01	2.43E+01	3.5000	2.051E+05
I-129	1.0618E-05	57.02	57.02	0.00E+00	6.05E-04	6.05E-04	5.0000	8.726E+04
Kr-85	1.1426E+00	57.02	57.02	0.00E+00	6.52E+01	6.52E+01	7.0000	1.002E+04
Np-237	1.5647E-04	57.02	57.02	0.00E+00	8.92E-03	8.92E-03	11.0000	1.148E+03
Pa-231	2.8624E-06	57.02	57.02	0.00E+00	1.63E-04	1.63E-04		
Pb-210	9.2770E-09	57.02	57.02	0.00E+00	5.29E-07	5.29E-07		
Pm-147	2.3690E-01	57.02	57.02	0.00E+00	1.35E+01	1.35E+01		
Pu-238	-6.1800E-01	57.02	0.00	1.54E+01	0.00E+00	1.54E+01		
Pu-239	-4.8280E-02	57.02	0.00	1.87E+00	0.00E+00	1.87E+00		
Pu-240	-3.0095E-01	57.02	0.00	2.38E+00	0.00E+00	2.38E+00		
Pu-241	-7.4000E+01	57.02	0.00	6.13E+02	0.00E+00	6.13E+02		
Pu-242	-1.1381E-04	57.02	0.00	1.03E-02	3.82E-03	1.03E-02		
Ra-226	3.2167E-08	57.02	57.02	0.00E+00	1.83E-06	1.83E-06		
Ra-228	5.9024E-07	57.02	57.02	0.00E+00	3.37E-05	3.37E-05		
Ru-106	3.9140E-06	57.02	57.02	0.00E+00	2.23E-04	2.23E-04		
Se-79	1.9184E-04	57.02	57.02	0.00E+00	1.09E-02	1.09E-02		
Sn-126	1.6671E-04	57.02	57.02	0.00E+00	9.51E-03	9.51E-03		
Sr-90	2.5126E+01	57.02	57.02	0.00E+00	1.43E+03	1.43E+03		
Tc-99	6.7678E-03	57.02	57.02	0.00E+00	3.86E-01	3.86E-01		
Th-229	1.2398E-06	57.02	57.02	0.00E+00	7.07E-05	7.07E-05		
Th-230	4.1442E-06	57.02	57.02	0.00E+00	2.36E-04	2.36E-04		
Th-232	6.0208E-07	57.02	57.02	0.00E+00	3.43E-05	3.43E-05		
Ti-208	9.6478E-05	57.02	57.02	0.00E+00	5.50E-03	5.50E-03		
U-232	2.6103E-04	57.02	57.02	0.00E+00	1.49E-02	1.49E-02	Thermal Power	
U-233	3.6128E-04	57.02	57.02	0.00E+00	2.06E-02	2.06E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.2788E-02	57.02	57.02	0.00E+00	7.29E-01	7.29E-01	1.27E+02	1.28E+02
U-235	5.7486E-04	57.02	57.02	5.16E-05	3.28E-02	3.28E-02	Total	Total
U-236	2.3485E-04	57.02	57.02	0.00E+00	1.34E-02	1.34E-02		
U-238	1.1581E-04	57.02	57.02	6.42E-06	6.61E-03	6.61E-03		
Y-90	2.5126E+01	57.02	57.02	0.00E+00	1.43E+03	1.43E+03		
Other Radionuclides					4.00E+03	4.00E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	This fuel didn't closely match any existing templates, therefore the worst case template was used.

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		57.02	
Bounding		57.02	Nominal burnup set equal to bounding burnup. Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	14.21		
Bounding	14.21		591.64

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MOX STAR 5

SNF ID #: 435

Fuel Units & Descr: 1 - SCRAP

Heavy Metal Mass BOL= , EOL=0 139kg

ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1985

Estimates as of: 2010

Template: (Worst Case)

<sup>2</sup>Template Burnup(MWd): 62.5

Template BOL Heavy Metal Mass (MT): 0.00186865

Template Decay Time: 25 years

Estimated

Canister usage

18"x15"

0.07

## II. Estimates

	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9648E-06	132.10	132.10	0.00E+00	2.60E-04	2.60E-04	Avg. MeV	
Am-241	7.8064E+00	132.10	132.10	0.00E+00	1.03E+03	1.03E+03	0.0150	2.212E+14
Am-242m	1.7632E-02	132.10	132.10	0.00E+00	2.33E+00	2.33E+00	0.0250	4.383E+13
Am-243	1.6336E-02	132.10	132.10	0.00E+00	2.16E+00	2.16E+00	0.0375	3.911E+13
C-14	1.2101E-01	132.10	132.10	0.00E+00	1.60E+01	1.60E+01	0.0575	5.338E+13
Cl-36	2.2849E-03	132.10	132.10	0.00E+00	3.02E-01	3.02E-01	0.0850	2.308E+13
Cm-243	1.1046E-03	132.10	132.10	0.00E+00	1.46E-01	1.46E-01	0.1250	2.007E+13
Cm-244	2.4704E-01	132.10	132.10	0.00E+00	3.26E+01	3.26E+01	0.2250	1.961E+13
Co-60	1.0466E+02	132.10	132.10	0.00E+00	1.38E+04	1.38E+04	0.3750	8.264E+12
Cs-134	9.8289E-03	132.10	132.10	0.00E+00	1.30E+00	1.30E+00	0.5750	1.318E+14
Cs-135	4.3976E-04	132.10	132.10	0.00E+00	5.81E-02	5.81E-02	0.8500	7.943E+12
Cs-137	2.6526E+01	132.10	132.10	0.00E+00	3.50E+03	3.50E+03	1.2500	1.031E+15
Eu-154	2.7975E+00	132.10	132.10	0.00E+00	3.70E+02	3.70E+02	1.7500	2.498E+11
Eu-155	2.7881E-01	132.10	132.10	0.00E+00	3.68E+01	3.68E+01	2.2500	5.427E+09
Fe-55	4.2151E+00	132.10	132.10	0.00E+00	5.57E+02	5.57E+02	2.7500	4.648E+08
H-3	4.2599E-01	132.10	132.10	0.00E+00	5.63E+01	5.63E+01	3.5000	4.752E+05
I-129	1.0618E-05	132.10	132.10	0.00E+00	1.40E-03	1.40E-03	5.0000	2.022E+05
Kr-85	1.1426E+00	132.10	132.10	0.00E+00	1.51E+02	1.51E+02	7.0000	2.321E+04
Np-237	1.5647E-04	132.10	132.10	0.00E+00	2.07E-02	2.07E-02	11.0000	2.660E+03
Pa-231	2.8624E-06	132.10	132.10	0.00E+00	3.78E-04	3.78E-04		
Pb-210	9.2770E-09	132.10	132.10	0.00E+00	1.23E-06	1.23E-06		
Pm-147	2.3690E-01	132.10	132.10	0.00E+00	3.13E+01	3.13E+01		
Pu-238	-6.1800E-01	132.10	0.00	3.57E+01	0.00E+00	3.57E+01		
Pu-239	-4.8280E-02	132.10	0.00	4.32E+00	0.00E+00	4.32E+00		
Pu-240	-3.0095E-01	132.10	0.00	5.52E+00	0.00E+00	5.52E+00		
Pu-241	-7.4000E+01	132.10	0.00	1.42E+03	0.00E+00	1.42E+03		
Pu-242	-1.1381E-04	132.10	0.00	2.39E-02	8.86E-03	2.39E-02		
Ra-226	3.2167E-08	132.10	132.10	0.00E+00	4.25E-06	4.25E-06		
Ra-228	5.9024E-07	132.10	132.10	0.00E+00	7.80E-05	7.80E-05		
Ru-106	3.9140E-06	132.10	132.10	0.00E+00	5.17E-04	5.17E-04		
Se-79	1.9184E-04	132.10	132.10	0.00E+00	2.53E-02	2.53E-02		
Sn-126	1.6671E-04	132.10	132.10	0.00E+00	2.20E-02	2.20E-02		
Sr-90	2.5126E+01	132.10	132.10	0.00E+00	3.32E+03	3.32E+03		
Tc-99	6.7678E-03	132.10	132.10	0.00E+00	8.94E-01	8.94E-01		
Th-229	1.2398E-06	132.10	132.10	0.00E+00	1.64E-04	1.64E-04		
Th-230	4.1442E-06	132.10	132.10	0.00E+00	5.47E-04	5.47E-04		
Th-232	6.0208E-07	132.10	132.10	0.00E+00	7.95E-05	7.95E-05		
Th-208	9.6478E-05	132.10	132.10	0.00E+00	1.27E-02	1.27E-02		
U-232	2.6103E-04	132.10	132.10	0.00E+00	3.45E-02	3.45E-02		
U-233	3.6128E-04	132.10	132.10	0.00E+00	4.77E-02	4.77E-02		
U-234	1.2788E-02	132.10	132.10	0.00E+00	1.69E+00	1.69E+00		
U-235	5.7486E-04	132.10	132.10	1.20E-04	7.61E-02	7.61E-02		
U-236	2.3485E-04	132.10	132.10	0.00E+00	3.10E-02	3.10E-02		
U-238	1.1581E-04	132.10	132.10	1.49E-05	1.53E-02	1.53E-02		
Y-90	2.5126E+01	132.10	132.10	0.00E+00	3.32E+03	3.32E+03		
Other Radionuclides					9.26E+03	9.26E+03		

Thermal Power		
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)	
2.95E+02	2.95E+02	
Total	Total	

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	This fuel didn't closely match any existing templates, therefore the worst case template was used

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		132.10	
Bounding		132.10	Nominal burnup set equal to bounding burnup. Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	14.21		
Bounding	14.21		591.64

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PNL MOX STAR 6  
SNF ID #: 436  
Fuel Units & Descr: 1 - SCRAP  
Heavy Metal Mass BOL= , EOL=0.069kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1985  
Estimates as of. 2010  
Template (Worst Case)  
<sup>2</sup>Template Burnup(MWd): 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186365  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
0.07

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CV/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1.9648E-06	65.57	65.57	0.00E+00	1.29E-04	1.29E-04	0.0150	1.098E+14
Am-241	7.8064E+00	65.57	65.57	0.00E+00	5.12E+02	5.12E+02	0.0250	2.176E+13
Am-242m	1.7632E-02	65.57	65.57	0.00E+00	1.16E+00	1.16E+00	0.0375	1.941E+13
Am-243	1.6336E-02	65.57	65.57	0.00E+00	1.07E+00	1.07E+00	0.0575	2.650E+13
C-14	1.2101E-01	65.57	65.57	0.00E+00	7.94E+00	7.94E+00	0.0850	1.146E+13
Cl-36	2.2849E-03	65.57	65.57	0.00E+00	1.50E-01	1.50E-01	0.1250	9.965E+12
Cm-243	1.1046E-03	65.57	65.57	0.00E+00	7.24E-02	7.24E-02	0.2250	9.733E+12
Cm-244	2.4704E-01	65.57	65.57	0.00E+00	1.62E+01	1.62E+01	0.3750	4.102E+12
Co-60	1.0466E+02	65.57	65.57	0.00E+00	6.86E+03	6.86E+03	0.5750	6.544E+13
Cs-134	9.8289E-03	65.57	65.57	0.00E+00	6.45E-01	6.45E-01	0.8500	3.943E+12
Cs-135	4.3976E-04	65.57	65.57	0.00E+00	2.88E-02	2.88E-02	1.2500	5.117E+14
Cs-137	2.6526E+01	65.57	65.57	0.00E+00	1.74E+03	1.74E+03	1.7500	1.240E+11
Eu-154	2.7975E+00	65.57	65.57	0.00E+00	1.83E+02	1.83E+02	2.2500	2.694E+09
Eu-155	2.7881E-01	65.57	65.57	0.00E+00	1.83E+01	1.83E+01	2.7500	2.307E+08
Fe-55	4.2151E+00	65.57	65.57	0.00E+00	2.76E+02	2.76E+02	3.5000	2.359E+05
H-3	4.2599E-01	65.57	65.57	0.00E+00	2.79E+01	2.79E+01	5.0000	1.004E+05
I-129	1.0618E-05	65.57	65.57	0.00E+00	6.96E-04	6.96E-04	7.0000	1.152E+04
Kr-85	1.1426E+00	65.57	65.57	0.00E+00	7.49E+01	7.49E+01	11.0000	1.320E+03
Np-237	1.5647E-04	65.57	65.57	0.00E+00	1.03E-02	1.03E-02		
Pa-231	2.8624E-06	65.57	65.57	0.00E+00	1.88E-04	1.88E-04		
Pb-210	9.2770E-09	65.57	65.57	0.00E+00	6.08E-07	6.08E-07		
Pm-147	2.3690E-01	65.57	65.57	0.00E+00	1.55E+01	1.55E+01		
Pu-238	-6.1800E-01	65.57	0.00	1.77E+01	0.00E+00	1.77E+01		
Pu-239	-4.8280E-02	65.57	0.00	2.15E+00	0.00E+00	2.15E+00		
Pu-240	-3.0095E-01	65.57	0.00	2.74E+00	0.00E+00	2.74E+00		
Pu-241	-7.4000E+01	65.57	0.00	7.05E+02	0.00E+00	7.05E+02		
Pu-242	-1.1381E-04	65.57	0.00	1.19E-02	4.40E-03	1.19E-02		
Ra-226	3.2167E-08	65.57	65.57	0.00E+00	2.11E-06	2.11E-06		
Ra-228	5.9024E-07	65.57	65.57	0.00E+00	3.87E-05	3.87E-05		
Ru-106	3.9140E-06	65.57	65.57	0.00E+00	2.57E-04	2.57E-04		
Se-79	1.9184E-04	65.57	65.57	0.00E+00	1.26E-02	1.26E-02		
Sn-126	1.6671E-04	65.57	65.57	0.00E+00	1.09E-02	1.09E-02		
Sr-90	2.5126E+01	65.57	65.57	0.00E+00	1.65E+03	1.65E+03		
Tc-99	6.7678E-03	65.57	65.57	0.00E+00	4.44E-01	4.44E-01		
Th-229	1.2398E-06	65.57	65.57	0.00E+00	8.13E-05	8.13E-05		
Th-230	4.1442E-06	65.57	65.57	0.00E+00	2.72E-04	2.72E-04		
Th-232	6.0208E-07	65.57	65.57	0.00E+00	3.95E-05	3.95E-05		
Ti-208	9.6478E-05	65.57	65.57	0.00E+00	6.33E-03	6.33E-03		
U-232	2.6103E-04	65.57	65.57	0.00E+00	1.71E-02	1.71E-02		
U-233	3.6128E-04	65.57	65.57	0.00E+00	2.37E-02	2.37E-02		
U-234	1.2788E-02	65.57	65.57	0.00E+00	8.39E-01	8.39E-01		
U-235	5.7486E-04	65.57	65.57	5.94E-05	3.78E-02	3.78E-02		
U-236	2.3485E-04	65.57	65.57	0.00E+00	1.54E-02	1.54E-02		
U-238	1.1581E-04	65.57	65.57	7.39E-06	7.60E-03	7.60E-03		
Y-90	2.5126E+01	65.57	65.57	0.00E+00	1.65E+03	1.65E+03		
Other Radionuclides					4.60E+03	4.60E+03		

Other Radionuclides

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator:	From SFD	Used	
Fuel Cladding	LIGHT WATER	(Worst Case)	This fuel didn't closely match any existing templates, therefore the worst case template was used.
BOL HM Constituents	SST	SST/Inconel	
BOL Enrichment %	Pu and U	U Th & Pu	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		65.57	Nominal burnup set equal to bounding burnup
Bounding		65.57	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	14.21		591.64
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PNL MOX STAR 7  
 SNF ID #: 422  
 Fuel Units & Descr: 1 - SCRAP  
 Heavy Metal Mass: BOL = ; EOL=0.348kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1985  
 Estimates as of: 2010  
 Template: (Worst Case)  
<sup>2</sup>Template Burnup(MWd): 62.5  
 Template BOL Heavy Metal Mass (MT): 0.00186865  
 Template Decay Time: 25 years

Estimated  
 Canister usage:  
 18"x15"  
 0.07

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9648E-06	330.72	330.72	0.00E+00	6.50E-04	6.50E-04	Avg MeV	
Am-241	7.8064E+00	330.72	330.72	0.00E+00	2.58E+03	2.58E+03	0.0150	5.538E+14
Am-242m	1.7632E-02	330.72	330.72	0.00E+00	5.83E+00	5.83E+00	0.0250	1.097E+14
Am-243	1.6336E-02	330.72	330.72	0.00E+00	5.40E+00	5.40E+00	0.0375	9.791E+13
C-14	1.2101E-01	330.72	330.72	0.00E+00	4.00E+01	4.00E+01	0.0575	1.336E+14
Cl-36	2.2849E-03	330.72	330.72	0.00E+00	7.56E-01	7.56E-01	0.0850	5.779E+13
Cm-243	1.1046E-03	330.72	330.72	0.00E+00	3.65E-01	3.65E-01	0.1250	5.026E+13
Cm-244	2.4704E-01	330.72	330.72	0.00E+00	8.17E+01	8.17E+01	0.2250	4.909E+13
Co-60	1.0466E+02	330.72	330.72	0.00E+00	3.46E+04	3.46E+04	0.3750	2.069E+13
Cs-134	9.8289E-03	330.72	330.72	0.00E+00	3.25E+00	3.25E+00	0.5750	3.300E+14
Cs-135	4.3976E-04	330.72	330.72	0.00E+00	1.45E-01	1.45E-01	0.8500	1.989E+13
Cs-137	2.6526E+01	330.72	330.72	0.00E+00	8.77E+03	8.77E+03	1.2500	2.581E+15
Eu-154	2.7975E+00	330.72	330.72	0.00E+00	9.25E+02	9.25E+02	1.7500	6.253E+11
Eu-155	2.7881E-01	330.72	330.72	0.00E+00	9.22E+01	9.22E+01	2.2500	1.359E+10
Fe-55	4.2151E+00	330.72	330.72	0.00E+00	1.39E+03	1.39E+03	2.7500	1.164E+09
H-3	4.2599E-01	330.72	330.72	0.00E+00	1.41E+02	1.41E+02	3.5000	1.190E+06
I-129	1.0618E-05	330.72	330.72	0.00E+00	3.51E-03	3.51E-03	5.0000	5.061E+05
Kr-85	1.1426E+00	330.72	330.72	0.00E+00	3.78E+02	3.78E+02	7.0000	5.811E+04
Np-237	1.5647E-04	330.72	330.72	0.00E+00	5.17E-02	5.17E-02	11.0000	6.659E+03
Pa-231	2.8624E-06	330.72	330.72	0.00E+00	9.47E-04	9.47E-04		
Pb-210	9.2770E-09	330.72	330.72	0.00E+00	3.07E-06	3.07E-06		
Pm-147	2.3690E-01	330.72	330.72	0.00E+00	7.83E+01	7.83E+01		
Pu-238	-6.1800E-01	330.72	0.00	8.94E+01	0.00E+00	8.94E+01		
Pu-239	-4.8280E-02	330.72	0.00	1.08E+01	0.00E+00	1.08E+01		
Pu-240	-3.0095E-01	330.72	0.00	1.38E+01	0.00E+00	1.38E+01		
Pu-241	-7.4000E+01	330.72	0.00	3.56E+03	0.00E+00	3.56E+03		
Pu-242	-1.1381E-04	330.72	0.00	5.98E-02	2.22E-02	5.98E-02		
Ra-226	3.2167E-08	330.72	330.72	0.00E+00	1.06E-05	1.06E-05		
Ra-228	5.9024E-07	330.72	330.72	0.00E+00	1.95E-04	1.95E-04		
Ru-106	3.9140E-06	330.72	330.72	0.00E+00	1.29E-03	1.29E-03		
Se-79	1.9184E-04	330.72	330.72	0.00E+00	6.34E-02	6.34E-02		
Sn-126	1.6671E-04	330.72	330.72	0.00E+00	5.51E-02	5.51E-02		
Sr-90	2.5126E+01	330.72	330.72	0.00E+00	8.31E+03	8.31E+03		
Tc-99	6.7678E-03	330.72	330.72	0.00E+00	2.24E+00	2.24E+00		
Th-229	1.2398E-06	330.72	330.72	0.00E+00	4.10E-04	4.10E-04		
Th-230	4.1442E-06	330.72	330.72	0.00E+00	1.37E-03	1.37E-03		
Th-232	6.0208E-07	330.72	330.72	0.00E+00	1.99E-04	1.99E-04		
Ti-208	9.6478E-05	330.72	330.72	0.00E+00	3.19E-02	3.19E-02		
U-232	2.6103E-04	330.72	330.72	0.00E+00	8.63E-02	8.63E-02		
U-233	3.6128E-04	330.72	330.72	0.00E+00	1.19E-01	1.19E-01		
U-234	1.2788E-02	330.72	330.72	0.00E+00	4.23E+00	4.23E+00		
U-235	5.7486E-04	330.72	330.72	2.99E-04	1.90E-01	1.90E-01		
U-236	2.3485E-04	330.72	330.72	0.00E+00	7.77E-02	7.77E-02		
U-238	1.1581E-04	330.72	330.72	3.73E-05	3.83E-02	3.83E-02		
Y-90	2.5126E+01	330.72	330.72	0.00E+00	8.31E+03	8.31E+03		
Other Radionuclides					2.32E+04	2.32E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator: Fuel Cladding: BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	(Worst Case)	
	SST	SST/Inconel	
This fuel didn't closely match any existing templates therefore the worst case template was used.			

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		330.72	
		330.72	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	14.21		
	14.21		591.64

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PNL-3  
SNF ID # 420  
Fuel Units & Descr 6 - ROD  
Heavy Metal Mass BOL= , EOL=0.064kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1969  
Estimates as of: 2010  
Template: (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 62.5  
Template BOL Heavy Metal Mass (MT): 0.00186865  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x15"  
0.44

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3072E-06	61.01	61.01	0.00E+00	1.41E-04	1.41E-04	Avg MeV	
Am-241	8.4448E+00	61.01	61.01	0.00E+00	5.15E+02	5.15E+02	0.0150	7.477E+13
Am-242m	1.6848E-02	61.01	61.01	0.00E+00	1.03E+00	1.03E+00	0.0250	1.488E+13
Am-243	1.6320E-02	61.01	61.01	0.00E+00	9.96E-01	9.96E-01	0.0375	1.300E+13
C-14	1.2090E-01	61.01	61.01	0.00E+00	7.38E+00	7.38E+00	0.0575	2.045E+13
Cl-36	2.2849E-03	61.01	61.01	0.00E+00	1.39E-01	1.39E-01	0.0850	7.982E+12
Cm-243	8.6624E-04	61.01	61.01	0.00E+00	5.29E-02	5.29E-02	0.1250	6.256E+12
Cm-244	1.6848E-01	61.01	61.01	0.00E+00	1.03E+01	1.03E+01	0.2250	6.915E+12
Co-60	2.8086E+01	61.01	61.01	0.00E+00	1.71E+03	1.71E+03	0.3750	2.958E+12
Cs-134	3.4148E-04	61.01	61.01	0.00E+00	2.08E-02	2.08E-02	0.5750	4.809E+13
Cs-135	4.3976E-04	61.01	61.01	0.00E+00	2.68E-02	2.68E-02	0.8500	1.838E+12
Cs-137	2.1049E+01	61.01	61.01	0.00E+00	1.28E+03	1.28E+03	1.2500	1.285E+14
Eu-154	1.2500E+00	61.01	61.01	0.00E+00	7.63E+01	7.63E+01	1.7500	5.683E+10
Eu-155	6.8986E-02	61.01	61.01	0.00E+00	4.21E+00	4.21E+00	2.2500	6.737E+08
Fe-55	2.9308E-01	61.01	61.01	0.00E+00	1.79E+01	1.79E+01	2.7500	1.899E+08
H-3	2.4311E-01	61.01	61.01	0.00E+00	1.48E+01	1.48E+01	3.5000	1.519E+05
I-129	1.0618E-05	61.01	61.01	0.00E+00	6.48E-04	6.48E-04	5.0000	6.453E+04
Kr-85	5.9882E-01	61.01	61.01	0.00E+00	3.65E+01	3.65E+01	7.0000	7.390E+03
Np-237	1.5668E-04	61.01	61.01	0.00E+00	9.56E-03	9.56E-03	11.0000	8.455E+02
Pa-231	2.8656E-06	61.01	61.01	0.00E+00	1.75E-04	1.75E-04		
Pb-210	2.3918E-08	61.01	61.01	0.00E+00	1.46E-06	1.46E-06		
Pm-147	1.6900E-02	61.01	61.01	0.00E+00	1.03E+00	1.03E+00		
Pu-238	-8.6120E-01	61.01	0.00	1.65E+01	0.00E+00	1.65E+01		
Pu-239	-4.8440E-02	61.01	0.00	2.00E+00	0.00E+00	2.00E+00		
Pu-240	-3.0095E-01	61.01	0.00	2.55E+00	0.00E+00	2.55E+00		
Pu-241	-1.0411E+02	61.01	0.00	6.56E+02	0.00E+00	6.56E+02		
Pu-242	-1.1381E-04	61.01	0.00	1.10E-02	4.09E-03	1.10E-02		
Ra-226	6.4400E-08	61.01	61.01	0.00E+00	3.93E-06	3.93E-06		
Ra-228	5.9952E-07	61.01	61.01	0.00E+00	3.66E-05	3.66E-05		
Ru-106	8.5526E-07	61.01	61.01	0.00E+00	5.22E-05	5.22E-05		
Se-79	1.9181E-04	61.01	61.01	0.00E+00	1.17E-02	1.17E-02		
Sn-126	1.6671E-04	61.01	61.01	0.00E+00	1.02E-02	1.02E-02		
Sr-90	1.9799E+01	61.01	61.01	0.00E+00	1.21E+03	1.21E+03		
Tc-99	6.7678E-03	61.01	61.01	0.00E+00	4.13E-01	4.13E-01		
Th-229	1.7488E-06	61.01	61.01	0.00E+00	1.07E-04	1.07E-04		
Th-230	5.8704E-06	61.01	61.01	0.00E+00	3.58E-04	3.58E-04		
Th-232	6.0208E-07	61.01	61.01	0.00E+00	3.67E-05	3.67E-05		
Ti-208	8.7573E-05	61.01	61.01	0.00E+00	5.34E-03	5.34E-03		
U-232	2.3706E-04	61.01	61.01	0.00E+00	1.45E-02	1.45E-02	Thermal Power	
U-233	3.6128E-04	61.01	61.01	0.00E+00	2.20E-02	2.20E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.2788E-02	61.01	61.01	0.00E+00	7.80E-01	7.80E-01	6.01E+01	6.08E+01
U-235	5.7486E-04	61.01	61.01	5.52E-05	3.51E-02	3.51E-02	Total	Total
U-236	2.3485E-04	61.01	61.01	0.00E+00	1.43E-02	1.43E-02		
U-238	1.1581E-04	61.01	61.01	6.87E-06	7.07E-03	7.07E-03		
Y-90	1.9804E+01	61.01	61.01	0.00E+00	1.21E+03	1.21E+03		
Other Radionuclides					3.76E+03	3.76E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
	From SFD	Used	
Reactor Moderator:	FAST	(Worst Case)	This fuel didn't closely match any existing templates, therefore the worst case template was used.
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %		0 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		61.01	Nominal burnup set equal to bounding burnup
Bounding		61.01	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	14.21		591.64
Bounding	14.21		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PULSTAR - BUFFALO (6%RODS)  
SNF ID #: 174  
Fuel Units & Descr: 24 - CANISTER OF RODS  
Heavy Metal Mass: BOL=254 671kg; EOL=252.202kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1978  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61.92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 25 years

Estimated  
Canister usage:  
18"x10"  
2 00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6376E-10	2,348 47	2,546 71	0 00E+00	1 56E-06	1 69E-06	Avg MeV	
Am-241	1 3144E-01	2,348 47	2,546 71	0 00E+00	3 09E+02	3 35E+02	0 0150	1 732E+14
Am-242m	3 0039E-04	2,348 47	2,546 71	0 00E+00	7 05E-01	7 65E-01	0 0250	3 508E+13
Am-243	6 2629E-04	2,348 47	2,546 71	0 00E+00	1 47E+00	1 59E+00	0 0375	3 395E+13
Ci-14	4 7965E-05	2,348 47	2,546 71	0 00E+00	1 13E-01	1 22E-01	0 0575	3 703E+13
Ci-36	8 0297E-07	2,348 47	2,546 71	0 00E+00	1 89E-03	2 04E-03	0 0850	1 962E+13
Cm-243	3 1993E-04	2,348 47	2,546 71	0 00E+00	7 51E-01	8 15E-01	0 1250	1 433E+13
Cm-244	7 1851E-02	2,348 47	2,546 71	0 00E+00	1 69E+02	1 83E+02	0 2250	1 685E+13
Co-60	9 5220E-03	2,348 47	2,546 71	0 00E+00	2 24E+01	2 42E+01	0 3750	7 228E+12
Cs-134	1 1662E-03	2,348 47	2,546 71	0 00E+00	2 74E+00	2 97E+00	0 5750	1 661E+14
Cs-135	1 4433E-05	2,348 47	2,546 71	0 00E+00	3 39E-02	3 68E-02	0 8500	3 278E+12
Cs-137	1 7603E+00	2,348 47	2,546 71	0 00E+00	4 13E+03	4 48E+03	1 2500	4 428E+12
Eu-154	4 5203E-02	2,348 47	2,546 71	0 00E+00	1 06E+02	1 15E+02	1 7500	9 702E+10
Eu-155	7 1479E-03	2,348 47	2,546 71	0 00E+00	1 68E+01	1 82E+01	2 2500	1 792E+07
Fe-55	6 1919E-04	2,348 47	2,546 71	0 00E+00	1 45E+00	1 58E+00	2 7500	2 014E+07
H-3	3 6386E-02	2,348 47	2,546 71	0 00E+00	8 55E+01	9 27E+01	3 5000	2 640E+06
I-129	9 8288E-07	2,348 47	2,546 71	0 00E+00	2 31E-03	2 50E-03	5 0000	1 128E+06
Kr-85	5 3844E-02	2,348 47	2,546 71	0 00E+00	1 26E+02	1 37E+02	7 0000	1 301E+05
Np-237	1 0546E-05	2,348 47	2,546 71	0 00E+00	2 48E-02	2 69E-02	11 0000	1 494E+04
Pa-231	1 1370E-09	2,348 47	2,546 71	0 00E+00	2 67E-06	2 90E-06		
Pb-210	3 3624E-11	2,348 47	2,546 71	0 00E+00	7 90E-08	8 56E-08		
Pm-147	5 1211E-03	2,348 47	2,546 71	0 00E+00	1 20E+01	1 30E+01		
Pu-238	8 0669E-02	2,348 47	2,546 71	0 00E+00	1 89E+02	2 05E+02		
Pu-239	1 1626E-02	2,348 47	2,546 71	0 00E+00	2 73E+01	2 96E+01		
Pu-240	1 5097E-02	2,348 47	2,546 71	0 00E+00	3 55E+01	3 84E+01		
Pu-241	1 4567E+00	2,348 47	2,546 71	0 00E+00	3 42E+03	3 71E+03		
Pu-242	6 4260E-05	2,348 47	2,546 71	0 00E+00	1 51E-01	1 64E-01		
Ra-226	1 1392E-10	2,348 47	2,546 71	0 00E+00	2 68E-07	2 90E-07		
Ra-228	5 1841E-12	2,348 47	2,546 71	0 00E+00	1 22E-08	1 32E-08		
Ru-106	5 9012E-07	2,348 47	2,546 71	0 00E+00	1 39E-03	1 50E-03		
Se-79	1 2379E-05	2,348 47	2,546 71	0 00E+00	2 91E-02	3 15E-02		
Sn-126	2 5210E-05	2,348 47	2,546 71	0 00E+00	5 92E-02	6 42E-02		
Sr-90	1 1630E+00	2,348 47	2,546 71	0 00E+00	2 73E+03	2 96E+03		
Tc-99	3 9357E-04	2,348 47	2,546 71	0 00E+00	9 24E-01	1 00E+00		
Th-229	8 5691E-11	2,348 47	2,546 71	0 00E+00	2 01E-07	2 18E-07		
Th-230	1 4493E-08	2,348 47	2,546 71	0 00E+00	3 40E-05	3 69E-05		
Th-232	5 2923E-12	2,348 47	2,546 71	0 00E+00	1 24E-08	1 35E-08		
Ti-208	1 9202E-07	2,348 47	2,546 71	0 00E+00	4 51E-04	4 89E-04		
U-232	5 2083E-07	2,348 47	2,546 71	0 00E+00	1 22E-03	1 33E-03		
U-233	2 4386E-08	2,348 47	2,546 71	0 00E+00	5 73E-05	6 21E-05	Thermal Power	
U-234	4 7012E-05	2,348 47	2,546 71	0 00E+00	1 10E-01	1 20E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-1 4492E-06	2,348 47	0 00	3 30E-02	2 96E-02	3 30E-02	6 44E+01	6 98E+01
U-236	7 5759E-06	2,348 47	2,546 71	0 00E+00	1 78E-02	1 93E-02	Total	Total
U-238	-2 6129E-07	2,348 47	0 00	8 05E-02	7 98E-02	8 05E-02		
Y-90	1 1631E+00	2,348 47	2,546 71	0 00E+00	2 73E+03	2 96E+03		
Other Radionuclides					3 97E+03	4 30E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons. This fuel matches PWR Template on all but one parameter (enrichment) making PWR a reasonable match.
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ZIRC	ZIRC	
BOL HM Constituents:	U	U	
BOL Enrichment %:	5 996	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup taken directly from SFD (converted to MWd).
Nominal:		2,348 47	
Bounding:	2,546 71	4,696 95	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1 00
Nominal:	0 26		
Bounding:	0 29	1 84	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name PULSTAR-N C STATE UNIV (4% ASSEMBLIES)  
SNF ID # 175  
Fuel Units & Descr 25 - 5 X 5 ROD ARRAY  
Heavy Metal Mass BOL=316 87kg, EOL=315 902kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 2035  
Estimates as of 2010  
Template PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 5 years

Estimated  
Canister usage  
18"x10"  
1 25

II. Estimates							Gamma Sources	
	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	2 3547E-10	920 05	1,840 09	0 00E+00	2 17E-07	4.33E-07	0 0150	2 626E+14
Am-241	6 5811E-02	920 05	1,840 09	0 00E+00	6 05E+01	1.21E+02	0 0250	6 048E+13
Am-242m	3 2913E-04	920 05	1,840 09	0 00E+00	3 03E-01	6 06E-01	0 0375	5.662E+13
Am-243	6 2742E-04	920 05	1,840 09	0 00E+00	5 77E-01	1.15E+00	0 0575	5.276E+13
C-14	4 8078E-05	920 05	1,840 09	0 00E+00	4 42E-02	8 85E-02	0 0850	3.332E+13
Cl-36	8 0313E-07	920 05	1,840 09	0.00E+00	7 39E-04	1.48E-03	0 1250	3.016E+13
Cm-243	5 2003E-04	920 05	1,840 09	0.00E+00	4 78E-01	9 57E-01	0.2250	2.835E+13
Cm-244	1 5441E-01	920 05	1,840 09	0 00E+00	1 42E+02	2.84E+02	0.3750	1.591E+13
Co-60	1.3196E-01	920.05	1,840 09	0 00E+00	1 21E+02	2 43E+02	0.5750	2.933E+14
Cs-134	9 6528E-01	920.05	1,840 09	0 00E+00	8 88E+02	1 78E+03	0.8500	6 786E+13
Cs-135	1 4433E-05	920.05	1,840 09	0 00E+00	1.33E-02	2 66E-02	1.2500	3 156E+13
Cs-137	2.7939E+00	920 05	1,840 09	0 00E+00	2.57E+03	5 14E+03	1.7500	4 894E+11
Eu-154	2.2626E-01	920 05	1,840 09	0 00E+00	2 08E+02	4 16E+02	2.2500	2.456E+11
Eu-155	1.1680E-01	920 05	1,840 09	0 00E+00	1 07E+02	2 15E+02	2.7500	8.226E+09
Fe-55	1.2760E-01	920 05	1,840 09	0 00E+00	1.17E+02	2 35E+02	3.5000	1 055E+09
H-3	1.1168E-01	920 05	1,840 09	0 00E+00	1 03E+02	2 05E+02	5 0000	1 732E+06
I-129	9 8288E-07	920 05	1,840 09	0 00E+00	9 04E-04	1 81E-03	7 0000	1 897E+05
Kr-85	1 9606E-01	920 05	1,840 09	0 00E+00	1.80E+02	3 61E+02	11 0000	2.294E+04
Np-237	9 6915E-06	920 05	1,840 09	0 00E+00	8 92E-03	1.78E-02		
Pa-231	8 5917E-10	920 05	1,840 09	0 00E+00	7 90E-07	1.58E-06		
Pb-210	1 6247E-12	920 05	1,840 09	0 00E+00	1 49E-09	2.99E-09		
Pm-147	1 0063E+00	920 05	1,840 09	0 00E+00	9 26E+02	1.85E+03		
Pu-238	9 4428E-02	920 05	1,840 09	0 00E+00	8 69E+01	1.74E+02		
Pu-239	1 1631E-02	920 05	1,840 09	0 00E+00	1 07E+01	2.14E+01		
Pu-240	1 4919E-02	920 05	1,840 09	0 00E+00	1.37E+01	2 75E+01		
Pu-241	3 8130E+00	920 05	1,840 09	0 00E+00	3 51E+03	7.02E+03		
Pu-242	6 4260E-05	920 05	1,840 09	0 00E+00	5 91E-02	1.18E-01		
Ra-226	1 2608E-11	920 05	1,840 09	0 00E+00	1.16E-08	2 32E-08		
Ra-228	3 8966E-12	920 05	1,840 09	0 00E+00	3 59E-09	7 17E-09		
Ru-106	5 4910E-01	920 05	1,840 09	0 00E+00	5 05E+02	1 01E+03		
Se-79	1 2380E-05	920 05	1,840 09	0 00E+00	1.14E-02	2 28E-02		
Sn-126	2 5210E-05	920 05	1,840 09	0 00E+00	2.32E-02	4 64E-02		
Sr-90	1 8718E+00	920 05	1,840 09	0 00E+00	1 72E+03	3 44E+03		
Tc-99	3 9357E-04	920 05	1,840 09	0 00E+00	3.62E-01	7.24E-01		
Th-229	2 9603E-11	920 05	1,840 09	0 00E+00	2.72E-08	5 45E-08		
Th-230	4.5559E-09	920 05	1,840 09	0 00E+00	4 19E-06	8.38E-06		
Th-232	5.2826E-12	920 05	1,840 09	0 00E+00	4 86E-09	9 72E-09		
Ti-208	1 9654E-07	920 05	1,840 09	0 00E+00	1 81E-04	3.62E-04		
U-232	5 7607E-07	920 05	1,840 09	0 00E+00	5.30E-04	1.06E-03		
U-233	2.3288E-08	920 05	1,840 09	0 00E+00	2 14E-05	4.29E-05		
U-234	4.1182E-05	920 05	1,840 09	0 00E+00	3 79E-02	7.58E-02		
U-235	-1.4494E-06	920 05	0 00	2 76E-02	2 62E-02	2.76E-02		
U-236	7.5646E-06	920 05	1,840 09	0 00E+00	6 96E-03	1.39E-02		
U-238	-2 6129E-07	920 05	0 00	1 02E-01	1 02E-01	1 02E-01		
Y-90	1.8718E+00	920 05	1,840 09	0 00E+00	1 72E+03	3 44E+03		
Other Radionuclides					3 82E+03	7 64E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	4 025941269	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		920 05	
Bounding		1,840 09	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 08		
Bounding	0 17		

Estimated EOL HM/Given EOL HM  
1 00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: PULSTAR-SUNY-BUFFALO (6% RODS)  
SNF ID #: 176  
Fuel Units & Descr: 996 - ROD  
Heavy Metal Mass: BOL=537 541kg; EOL=499 992kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1965  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 35 years

Estimated  
Canister usage  
18"x10"  
2 96

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	35,707.51	71,415.03	0 00E+00	3.13E-05	6.27E-05	Avg. MeV	
Am-241	1 4352E-01	35,707.51	71,415.03	0 00E+00	5 12E+03	1 02E+04	0 0150	3 843E+15
Am-242m	2 8698E-04	35,707.51	71,415.03	0 00E+00	1 02E+01	2 05E+01	0 0250	7 749E+14
Am-243	6 2565E-04	35,707.51	71,415.03	0 00E+00	2 23E+01	4 47E+01	0 0375	7.390E+14
C-14	4 7901E-05	35,707.51	71,415.03	0 00E+00	1 71E+00	3 42E+00	0 0575	8 539E+14
Cl-36	8 0297E-07	35,707.51	71,415.03	0 00E+00	2 87E-02	5.73E-02	0 0850	4.300E+14
Cm-243	2 5081E-04	35,707.51	71,415.03	0 00E+00	8 96E+00	1 79E+01	0 1250	2 984E+14
Cm-244	4 9015E-02	35,707.51	71,415.03	0 00E+00	1 75E+03	3 50E+03	0.2250	3 687E+14
Co-60	2 5581E-03	35,707.51	71,415.03	0 00E+00	9 13E+01	1 83E+02	0.3750	1 585E+14
Cs-134	4 0536E-05	35,707.51	71,415.03	0 00E+00	1 45E+00	2 89E+00	0.5750	3 687E+15
Cs-135	1 4433E-05	35,707.51	71,415.03	0 00E+00	5 15E-01	1 03E+00	0.8500	5 101E+13
Cs-137	1 3979E+00	35,707.51	71,415.03	0 00E+00	4 99E+04	9 98E+04	1.2500	5 011E+13
Eu-154	2 0203E-02	35,707.51	71,415.03	0 00E+00	7 21E+02	1 44E+03	1 7500	1 501E+12
Eu-155	1 7684E-03	35,707.51	71,415.03	0 00E+00	6 31E+01	1 26E+02	2.2500	2 416E+08
Fe-55	4 3136E-05	35,707.51	71,415.03	0 00E+00	1 54E+00	3 08E+00	2 7500	4 950E+08
H-3	2 0769E-02	35,707.51	71,415.03	0 00E+00	7 42E+02	1 48E+03	3 5000	5 097E+07
I-129	9 8288E-07	35,707.51	71,415.03	0 00E+00	3 51E-02	7 02E-02	5 0000	2 179E+07
Kr-85	2 8214E-02	35,707.51	71,415.03	0 00E+00	1 01E+03	2 01E+03	7 0000	2.512E+06
Np-237	1 1218E-05	35,707.51	71,415.03	0 00E+00	4 01E-01	8 01E-01	11 0000	2.885E+05
Pa-231	1 3036E-09	35,707.51	71,415.03	0 00E+00	4 65E-05	9 31E-05		
Pb-210	8 5078E-11	35,707.51	71,415.03	0 00E+00	3 04E-06	6 08E-06		
Pm-147	3 6531E-04	35,707.51	71,415.03	0 00E+00	1 30E+01	2 61E+01		
Pu-238	7 4564E-02	35,707.51	71,415.03	0 00E+00	2 66E+03	5 32E+03		
Pu-239	1 1623E-02	35,707.51	71,415.03	0 00E+00	4 15E+02	8 30E+02		
Pu-240	1 5132E-02	35,707.51	71,415.03	0 00E+00	5 40E+02	1 08E+03		
Pu-241	9 0036E-01	35,707.51	71,415.03	0 00E+00	3 21E+04	6 43E+04		
Pu-242	6 4260E-05	35,707.51	71,415.03	0 00E+00	2 29E+00	4 59E+00		
Ra-226	2 2804E-10	35,707.51	71,415.03	0 00E+00	8 14E-06	1 63E-05		
Ra-228	5 2713E-12	35,707.51	71,415.03	0 00E+00	1 88E-07	3 76E-07		
Ru-106	6 1160E-10	35,707.51	71,415.03	0 00E+00	2 18E-05	4 37E-05		
Se-79	1 2377E-05	35,707.51	71,415.03	0 00E+00	4 42E-01	8 84E-01		
Sr-126	2 5210E-05	35,707.51	71,415.03	0 00E+00	9 00E-01	1 80E+00		
Sr-90	9 1667E-01	35,707.51	71,415.03	0 00E+00	3.27E+04	6 55E+04		
Tc-99	3 9357E-04	35,707.51	71,415.03	0 00E+00	1 41E+01	2 81E+01		
Th-229	1 2057E-10	35,707.51	71,415.03	0 00E+00	4 31E-06	8 61E-06		
Th-230	2 1043E-08	35,707.51	71,415.03	0 00E+00	7 51E-04	1 50E-03		
Th-232	5 2972E-12	35,707.51	71,415.03	0 00E+00	1 89E-07	3 78E-07		
Ti-208	1 7474E-07	35,707.51	71,415.03	0 00E+00	6 24E-03	1 25E-02		
U-232	4 7368E-07	35,707.51	71,415.03	0 00E+00	1 69E-02	3 38E-02		
U-233	2 5097E-08	35,707.51	71,415.03	0 00E+00	8 96E-04	1 79E-03		
U-234	5 0000E-05	35,707.51	71,415.03	0 00E+00	1 79E+00	3 57E+00		
U-235	-1 4489E-06	35,707.51	0 00	6 93E-02	1 76E-02	6 93E-02		
U-236	7 5824E-06	35,707.51	71,415.03	0 00E+00	2.71E-01	5 41E-01		
U-238	-2 6129E-07	35,707.51	0 00	1 70E-01	1 61E-01	1 70E-01		
Y-90	9 1699E-01	35,707.51	71,415.03	0 00E+00	3.27E+04	6 55E+04		
Other Radionuclides					4 79E+04	9 59E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	ZIRC	ZIRC	This fuel matches PWR Template on all but one parameter (enrichment) making PWR a reasonable match.
BOL HM Constituents	U	U	
BOL Enrichment %	5 965123646	0 to 5	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		35 707.51	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		71 415.03	Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1 90		1 00
Bounding	3 80		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name RESIDUE FAILED PBF RODS  
SNF ID #: 381  
Fuel Units & Descr: 1 - DEBRIS  
Heavy Metal Mass: BOL= ; EOL=1 109kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1985  
Estimates as of 2010  
Template Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 6.01  
Template BOL Heavy Metal Mass (MT) 0.00012882  
Template Decay Time 25 years

Estimated  
Canister usage:  
HIC  
1.00

II. Estimates		m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	1.3562E-08	1,047.61	1,047.61	0.00E+00	1.42E-05	1.42E-05	Avg MeV		
Am-241	1.0168E-04	1,047.61	1,047.61	0.00E+00	1.07E-01	1.07E-01	0.0150	9.968E+13	
Am-242m	8.9052E-09	1,047.61	1,047.61	0.00E+00	9.33E-06	9.33E-06	0.0250	2.071E+13	
Am-243	9.8602E-10	1,047.61	1,047.61	0.00E+00	1.03E-06	1.03E-06	0.0375	1.788E+13	
C-14	2.3045E-04	1,047.61	1,047.61	0.00E+00	2.41E-01	2.41E-01	0.0575	1.929E+13	
Cl-36	1.2261E-06	1,047.61	1,047.61	0.00E+00	1.28E-03	1.28E-03	0.0850	1.166E+13	
Cm-243	3.1730E-10	1,047.61	1,047.61	0.00E+00	3.32E-07	3.32E-07	0.1250	7.577E+12	
Cm-244	3.3977E-09	1,047.61	1,047.61	0.00E+00	3.56E-06	3.56E-06	0.2250	1.001E+13	
Co-60	2.6373E-01	1,047.61	1,047.61	0.00E+00	2.76E+02	2.76E+02	0.3750	4.368E+12	
Cs-134	8.7072E-05	1,047.61	1,047.61	0.00E+00	9.12E-02	9.12E-02	0.5750	7.133E+13	
Cs-135	3.0316E-05	1,047.61	1,047.61	0.00E+00	3.18E-02	3.18E-02	0.8500	7.438E+11	
Cs-137	1.8286E+00	1,047.61	1,047.61	0.00E+00	1.92E+03	1.92E+03	1.2500	2.072E+13	
Eu-154	1.4982E-03	1,047.61	1,047.61	0.00E+00	1.57E+00	1.57E+00	1.7500	1.916E+10	
Eu-155	2.8236E-03	1,047.61	1,047.61	0.00E+00	2.96E+00	2.96E+00	2.2500	1.104E+08	
Fe-55	1.7687E-02	1,047.61	1,047.61	0.00E+00	1.85E+01	1.85E+01	2.7500	1.215E+06	
H-3	4.4043E-03	1,047.61	1,047.61	0.00E+00	4.61E+00	4.61E+00	3.5000	2.566E+02	
I-129	7.3195E-07	1,047.61	1,047.61	0.00E+00	7.67E-04	7.67E-04	5.0000	2.599E+01	
Kr-85	7.8769E-02	1,047.61	1,047.61	0.00E+00	8.25E+01	8.25E+01	7.0000	2.870E+00	
Np-237	1.1484E-06	1,047.61	1,047.61	0.00E+00	1.20E-03	1.20E-03	11.0000	3.220E-01	
Pa-231	3.2396E-08	1,047.61	1,047.61	0.00E+00	3.39E-05	3.39E-05			
Pb-210	2.4409E-13	1,047.61	1,047.61	0.00E+00	2.56E-10	2.56E-10			
Pm-147	1.6331E-02	1,047.61	1,047.61	0.00E+00	1.71E+01	1.71E+01			
Pu-238	3.1947E-04	1,047.61	1,047.61	0.00E+00	3.35E-01	3.35E-01			
Pu-239	6.6789E-04	1,047.61	1,047.61	0.00E+00	7.00E-01	7.00E-01			
Pu-240	8.6922E-05	1,047.61	1,047.61	0.00E+00	9.11E-02	9.11E-02			
Pu-241	1.1567E-03	1,047.61	1,047.61	0.00E+00	1.21E+00	1.21E+00			
Pu-242	1.9717E-09	1,047.61	1,047.61	0.00E+00	2.07E-06	2.07E-06			
Ra-226	8.6190E-13	1,047.61	1,047.61	0.00E+00	9.03E-10	9.03E-10			
Ra-228	8.1498E-12	1,047.61	1,047.61	0.00E+00	8.54E-09	8.54E-09			
Ru-106	1.7770E-07	1,047.61	1,047.61	0.00E+00	1.86E-04	1.86E-04			
Se-79	1.3225E-05	1,047.61	1,047.61	0.00E+00	1.39E-02	1.39E-02			
Sn-126	1.1493E-05	1,047.61	1,047.61	0.00E+00	1.20E-02	1.20E-02			
Sr-90	1.7321E+00	1,047.61	1,047.61	0.00E+00	1.81E+03	1.81E+03			
Tc-99	4.6656E-04	1,047.61	1,047.61	0.00E+00	4.89E-01	4.89E-01			
Th-229	1.0110E-11	1,047.61	1,047.61	0.00E+00	1.06E-08	1.06E-08			
Th-230	1.1466E-10	1,047.61	1,047.61	0.00E+00	1.20E-07	1.20E-07			
Th-232	8.3245E-12	1,047.61	1,047.61	0.00E+00	8.72E-09	8.72E-09			
Ti-208	2.3860E-08	1,047.61	1,047.61	0.00E+00	2.50E-05	2.50E-05			
U-232	6.4576E-08	1,047.61	1,047.61	0.00E+00	6.77E-05	6.77E-05			
U-233	3.1082E-09	1,047.61	1,047.61	0.00E+00	3.26E-06	3.26E-06			
U-234	3.7587E-07	1,047.61	1,047.61	0.00E+00	3.94E-04	3.94E-04			
U-235	-2.7761E-06	1,047.61	0.00	4.48E-03	1.57E-03	4.48E-03			
U-236	1.6190E-05	1,047.61	1,047.61	0.00E+00	1.70E-02	1.70E-02			
U-238	-2.8547E-09	1,047.61	0.00	4.84E-05	4.54E-05	4.84E-05			
Y-90	1.7321E+00	1,047.61	1,047.61	0.00E+00	1.81E+03	1.81E+03			
Other Radionuclides					2.13E+03	2.13E+03			

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding	SST	SST	
BOL HM Constituents:	U	U	
BOL Enrichment %		60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Nominal		1,047.61	
Bounding		1,047.61	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1.02
Nominal	10 12		
Bounding	10 12		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: ROBERT E. GINNA  
SNF ID #: 182  
Fuel Units & Descr: 40 - 14 X 14 ROD ARRAY  
Heavy Metal Mass: BOL=15287.2kg; EOL=15126 928kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1972  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 35 years

Estimated  
Canister usage  
Bare Fuel Transfer

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	154,660 60	218,499 95	0 00E+00	1 36E-04	1 92E-04	Avg MeV	
Am-241	1 4352E-01	154,660 60	218,499 95	0 00E+00	2 22E+04	3 14E+04	0 0150	1 176E+16
Am-242m	2 8698E-04	154,660 60	218,499 95	0 00E+00	4 44E+01	6 27E+01	0 0250	2 371E+15
Am-243	6 2565E-04	154,660 60	218,499 95	0 00E+00	9 68E+01	1 37E+02	0 0375	2 261E+15
Cf-14	4 7901E-05	154,660 60	218,499 95	0 00E+00	7 41E+00	1 05E+01	0 0575	2 613E+15
Cl-36	8 0297E-07	154,660 60	218,499 95	0 00E+00	1 24E-01	1 75E-01	0 0850	1 315E+15
Cm-243	2 5081E-04	154,660 60	218,499 95	0 00E+00	3 88E+01	5 48E+01	0 1250	9 129E+14
Cm-244	4 9015E-02	154,660 60	218,499 95	0 00E+00	7 58E+03	1 07E+04	0 2250	1 128E+15
Co-60	2 5581E-03	154,660 60	218,499 95	0 00E+00	3 96E+02	5 59E+02	0 3750	4 851E+14
Cs-134	4 0536E-05	154,660 60	218,499 95	0 00E+00	6 27E+00	8 86E+00	0 5750	1 128E+16
Cs-135	1 4433E-05	154,660 60	218,499 95	0 00E+00	2 23E+00	3 15E+00	0 8500	1 561E+14
Cs-137	1 3979E+00	154,660 60	218,499 95	0 00E+00	2 16E+05	3 05E+05	1 2500	1 533E+14
Eu-154	2 0203E-02	154,660 60	218,499 95	0 00E+00	3 12E+03	4 41E+03	1 7500	4 591E+12
Eu-155	1 7684E-03	154,660 60	218,499 95	0 00E+00	2 74E+02	3 86E+02	2 2500	7 393E+08
Fe-55	4 3136E-05	154,660 60	218,499 95	0 00E+00	6 67E+00	9 43E+00	2 7500	1 515E+09
H-3	2 0769E-02	154,660 60	218,499 95	0 00E+00	3 21E+03	4 54E+03	3 5000	1 560E+08
I-129	9 8288E-07	154,660 60	218,499 95	0 00E+00	1 52E-01	2 15E-01	5 0000	6 669E+07
Kr-85	2 8214E-02	154,660 60	218,499 95	0 00E+00	4 36E+03	6 16E+03	7 0000	7 686E+06
Np-237	1 1218E-05	154,660 60	218,499 95	0 00E+00	1 73E+00	2 45E+00	11 0000	8 828E+05
Pa-231	1 3036E-09	154,660 60	218,499 95	0 00E+00	2 02E-04	2 85E-04		
Pb-210	8 5078E-11	154,660 60	218,499 95	0 00E+00	1 32E-05	1 86E-05		
Pm-147	3 6531E-04	154,660 60	218,499 95	0 00E+00	5 65E+01	7 98E+01		
Pu-238	7 4564E-02	154,660 60	218,499 95	0 00E+00	1 15E+04	1 63E+04		
Pu-239	1 1623E-02	154,660 60	218,499 95	0 00E+00	1 80E+03	2 54E+03		
Pu-240	1 5132E-02	154,660 60	218,499 95	0 00E+00	2 34E+03	3 31E+03		
Pu-241	9 0036E-01	154,660 60	218,499 95	0 00E+00	1 39E+05	1 97E+05		
Pu-242	6 4260E-05	154,660 60	218,499 95	0 00E+00	9 94E+00	1 40E+01		
Ra-226	2 2804E-10	154,660 60	218,499 95	0 00E+00	3 53E-05	4 98E-05		
Ra-228	5 2713E-12	154,660 60	218,499 95	0 00E+00	8 15E-07	1 15E-06		
Ru-106	6 1160E-10	154,660 60	218,499 95	0 00E+00	9 46E-05	1 34E-04		
Sa-79	1 2377E-05	154,660 60	218,499 95	0 00E+00	1 91E+00	2 70E+00		
Sn-126	2 5210E-05	154,660 60	218,499 95	0 00E+00	3 90E+00	5 51E+00		
Sr-90	9 1667E-01	154,660 60	218,499 95	0 00E+00	1 42E+05	2 00E+05		
Tc-99	3 9357E-04	154,660 60	218,499 95	0 00E+00	6 09E+01	8 60E+01		
Th-229	1 2057E-10	154,660 60	218,499 95	0 00E+00	1 86E-05	2 63E-05		
Th-230	2 1043E-08	154,660 60	218,499 95	0 00E+00	3 25E-03	4 60E-03		
Th-232	5 2972E-12	154,660 60	218,499 95	0 00E+00	8 19E-07	1 16E-06		
Ti-208	1 7474E-07	154,660 60	218,499 95	0 00E+00	2 70E-02	3 82E-02		
U-232	4 7368E-07	154,660 60	218,499 95	0 00E+00	7 33E-02	1 03E-01		
U-233	2 5097E-08	154,660 60	218,499 95	0 00E+00	3 88E-03	5 48E-03	Thermal Power	
U-234	5 0000E-05	154,660 60	218,499 95	0 00E+00	7 73E+00	1 09E+01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-1 4489E-06	154,660 60	0 00	1 15E+00	9 26E-01	1 15E+00	3 56E+03	5 03E+03
U-236	7 5824E-06	154,660 60	218,499 95	0 00E+00	1 17E+00	1 66E+00	Total	Total
U-238	-2 6129E-07	154,660 60	0 00	4 96E+00	4 92E+00	4 96E+00		
Y-90	9 1699E-01	154,660 60	218,499 95	0 00E+00	1 42E+05	2 00E+05		
Other Radionuclides					2 08E+05	2 93E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	3 480035585	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
	154 660 60 218 499 95	152,411 09 304 822 18	
			Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup taken directly from SFD (converted to MWd).

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0 29 0 41	0 99 1 40	
			1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name ROVER (UBM)  
SNF ID # 840  
Fuel Units & Descr 65 - PARTICULATE  
Heavy Metal Mass BOL=119 775kg, EOL=119 775kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 2050  
Estimates as of: 2010  
Template (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 62.5  
Template BOL Heavy Metal Mass (MT): 0 00186865  
Template Decay Time: 5 years

Estimated  
Canister usage  
18"x15"  
5 91

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	8 7456E-07	2,276 58	4,553 16	0 00E+00	1.99E-03	3 98E-03	Avg MeV	
Am-241	4 2816E+00	2,276 58	4,553 16	0 00E+00	9 75E+03	1 95E+04	0 0150	2 664E+16
Am-242m	1 9312E-02	2,276 58	4,553 16	0 00E+00	4 40E+01	8 79E+01	0 0250	5.207E+15
Am-243	1 6368E-02	2,276 58	4,553 16	0 00E+00	3 73E+01	7 45E+01	0 0375	4 516E+15
C-14	1.2134E-01	2,276 58	4,553 16	0 00E+00	2.76E+02	5 52E+02	0 0575	4 402E+15
Cl-36	2.2860E-03	2,276 58	4,553 16	0 00E+00	5.20E+00	1 04E+01	0 0850	2 396E+15
Cm-243	1.7968E-03	2,276 58	4,553 16	0 00E+00	4 09E+00	8 18E+00	0 1250	2 560E+15
Cm-244	5.3120E-01	2,276 58	4,553 16	0 00E+00	1.21E+03	2 42E+03	0.2250	1 612E+15
Co-60	1 4534E+03	2,276 58	4,553 16	0 00E+00	3 31E+06	6 62E+06	0.3750	7 648E+14
Cs-134	8.1336E+00	2,276 58	4,553 16	0 00E+00	1 85E+04	3 70E+04	0.5750	9 568E+15
Cs-135	4.3976E-04	2,276 58	4,553 16	0.00E+00	1 00E+00	2 00E+00	0.8500	2 576E+15
Cs-137	4.2070E+01	2,276.58	4,553 16	0 00E+00	9 58E+04	1 92E+05	1.2500	4 911E+17
Eu-154	1 4005E+01	2,276.58	4,553 16	0 00E+00	3 19E+04	6 38E+04	1 7500	4 442E+13
Eu-155	4 5553E+00	2,276.58	4,553 16	0 00E+00	1 04E+04	2 07E+04	2.2500	2 094E+13
Fe-55	8 7194E+02	2,276 58	4,553 16	0 00E+00	1 99E+06	3 97E+06	2 7500	1 745E+11
H-3	1.3083E+00	2,276 58	4,553 16	0 00E+00	2 98E+03	5 96E+03	3.5000	1 744E+10
I-129	1 0618E-05	2,276 58	4,553 16	0 00E+00	2 42E-02	4 83E-02	5 0000	1.544E+07
Kr-85	4 1611E+00	2,276 58	4,553 16	0 00E+00	9 47E+03	1.89E+04	7.0000	1 776E+06
Np-237	1 5617E-04	2,276 58	4,553 16	0 00E+00	3 56E-01	7 11E-01	11 0000	2.038E+05
Pa-231	2 8576E-06	2,276 58	4,553 16	0 00E+00	6.51E-03	1.30E-02		
Pb-210	3 1687E-10	2,276 58	4,553 16	0 00E+00	7.21E-07	1 44E-06		
Pm-147	4 6559E+01	2,276 58	4,553 16	0 00E+00	1 06E+05	2 12E+05		
Pu-238	3 7728E+00	2,276 58	4,553 16	0 00E+00	8 59E+03	1 72E+04		
Pu-239	4 1680E-01	2,276 58	4,553 16	0 00E+00	9 49E+02	1 90E+03		
Pu-240	2 9264E-01	2,276 58	4,553 16	0 00E+00	6 66E+02	1.33E+03		
Pu-241	2 0640E+02	2,276 58	4,553 16	0 00E+00	4 70E+05	9 40E+05		
Pu-242	2 4560E-03	2,276 58	4,553 16	0 00E+00	5.59E+00	1 12E+01		
Ra-226	3 0225E-09	2,276 58	4,553 16	0 00E+00	6 88E-06	1 38E-05		
Ra-228	4 4512E-07	2,276.58	4,553 16	0 00E+00	1 01E-03	2 03E-03		
Ru-106	3.6772E+00	2,276.58	4,553 16	0 00E+00	8 37E+03	1 67E+04		
Se-79	1 9188E-04	2,276.58	4,553 16	0 00E+00	4 37E-01	8 74E-01		
Sn-126	1 6673E-04	2,276.58	4,553 16	0 00E+00	3 80E-01	7.59E-01		
Sr-90	4 0404E+01	2,276 58	4,553 16	0 00E+00	9.20E+04	1 84E+05		
Tc-99	6 7678E-03	2,276 58	4,553 16	0.00E+00	1 54E+01	3 08E+01		
Th-229	4 1968E-07	2,276.58	4,553 16	0 00E+00	9 55E-04	1.91E-03		
Th-230	1 2679E-06	2,276.58	4,553 16	0 00E+00	2 89E-03	5 77E-03		
Th-232	6 0208E-07	2,276 58	4,553 16	0 00E+00	1.37E-03	2 74E-03		
Ti-208	1 0992E-04	2,276 58	4,553 16	0 00E+00	2 50E-01	5 00E-01		
U-232	3 1650E-04	2,276 58	4,553 16	0 00E+00	7.21E-01	1.44E+00		
U-233	3 6144E-04	2,276 58	4,553 16	0 00E+00	8.23E-01	1 65E+00		
U-234	1.2788E-02	2,276 58	4,553 16	0 00E+00	2 91E+01	5 82E+01		
U-235	5 7486E-04	2,276 58	4,553 16	2 41E-01	1.55E+00	2 86E+00		
U-236	2.3485E-04	2,276 58	4,553 16	0 00E+00	5.35E-01	1 07E+00		
U-238	1.1581E-04	2,276 58	4,553 16	2 81E-03	2.66E-01	5 30E-01		
Y-90	4 0428E+01	2,276 58	4,553 16	0 00E+00	9.20E+04	1 84E+05		
Other Radionuclides					2 88E+05	5 75E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	GRAPHITE	(Worst Case)	This fuel didn't closely match any existing templates, therefore the worst case template was used.
Fuel Cladding	NONE	SST/Inconel	
BOL HM Constituents	U	U, Th & Pu	
BOL Enrichment %	93 02375258	0 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		2,276 58	Nominal burnup assumed to be 2% of BOL heavy metal mass.
Bounding		4,553 16	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 57		13 02
Bounding	1 14		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT LWBR BLKT I  
SNF ID #: 374  
Fuel Units & Descr: 3 - 443 ROD ARRAY  
Heavy Metal Mass: BOL=3795 7kg, EOL=3755.2kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1982  
Estimates as of: 2010  
Template: LWBR (Light Water, Zirc, 60 to 100%, Th and U)  
<sup>2</sup>Template Burnup(MWd): 10269 14  
Template BOL Heavy Metal Mass (MT): 0 45991251  
Template Decay Time: 25 years

Estimated  
Canister usage  
24"x15"  
3 00

II. Estimates		m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	8.3425E-05	50,103 24	88,060 24	0 00E+00	4 18E+00	7 35E+00	Avg. MeV		
Am-241	2.2387E-04	50,103 24	88,060 24	0 00E+00	1 12E+01	1 97E+01	0 0150	9.216E+15	
Am-242m	1 5512E-06	50,103 24	88,060 24	0 00E+00	7 77E-02	1.37E-01	0 0250	1 902E+15	
Am-243	3.1181E-07	50,103 24	88,060 24	0 00E+00	1 56E-02	2.75E-02	0 0375	1 629E+15	
C-14	9 2539E-05	50,103 24	88,060 24	0 00E+00	4 64E+00	8 15E+00	0 0575	1 776E+15	
Cl-36	1 8103E-06	50,103 24	88,060 24	0 00E+00	9 07E-02	1.59E-01	0 0850	1 127E+15	
Cm-243	3 9020E-07	50,103 24	88,060 24	0 00E+00	1 96E-02	3.44E-02	0 1250	7.219E+14	
Cm-244	2 0742E-05	50,103 24	88,060 24	0 00E+00	1 04E+00	1 83E+00	0 2250	1 006E+15	
Co-60	3.2554E-03	50,103 24	88 060 24	0 00E+00	1 63E+02	2 87E+02	0.3750	4 084E+14	
Cs-134	7.3823E-04	50,103 24	88,060 24	0 00E+00	3 70E+01	6.50E+01	0 5750	6.185E+15	
Cs-135	2 8639E-05	50,103 24	88,060 24	0 00E+00	1 43E+00	2 52E+00	0 8500	1.224E+14	
Cs-137	1 8609E+00	50,103 24	88,060 24	0 00E+00	9 32E+04	1 64E+05	1.2500	7 742E+13	
Eu-154	1 9262E-02	50,103 24	88,060 24	0 00E+00	9 65E+02	1 70E+03	1 7500	7.381E+12	
Eu-155	2 6721E-03	50,103 24	88,060 24	0 00E+00	1 34E+02	2 35E+02	2.2500	2.971E+08	
Fe-55	3.3099E-05	50,103 24	88,060 24	0 00E+00	1 66E+00	2 91E+00	2.7500	4 757E+13	
H-3	3.7296E-03	50,103 24	88,060 24	0 00E+00	1 87E+02	3.28E+02	3.5000	1 879E+05	
I-129	1.5853E-06	50,103 24	88,060 24	0 00E+00	7 94E-02	1 40E-01	5 0000	5.851E+04	
Kr-85	1 1958E-01	50,103 24	88,060 24	0 00E+00	5 99E+03	1 05E+04	7 0000	4.394E+03	
Np-237	1.2513E-07	50,103 24	88,060 24	0 00E+00	6.27E-03	1.10E-02	11 0000	3 485E+02	
Pa-231	1.2017E-04	50,103 24	88,060 24	0 00E+00	6 02E+00	1 06E+01			
Pb-210	1 1939E-08	50,103 24	88,060 24	0 00E+00	5 98E-04	1.05E-03			
Pm-147	3 6819E-03	50,103 24	88,060 24	0 00E+00	1 84E+02	3.24E+02			
Pu-238	4 5953E-04	50,103 24	88,060 24	0 00E+00	2 30E+01	4 05E+01			
Pu-239	2.7529E-05	50,103 24	88,060 24	0 00E+00	1 38E+00	2 42E+00			
Pu-240	1 6184E-05	50,103 24	88,060 24	0 00E+00	8.11E-01	1 43E+00			
Pu-241	2 3780E-03	50,103 24	88,060 24	0 00E+00	1 19E+02	2 09E+02			
Pu-242	4 0821E-08	50,103 24	88,060 24	0 00E+00	2 05E-03	3 59E-03			
Ra-226	1 4471E-08	50,103 24	88,060 24	0 00E+00	7 25E-04	1.27E-03			
Ra-228	4 5651E-06	50,103 24	88,060 24	0 00E+00	2 29E-01	4.02E-01			
Ru-106	3 8971E-08	50,103 24	88,060 24	0 00E+00	1 95E-03	3 43E-03			
Se-79	3 5417E-05	50,103 24	88,060 24	0 00E+00	1 77E+00	3.12E+00			
Sn-126	3 9848E-05	50,103 24	88,060 24	0 00E+00	2 00E+00	3 51E+00			
Sr-90	1 8940E+00	50,103 24	88,060 24	0 00E+00	9 49E+04	1 67E+05			
Tc-99	3 2534E-04	50,103 24	88,060 24	0 00E+00	1 63E+01	2 86E+01			
Th-229	4 6839E-05	50,103 24	88,060 24	0 00E+00	2 35E+00	4 12E+00			
Th-230	1 0322E-06	50,103 24	88,060 24	0 00E+00	5 17E-02	9 09E-02			
Th-232	-9 0328E-08	50,103 24	0 00	4 01E-01	3 96E-01	4 01E-01			
Ti-208	1 5386E-02	50,103 24	88,060 24	0 00E+00	7 71E+02	1.35E+03			
U-232	4 1639E-02	50,103 24	88,060 24	0 00E+00	2 09E+03	3 67E+03			
U-233	-3.3244E-03	50,103 24	0 00	1 35E+03	1 18E+03	1 35E+03			
U-234	8 1769E-04	50,103 24	88,060 24	0 00E+00	4 10E+01	7 20E+01			
U-235	5 7813E-08	50,103 24	88,060 24	2 76E-04	3 17E-03	5.37E-03			
U-236	1 3273E-07	50,103 24	88,060 24	0 00E+00	6 65E-03	1.17E-02			
U-238	-3.1121E-10	50,103 24	0 00	1 76E-04	1 61E-04	1 76E-04			
Y-90	1 8940E+00	50,103 24	88,060 24	0 00E+00	9 49E+04	1 67E+05			
Other Radionuclides					1 03E+05	1 81E+05			

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

		From SFD	Used	Basis for Parameter Differences:
Reactor Moderator		LIGHT WATER	LIGHT WATER	
Fuel Cladding		ZIRC	ZIRC	
BOL HM Constituents		Th and U	Th and U	
BOL Enrichment %		0 089989331	60 to 100	
				This Template was used for the following reasons: This fuel matches on all parameters except enrichment.

### Burnup Summary (MWd)<sup>2</sup>

		From SFD	Estimated	Basis for burnup used in estimate:
Nominal		50,103 24	39 413 10	
Bounding		88 060 24	78 826 19	
				Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup taken directly from SFD (converted to MWd).

### Checks

		Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal		0.59	0.79	
Bounding		1.04	0.90	
				1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT LWBR BLKT II  
 SNF ID #: 375  
 Fuel Units & Descr: 3 - 261 ROD ARRAY  
 Heavy Metal Mass: BOL=4373 5kg, EOL=4331 7kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1982  
 Estimates as of: 2010  
 Template: LWBR (Light Water, Zirc, 60 to 100%, Th and U)  
<sup>2</sup>Template Burnup(MWd): 10269 14  
 Template BOL Heavy Metal Mass (MT): 0 45991251  
 Template Decay Time: 25 years

Estimated  
 Canister usage  
 24"x15"  
 3 00

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	8 3425E-05	64,290 45	110,212 20	0 00E+00	5 36E+00	9 19E+00	0.0150	1 153E+16
Am-241	2 2387E-04	64,290 45	110,212 20	0 00E+00	1 44E+01	2 47E+01	0.0250	2 381E+15
Am-242m	1.5512E-06	64,290 45	110,212 20	0 00E+00	9 97E-02	1 71E-01	0.0375	2 039E+15
Am-243	3 1181E-07	64,290 45	110,212 20	0 00E+00	2 00E-02	3 44E-02	0.0575	2 223E+15
C-14	9 2539E-05	64,290 45	110,212 20	0 00E+00	5.95E+00	1 02E+01	0.0850	1 411E+15
Cl-36	1.8103E-06	64,290 45	110,212 20	0 00E+00	1 16E-01	2 00E-01	0.1250	9 035E+14
Cm-243	3 9020E-07	64,290 45	110,212 20	0 00E+00	2 51E-02	4.30E-02	0.2250	1 259E+15
Cm-244	2 0742E-05	64,290 45	110,212 20	0 00E+00	1.33E+00	2 29E+00	0.3750	5 112E+14
Co-60	3.2554E-03	64,290 45	110,212 20	0 00E+00	2 09E+02	3 59E+02	0.5750	7 741E+15
Cs-134	7 3823E-04	64,290 45	110,212 20	0 00E+00	4 75E+01	8 14E+01	0.8500	1.532E+14
Cs-135	2 8639E-05	64,290 45	110,212 20	0 00E+00	1 84E+00	3 16E+00	1.2500	9 690E+13
Cs-137	1 8609E+00	64,290 45	110,212 20	0 00E+00	1 20E+05	2 05E+05	1.7500	9.238E+12
Eu-154	1 9262E-02	64,290 45	110,212 20	0 00E+00	1 24E+03	2.12E+03	2.2500	3 718E+08
Eu-155	2 6721E-03	64,290 45	110,212 20	0 00E+00	1 72E+02	2.94E+02	2.7500	5.954E+13
Fe-55	3 3099E-05	64,290 45	110,212 20	0 00E+00	2 13E+00	3 65E+00	3.5000	2.343E+05
H-3	3 7296E-03	64,290 45	110,212 20	0 00E+00	2 40E+02	4 11E+02	5.0000	7.297E+04
I-129	1.5853E-06	64,290 45	110,212 20	0 00E+00	1.02E-01	1 75E-01	7.0000	5 482E+03
Kr-85	1.1958E-01	64,290 45	110,212 20	0 00E+00	7.69E+03	1.32E+04	11 0000	4.351E+02
Np-237	1.2513E-07	64,290 45	110,212 20	0 00E+00	8 04E-03	1 38E-02		
Pa-231	1.2017E-04	64,290 45	110,212 20	0 00E+00	7.73E+00	1 32E+01		
Pb-210	1 1939E-08	64,290 45	110,212 20	0 00E+00	7.68E-04	1.32E-03		
Pm-147	3 6819E-03	64,290 45	110,212 20	0 00E+00	2.37E+02	4 06E+02		
Pu-238	4 5953E-04	64,290 45	110,212 20	0 00E+00	2 95E+01	5 06E+01		
Pu-239	2 7529E-05	64,290 45	110,212 20	0 00E+00	1 77E+00	3 03E+00		
Pu-240	1 6184E-05	64,290 45	110,212 20	0 00E+00	1 04E+00	1.78E+00		
Pu-241	2 3780E-03	64,290 45	110,212 20	0 00E+00	1 53E+02	2 62E+02		
Pu-242	4 0821E-08	64,290 45	110,212 20	0 00E+00	2 62E-03	4.50E-03		
Ra-226	1 4471E-08	64,290 45	110,212 20	0 00E+00	9 30E-04	1.59E-03		
Ra-228	4 5651E-06	64,290 45	110,212 20	0 00E+00	2 93E-01	5 03E-01		
Ru-106	3.8971E-08	64,290 45	110,212 20	0 00E+00	2.51E-03	4.30E-03		
Se-79	3.5417E-05	64,290 45	110,212 20	0 00E+00	2.28E+00	3 90E+00		
Sn-126	3 9848E-05	64,290 45	110,212 20	0 00E+00	2.56E+00	4 39E+00		
Sr-90	1 8940E+00	64,290 45	110,212 20	0 00E+00	1.22E+05	2 09E+05		
Tc-99	3.2534E-04	64,290 45	110,212 20	0 00E+00	2.09E+01	3 59E+01		
Th-229	4 6839E-05	64,290 45	110,212 20	0 00E+00	3 01E+00	5 16E+00		
Th-230	1 0322E-06	64,290 45	110,212 20	0 00E+00	6 64E-02	1 14E-01		
Th-232	-9 0328E-08	64,290 45	0 00	4.62E-01	4 56E-01	4 62E-01		
Ti-208	1 5386E-02	64,290 45	110,212 20	0 00E+00	9 89E+02	1 70E+03		
U-232	4 1639E-02	64,290 45	110,212 20	0 00E+00	2 68E+03	4.59E+03		
U-233	-3 3244E-03	64,290 45	0 00	1.55E+03	1.34E+03	1.55E+03		
U-234	8 1769E-04	64,290 45	110,212 20	0 00E+00	5 26E+01	9.01E+01		
U-235	5 7813E-08	64,290 45	110,212 20	3 18E-04	4 03E-03	6 69E-03		
U-236	1.3273E-07	64,290 45	110,212 20	0 00E+00	8.53E-03	1 46E-02		
U-238	-3 1121E-10	64,290 45	0 00	2 03E-04	1.83E-04	2 03E-04		
Y-90	1.8940E+00	64,290 45	110,212 20	0 00E+00	1.22E+05	2 09E+05		
Other Radionuclides					1.32E+05	2 27E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences <sup>1</sup>
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	ZIRC	ZIRC	This fuel matches on all parameters except enrichment.
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	0.071220718	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate.
Nominal	64,290 45	40 678 11	Nominal burnup taken directly from SFD (converted to MWd)
Bounding	110,212.20	81,356.22	Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.66	0.63	0.99
Bounding	1.13	0.74	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT LWBR BLKT III  
SNF ID #: 376  
Fuel Units & Descr: 6 - 445 ROD ARRAY  
Heavy Metal Mass: BOL=8776.5kg, EOL=8700 87kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date,  
Estimates as of,

1982  
2010

Template: LWBR (Light Water, Zirc, 60 to 100%, Th and U)

<sup>2</sup>Template Burnup(MWd),

10269 14

Template BOL Heavy Metal Mass (MT),

0 45991251

Template Decay Time:

25 years

Estimated  
Canister usage:  
24"x15"  
6 00

## II. Estimates

	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 3425E-05	129,014 55	221,167 80	0 00E+00	1 08E+01	1 85E+01	Avg MeV	
Am-241	2 2387E-04	129,014 55	221,167 80	0 00E+00	2 89E+01	4 95E+01	0 0150	2 314E+16
Am-242m	1 5512E-06	129,014 55	221,167 80	0 00E+00	2 00E-01	3 43E-01	0 0250	4 778E+15
Am-243	3 1181E-07	129,014 55	221,167 80	0 00E+00	4 02E-02	6 90E-02	0 0375	4 091E+15
C-14	9 2539E-05	129,014 55	221,167 80	0 00E+00	1 19E+01	2 05E+01	0 0575	4 462E+15
Ci-36	1 8103E-06	129,014 55	221,167 80	0 00E+00	2 34E-01	4 00E-01	0 0850	2 831E+15
Cm-243	3 9020E-07	129,014 55	221,167 80	0 00E+00	5 03E-02	8 63E-02	0 1250	1 813E+15
Cm-244	2 0742E-05	129,014 55	221,167 80	0 00E+00	2 68E+00	4 59E+00	0 2250	2 527E+15
Co-60	3 2554E-03	129,014 55	221,167 80	0 00E+00	4 20E+02	7 20E+02	0 3750	1 026E+15
Cs-134	7 3823E-04	129,014 55	221,167 80	0 00E+00	9 52E+01	1 63E+02	0 5750	1 553E+16
Cs-135	2 8639E-05	129,014 55	221,167 80	0 00E+00	3 69E+00	6 33E+00	0 8500	3 074E+14
Cs-137	1 8609E+00	129,014 55	221,167 80	0 00E+00	2 40E+05	4 12E+05	1 2500	1 944E+14
Eu-154	1 9626E-02	129,014 55	221,167 80	0 00E+00	2 49E+03	4 26E+03	1 7500	1 854E+13
Eu-155	2 6721E-03	129,014 55	221,167 80	0 00E+00	3 45E+02	5 91E+02	2 2500	7 462E+08
Fe-55	3 3099E-05	129,014 55	221,167 80	0 00E+00	4 27E+00	7 32E+00	2 7500	1 195E+14
H-3	3 7296E-03	129,014 55	221,167 80	0 00E+00	4 81E+02	8 25E+02	3 5000	4 701E+05
I-129	1 5853E-06	129,014 55	221,167 80	0 00E+00	2 05E-01	3 51E-01	5 0000	1 464E+05
Kr-85	1 1958E-01	129,014 55	221,167 80	0 00E+00	1 54E+04	2 64E+04	7 0000	1 100E+04
Np-237	1 2513E-07	129,014 55	221,167 80	0 00E+00	1 61E-02	2 77E-02	11 0000	8 732E+02
Pa-231	1 2017E-04	129,014 55	221,167 80	0 00E+00	1 55E+01	2 66E+01		
Pb-210	1 1939E-08	129,014 55	221,167 80	0 00E+00	1 54E-03	2 64E-03		
Pm-147	3 6819E-03	129,014 55	221,167 80	0 00E+00	4 75E+02	8 14E+02		
Pu-238	4 5953E-04	129,014 55	221,167 80	0 00E+00	5 93E+01	1 02E+02		
Pu-239	2 7529E-05	129,014 55	221,167 80	0 00E+00	3 55E+00	6 09E+00		
Pu-240	1 6184E-05	129,014 55	221,167 80	0 00E+00	2 09E+00	3 58E+00		
Pu-241	2 3780E-03	129,014 55	221,167 80	0 00E+00	3 07E+02	5 26E+02		
Pu-242	4 0821E-08	129,014 55	221,167 80	0 00E+00	5 27E-03	9 03E-03		
Ra-226	1 4471E-08	129,014 55	221,167 80	0 00E+00	1 87E-03	3 20E-03		
Ra-228	4 5651E-06	129,014 55	221,167 80	0 00E+00	5 89E-01	1 01E+00		
Ru-106	3 8971E-08	129,014 55	221,167 80	0 00E+00	5 03E-03	8 62E-03		
Se-79	3 5417E-05	129,014 55	221,167 80	0 00E+00	4 57E+00	7 83E+00		
Sn-126	3 9848E-05	129,014 55	221,167 80	0 00E+00	5 14E+00	8 81E+00		
Sr-90	1 8940E+00	129,014 55	221,167 80	0 00E+00	2 44E+05	4 19E+05		
Tc-99	3 2534E-04	129,014 55	221,167 80	0 00E+00	4 20E+01	7 20E+01		
Th-229	4 6839E-05	129,014 55	221,167 80	0 00E+00	6 04E+00	1 04E+01		
Th-230	1 0322E-06	129,014 55	221,167 80	0 00E+00	1 33E-01	2 28E-01		
Th-232	-9 0328E-08	129,014 55	0 00	9 27E-01	9 15E-01	9 27E-01		
Ti-208	1 5386E-02	129,014 55	221,167 80	0 00E+00	1 99E+03	3 40E+03		
U-232	4 1639E-02	129,014 55	221,167 80	0 00E+00	5 37E+03	9 21E+03		
U-233	-3 3244E-03	129,014 55	0 00	3 12E+03	2 69E+03	3 12E+03		
U-234	8 1769E-04	129,014 55	221,167 80	0 00E+00	1 05E+02	1 81E+02		
U-235	5 7813E-08	129,014 55	221,167 80	6 38E-04	8 10E-03	1 34E-02		
U-236	1 3273E-07	129,014 55	221,167 80	0 00E+00	1 71E-02	2 94E-02		
U-238	-3 1121E-10	129,014 55	0 00	4 08E-04	3 68E-04	4 08E-04		
Y-90	1 8940E+00	129,014 55	221,167 80	0 00E+00	2 44E+05	4 19E+05		
Other Radionuclides					2 66E+05	4 56E+05		

Thermal Power  
Nominal Heat Output (Watts)  
Bounding Heat Output (Watts)  
4.25E+03  
7.25E+03  
Total  
Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	ZIRC	ZIRC	This fuel matches on all parameters except enrichment.
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	0 072866152	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	129,014 55	73,600.31	Nominal burnup taken directly from SFD (converted to MWd).
Bounding	221,167 80	147,200 62	Bounding burnup taken directly from SFD (converted to MWd).

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 66	0 57	0 99
Bounding	1 13	0 67	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SHIPPINGPORT LWBR REFLCT IV  
SNF ID # 371  
Fuel Units & Descr. 9 - 261 ROD ARRAY  
Heavy Metal Mass BOL=11491 kg, EOL=11491 5kg  
ROD Storage Site INEEL

Fuel decay start date.

1982

Estimates as of

2010

Template

LWBR (Light Water, Zirc, 60 to 100%, Th and U)

Template Burnup(MWd)

10269 14

Template BOL Heavy Metal Mass (MT)

0.45991251

Template Decay Time

25 years

Estimated

Canister usage

24"x15"

9.00

## II. Estimates

Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources
							Photon Energy Group      Total Photons/sec (bounding)
Ac-227	8.3425E-05	25,281.52	51,712.20	0.00E+00	2.11E+00	4.31E+00	Avg MeV      5.422E+15
Am-241	2.2387E-04	25,281.52	51,712.20	0.00E+00	5.66E+00	1.16E+01	0.0150      1.117E+15
Am-242m	1.5512E-06	25,281.52	51,712.20	0.00E+00	3.92E-02	8.02E-02	0.0250      9.567E+14
Am-243	3.1181E-07	25,281.52	51,712.20	0.00E+00	7.88E-03	1.61E-02	0.0375      1.043E+15
C-14	9.2539E-05	25,281.52	51,712.20	0.00E+00	2.34E+00	4.79E+00	0.0575      6.620E+14
Cl-36	1.8103E-06	25,281.52	51,712.20	0.00E+00	4.58E-02	9.36E-02	0.0850      4.240E+14
Cm-243	3.9020E-07	25,281.52	51,712.20	0.00E+00	9.86E-03	2.02E-02	0.1250      5.910E+14
Cm-244	2.0742E-05	25,281.52	51,712.20	0.00E+00	5.24E-01	1.07E+00	0.2250      2.399E+14
Co-60	3.2554E-03	25,281.52	51,712.20	0.00E+00	8.23E+01	1.68E+02	0.3750      3.632E+15
Cs-134	7.3823E-04	25,281.52	51,712.20	0.00E+00	1.87E+01	3.82E+01	0.5750      7.187E+13
Cs-135	2.8639E-05	25,281.52	51,712.20	0.00E+00	7.24E-01	1.48E+00	0.8500      1.2500
Cs-137	1.8609E+00	25,281.52	51,712.20	0.00E+00	4.70E+04	9.62E+04	1.2500      4.334E+12
Eu-154	1.9262E-02	25,281.52	51,712.20	0.00E+00	4.87E+02	9.96E+02	1.7500      2.2500
Eu-155	2.6721E-03	25,281.52	51,712.20	0.00E+00	6.76E+01	1.38E+02	2.2500      2.794E+13
Fe-55	3.3099E-05	25,281.52	51,712.20	0.00E+00	8.37E-01	1.71E+00	2.7500      3.5000
H-3	3.7296E-03	25,281.52	51,712.20	0.00E+00	9.43E+01	1.93E+02	3.5000      5.0000
I-129	1.5853E-06	25,281.52	51,712.20	0.00E+00	4.01E-02	8.20E-02	5.0000      7.0000
Kr-85	1.1958E-01	25,281.52	51,712.20	0.00E+00	3.02E+03	6.18E+03	7.0000      11.0000
Np-237	1.2513E-07	25,281.52	51,712.20	0.00E+00	3.16E-03	6.47E-03	
Pa-231	1.2017E-04	25,281.52	51,712.20	0.00E+00	3.04E+00	6.21E+00	
Pb-210	1.1939E-08	25,281.52	51,712.20	0.00E+00	3.02E-04	6.17E-04	
Pm-147	3.6819E-03	25,281.52	51,712.20	0.00E+00	9.31E+01	1.90E+02	
Pu-238	4.5953E-04	25,281.52	51,712.20	0.00E+00	1.16E+01	2.38E+01	
Pu-239	2.7529E-05	25,281.52	51,712.20	0.00E+00	6.96E-01	1.42E+00	
Pu-240	1.6184E-05	25,281.52	51,712.20	0.00E+00	4.09E-01	8.37E-01	
Pu-241	2.3780E-03	25,281.52	51,712.20	0.00E+00	6.01E+01	1.23E+02	
Pu-242	4.0821E-08	25,281.52	51,712.20	0.00E+00	1.03E-03	2.11E-03	
Ra-226	1.4471E-08	25,281.52	51,712.20	0.00E+00	3.66E-04	7.48E-04	
Ra-228	4.5651E-06	25,281.52	51,712.20	0.00E+00	1.15E-01	2.36E-01	
Ru-106	3.8971E-08	25,281.52	51,712.20	0.00E+00	9.85E-04	2.02E-03	
Se-79	3.5417E-05	25,281.52	51,712.20	0.00E+00	8.95E-01	1.83E+00	
Sn-126	3.9848E-05	25,281.52	51,712.20	0.00E+00	1.01E+00	2.06E+00	
Sr-90	1.8940E+00	25,281.52	51,712.20	0.00E+00	4.79E+04	9.79E+04	
Tc-99	3.2534E-04	25,281.52	51,712.20	0.00E+00	8.23E+00	1.68E+01	
Th-229	4.6839E-05	25,281.52	51,712.20	0.00E+00	1.18E+00	2.42E+00	
Th-230	1.0322E-06	25,281.52	51,712.20	0.00E+00	2.61E-02	5.34E-02	
Th-232	-9.0328E-08	25,281.52	0.00	1.21E+00	1.21E+00	1.21E+00	
Ti-208	1.5386E-02	25,281.52	51,712.20	0.00E+00	3.89E+02	7.96E+02	
U-232	4.1639E-02	25,281.52	51,712.20	0.00E+00	1.05E+03	2.15E+03	
U-233	-3.3244E-03	25,281.52	0.00	4.08E+03	4.08E+03	4.08E+03	
U-234	8.1769E-04	25,281.52	51,712.20	0.00E+00	2.07E+01	4.23E+01	
U-235	5.7813E-08	25,281.52	51,712.20	8.35E-04	2.30E-03	3.82E-03	
U-236	1.3273E-07	25,281.52	51,712.20	0.00E+00	3.36E-03	6.86E-03	
U-238	-3.1121E-10	25,281.52	0.00	5.34E-04	5.26E-04	5.34E-04	
Y-90	1.8940E+00	25,281.52	51,712.20	0.00E+00	4.79E+04	9.79E+04	
Other Radionuclides					5.21E+04	1.07E+05	

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences*
Reactor Moderator	From SFD	Used	
Fuel Cladding	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	ZIRC	ZIRC	
BOL Enrichment %	Th and U	Th and U	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	25,281.52	97.22	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup taken directly from SFD (converted to MWd)
Bounding	51,712.20	194.44	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.10	0.00	1.00
Bounding	0.20	0.00	

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT LWBR REFLCT V  
SNF ID #: 372  
Fuel Units & Descr: 6 - 166 ROD ARRAY  
Heavy Metal Mass BOL=5850kg, EOL=5844 7kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1982  
Estimates as of: 2010  
Template: LWBR (Light Water, Zirc, 60 to 100%, Th and U)  
<sup>2</sup>Template Burnup(MWd): 10269 14  
Template BOL Heavy Metal Mass (MT): 0 45991251  
Template Decay Time: 25 years

Estimated  
Canister usage:  
24"x15"  
6 00

## II. Estimates

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.3425E-05	12,870 00	26,325 00	0 00E+00	1 07E+00	2 20E+00	Avg MeV	
Am-241	2.2387E-04	12,870 00	26,325 00	0 00E+00	2 88E+00	5 89E+00	0 0150	2 760E+15
Am-242m	1 5512E-06	12,870 00	26,325 00	0 00E+00	2 00E-02	4 08E-02	0 0250	5 687E+14
Am-243	3 1181E-07	12,870 00	26,325 00	0 00E+00	4 01E-03	8 21E-03	0 0375	4 870E+14
C-14	9.2539E-05	12,870 00	26,325 00	0 00E+00	1.19E+00	2 44E+00	0 0575	5.311E+14
Cl-36	1 8103E-06	12,870 00	26,325 00	0 00E+00	2 33E-02	4 77E-02	0 0850	3 370E+14
Cm-243	3.9020E-07	12,870 00	26,325 00	0 00E+00	5 02E-03	1 03E-02	0 1250	2 158E+14
Cm-244	2 0742E-05	12,870 00	26,325 00	0 00E+00	2 67E-01	5 46E-01	0.2250	3 008E+14
Co-60	3.2554E-03	12,870 00	26,325 00	0 00E+00	4.19E+01	8 57E+01	0 3750	1.221E+14
Cs-134	7 3823E-04	12,870 00	26,325 00	0 00E+00	9.50E+00	1 94E+01	0 5750	1.849E+15
Cs-135	2 8639E-05	12,870 00	26,325 00	0 00E+00	3 69E-01	7 54E-01	0 8500	3 659E+13
Cs-137	1 8609E+00	12,870 00	26,325 00	0 00E+00	2.39E+04	4 90E+04	1 2500	2.314E+13
Eu-154	1 9262E-02	12,870 00	26,325 00	0 00E+00	2 48E+02	5 07E+02	1 7500	2.207E+12
Eu-155	2 6721E-03	12,870 00	26,325 00	0 00E+00	3 44E+01	7.03E+01	2.2500	8.885E+07
Fe-55	3 3099E-05	12,870 00	26,325 00	0 00E+00	4.26E-01	8 71E-01	2 7500	1 422E+13
H-3	3 7296E-03	12,870 00	26,325 00	0 00E+00	4 80E+01	9 82E+01	3 5000	6 708E+04
I-129	1 5853E-06	12,870 00	26,325 00	0 00E+00	2.04E-02	4 17E-02	5 0000	2.075E+04
Kr-85	1 1958E-01	12,870 00	26,325 00	0 00E+00	1 54E+03	3.15E+03	7 0000	1.526E+03
Np-237	1 2513E-07	12,870 00	26,325 00	0 00E+00	1 61E-03	3.29E-03	11 0000	1 176E+02
Pa-231	1 2017E-04	12,870 00	26,325 00	0 00E+00	1 55E+00	3.16E+00		
Pb-210	1 1939E-08	12,870 00	26,325 00	0 00E+00	1 54E-04	3.14E-04		
Pm-147	3 6819E-03	12,870 00	26,325 00	0 00E+00	4 74E+01	9 69E+01		
Pu-238	4 5953E-04	12,870 00	26,325 00	0 00E+00	5 91E+00	1.21E+01		
Pu-239	2.7529E-05	12,870 00	26,325 00	0 00E+00	3 54E-01	7.25E-01		
Pu-240	1 6184E-05	12,870 00	26,325 00	0 00E+00	2 08E-01	4.26E-01		
Pu-241	2.3780E-03	12,870 00	26,325 00	0 00E+00	3 06E+01	6 26E+01		
Pu-242	4 0821E-08	12,870 00	26,325 00	0 00E+00	5 25E-04	1 07E-03		
Ra-226	1 4471E-08	12,870 00	26,325 00	0 00E+00	1 86E-04	3 81E-04		
Ra-228	4 5651E-06	12,870 00	26,325 00	0 00E+00	5 88E-02	1 20E-01		
Ru-106	3.8971E-08	12,870 00	26,325 00	0 00E+00	5 02E-04	1 03E-03		
Se-79	3 5417E-05	12,870 00	26,325 00	0 00E+00	4 56E-01	9 32E-01		
Sn-126	3 9848E-05	12,870 00	26,325 00	0 00E+00	5 13E-01	1 05E+00		
Sr-90	1 8940E+00	12,870 00	26,325 00	0 00E+00	2 44E+04	4 99E+04		
Tc-99	3.2534E-04	12,870 00	26,325 00	0 00E+00	4 19E+00	8 56E+00		
Th-229	4 6839E-05	12,870 00	26,325 00	0 00E+00	6 03E-01	1.23E+00		
Th-230	1 0322E-06	12,870 00	26,325 00	0 00E+00	1.33E-02	2 72E-02		
Th-232	-9 0328E-08	12,870 00	0 00	6 18E-01	6.17E-01	6 18E-01		
Th-208	1 5386E-02	12,870 00	26,325 00	0 00E+00	1 98E+02	4.05E+02		
U-232	4.1639E-02	12,870 00	26,325 00	0 00E+00	5 36E+02	1.10E+03		
U-233	-3 3244E-03	12,870 00	0 00	2 08E+03	2 03E+03	2 08E+03	Thermal Power	
U-234	8 1769E-04	12,870 00	26,325 00	0 00E+00	1 05E+01	2.15E+01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	5 7813E-08	12,870 00	26,325 00	4 25E-04	1 17E-03	1.95E-03	4 76E+02	9 12E+02
U-236	1.3273E-07	12,870 00	26,325 00	0 00E+00	1.71E-03	3.49E-03	Total	Total
U-238	-3 1121E-10	12,870 00	0 00	2 72E-04	2 68E-04	2.72E-04		
Y-90	1 8940E+00	12,870 00	26,325 00	0 00E+00	2 44E+04	4 99E+04		
Other Radionuclides					2 65E+04	5 42E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ZIRC	ZIRC
BOL HM Constituents	Th and U	Th and U
BOL Enrichment %		60 to 100

### Basis for Parameter Differences:

This Template was used for the following reasons:  
This fuel matches on all parameters except enrichment (unknown)

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal:	12,870 00	5,157.57
Bounding	26 325 00	10,315 14

### Basis for burnup used in estimate:

Nominal burnup taken directly from SFD (converted to MWd).  
Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 10	0 40
Bounding	0.20	0.39

Estimated EOL HM/Given EOL HM

1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SHIPPINGPORT LWBR SCRAP  
SNF ID # 377  
Fuel Units & Descr: 7 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL=3127kg EOL=3116 kg  
ROD Storage Site: INEEL

Fuel decay start date: 1982  
Estimates as of: 2010  
Template: LWBR (Light Water, Zirc, 60 to 100%, Th and U)  
Template Burnup(MWd): 10269 14  
Template BOL Heavy Metal Mass (MT): 0 45991251  
Template Decay Time: 25 years

Estimated  
Canister usage:  
HIC  
7 00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 3425E-05	10,315 62	166,981.81	0 00E+00	8 61E-01	1.39E+01	Avg MeV	
Am-241	2.2387E-04	10,315 62	166,981.81	0 00E+00	2 31E+00	3 74E+01	0 0150	1 747E+16
Am-242m	1.5512E-06	10,315 62	166,981.81	0 00E+00	1 60E-02	2 59E-01	0 0250	3 607E+15
Am-243	3 1181E-07	10,315 62	166,981.81	0 00E+00	3 22E-03	5 21E-02	0 0375	3 089E+15
C-14	9.2539E-05	10,315 62	166,981.81	0 00E+00	9 55E-01	1.55E+01	0 0575	3.368E+15
Cl-36	1.8103E-06	10,315 62	166,981.81	0 00E+00	1 87E-02	3 02E-01	0 0850	2 137E+15
Cm-243	3 9020E-07	10,315 62	166,981.81	0 00E+00	4 03E-03	6 52E-02	0 1250	1.369E+15
Cm-244	2 0742E-05	10,315 62	166,981.81	0 00E+00	2 14E-01	3 46E+00	0.2250	1.908E+15
Co-60	3 2554E-03	10,315 62	166,981.81	0 00E+00	3 36E+01	5 44E+02	0 3750	7 744E+14
Cs-134	7.3823E-04	10,315 62	166,981.81	0 00E+00	7 62E+00	1.23E+02	0.5750	1.173E+16
Cs-135	2 8639E-05	10,315 62	166,981.81	0 00E+00	2.95E-01	4 78E+00	0.8500	2.321E+14
Cs-137	1 8609E+00	10,315 62	166,981.81	0 00E+00	1 92E+04	3 11E+05	1.2500	1.468E+14
Eu-154	1 9262E-02	10,315 62	166,981.81	0 00E+00	1 99E+02	3 22E+03	1 7500	1 400E+13
Eu-155	2 6721E-03	10,315 62	166,981.81	0 00E+00	2.76E+01	4 46E+02	2.2500	5 634E+08
Fe-55	3 3099E-05	10,315 62	166,981.81	0 00E+00	3 41E-01	5 53E+00	2 7500	9 021E+13
H-3	3 7296E-03	10,315 62	166,981.81	0 00E+00	3.85E+01	6.23E+02	3 5000	3 469E+05
I-129	1.5853E-06	10,315 62	166,981.81	0 00E+00	1 64E-02	2.65E-01	5 0000	1.081E+05
Kr-85	1.1958E-01	10,315 62	166,981.81	0 00E+00	1.23E+03	2 00E+04	7 0000	8 149E+03
Np-237	1.2513E-07	10,315 62	166,981.81	0 00E+00	1 29E-03	2.09E-02	11 0000	6 493E+02
Pa-231	1.2017E-04	10,315 62	166,981.81	0 00E+00	1.24E+00	2 01E+01		
Pb-210	1 1939E-08	10,315 62	166,981.81	0 00E+00	1 23E-04	1.99E-03		
Pm-147	3 6819E-03	10,315 62	166,981.81	0 00E+00	3 80E+01	6.15E+02		
Pu-238	4 5953E-04	10,315 62	166,981.81	0 00E+00	4 74E+00	7.67E+01		
Pu-239	2 7529E-05	10,315 62	166,981.81	0.00E+00	2 84E-01	4 60E+00		
Pu-240	1 6184E-05	10,315 62	166,981.81	0.00E+00	1 67E-01	2 70E+00		
Pu-241	2 3780E-03	10,315 62	166,981.81	0 00E+00	2 45E+01	3 97E+02		
Pu-242	4 0821E-08	10,315 62	166,981.81	0 00E+00	4.21E-04	6 82E-03		
Ra-226	1 4471E-08	10,315 62	166,981.81	0 00E+00	1 49E-04	2 42E-03		
Ra-228	4 5651E-06	10,315 62	166,981.81	0 00E+00	4.71E-02	7 62E-01		
Ru-106	3.8971E-08	10,315 62	166,981.81	0 00E+00	4.02E-04	6 51E-03		
Se-79	3.5417E-05	10,315 62	166,981.81	0 00E+00	3.65E-01	5 91E+00		
Sn-126	3.9848E-05	10,315 62	166,981.81	0 00E+00	4 11E-01	6 65E+00		
Sr-90	1 8940E+00	10,315 62	166,981.81	0 00E+00	1.95E+04	3 16E+05		
Tc-99	3.2534E-04	10,315 62	166,981.81	0 00E+00	3.36E+00	5 43E+01		
Th-229	4 6839E-05	10,315 62	166,981.81	0 00E+00	4 83E-01	7.82E+00		
Th-230	1 0322E-06	10,315 62	166,981.81	0 00E+00	1 06E-02	1.72E-01		
Th-232	-9 0328E-08	10,315 62	0 00	3 30E-01	3 29E-01	3.30E-01		
Ti-208	1 5386E-02	10,315 62	166,981.81	0.00E+00	1.59E+02	2.57E+03		
U-232	4 1639E-02	10,315 62	166,981.81	0 00E+00	4.30E+02	6.95E+03	Thermal Power	
U-233	-3.3244E-03	10,315 62	0 00	1 11E+03	1 08E+03	1.11E+03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	8 1769E-04	10,315 62	166,981.81	0 00E+00	8 44E+00	1.37E+02	3 65E+02	5.44E+03
U-235	5 7813E-08	10,315 62	166,981.81	2.27E-04	8 24E-04	9 88E-03	Total	Total
U-236	1.3273E-07	10,315 62	166,981.81	0 00E+00	1.37E-03	2.22E-02		
U-238	-3 1121E-10	10,315 62	0.00	1 45E-04	1 42E-04	1 45E-04		
Y-90	1.8940E+00	10,315 62	166,981.81	0 00E+00	1 95E+04	3 16E+05		
Other Radionuclides					2.12E+04	3 44E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	60 to 100	60 to 100	This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		10,315 62	
Bounding	166 981.81	20 631.25	
			Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup taken directly from SFD (converted to MWd)

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 15		
Bounding	2.39	0 12	
			1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT LWBR SCRAP (LINER 15718)  
 SNF ID #: 379  
 Fuel Units & Descr: 1 - CANISTER OF SCRAP  
 Heavy Metal Mass: BOL=244.6kg, EOL=242.9kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1982  
 Estimates as of 2010  
 Template: LWBR (Light Water, Zirc, 60 to 100%, Th and U)  
<sup>2</sup>Template Burnup(MWd), 10269.14  
 Template BOL Heavy Metal Mass (MT): 0.45991251  
 Template Decay Time: 25 years

Estimated  
 Canister usage  
 HIC  
 1.00

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.3425E-05	1,654.38	13,061.64	0.00E+00	1.38E-01	1.09E+00	Avg MeV	
Am-241	2.2387E-04	1,654.38	13,061.64	0.00E+00	3.70E-01	2.92E+00	0.0150	1.367E+15
Am-242m	1.5512E-06	1,654.38	13,061.64	0.00E+00	2.57E-03	2.03E-02	0.0250	2.821E+14
Am-243	3.1181E-07	1,654.38	13,061.64	0.00E+00	5.16E-04	4.07E-03	0.0375	2.416E+14
C-14	9.2539E-05	1,654.38	13,061.64	0.00E+00	1.53E-01	1.21E+00	0.0575	2.635E+14
Cl-36	1.8103E-06	1,654.38	13,061.64	0.00E+00	2.99E-03	2.36E-02	0.0850	1.672E+14
Cm-243	3.9020E-07	1,654.38	13,061.64	0.00E+00	6.46E-04	5.10E-03	0.1250	1.071E+14
Cm-244	2.0742E-05	1,654.38	13,061.64	0.00E+00	3.43E-02	2.71E-01	0.2250	1.493E+14
Co-60	3.2554E-03	1,654.38	13,061.64	0.00E+00	5.39E+00	4.25E+01	0.3750	6.058E+13
Cs-134	7.3823E-04	1,654.38	13,061.64	0.00E+00	1.22E+00	9.64E+00	0.5750	9.174E+14
Cs-135	2.8639E-05	1,654.38	13,061.64	0.00E+00	4.74E-02	3.74E-01	0.8500	1.815E+13
Cs-137	1.8609E+00	1,654.38	13,061.64	0.00E+00	3.08E+03	2.43E+04	1.2500	1.148E+13
Eu-154	1.9262E-02	1,654.38	13,061.64	0.00E+00	3.19E+01	2.52E+02	1.7500	1.095E+12
Eu-155	2.6721E-03	1,654.38	13,061.64	0.00E+00	4.42E+00	3.49E+01	2.2500	4.407E+07
Fe-55	3.3099E-05	1,654.38	13,061.64	0.00E+00	5.48E-02	4.32E-01	2.7500	7.056E+12
H-3	3.7296E-03	1,654.38	13,061.64	0.00E+00	6.17E+00	4.87E+01	3.5000	2.713E+04
I-129	1.5853E-06	1,654.38	13,061.64	0.00E+00	2.62E-03	2.07E-02	5.0000	8.459E+03
Kr-85	1.1958E-01	1,654.38	13,061.64	0.00E+00	1.98E+02	1.56E+03	7.0000	6.374E+02
Np-237	1.2513E-07	1,654.38	13,061.64	0.00E+00	2.07E-04	1.63E-03	11.0000	5.079E+01
Pa-231	1.2017E-04	1,654.38	13,061.64	0.00E+00	1.99E-01	1.57E+00		
Pb-210	1.1939E-08	1,654.38	13,061.64	0.00E+00	1.98E-05	1.56E-04		
Pm-147	3.6819E-03	1,654.38	13,061.64	0.00E+00	6.09E+00	4.81E+01		
Pu-238	4.5953E-04	1,654.38	13,061.64	0.00E+00	7.60E-01	6.00E+00		
Pu-239	2.7529E-05	1,654.38	13,061.64	0.00E+00	4.55E-02	3.60E-01		
Pu-240	1.6184E-05	1,654.38	13,061.64	0.00E+00	2.68E-02	2.11E-01		
Pu-241	2.3780E-03	1,654.38	13,061.64	0.00E+00	3.93E+00	3.11E+01		
Pu-242	4.0821E-08	1,654.38	13,061.64	0.00E+00	6.75E-05	5.33E-04		
Ra-226	1.4471E-08	1,654.38	13,061.64	0.00E+00	2.39E-05	1.89E-04		
Ra-228	4.5651E-06	1,654.38	13,061.64	0.00E+00	7.55E-03	5.96E-02		
Ru-106	3.8971E-08	1,654.38	13,061.64	0.00E+00	6.45E-05	5.09E-04		
Se-79	3.5417E-05	1,654.38	13,061.64	0.00E+00	5.86E-02	4.63E-01		
Sn-126	3.9848E-05	1,654.38	13,061.64	0.00E+00	6.59E-02	5.20E-01		
Sr-90	1.8940E+00	1,654.38	13,061.64	0.00E+00	3.13E+03	2.47E+04		
Tc-99	3.2534E-04	1,654.38	13,061.64	0.00E+00	5.38E-01	4.25E+00		
Th-229	4.6839E-05	1,654.38	13,061.64	0.00E+00	7.75E-02	6.12E-01		
Th-230	1.0322E-06	1,654.38	13,061.64	0.00E+00	1.71E-03	1.35E-02		
Th-232	-9.0328E-08	1,654.38	0.00	2.58E-02	2.57E-02	2.58E-02		
Ti-208	1.5386E-02	1,654.38	13,061.64	0.00E+00	2.55E+01	2.01E+02		
U-232	4.1639E-02	1,654.38	13,061.64	0.00E+00	6.89E+01	5.44E+02		
U-233	-3.3244E-03	1,654.38	0.00	8.69E+01	8.14E+01	8.69E+01		
U-234	8.1769E-04	1,654.38	13,061.64	0.00E+00	1.35E+00	1.07E+01		
U-235	5.7813E-08	1,654.38	13,061.64	1.78E-05	1.13E-04	7.73E-04		
U-236	1.3273E-07	1,654.38	13,061.64	0.00E+00	2.20E-04	1.73E-03		
U-238	-3.1121E-10	1,654.38	0.00	1.14E-05	1.08E-05	1.14E-05		
Y-90	1.8940E+00	1,654.38	13,061.64	0.00E+00	3.13E+03	2.47E+04		
Other Radionuclides					3.41E+03	2.69E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

Reactor Moderator	From SFD	Used	Basis for Parameter Differences:
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	0.71	60 to 100	

### Burnup Summary (MWd)<sup>3</sup>

Nominal	From SFD	Estimated	Basis for burnup used in estimate:
	13.061.64	1.654.38	
Bounding		3,308.75	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup taken directly from SFD (converted to MWd)

### Checks

Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	0.30		
Bounding	2.39	0.25	1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SHIPPINGPORT LWBR SEED

SNF ID # 380

Fuel Units & Descr: 12 - 619 ROD HEX ARRAY

Heavy Metal Mass BOL=5218 3kg, EOL=5110 5kg

ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date

1982

Estimates as of

2010

Template

LWBR (Light Water, Zinc, 60 to 100% Th and U)

<sup>2</sup>Template Burnup(MWd):

10269 14

Template BOL Heavy Metal Mass (MT)

0 45991251

Template Decay Time

25 years

Estimated

Canister usage

18"x15"

12 00

## II. Estimates

	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 3425E-05	155,505 33	278,657 20	0 00E+00	1 30E+01	2 32E+01	Avg MeV	
Am-241	2 2387E-04	155,505 33	278,657 20	0 00E+00	3 48E+01	6 24E+01	0 0150	2 915E+16
Am-242m	1 5512E-06	155,505 33	278,657 20	0 00E+00	2 41E-01	4 32E-01	0 0250	6 019E+15
Am-243	3 1181E-07	155,505 33	278,657 20	0 00E+00	4 85E-02	8 69E-02	0 0375	5 154E+15
C-14	9 2539E-05	155,505 33	278,657 20	0 00E+00	1 44E+01	2 58E+01	0 0575	5 621E+15
Cl-36	1 8103E-06	155,505 33	278,657 20	0 00E+00	2 82E-01	5 04E-01	0 0850	3 567E+15
Cm-243	3 9020E-07	155,505 33	278,657 20	0 00E+00	6 07E-02	1 09E-01	0 1250	2 284E+15
Cm-244	2 0742E-05	155,505 33	278,657 20	0 00E+00	3 23E+00	5 78E+00	0 2250	3 184E+15
Co-60	3 2554E-03	155,505 33	278,657 20	0 00E+00	5 06E+02	9 07E+02	0 3750	1 292E+15
Cs-134	7 3823E-04	155,505 33	278,657 20	0 00E+00	1 15E+02	2 06E+02	0 5750	1 957E+16
Cs-135	2 8639E-05	155,505 33	278,657 20	0 00E+00	4 45E+00	7 98E+00	0 8500	3 873E+14
Cs-137	1 8609E+00	155,505 33	278,657 20	0 00E+00	2 89E+05	5 19E+05	1 2500	2 450E+14
Eu-154	1 9262E-02	155,505 33	278,657 20	0 00E+00	3 00E+03	5 37E+03	1 7500	2 336E+13
Eu-155	2 6721E-03	155,505 33	278,657 20	0 00E+00	4 16E+02	7 45E+02	2 2500	9 401E+08
Fe-55	3 3099E-05	155,505 33	278,657 20	0 00E+00	5 15E+00	9 22E+00	2 7500	1 505E+14
H-3	3 7296E-03	155,505 33	278,657 20	0 00E+00	5 80E+02	1 04E+03	3 5000	5 788E+05
I-129	1 5853E-06	155,505 33	278,657 20	0 00E+00	2 47E-01	4 42E-01	5 0000	1 805E+05
Kr-85	1 1958E-01	155,505 33	278,657 20	0 00E+00	1 86E+04	3 33E+04	7 0000	1 360E+04
Np-237	1 2513E-07	155,505 33	278,657 20	0 00E+00	1 95E-02	3 49E-02	11 0000	1 083E+03
Pa-231	1 2017E-04	155,505 33	278,657 20	0 00E+00	1 87E+01	3 35E+01		
Pb-210	1 1939E-08	155,505 33	278,657 20	0 00E+00	1 86E-03	3 33E-03		
Pm-147	3 6819E-03	155,505 33	278,657 20	0 00E+00	5 73E+02	1 03E+03		
Pu-238	4 5953E-04	155,505 33	278,657 20	0 00E+00	7 15E+01	1 28E+02		
Pu-239	2 7529E-05	155,505 33	278,657 20	0 00E+00	4 28E+00	7 67E+00		
Pu-240	1 6184E-05	155,505 33	278,657 20	0 00E+00	2 52E+00	4 51E+00		
Pu-241	2 3780E-03	155,505 33	278,657 20	0 00E+00	3 70E+02	6 63E+02		
Pu-242	4 0821E-08	155,505 33	278,657 20	0 00E+00	6 35E-03	1 14E-02		
Ra-226	1 4471E-08	155,505 33	278,657 20	0 00E+00	2 25E-03	4 03E-03		
Ra-228	4 5651E-06	155,505 33	278,657 20	0 00E+00	7 10E-01	1 27E+00		
Ru-106	3 8971E-08	155,505 33	278,657 20	0 00E+00	6 06E-03	1 09E-02		
Se-79	3 5417E-05	155,505 33	278,657 20	0 00E+00	5 51E+00	9 87E+00		
Sn-126	3 9848E-05	155,505 33	278,657 20	0 00E+00	6 20E+00	1 11E+01		
Sr-90	1 8940E+00	155,505 33	278,657 20	0 00E+00	2 95E+05	5 28E+05		
Tc-99	3 2534E-04	155,505 33	278,657 20	0 00E+00	5 06E+01	9 07E+01		
Th-229	4 6839E-05	155,505 33	278,657 20	0 00E+00	7 28E+00	1 31E+01		
Th-230	1 0322E-06	155,505 33	278,657 20	0 00E+00	1 61E-01	2 88E-01		
Th-232	-9 0328E-08	155,505 33	0 00	5 51E-01	5 37E-01	5 51E-01		
Ti-208	1 5386E-02	155,505 33	278,657 20	0 00E+00	2 39E+03	4 29E+03		
U-232	4 1639E-02	155,505 33	278,657 20	0 00E+00	6 48E+03	1 16E+04		
U-233	-3 3244E-03	155,505 33	0 00	1 85E+03	1 34E+03	1 85E+03		
U-234	8 1769E-04	155,505 33	278,657 20	0 00E+00	1 27E+02	2 28E+02		
U-235	5 7813E-08	155,505 33	278,657 20	3 79E-04	9 37E-03	1 65E-02		
U-236	1 3273E-07	155,505 33	278,657 20	0 00E+00	2 06E-02	3 70E-02		
U-238	-3 1121E-10	155,505 33	0 00	2 42E-04	1 94E-04	2 42E-04		
Y-90	1 8940E+00	155,505 33	278,657 20	0 00E+00	2 95E+05	5 28E+05		
Other Radionuclides					3 20E+05	5 74E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD LIGHT WATER	Used LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding:	ZIRC	ZIRC	This fuel matches on all parameters except enrichment.
BOL HM Constituents:	Th and U	Th and U	
BOL Enrichment %:	0 070817874	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	155,505 33	104 906 57	Nominal burnup taken directly from SFD (converted to MWd)
Bounding	278 657 20	209 813 14	Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 33	0 67	0 99
Bounding	2 39	0 75	

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT PWR C1 BLKT  
SNF ID #: 191  
Fuel Units & Descr: 36 - 17 FLAT PLATES  
Heavy Metal Mass: BOL=583 92kg; EOL=569 66kg  
ROD Storage Site: INEEL

Fuel decay start date: 1969  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5%, U)  
Template Burnup(MWd): 61 92  
Template BOL Heavy Metal Mass (MT): 0 00176911  
Template Decay Time: 35 years

Estimated  
Canister usage:  
18"x15"  
36 00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	13,560.21	27,120.41	0.00E+00	1.19E-05	2.38E-05	Avg. MeV	
Am-241	1.4352E-01	13,560.21	27,120.41	0.00E+00	1.95E+03	3.89E+03	0.0150	1.459E+15
Am-242m	2.8698E-04	13,560.21	27,120.41	0.00E+00	3.89E+00	7.78E+00	0.0250	2.943E+14
Am-243	6.2565E-04	13,560.21	27,120.41	0.00E+00	8.48E+00	1.70E+01	0.0375	2.806E+14
C-14	4.7901E-05	13,560.21	27,120.41	0.00E+00	6.50E-01	1.30E+00	0.0575	3.243E+14
Cl-36	8.0297E-07	13,560.21	27,120.41	0.00E+00	1.09E-02	2.18E-02	0.0850	1.633E+14
Cm-243	2.5081E-04	13,560.21	27,120.41	0.00E+00	3.40E+00	6.80E+00	0.1250	1.133E+14
Cm-244	4.9015E-02	13,560.21	27,120.41	0.00E+00	6.65E+02	1.33E+03	0.2250	1.400E+14
Co-60	2.5581E-03	13,560.21	27,120.41	0.00E+00	3.47E+01	6.94E+01	0.3750	6.021E+13
Cs-134	4.0536E-05	13,560.21	27,120.41	0.00E+00	5.50E-01	1.10E+00	0.5750	1.400E+15
Cs-135	1.4433E-05	13,560.21	27,120.41	0.00E+00	1.96E-01	3.91E-01	0.8500	1.937E+13
Cs-137	1.3979E+00	13,560.21	27,120.41	0.00E+00	1.90E+04	3.79E+04	1.2500	1.903E+13
Eu-154	2.0203E-02	13,560.21	27,120.41	0.00E+00	2.74E+02	5.48E+02	1.7500	5.698E+11
Eu-155	1.7684E-03	13,560.21	27,120.41	0.00E+00	2.40E+01	4.80E+01	2.2500	9.176E+07
Fe-55	4.3136E-05	13,560.21	27,120.41	0.00E+00	5.85E-01	1.17E+00	2.7500	1.880E+08
H-3	2.0769E-02	13,560.21	27,120.41	0.00E+00	2.82E+02	5.63E+02	3.5000	1.936E+07
I-129	9.8288E-07	13,560.21	27,120.41	0.00E+00	1.33E-02	2.67E-02	5.0000	8.276E+06
Kr-85	2.8214E-02	13,560.21	27,120.41	0.00E+00	3.83E+02	7.65E+02	7.0000	9.539E+05
Np-237	1.1218E-05	13,560.21	27,120.41	0.00E+00	1.52E-01	3.04E-01	11.0000	1.096E+05
Pa-231	1.3036E-09	13,560.21	27,120.41	0.00E+00	1.77E-05	3.54E-05		
Pb-210	8.5078E-11	13,560.21	27,120.41	0.00E+00	1.15E-06	2.31E-06		
Pm-147	3.6531E-04	13,560.21	27,120.41	0.00E+00	4.95E+00	9.91E+00		
Pu-238	7.4564E-02	13,560.21	27,120.41	0.00E+00	1.01E+03	2.02E+03		
Pu-239	1.1623E-02	13,560.21	27,120.41	0.00E+00	1.58E+02	3.15E+02		
Pu-240	1.5132E-02	13,560.21	27,120.41	0.00E+00	2.05E+02	4.10E+02		
Pu-241	9.0036E-01	13,560.21	27,120.41	0.00E+00	1.22E+04	2.44E+04		
Pu-242	6.4260E-05	13,560.21	27,120.41	0.00E+00	8.71E-01	1.74E+00		
Ra-226	2.2804E-10	13,560.21	27,120.41	0.00E+00	3.09E-06	6.18E-06		
Ra-228	5.2713E-12	13,560.21	27,120.41	0.00E+00	7.15E-08	1.43E-07		
Ru-106	6.1160E-10	13,560.21	27,120.41	0.00E+00	8.29E-06	1.66E-05		
Se-79	1.2377E-05	13,560.21	27,120.41	0.00E+00	1.68E-01	3.36E-01		
Sn-126	2.5210E-05	13,560.21	27,120.41	0.00E+00	3.42E-01	6.84E-01		
Sr-90	9.1667E-01	13,560.21	27,120.41	0.00E+00	1.24E+04	2.49E+04		
Tc-99	3.9357E-04	13,560.21	27,120.41	0.00E+00	5.34E+00	1.07E+01		
Th-229	1.2057E-10	13,560.21	27,120.41	0.00E+00	1.64E-06	3.27E-06		
Th-230	2.1043E-08	13,560.21	27,120.41	0.00E+00	2.85E-04	5.71E-04		
Th-232	5.2972E-12	13,560.21	27,120.41	0.00E+00	7.18E-08	1.44E-07		
Ti-208	1.7474E-07	13,560.21	27,120.41	0.00E+00	2.37E-03	4.74E-03		
U-232	4.7368E-07	13,560.21	27,120.41	0.00E+00	6.42E-03	1.28E-02		
U-233	2.5097E-08	13,560.21	27,120.41	0.00E+00	3.40E-04	6.81E-04		
U-234	5.0000E-05	13,560.21	27,120.41	0.00E+00	6.78E-01	1.36E+00		
U-235	-1.4489E-06	13,560.21	0.00	1.24E-02	0.00E+00	1.24E-02		
U-236	7.5824E-06	13,560.21	27,120.41	0.00E+00	1.03E-01	2.06E-01		
U-238	-2.6129E-07	13,560.21	0.00	1.94E-01	1.91E-01	1.94E-01		
Y-90	9.1699E-01	13,560.21	27,120.41	0.00E+00	1.24E+04	2.49E+04		
Other Radionuclides					1.82E+04	3.64E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	0.98643828	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	6 481 51	13 560 21	
Bounding		27,120 41	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.66	2.09	
Bounding	1.33		1.01

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SHIPPINGPORT PWR C2 BLKT  
SNF ID # 192  
Fuel Units & Descr 17 - 17 FLAT PLATES  
Heavy Metal Mass BOL=1323 635kg EOL=1038 999kg  
ROD Storage Site INEEL

Fuel decay start date 1974  
Estimates as of 2010  
Template PWR (Light Water, Zirc, 0 to 5%, U)  
Template Burnup(MWd) 61 92  
Template BOL Heavy Metal Mass (MT) 0 00176911  
Template Decay Time 35 years

Estimated  
Canister usage:  
18"x15"  
17 00

Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 7758E-10	270,675 47	541,350 94	0 00E+00	2 38E-04	4 75E-04	Avg MeV	
Am-241	1 4352E-01	270,675 47	541,350 94	0 00E+00	3 88E+04	7 77E+04	0 0150	2.913E+16
Am-242m	2 8698E-04	270,675 47	541,350 94	0 00E+00	7 77E+01	1 55E+02	0 0250	5 874E+15
Am-243	6 2565E-04	270,675 47	541,350 94	0 00E+00	1 69E+02	3 39E+02	0 0375	5 602E+15
C-14	4 7901E-05	270,675 47	541,350 94	0 00E+00	1 30E+01	2 59E+01	0 0575	6 473E+15
Ci-36	8 0297E-07	270,675 47	541,350 94	0 00E+00	2 17E-01	4 35E-01	0 0850	3.259E+15
Cm-243	2 5081E-04	270,675 47	541,350 94	0 00E+00	6 79E+01	1 36E+02	0 1250	2.262E+15
Cm-244	4 9015E-02	270,675 47	541,350 94	0 00E+00	1 33E+04	2 65E+04	0 2250	2.795E+15
Co-60	2 5581E-03	270,675 47	541,350 94	0 00E+00	6 92E+02	1 38E+03	0 3750	1.202E+15
Cs-134	4 0536E-05	270,675 47	541,350 94	0 00E+00	1 10E+01	2 19E+01	0 5750	2.795E+16
Cs-135	1 4433E-05	270,675 47	541,350 94	0 00E+00	3 91E+00	7 81E+00	0 8500	3.867E+14
Cs-137	1 3979E+00	270,675 47	541,350 94	0 00E+00	3 78E+05	7 57E+05	1 2500	3.798E+14
Eu-154	2 0203E-02	270,675 47	541,350 94	0 00E+00	5 47E+03	1 09E+04	1 7500	1.137E+13
Eu-155	1 7684E-03	270,675 47	541,350 94	0 00E+00	4 79E+02	9 57E+02	2 2500	1.832E+09
Fe-55	4 3136E-05	270,675 47	541,350 94	0 00E+00	1 17E+01	2 34E+01	2 7500	3.752E+09
H-3	2 0769E-02	270,675 47	541,350 94	0 00E+00	5 62E+03	1 12E+04	3 5000	3.864E+08
I-129	9 8288E-07	270,675 47	541,350 94	0 00E+00	2 66E-01	5 32E-01	5 0000	1.652E+08
Kr-85	2 8214E-02	270,675 47	541,350 94	0 00E+00	7 64E+03	1 53E+04	7 0000	1.904E+07
Np-237	1 1218E-05	270,675 47	541,350 94	0 00E+00	3 04E+00	6 07E+00	11 0000	2.187E+06
Pa-231	1 3036E-09	270,675 47	541,350 94	0 00E+00	3 53E-04	7 06E-04		
Pb-210	8 5078E-11	270,675 47	541,350 94	0 00E+00	2 30E-05	4 61E-05		
Pm-147	3 6531E-04	270,675 47	541,350 94	0 00E+00	9 89E+01	1 98E+02		
Pu-238	7 4564E-02	270,675 47	541,350 94	0 00E+00	2 02E+04	4 04E+04		
Pu-239	1 1623E-02	270,675 47	541,350 94	0 00E+00	3 15E+03	6 29E+03		
Pu-240	1 5132E-02	270,675 47	541,350 94	0 00E+00	4 10E+03	8 19E+03		
Pu-241	9 0036E-01	270,675 47	541,350 94	0 00E+00	2 44E+05	4 87E+05		
Pu-242	6 4260E-05	270,675 47	541,350 94	0 00E+00	1 74E+01	3 48E+01		
Ra-226	2 2804E-10	270,675 47	541,350 94	0 00E+00	6 17E-05	1 23E-04		
Ra-228	5 2713E-12	270,675 47	541,350 94	0 00E+00	1 43E-06	2 85E-06		
Ru-106	6 1160E-10	270,675 47	541,350 94	0 00E+00	1 66E-04	3 31E-04		
Se-79	1 2377E-05	270,675 47	541,350 94	0 00E+00	3 35E+00	6 70E+00		
Sn-126	2 5210E-05	270,675 47	541,350 94	0 00E+00	6 82E+00	1 36E+01		
Sr-90	9 1667E-01	270,675 47	541,350 94	0 00E+00	2 48E+05	4 96E+05		
Tc-99	3 9357E-04	270,675 47	541,350 94	0 00E+00	1 07E+02	2 13E+02		
Th-229	1 2057E-10	270,675 47	541,350 94	0 00E+00	3 26E-05	6 53E-05		
Th-230	2 1043E-08	270,675 47	541,350 94	0 00E+00	5 70E-03	1 14E-02		
Th-232	5 2972E-12	270,675 47	541,350 94	0 00E+00	1 43E-06	2 87E-06		
Ti-208	1 7474E-07	270,675 47	541,350 94	0 00E+00	4 73E-02	9 46E-02		
U-232	4 7368E-07	270,675 47	541,350 94	0 00E+00	1 28E-01	2 56E-01		
U-233	2 5097E-08	270,675 47	541,350 94	0 00E+00	6 79E-03	1 36E-02		
U-234	5 0000E-05	270,675 47	541,350 94	0 00E+00	1 35E+01	2 71E+01		
U-235	-1 4489E-06	270,675 47	0 00	2 03E-02	0 00E+00	2 03E-02		
U-236	7 5824E-06	270,675 47	541,350 94	0 00E+00	2 05E+00	4 10E+00		
U-238	-2 6129E-07	270,675 47	0 00	4 42E-01	3 71E-01	4 42E-01		
Y-90	9 1699E-01	270,675 47	541,350 94	0 00E+00	2 48E+05	4 96E+05		
Other Radionuclides					3 63E+05	7 27E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	0.71	0 to 5	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
Nominal	From SFD 18,892.25	Estimated 270 675 47	
Bounding		541,350 94	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier 5.84	Estimated Burnup/ Given Burnup 14.33	
Bounding	11.69		1.17

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT PWR-C1-S4  
SNF ID #: 194  
Fuel Units & Descr: 1 - 17 FLAT PLATES  
Heavy Metal Mass: BOL=3 024kg; EOL=2 063kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1964  
Estimates as of: 2010  
Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 6 01  
Template BOL Heavy Metal Mass (MT): 0 00012882  
Template Decay Time: 35 years

Estimated  
Canister usage:  
18"x15"  
1 00

II. Estimates	m	X <sub>n</sub>	X <sub>b</sub>	b	Y <sub>n</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	908 00	1,815 99	0 00E+00	2.12E-05	4 24E-05	Avg MeV	
Am-241	1.1135E-04	908 00	1,815 99	0 00E+00	1 01E-01	2 02E-01	0 0150	1.355E+14
Am-242m	8.5075E-09	908 00	1,815 99	0 00E+00	7 72E-06	1 54E-05	0 0250	2 817E+13
Am-243	9.8519E-10	908 00	1,815 99	0 00E+00	8 95E-07	1 79E-06	0 0375	2 436E+13
C-14	2.3012E-04	908 00	1,815 99	0 00E+00	2 09E-01	4 18E-01	0 0575	2 626E+13
Cl-36	1.2261E-06	908 00	1,815 99	0 00E+00	1 11E-03	2 23E-03	0 0850	1 587E+13
Cm-243	2 4875E-10	908 00	1,815 99	0 00E+00	2 26E-07	4 52E-07	0 1250	1 030E+13
Cm-244	2 3178E-09	908 00	1,815 99	0 00E+00	2 10E-06	4 21E-06	0 2250	1 366E+13
Co-60	7 0849E-02	908 00	1,815 99	0 00E+00	6 43E+01	1 29E+02	0 3750	5 957E+12
Cs-134	3 0266E-06	908 00	1,815 99	0 00E+00	2 75E-03	5 50E-03	0 5750	9 813E+13
Cs-135	3 0316E-05	908 00	1,815 99	0 00E+00	2 75E-02	5 51E-02	0 8500	9 933E+11
Cs-137	1 4511E+00	908 00	1,815 99	0 00E+00	1 32E+03	2 64E+03	1 2500	9 873E+12
Eu-154	6 6955E-04	908 00	1,815 99	0 00E+00	6 08E-01	1 22E+00	1 7500	2 562E+10
Eu-155	6 9850E-04	908 00	1,815 99	0 00E+00	6 34E-01	1 27E+00	2 2500	5 319E+07
Fe-55	1 2318E-03	908 00	1,815 99	0 00E+00	1 12E+00	2 24E+00	2 7500	1 538E+06
H-3	2 5141E-03	908 00	1,815 99	0 00E+00	2 28E+00	4 57E+00	3 5000	1 083E+02
I-129	7 3195E-07	908 00	1,815 99	0 00E+00	6 65E-04	1 33E-03	5 0000	4 454E+01
Kr-85	4 1281E-02	908 00	1,815 99	0 00E+00	3 75E+01	7 50E+01	7 0000	4 918E+00
Np-237	1 1489E-06	908 00	1,815 99	0 00E+00	1 04E-03	2 09E-03	11 0000	5 518E-01
Pa-231	4 5241E-08	908 00	1,815 99	0 00E+00	4 11E-05	8 22E-05		
Pb-210	6 4476E-13	908 00	1,815 99	0 00E+00	5 85E-10	1 17E-09		
Pm-147	1 1651E-03	908 00	1,815 99	0 00E+00	1 06E+00	2 12E+00		
Pu-238	2 9517E-04	908 00	1,815 99	0 00E+00	2 68E-01	5 36E-01		
Pu-239	6 6772E-04	908 00	1,815 99	0 00E+00	6 06E-01	1 21E+00		
Pu-240	8 6839E-05	908 00	1,815 99	0 00E+00	7 88E-02	1 58E-01		
Pu-241	7 1514E-04	908 00	1,815 99	0 00E+00	6 49E-01	1 30E+00		
Pu-242	1 9717E-09	908 00	1,815 99	0 00E+00	1 79E-06	3 58E-06		
Ra-226	1 7654E-12	908 00	1,815 99	0 00E+00	1 60E-09	3 21E-09		
Ra-228	8 2928E-12	908 00	1,815 99	0 00E+00	7 53E-09	1 51E-08		
Ru-106	1 8419E-10	908 00	1,815 99	0 00E+00	1 67E-07	3 34E-07		
Se-79	1 3223E-05	908 00	1,815 99	0 00E+00	1 20E-02	2 40E-02		
Sn-126	1 1493E-05	908 00	1,815 99	0 00E+00	1 04E-02	2 09E-02		
Sr-90	1 3649E+00	908 00	1,815 99	0 00E+00	1 24E+03	2 48E+03		
Tc-99	4 6656E-04	908 00	1,815 99	0 00E+00	4 24E-01	8 47E-01		
Th-229	1 4547E-11	908 00	1,815 99	0 00E+00	1 32E-08	2 64E-08		
Th-230	1 6617E-10	908 00	1,815 99	0 00E+00	1 51E-07	3 02E-07		
Th-232	8 3361E-12	908 00	1,815 99	0 00E+00	7 57E-09	1 51E-08		
Ti-208	2 1664E-08	908 00	1,815 99	0 00E+00	1 97E-05	3 93E-05		
U-232	5 8669E-08	908 00	1,815 99	0 00E+00	5 33E-05	1 07E-04		
U-233	3 1847E-09	908 00	1,815 99	0 00E+00	2 89E-06	5 78E-06		
U-234	3 8769E-07	908 00	1,815 99	0 00E+00	3 52E-04	7 04E-04		
U-235	-2 7761E-06	908 00	0 00	6 08E-03	3 56E-03	6 08E-03		
U-236	1 6190E-05	908 00	1,815 99	0 00E+00	1 47E-02	2 94E-02		
U-238	-2 8547E-09	908 00	0 00	7 12E-05	6 86E-05	7 12E-05		
Y-90	1 3652E+00	908 00	1,815 99	0 00E+00	1 24E+03	2 48E+03		
Other Radionuclides					1 50E+03	3 00E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	ZIRC	SST	This fuel matches Pathfinder Template on all but one parameter (cladding, but substituting Stainless Steel is a good conservative assumption).
BOL HM Constituents	U	U	
BOL Enrichment %	92 9998016	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		908.00	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		1 815.99	Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	6.44		1 01
Bounding	12.87		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SHIPPINGPORT PWR-C2-S1  
 SNF ID # 195  
 Fuel Units & Descr 19 - 19 FLAT PLATES  
 Heavy Metal Mass BOL=343.226kg, EOL=220.031kg  
 ROD Storage Site INEEL  
 Fuel decay start date 1969  
 Estimates as of 2010  
 Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
 \*Template Burnup(MWd) 6.01  
 Template BOL Heavy Metal Mass (MT) 0.00012882  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 18"x15"  
 19.00

II. Estimates	m	X <sub>a</sub>	X <sub>b</sub>	b	Y <sub>a</sub>	Y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3344E-08	116,375.01	232,750.02	0.00E+00	2.72E-03	5.43E-03	Avg MeV	
Am-241	1.1135E-04	116,375.01	232,750.02	0.00E+00	1.30E+01	2.59E+01	0.0150	1.737E+16
Am-242m	8.5075E-09	116,375.01	232,750.02	0.00E+00	9.90E-04	1.98E-03	0.0250	3.610E+15
Am-243	9.8519E-10	116,375.01	232,750.02	0.00E+00	1.15E-04	2.29E-04	0.0375	3.122E+15
C-14	2.3012E-04	116,375.01	232,750.02	0.00E+00	2.68E+01	5.36E+01	0.0575	3.366E+15
Cl-36	1.2261E-06	116,375.01	232,750.02	0.00E+00	1.43E-01	2.85E-01	0.0850	2.034E+15
Cm-243	2.4875E-10	116,375.01	232,750.02	0.00E+00	2.89E-05	5.79E-05	0.1250	1.320E+15
Cm-244	2.3178E-09	116,375.01	232,750.02	0.00E+00	2.70E-04	5.39E-04	0.2250	1.750E+15
Co-60	7.0849E-02	116,375.01	232,750.02	0.00E+00	8.25E+03	1.65E+04	0.3750	7.635E+14
Cs-134	3.0266E-06	116,375.01	232,750.02	0.00E+00	3.52E-01	7.04E-01	0.5750	1.258E+16
Cs-135	3.0316E-05	116,375.01	232,750.02	0.00E+00	3.53E+00	7.06E+00	0.8500	1.273E+14
Cs-137	1.4511E+00	116,375.01	232,750.02	0.00E+00	1.69E+05	3.38E+05	1.2500	1.265E+15
Eu-154	6.6955E-04	116,375.01	232,750.02	0.00E+00	7.79E+01	1.56E+02	1.7500	3.284E+12
Eu-155	6.9850E-04	116,375.01	232,750.02	0.00E+00	8.13E+01	1.63E+02	2.2500	6.818E+09
Fe-55	1.2318E-03	116,375.01	232,750.02	0.00E+00	1.43E+02	2.87E+02	2.7500	1.971E+08
H-3	2.5141E-03	116,375.01	232,750.02	0.00E+00	2.93E+02	5.85E+02	3.5000	1.387E+04
I-129	7.3195E-07	116,375.01	232,750.02	0.00E+00	8.52E-02	1.70E-01	5.0000	5.705E+03
Kr-85	4.1281E-02	116,375.01	232,750.02	0.00E+00	4.80E+03	9.61E+03	7.0000	6.299E+02
Np-237	1.1489E-06	116,375.01	232,750.02	0.00E+00	1.34E-01	2.67E-01	11.0000	7.068E+01
Pa-231	4.5241E-08	116,375.01	232,750.02	0.00E+00	5.26E-03	1.05E-02		
Pb-210	6.4476E-13	116,375.01	232,750.02	0.00E+00	7.50E-08	1.50E-07		
Pm-147	1.1651E-03	116,375.01	232,750.02	0.00E+00	1.36E+02	2.71E+02		
Pu-238	2.9517E-04	116,375.01	232,750.02	0.00E+00	3.44E+01	6.87E+01		
Pu-239	6.6772E-04	116,375.01	232,750.02	0.00E+00	7.77E+01	1.55E+02		
Pu-240	8.6839E-05	116,375.01	232,750.02	0.00E+00	1.01E+01	2.02E+01		
Pu-241	7.1514E-04	116,375.01	232,750.02	0.00E+00	8.32E+01	1.66E+02		
Pu-242	1.9717E-09	116,375.01	232,750.02	0.00E+00	2.29E-04	4.59E-04		
Ra-226	1.7654E-12	116,375.01	232,750.02	0.00E+00	2.05E-07	4.11E-07		
Ra-228	8.2928E-12	116,375.01	232,750.02	0.00E+00	9.65E-07	1.93E-06		
Ru-106	1.8419E-10	116,375.01	232,750.02	0.00E+00	2.14E-05	4.29E-05		
Se-79	1.3223E-05	116,375.01	232,750.02	0.00E+00	1.54E+00	3.08E+00		
Sn-126	1.1493E-05	116,375.01	232,750.02	0.00E+00	1.34E+00	2.67E+00		
Sr-90	1.3649E+00	116,375.01	232,750.02	0.00E+00	1.59E+05	3.18E+05		
Tc-99	4.6656E-04	116,375.01	232,750.02	0.00E+00	5.43E+01	1.09E+02		
Th-229	1.4547E-11	116,375.01	232,750.02	0.00E+00	1.69E-06	3.39E-06		
Th-230	1.6617E-10	116,375.01	232,750.02	0.00E+00	1.93E-05	3.87E-05		
Th-232	8.3361E-12	116,375.01	232,750.02	0.00E+00	9.70E-07	1.94E-06		
Th-208	2.1664E-08	116,375.01	232,750.02	0.00E+00	2.52E-03	5.04E-03		
U-232	5.8669E-08	116,375.01	232,750.02	0.00E+00	6.83E-03	1.37E-02	Thermal Power	
U-233	3.1847E-09	116,375.01	232,750.02	0.00E+00	3.71E-04	7.41E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	3.8769E-07	116,375.01	232,750.02	0.00E+00	4.51E-02	9.02E-02	2.03E+03	4.06E+03
U-235	-2.7761E-06	116,375.01	0.00	6.90E-01	3.67E-01	6.90E-01	Total	Total
U-236	1.6190E-05	116,375.01	232,750.02	0.00E+00	1.88E+00	3.77E+00		
U-238	-2.8547E-09	116,375.01	0.00	8.07E-03	7.74E-03	8.07E-03		
Y-90	1.3652E+00	116,375.01	232,750.02	0.00E+00	1.59E+05	3.18E+05		
Other Radionuclides					1.92E+05	3.84E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	ZIRC	SST	This fuel matches Pathfinder Template on all but one parameter (cladding, but substituting Stainless Steel is a good conservative assumption)
BOL HM Constituents	U	U	
BOL Enrichment %	93.00008304	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		116,375.01	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		232,750.02	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	7.27		1.01
Bounding	14.54		

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SHIPPINGPORT PWR-C2-S2  
SNF ID #: 196  
Fuel Units & Descr: 20 - 19 FLAT PLATES  
Heavy Metal Mass: BOL=419 354kg, EOL=301.588kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1974  
Estimates as of: 2010  
Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 6.01  
Template BOL Heavy Metal Mass (MT): 0.00012882  
Template Decay Time: 35 years

Estimated  
Canister usage:  
18"x15"  
20.00

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	2.3344E-08	111,247.37	222,494.74	0.00E+00	2.60E-03	5.19E-03	Avg. MeV	
Am-241	1.1135E-04	111,247.37	222,494.74	0.00E+00	1.24E+01	2.48E+01	0.0150	1.661E+16
Am-242m	8.5075E-09	111,247.37	222,494.74	0.00E+00	9.46E-04	1.89E-03	0.0250	3.451E+15
Am-243	9.8519E-10	111,247.37	222,494.74	0.00E+00	1.10E-04	2.19E-04	0.0375	2.985E+15
C-14	2.3012E-04	111,247.37	222,494.74	0.00E+00	2.56E+01	5.12E+01	0.0575	3.217E+15
Cl-36	1.2261E-06	111,247.37	222,494.74	0.00E+00	1.36E-01	2.73E-01	0.0850	1.944E+15
Cm-243	2.4875E-10	111,247.37	222,494.74	0.00E+00	2.77E-05	5.53E-05	0.1250	1.262E+15
Cm-244	2.3178E-09	111,247.37	222,494.74	0.00E+00	2.58E-04	5.16E-04	0.2250	1.673E+15
Co-60	7.0849E-02	111,247.37	222,494.74	0.00E+00	7.88E+03	1.58E+04	0.3750	7.299E+14
Cs-134	3.0266E-06	111,247.37	222,494.74	0.00E+00	3.37E-01	6.73E-01	0.5750	1.202E+16
Cs-135	3.0316E-05	111,247.37	222,494.74	0.00E+00	3.37E+00	6.75E+00	0.8500	1.217E+14
Cs-137	1.4511E+00	111,247.37	222,494.74	0.00E+00	1.61E+05	3.23E+05	1.2500	1.210E+15
Eu-154	6.6955E-04	111,247.37	222,494.74	0.00E+00	7.45E+01	1.49E+02	1.7500	3.139E+12
Eu-155	6.9850E-04	111,247.37	222,494.74	0.00E+00	7.77E+01	1.55E+02	2.2500	6.517E+09
Fe-55	1.2318E-03	111,247.37	222,494.74	0.00E+00	1.37E+02	2.74E+02	2.7500	1.884E+08
H-3	2.5141E-03	111,247.37	222,494.74	0.00E+00	2.80E+02	5.59E+02	3.5000	1.328E+04
I-129	7.3195E-07	111,247.37	222,494.74	0.00E+00	8.14E-02	1.63E-01	5.0000	5.461E+03
Kr-85	4.1281E-02	111,247.37	222,494.74	0.00E+00	4.59E+03	9.18E+03	7.0000	6.030E+02
Np-237	1.1489E-06	111,247.37	222,494.74	0.00E+00	1.28E-01	2.56E-01	11.0000	6.766E+01
Pa-231	4.5241E-08	111,247.37	222,494.74	0.00E+00	5.03E-03	1.01E-02		
Pb-210	6.4476E-13	111,247.37	222,494.74	0.00E+00	7.17E-08	1.43E-07		
Pm-147	1.1651E-03	111,247.37	222,494.74	0.00E+00	1.30E+02	2.59E+02		
Pu-238	2.9517E-04	111,247.37	222,494.74	0.00E+00	3.28E+01	6.57E+01		
Pu-239	6.6772E-04	111,247.37	222,494.74	0.00E+00	7.43E+01	1.49E+02		
Pu-240	8.6839E-05	111,247.37	222,494.74	0.00E+00	9.66E+00	1.93E+01		
Pu-241	7.1514E-04	111,247.37	222,494.74	0.00E+00	7.96E+01	1.59E+02		
Pu-242	1.9717E-09	111,247.37	222,494.74	0.00E+00	2.19E-04	4.39E-04		
Ra-226	1.7654E-12	111,247.37	222,494.74	0.00E+00	1.96E-07	3.93E-07		
Ra-228	8.2928E-12	111,247.37	222,494.74	0.00E+00	9.23E-07	1.85E-06		
Ru-106	1.8419E-10	111,247.37	222,494.74	0.00E+00	2.05E-05	4.10E-05		
Se-79	1.3223E-05	111,247.37	222,494.74	0.00E+00	1.47E+00	2.94E+00		
Sn-126	1.1493E-05	111,247.37	222,494.74	0.00E+00	1.28E+00	2.56E+00		
Sr-90	1.3649E+00	111,247.37	222,494.74	0.00E+00	1.52E+05	3.04E+05		
Tc-99	4.6656E-04	111,247.37	222,494.74	0.00E+00	5.19E+01	1.04E+02		
Th-229	1.4547E-11	111,247.37	222,494.74	0.00E+00	1.62E-06	3.24E-06		
Th-230	1.6617E-10	111,247.37	222,494.74	0.00E+00	1.85E-05	3.70E-05		
Th-232	8.3361E-12	111,247.37	222,494.74	0.00E+00	9.27E-07	1.85E-06		
Th-208	2.1664E-08	111,247.37	222,494.74	0.00E+00	2.41E-03	4.82E-03		
U-232	5.8669E-08	111,247.37	222,494.74	0.00E+00	6.53E-03	1.31E-02		
U-233	3.1847E-09	111,247.37	222,494.74	0.00E+00	3.54E-04	7.09E-04		
U-234	3.8769E-07	111,247.37	222,494.74	0.00E+00	4.31E-02	8.63E-02		
U-235	-2.7761E-06	111,247.37	0.00	8.43E-01	5.34E-01	8.43E-01		
U-236	1.6190E-05	111,247.37	222,494.74	0.00E+00	1.80E+00	3.60E+00		
U-238	-2.8547E-09	111,247.37	0.00	9.87E-03	9.55E-03	9.87E-03		
Y-90	1.3652E+00	111,247.37	222,494.74	0.00E+00	1.52E+05	3.04E+05		
Other Radionuclides					1.84E+05	3.67E+05		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93.00000016	60 to 100	This fuel matches Pathfinder Template on all but one parameter (cladding, but substituting Stainless Steel is a good conservative assumption)

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		111,247.37	
Bounding		222,494.74	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	5.69		
Bounding	11.37		1.01

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SM-1A  
SNF ID #: 201  
Fuel Units & Descr: 93 - ASSEMBLY  
Heavy Metal Mass BOL=79 775kg, EOL=65 751kg  
ROD Storage Site INEEL

Fuel decay start date 1971  
Estimates as of 2010  
Template Pathfinder (Light Water SST, 60 to 100%, U)  
Template Burnup (MWd) 6 01  
Template BOL Heavy Metal Mass (MT) 0 00012882  
Template Decay Time 35 years

Estimated  
Canister usage  
18"x10"  
5 81

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 334E-08	13,248 12	26,496 23	0 00E+00	3 09E-04	6 19E-04	Avg MeV	
Am-241	1.1135E-04	13,248 12	26,496 23	0 00E+00	1 48E+00	2 95E+00	0 0150	1 978E+15
Am-242m	8.5075E-09	13,248 12	26,496 23	0 00E+00	1.13E-04	2.25E-04	0 0250	4 110E+14
Am-243	9 8519E-10	13,248 12	26,496 23	0 00E+00	1.31E-05	2 61E-05	0 0375	3 555E+14
C-14	2.3012E-04	13,248 12	26,496 23	0 00E+00	3 05E+00	6 10E+00	0 0575	3 832E+14
Cl-36	1.2261E-06	13,248 12	26,496 23	0 00E+00	1.62E-02	3.25E-02	0 0850	2.315E+14
Cm-243	2 4875E-10	13,248 12	26,496 23	0 00E+00	3 30E-06	6.59E-06	0 1250	1 503E+14
Cm-244	2 3178E-09	13,248 12	26,496 23	0 00E+00	3 07E-05	6.14E-05	0 2250	1 993E+14
Co-60	7 0849E-02	13,248 12	26,496 23	0 00E+00	9.39E+02	1 88E+03	0 3750	8 692E+13
Cs-134	3 0266E-06	13,248 12	26,496 23	0 00E+00	4 01E-02	8 02E-02	0 5750	1 432E+15
Cs-135	3 0316E-05	13,248 12	26,496 23	0 00E+00	4 02E-01	8 03E-01	0 8500	1 449E+13
Cs-137	1 4511E+00	13,248 12	26,496 23	0 00E+00	1.92E+04	3 84E+04	1.2500	1 441E+14
Eu-154	6 6955E-04	13,248 12	26,496 23	0 00E+00	8 87E+00	1.77E+01	1 7500	3 738E+11
Eu-155	6 9850E-04	13,248 12	26,496 23	0 00E+00	9.25E+00	1.85E+01	2.2500	7 761E+08
Fe-55	1 2318E-03	13,248 12	26,496 23	0 00E+00	1 63E+01	3.26E+01	2 7500	2.244E+07
H-3	2 5141E-03	13,248 12	26,496 23	0 00E+00	3 33E+01	6 66E+01	3.5000	1.587E+03
I-129	7.3195E-07	13,248 12	26,496 23	0 00E+00	9 70E-03	1 94E-02	5.0000	6.528E+02
Kr-85	4 1281E-02	13,248 12	26,496 23	0 00E+00	5 47E+02	1 09E+03	7.0000	7.208E+01
Np-237	1.1489E-06	13,248 12	26,496 23	0 00E+00	1.52E-02	3 04E-02	11.0000	8 089E+00
Pa-231	4 5241E-08	13,248 12	26,496 23	0 00E+00	5 99E-04	1.20E-03		
Pb-210	6 4476E-13	13,248 12	26,496 23	0 00E+00	8 54E-09	1 71E-08		
Pm-147	1.1651E-03	13,248 12	26,496 23	0 00E+00	1 54E+01	3 09E+01		
Pu-238	2.9517E-04	13,248 12	26,496 23	0 00E+00	3 91E+00	7 82E+00		
Pu-239	6 6772E-04	13,248 12	26,496 23	0 00E+00	8 85E+00	1 77E+01		
Pu-240	8 6839E-05	13,248 12	26,496 23	0 00E+00	1.15E+00	2.30E+00		
Pu-241	7 1514E-04	13,248 12	26,496 23	0 00E+00	9 47E+00	1.89E+01		
Pu-242	1 9717E-09	13,248 12	26,496 23	0 00E+00	2.61E-05	5.22E-05		
Ra-226	1 7654E-12	13,248 12	26,496 23	0 00E+00	2.34E-08	4 68E-08		
Ra-228	8 2928E-12	13,248 12	26,496 23	0 00E+00	1 10E-07	2.20E-07		
Ru-106	1 8419E-10	13,248 12	26,496 23	0 00E+00	2 44E-06	4 88E-06		
Se-79	1 3223E-05	13,248 12	26,496 23	0 00E+00	1.75E-01	3 50E-01		
Sn-126	1 1493E-05	13,248 12	26,496 23	0 00E+00	1 52E-01	3 05E-01		
Sr-90	1 3649E+00	13,248 12	26,496 23	0 00E+00	1 81E+04	3 62E+04		
Tc-99	4 6656E-04	13,248 12	26,496 23	0 00E+00	6 18E+00	1.24E+01		
Th-229	1 4547E-11	13,248 12	26,496 23	0 00E+00	1 93E-07	3 85E-07		
Th-230	1 6617E-10	13,248 12	26,496 23	0 00E+00	2 20E-06	4 40E-06		
Th-232	8 3361E-12	13,248 12	26,496 23	0 00E+00	1.10E-07	2 21E-07		
Ti-208	2.1664E-08	13,248 12	26,496 23	0 00E+00	2.87E-04	5 74E-04		
U-232	5 8669E-08	13,248 12	26,496 23	0 00E+00	7 77E-04	1.55E-03	Thermal Power	
U-233	3 1847E-09	13,248 12	26,496 23	0 00E+00	4.22E-05	8 44E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	3 8769E-07	13,248 12	26,496 23	0 00E+00	5.14E-03	1.03E-02	2.31E+02	4 63E+02
U-235	-2 7761E-06	13,248 12	0 00	1.60E-01	1.24E-01	1.60E-01	Total	Total
U-236	1 6190E-05	13,248 12	26,496 23	0 00E+00	2.14E-01	4.29E-01		
U-238	-2 8547E-09	13,248 12	0 00	1 87E-03	1.84E-03	1.87E-03		
Y-90	1.3652E+00	13,248 12	26,496 23	0 00E+00	1 81E+04	3 62E+04		
Other Radionuclides					2.19E+04	4.37E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
	LIGHT WATER	LIGHT WATER	
Reactor Moderator			
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93 01311673	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	408 77	13,248 12	
Bounding		26 496 23	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	3.56	32 41	
Bounding	7.12		1 01

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SNAP  
SNF ID #: 203  
Fuel Units & Descr: 615 - DECLAD ROD  
Heavy Metal Mass: BOL= , EOL=29 766kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1958  
Estimates as of: 2010  
Template: TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
Template BOL Heavy Metal Mass (MT): 0.000195  
Template Decay Time: 50 years

Estimated  
Canister usage  
HIC  
6.15

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.4992E-09	28,414.84	28,414.84	0.00E+00	2.70E-04	2.70E-04	Avg. MeV	
Am-241	4.0120E-03	28,414.84	28,414.84	0.00E+00	1.14E+02	1.14E+02	0.0150	1.387E+15
Am-242m	1.1510E-06	28,414.84	28,414.84	0.00E+00	3.27E-02	3.27E-02	0.0250	2.881E+14
Am-243	1.4713E-07	28,414.84	28,414.84	0.00E+00	4.18E-03	4.18E-03	0.0375	2.508E+14
C-14	1.2800E-04	28,414.84	28,414.84	0.00E+00	3.64E+00	3.64E+00	0.0575	2.702E+14
Cl-36	2.8120E-06	28,414.84	28,414.84	0.00E+00	7.99E-02	7.99E-02	0.0850	1.622E+14
Cm-243	6.0120E-08	28,414.84	28,414.84	0.00E+00	1.71E-03	1.71E-03	0.1250	1.053E+14
Cm-244	3.0331E-07	28,414.84	28,414.84	0.00E+00	8.62E-03	8.62E-03	0.2250	1.398E+14
Co-60	3.4647E-03	28,414.84	28,414.84	0.00E+00	9.84E+01	9.84E+01	0.3750	6.097E+13
Cs-134	2.4632E-08	28,414.84	28,414.84	0.00E+00	7.00E-04	7.00E-04	0.5750	1.031E+15
Cs-135	3.2195E-05	28,414.84	28,414.84	0.00E+00	9.15E-01	9.15E-01	0.8500	1.014E+13
Cs-137	9.7519E-01	28,414.84	28,414.84	0.00E+00	2.77E+04	2.77E+04	1.2500	1.085E+13
Eu-154	4.0947E-04	28,414.84	28,414.84	0.00E+00	1.16E+01	1.16E+01	1.7500	2.617E+11
Eu-155	5.4586E-05	28,414.84	28,414.84	0.00E+00	1.55E+00	1.55E+00	2.2500	6.667E+07
Fe-55	4.7955E-06	28,414.84	28,414.84	0.00E+00	1.36E-01	1.36E-01	2.7500	1.202E+07
H-3	8.9038E-04	28,414.84	28,414.84	0.00E+00	2.53E+01	2.53E+01	3.5000	3.476E+04
I-129	7.3684E-07	28,414.84	28,414.84	0.00E+00	2.09E-02	2.09E-02	5.0000	1.463E+04
Kr-85	1.3791E-02	28,414.84	28,414.84	0.00E+00	3.92E+02	3.92E+02	7.0000	1.650E+03
Np-237	1.3038E-06	28,414.84	28,414.84	0.00E+00	3.70E-02	3.70E-02	11.0000	1.876E+02
Pa-231	1.5534E-08	28,414.84	28,414.84	0.00E+00	4.41E-04	4.41E-04		
Pb-210	7.1759E-13	28,414.84	28,414.84	0.00E+00	2.04E-08	2.04E-08		
Pm-147	1.4547E-05	28,414.84	28,414.84	0.00E+00	4.13E-01	4.13E-01		
Pu-238	7.2827E-04	28,414.84	28,414.84	0.00E+00	2.07E+01	2.07E+01		
Pu-239	5.5218E-03	28,414.84	28,414.84	0.00E+00	1.57E+02	1.57E+02		
Pu-240	2.1173E-03	28,414.84	28,414.84	0.00E+00	6.02E+01	6.02E+01		
Pu-241	1.1702E-02	28,414.84	28,414.84	0.00E+00	3.33E+02	3.33E+02		
Pu-242	2.3128E-07	28,414.84	28,414.84	0.00E+00	6.57E-03	6.57E-03		
Ra-226	1.6827E-12	28,414.84	28,414.84	0.00E+00	4.78E-08	4.78E-08		
Ra-228	2.5263E-10	28,414.84	28,414.84	0.00E+00	7.18E-06	7.18E-06		
Ru-106	3.4090E-15	28,414.84	28,414.84	0.00E+00	9.69E-11	9.69E-11		
Se-79	1.3012E-05	28,414.84	28,414.84	0.00E+00	3.70E-01	3.70E-01		
Sn-126	1.2162E-05	28,414.84	28,414.84	0.00E+00	3.46E-01	3.46E-01		
Sr-90	8.9323E-01	28,414.84	28,414.84	0.00E+00	2.54E+04	2.54E+04		
Tc-99	4.4241E-04	28,414.84	28,414.84	0.00E+00	1.26E+01	1.26E+01		
Th-229	7.6902E-10	28,414.84	28,414.84	0.00E+00	2.19E-05	2.19E-05		
Th-230	1.3059E-10	28,414.84	28,414.84	0.00E+00	3.71E-06	3.71E-06		
Th-232	2.5278E-10	28,414.84	28,414.84	0.00E+00	7.18E-06	7.18E-06		
Th-208	1.1892E-08	28,414.84	28,414.84	0.00E+00	3.38E-04	3.38E-04		
U-232	3.1970E-08	28,414.84	28,414.84	0.00E+00	9.08E-04	9.08E-04		
U-233	1.2232E-07	28,414.84	28,414.84	0.00E+00	3.48E-03	3.48E-03		
U-234	2.8662E-07	28,414.84	28,414.84	0.00E+00	8.14E-03	8.14E-03		
U-235	-2.6194E-06	28,414.84	0.00	2.57E-02	0.00E+00	2.57E-02		
U-236	1.2696E-05	28,414.84	28,414.84	0.00E+00	3.61E-01	3.61E-01		
U-238	-3.6331E-08	28,414.84	0.00	1.60E-02	1.50E-02	1.60E-02		
Y-90	8.9338E-01	28,414.84	28,414.84	0.00E+00	2.54E+04	2.54E+04		
Other Radionuclides					2.80E+04	2.80E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	This Template was used for the following reasons
Fuel Cladding	NONE	SST	This fuel matches on all parameters except cladding (SST is conservative) and enrichment (unknown).
BOL HM Constituents	U	U	
BOL Enrichment %		10 to 20.1	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		28 414.84	Nominal burnup set equal to bounding burnup.
Bounding		28 414.84	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	14.00		1.78
Bounding	14.00		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SODIUM LOOP SAFETY FAC  
SNF ID # 352  
Fuel Units & Descr 20 - ROD  
Heavy Metal Mass: BOL=4.2kg; EOL=3.968kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1981  
Estimates as of 2010  
Template: (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 62.5  
Template BOL Heavy Metal Mass (MT) 0.00186865  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x10"  
0.42

II. Estimates							Gamma Sources	
	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1.9648E-06	220.48	440.96	0.00E+00	4.33E-04	8.66E-04	0.0150	7.418E+14
Am-241	7.8064E+00	220.48	440.96	0.00E+00	1.72E+03	3.44E+03	0.0250	1.463E+14
Am-242m	1.7632E-02	220.48	440.96	0.00E+00	3.89E+00	7.78E+00	0.0375	1.305E+14
Am-243	1.6336E-02	220.48	440.96	0.00E+00	3.60E+00	7.20E+00	0.0575	1.782E+14
C-14	1.2101E-01	220.48	440.96	0.00E+00	2.67E+01	5.34E+01	0.0850	7.705E+13
Cl-36	2.2849E-03	220.48	440.96	0.00E+00	5.04E-01	1.01E+00	0.1250	6.701E+13
Cm-243	1.1046E-03	220.48	440.96	0.00E+00	2.44E-01	4.87E-01	0.2250	6.545E+13
Cm-244	2.4704E-01	220.48	440.96	0.00E+00	5.45E+01	1.09E+02	0.3750	2.759E+13
Co-60	1.0466E+02	220.48	440.96	0.00E+00	2.31E+04	4.62E+04	0.5750	4.401E+14
Cs-134	9.8289E-03	220.48	440.96	0.00E+00	2.17E+00	4.33E+00	0.8500	2.652E+13
Cs-135	4.3976E-04	220.48	440.96	0.00E+00	9.70E-02	1.94E-01	1.2500	3.441E+15
Cs-137	2.6526E+01	220.48	440.96	0.00E+00	5.85E+03	1.17E+04	1.7500	8.337E+11
Eu-154	2.7975E+00	220.48	440.96	0.00E+00	6.17E+02	1.23E+03	2.2500	1.812E+10
Eu-155	2.7881E-01	220.48	440.96	0.00E+00	6.15E+01	1.23E+02	2.7500	1.552E+09
Fe-55	4.2151E+00	220.48	440.96	0.00E+00	9.29E+02	1.86E+03	3.5000	1.648E+06
H-3	4.2599E-01	220.48	440.96	0.00E+00	9.39E+01	1.88E+02	5.0000	7.009E+05
I-129	1.0618E-05	220.48	440.96	0.00E+00	2.34E-03	4.68E-03	7.0000	8.043E+04
Kr-85	1.1426E+00	220.48	440.96	0.00E+00	2.52E+02	5.04E+02	11.0000	9.215E+03
Np-237	1.5647E-04	220.48	440.96	0.00E+00	3.45E-02	6.90E-02		
Pa-231	2.8624E-06	220.48	440.96	0.00E+00	6.31E-04	1.26E-03		
Pb-210	9.2770E-09	220.48	440.96	0.00E+00	2.05E-06	4.09E-06		
Pm-147	2.3690E-01	220.48	440.96	0.00E+00	5.22E+01	1.04E+02		
Pu-238	-6.1800E-01	220.48	0.00	5.40E+02	4.03E+02	5.40E+02		
Pu-239	-4.8280E-02	220.48	0.00	6.53E+01	5.47E+01	6.53E+01		
Pu-240	-3.0095E-01	220.48	0.00	8.34E+01	1.70E+01	8.34E+01		
Pu-241	-7.4000E+01	220.48	0.00	2.15E+04	5.15E+03	2.15E+04		
Pu-242	-1.1381E-04	220.48	0.00	3.61E-01	3.36E-01	3.61E-01		
Ra-226	3.2167E-08	220.48	440.96	0.00E+00	7.09E-06	1.42E-05		
Ra-228	5.9024E-07	220.48	440.96	0.00E+00	1.30E-04	2.60E-04		
Ru-106	3.9140E-06	220.48	440.96	0.00E+00	8.63E-04	1.73E-03		
Se-79	1.9184E-04	220.48	440.96	0.00E+00	4.23E-02	8.46E-02		
Sn-126	1.6671E-04	220.48	440.96	0.00E+00	3.68E-02	7.35E-02		
Sr-90	2.5126E+01	220.48	440.96	0.00E+00	5.54E+03	1.11E+04		
Tc-99	6.7678E-03	220.48	440.96	0.00E+00	1.49E+00	2.98E+00		
Th-229	1.2398E-06	220.48	440.96	0.00E+00	2.73E-04	5.47E-04		
Th-230	4.1442E-06	220.48	440.96	0.00E+00	9.14E-04	1.83E-03		
Th-232	6.0208E-07	220.48	440.96	0.00E+00	1.33E-04	2.65E-04		
Ti-208	9.6478E-05	220.48	440.96	0.00E+00	2.13E-02	4.25E-02		
U-232	2.6103E-04	220.48	440.96	0.00E+00	5.76E-02	1.15E-01		
U-233	3.6128E-04	220.48	440.96	0.00E+00	7.97E-02	1.59E-01		
U-234	1.2788E-02	220.48	440.96	0.00E+00	2.82E+00	5.64E+00		
U-235	5.7486E-04	220.48	440.96	1.81E-03	1.29E-01	2.55E-01		
U-236	2.3485E-04	220.48	440.96	0.00E+00	5.18E-02	1.04E-01		
U-238	1.1581E-04	220.48	440.96	2.25E-04	2.58E-02	5.13E-02		
Y-90	2.5126E+01	220.48	440.96	0.00E+00	5.54E+03	1.11E+04		
Other Radionuclides					1.55E+04	3.09E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	(Worst Case)	This fuel didn't closely match any existing templates, therefore the worst case template was used.
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %	78.235	0 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal	42.00	220.48	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		440.96	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.57	5.25	35.21
Bounding	3.14		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SODIUM LOOP SAFETY FAC.  
SNF ID #: 367  
Fuel Units & Descr: 12 - ROD  
Heavy Metal Mass: BOL=6.256kg, EOL=7.332kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1981  
Estimates as of: 2010  
Template, (Worst Case)  
<sup>2</sup>Template Burnup(MWd): 62.5  
Template BOL Heavy Metal Mass (MT): 0.00186865  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x10"  
0.25

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	1.9648E-06	62.56	125.11	0.00E+00	1.23E-04	2.46E-04	Avg MeV	
Am-241	7.8064E+00	62.56	125.11	0.00E+00	4.88E+02	9.77E+02	0.0150	2.157E+14
Am-242m	1.7632E-02	62.56	125.11	0.00E+00	1.10E+00	2.21E+00	0.0250	4.152E+13
Am-243	1.6336E-02	62.56	125.11	0.00E+00	1.02E+00	2.04E+00	0.0375	3.705E+13
C-14	1.2101E-01	62.56	125.11	0.00E+00	7.57E+00	1.51E+01	0.0575	5.055E+13
Cl-36	2.2849E-03	62.56	125.11	0.00E+00	1.43E-01	2.86E-01	0.0850	2.186E+13
Cm-243	1.1046E-03	62.56	125.11	0.00E+00	6.91E-02	1.38E-01	0.1250	1.901E+13
Cm-244	2.4704E-01	62.56	125.11	0.00E+00	1.55E+01	3.09E+01	0.2250	1.857E+13
Co-60	1.0466E+02	62.56	125.11	0.00E+00	6.55E+03	1.31E+04	0.3750	7.828E+12
Cs-134	9.8289E-03	62.56	125.11	0.00E+00	6.15E-01	1.23E+00	0.5750	1.249E+14
Cs-135	4.3976E-04	62.56	125.11	0.00E+00	2.75E-02	5.50E-02	0.8500	7.523E+12
Cs-137	2.6526E+01	62.56	125.11	0.00E+00	1.66E+03	3.32E+03	1.2500	9.763E+14
Eu-154	2.7975E+00	62.56	125.11	0.00E+00	1.75E+02	3.50E+02	1.7500	2.366E+11
Eu-155	2.7881E-01	62.56	125.11	0.00E+00	1.74E+01	3.49E+01	2.2500	5.140E+09
Fe-55	4.2151E+00	62.56	125.11	0.00E+00	2.64E+02	5.27E+02	2.7500	4.404E+08
H-3	4.2599E-01	62.56	125.11	0.00E+00	2.66E+01	5.33E+01	3.5000	5.634E+05
I-129	1.0618E-05	62.56	125.11	0.00E+00	6.64E-04	1.33E-03	5.0000	2.393E+05
Kr-85	1.1426E+00	62.56	125.11	0.00E+00	7.15E+01	1.43E+02	7.0000	2.739E+04
Np-237	1.5647E-04	62.56	125.11	0.00E+00	9.79E-03	1.96E-02	11.0000	3.135E+03
Pa-231	2.8624E-06	62.56	125.11	0.00E+00	1.79E-04	3.58E-04		
Pb-210	9.2770E-09	62.56	125.11	0.00E+00	5.80E-07	1.16E-06		
Pm-147	2.3690E-01	62.56	125.11	0.00E+00	1.48E+01	2.96E+01		
Pu-238	-6.1800E-01	62.56	0.00	8.04E+02	7.65E+02	8.04E+02		
Pu-239	-4.8280E-02	62.56	0.00	9.73E+01	9.43E+01	9.73E+01		
Pu-240	-3.0095E-01	62.56	0.00	1.24E+02	1.05E+02	1.24E+02		
Pu-241	-7.4000E+01	62.56	0.00	3.20E+04	2.73E+04	3.20E+04		
Pu-242	-1.1381E-04	62.56	0.00	5.38E-01	5.31E-01	5.38E-01		
Ra-226	3.2167E-08	62.56	125.11	0.00E+00	2.01E-06	4.02E-06		
Ra-228	5.9024E-07	62.56	125.11	0.00E+00	3.69E-05	7.38E-05		
Ru-106	3.9140E-06	62.56	125.11	0.00E+00	2.45E-04	4.90E-04		
Se-79	1.9184E-04	62.56	125.11	0.00E+00	1.20E-02	2.40E-02		
Sn-126	1.6671E-04	62.56	125.11	0.00E+00	1.04E-02	2.09E-02		
Sr-90	2.5126E+01	62.56	125.11	0.00E+00	1.57E+03	3.14E+03		
Tc-99	6.7678E-03	62.56	125.11	0.00E+00	4.23E-01	8.47E-01		
Th-229	1.2398E-06	62.56	125.11	0.00E+00	7.76E-05	1.55E-04		
Th-230	4.1442E-06	62.56	125.11	0.00E+00	2.59E-04	5.18E-04		
Th-232	6.0208E-07	62.56	125.11	0.00E+00	3.77E-05	7.53E-05		
Ti-208	9.6478E-05	62.56	125.11	0.00E+00	6.04E-03	1.21E-02		
U-232	2.6103E-04	62.56	125.11	0.00E+00	1.63E-02	3.27E-02	Thermal Power	
U-233	3.6128E-04	62.56	125.11	0.00E+00	2.26E-02	4.52E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.2788E-02	62.56	125.11	0.00E+00	8.00E-01	1.60E+00	1.72E+02	3.14E+02
U-235	5.7486E-04	62.56	125.11	2.69E-03	3.87E-02	7.46E-02	Total	Total
U-236	2.3485E-04	62.56	125.11	0.00E+00	1.47E-02	2.94E-02		
U-238	1.1581E-04	62.56	125.11	3.35E-04	7.58E-03	1.48E-02		
Y-90	2.5126E+01	62.56	125.11	0.00E+00	1.57E+03	3.14E+03		
Other Radionuclides					4.39E+03	8.77E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:  This fuel didn't closely match any existing templates, therefore the worst case template was used.
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	SST	SST/Inconel	
BOL HM Constituents	Pu and U	U, Th, & Pu	
BOL Enrichment %	87.054	0 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:  Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup.
Nominal	62.56	-1,022.96	
Bounding		125.11	

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 5.94
Nominal	0.30	-16.35	
Bounding	0.60		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name SPEC (ORME)  
SNF ID # 208  
Fuel Units & Descr 1 - FLAT PLATES IN CAN  
Heavy Metal Mass BOL=2.39kg EOL=2.39kg  
ROD Storage Site NEEL

<sup>1</sup>Fuel decay start date: 1958  
Estimates as of 2010  
Template HFBR (Heavy Water, Alum, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 15  
Template BOL Heavy Metal Mass (MT) 0.00034251  
Template Decay Time 50 years

Estimated  
Canister usage:  
HIC  
1.00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.9527E-09	45.43	90.86	0.00E+00	1.80E-07	3.59E-07	Avg MeV	
Am-241	2.9407E-02	45.43	90.86	0.00E+00	1.34E+00	2.67E+00	0.0150	4.507E+12
Am-242m	7.7733E-06	45.43	90.86	0.00E+00	3.53E-04	7.06E-04	0.0250	9.334E+11
Am-243	6.3827E-06	45.43	90.86	0.00E+00	2.90E-04	5.80E-04	0.0375	8.169E+11
C-14	2.9513E-08	45.43	90.86	0.00E+00	1.34E-06	2.68E-06	0.0575	9.049E+11
Cl-36	5.9507E-35	45.43	90.86	0.00E+00	2.70E-33	5.41E-33	0.0850	5.242E+11
Cm-243	1.0647E-06	45.43	90.86	0.00E+00	4.84E-05	9.67E-05	0.1250	3.421E+11
Cm-244	3.4907E-05	45.43	90.86	0.00E+00	1.59E-03	3.17E-03	0.2250	4.517E+11
Co-60	3.1593E-07	45.43	90.86	0.00E+00	1.44E-05	2.87E-05	0.3750	1.967E+11
Cs-134	8.9067E-08	45.43	90.86	0.00E+00	4.05E-06	8.09E-06	0.5750	3.416E+12
Cs-135	4.8607E-06	45.43	90.86	0.00E+00	2.21E-04	4.42E-04	0.8500	3.482E+10
Cs-137	1.0113E+00	45.43	90.86	0.00E+00	4.59E+01	9.19E+01	1.2500	1.382E+10
Eu-154	1.8607E-03	45.43	90.86	0.00E+00	8.45E-02	1.69E-01	1.7500	9.201E+08
Eu-155	6.1700E-05	45.43	90.86	0.00E+00	2.80E-03	5.61E-03	2.2500	9.103E+04
Fe-55	4.7627E-07	45.43	90.86	0.00E+00	2.16E-05	4.33E-05	2.7500	1.879E+04
H-3	8.6600E-04	45.43	90.86	0.00E+00	3.93E-02	7.87E-02	3.5000	3.590E+02
I-129	7.1600E-07	45.43	90.86	0.00E+00	3.25E-05	6.51E-05	5.0000	1.503E+02
Kr-85	1.4713E-02	45.43	90.86	0.00E+00	6.68E-01	1.34E+00	7.0000	1.687E+01
Np-237	4.0773E-06	45.43	90.86	0.00E+00	1.85E-04	3.70E-04	11.0000	1.911E+00
Pa-231	6.7867E-09	45.43	90.86	0.00E+00	3.08E-07	6.17E-07		
Pb-210	1.2127E-12	45.43	90.86	0.00E+00	5.51E-11	1.10E-10		
Pm-147	1.6720E-05	45.43	90.86	0.00E+00	7.60E-04	1.52E-03		
Pu-238	4.3627E-03	45.43	90.86	0.00E+00	1.98E-01	3.96E-01		
Pu-239	1.0307E-02	45.43	90.86	0.00E+00	4.68E-01	9.37E-01		
Pu-240	5.4007E-03	45.43	90.86	0.00E+00	2.45E-01	4.91E-01		
Pu-241	8.8667E-02	45.43	90.86	0.00E+00	4.03E+00	8.06E+00		
Pu-242	3.0713E-06	45.43	90.86	0.00E+00	1.40E-04	2.79E-04		
Ra-226	3.2767E-12	45.43	90.86	0.00E+00	1.49E-10	2.98E-10		
Ra-228	3.5827E-14	45.43	90.86	0.00E+00	1.63E-12	3.26E-12		
Ru-106	9.3133E-15	45.43	90.86	0.00E+00	4.23E-13	8.46E-13		
Se-79	1.2533E-05	45.43	90.86	0.00E+00	5.69E-04	1.14E-03		
Sn-126	1.1393E-05	45.43	90.86	0.00E+00	5.18E-04	1.04E-03		
Sr-90	9.0067E-01	45.43	90.86	0.00E+00	4.09E+01	8.18E+01		
Tc-99	4.3533E-04	45.43	90.86	0.00E+00	1.98E-02	3.96E-02		
Th-229	3.5147E-12	45.43	90.86	0.00E+00	1.60E-10	3.19E-10		
Th-230	3.2487E-10	45.43	90.86	0.00E+00	1.48E-08	2.95E-08		
Th-232	4.2020E-14	45.43	90.86	0.00E+00	1.91E-12	3.82E-12		
Ti-208	5.7620E-09	45.43	90.86	0.00E+00	2.62E-07	5.24E-07		
U-232	1.5613E-08	45.43	90.86	0.00E+00	7.09E-07	1.42E-06		
U-233	1.1207E-09	45.43	90.86	0.00E+00	5.09E-08	1.02E-07		
U-234	9.8267E-07	45.43	90.86	0.00E+00	4.46E-05	8.93E-05		
U-235	-2.5335E-06	45.43	0.00	2.66E-04	1.51E-04	2.66E-04		
U-236	1.3007E-05	45.43	90.86	0.00E+00	5.91E-04	1.18E-03		
U-238	-1.4207E-08	45.43	0.00	7.62E-04	7.61E-04	7.62E-04		
Y-90	9.0133E-01	45.43	90.86	0.00E+00	4.09E+01	8.19E+01		
Other Radionuclides					4.37E+01	8.74E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	ORGANIC	HEAVY WATER	This Template was used for the following reasons
Fuel Cladding	ALUM	ALUM	This fuel matches on cladding and BOL heavy metal, heavy water is a conservative assumption for moderator, and it is fairly close on enrichment.
BOL HM Constituents	U	U	
BOL Enrichment %	5.146443515	10 to 20	

### Burnup Summary (MWd)<sup>1</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		45.43	Nominal burnup assumed to be 2% of BOL heavy metal mass
Bounding		90.86	Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.43		0.98
Bounding	0.87		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: SPSS (SPERT)  
SNF ID #: 213  
Fuel Units & Descr: 1 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL=0.59kg; EOL=0.588kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1959  
Estimates as of: 2010  
Template: Pathfinder (Light Water, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd), 6.01  
Template BOL Heavy Metal Mass (MT): 0.00012882  
Template Decay Time: 50 years

Estimated  
Canister usage:  
18"x10"  
0.08

II. Estimates		m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	3.4276E-08	1.89	3.78	0.00E+00	6.48E-08	1.30E-07	Avg MeV		
Am-241	1.1458E-04	1.89	3.78	0.00E+00	2.16E-04	4.33E-04	0.0150	1.971E+11	
Am-242m	7.9468E-09	1.89	3.78	0.00E+00	1.50E-08	3.00E-08	0.0250	4.095E+10	
Am-243	9.8386E-10	1.89	3.78	0.00E+00	1.86E-09	3.72E-09	0.0375	3.550E+10	
C-14	2.2978E-04	1.89	3.78	0.00E+00	4.34E-04	8.68E-04	0.0575	3.818E+10	
Cl-36	1.2261E-06	1.89	3.78	0.00E+00	2.32E-06	4.63E-06	0.0850	2.307E+10	
Cm-243	1.7271E-10	1.89	3.78	0.00E+00	3.26E-10	6.53E-10	0.1250	1.497E+10	
Cm-244	1.3058E-09	1.89	3.78	0.00E+00	2.47E-09	4.93E-09	0.2250	1.990E+10	
Co-60	9.8636E-03	1.89	3.78	0.00E+00	1.86E-02	3.73E-02	0.3750	8.670E+09	
Cs-134	1.9617E-08	1.89	3.78	0.00E+00	3.71E-08	7.41E-08	0.5750	1.444E+11	
Cs-135	3.0316E-05	1.89	3.78	0.00E+00	5.73E-05	1.15E-04	0.8500	1.425E+09	
Cs-137	1.0263E+00	1.89	3.78	0.00E+00	1.94E+00	3.88E+00	1.2500	3.246E+09	
Eu-154	2.0017E-04	1.89	3.78	0.00E+00	3.78E-04	7.56E-04	1.7500	3.670E+07	
Eu-155	8.5957E-05	1.89	3.78	0.00E+00	1.62E-04	3.25E-04	2.2500	1.860E+04	
Fe-55	2.2646E-05	1.89	3.78	0.00E+00	4.28E-05	8.56E-05	2.7500	2.534E+03	
H-3	1.0835E-03	1.89	3.78	0.00E+00	2.05E-03	4.09E-03	3.5000	3.334E-01	
I-129	7.3195E-07	1.89	3.78	0.00E+00	1.38E-06	2.77E-06	5.0000	1.385E-01	
Kr-85	1.5661E-02	1.89	3.78	0.00E+00	2.96E-02	5.92E-02	7.0000	1.541E-02	
Np-237	1.1494E-06	1.89	3.78	0.00E+00	2.17E-06	4.34E-06	11.0000	1.736E-03	
Pa-231	5.8070E-08	1.89	3.78	0.00E+00	1.10E-07	2.19E-07			
Pb-210	1.2985E-12	1.89	3.78	0.00E+00	2.45E-12	4.91E-12			
Pm-147	2.2196E-05	1.89	3.78	0.00E+00	4.19E-05	8.39E-05			
Pu-238	2.6223E-04	1.89	3.78	0.00E+00	4.95E-04	9.91E-04			
Pu-239	6.6739E-04	1.89	3.78	0.00E+00	1.26E-03	2.52E-03			
Pu-240	8.6705E-05	1.89	3.78	0.00E+00	1.64E-04	3.28E-04			
Pu-241	3.4759E-04	1.89	3.78	0.00E+00	6.57E-04	1.31E-03			
Pu-242	1.9717E-09	1.89	3.78	0.00E+00	3.73E-09	7.45E-09			
Ra-226	3.0000E-12	1.89	3.78	0.00E+00	5.67E-12	1.13E-11			
Ra-228	8.3328E-12	1.89	3.78	0.00E+00	1.57E-11	3.15E-11			
Ru-106	6.1464E-15	1.89	3.78	0.00E+00	1.16E-14	2.32E-14			
Se-79	1.3221E-05	1.89	3.78	0.00E+00	2.50E-05	5.00E-05			
Sn-126	1.1491E-05	1.89	3.78	0.00E+00	2.17E-05	4.34E-05			
Sr-90	9.5541E-01	1.89	3.78	0.00E+00	1.81E+00	3.61E+00			
Tc-99	4.6656E-04	1.89	3.78	0.00E+00	8.81E-04	1.76E-03			
Th-229	1.9085E-11	1.89	3.78	0.00E+00	3.61E-11	7.21E-11			
Th-230	2.1913E-10	1.89	3.78	0.00E+00	4.14E-10	8.28E-10			
Th-232	8.3478E-12	1.89	3.78	0.00E+00	1.58E-11	3.15E-11			
Ti-208	1.8752E-08	1.89	3.78	0.00E+00	3.54E-08	7.09E-08			
U-232	5.0782E-08	1.89	3.78	0.00E+00	9.59E-08	1.92E-07			
U-233	3.2596E-09	1.89	3.78	0.00E+00	6.16E-09	1.23E-08			
U-234	3.9817E-07	1.89	3.78	0.00E+00	7.52E-07	1.50E-06			
U-235	-2.7761E-06	1.89	0.00	1.19E-03	1.18E-03	1.19E-03			
U-236	1.6190E-05	1.89	3.78	0.00E+00	3.06E-05	6.12E-05			
U-238	-2.8547E-09	1.89	0.00	1.38E-05	1.38E-05	1.38E-05			
Y-90	9.5557E-01	1.89	3.78	0.00E+00	1.81E+00	3.61E+00			
Other Radionuclides					2.30E+00	4.61E+00			

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	SST	SST	
	U	U	
	93.051	60 to 100	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		1.89 3.78	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.07 0.14		

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TMI-2  
SNF ID # 228  
Fuel Units & Descr: 1 - CANISTER OF SCRAP  
Heavy Metal Mass BOL=0.032kg, EOL=0.032kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date. 1979  
Estimates as of 2010  
Template PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT). 0.00176911  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x10"  
0.06

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	0.19	0.38	0.00E+00	1.26E-10	2.52E-10	Avg MeV	
Am-241	1.3144E-01	0.19	0.38	0.00E+00	2.50E-02	5.00E-02	0.0150	2.587E+10
Am-242m	3.0039E-04	0.19	0.38	0.00E+00	5.71E-05	1.14E-04	0.0250	5.239E+09
Am-243	6.2629E-04	0.19	0.38	0.00E+00	1.19E-04	2.38E-04	0.0375	5.070E+09
C-14	4.7965E-05	0.19	0.38	0.00E+00	9.12E-06	1.82E-05	0.0575	5.531E+09
Cf-252	8.0297E-07	0.19	0.38	0.00E+00	1.53E-07	3.05E-07	0.0850	2.931E+09
Cm-243	3.1993E-04	0.19	0.38	0.00E+00	6.08E-05	1.22E-04	0.1250	2.141E+09
Cm-244	7.1851E-02	0.19	0.38	0.00E+00	1.37E-02	2.73E-02	0.2250	2.516E+09
Co-60	9.5220E-03	0.19	0.38	0.00E+00	1.81E-03	3.62E-03	0.3750	1.080E+09
Cs-134	1.1662E-03	0.19	0.38	0.00E+00	2.22E-04	4.44E-04	0.5750	2.481E+10
Cs-135	1.4433E-05	0.19	0.38	0.00E+00	2.75E-06	5.49E-06	0.8500	4.897E+08
Cs-137	1.7603E+00	0.19	0.38	0.00E+00	3.35E-01	6.70E-01	1.2500	6.614E+08
Eu-154	4.5203E-02	0.19	0.38	0.00E+00	8.60E-03	1.72E-02	1.7500	1.449E+07
Eu-155	7.1479E-03	0.19	0.38	0.00E+00	1.36E-03	2.72E-03	2.2500	2.677E+07
Fe-55	6.1919E-04	0.19	0.38	0.00E+00	1.18E-04	2.36E-04	2.7500	3.009E+03
H-3	3.6386E-02	0.19	0.38	0.00E+00	6.92E-03	1.38E-02	3.5000	3.942E+02
I-129	9.8288E-07	0.19	0.38	0.00E+00	1.87E-07	3.74E-07	5.0000	1.685E+02
Kr-85	5.5844E-02	0.19	0.38	0.00E+00	1.02E-02	2.05E-02	7.0000	1.943E+01
Np-237	1.0546E-05	0.19	0.38	0.00E+00	2.01E-06	4.01E-06	11.0000	2.231E+00
Pa-231	1.1370E-09	0.19	0.38	0.00E+00	2.16E-10	4.32E-10		
Pb-210	3.3624E-11	0.19	0.38	0.00E+00	6.39E-12	1.28E-11		
Pm-147	5.1211E-03	0.19	0.38	0.00E+00	9.74E-04	1.95E-03		
Pu-238	8.0669E-02	0.19	0.38	0.00E+00	1.53E-02	3.07E-02		
Pu-239	1.1626E-02	0.19	0.38	0.00E+00	2.21E-03	4.42E-03		
Pu-240	1.5097E-02	0.19	0.38	0.00E+00	2.87E-03	5.74E-03		
Pu-241	1.4567E+00	0.19	0.38	0.00E+00	2.77E-01	5.54E-01		
Pu-242	6.4260E-05	0.19	0.38	0.00E+00	1.22E-05	2.44E-05		
Ra-226	1.1392E-10	0.19	0.38	0.00E+00	2.17E-11	4.33E-11		
Ra-228	5.1841E-12	0.19	0.38	0.00E+00	9.86E-13	1.97E-12		
Ru-106	5.9012E-07	0.19	0.38	0.00E+00	1.12E-07	2.24E-07		
Se-79	1.2379E-05	0.19	0.38	0.00E+00	2.35E-06	4.71E-06		
Sn-126	2.5210E-05	0.19	0.38	0.00E+00	4.79E-06	9.59E-06		
Sr-90	1.1630E+00	0.19	0.38	0.00E+00	2.21E-01	4.42E-01		
Tc-99	3.9357E-04	0.19	0.38	0.00E+00	7.49E-05	1.50E-04		
Th-229	8.5691E-11	0.19	0.38	0.00E+00	1.63E-11	3.26E-11		
Th-230	1.4493E-08	0.19	0.38	0.00E+00	2.76E-09	5.51E-09		
Th-232	5.2923E-12	0.19	0.38	0.00E+00	1.01E-12	2.01E-12		
Th-208	1.9202E-07	0.19	0.38	0.00E+00	3.65E-08	7.30E-08		
U-232	5.2083E-07	0.19	0.38	0.00E+00	9.91E-08	1.98E-07		
U-233	2.4386E-08	0.19	0.38	0.00E+00	4.64E-09	9.28E-09		
U-234	4.7012E-05	0.19	0.38	0.00E+00	8.94E-06	1.79E-05		
U-235	-1.4492E-06	0.19	0.00	2.50E-06	2.22E-06	2.50E-06		
U-236	7.5759E-06	0.19	0.38	0.00E+00	1.44E-06	2.88E-06		
U-238	-2.6129E-07	0.19	0.00	1.04E-05	1.04E-05	1.04E-05		
Y-90	1.1631E+00	0.19	0.38	0.00E+00	2.21E-01	4.42E-01		
Other Radionuclides					3.21E-01	6.43E-01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.21E-03	1.04E-02
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	LIGHT WATER
Fuel Cladding:	ZIRC	ZIRC
BOL HM Constituents:	U	U
BOL Enrichment %:	3.588	0 to 5

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal		0.19
Bounding		0.38

Basis for burnup used in estimate

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.17	
Bounding	0.34	

Estimated EOL HM/ Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TMI-2 CORE DEBRIS  
SNF ID #: 914  
Fuel Units & Descr: 341 - DEBRIS  
Heavy Metal Mass: BOL=82038.394kg; EOL=81749.226kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1979  
Estimates as of: 2010  
Template: PWR (Light Water, Zirc, 0 to 5% U)  
<sup>2</sup>Template Burnup(MWd): 61.92  
Template BOL Heavy Metal Mass (MT): 0.00176911  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x15"  
341.00

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	274,985.09	549,970.18	0.00E+00	1.83E-04	3.65E-04	Avg MeV	
Am-241	1.3144E-01	274,985.09	549,970.18	0.00E+00	3.61E+04	7.23E+04	0.0150	3.740E+16
Am-242m	3.0039E-04	274,985.09	549,970.18	0.00E+00	8.26E+01	1.65E+02	0.0250	7.575E+15
Am-243	6.2629E-04	274,985.09	549,970.18	0.00E+00	1.72E+02	3.44E+02	0.0375	7.331E+15
C-14	4.7965E-05	274,985.09	549,970.18	0.00E+00	1.32E+01	2.64E+01	0.0575	7.997E+15
Cl-36	8.0297E-07	274,985.09	549,970.18	0.00E+00	2.21E-01	4.42E-01	0.0850	4.238E+15
Cm-243	3.1993E-04	274,985.09	549,970.18	0.00E+00	8.80E+01	1.76E+02	0.1250	3.096E+15
Cm-244	7.1851E-02	274,985.09	549,970.18	0.00E+00	1.98E+04	3.95E+04	0.2250	3.638E+15
Co-60	9.5220E-03	274,985.09	549,970.18	0.00E+00	2.62E+03	5.24E+03	0.3750	1.561E+15
Cs-134	1.1662E-03	274,985.09	549,970.18	0.00E+00	3.21E+02	6.41E+02	0.5750	3.587E+16
Cs-135	1.4433E-05	274,985.09	549,970.18	0.00E+00	3.97E+00	7.94E+00	0.8500	7.080E+14
Cs-137	1.7603E+00	274,985.09	549,970.18	0.00E+00	4.84E+05	9.68E+05	1.2500	9.563E+14
Eu-154	4.5203E-02	274,985.09	549,970.18	0.00E+00	1.24E+04	2.49E+04	1.7500	2.095E+13
Eu-155	7.1479E-03	274,985.09	549,970.18	0.00E+00	1.97E+03	3.93E+03	2.2500	3.870E+09
Fe-55	6.1919E-04	274,985.09	549,970.18	0.00E+00	1.70E+02	3.41E+02	2.7500	4.350E+09
H-3	3.6386E-02	274,985.09	549,970.18	0.00E+00	1.00E+04	2.00E+04	3.5000	5.701E+08
I-129	9.8288E-07	274,985.09	549,970.18	0.00E+00	2.70E-01	5.41E-01	5.0000	2.437E+08
Kr-85	5.3844E-02	274,985.09	549,970.18	0.00E+00	1.48E+04	2.96E+04	7.0000	2.809E+07
Np-237	1.0546E-05	274,985.09	549,970.18	0.00E+00	2.90E+00	5.80E+00	11.0000	3.226E+06
Pa-231	1.1370E-09	274,985.09	549,970.18	0.00E+00	3.13E-04	6.25E-04		
Pb-210	3.3624E-11	274,985.09	549,970.18	0.00E+00	9.25E-06	1.85E-05		
Pm-147	5.1211E-03	274,985.09	549,970.18	0.00E+00	1.41E+03	2.82E+03		
Pu-238	8.0669E-02	274,985.09	549,970.18	0.00E+00	2.22E+04	4.44E+04		
Pu-239	1.1626E-02	274,985.09	549,970.18	0.00E+00	3.20E+03	6.39E+03		
Pu-240	1.5097E-02	274,985.09	549,970.18	0.00E+00	4.15E+03	8.30E+03		
Pu-241	1.4567E+00	274,985.09	549,970.18	0.00E+00	4.01E+05	8.01E+05		
Pu-242	6.4260E-05	274,985.09	549,970.18	0.00E+00	1.77E+01	3.53E+01		
Ra-226	1.1392E-10	274,985.09	549,970.18	0.00E+00	3.13E-05	6.27E-05		
Ra-228	5.1841E-12	274,985.09	549,970.18	0.00E+00	1.43E-06	2.85E-06		
Ru-106	5.9012E-07	274,985.09	549,970.18	0.00E+00	1.62E-01	3.25E-01		
Se-79	1.2379E-05	274,985.09	549,970.18	0.00E+00	3.40E+00	6.81E+00		
Sn-126	2.5210E-05	274,985.09	549,970.18	0.00E+00	6.93E+00	1.39E+01		
Sr-90	1.1630E+00	274,985.09	549,970.18	0.00E+00	3.20E+05	6.40E+05		
Tc-99	3.9357E-04	274,985.09	549,970.18	0.00E+00	1.08E+02	2.16E+02		
Th-229	8.5691E-11	274,985.09	549,970.18	0.00E+00	2.36E-05	4.71E-05		
Th-230	1.4493E-08	274,985.09	549,970.18	0.00E+00	3.99E-03	7.97E-03		
Th-232	5.2923E-12	274,985.09	549,970.18	0.00E+00	1.46E-06	2.91E-06		
Ti-208	1.9202E-07	274,985.09	549,970.18	0.00E+00	5.28E-02	1.06E-01		
U-232	5.2083E-07	274,985.09	549,970.18	0.00E+00	1.43E-01	2.86E-01		
U-233	2.4386E-08	274,985.09	549,970.18	0.00E+00	6.71E-03	1.34E-02		
U-234	4.7012E-05	274,985.09	549,970.18	0.00E+00	1.29E+01	2.59E+01		
U-235	-1.4492E-06	274,985.09	0.00	4.50E+00	4.10E+00	4.50E+00		
U-236	7.5759E-06	274,985.09	549,970.18	0.00E+00	2.08E+00	4.17E+00		
U-238	-2.6129E-07	274,985.09	0.00	2.69E+01	2.68E+01	2.69E+01		
Y-90	1.1631E+00	274,985.09	549,970.18	0.00E+00	3.20E+05	6.40E+05		
Other Radionuclides					4.65E+05	9.29E+05		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.54E+03	1.51E+04
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ZIRC	ZIRC	
	U	U	
	2.539514873	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
	260.471.90	274,985.09	
Nominal			Nominal burnup calculated from the heavy metal mass destroyed
Bounding	489.359.02	549.970.18	Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
	0.10	1.06	
Nominal			
Bounding	0.19	1.12	1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TMI-2 CORE DEBRIS (D-153 & 383)  
SNF ID #: 229  
Fuel Units & Descr: 2 - DEBRIS  
Heavy Metal Mass BOL=19.08kg EOL=19.01kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1979  
Estimates as of 2010  
Template PWR (Light Water, Zirc, 0 to 5%, U)  
<sup>2</sup>Template Burnup(MWd) 61.92  
Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x15"  
2.00

II. Estimates							Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	66.57	133.13	0.00E+00	4.42E-08	8.84E-08	Avg MeV	
Am-241	1.3144E-01	66.57	133.13	0.00E+00	8.75E+00	1.75E+01	0.0150	9.053E+12
Am-242m	3.0039E-04	66.57	133.13	0.00E+00	2.00E-02	4.00E-02	0.0250	1.834E+12
Am-243	6.2629E-04	66.57	133.13	0.00E+00	4.17E-02	8.34E-02	0.0375	1.775E+12
C-14	4.7965E-05	66.57	133.13	0.00E+00	3.19E-03	6.39E-03	0.0575	1.936E+12
Ct-36	8.0297E-07	66.57	133.13	0.00E+00	5.35E-05	1.07E-04	0.0850	1.026E+12
Cm-243	3.1993E-04	66.57	133.13	0.00E+00	2.13E-02	4.26E-02	0.1250	7.494E+11
Cm-244	7.1851E-02	66.57	133.13	0.00E+00	4.78E+00	9.57E+00	0.2250	8.807E+11
Co-60	9.5220E-03	66.57	133.13	0.00E+00	6.34E-01	1.27E+00	0.3750	3.779E+11
Cs-134	1.1662E-03	66.57	133.13	0.00E+00	7.76E-02	1.55E-01	0.5750	8.683E+12
Cs-135	1.4433E-05	66.57	133.13	0.00E+00	9.61E-04	1.92E-03	0.8500	1.714E+11
Cs-137	1.7603E+00	66.57	133.13	0.00E+00	1.17E+02	2.34E+02	1.2500	2.315E+11
Eu-154	4.5203E-02	66.57	133.13	0.00E+00	3.01E+00	6.02E+00	1.7500	5.072E+09
Eu-155	7.1479E-03	66.57	133.13	0.00E+00	4.76E-01	9.52E-01	2.2500	9.369E+05
Fe-55	6.1919E-04	66.57	133.13	0.00E+00	4.12E-02	8.24E-02	2.7500	1.053E+06
H-3	3.6386E-02	66.57	133.13	0.00E+00	2.42E+00	4.84E+00	3.5000	1.380E+05
I-129	9.8288E-07	66.57	133.13	0.00E+00	6.54E-05	1.31E-04	5.0000	5.898E+04
Kr-85	5.3844E-02	66.57	133.13	0.00E+00	3.58E+00	7.17E+00	7.0000	6.800E+03
Np-237	1.0546E-05	66.57	133.13	0.00E+00	7.02E-04	1.40E-03	11.0000	7.810E+02
Pa-231	1.1370E-09	66.57	133.13	0.00E+00	7.57E-08	1.51E-07		
Pb-210	3.3624E-11	66.57	133.13	0.00E+00	2.24E-09	4.48E-09		
Pm-147	5.1211E-03	66.57	133.13	0.00E+00	3.41E-01	6.82E-01		
Pu-238	8.0669E-02	66.57	133.13	0.00E+00	5.37E+00	1.07E+01		
Pu-239	1.1626E-02	66.57	133.13	0.00E+00	7.74E-01	1.55E+00		
Pu-240	1.5097E-02	66.57	133.13	0.00E+00	1.00E+00	2.01E+00		
Pu-241	1.4567E+00	66.57	133.13	0.00E+00	9.70E+01	1.94E+02		
Pu-242	6.4260E-05	66.57	133.13	0.00E+00	4.28E-03	8.56E-03		
Ra-226	1.1392E-10	66.57	133.13	0.00E+00	7.58E-09	1.52E-08		
Ra-228	5.1841E-12	66.57	133.13	0.00E+00	3.45E-10	6.90E-10		
Ru-106	5.9012E-07	66.57	133.13	0.00E+00	3.93E-05	7.86E-05		
Se-79	1.2379E-05	66.57	133.13	0.00E+00	8.24E-04	1.65E-03		
Sn-126	2.5210E-05	66.57	133.13	0.00E+00	1.68E-03	3.36E-03		
Sr-90	1.1630E+00	66.57	133.13	0.00E+00	7.74E+01	1.55E+02		
Tc-99	3.9357E-04	66.57	133.13	0.00E+00	2.62E-02	5.24E-02		
Th-229	8.5691E-11	66.57	133.13	0.00E+00	5.70E-09	1.14E-08		
Th-230	1.4493E-08	66.57	133.13	0.00E+00	9.65E-07	1.93E-06		
Th-232	5.2923E-12	66.57	133.13	0.00E+00	3.52E-10	7.05E-10		
Ti-208	1.9202E-07	66.57	133.13	0.00E+00	1.28E-05	2.56E-05		
U-232	5.2083E-07	66.57	133.13	0.00E+00	3.47E-05	6.93E-05		
U-233	2.4386E-08	66.57	133.13	0.00E+00	1.62E-06	3.25E-06		
U-234	4.7012E-05	66.57	133.13	0.00E+00	3.13E-03	6.26E-03		
U-235	-1.4492E-06	66.57	0.00	1.29E-03	1.19E-03	1.29E-03		
U-236	7.5759E-06	66.57	133.13	0.00E+00	5.04E-04	1.01E-03		
U-238	-2.6129E-07	66.57	0.00	6.21E-03	6.19E-03	6.21E-03		
Y-90	1.1631E+00	66.57	133.13	0.00E+00	7.74E+01	1.55E+02		
Other Radionuclides					1.12E+02	2.25E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %:	3.125	0 to 5	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	60.58	66.57	
Bounding	113.81	133.13	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.10	1.10	
Bounding	0.20	1.17	1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TORY-1IA  
SNF ID #: 230  
Fuel Units & Descr: 146 - CANISTER OF SCRAP  
Heavy Metal Mass: BOL=48 647kg, EOL=48 647kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1962  
Estimates as of: 2010  
Template: HFBR (Heavy Water, Alum, 40 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 164.6  
Template BOL Heavy Metal Mass (MT): 0.000377  
Template Decay Time: 35 years

Estimated  
Canister usage:  
HIC  
3.65

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.5869E-10	896.18	1,792.36	0.00E+00	8.59E-07	1.72E-06	Avg MeV	
Am-241	1.0109E-02	896.18	1,792.36	0.00E+00	9.06E+00	1.81E+01	0.0150	1.324E+14
Am-242m	1.2789E-06	896.18	1,792.36	0.00E+00	1.15E-03	2.29E-03	0.0250	2.720E+13
Am-243	3.7047E-05	896.18	1,792.36	0.00E+00	3.32E-02	6.64E-02	0.0375	2.384E+13
C-14	2.6416E-08	896.18	1,792.36	0.00E+00	2.37E-05	4.73E-05	0.0575	2.565E+13
Cl-36	4.4441E-31	896.18	1,792.36	0.00E+00	3.98E-28	7.97E-28	0.0850	1.535E+13
Cm-243	3.9605E-06	896.18	1,792.36	0.00E+00	3.55E-03	7.10E-03	0.1250	1.035E+13
Cm-244	2.6227E-03	896.18	1,792.36	0.00E+00	2.35E+00	4.70E+00	0.2250	1.327E+13
Co-60	6.7740E-06	896.18	1,792.36	0.00E+00	6.07E-03	1.21E-02	0.3750	5.757E+12
Cs-134	6.8894E-05	896.18	1,792.36	0.00E+00	6.17E-02	1.23E-01	0.5750	9.616E+13
Cs-135	4.2564E-06	896.18	1,792.36	0.00E+00	3.81E-03	7.63E-03	0.8500	1.424E+12
Cs-137	1.4399E+00	896.18	1,792.36	0.00E+00	1.29E+03	2.58E+03	1.2500	8.509E+11
Eu-154	1.5522E-02	896.18	1,792.36	0.00E+00	1.39E+01	2.78E+01	1.7500	4.025E+10
Eu-155	1.7588E-03	896.18	1,792.36	0.00E+00	1.58E+00	3.15E+00	2.2500	2.787E+06
Fe-55	2.4933E-05	896.18	1,792.36	0.00E+00	2.23E-02	4.47E-02	2.7500	2.801E+06
H-3	1.9945E-03	896.18	1,792.36	0.00E+00	1.79E+00	3.57E+00	3.5000	7.448E+04
I-129	6.6403E-07	896.18	1,792.36	0.00E+00	5.95E-04	1.19E-03	5.0000	3.165E+04
Kr-85	4.1002E-02	896.18	1,792.36	0.00E+00	3.67E+01	7.35E+01	7.0000	3.624E+03
Np-237	3.1610E-05	896.18	1,792.36	0.00E+00	2.83E-02	5.67E-02	11.0000	4.147E+02
Pa-231	1.8876E-09	896.18	1,792.36	0.00E+00	1.69E-06	3.38E-06		
Pb-210	8.3840E-11	896.18	1,792.36	0.00E+00	7.51E-08	1.50E-07		
Pm-147	4.6501E-04	896.18	1,792.36	0.00E+00	4.17E-01	8.33E-01		
Pu-238	1.3645E-01	896.18	1,792.36	0.00E+00	1.22E+02	2.45E+02		
Pu-239	6.9502E-04	896.18	1,792.36	0.00E+00	6.23E-01	1.25E+00		
Pu-240	3.8183E-04	896.18	1,792.36	0.00E+00	3.42E-01	6.84E-01		
Pu-241	6.5310E-02	896.18	1,792.36	0.00E+00	5.85E+01	1.17E+02		
Pu-242	3.0911E-06	896.18	1,792.36	0.00E+00	2.77E-03	5.54E-03		
Ra-226	2.3512E-10	896.18	1,792.36	0.00E+00	2.11E-07	4.21E-07		
Ra-228	3.3366E-14	896.18	1,792.36	0.00E+00	2.99E-11	5.98E-11		
Ru-106	2.4490E-10	896.18	1,792.36	0.00E+00	2.19E-07	4.39E-07		
Se-79	1.2333E-05	896.18	1,792.36	0.00E+00	1.11E-02	2.21E-02		
Sn-126	1.0194E-05	896.18	1,792.36	0.00E+00	9.14E-03	1.83E-02		
Sr-90	1.3348E+00	896.18	1,792.36	0.00E+00	1.20E+03	2.39E+03		
Tc-99	3.8056E-04	896.18	1,792.36	0.00E+00	3.41E-01	6.82E-01		
Th-229	1.7868E-11	896.18	1,792.36	0.00E+00	1.60E-08	3.20E-08		
Th-230	2.3348E-08	896.18	1,792.36	0.00E+00	2.09E-05	4.18E-05		
Th-232	4.1288E-14	896.18	1,792.36	0.00E+00	3.70E-11	7.40E-11		
Ti-208	4.3190E-08	896.18	1,792.36	0.00E+00	3.87E-05	7.74E-05		
U-232	1.1707E-07	896.18	1,792.36	0.00E+00	1.05E-04	2.10E-04		
U-233	7.2175E-09	896.18	1,792.36	0.00E+00	6.47E-06	1.29E-05		
U-234	6.1543E-05	896.18	1,792.36	0.00E+00	5.52E-02	1.10E-01		
U-235	2.8661E-06	896.18	0.00	9.80E-02	9.54E-02	9.80E-02		
U-236	1.6701E-05	896.18	1,792.36	0.00E+00	1.50E-02	2.99E-02		
U-238	-9.4194E-09	896.18	0.00	1.12E-03	1.11E-03	1.12E-03		
Y-90	1.3348E+00	896.18	1,792.36	0.00E+00	1.20E+03	2.39E+03		
Other Radionuclides					1.24E+03	2.47E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	BERYLLIUM	HEAVY WATER	This Template was used for the following reasons.
Fuel Cladding	NONE	ALUM	This fuel matches on all parameters except cladding (none) and moderator (Heavy Water is conservative)
BOL HM Constituents	U	U	
BOL Enrichment %	93.175	40 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		896.18	Nominal burnup assumed to be 2% of BOL heavy metal mass.
Bounding		1,792.36	Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.04		0.98
Bounding	0.08		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TORY-IC  
SNF ID #: 231  
Fuel Units & Descr: 655 - CANISTER OF SCRAP  
Heavy Metal Mass BOL=59 081kg EOL=59 081kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1964  
Estimates as of 2010  
Template HFBR (Heavy Water, Alum, 40 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 164.6  
Template BOL Heavy Metal Mass (MT) 0.000377  
Template Decay Time 35 years

Estimated  
Canister usage:  
18"x10"  
13 10

II. Estimates							Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.5869E-10	1,088.39	2,176.79	0.00E+00	1.04E-06	2.09E-06	Avg MeV	
Am-241	1.0109E-02	1,088.39	2,176.79	0.00E+00	1.10E+01	2.20E+01	0.0150	1.608E+14
Am-242m	1.2789E-06	1,088.39	2,176.79	0.00E+00	1.39E-03	2.78E-03	0.0250	3.304E+13
Am-243	3.7047E-05	1,088.39	2,176.79	0.00E+00	4.03E-02	8.06E-02	0.0375	2.895E+13
C-14	2.6416E-08	1,088.39	2,176.79	0.00E+00	2.88E-05	5.75E-05	0.0575	3.115E+13
Cl-36	4.4441E-31	1,088.39	2,176.79	0.00E+00	4.84E-28	9.67E-28	0.0850	1.864E+13
Cm-243	3.9605E-06	1,088.39	2,176.79	0.00E+00	4.31E-03	8.62E-03	0.1250	1.257E+13
Cm-244	2.6227E-03	1,088.39	2,176.79	0.00E+00	2.85E+00	5.71E+00	0.2250	1.611E+13
Co-60	6.7740E-06	1,088.39	2,176.79	0.00E+00	7.37E-03	1.47E-02	0.3750	6.991E+12
Cs-134	6.8894E-05	1,088.39	2,176.79	0.00E+00	7.50E-02	1.50E-01	0.5750	1.168E+14
Cs-135	4.2564E-06	1,088.39	2,176.79	0.00E+00	4.63E-03	9.27E-03	0.8500	1.730E+12
Cs-137	1.4399E+00	1,088.39	2,176.79	0.00E+00	1.57E+03	3.13E+03	1.2500	1.033E+12
Eu-154	1.5522E-02	1,088.39	2,176.79	0.00E+00	1.69E+01	3.38E+01	1.7500	4.889E+10
Eu-155	1.7588E-03	1,088.39	2,176.79	0.00E+00	1.91E+00	3.83E+00	2.2500	3.384E+06
Fe-55	2.4933E-05	1,088.39	2,176.79	0.00E+00	2.71E-02	5.43E-02	2.7500	3.402E+06
H-3	1.9945E-03	1,088.39	2,176.79	0.00E+00	2.17E+00	4.34E+00	3.5000	9.045E+04
I-129	6.6403E-07	1,088.39	2,176.79	0.00E+00	7.23E-04	1.45E-03	5.0000	3.844E+04
Kr-85	4.1002E-02	1,088.39	2,176.79	0.00E+00	4.46E+01	8.93E+01	7.0000	4.401E+03
Np-237	3.1610E-05	1,088.39	2,176.79	0.00E+00	3.44E-02	6.88E-02	11.0000	5.036E+02
Pa-231	1.8876E-09	1,088.39	2,176.79	0.00E+00	2.05E-06	4.11E-06		
Pb-210	8.3840E-11	1,088.39	2,176.79	0.00E+00	9.13E-08	1.83E-07		
Pm-147	4.6501E-04	1,088.39	2,176.79	0.00E+00	5.06E-01	1.01E+00		
Pu-238	1.3645E-01	1,088.39	2,176.79	0.00E+00	1.49E+02	2.97E+02		
Pu-239	6.9502E-04	1,088.39	2,176.79	0.00E+00	7.56E-01	1.51E+00		
Pu-240	3.8183E-04	1,088.39	2,176.79	0.00E+00	4.16E-01	8.31E-01		
Pu-241	6.5310E-02	1,088.39	2,176.79	0.00E+00	7.11E+01	1.42E+02		
Pu-242	3.0911E-06	1,088.39	2,176.79	0.00E+00	3.36E-03	6.73E-03		
Ra-226	2.3512E-10	1,088.39	2,176.79	0.00E+00	2.56E-07	5.12E-07		
Ra-228	3.3366E-14	1,088.39	2,176.79	0.00E+00	3.63E-11	7.26E-11		
Ru-106	2.4490E-10	1,088.39	2,176.79	0.00E+00	2.67E-07	5.33E-07		
Se-79	1.2333E-05	1,088.39	2,176.79	0.00E+00	1.34E-02	2.68E-02		
Sn-126	1.0194E-05	1,088.39	2,176.79	0.00E+00	1.11E-02	2.22E-02		
Sr-90	1.3348E+00	1,088.39	2,176.79	0.00E+00	1.45E+03	2.91E+03		
Tc-99	3.8056E-04	1,088.39	2,176.79	0.00E+00	4.14E-01	8.28E-01		
Th-229	1.7868E-11	1,088.39	2,176.79	0.00E+00	1.94E-08	3.89E-08		
Th-230	2.3348E-08	1,088.39	2,176.79	0.00E+00	2.54E-05	5.08E-05		
Th-232	4.1288E-14	1,088.39	2,176.79	0.00E+00	4.49E-11	8.99E-11		
Th-208	4.3190E-08	1,088.39	2,176.79	0.00E+00	4.70E-05	9.40E-05		
U-232	1.1707E-07	1,088.39	2,176.79	0.00E+00	1.27E-04	2.55E-04		
U-233	7.2175E-09	1,088.39	2,176.79	0.00E+00	7.86E-06	1.57E-05		
U-234	6.1543E-05	1,088.39	2,176.79	0.00E+00	6.70E-02	1.34E-01		
U-235	2.8661E-06	1,088.39	0.00	1.19E-01	1.16E-01	1.19E-01		
U-236	1.6701E-05	1,088.39	2,176.79	0.00E+00	1.82E-02	3.64E-02		
U-238	9.4194E-09	1,088.39	0.00	1.36E-03	1.35E-03	1.36E-03		
Y-90	1.3348E+00	1,088.39	2,176.79	0.00E+00	1.45E+03	2.91E+03		
Other Radionuclides					1.50E+03	3.00E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except cladding (none) and moderator (Heavy Water is conservative)
Reactor Moderator	From SFD	Used	
Fuel Cladding	BERYLLIUM	HEAVY WATER	
BOL HM Constituents	NONE	ALUM	
BOL Enrichment %	U	U	
	93.147	40 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate: Nominal burnup assumed to be 2% of BOL heavy metal mass. Bounding burnup assumed to be twice nominal burnup.
	From SFD	Estimated	
Nominal		1,088.39	
Bounding		2,176.79	

  

Checks			Estimated EOL HM/Given EOL HM 0.98
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.04		
Bounding	0.08		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TREAT DRIVER  
SNF ID #: 232  
Fuel Units & Descr: 391 - ASSEMBLY  
Heavy Metal Mass: BOL=15 64kg, EOL=14 897kg  
ROD Storage Site: INEEL

Fuel decay start date: 1994  
Estimates as of: 2010  
Template: N-Reactor (Graphite, Zirc, 0 to 5%, U)  
Template Burnup(MWd): 69600  
Template BOL Heavy Metal Mass (MT): 11 6  
Template Decay Time: 15 years

Estimated  
Canister usage  
18"x15"  
14 48

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00	0 0150	1 030E+14
Am-241	7 2313E-02	783.73	1,567.46	0 00E+00	5 67E+01	1 13E+02	0 0250	2 113E+13
Am-242m	6 2011E-05	783.73	1,567.46	0 00E+00	4 86E-02	9 72E-02	0 0375	1 970E+13
Am-243	4 6336E-05	783.73	1,567.46	0 00E+00	3 63E-02	7 26E-02	0 0575	2 115E+13
C-14	9 2170E-05	783.73	1,567.46	0 00E+00	7 22E-02	1 44E-01	0 0850	1 180E+13
Cl-36	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00	0 1250	8 058E+12
Cm-243	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00	0 2250	1 014E+13
Cm-244	7 4511E-04	783.73	1,567.46	0 00E+00	5 84E-01	1 17E+00	0 3750	4 374E+12
Co-60	3 4842E-04	783.73	1,567.46	0 00E+00	2 73E-01	5 46E-01	0 5750	9 345E+13
Cs-134	1 0795E-03	783.73	1,567.46	0 00E+00	8 46E-01	1 69E+00	0 8500	1 282E+12
Cs-135	1 0066E-05	783.73	1,567.46	0 00E+00	7 89E-03	1 58E-02	1 2500	8 559E+11
Cs-137	1 6092E+00	783.73	1,567.46	0 00E+00	1 26E+03	2 52E+03	1 7500	3 542E+10
Eu-154	1 8822E-02	783.73	1,567.46	0 00E+00	1 48E+01	2 95E+01	2 2500	2 707E+06
Eu-155	1 7672E-03	783.73	1,567.46	0 00E+00	1 39E+00	2 77E+00	2 7500	9 738E+04
Fe-55	9 0172E-05	783.73	1,567.46	0 00E+00	7 07E-02	1 41E-01	3 5000	4 567E+04
H-3	4 3506E-03	783.73	1,567.46	0 00E+00	3 41E+00	6 82E+00	5 0000	1 641E+04
I-129	8 6006E-07	783.73	1,567.46	0 00E+00	6 74E-04	1 35E-03	7 0000	1 868E+03
Kr-85	6 1652E-02	783.73	1,567.46	0 00E+00	4 83E+01	9 66E+01	11 0000	2 133E+02
Np-237	7 7672E-06	783.73	1,567.46	0 00E+00	6 09E-03	1 22E-02		
Pa-231	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Pb-210	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Pm-147	1 8175E-02	783.73	1,567.46	0 00E+00	1 42E+01	2 85E+01		
Pu-238	2 2170E-02	783.73	1,567.46	0 00E+00	1 74E+01	3 47E+01		
Pu-239	2 8836E-02	783.73	1,567.46	0 00E+00	2 26E+01	4 52E+01		
Pu-240	2 2830E-02	783.73	1,567.46	0 00E+00	1 79E+01	3 58E+01		
Pu-241	1 1362E+00	783.73	1,567.46	0 00E+00	8 90E+02	1 78E+03		
Pu-242	1 4526E-05	783.73	1,567.46	0 00E+00	1 14E-02	2 28E-02		
Ra-226	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Ra-228	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Ru-106	4 2672E-06	783.73	1,567.46	0 00E+00	3 34E-03	6 69E-03		
Se-79	1 0901E-05	783.73	1,567.46	0 00E+00	8 54E-03	1 71E-02		
Sn-126	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Sr-90	1 1546E+00	783.73	1,567.46	0 00E+00	9 05E+02	1 81E+03		
Tc-99	3 6494E-04	783.73	1,567.46	0 00E+00	2 86E-01	5 72E-01		
Th-229	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Th-230	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Th-232	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
Tl-208	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
U-232	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
U-233	0 0000E+00	783.73	1,567.46	0 00E+00	0 00E+00	0 00E+00		
U-234	6 3994E-05	783.73	1,567.46	0 00E+00	5 02E-02	1 00E-01		
U-235	-1.2944E-06	783.73	0 00	3 13E-02	3 02E-02	3.13E-02		
U-236	1.1932E-05	783.73	1,567.46	0 00E+00	9 35E-03	1.87E-02		
U-238	-3 0619E-07	783.73	0 00	3 94E-04	1 54E-04	3 94E-04		
Y-90	1.1550E+00	783.73	1,567.46	0 00E+00	9 05E+02	1 81E+03		
Other Radionuclides					1 21E+03	2 42E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	GRAPHITE	GRAPHITE	This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	92.5	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	30 19	783.73	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		1,567.46	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	8.35	25.96	1.01
Bounding	16.70		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA 8.5/20 FFCR OSU  
SNF ID # 1039  
Fuel Units & Descr. 3 - ELEMENT  
Heavy Metal Mass BOL=0.48kg EOL=0.472kg  
ROD Storage Site INEEL  
Fuel decay start date 2025  
Estimate as of 2010  
Template TRIGA-SS (LW/U-Zrx, SST, 10 to 20% U)  
Template Burnup(MWd) 6.65  
Template BOL Heavy Metal Mass (MT) 0.000195  
Template Decay Time 5 years

Estimated  
Canister usage  
18"x10"  
0.04

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	7.73	15.46	0.00E+00	6.59E-09	1.32E-08	Avg MeV	
Am-241	1.8331E-03	7.73	15.46	0.00E+00	1.42E-02	2.83E-02	0.0150	2.499E+12
Am-242m	1.4129E-06	7.73	15.46	0.00E+00	1.09E-05	2.19E-05	0.0250	5.500E+11
Am-243	1.4774E-07	7.73	15.46	0.00E+00	1.14E-06	2.28E-06	0.0375	4.684E+11
C-14	1.2871E-04	7.73	15.46	0.00E+00	9.95E-04	1.99E-03	0.0575	4.807E+11
Cl-36	2.8120E-06	7.73	15.46	0.00E+00	2.17E-05	4.35E-05	0.0850	2.978E+11
Cm-243	1.7940E-07	7.73	15.46	0.00E+00	1.39E-06	2.77E-06	0.1250	2.163E+11
Cm-244	1.6962E-06	7.73	15.46	0.00E+00	1.31E-05	2.62E-05	0.2250	2.526E+11
Co-60	1.2839E+00	7.73	15.46	0.00E+00	9.93E+00	1.99E+01	0.3750	1.282E+11
Cs-134	9.0541E-02	7.73	15.46	0.00E+00	7.00E-01	1.40E+00	0.5750	1.704E+12
Cs-135	3.2195E-05	7.73	15.46	0.00E+00	2.49E-04	4.98E-04	0.8500	7.315E+10
Cs-137	2.7564E+00	7.73	15.46	0.00E+00	2.13E+01	4.26E+01	1.2500	1.486E+12
Eu-154	1.5368E-02	7.73	15.46	0.00E+00	1.19E-01	2.38E-01	1.7500	9.903E+08
Eu-155	2.9293E-02	7.73	15.46	0.00E+00	2.27E-01	4.53E-01	2.2500	1.596E+09
Fe-55	7.7158E-01	7.73	15.46	0.00E+00	5.97E+00	1.19E+01	2.7500	1.267E+07
H-3	1.1111E-02	7.73	15.46	0.00E+00	8.59E-02	1.72E-01	3.5000	1.474E+06
I-129	7.3684E-07	7.73	15.46	0.00E+00	5.70E-06	1.14E-05	5.0000	8.403E+00
Kr-85	2.5263E-01	7.73	15.46	0.00E+00	1.95E+00	3.91E+00	7.0000	9.516E-01
Np-237	1.2427E-06	7.73	15.46	0.00E+00	9.61E-06	1.92E-05	11.0000	1.084E-01
Pa-231	3.8511E-09	7.73	15.46	0.00E+00	2.98E-08	5.96E-08		
Pb-210	7.3880E-15	7.73	15.46	0.00E+00	5.71E-14	1.14E-13		
Pm-147	2.1023E+00	7.73	15.46	0.00E+00	1.63E+01	3.25E+01		
Pu-238	1.0383E-03	7.73	15.46	0.00E+00	8.03E-03	1.61E-02		
Pu-239	5.5293E-03	7.73	15.46	0.00E+00	4.28E-02	8.55E-02		
Pu-240	2.1278E-03	7.73	15.46	0.00E+00	1.65E-02	3.29E-02		
Pu-241	1.0195E-01	7.73	15.46	0.00E+00	7.88E-01	1.58E+00		
Pu-242	2.3128E-07	7.73	15.46	0.00E+00	1.79E-06	3.58E-06		
Ra-226	5.2782E-14	7.73	15.46	0.00E+00	4.08E-13	8.16E-13		
Ra-228	1.9338E-10	7.73	15.46	0.00E+00	1.50E-09	2.99E-09		
Ru-106	9.1684E-02	7.73	15.46	0.00E+00	7.09E-01	1.42E+00		
Se-79	1.3018E-05	7.73	15.46	0.00E+00	1.01E-04	2.01E-04		
Sn-126	1.2167E-05	7.73	15.46	0.00E+00	9.41E-05	1.88E-04		
Sr-90	2.6045E+00	7.73	15.46	0.00E+00	2.01E+01	4.03E+01		
Tc-99	4.4241E-04	7.73	15.46	0.00E+00	3.42E-03	6.84E-03		
Th-229	1.3713E-10	7.73	15.46	0.00E+00	1.06E-09	2.12E-09		
Th-230	1.8090E-11	7.73	15.46	0.00E+00	1.40E-10	2.80E-10		
Th-232	2.5278E-10	7.73	15.46	0.00E+00	1.95E-09	3.91E-09		
Ti-208	1.6947E-08	7.73	15.46	0.00E+00	1.31E-07	2.62E-07		
U-232	4.8737E-08	7.73	15.46	0.00E+00	3.77E-07	7.54E-07	Thermal Power	
U-233	1.2203E-07	7.73	15.46	0.00E+00	9.44E-07	1.89E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.5925E-07	7.73	15.46	0.00E+00	1.23E-06	2.46E-06	4.50E-01	9.00E-01
U-235	-2.6194E-06	7.73	0.00	2.06E-04	1.86E-04	2.06E-04	Total	Total
U-236	1.2693E-05	7.73	15.46	0.00E+00	9.81E-05	1.96E-04		
U-238	-3.6331E-08	7.73	0.00	1.29E-04	1.29E-04	1.29E-04		
Y-90	2.6060E+00	7.73	15.46	0.00E+00	2.02E+01	4.03E+01		
Other Radionuclides					2.79E+01	5.58E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator:	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding:	SST	SST
BOL HM Constituents:	U	U
BOL Enrichment %:	19.9	10 to 20.1

### Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	4.68	7.73
Bounding		15.46

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

### Basis for burnup used in estimate:

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.47	1.65	1.00
Bounding	0.94		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA 8.5/20 FFCR UNIV OF CAL-IRVINE  
SNF ID #: 1050  
Fuel Units & Descr: 2 - ELEMENT  
Heavy Metal Mass: BOL=0.383kg EOL=0.38kg  
ROD Storage Site: INEEL

Fuel decay start date: 2035  
Estimates as of: 2010  
Template: TRIGA-SS (LW/U-Zr, SST, 10 to 20%, U)  
Template Burnup(MWd): 6.65  
Template BOL Heavy Metal Mass (MT): 0.000195  
Template Decay Time: 5 years

Estimated  
Canister usage,  
18"x10"  
0.02

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	3.73	7.47	0.00E+00	3.18E-09	6.36E-09	Avg MeV	
Am-241	1.8331E-03	3.73	7.47	0.00E+00	6.85E-03	1.37E-02	0.0150	1.207E+12
Am-242m	1.4129E-06	3.73	7.47	0.00E+00	5.28E-06	1.06E-05	0.0250	2.656E+11
Am-243	1.4774E-07	3.73	7.47	0.00E+00	5.52E-07	1.10E-06	0.0375	2.262E+11
C-14	1.2871E-04	3.73	7.47	0.00E+00	4.81E-04	9.61E-04	0.0575	2.322E+11
Cl-36	2.8120E-06	3.73	7.47	0.00E+00	1.05E-05	2.10E-05	0.0850	1.438E+11
Cm-243	1.7940E-07	3.73	7.47	0.00E+00	6.70E-07	1.34E-06	0.1250	1.045E+11
Cm-244	1.6962E-06	3.73	7.47	0.00E+00	6.33E-06	1.27E-05	0.2250	1.220E+11
Co-60	1.2839E+00	3.73	7.47	0.00E+00	4.79E+00	9.59E+00	0.3750	6.193E+10
Cs-134	9.0541E-02	3.73	7.47	0.00E+00	3.38E-01	6.76E-01	0.5750	8.233E+11
Cs-135	3.2195E-05	3.73	7.47	0.00E+00	1.20E-04	2.40E-04	0.8500	3.533E+10
Cs-137	2.7564E+00	3.73	7.47	0.00E+00	1.03E+01	2.06E+01	1.2500	7.175E+11
Eu-154	1.5368E-02	3.73	7.47	0.00E+00	5.74E-02	1.15E-01	1.7500	4.783E+08
Eu-155	2.9293E-02	3.73	7.47	0.00E+00	1.09E-01	2.19E-01	2.2500	7.710E+08
Fe-55	7.7158E-01	3.73	7.47	0.00E+00	2.88E+00	5.76E+00	2.7500	6.118E+06
H-3	1.1111E-02	3.73	7.47	0.00E+00	4.15E-02	8.30E-02	3.5000	7.120E+05
I-129	7.3684E-07	3.73	7.47	0.00E+00	2.75E-06	5.50E-06	5.0000	4.153E+00
Kr-85	2.5263E-01	3.73	7.47	0.00E+00	9.43E-01	1.89E+00	7.0000	4.704E-01
Np-237	1.2427E-06	3.73	7.47	0.00E+00	4.64E-06	9.28E-06	11.0000	5.361E-02
Pa-231	3.8511E-09	3.73	7.47	0.00E+00	1.44E-08	2.88E-08		
Pb-210	7.3880E-15	3.73	7.47	0.00E+00	2.76E-14	5.52E-14		
Pm-147	2.1023E+00	3.73	7.47	0.00E+00	7.85E+00	1.57E+01		
Pu-238	1.0383E-03	3.73	7.47	0.00E+00	3.88E-03	7.76E-03		
Pu-239	5.5293E-03	3.73	7.47	0.00E+00	2.07E-02	4.13E-02		
Pu-240	2.1278E-03	3.73	7.47	0.00E+00	7.95E-03	1.59E-02		
Pu-241	1.0195E-01	3.73	7.47	0.00E+00	3.81E-01	7.62E-01		
Pu-242	2.3128E-07	3.73	7.47	0.00E+00	8.64E-07	1.73E-06		
Ra-226	5.2782E-14	3.73	7.47	0.00E+00	1.97E-13	3.94E-13		
Ra-228	1.9338E-10	3.73	7.47	0.00E+00	7.22E-10	1.44E-09		
Ru-106	9.1684E-02	3.73	7.47	0.00E+00	3.42E-01	6.85E-01		
Se-79	1.3018E-05	3.73	7.47	0.00E+00	4.86E-05	9.72E-05		
Sn-126	1.2167E-05	3.73	7.47	0.00E+00	4.54E-05	9.09E-05		
Sr-90	2.6045E+00	3.73	7.47	0.00E+00	9.73E+00	1.95E+01		
Tc-99	4.4241E-04	3.73	7.47	0.00E+00	1.65E-03	3.30E-03		
Th-229	1.3713E-10	3.73	7.47	0.00E+00	5.12E-10	1.02E-09		
Th-230	1.8090E-11	3.73	7.47	0.00E+00	6.76E-11	1.35E-10		
Th-232	2.5278E-10	3.73	7.47	0.00E+00	9.44E-10	1.89E-09		
Tl-208	1.6947E-08	3.73	7.47	0.00E+00	6.33E-08	1.27E-07		
U-232	4.8737E-08	3.73	7.47	0.00E+00	1.82E-07	3.64E-07	Thermal Power	
U-233	1.2203E-07	3.73	7.47	0.00E+00	4.56E-07	9.11E-07	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.5925E-07	3.73	7.47	0.00E+00	5.95E-07	1.19E-06	2.17E-01	4.35E-01
U-235	-2.6194E-06	3.73	0.00	1.66E-04	1.56E-04	1.66E-04	Total	Total
U-238	1.2693E-05	3.73	7.47	0.00E+00	4.74E-05	9.48E-05		
U-238	-3.6331E-08	3.73	0.00	1.03E-04	1.03E-04	1.03E-04		
Y-90	2.6060E+00	3.73	7.47	0.00E+00	9.73E+00	1.95E+01		
Other Radionuclides					1.35E+01	2.69E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20.0002088	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal	3.73	2.86	
Bounding		7.47	Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.29	0.77	
Bounding	0.57		1.00

\*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA 8 5/20 FFCR UNIV OF CAL-IRVINE  
SNF ID # 1052  
Fuel Units & Descr 1 - ELEMENT  
Heavy Metal Mass BOL=0 183kg EOL=0 183kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 2035  
Estimates as of 2010  
Template TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd) 6 65  
Template BOL Heavy Metal Mass (MT): 0 000195  
Template Decay Time 5 years

Estimated  
Canister usage  
18"x10"  
0 01

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	Avg MeV	
Am-241	1 8331E-03	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0150	1 961E+06
Am-242m	1 4129E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0250	0 000E+00
Am-243	1 4774E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0375	2 676E+03
C-14	1 2871E-04	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0575	1 621E+03
Cl-36	2 8120E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0850	2 286E+05
Cm-243	1 7940E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 1250	4 514E+05
Cm-244	1 6962E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 2250	1 598E+06
Co-60	1 2839E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 3750	3 986E+03
Cs-134	9 0541E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 5750	1 961E+02
Cs-135	3 2195E-05	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 8500	3 056E+01
Cs-137	2 7564E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	1 2500	1 802E+00
Eu-154	1 5368E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	1 7500	8 816E-01
Eu-155	2 9293E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	2 2500	5 107E-01
Fe-55	7 7158E-01	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	2 7500	2 967E-01
H-3	1 1111E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	3 5000	2 653E-01
I-129	7 3684E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	5 0000	1 140E-01
Kr-85	2 5263E-01	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	7 0000	1 312E-02
Np-237	1 2427E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	11 0000	1 508E-03
Pa-231	3 8511E-09	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Pb-210	7 3880E-15	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Pm-147	2 1023E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Pu-238	1 0383E-03	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Pu-239	5 5293E-03	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Pu-240	2 1278E-03	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Pu-241	1 0195E-01	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Pu-242	2 3128E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Ra-226	5 2782E-14	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Ra-228	1 9338E-10	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Ru-106	9 1684E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Se-79	1 3018E-05	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Sn-126	1 2167E-05	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Sr-90	2 6045E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Tc-99	4 4241E-04	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Th-229	1 3713E-10	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Th-230	1 8090E-11	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Th-232	2 5278E-10	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Th-208	1 6947E-08	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
U-232	4 8737E-08	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
U-233	1 2203E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
U-234	1 5925E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
U-235	-2 6194E-06	0 00	0 00	7 92E-05	7 92E-05	7 92E-05		
U-236	1 2693E-05	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
U-238	-3 6331E-08	0 00	0 00	4 93E-05	4 93E-05	4 93E-05		
Y-90	2 6060E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
Other Radionuclides					0 00E+00	0 00E+00		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences*
Reactor Moderator	From SFD	Used	
Fuel Cladding	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
BOL HM Constituents	SST	SST	
BOL Enrichment %	U	U	
	19 99996708	10 to 20 1	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding	0 00		
			Nominal burnup taken directly from SFD (converted to MWd)
			Bounding burnup assumed to be twice nominal burnup

  

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
Bounding	0 00		
	0 00		1.00

\*Reactor shutdown, core removal, storage, shipping or other data confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (ACPR 12/20) JAPAN  
SNF ID #: 480  
Fuel Units & Descr: 182 - ELEMENT  
Heavy Metal Mass: BOL=48.357kg; EOL=48.23kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
Estimates as of: 2010  
Template: TRIGA-SS (LW/U-Zr, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
Template BOL Heavy Metal Mass (MT): 0.000195  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
1.64

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	455.87	911.73	0.00E+00	3.88E-07	7.77E-07	Avg MeV	
Am-241	1.8331E-03	455.87	911.73	0.00E+00	8.36E-01	1.67E+00	0.0150	1.474E+14
Am-242m	1.4129E-06	455.87	911.73	0.00E+00	6.44E-04	1.29E-03	0.0250	3.242E+13
Am-243	1.4774E-07	455.87	911.73	0.00E+00	6.74E-05	1.35E-04	0.0375	2.761E+13
C-14	1.2871E-04	455.87	911.73	0.00E+00	5.87E-02	1.17E-01	0.0575	2.834E+13
Cl-36	2.8120E-06	455.87	911.73	0.00E+00	1.28E-03	2.56E-03	0.0850	1.756E+13
Cm-243	1.7940E-07	455.87	911.73	0.00E+00	8.18E-05	1.64E-04	0.1250	1.275E+13
Cm-244	1.6962E-06	455.87	911.73	0.00E+00	7.73E-04	1.55E-03	0.2250	1.490E+13
Co-60	1.2839E+00	455.87	911.73	0.00E+00	5.85E+02	1.17E+03	0.3750	7.559E+12
Cs-134	9.0641E-02	455.87	911.73	0.00E+00	4.13E+01	8.25E+01	0.5750	1.005E+14
Cs-135	3.2195E-05	455.87	911.73	0.00E+00	1.47E-02	2.94E-02	0.8500	4.313E+12
Cs-137	2.7564E+00	455.87	911.73	0.00E+00	1.26E+03	2.51E+03	1.2500	8.759E+13
Eu-154	1.5368E-02	455.87	911.73	0.00E+00	7.01E+00	1.40E+01	1.7500	5.838E+10
Eu-155	2.9293E-02	455.87	911.73	0.00E+00	1.34E+01	2.67E+01	2.2500	9.411E+10
Fe-55	7.7158E-01	455.87	911.73	0.00E+00	3.52E+02	7.03E+02	2.7500	7.468E+08
H-3	1.1111E-02	455.87	911.73	0.00E+00	5.07E+00	1.01E+01	3.5000	8.691E+07
I-129	7.3684E-07	455.87	911.73	0.00E+00	3.36E-04	6.72E-04	5.0000	5.079E+02
Kr-85	2.5263E-01	455.87	911.73	0.00E+00	1.15E+02	2.30E+02	7.0000	5.754E+01
Np-237	1.2427E-06	455.87	911.73	0.00E+00	5.67E-04	1.13E-03	11.0000	6.557E+00
Pa-231	3.8511E-09	455.87	911.73	0.00E+00	1.76E-06	3.51E-06		
Pb-210	7.3880E-15	455.87	911.73	0.00E+00	3.37E-12	6.74E-12		
Pm-147	2.1023E+00	455.87	911.73	0.00E+00	9.58E+02	1.92E+03		
Pu-238	1.0383E-03	455.87	911.73	0.00E+00	4.73E-01	9.47E-01		
Pu-239	5.5293E-03	455.87	911.73	0.00E+00	2.52E+00	5.04E+00		
Pu-240	2.1278E-03	455.87	911.73	0.00E+00	9.70E-01	1.94E+00		
Pu-241	1.0195E-01	455.87	911.73	0.00E+00	4.65E+01	9.30E+01		
Pu-242	2.3128E-07	455.87	911.73	0.00E+00	1.05E-04	2.11E-04		
Ra-226	5.2782E-14	455.87	911.73	0.00E+00	2.41E-11	4.81E-11		
Ra-228	1.9338E-10	455.87	911.73	0.00E+00	8.82E-08	1.76E-07		
Ru-106	9.1684E-02	455.87	911.73	0.00E+00	4.18E+01	8.36E+01		
Se-79	1.3018E-05	455.87	911.73	0.00E+00	5.93E-03	1.19E-02		
Sn-126	1.2167E-05	455.87	911.73	0.00E+00	5.55E-03	1.11E-02		
Sr-90	2.6045E+00	455.87	911.73	0.00E+00	1.19E+03	2.37E+03		
Tc-99	4.4241E-04	455.87	911.73	0.00E+00	2.02E-01	4.03E-01		
Th-229	1.3713E-10	455.87	911.73	0.00E+00	6.25E-08	1.25E-07		
Th-230	1.8090E-11	455.87	911.73	0.00E+00	8.25E-09	1.65E-08		
Th-232	2.5278E-10	455.87	911.73	0.00E+00	1.15E-07	2.30E-07		
Ti-208	1.6947E-08	455.87	911.73	0.00E+00	7.73E-06	1.55E-05		
U-232	4.8737E-08	455.87	911.73	0.00E+00	2.22E-05	4.44E-05		
U-233	1.2203E-07	455.87	911.73	0.00E+00	5.56E-05	1.11E-04		
U-234	1.5925E-07	455.87	911.73	0.00E+00	7.26E-05	1.45E-04		
U-235	-2.6194E-06	455.87	0.00	2.08E-02	1.97E-02	2.08E-02		
U-236	1.2693E-05	455.87	911.73	0.00E+00	5.79E-03	1.16E-02		
U-238	-3.6331E-08	455.87	0.00	1.30E-02	1.30E-02	1.30E-02		
Y-90	2.6060E+00	455.87	911.73	0.00E+00	1.19E+03	2.38E+03		
Other Radionuclides					1.64E+03	3.29E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
BOL HM Constituents	SST	SST	
BOL Enrichment %	U	U	
	19.95031243	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	455.87	121.62	
Bounding		911.73	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.28	0.27	
Bounding	0.55		0.99

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (ACPR 12/20) PENN STATE UNIV  
 SNF ID #: 1002  
 Fuel Units & Descr: 46 - ELEMENT  
 Heavy Metal Mass: BOL=12 779kg EOL=12 006kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 2035  
 Estimates as of 2010  
 Template TRIGA-SS (LW/U-Zrx SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd) 6 65  
 Template BOL Heavy Metal Mass (MT) 0 000195  
 Template Decay Time 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0 41

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	737.72	1,475.44	0 00E+00	6.28E-07	1.26E-06	Avg MeV	
Am-241	1 8331E-03	737.72	1,475.44	0 00E+00	1.35E+00	2 70E+00	0 0150	2.385E+14
Am-242m	1 4129E-06	737.72	1,475.44	0 00E+00	1.04E-03	2 08E-03	0 0250	5.247E+13
Am-243	1 4774E-07	737.72	1,475.44	0 00E+00	1.09E-04	2.18E-04	0 0375	4.468E+13
C-14	1.2871E-04	737.72	1,475.44	0 00E+00	9.49E-02	1 90E-01	0 0575	4.587E+13
Cl-36	2 8120E-06	737.72	1,475.44	0 00E+00	2.07E-03	4 15E-03	0 0850	2.841E+13
Cm-243	1 7940E-07	737.72	1,475.44	0 00E+00	1.32E-04	2 65E-04	0 1250	2 063E+13
Cm-244	1 6962E-06	737.72	1,475.44	0 00E+00	1.25E-03	2 50E-03	0 2250	2 410E+13
Co-60	1 2839E+00	737.72	1,475.44	0 00E+00	9.47E+02	1 89E+03	0 3750	1.223E+13
Cs-134	9 0541E-02	737.72	1,475.44	0 00E+00	6.68E+01	1 34E+02	0 5750	1 626E+14
Cs-135	3 2195E-05	737.72	1,475.44	0 00E+00	2.38E-02	4 75E-02	0 8500	6 979E+12
Cs-137	2 7564E+00	737.72	1,475.44	0 00E+00	2 03E+03	4 07E+03	1.2500	1 417E+14
Eu-154	1 5368E-02	737.72	1,475.44	0 00E+00	1.13E+01	2 27E+01	1.7500	9 448E+10
Eu-155	2 9293E-02	737.72	1,475.44	0 00E+00	2.16E+01	4 32E+01	2.2500	1.523E+11
Fe-55	7 7158E-01	737.72	1,475.44	0 00E+00	5.69E+02	1 14E+03	2 7500	1.209E+09
H-3	1 1111E-02	737.72	1,475.44	0 00E+00	8.20E+00	1 64E+01	3 5000	1 406E+08
I-129	7 3684E-07	737.72	1,475.44	0 00E+00	5.44E-04	1 09E-03	5 0000	7.812E+02
Kr-85	2 5263E-01	737.72	1,475.44	0 00E+00	1.86E+02	3 73E+02	7 0000	8.843E+01
Np-237	1 2427E-06	737.72	1,475.44	0 00E+00	9 17E-04	1 83E-03	11 0000	1 007E+01
Pa-231	3 8511E-09	737.72	1,475.44	0 00E+00	2 84E-06	5 68E-06		
Pb-210	7 3880E-15	737.72	1,475.44	0 00E+00	5.45E-12	1 09E-11		
Pm-147	2 1023E+00	737.72	1,475.44	0 00E+00	1.55E+03	3 10E+03		
Pu-238	1 0383E-03	737.72	1,475.44	0 00E+00	7.66E-01	1 53E+00		
Pu-239	5 5293E-03	737.72	1,475.44	0 00E+00	4 08E+00	8 16E+00		
Pu-240	2 1278E-03	737.72	1,475.44	0 00E+00	1.57E+00	3 14E+00		
Pu-241	1 0195E-01	737.72	1,475.44	0 00E+00	7.52E+01	1 50E+02		
Pu-242	2 3128E-07	737.72	1,475.44	0 00E+00	1.71E-04	3 41E-04		
Ra-226	5 2782E-14	737.72	1,475.44	0 00E+00	3 89E-11	7.79E-11		
Ra-228	1 9338E-10	737.72	1,475.44	0 00E+00	1.43E-07	2 85E-07		
Ru-106	9 1684E-02	737.72	1,475.44	0 00E+00	6 76E+01	1 35E+02		
Se-79	1.3018E-05	737.72	1,475.44	0 00E+00	9 60E-03	1 92E-02		
Sn-126	1.2167E-05	737.72	1,475.44	0 00E+00	8.98E-03	1 80E-02		
Sr-90	2 6045E+00	737.72	1,475.44	0 00E+00	1 92E+03	3 84E+03		
Tc-99	4 4241E-04	737.72	1,475.44	0 00E+00	3.26E-01	6 53E-01		
Th-229	1.3713E-10	737.72	1,475.44	0 00E+00	1.01E-07	2 02E-07		
Th-230	1 8090E-11	737.72	1,475.44	0 00E+00	1.33E-08	2.67E-08		
Th-232	2 5278E-10	737.72	1,475.44	0 00E+00	1.86E-07	3 73E-07		
Th-208	1 6947E-08	737.72	1,475.44	0 00E+00	1.25E-05	2.50E-05		
U-232	4 8737E-08	737.72	1,475.44	0 00E+00	3 60E-05	7.19E-05		
U-233	1.2203E-07	737.72	1,475.44	0 00E+00	9 00E-05	1 80E-04		
U-234	1.5925E-07	737.72	1,475.44	0 00E+00	1.17E-04	2.35E-04		
U-235	-2.6194E-06	737.72	0 00	5 47E-03	3.54E-03	5 47E-03		
U-236	1.2693E-05	737.72	1,475.44	0 00E+00	9.36E-03	1.87E-02		
U-238	-3 6331E-08	737.72	0 00	3 44E-03	3 42E-03	3 44E-03		
Y-90	2 6060E+00	737.72	1,475.44	0 00E+00	1.92E+03	3 85E+03		
Other Radionuclides					2 66E+03	5 32E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	19 79999842	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	240.93	737.72	
Bounding		1,475.44	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.69	3.06	
Bounding	3.39		1.00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (ACPR 12/20) SLOVENIA  
SNF ID #: 932  
Fuel Units & Descr: 1 - ELEMENT  
Heavy Metal Mass: BOL=0.276kg, EOL=0.276kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1999  
Estimates as of: 2010  
Template: TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
Template BOL Heavy Metal Mass (MT): 0.000195  
Template Decay Time: 10 years

Estimated  
Canister usage:  
18"x10"  
0.01

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3731E-09	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	Avg MeV	
Am-241	2.3865E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0150	2.933E+06
Am-242m	1.3812E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0250	0.000E+00
Am-243	1.4767E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0375	4.000E+03
C-14	1.2863E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0575	2.436E+03
Cl-36	2.8120E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0850	3.418E+05
Cm-243	1.5895E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.1250	6.747E+05
Cm-244	1.4008E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.2250	2.388E+06
Co-60	6.6541E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.3750	5.959E+03
Cs-134	1.6887E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.5750	2.931E+02
Cs-135	3.2195E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.8500	4.573E+01
Cs-137	2.4556E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.2500	2.713E+00
Eu-154	1.0268E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.7500	1.327E+00
Eu-155	1.4570E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.2500	7.689E-01
Fe-55	2.0361E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.7500	4.467E-01
H-3	8.3940E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	3.5000	3.994E-01
I-129	7.3684E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	5.0000	1.716E-01
Kr-85	1.8286E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	7.0000	1.975E-02
Np-237	1.2462E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	11.0000	2.271E-03
Pa-231	4.9143E-09	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pb-210	1.7173E-14	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pm-147	5.6165E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-238	9.9820E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-239	5.5293E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-240	2.1263E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-241	8.0165E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-242	2.3128E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ra-226	9.9774E-14	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ra-228	2.1729E-10	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ru-106	2.9519E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Se-79	1.3017E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Sn-126	1.2167E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Sr-90	2.3128E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Tc-99	4.4241E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Th-229	1.9459E-10	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Th-230	2.5564E-11	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Th-232	2.5278E-10	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ti-208	1.6947E-08	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-232	4.6812E-08	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-233	1.2206E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-234	1.7323E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-235	-2.6194E-06	0.00	0.00	1.18E-04	1.18E-04	1.18E-04		
U-236	1.2693E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-238	-3.6331E-08	0.00	0.00	7.42E-05	7.42E-05	7.42E-05		
Y-90	2.3128E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Other Radionuclides					0.00E+00	0.00E+00		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.98E-06	4.98E-06
Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	SST	SST
BOL HM Constituents	U	U
BOL Enrichment %	19.88316824	10 to 20.1

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	0.00	
Bounding		

Basis for burnup used in estimate:

Nominal burnup taken directly from SFD (converted to MWd)  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.00	
Bounding	0.00	

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (ACPR) ROMANIA

SNF ID #: 1077

Fuel Units & Descr: 75 - ELEMENT

Heavy Metal Mass BOL=14.7kg EOL=14.445kg

ROD Storage Site INEEL

Fuel decay start date 1999

Estimates as of 2010

Template TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)

Template Burnup(MWd) 6.65

Template BOL Heavy Metal Mass (MT) 0.000195

Template Decay Time 10 years

Estimated  
Canister usage  
18"x10"  
0.68

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3731E-09	243.42	486.85	0.00E+00	3.34E-07	6.68E-07	Avg MeV	
Am-241	2.3865E-03	243.42	486.85	0.00E+00	5.81E-01	1.16E+00	0.0150	6.290E+13
Am-242m	1.3812E-06	243.42	486.85	0.00E+00	3.36E-04	6.72E-04	0.0250	1.332E+13
Am-243	1.4767E-07	243.42	486.85	0.00E+00	3.59E-05	7.19E-05	0.0375	1.138E+13
C-14	1.2863E-04	243.42	486.85	0.00E+00	3.13E-02	6.26E-02	0.0575	1.213E+13
Cl-36	2.8120E-06	243.42	486.85	0.00E+00	6.85E-04	1.37E-03	0.0850	7.359E+12
Cm-243	1.5895E-07	243.42	486.85	0.00E+00	3.87E-05	7.74E-05	0.1250	4.838E+12
Cm-244	1.4008E-06	243.42	486.85	0.00E+00	3.41E-04	6.82E-04	0.2250	6.277E+12
Co-60	6.6541E-01	243.42	486.85	0.00E+00	1.62E+02	3.24E+02	0.3750	2.883E+12
Cs-134	1.6887E-02	243.42	486.85	0.00E+00	4.11E+00	8.22E+00	0.5750	4.517E+13
Cs-135	3.2195E-05	243.42	486.85	0.00E+00	7.84E-03	1.57E-02	0.8500	8.063E+11
Cs-137	2.4556E+00	243.42	486.85	0.00E+00	5.98E+02	1.20E+03	1.2500	2.424E+13
Eu-154	1.0268E-02	243.42	486.85	0.00E+00	2.50E+00	5.00E+00	1.7500	1.459E+10
Eu-155	1.4570E-02	243.42	486.85	0.00E+00	3.55E+00	7.09E+00	2.2500	7.620E+08
Fe-55	2.0361E-01	243.42	486.85	0.00E+00	4.96E+01	9.91E+01	2.7500	1.261E+07
H-3	8.3940E-03	243.42	486.85	0.00E+00	2.04E+00	4.09E+00	3.5000	1.495E+06
I-129	7.3684E-07	243.42	486.85	0.00E+00	1.79E-04	3.59E-04	5.0000	2.632E+02
Kr-85	1.8286E-01	243.42	486.85	0.00E+00	4.45E+01	8.90E+01	7.0000	2.978E+01
Np-237	1.2462E-06	243.42	486.85	0.00E+00	3.03E-04	6.07E-04	11.0000	3.391E+00
Pa-231	4.9143E-09	243.42	486.85	0.00E+00	1.20E-06	2.39E-06		
Pb-210	1.7173E-14	243.42	486.85	0.00E+00	4.18E-12	8.36E-12		
Pm-147	5.6165E-01	243.42	486.85	0.00E+00	1.37E+02	2.73E+02		
Pu-238	9.9820E-04	243.42	486.85	0.00E+00	2.43E-01	4.86E-01		
Pu-239	5.5293E-03	243.42	486.85	0.00E+00	1.35E+00	2.69E+00		
Pu-240	2.1263E-03	243.42	486.85	0.00E+00	5.18E-01	1.04E+00		
Pu-241	8.0165E-02	243.42	486.85	0.00E+00	1.95E+01	3.90E+01		
Pu-242	2.3128E-07	243.42	486.85	0.00E+00	5.63E-05	1.13E-04		
Ra-226	9.9774E-14	243.42	486.85	0.00E+00	2.43E-11	4.86E-11		
Ra-228	2.1729E-10	243.42	486.85	0.00E+00	5.29E-08	1.06E-07		
Ru-106	2.9519E-03	243.42	486.85	0.00E+00	7.19E-01	1.44E+00		
Se-79	1.3017E-05	243.42	486.85	0.00E+00	3.17E-03	6.34E-03		
Sn-126	1.2167E-05	243.42	486.85	0.00E+00	2.96E-03	5.92E-03		
Sr-90	2.3128E+00	243.42	486.85	0.00E+00	5.63E+02	1.13E+03		
Tc-99	4.4241E-04	243.42	486.85	0.00E+00	1.08E-01	2.15E-01		
Th-229	1.9459E-10	243.42	486.85	0.00E+00	4.74E-08	9.47E-08		
Th-230	2.5564E-11	243.42	486.85	0.00E+00	6.22E-09	1.24E-08		
Th-232	2.5278E-10	243.42	486.85	0.00E+00	6.15E-08	1.23E-07		
Ti-208	1.6947E-08	243.42	486.85	0.00E+00	4.13E-06	8.25E-06		
U-232	4.6812E-08	243.42	486.85	0.00E+00	1.14E-05	2.28E-05	Thermal Power	
U-233	1.2206E-07	243.42	486.85	0.00E+00	2.97E-05	5.94E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.7323E-07	243.42	486.85	0.00E+00	4.22E-05	8.43E-05	9.53E+00	1.91E+01
U-235	-2.6194E-06	243.42	0.00	6.32E-03	5.68E-03	6.32E-03	Total	Total
U-236	1.2693E-05	243.42	486.85	0.00E+00	3.09E-03	6.18E-03		
U-238	-3.6331E-08	243.42	0.00	3.96E-03	3.95E-03	3.96E-03		
Y-90	2.3128E+00	243.42	486.85	0.00E+00	5.63E+02	1.13E+03		
Other Radionuclides					5.97E+02	1.19E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	19.898	10 to 20.1	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate
Nominal	0.00	243.42	
Bounding		486.85	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.49		
Bounding	0.97		1.00

<sup>1</sup> Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup> Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (DEMOUNTABLE) U OF AZ  
 SNF ID #: 971  
 Fuel Units & Descr: 1 - ELEMENT  
 Heavy Metal Mass: BOL=0.195kg, EOL=0.181kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2035  
 Estimates as of: 2010  
 Template: TRIGA-SS (LW/U-Zr, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.000195  
 Template Decay Time: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.01

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	13.46	26.92	0.00E+00	1.15E-08	2.29E-08	Avg MeV	
Am-241	1.8331E-03	13.46	26.92	0.00E+00	2.47E-02	4.93E-02	0.0150	4.351E+12
Am-242m	1.4129E-06	13.46	26.92	0.00E+00	1.90E-05	3.80E-05	0.0250	9.574E+11
Am-243	1.4774E-07	13.46	26.92	0.00E+00	1.99E-06	3.98E-06	0.0375	8.153E+11
C-14	1.2871E-04	13.46	26.92	0.00E+00	1.73E-03	3.46E-03	0.0575	8.368E+11
Cl-36	2.8120E-06	13.46	26.92	0.00E+00	3.78E-05	7.57E-05	0.0850	5.184E+11
Cm-243	1.7940E-07	13.46	26.92	0.00E+00	2.41E-06	4.83E-06	0.1250	3.765E+11
Cm-244	1.6962E-06	13.46	26.92	0.00E+00	2.28E-05	4.57E-05	0.2250	4.398E+11
Co-60	1.2839E+00	13.46	26.92	0.00E+00	1.73E+01	3.46E+01	0.3750	2.232E+11
Cs-134	9.0541E-02	13.46	26.92	0.00E+00	1.22E+00	2.44E+00	0.5750	2.967E+12
Cs-135	3.2195E-05	13.46	26.92	0.00E+00	4.33E-04	8.67E-04	0.8500	1.273E+11
Cs-137	2.7564E+00	13.46	26.92	0.00E+00	3.71E+01	7.42E+01	1.2500	2.586E+12
Eu-154	1.5368E-02	13.46	26.92	0.00E+00	2.07E-01	4.14E-01	1.7500	1.724E+09
Eu-155	2.9293E-02	13.46	26.92	0.00E+00	3.94E-01	7.89E-01	2.2500	2.779E+09
Fe-55	7.7158E-01	13.46	26.92	0.00E+00	1.04E+01	2.08E+01	2.7500	2.205E+07
H-3	1.1111E-02	13.46	26.92	0.00E+00	1.50E-01	2.99E-01	3.5000	2.566E+06
I-129	7.3684E-07	13.46	26.92	0.00E+00	9.92E-06	1.98E-05	5.0000	1.423E+01
Kr-85	2.5263E-01	13.46	26.92	0.00E+00	3.40E+00	6.80E+00	7.0000	1.611E+00
Np-237	1.2427E-06	13.46	26.92	0.00E+00	1.67E-05	3.35E-05	11.0000	1.835E-01
Pa-231	3.8511E-09	13.46	26.92	0.00E+00	5.18E-08	1.04E-07		
Pb-210	7.3880E-15	13.46	26.92	0.00E+00	9.94E-14	1.99E-13		
Pm-147	2.1023E+00	13.46	26.92	0.00E+00	2.83E+01	5.66E+01		
Pu-238	1.0383E-03	13.46	26.92	0.00E+00	1.40E-02	2.80E-02		
Pu-239	5.5293E-03	13.46	26.92	0.00E+00	7.44E-02	1.49E-01		
Pu-240	2.1278E-03	13.46	26.92	0.00E+00	2.86E-02	5.73E-02		
Pu-241	1.0195E-01	13.46	26.92	0.00E+00	1.37E+00	2.74E+00		
Pu-242	2.3128E-07	13.46	26.92	0.00E+00	3.11E-06	6.23E-06		
Ra-226	5.2782E-14	13.46	26.92	0.00E+00	7.10E-13	1.42E-12		
Ra-228	1.9338E-10	13.46	26.92	0.00E+00	2.60E-09	5.21E-09		
Ru-106	9.1684E-02	13.46	26.92	0.00E+00	1.23E+00	2.47E+00		
Se-79	1.3018E-05	13.46	26.92	0.00E+00	1.75E-04	3.50E-04		
Sn-126	1.2167E-05	13.46	26.92	0.00E+00	1.64E-04	3.28E-04		
Sr-90	2.6045E+00	13.46	26.92	0.00E+00	3.51E+01	7.01E+01		
Tc-99	4.4241E-04	13.46	26.92	0.00E+00	5.95E-03	1.19E-02		
Th-229	1.3713E-10	13.46	26.92	0.00E+00	1.85E-09	3.69E-09		
Th-230	1.8090E-11	13.46	26.92	0.00E+00	2.43E-10	4.87E-10		
Th-232	2.5278E-10	13.46	26.92	0.00E+00	3.40E-09	6.80E-09		
Ti-208	1.6947E-08	13.46	26.92	0.00E+00	2.28E-07	4.56E-07		
U-232	4.8737E-08	13.46	26.92	0.00E+00	6.56E-07	1.31E-06		
U-233	1.2203E-07	13.46	26.92	0.00E+00	1.64E-06	3.29E-06		
U-234	1.5925E-07	13.46	26.92	0.00E+00	2.14E-06	4.29E-06		
U-235	-2.6194E-06	13.46	0.00	8.43E-05	4.90E-05	8.43E-05		
U-236	1.2693E-05	13.46	26.92	0.00E+00	1.71E-04	3.42E-04		
U-238	-3.6331E-08	13.46	0.00	5.24E-05	5.19E-05	5.24E-05		
Y-90	2.6060E+00	13.46	26.92	0.00E+00	3.51E+01	7.02E+01		
Other Radionuclides					4.85E+01	9.71E+01		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20	10 to 20.1	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	2.85	13.46	
Bounding		26.92	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	2.02	4.72	
Bounding	4.05		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP LEU 45/20) (DAMAGED) SO KOREA  
 SNF ID #: 819  
 Fuel Units & Descr: 4 - ELEMENT  
 Heavy Metal Mass: BOL=0.583kg, EOL=0.556kg  
 ROD Storage Site: INEEL

Fuel decay start date: 1996  
 Estimates as of: 2010  
 Template: TRIGA-SS (LW/U-Zr, SST, 10 to 20% U)  
 Template Burnup (MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.000195  
 Template Decay Time: 10 years

Estimated  
 Canister usage  
 18"x10"  
 0.04

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ct/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3731E-09	25.58	51.17	0.00E+00	3.51E-08	7.03E-08	Avg MeV	
Am-241	2.3865E-03	25.58	51.17	0.00E+00	6.11E-02	1.22E-01	0.0150	6.610E+12
Am-242m	1.3812E-06	25.58	51.17	0.00E+00	3.53E-05	7.07E-05	0.0250	1.400E+12
Am-243	1.4767E-07	25.58	51.17	0.00E+00	3.78E-06	7.56E-06	0.0375	1.196E+12
C-14	1.2863E-04	25.58	51.17	0.00E+00	3.29E-03	6.58E-03	0.0575	1.275E+12
Cl-36	2.8120E-06	25.58	51.17	0.00E+00	7.19E-05	1.44E-04	0.0850	7.734E+11
Cm-243	1.5895E-07	25.58	51.17	0.00E+00	4.07E-06	8.13E-06	0.1250	5.084E+11
Cm-244	1.4008E-06	25.58	51.17	0.00E+00	3.58E-05	7.17E-05	0.2250	6.596E+11
Co-60	6.6541E-01	25.58	51.17	0.00E+00	1.70E+01	3.40E+01	0.3750	3.030E+11
Cs-134	1.6887E-02	25.58	51.17	0.00E+00	4.32E-01	8.64E-01	0.5750	4.747E+12
Cs-135	3.2195E-05	25.58	51.17	0.00E+00	8.24E-04	1.65E-03	0.8500	8.474E+10
Cs-137	2.4556E+00	25.58	51.17	0.00E+00	6.28E+01	1.26E+02	1.2500	2.548E+12
Eu-154	1.0268E-02	25.58	51.17	0.00E+00	2.63E-01	5.25E-01	1.7500	1.533E+09
Eu-155	1.4570E-02	25.58	51.17	0.00E+00	3.73E-01	7.45E-01	2.2500	8.009E+07
Fe-55	2.0361E-01	25.58	51.17	0.00E+00	5.21E+00	1.04E+01	2.7500	1.326E+06
H-3	8.3940E-03	25.58	51.17	0.00E+00	2.15E-01	4.29E-01	3.5000	1.571E+05
I-129	7.3684E-07	25.58	51.17	0.00E+00	1.89E-05	3.77E-05	5.0000	2.695E+01
Kr-85	1.8286E-01	25.58	51.17	0.00E+00	4.68E+00	9.36E+00	7.0000	3.048E+00
Np-237	1.2462E-06	25.58	51.17	0.00E+00	3.19E-05	6.38E-05	11.0000	3.470E-01
Pa-231	4.9143E-09	25.58	51.17	0.00E+00	1.26E-07	2.51E-07		
Pb-210	1.7173E-14	25.58	51.17	0.00E+00	4.39E-13	8.79E-13		
Pm-147	5.6165E-01	25.58	51.17	0.00E+00	1.44E+01	2.87E+01		
Pu-238	9.9820E-04	25.58	51.17	0.00E+00	2.55E-02	5.11E-02		
Pu-239	5.5293E-03	25.58	51.17	0.00E+00	1.41E-01	2.83E-01		
Pu-240	2.1263E-03	25.58	51.17	0.00E+00	5.44E-02	1.09E-01		
Pu-241	8.0165E-02	25.58	51.17	0.00E+00	2.05E+00	4.10E+00		
Pu-242	2.3128E-07	25.58	51.17	0.00E+00	5.92E-06	1.18E-05		
Ra-226	9.9774E-14	25.58	51.17	0.00E+00	2.55E-12	5.11E-12		
Ra-228	2.1729E-10	25.58	51.17	0.00E+00	5.56E-09	1.11E-08		
Ru-106	2.9519E-03	25.58	51.17	0.00E+00	7.55E-02	1.51E-01		
Se-79	1.3017E-05	25.58	51.17	0.00E+00	3.33E-04	6.66E-04		
Sn-126	1.2167E-05	25.58	51.17	0.00E+00	3.11E-04	6.23E-04		
Sr-90	2.3128E+00	25.58	51.17	0.00E+00	5.92E+01	1.18E+02		
Tc-99	4.4241E-04	25.58	51.17	0.00E+00	1.13E-02	2.26E-02		
Th-229	1.9459E-10	25.58	51.17	0.00E+00	4.98E-09	9.96E-09		
Th-230	2.5564E-11	25.58	51.17	0.00E+00	6.54E-10	1.31E-09		
Th-232	2.5278E-10	25.58	51.17	0.00E+00	6.47E-09	1.29E-08		
Th-208	1.6947E-08	25.58	51.17	0.00E+00	4.34E-07	8.67E-07		
U-232	4.6812E-08	25.58	51.17	0.00E+00	1.20E-06	2.40E-06		
U-233	1.2206E-07	25.58	51.17	0.00E+00	3.12E-06	6.25E-06		
U-234	1.7323E-07	25.58	51.17	0.00E+00	4.43E-06	8.86E-06		
U-235	2.6194E-06	25.58	0.00	5.81E-04	5.14E-04	5.81E-04		
U-236	1.2693E-05	25.58	51.17	0.00E+00	3.25E-04	6.49E-04		
U-238	3.6331E-08	25.58	0.00	1.06E-04	1.05E-04	1.06E-04		
Y-90	2.3128E+00	25.58	51.17	0.00E+00	5.92E+01	1.18E+02		
Other Radionuclides					6.27E+01	1.25E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	This Template was used for the following reasons:
BOL HM Constituents	SST	SST	This fuel matches on all parameters except enrichment.
BOL Enrichment %	U	U	
	46.09053498	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	14.21	25.58	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		51.17	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.29	1.80	1.00
Bounding	2.57		

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP LEU-I 20/20) MALAYSIA  
SNF ID #: 497  
Fuel Units & Descr: 94 - ELEMENT  
Heavy Metal Mass: BOL=47 376kg; EOL=46 53kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
Estimates as of: 2010  
Template: TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6 65  
Template BOL Heavy Metal Mass (MT): 0.000195  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
0.85

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	807.60	1,615.20	0.00E+00	6.88E-07	1.38E-06	Avg MeV	
Am-241	1.8331E-03	807.60	1,615.20	0.00E+00	1.48E+00	2.96E+00	0.0150	2.611E+14
Am-242m	1.4129E-06	807.60	1,615.20	0.00E+00	1.14E-03	2.28E-03	0.0250	5.744E+13
Am-243	1.4774E-07	807.60	1,615.20	0.00E+00	1.19E-04	2.39E-04	0.0375	4.892E+13
C-14	1.2871E-04	807.60	1,615.20	0.00E+00	1.04E-01	2.08E-01	0.0575	5.021E+13
Cl-36	2.8120E-06	807.60	1,615.20	0.00E+00	2.27E-03	4.54E-03	0.0850	3.111E+13
Cm-243	1.7940E-07	807.60	1,615.20	0.00E+00	1.45E-04	2.90E-04	0.1250	2.259E+13
Cm-244	1.6962E-06	807.60	1,615.20	0.00E+00	1.37E-03	2.74E-03	0.2250	2.639E+13
Co-60	1.2839E+00	807.60	1,615.20	0.00E+00	1.04E+03	2.07E+03	0.3750	1.339E+13
Cs-134	9.0541E-02	807.60	1,615.20	0.00E+00	7.31E+01	1.46E+02	0.5750	1.780E+14
Cs-135	3.2195E-05	807.60	1,615.20	0.00E+00	2.60E-02	5.20E-02	0.8500	7.641E+12
Cs-137	2.7564E+00	807.60	1,615.20	0.00E+00	2.23E+03	4.45E+03	1.2500	1.552E+14
Eu-154	1.5368E-02	807.60	1,615.20	0.00E+00	1.24E+01	2.48E+01	1.7500	1.034E+11
Eu-155	2.9293E-02	807.60	1,615.20	0.00E+00	2.37E+01	4.73E+01	2.2500	1.667E+11
Fe-55	7.7158E-01	807.60	1,615.20	0.00E+00	6.23E+02	1.25E+03	2.7500	1.323E+09
H-3	1.1111E-02	807.60	1,615.20	0.00E+00	8.97E+00	1.79E+01	3.5000	1.540E+08
I-129	7.3684E-07	807.60	1,615.20	0.00E+00	5.95E-04	1.19E-03	5.0000	8.759E+02
Kr-85	2.5263E-01	807.60	1,615.20	0.00E+00	2.04E+02	4.08E+02	7.0000	9.919E+01
Np-237	1.2427E-06	807.60	1,615.20	0.00E+00	1.00E-03	2.01E-03	11.0000	1.130E+01
Pa-231	3.8511E-09	807.60	1,615.20	0.00E+00	3.11E-06	6.22E-06		
Pb-210	7.3880E-15	807.60	1,615.20	0.00E+00	5.97E-12	1.19E-11		
Pm-147	2.1023E+00	807.60	1,615.20	0.00E+00	1.70E+03	3.40E+03		
Pu-238	1.0383E-03	807.60	1,615.20	0.00E+00	8.39E-01	1.68E+00		
Pu-239	5.5293E-03	807.60	1,615.20	0.00E+00	4.47E+00	8.93E+00		
Pu-240	2.1278E-03	807.60	1,615.20	0.00E+00	1.72E+00	3.44E+00		
Pu-241	1.0195E-01	807.60	1,615.20	0.00E+00	8.23E+01	1.65E+02		
Pu-242	2.3128E-07	807.60	1,615.20	0.00E+00	1.87E-04	3.74E-04		
Ra-226	5.2782E-14	807.60	1,615.20	0.00E+00	4.26E-11	8.53E-11		
Ra-228	1.9338E-10	807.60	1,615.20	0.00E+00	1.56E-07	3.12E-07		
Ru-106	9.1684E-02	807.60	1,615.20	0.00E+00	7.40E+01	1.48E+02		
Se-79	1.3018E-05	807.60	1,615.20	0.00E+00	1.05E-02	2.10E-02		
Sn-126	1.2167E-05	807.60	1,615.20	0.00E+00	9.83E-03	1.97E-02		
Sr-90	2.6045E+00	807.60	1,615.20	0.00E+00	2.10E+03	4.21E+03		
Tc-99	4.4241E-04	807.60	1,615.20	0.00E+00	3.57E-01	7.15E-01		
Th-229	1.3713E-10	807.60	1,615.20	0.00E+00	1.11E-07	2.21E-07		
Th-230	1.8090E-11	807.60	1,615.20	0.00E+00	1.46E-08	2.92E-08		
Th-232	2.5278E-10	807.60	1,615.20	0.00E+00	2.04E-07	4.08E-07		
Ti-208	1.6947E-08	807.60	1,615.20	0.00E+00	1.37E-05	2.74E-05		
U-232	4.8737E-08	807.60	1,615.20	0.00E+00	3.94E-05	7.87E-05		
U-233	1.2203E-07	807.60	1,615.20	0.00E+00	9.86E-05	1.97E-04		
U-234	1.5925E-07	807.60	1,615.20	0.00E+00	1.29E-04	2.57E-04		
U-235	-2.6194E-06	807.60	0.00	2.05E-02	1.84E-02	2.05E-02		
U-236	1.2693E-05	807.60	1,615.20	0.00E+00	1.03E-02	2.05E-02		
U-238	-3.6331E-08	807.60	0.00	1.27E-02	1.27E-02	1.27E-02		
Y-90	2.6060E+00	807.60	1,615.20	0.00E+00	2.10E+03	4.21E+03		
Other Radionuclides					2.91E+03	5.82E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20.0398254	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	446.61	807.60	
Bounding		1,615.20	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.50	1.81	
Bounding	1.00		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA (FLIP LEU-1 20/20) THAILAND  
SNF ID #: 496  
Fuel Units & Descr: 36 - ELEMENT  
Heavy Metal Mass BOL=18 144kg, EOL=15 649kg  
ROD Storage Site: INEEL

Fuel decay start date 2010  
Estimates as of 2010  
Template TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
Template Burnup(MWd) 6 65  
Template BOL Heavy Metal Mass (MT) 0 000195  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
0 32

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	2,381 55	4,763 11	0 00E+00	2 03E-06	4 06E-06	Avg MeV	
Am-241	1 8331E-03	2,381 55	4,763 11	0 00E+00	4 37E+00	8 73E+00	0 0150	7.698E+14
Am-242m	1 4129E-06	2,381 55	4,763 11	0 00E+00	3 36E-03	6 73E-03	0 0250	1 694E+14
Am-243	1 4774E-07	2,381 55	4,763 11	0 00E+00	3 52E-04	7 04E-04	0 0375	1 443E+14
C-14	1 2871E-04	2,381 55	4,763 11	0 00E+00	3 07E-01	6 13E-01	0 0575	1 481E+14
Cl-36	2 8120E-06	2,381 55	4,763 11	0 00E+00	6 70E-03	1 34E-02	0 0850	9 173E+13
Cm-243	1 7940E-07	2,381 55	4,763 11	0 00E+00	4 27E-04	8 54E-04	0 1250	6 661E+13
Cm-244	1 6962E-06	2,381 55	4,763 11	0 00E+00	4 04E-03	8 08E-03	0 2250	7 781E+13
Co-60	1 2839E+00	2,381 55	4,763 11	0 00E+00	3 06E+03	6 12E+03	0 3750	3 949E+13
Cs-134	9 0541E-02	2,381 55	4,763 11	0 00E+00	2 16E+02	4 31E+02	0 5750	5 250E+14
Cs-135	3 2195E-05	2,381 55	4,763 11	0 00E+00	7 67E-02	1 53E-01	0 8500	2 253E+13
Cs-137	2 7564E+00	2,381 55	4,763 11	0 00E+00	6 56E+03	1 31E+04	1 2500	4 576E+14
Eu-154	1 5368E-02	2,381 55	4,763 11	0 00E+00	3 66E+01	7 32E+01	1 7500	3 050E+11
Eu-155	2 9293E-02	2,381 55	4,763 11	0 00E+00	6 98E+01	1 40E+02	2 2500	4 916E+11
Fe-55	7 7158E-01	2,381 55	4,763 11	0 00E+00	1 84E+03	3 68E+03	2 7500	3 901E+09
H-3	1 1111E-02	2,381 55	4,763 11	0 00E+00	2 65E+01	5 29E+01	3 5000	4 540E+08
I-129	7 3684E-07	2,381 55	4,763 11	0 00E+00	1 75E-03	3 51E-03	5 0000	2 507E+03
Kr-85	2 5263E-01	2,381 55	4,763 11	0 00E+00	6 02E+02	1 20E+03	7 0000	2 838E+02
Np-237	1 2427E-06	2,381 55	4,763 11	0 00E+00	2 96E-03	5 92E-03	11 0000	3 233E+01
Pa-231	3 8511E-09	2,381 55	4,763 11	0 00E+00	9 17E-06	1 83E-05		
Pb-210	7 3880E-15	2,381 55	4,763 11	0 00E+00	1 76E-11	3 52E-11		
Pm-147	2 1023E+00	2,381 55	4,763 11	0 00E+00	5 01E+03	1 00E+04		
Pu-238	1 0383E-03	2,381 55	4,763 11	0 00E+00	2 47E+00	4 95E+00		
Pu-239	5 5293E-03	2,381 55	4,763 11	0 00E+00	1 32E+01	2 63E+01		
Pu-240	2 1278E-03	2,381 55	4,763 11	0 00E+00	5 07E+00	1 01E+01		
Pu-241	1 0195E-01	2,381 55	4,763 11	0 00E+00	2 43E+02	4 86E+02		
Pu-242	2 3128E-07	2,381 55	4,763 11	0 00E+00	5 51E-04	1 10E-03		
Ra-226	5 2782E-14	2,381 55	4,763 11	0 00E+00	1 26E-10	2 51E-10		
Ra-228	1 9338E-10	2,381 55	4,763 11	0 00E+00	4 61E-07	9 21E-07		
Ru-106	9 1684E-02	2,381 55	4,763 11	0 00E+00	2 18E+02	4 37E+02		
Se-79	1 3018E-05	2,381 55	4,763 11	0 00E+00	3 10E-02	6 20E-02		
Sn-126	1 2167E-05	2,381 55	4,763 11	0 00E+00	2 90E-02	5 80E-02		
Sr-90	2 6045E+00	2,381 55	4,763 11	0 00E+00	6 20E+03	1 24E+04		
Tc-99	4 4241E-04	2,381 55	4,763 11	0 00E+00	1 05E+00	2 11E+00		
Th-229	1 3713E-10	2,381 55	4,763 11	0 00E+00	3 27E-07	6 53E-07		
Th-230	1 8090E-11	2,381 55	4,763 11	0 00E+00	4 31E-08	8 62E-08		
Th-232	2 5278E-10	2,381 55	4,763 11	0 00E+00	6 02E-07	1 20E-06		
Tl-208	1 6947E-08	2,381 55	4,763 11	0 00E+00	4 04E-05	8 07E-05		
U-232	4 8737E-08	2,381 55	4,763 11	0 00E+00	1 16E-04	2 32E-04		
U-233	1 2203E-07	2,381 55	4,763 11	0 00E+00	2 91E-04	5 81E-04		
U-234	1 5925E-07	2,381 55	4,763 11	0 00E+00	3 79E-04	7 59E-04		
U-235	-2 6194E-06	2,381 55	0 00	7 86E-03	1 62E-03	7 86E-03		
U-236	1 2693E-05	2,381 55	4,763 11	0 00E+00	3 02E-02	6 05E-02		
U-238	-3 6331E-08	2,381 55	0 00	4 88E-03	4 79E-03	4 88E-03		
Y-90	2 6060E+00	2,381 55	4,763 11	0 00E+00	6 21E+03	1 24E+04		
Other Radionuclides					8 59E+03	1 72E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences*
Reactor Moderator	From SFD	Used	
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20 03968254	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal	855.20	2,381.55	
Bounding		4 763 11	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	3 85	2 78	
Bounding	7 70		1 00

\*Reactor shutdown, core removal, storage shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP LEU-I) BANGLADESH  
SNF ID #: 470  
Fuel Units & Descr: 100 - ELEMENT  
Heavy Metal Mass: BOL=50.4kg, EOL=46.06kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
Estimates as of: 2010  
Template: TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
Template BOL Heavy Metal Mass (MT): 0.000195  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
0.90

II. Estimates:	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	4,143.00	8,285.99	0.00E+00	3.53E-06	7.06E-06	Avg MeV	
Am-241	1.8331E-03	4,143.00	8,285.99	0.00E+00	7.59E+00	1.52E+01	0.0150	1.339E+15
Am-242m	1.4129E-06	4,143.00	8,285.99	0.00E+00	5.85E-03	1.17E-02	0.0250	2.947E+14
Am-243	1.4774E-07	4,143.00	8,285.99	0.00E+00	6.12E-04	1.22E-03	0.0375	2.509E+14
C-14	1.2871E-04	4,143.00	8,285.99	0.00E+00	5.33E-01	1.07E+00	0.0575	2.576E+14
Cl-36	2.8120E-06	4,143.00	8,285.99	0.00E+00	1.17E-02	2.33E-02	0.0850	1.596E+14
Cm-243	1.7940E-07	4,143.00	8,285.99	0.00E+00	7.43E-04	1.49E-03	0.1250	1.159E+14
Cm-244	1.6962E-06	4,143.00	8,285.99	0.00E+00	7.03E-03	1.41E-02	0.2250	1.354E+14
Co-60	1.2839E+00	4,143.00	8,285.99	0.00E+00	5.32E+03	1.06E+04	0.3750	6.870E+13
Cs-134	9.0541E-02	4,143.00	8,285.99	0.00E+00	3.75E+02	7.50E+02	0.5750	9.133E+14
Cs-135	3.2195E-05	4,143.00	8,285.99	0.00E+00	1.33E-01	2.67E-01	0.8500	3.920E+13
Cs-137	2.7564E+00	4,143.00	8,285.99	0.00E+00	1.14E+04	2.28E+04	1.2500	7.960E+14
Eu-154	1.5368E-02	4,143.00	8,285.99	0.00E+00	6.37E+01	1.27E+02	1.7500	5.306E+11
Eu-155	2.9293E-02	4,143.00	8,285.99	0.00E+00	1.21E+02	2.43E+02	2.2500	8.553E+11
Fe-55	7.7158E-01	4,143.00	8,285.99	0.00E+00	3.20E+03	6.39E+03	2.7500	6.787E+09
H-3	1.1111E-02	4,143.00	8,285.99	0.00E+00	4.60E+01	9.21E+01	3.5000	7.899E+08
I-129	7.3684E-07	4,143.00	8,285.99	0.00E+00	3.05E-03	6.11E-03	5.0000	4.374E+03
Kr-85	2.5263E-01	4,143.00	8,285.99	0.00E+00	1.05E+03	2.09E+03	7.0000	4.951E+02
Np-237	1.2427E-06	4,143.00	8,285.99	0.00E+00	5.15E-03	1.03E-02	11.0000	5.639E+01
Pa-231	3.8511E-09	4,143.00	8,285.99	0.00E+00	1.60E-05	3.19E-05		
Pb-210	7.3880E-15	4,143.00	8,285.99	0.00E+00	3.06E-11	6.12E-11		
Pm-147	2.1023E+00	4,143.00	8,285.99	0.00E+00	8.71E+03	1.74E+04		
Pu-238	1.0383E-03	4,143.00	8,285.99	0.00E+00	4.30E+00	8.60E+00		
Pu-239	5.5293E-03	4,143.00	8,285.99	0.00E+00	2.29E+01	4.58E+01		
Pu-240	2.1278E-03	4,143.00	8,285.99	0.00E+00	8.82E+00	1.76E+01		
Pu-241	1.0195E-01	4,143.00	8,285.99	0.00E+00	4.22E+02	8.45E+02		
Pu-242	2.3128E-07	4,143.00	8,285.99	0.00E+00	9.58E-04	1.92E-03		
Ra-226	5.2782E-14	4,143.00	8,285.99	0.00E+00	2.19E-10	4.37E-10		
Ra-228	1.9338E-10	4,143.00	8,285.99	0.00E+00	8.01E-07	1.60E-06		
Ru-106	9.1684E-02	4,143.00	8,285.99	0.00E+00	3.80E+02	7.60E+02		
Sa-79	1.3018E-05	4,143.00	8,285.99	0.00E+00	5.39E-02	1.08E-01		
Sn-126	1.2167E-05	4,143.00	8,285.99	0.00E+00	5.04E-02	1.01E-01		
Sr-90	2.6045E+00	4,143.00	8,285.99	0.00E+00	1.08E+04	2.16E+04		
Tc-99	4.4241E-04	4,143.00	8,285.99	0.00E+00	1.83E+00	3.67E+00		
Th-229	1.3713E-10	4,143.00	8,285.99	0.00E+00	5.68E-07	1.14E-06		
Th-230	1.8090E-11	4,143.00	8,285.99	0.00E+00	7.49E-08	1.50E-07		
Th-232	2.5278E-10	4,143.00	8,285.99	0.00E+00	1.05E-06	2.09E-06		
Th-208	1.6947E-08	4,143.00	8,285.99	0.00E+00	7.02E-05	1.40E-04		
U-232	4.8737E-08	4,143.00	8,285.99	0.00E+00	2.02E-04	4.04E-04		
U-233	1.2203E-07	4,143.00	8,285.99	0.00E+00	5.06E-04	1.01E-03		
U-234	1.5925E-07	4,143.00	8,285.99	0.00E+00	6.60E-04	1.32E-03		
U-235	-2.6194E-06	4,143.00	0.00	2.18E-02	1.10E-02	2.18E-02		
U-236	1.2693E-05	4,143.00	8,285.99	0.00E+00	5.26E-02	1.05E-01		
U-238	-3.6331E-08	4,143.00	0.00	1.35E-02	1.34E-02	1.35E-02		
Y-90	2.6060E+00	4,143.00	8,285.99	0.00E+00	1.08E+04	2.16E+04		
Other Radionuclides					1.49E+04	2.99E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
Fuel Cladding	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
BOL HM Constituents	SST	SST	
BOL Enrichment %	20.03968254	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	475.12	4,143.00	
Bounding		8,285.99	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	2.41	8.72	
Bounding	4.82		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# **Fuel Radionuclide Inventory Worksheet**

## **I. Fuel and Template Information**

Fuel Name TRIGA (FLIP LEU-II 20/30) PHILIPPINES  
 SNF ID # 499  
 Fuel Units & Descr. 128 - ELEMENT  
 Heavy Metal Mass BOL=105.472kg, EOL=105.344kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date 2010  
 Estimates as of 2010  
 Template TRIGA-SS (LW/U-Zr, SST, 10 to 20% U)  
<sup>2</sup>Template Burnup(MWd) 6.65  
 Template BOL Heavy Metal Mass (MT) 0.000195  
 Template Decay Time 5 years

Estimated  
 Canister usage:  
 18"x10"  
 1.15

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	994.28	1,988.57	0.00E+00	8.47E-07	1.69E-06	Avg MeV	
Am-241	1.8331E-03	994.28	1,988.57	0.00E+00	1.82E+00	3.65E+00	0.0150	3.214E+14
Am-242m	1.4129E-06	994.28	1,988.57	0.00E+00	1.40E-03	2.81E-03	0.0250	7.072E+13
Am-243	1.4774E-07	994.28	1,988.57	0.00E+00	1.47E-04	2.94E-04	0.0375	6.023E+13
C-14	1.2871E-04	994.28	1,988.57	0.00E+00	1.28E-01	2.56E-01	0.0575	6.182E+13
Cl-36	2.8120E-06	994.28	1,988.57	0.00E+00	2.80E-03	5.59E-03	0.0850	3.830E+13
Cm-243	1.7940E-07	994.28	1,988.57	0.00E+00	1.78E-04	3.57E-04	0.1250	2.781E+13
Cm-244	1.6962E-06	994.28	1,988.57	0.00E+00	1.69E-03	3.37E-03	0.2250	3.249E+13
Co-60	1.2839E+00	994.28	1,988.57	0.00E+00	1.28E+03	2.55E+03	0.3750	1.649E+13
Cs-134	9.0541E-02	994.28	1,988.57	0.00E+00	9.00E+01	1.80E+02	0.5750	2.192E+14
Cs-135	3.2195E-05	994.28	1,988.57	0.00E+00	3.20E-02	6.40E-02	0.8500	9.407E+12
Cs-137	2.7564E+00	994.28	1,988.57	0.00E+00	2.74E+03	5.48E+03	1.2500	1.910E+14
Eu-154	1.5368E-02	994.28	1,988.57	0.00E+00	1.53E+01	3.06E+01	1.7500	1.273E+11
Eu-155	2.9293E-02	994.28	1,988.57	0.00E+00	2.91E+01	5.83E+01	2.2500	2.053E+11
Fe-55	7.7158E-01	994.28	1,988.57	0.00E+00	7.67E+02	1.53E+03	2.7500	1.629E+09
H-3	1.1111E-02	994.28	1,988.57	0.00E+00	1.10E+01	2.21E+01	3.5000	1.896E+08
I-129	7.2684E-07	994.28	1,988.57	0.00E+00	7.33E-04	1.47E-03	5.0000	1.108E+03
Kr-85	2.5263E-01	994.28	1,988.57	0.00E+00	2.51E+02	5.02E+02	7.0000	1.255E+02
Np-237	1.2427E-06	994.28	1,988.57	0.00E+00	1.24E-03	2.47E-03	11.0000	1.430E+01
Pa-231	3.8511E-09	994.28	1,988.57	0.00E+00	3.83E-06	7.66E-06		
Pb-210	7.3880E-15	994.28	1,988.57	0.00E+00	7.35E-12	1.47E-11		
Pm-147	2.1023E+00	994.28	1,988.57	0.00E+00	2.09E+03	4.18E+03		
Pu-238	1.0383E-03	994.28	1,988.57	0.00E+00	1.03E+00	2.06E+00		
Pu-239	5.5293E-03	994.28	1,988.57	0.00E+00	5.50E+00	1.10E+01		
Pu-240	2.1278E-03	994.28	1,988.57	0.00E+00	2.12E+00	4.23E+00		
Pu-241	1.0195E-01	994.28	1,988.57	0.00E+00	1.01E+02	2.03E+02		
Pu-242	2.3128E-07	994.28	1,988.57	0.00E+00	2.30E-04	4.60E-04		
Ra-226	5.2782E-14	994.28	1,988.57	0.00E+00	5.25E-11	1.05E-10		
Ra-228	1.9338E-10	994.28	1,988.57	0.00E+00	1.92E-07	3.85E-07		
Ru-106	9.1684E-02	994.28	1,988.57	0.00E+00	9.12E+01	1.82E+02		
Se-79	1.3018E-05	994.28	1,988.57	0.00E+00	1.29E-02	2.59E-02		
Sn-126	1.2167E-05	994.28	1,988.57	0.00E+00	1.21E-02	2.42E-02		
Sr-90	2.6045E+00	994.28	1,988.57	0.00E+00	2.59E+03	5.18E+03		
Tc-99	4.4241E-04	994.28	1,988.57	0.00E+00	4.40E-01	8.80E-01		
Th-229	1.3713E-10	994.28	1,988.57	0.00E+00	1.36E-07	2.73E-07		
Th-230	1.8090E-11	994.28	1,988.57	0.00E+00	1.80E-08	3.60E-08		
Th-232	2.5278E-10	994.28	1,988.57	0.00E+00	2.51E-07	5.03E-07		
Ti-208	1.6947E-08	994.28	1,988.57	0.00E+00	1.69E-05	3.37E-05		
U-232	4.8737E-08	994.28	1,988.57	0.00E+00	4.85E-05	9.69E-05		
U-233	1.2203E-07	994.28	1,988.57	0.00E+00	1.21E-04	2.43E-04		
U-234	1.5925E-07	994.28	1,988.57	0.00E+00	1.58E-04	3.17E-04		
U-235	-2.6194E-06	994.28	0.00	4.56E-02	4.30E-02	4.56E-02		
U-236	1.2693E-05	994.28	1,988.57	0.00E+00	1.26E-02	2.52E-02		
U-238	-3.6331E-08	994.28	0.00	2.84E-02	2.83E-02	2.84E-02		
Y-90	2.6060E+00	994.28	1,988.57	0.00E+00	2.59E+03	5.18E+03		
Other Radionuclides					3.58E+03	7.17E+03		

## **III. Template Selection Summary, Burnup Summary, and Checks**

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20.02427184	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	994.28	122.19	
Bounding		1,988.57	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.28	0.12	
Bounding	0.55		0.99

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP LEU-II 20/30) TAIWAN  
 SNF ID #: 498  
 Fuel Units & Descr: 144 - ELEMENT  
 Heavy Metal Mass: BOL=118 656kg, EOL=118.512kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template: TRIGA-SS (LW/U-Zr, SST, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6 65  
 Template BOL Heavy Metal Mass (MT): 0 000195  
 Template Decay Time: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 1 30

II. Estimates		m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	Avg MeV
Ac-227	8 5173E-10	1,118 57	2,237 14	0 00E+00	9 53E-07	1 91E-06	0 0150	3 616E+14	0 0250
Am-241	1 8331E-03	1,118 57	2,237 14	0 00E+00	2 05E+00	4 10E+00	0 0375	6 775E+13	0 0575
Am-242m	1 4129E-06	1,118 57	2,237 14	0 00E+00	1 58E-03	3 16E-03	0 0850	4 308E+13	0 1250
Am-243	1 4774E-07	1,118 57	2,237 14	0 00E+00	1 65E-04	3 31E-04	0 2250	3 655E+13	0 3750
C-14	1 2871E-04	1,118 57	2,237 14	0 00E+00	1 44E-01	2 88E-01	0 3750	1 855E+13	0 5750
Cf-252	2 8120E-06	1,118 57	2,237 14	0 00E+00	3 15E-03	6 29E-03	0 5750	2 466E+14	0 8500
Cm-243	1 7940E-07	1,118 57	2,237 14	0 00E+00	2 01E-04	4 01E-04	1 2500	2 149E+13	0 2500
Cm-244	1 6962E-06	1,118 57	2,237 14	0 00E+00	1 90E-03	3 79E-03	0 3750	1 855E+13	0 5750
Co-60	1 2839E+00	1,118 57	2,237 14	0 00E+00	1 44E+03	2 87E+03	0 5750	2 466E+14	0 8500
Cs-134	9 0541E-02	1,118 57	2,237 14	0 00E+00	1 01E+02	2 03E+02	1 2500	2 149E+13	0 2500
Cs-135	3 2195E-05	1,118 57	2,237 14	0 00E+00	3 60E-02	7 20E-02	0 8500	1 058E+13	0 1250
Cs-137	2 7564E+00	1,118 57	2,237 14	0 00E+00	3 08E+03	6 17E+03	1 2500	2 149E+13	0 2500
Eu-154	1 5368E-02	1,118 57	2,237 14	0 00E+00	1 72E+01	3 44E+01	1 7500	1 433E+11	2 7500
Eu-155	2 9293E-02	1,118 57	2,237 14	0 00E+00	3 28E+01	6 55E+01	2 7500	2 309E+11	2 7500
Fe-55	7 7158E-01	1,118 57	2,237 14	0 00E+00	8 63E+02	1 73E+03	2 7500	1 832E+09	2 7500
H-3	1 1111E-02	1,118 57	2,237 14	0 00E+00	1 24E+01	2 49E+01	3 5000	2 133E+08	5 0000
I-129	7 3684E-07	1,118 57	2,237 14	0 00E+00	8 24E-04	1 65E-03	5 0000	1 246E+03	7 0000
Kr-85	2 5263E-01	1,118 57	2,237 14	0 00E+00	2 83E+02	5 65E+02	11 0000	1 412E+02	11 0000
Np-237	1 2427E-06	1,118 57	2,237 14	0 00E+00	1 39E-03	2 78E-03			
Pa-231	3 8511E-09	1,118 57	2,237 14	0 00E+00	4 31E-06	8 62E-06			
Pb-210	7 3880E-15	1,118 57	2,237 14	0 00E+00	8 26E-12	1 65E-11			
Pm-147	2 1023E+00	1,118 57	2,237 14	0 00E+00	2 35E+03	4 70E+03			
Pu-238	1 0383E-03	1,118 57	2,237 14	0 00E+00	1 16E+00	2 32E+00			
Pu-239	5 5293E-03	1,118 57	2,237 14	0 00E+00	6 18E+00	1 24E+01			
Pu-240	2 1278E-03	1,118 57	2,237 14	0 00E+00	2 38E+00	4 76E+00			
Pu-241	1 0195E-01	1,118 57	2,237 14	0 00E+00	1 14E+02	2 28E+02			
Pu-242	2 3128E-07	1,118 57	2,237 14	0 00E+00	2 59E-04	5 17E-04			
Ra-226	5 2782E-14	1,118 57	2,237 14	0 00E+00	5 90E-11	1 18E-10			
Ra-228	1 9338E-10	1,118 57	2,237 14	0 00E+00	2 16E-07	4 33E-07			
Ru-106	9 1684E-02	1,118 57	2,237 14	0 00E+00	1 03E+02	2 05E+02			
Se-79	1 3018E-05	1,118 57	2,237 14	0 00E+00	1 46E-02	2 91E-02			
Sn-126	1 2167E-05	1,118 57	2,237 14	0 00E+00	1 36E-02	2 72E-02			
Sr-90	2 6045E+00	1,118 57	2,237 14	0 00E+00	2 91E+03	5 83E+03			
Tc-99	4 4241E-04	1,118 57	2,237 14	0 00E+00	4 95E-01	9 90E-01			
Th-229	1 3713E-10	1,118 57	2,237 14	0 00E+00	1 53E-07	3 07E-07			
Th-230	1 8090E-11	1,118 57	2,237 14	0 00E+00	2 02E-08	4 05E-08			
Th-232	2 5278E-10	1,118 57	2,237 14	0 00E+00	2 83E-07	5 66E-07			
Ti-208	1 6947E-08	1,118 57	2,237 14	0 00E+00	1 90E-05	3 79E-05			
U-232	4 8737E-08	1,118 57	2,237 14	0 00E+00	5 45E-05	1 09E-04			
U-233	1 2203E-07	1,118 57	2,237 14	0 00E+00	1 36E-04	2 73E-04			
U-234	1 5925E-07	1,118 57	2,237 14	0 00E+00	1 78E-04	3 56E-04			
U-235	-2 6194E-06	1,118 57	0 00	5 13E-02	4 84E-02	5 13E-02			
U-236	1 2693E-05	1,118 57	2,237 14	0 00E+00	1 42E-02	2 84E-02			
U-238	-3 6331E-08	1,118 57	0 00	3 19E-02	3 19E-02	3 19E-02			
Y-90	2 6060E+00	1,118 57	2,237 14	0 00E+00	2 92E+03	5 83E+03			
Other Radionuclides					4 03E+03	8 07E+03			

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20 024	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	1 118.57	137 46	
Bounding		2,237 14	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 28	0 12	
Bounding	0 55		0 99

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA (FLIP)  
SNF ID # 729  
Fuel Units & Descr 111 - ELEMENT  
Heavy Metal Mass BOL=21.534kg EOL=16.35kg  
ROD Storage Site: INEEL

Fuel decay start date 2035  
Estimates as of 2010  
Template TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100%, U)  
Template Burnup(MWd) 66.52  
Template BOL Heavy Metal Mass (MT) 0.000196  
Template Decay Time 5 years

Estimated  
Canister usage  
18"x10"  
1.00

III. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.8488E-10	4,926.69	9,853.39	0.00E+00	1.40E-06	2.81E-06	Avg MeV	
Am-241	7.5767E-03	4,926.69	9,853.39	0.00E+00	3.73E+01	7.47E+01	0.0150	1.590E+15
Am-242m	2.4459E-05	4,926.69	9,853.39	0.00E+00	1.21E-01	2.41E-01	0.0250	3.489E+14
Am-243	3.0983E-05	4,926.69	9,853.39	0.00E+00	1.53E-01	3.05E-01	0.0375	3.086E+14
C-14	1.2590E-04	4,926.69	9,853.39	0.00E+00	6.20E-01	1.24E+00	0.0575	3.080E+14
Cf-252	2.6624E-06	4,926.69	9,853.39	0.00E+00	1.31E-02	2.62E-02	0.0850	1.917E+14
Cm-243	3.8244E-05	4,926.69	9,853.39	0.00E+00	1.88E-01	3.77E-01	0.1250	1.539E+14
Cm-244	4.1010E-03	4,926.69	9,853.39	0.00E+00	2.02E+01	4.04E+01	0.2250	1.629E+14
Co-60	1.2410E+00	4,926.69	9,853.39	0.00E+00	6.11E+03	1.22E+04	0.3750	8.127E+13
Cs-134	6.5454E-01	4,926.69	9,853.39	0.00E+00	3.22E+03	6.45E+03	0.5750	1.345E+15
Cs-135	1.9753E-05	4,926.69	9,853.39	0.00E+00	9.73E-02	1.95E-01	0.8500	2.468E+14
Cs-137	2.7375E+00	4,926.69	9,853.39	0.00E+00	1.35E+04	2.70E+04	1.2500	9.478E+14
Eu-154	1.2324E-01	4,926.69	9,853.39	0.00E+00	6.07E+02	1.21E+03	1.7500	1.268E+12
Eu-155	5.3037E-02	4,926.69	9,853.39	0.00E+00	2.61E+02	5.23E+02	2.2500	9.937E+11
Fe-55	7.9555E-01	4,926.69	9,853.39	0.00E+00	3.92E+03	7.84E+03	2.7500	9.009E+09
H-3	1.0531E-02	4,926.69	9,853.39	0.00E+00	5.19E+01	1.04E+02	3.5000	1.060E+09
I-129	7.1287E-07	4,926.69	9,853.39	0.00E+00	3.51E-03	7.02E-03	5.0000	2.540E+05
Kr-85	2.4955E-01	4,926.69	9,853.39	0.00E+00	1.23E+03	2.46E+03	7.0000	2.923E+04
Np-237	1.2121E-05	4,926.69	9,853.39	0.00E+00	5.97E-02	1.19E-01	11.0000	3.354E+03
Pa-231	1.1230E-09	4,926.69	9,853.39	0.00E+00	5.53E-06	1.11E-05		
Pb-210	6.1636E-14	4,926.69	9,853.39	0.00E+00	3.04E-10	6.07E-10		
Pm-147	1.1302E+00	4,926.69	9,853.39	0.00E+00	5.57E+03	1.11E+04		
Pu-238	5.4826E-02	4,926.69	9,853.39	0.00E+00	2.70E+02	5.40E+02		
Pu-239	1.4056E-03	4,926.69	9,853.39	0.00E+00	6.92E+00	1.38E+01		
Pu-240	1.1536E-03	4,926.69	9,853.39	0.00E+00	5.68E+00	1.14E+01		
Pu-241	4.2995E-01	4,926.69	9,853.39	0.00E+00	2.12E+03	4.24E+03		
Pu-242	4.9910E-06	4,926.69	9,853.39	0.00E+00	2.46E-02	4.92E-02		
Ra-226	2.4008E-13	4,926.69	9,853.39	0.00E+00	1.18E-09	2.37E-09		
Ra-228	1.8220E-11	4,926.69	9,853.39	0.00E+00	8.98E-08	1.80E-07		
Ru-106	1.0343E-01	4,926.69	9,853.39	0.00E+00	5.10E+02	1.02E+03		
Se-79	1.2832E-05	4,926.69	9,853.39	0.00E+00	6.32E-02	1.26E-01		
Sn-126	1.2090E-05	4,926.69	9,853.39	0.00E+00	5.96E-02	1.19E-01		
Sr-90	2.5646E+00	4,926.69	9,853.39	0.00E+00	1.26E+04	2.53E+04		
Tc-99	4.0319E-04	4,926.69	9,853.39	0.00E+00	1.99E+00	3.97E+00		
Th-229	7.7375E-11	4,926.69	9,853.39	0.00E+00	3.81E-07	7.62E-07		
Th-230	1.2211E-10	4,926.69	9,853.39	0.00E+00	6.02E-07	1.20E-06		
Th-232	2.3842E-11	4,926.69	9,853.39	0.00E+00	1.17E-07	2.35E-07		
Ti-208	1.4313E-07	4,926.69	9,853.39	0.00E+00	7.05E-04	1.41E-03		
U-232	4.1927E-07	4,926.69	9,853.39	0.00E+00	2.07E-03	4.13E-03		
U-233	6.8491E-08	4,926.69	9,853.39	0.00E+00	3.37E-04	6.75E-04		
U-234	2.0189E-06	4,926.69	9,853.39	0.00E+00	9.95E-03	1.99E-02		
U-235	-2.6572E-06	4,926.69	0.00	3.26E-02	1.95E-02	3.26E-02		
U-236	1.3575E-05	4,926.69	9,853.39	0.00E+00	6.69E-02	1.34E-01		
U-238	-2.2698E-08	4,926.69	0.00	2.17E-03	2.06E-03	2.17E-03		
Y-90	2.5646E+00	4,926.69	9,853.39	0.00E+00	1.26E+04	2.53E+04		
Other Radionuclides					1.75E+04	3.51E+04		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	70.03211513	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	4,697.97	4,926.69	
Bounding		9,853.39	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.67	1.05	
Bounding	1.35		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) ANL-W

SNF ID #: 354

Fuel Units & Descr: 6 - ELEMENT

Heavy Metal Mass: BOL=1 068kg; EOL=0 979kg

ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1994

Estimates as of: 2010

Template: TRIGA-FLIP (LW/U-Zr, SST, 60 to 100%, U)

<sup>2</sup>Template Burnup(MWd): 66.52

Template BOL Heavy Metal Mass (MT): 0 000196

Template Decay Time: 15 years

Estimated  
Canister usage  
18"x10"  
0 05

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	5 6765E-10	84 97	169 94	0 00E+00	4 82E-08	9 65E-08	Avg MeV	
Am-241	1 1720E-02	84 97	169 94	0 00E+00	9 96E-01	1 99E+00	0 0150	1 910E+13
Am-242m	2 3361E-05	84 97	169 94	0 00E+00	1 98E-03	3 97E-03	0 0250	3 978E+12
Am-243	3 0953E-05	84 97	169 94	0 00E+00	2 63E-03	5 26E-03	0 0375	3 514E+12
C-14	1 2574E-04	84 97	169 94	0 00E+00	1 07E-02	2 14E-02	0 0575	3 718E+12
Cl-36	2 6624E-06	84 97	169 94	0 00E+00	2 26E-04	4 52E-04	0 0850	2 239E+12
Cm-243	2 9991E-05	84 97	169 94	0 00E+00	2 55E-03	5 10E-03	0 1250	1 585E+12
Cm-244	2 7977E-03	84 97	169 94	0 00E+00	2 38E-01	4 75E-01	0 2250	1 928E+12
Co-60	3 3343E-01	84 97	169 94	0 00E+00	2 83E+01	5 67E+01	0 3750	8 464E+11
Cs-134	2 2760E-02	84 97	169 94	0 00E+00	1 93E+00	3 87E+00	0 5750	1 398E+13
Cs-135	1 9753E-05	84 97	169 94	0 00E+00	1 68E-03	3 36E-03	0 8500	4 252E+11
Cs-137	2 1723E+00	84 97	169 94	0 00E+00	1 85E+02	3 69E+02	1 2500	4 428E+12
Eu-154	5 5066E-02	84 97	169 94	0 00E+00	4 68E+00	9 36E+00	1 7500	8 922E+09
Eu-155	1 3119E-02	84 97	169 94	0 00E+00	1 11E+00	2 23E+00	2 2500	2 580E+07
Fe-55	5 5412E-02	84 97	169 94	0 00E+00	4 71E+00	9 42E+00	2 7500	1 110E+06
H-3	6 0102E-03	84 97	169 94	0 00E+00	5 11E-01	1 02E+00	3 5000	2 606E+04
I-129	7 1287E-07	84 97	169 94	0 00E+00	6 06E-05	1 21E-04	5 0000	3 036E+03
Kr-85	1 3077E-01	84 97	169 94	0 00E+00	1 11E+01	2 22E+01	7 0000	3 490E+02
Np-237	1 2153E-05	84 97	169 94	0 00E+00	1 03E-03	2 07E-03	11 0000	4 003E+01
Pa-231	1 5021E-09	84 97	169 94	0 00E+00	1 28E-07	2 55E-07		
Pb-210	2 2760E-13	84 97	169 94	0 00E+00	1 93E-11	3 87E-11		
Pm-147	8 0622E-02	84 97	169 94	0 00E+00	6 85E+00	1 37E+01		
Pu-238	5 0676E-02	84 97	169 94	0 00E+00	4 31E+00	8 61E+00		
Pu-239	1 4051E-03	84 97	169 94	0 00E+00	1 19E-01	2 39E-01		
Pu-240	1 1553E-03	84 97	169 94	0 00E+00	9 82E-02	1 96E-01		
Pu-241	2 6578E-01	84 97	169 94	0 00E+00	2 26E+01	4 52E+01		
Pu-242	4 9910E-06	84 97	169 94	0 00E+00	4 24E-04	8 48E-04		
Ra-226	1 2541E-12	84 97	169 94	0 00E+00	1 07E-10	2 13E-10		
Ra-228	2 1843E-11	84 97	169 94	0 00E+00	1 86E-09	3 71E-09		
Ru-106	1 0722E-04	84 97	169 94	0 00E+00	9 11E-03	1 82E-02		
Se-79	1 2831E-05	84 97	169 94	0 00E+00	1 09E-03	2 18E-03		
Sn-126	1 2090E-05	84 97	169 94	0 00E+00	1 03E-03	2 05E-03		
Sr-90	2 0204E+00	84 97	169 94	0 00E+00	1 72E+02	3 43E+02		
Tc-99	4 0319E-04	84 97	169 94	0 00E+00	3 43E-02	6 85E-02		
Th-229	1 4217E-10	84 97	169 94	0 00E+00	1 21E-08	2 42E-08		
Th-230	3 6906E-10	84 97	169 94	0 00E+00	3 14E-08	6 27E-08		
Th-232	2 3857E-11	84 97	169 94	0 00E+00	2 03E-09	4 05E-09		
Ti-208	1 4857E-07	84 97	169 94	0 00E+00	1 26E-05	2 52E-05		
U-232	4 1251E-07	84 97	169 94	0 00E+00	3 50E-05	7 01E-05		
U-233	6 9017E-08	84 97	169 94	0 00E+00	5 86E-06	1 17E-05		
U-234	3 4546E-06	84 97	169 94	0 00E+00	2 94E-04	5 87E-04		
U-235	-2 6572E-06	84 97	0 00	1 62E-03	1 39E-03	1 62E-03		
U-236	1 3575E-05	84 97	169 94	0 00E+00	1 15E-03	2 31E-03		
U-238	-2 2698E-08	84 97	0 00	1 07E-04	1 05E-04	1 07E-04		
Y-90	2 0219E+00	84 97	169 94	0 00E+00	1 72E+02	3 44E+02		
Other Radionuclides					1 81E+02	3 62E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	70.2247191	60 to 100	

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	77 67	84 97	
Bounding	43 79	169 94	

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.23	1 09	
Bounding	0 47	3 88	

<sup>1</sup>Reactor shutdown, core removal, storage shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) ANL-W (NRAD)

SNF ID #: 884

Fuel Units & Descr: 61 - ELEMENT

Heavy Metal Mass BOL=10.858kg, EOL=10.602kg

ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date

1994

Estimates as of

2010

Template: TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100%, U)

<sup>2</sup>Template Burnup(MWd)

66.52

Template BOL Heavy Metal Mass (MT)

0.000196

Template Decay Time

15 years

Estimated

Canister usage:

18"x10"

0.55

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	5.6765E-10	263.21	445.18	0.00E+00	1.49E-07	2.53E-07	Avg MeV	
Am-241	1.1720E-02	263.21	445.18	0.00E+00	3.08E+00	5.22E+00	0.0150	5.003E+13
Am-242m	2.3361E-05	263.21	445.18	0.00E+00	6.15E-03	1.04E-02	0.0250	1.042E+13
Am-243	3.0953E-05	263.21	445.18	0.00E+00	8.15E-03	1.38E-02	0.0375	9.204E+12
C-14	1.2574E-04	263.21	445.18	0.00E+00	3.31E-02	5.60E-02	0.0575	9.741E+12
Cl-36	2.6624E-06	263.21	445.18	0.00E+00	7.01E-04	1.19E-03	0.0850	5.866E+12
Cm-243	2.9991E-05	263.21	445.18	0.00E+00	7.89E-03	1.34E-02	0.1250	4.152E+12
Cm-244	2.7977E-03	263.21	445.18	0.00E+00	7.36E-01	1.25E+00	0.2250	5.052E+12
Co-60	3.3343E-01	263.21	445.18	0.00E+00	8.78E+01	1.48E+02	0.3750	2.217E+12
Cs-134	2.2760E-02	263.21	445.18	0.00E+00	5.99E+00	1.01E+01	0.5750	3.662E+13
Cs-135	1.9753E-05	263.21	445.18	0.00E+00	5.20E-03	8.79E-03	0.8500	1.114E+12
Cs-137	2.1723E+00	263.21	445.18	0.00E+00	5.72E+02	9.67E+02	1.2500	1.160E+13
Eu-154	5.5066E-02	263.21	445.18	0.00E+00	1.45E+01	2.45E+01	1.7500	2.337E+10
Eu-155	1.3119E-02	263.21	445.18	0.00E+00	3.45E+00	5.84E+00	2.2500	6.759E+07
Fe-55	5.5412E-02	263.21	445.18	0.00E+00	1.46E+01	2.47E+01	2.7500	2.908E+06
H-3	6.0102E-03	263.21	445.18	0.00E+00	1.58E+00	2.68E+00	3.5000	6.827E+04
I-129	7.1287E-07	263.21	445.18	0.00E+00	1.88E-04	3.17E-04	5.0000	7.955E+03
Kr-85	1.3077E-01	263.21	445.18	0.00E+00	3.44E+01	5.82E+01	7.0000	9.145E+02
Np-237	1.2153E-05	263.21	445.18	0.00E+00	3.20E-03	5.41E-03	11.0000	1.049E+02
Pa-231	1.5021E-09	263.21	445.18	0.00E+00	3.95E-07	6.69E-07		
Pb-210	2.2760E-13	263.21	445.18	0.00E+00	5.99E-11	1.01E-10		
Pm-147	8.0622E-02	263.21	445.18	0.00E+00	2.12E+01	3.59E+01		
Pu-238	5.0676E-02	263.21	445.18	0.00E+00	1.33E+01	2.26E+01		
Pu-239	1.4051E-03	263.21	445.18	0.00E+00	3.70E-01	6.26E-01		
Pu-240	1.1553E-03	263.21	445.18	0.00E+00	3.04E-01	5.14E-01		
Pu-241	2.6578E-01	263.21	445.18	0.00E+00	7.00E+01	1.18E+02		
Pu-242	4.9910E-06	263.21	445.18	0.00E+00	1.31E-03	2.22E-03		
Ra-226	1.2541E-12	263.21	445.18	0.00E+00	3.30E-10	5.58E-10		
Ra-228	2.1843E-11	263.21	445.18	0.00E+00	5.75E-09	9.72E-09		
Ru-106	1.0722E-04	263.21	445.18	0.00E+00	2.82E-02	4.77E-02		
Se-79	1.2831E-05	263.21	445.18	0.00E+00	3.38E-03	5.71E-03		
Sn-126	1.2090E-05	263.21	445.18	0.00E+00	3.18E-03	5.38E-03		
Sr-90	2.0204E+00	263.21	445.18	0.00E+00	5.32E+02	8.99E+02		
Tc-99	4.0319E-04	263.21	445.18	0.00E+00	1.06E-01	1.79E-01		
Th-229	1.4217E-10	263.21	445.18	0.00E+00	3.74E-08	6.33E-08		
Th-230	3.6906E-10	263.21	445.18	0.00E+00	9.71E-08	1.64E-07		
Th-232	2.3857E-11	263.21	445.18	0.00E+00	6.28E-09	1.06E-08		
Ti-208	1.4857E-07	263.21	445.18	0.00E+00	3.91E-05	6.61E-05		
U-232	4.1251E-07	263.21	445.18	0.00E+00	1.09E-04	1.84E-04		
U-233	6.9017E-08	263.21	445.18	0.00E+00	1.82E-05	3.07E-05		
U-234	3.4546E-06	263.21	445.18	0.00E+00	9.09E-04	1.54E-03		
U-235	-2.6572E-06	263.21	0.00	1.65E-02	1.58E-02	1.65E-02		
U-236	1.3575E-05	263.21	445.18	0.00E+00	3.57E-03	6.04E-03		
U-238	-2.2698E-08	263.21	0.00	1.09E-03	1.08E-03	1.09E-03		
Y-90	2.0219E+00	263.21	445.18	0.00E+00	5.32E+02	9.00E+02		
Other Radionuclides					5.61E+02	9.49E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	70.2247191	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	263.21	243.50	
Bounding	445.18	487.00	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.07	0.93	
Bounding	0.12	1.09	1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) AUSTRIA  
SNF ID #: 492  
Fuel Units & Descr: 10 - ELEMENT  
Heavy Metal Mass: BOL=1 96kg; EOL=1 95kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
Estimates as of: 2010

Template: TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100%, U)

<sup>2</sup>Template Burnup(MWd) 66 52

Template BOL Heavy Metal Mass (MT) 0 000196

Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
0 09

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 8488E-10	47 51	95 02	0 00E+00	1 35E-08	2 71E-08	Avg. MeV	
Am-241	7 5767E-03	47 51	95 02	0 00E+00	3 60E-01	7 20E-01	0 0150	1 533E+13
Am-242m	2 4459E-05	47 51	95 02	0 00E+00	1 16E-03	2 32E-03	0 0250	3 364E+12
Am-243	3 0983E-05	47 51	95 02	0 00E+00	1 47E-03	2 94E-03	0 0375	2 976E+12
C-14	1 2590E-04	47 51	95 02	0 00E+00	5 98E-03	1 20E-02	0 0575	2 970E+12
Cl-36	2 6624E-06	47 51	95 02	0 00E+00	1 26E-04	2 53E-04	0 0850	1 848E+12
Cm-243	3 8244E-05	47 51	95 02	0 00E+00	1 82E-03	3 63E-03	0 1250	1 484E+12
Cm-244	4 1010E-03	47 51	95 02	0 00E+00	1 95E-01	3 90E-01	0 2250	1 571E+12
Co-60	1 2410E+00	47 51	95 02	0 00E+00	5 90E+01	1 18E+02	0 3750	7 838E+11
Cs-134	6 5454E-01	47 51	95 02	0 00E+00	3 11E+01	6 22E+01	0 5750	1 297E+13
Cs-135	1 9753E-05	47 51	95 02	0 00E+00	9 39E-04	1 88E-03	0 8500	2 380E+12
Cs-137	2 7375E+00	47 51	95 02	0 00E+00	1 30E+02	2 60E+02	1 2500	9 141E+12
Eu-154	1 2324E-01	47 51	95 02	0 00E+00	5 86E+00	1 17E+01	1 7500	1 223E+10
Eu-155	5 3037E-02	47 51	95 02	0 00E+00	2 52E+00	5 04E+00	2 2500	9 583E+09
Fe-55	7 9555E-01	47 51	95 02	0 00E+00	3 78E+01	7 56E+01	2 7500	8 688E+07
H-3	1 0531E-02	47 51	95 02	0 00E+00	5 00E-01	1 00E+00	3 5000	1 022E+07
I-129	7 1287E-07	47 51	95 02	0 00E+00	3 39E-05	6 77E-05	5 0000	2 450E+03
Kr-85	2 4955E-01	47 51	95 02	0 00E+00	1 19E+01	2 37E+01	7 0000	2 819E+02
Np-237	1 2121E-05	47 51	95 02	0 00E+00	5 76E-04	1 15E-03	11 0000	3 235E+01
Pa-231	1 1230E-09	47 51	95 02	0 00E+00	5 34E-08	1 07E-07		
Pb-210	6 1636E-14	47 51	95 02	0 00E+00	2 93E-12	5 86E-12		
Pm-147	1 1302E+00	47 51	95 02	0 00E+00	5 37E+01	1 07E+02		
Pu-238	5 4826E-02	47 51	95 02	0 00E+00	2 60E+00	5 21E+00		
Pu-239	1 4056E-03	47 51	95 02	0 00E+00	6 68E-02	1 34E-01		
Pu-240	1 1536E-03	47 51	95 02	0 00E+00	5 48E-02	1 10E-01		
Pu-241	4 2995E-01	47 51	95 02	0 00E+00	2 04E+01	4 09E+01		
Pu-242	4 9910E-06	47 51	95 02	0 00E+00	2 37E-04	4 74E-04		
Ra-226	2 4008E-13	47 51	95 02	0 00E+00	1 14E-11	2 28E-11		
Ra-228	1 8220E-11	47 51	95 02	0 00E+00	8 66E-10	1 73E-09		
Ru-106	1 0343E-01	47 51	95 02	0 00E+00	4 91E+00	9 83E+00		
Se-79	1 2832E-05	47 51	95 02	0 00E+00	6 10E-04	1 22E-03		
Sr-126	1 2090E-05	47 51	95 02	0 00E+00	5 74E-04	1 15E-03		
Sr-90	2 5646E+00	47 51	95 02	0 00E+00	1 22E+02	2 44E+02		
Tc-99	4 0319E-04	47 51	95 02	0 00E+00	1 92E-02	3 83E-02		
Th-229	7 7375E-11	47 51	95 02	0 00E+00	3 68E-09	7 35E-09		
Th-230	1 2211E-10	47 51	95 02	0 00E+00	5 80E-09	1 16E-08		
Th-232	2 3842E-11	47 51	95 02	0 00E+00	1 13E-09	2 27E-09		
Th-208	1 4313E-07	47 51	95 02	0 00E+00	6 80E-06	1 36E-05		
U-232	4 1927E-07	47 51	95 02	0 00E+00	1 99E-05	3 98E-05		
U-233	6 8491E-08	47 51	95 02	0 00E+00	3 25E-06	6 51E-06		
U-234	2 0189E-06	47 51	95 02	0 00E+00	9 59E-05	1 92E-04		
U-235	-2 6572E-06	47 51	0 00	2 96E-03	2 83E-03	2 96E-03		
U-236	1 3575E-05	47 51	95 02	0 00E+00	6 45E-04	1 29E-03		
U-238	-2 2698E-08	47 51	0 00	1 98E-04	1 97E-04	1 98E-04		
Y-90	2 5646E+00	47 51	95 02	0 00E+00	1 22E+02	2 44E+02		
Other Radionuclides					1 69E+02	3 38E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	69 89795918	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	47 51	9 50	
Bounding		95 02	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 07	0 20	
Bounding	0 14		0 98

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA (FLIP) FFCR  
SNF ID # 996  
Fuel Units & Descr 6 - ELEMENT  
Heavy Metal Mass BOL=0.965kg, EOL=0.607kg  
ROD Storage Site INEEL  
Fuel decay start date 2035  
Estimates as of 2010  
Template TRIGA-FLIP (LW/U-Zr, SST, 60 to 100%, U)  
\*Template Burnup (MWd) 66.52  
Template BOL Heavy Metal Mass (MT) 0.000196  
Template Decay Time 5 years

Estimated  
Canister usage:  
18"x10"  
0.08

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.8488E-10	339.87	679.74	0.00E+00	9.68E-08	1.94E-07	Avg MeV	
Am-241	7.5767E-03	339.87	679.74	0.00E+00	2.58E+00	5.15E+00	0.0150	1.097E+14
Am-242m	2.4459E-05	339.87	679.74	0.00E+00	8.31E-03	1.66E-02	0.0250	2.407E+13
Am-243	3.0983E-05	339.87	679.74	0.00E+00	1.05E-02	2.11E-02	0.0375	2.129E+13
C-14	1.2590E-04	339.87	679.74	0.00E+00	4.28E-02	8.56E-02	0.0575	2.125E+13
Cl-36	2.6624E-06	339.87	679.74	0.00E+00	9.05E-04	1.81E-03	0.0850	1.322E+13
Co-243	3.8244E-05	339.87	679.74	0.00E+00	1.30E-02	2.60E-02	0.1250	1.062E+13
Co-244	4.1010E-03	339.87	679.74	0.00E+00	1.39E+00	2.79E+00	0.2250	1.124E+13
Co-60	1.2410E+00	339.87	679.74	0.00E+00	4.22E+02	8.44E+02	0.3750	5.606E+12
Cs-134	6.5454E-01	339.87	679.74	0.00E+00	2.22E+02	4.45E+02	0.5750	9.279E+13
Cs-135	1.9753E-05	339.87	679.74	0.00E+00	6.71E-03	1.34E-02	0.8500	1.702E+13
Cs-137	2.7375E+00	339.87	679.74	0.00E+00	9.30E+02	1.86E+03	1.2500	6.538E+13
Eu-154	1.2324E-01	339.87	679.74	0.00E+00	4.19E+01	8.38E+01	1.7500	8.745E+10
Eu-155	5.3037E-02	339.87	679.74	0.00E+00	1.80E+01	3.61E+01	2.2500	6.855E+10
Fe-55	7.9555E-01	339.87	679.74	0.00E+00	2.70E+02	5.41E+02	2.7500	6.215E+08
H-3	1.0531E-02	339.87	679.74	0.00E+00	3.58E+00	7.16E+00	3.5000	7.314E+07
I-129	7.1287E-07	339.87	679.74	0.00E+00	2.42E-04	4.85E-04	5.0000	1.752E+04
Kr-85	2.4955E-01	339.87	679.74	0.00E+00	8.48E+01	1.70E+02	7.0000	2.016E+03
Np-237	1.2121E-05	339.87	679.74	0.00E+00	4.12E-03	8.24E-03	11.0000	2.314E+02
Pa-231	1.1230E-09	339.87	679.74	0.00E+00	3.82E-07	7.63E-07		
Pb-210	6.1636E-14	339.87	679.74	0.00E+00	2.09E-11	4.19E-11		
Pm-147	1.1302E+00	339.87	679.74	0.00E+00	3.84E+02	7.68E+02		
Pu-238	5.4826E-02	339.87	679.74	0.00E+00	1.86E+01	3.73E+01		
Pu-239	1.4056E-03	339.87	679.74	0.00E+00	4.78E-01	9.55E-01		
Pu-240	1.1536E-03	339.87	679.74	0.00E+00	3.92E-01	7.84E-01		
Pu-241	4.2995E-01	339.87	679.74	0.00E+00	1.46E+02	2.92E+02		
Pu-242	4.9910E-06	339.87	679.74	0.00E+00	1.70E-03	3.39E-03		
Ra-226	2.4008E-13	339.87	679.74	0.00E+00	8.16E-11	1.63E-10		
Ra-228	1.8220E-11	339.87	679.74	0.00E+00	6.19E-09	1.24E-08		
Ru-106	1.0343E-01	339.87	679.74	0.00E+00	3.52E+01	7.03E+01		
Se-79	1.2832E-05	339.87	679.74	0.00E+00	4.36E-03	8.72E-03		
Sn-126	1.2090E-05	339.87	679.74	0.00E+00	4.11E-03	8.22E-03		
Sr-90	2.5646E+00	339.87	679.74	0.00E+00	8.72E+02	1.74E+03		
Tc-99	4.0319E-04	339.87	679.74	0.00E+00	1.37E-01	2.74E-01		
Th-229	7.7375E-11	339.87	679.74	0.00E+00	2.63E-08	5.26E-08		
Th-230	1.2211E-10	339.87	679.74	0.00E+00	4.15E-08	8.30E-08		
Th-232	2.3842E-11	339.87	679.74	0.00E+00	8.10E-09	1.62E-08		
Th-208	1.4313E-07	339.87	679.74	0.00E+00	4.86E-05	9.73E-05		
U-232	4.1927E-07	339.87	679.74	0.00E+00	1.42E-04	2.85E-04		
U-233	6.8491E-08	339.87	679.74	0.00E+00	2.33E-05	4.66E-05		
U-234	2.0189E-06	339.87	679.74	0.00E+00	6.86E-04	1.37E-03		
U-235	-2.6572E-06	339.87	0.00	1.46E-03	5.57E-04	1.46E-03		
U-236	1.3575E-05	339.87	679.74	0.00E+00	4.61E-03	9.23E-03		
U-238	-2.2698E-08	339.87	0.00	9.71E-05	8.94E-05	9.71E-05		
Y-90	2.5646E+00	339.87	679.74	0.00E+00	8.72E+02	1.74E+03		
Other Radionuclides					1.21E+03	2.42E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
	Fuel Cladding	SST	
	BOL HM Constituents	U	
BOL Enrichment %	70.05184872	60 to 100	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
	327.42	339.87	
Bounding		679.74	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
	1.04	1.04	
Bounding	2.08		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) FFCR OSU  
SNF ID #: 702

Fuel Units & Descr: 4 - ELEMENT  
Heavy Metal Mass: BOL=0.64kg, EOL=0.617kg  
ROD Storage Site: INEEL

Fuel decay start date: 2025  
Estimates as of: 2010

Template: TRIGA-FLIP (LW/U-Zr, SST, 60 to 100% U)  
Template Burnup (MWd): 66.52  
Template BOL Heavy Metal Mass (MT): 0.000196  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
0.05

II. Estimates		m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	2.8488E-10	21.67	43.34	0.00E+00	6.17E-09	1.23E-08	Avg. MeV		
Am-241	7.5767E-03	21.67	43.34	0.00E+00	1.64E-01	3.28E-01	0.0150	6.993E+12	
Am-242m	2.4459E-05	21.67	43.34	0.00E+00	5.30E-04	1.06E-03	0.0250	1.534E+12	
Am-243	3.0983E-05	21.67	43.34	0.00E+00	6.71E-04	1.34E-03	0.0375	1.357E+12	
C-14	1.2590E-04	21.67	43.34	0.00E+00	2.73E-03	5.46E-03	0.0575	1.355E+12	
Cl-36	2.6624E-06	21.67	43.34	0.00E+00	5.77E-05	1.15E-04	0.0850	8.430E+11	
Cm-243	3.8244E-05	21.67	43.34	0.00E+00	8.29E-04	1.66E-03	0.1250	6.769E+11	
Cm-244	4.1010E-03	21.67	43.34	0.00E+00	8.89E-02	1.78E-01	0.2250	7.164E+11	
Co-60	1.2410E+00	21.67	43.34	0.00E+00	2.69E+01	5.38E+01	0.3750	3.575E+11	
Cs-134	6.5454E-01	21.67	43.34	0.00E+00	1.42E+01	2.84E+01	0.5750	5.916E+12	
Cs-135	1.9753E-05	21.67	43.34	0.00E+00	4.28E-04	8.56E-04	0.8500	1.085E+12	
Cs-137	2.7375E+00	21.67	43.34	0.00E+00	5.93E+01	1.19E+02	1.2500	4.169E+12	
Eu-154	1.2324E-01	21.67	43.34	0.00E+00	2.67E+00	5.34E+00	1.7500	5.576E+09	
Eu-155	5.3037E-02	21.67	43.34	0.00E+00	1.15E+00	2.30E+00	2.2500	4.371E+09	
Fe-55	7.9555E-01	21.67	43.34	0.00E+00	1.72E+01	3.45E+01	2.7500	3.962E+07	
H-3	1.0531E-02	21.67	43.34	0.00E+00	2.28E-01	4.56E-01	3.5000	4.663E+06	
I-129	7.1287E-07	21.67	43.34	0.00E+00	1.54E-05	3.09E-05	5.0000	1.117E+03	
Kr-85	2.4955E-01	21.67	43.34	0.00E+00	5.41E+00	1.08E+01	7.0000	1.286E+02	
Np-237	1.2121E-05	21.67	43.34	0.00E+00	2.63E-04	5.25E-04	11.0000	1.475E+01	
Pa-231	1.1230E-09	21.67	43.34	0.00E+00	2.43E-08	4.87E-08			
Pb-210	6.1636E-14	21.67	43.34	0.00E+00	1.34E-12	2.67E-12			
Pm-147	1.1302E+00	21.67	43.34	0.00E+00	2.45E+01	4.90E+01			
Pu-238	5.4826E-02	21.67	43.34	0.00E+00	1.19E+00	2.38E+00			
Pu-239	1.4056E-03	21.67	43.34	0.00E+00	3.05E-02	6.09E-02			
Pu-240	1.1536E-03	21.67	43.34	0.00E+00	2.50E-02	5.00E-02			
Pu-241	4.2995E-01	21.67	43.34	0.00E+00	9.32E+00	1.86E+01			
Pu-242	4.9910E-06	21.67	43.34	0.00E+00	1.08E-04	2.16E-04			
Ra-226	2.4008E-13	21.67	43.34	0.00E+00	5.20E-12	1.04E-11			
Ra-228	1.8220E-11	21.67	43.34	0.00E+00	3.95E-10	7.90E-10			
Ru-106	1.0343E-01	21.67	43.34	0.00E+00	2.24E+00	4.48E+00			
Se-79	1.2832E-05	21.67	43.34	0.00E+00	2.78E-04	5.56E-04			
Sn-126	1.2090E-05	21.67	43.34	0.00E+00	2.62E-04	5.24E-04			
Sr-90	2.5646E+00	21.67	43.34	0.00E+00	5.56E+01	1.11E+02			
Tc-99	4.0319E-04	21.67	43.34	0.00E+00	8.74E-03	1.75E-02			
Th-229	7.7375E-11	21.67	43.34	0.00E+00	1.68E-09	3.35E-09			
Th-230	1.2211E-10	21.67	43.34	0.00E+00	2.65E-09	5.29E-09			
Th-232	2.3842E-11	21.67	43.34	0.00E+00	5.17E-10	1.03E-09			
Ti-208	1.4313E-07	21.67	43.34	0.00E+00	3.10E-06	6.20E-06			
U-232	4.1927E-07	21.67	43.34	0.00E+00	9.09E-06	1.82E-05			
U-233	6.8491E-08	21.67	43.34	0.00E+00	1.48E-06	2.97E-06			
U-234	2.0189E-06	21.67	43.34	0.00E+00	4.37E-05	8.75E-05			
U-235	2.6572E-06	21.67	0.00	9.67E-04	9.09E-04	9.67E-04			
U-236	1.3575E-05	21.67	43.34	0.00E+00	2.94E-04	5.88E-04			
U-238	2.2698E-08	21.67	0.00	6.47E-05	6.43E-05	6.47E-05			
Y-90	2.5646E+00	21.67	43.34	0.00E+00	5.56E+01	1.11E+02			
Other Radionuclides					7.72E+01	1.54E+02			

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	69.9	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	6.03	21.67	
Bounding		43.34	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.10	3.59	
Bounding	0.20		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA (FLIP) FFCR SO KOREA  
SNF ID # 733  
Fuel Units & Descr 4 - ELEMENT  
Heavy Metal Mass BOL=0.638kg EOL=0.561kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1997  
Estimates as of 2010  
Template TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 66.52  
Template BOL Heavy Metal Mass (MT) 0.000196  
Template Decay Time 10 years

Estimated  
Canister usage  
18"x10"  
0.05

II. Estimates							Gamma Sources	
	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	4.2243E-10	73.37	146.74	0.00E+00	3.10E-08	6.20E-08	0.0150	1.882E+13
Am-241	9.9143E-03	73.37	146.74	0.00E+00	7.27E-01	1.45E+00	0.0250	3.972E+12
Am-242m	2.3903E-05	73.37	146.74	0.00E+00	1.75E-03	3.51E-03	0.0375	3.501E+12
Am-243	3.0968E-05	73.37	146.74	0.00E+00	2.27E-03	4.54E-03	0.0575	3.651E+12
C-14	1.2581E-04	73.37	146.74	0.00E+00	9.23E-03	1.85E-02	0.0850	2.214E+12
Cl-36	2.6624E-06	73.37	146.74	0.00E+00	1.95E-04	3.91E-04	0.1250	1.608E+12
Cm-243	3.3870E-05	73.37	146.74	0.00E+00	2.49E-03	4.97E-03	0.2250	1.898E+12
Cm-244	3.3870E-03	73.37	146.74	0.00E+00	2.49E-01	4.97E-01	0.3750	8.605E+11
Co-60	6.4311E-01	73.37	146.74	0.00E+00	4.72E+01	9.44E+01	0.5750	1.428E+13
Cs-134	1.2201E-01	73.37	146.74	0.00E+00	8.95E+00	1.79E+01	0.8500	9.292E+11
Cs-135	1.9753E-05	73.37	146.74	0.00E+00	1.45E-03	2.90E-03	1.2500	7.302E+12
Cs-137	2.4384E+00	73.37	146.74	0.00E+00	1.79E+02	3.58E+02	1.7500	1.053E+10
Eu-154	8.2396E-02	73.37	146.74	0.00E+00	6.05E+00	1.21E+01	2.2500	2.263E+08
Eu-155	2.6383E-02	73.37	146.74	0.00E+00	1.94E+00	3.87E+00	2.7500	4.921E+06
Fe-55	2.1001E-01	73.37	146.74	0.00E+00	1.54E+01	3.08E+01	3.5000	5.154E+05
H-3	7.9555E-03	73.37	146.74	0.00E+00	5.84E-01	1.17E+00	5.0000	3.145E+03
I-129	7.1287E-07	73.37	146.74	0.00E+00	5.23E-05	1.05E-04	7.0000	3.618E+02
Kr-85	1.8070E-01	73.37	146.74	0.00E+00	1.33E+01	2.65E+01	11.0000	4.151E+01
Np-237	1.2135E-05	73.37	146.74	0.00E+00	8.90E-04	1.78E-03		
Pa-231	1.3125E-09	73.37	146.74	0.00E+00	9.63E-08	1.93E-07		
Pb-210	1.1201E-13	73.37	146.74	0.00E+00	8.22E-12	1.64E-11		
Pm-147	3.0186E-01	73.37	146.74	0.00E+00	2.21E+01	4.43E+01		
Pu-238	5.2706E-02	73.37	146.74	0.00E+00	3.87E+00	7.73E+00		
Pu-239	1.4054E-03	73.37	146.74	0.00E+00	1.03E-01	2.06E-01		
Pu-240	1.1545E-03	73.37	146.74	0.00E+00	8.47E-02	1.69E-01		
Pu-241	3.3809E-01	73.37	146.74	0.00E+00	2.48E+01	4.96E+01		
Pu-242	4.9910E-06	73.37	146.74	0.00E+00	3.66E-04	7.32E-04		
Ra-226	6.1395E-13	73.37	146.74	0.00E+00	4.50E-11	9.01E-11		
Ra-228	2.0490E-11	73.37	146.74	0.00E+00	1.50E-09	3.01E-09		
Ru-106	3.3298E-03	73.37	146.74	0.00E+00	2.44E-01	4.89E-01		
Se-79	1.2831E-05	73.37	146.74	0.00E+00	9.41E-04	1.88E-03		
Sn-126	1.2090E-05	73.37	146.74	0.00E+00	8.87E-04	1.77E-03		
Sr-90	2.2760E+00	73.37	146.74	0.00E+00	1.67E+02	3.34E+02		
Tc-99	4.0319E-04	73.37	146.74	0.00E+00	2.96E-02	5.92E-02		
Th-229	1.0973E-10	73.37	146.74	0.00E+00	8.05E-09	1.61E-08		
Th-230	2.2940E-10	73.37	146.74	0.00E+00	1.68E-08	3.37E-08		
Th-232	2.3842E-11	73.37	146.74	0.00E+00	1.75E-09	3.50E-09		
Th-208	1.4857E-07	73.37	146.74	0.00E+00	1.09E-05	2.18E-05		
U-232	4.1927E-07	73.37	146.74	0.00E+00	3.08E-05	6.15E-05		
U-233	6.8746E-08	73.37	146.74	0.00E+00	5.04E-06	1.01E-05		
U-234	2.7511E-06	73.37	146.74	0.00E+00	2.02E-04	4.04E-04		
U-235	-2.6572E-06	73.37	0.00	9.65E-04	7.70E-04	9.65E-04		
U-236	1.3575E-05	73.37	146.74	0.00E+00	9.96E-04	1.99E-03		
U-238	-2.2698E-08	73.37	0.00	6.44E-05	6.27E-05	6.44E-05		
Y-90	2.2775E+00	73.37	146.74	0.00E+00	1.67E+02	3.34E+02		
Other Radionuclides					1.78E+02	3.55E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	69.98432602	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal	30.07	73.37	
Bounding		146.74	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.34	2.44	
Bounding	0.68		1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) MEXICO  
SNF ID #: 493  
Fuel Units & Descr: 35 - ELEMENT  
Heavy Metal Mass: BOL=6 86kg EOL=6 825kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
Estimates as of: 2010  
Template: TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 66.52  
Template BOL Heavy Metal Mass (MT): 0 000196  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
0.32

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 8488E-10	64 67	129 34	0 00E+00	1 84E-08	3 68E-08	Avg MeV	
Am-241	7 5767E-03	64 67	129 34	0 00E+00	4 90E-01	9 80E-01	0 0150	2.087E+13
Am-242m	2.4459E-05	64 67	129 34	0 00E+00	1 58E-03	3 16E-03	0 0250	4.579E+12
Am-243	3 0983E-05	64 67	129 34	0 00E+00	2 00E-03	4 01E-03	0 0375	4.051E+12
C-14	1.2590E-04	64 67	129 34	0 00E+00	8 14E-03	1 63E-02	0 0575	4.043E+12
Cl-36	2 6624E-06	64 67	129 34	0 00E+00	1 72E-04	3.44E-04	0 0850	2.516E+12
Cm-243	3 8244E-05	64 67	129 34	0 00E+00	2 47E-03	4 95E-03	0 1250	2 020E+12
Cm-244	4 1010E-03	64 67	129 34	0 00E+00	2 65E-01	5.30E-01	0.2250	2 138E+12
Co-60	1 2410E+00	64 67	129 34	0 00E+00	8 03E+01	1 61E+02	0 3750	1 067E+12
Cs-134	6 5454E-01	64 67	129 34	0 00E+00	4 23E+01	8.47E+01	0 5750	1 766E+12
Cs-135	1 9753E-05	64 67	129 34	0 00E+00	1.28E-03	2 55E-03	0.8500	3.239E+12
Cs-137	2 7375E+00	64 67	129 34	0 00E+00	1 77E+02	3.54E+02	1.2500	1.244E+13
Eu-154	1 2324E-01	64 67	129 34	0 00E+00	7 97E+00	1.59E+01	1 7500	1 664E+10
Eu-155	5 3037E-02	64 67	129 34	0 00E+00	3 43E+00	6 86E+00	2.2500	1.304E+10
Fe-55	7 9555E-01	64 67	129 34	0 00E+00	5 14E+01	1.03E+02	2.7500	1 182E+08
H-3	1 0531E-02	64 67	129 34	0 00E+00	6 81E-01	1.36E+00	3.5000	1 392E+07
I-129	7 1287E-07	64 67	129 34	0 00E+00	4 61E-05	9.22E-05	5.0000	3.336E+03
Kr-85	2 4955E-01	64 67	129 34	0 00E+00	1 61E+01	3.23E+01	7 0000	3.839E+02
Np-237	1 1212E-05	64 67	129 34	0 00E+00	7 84E-04	1 57E-03	11 0000	4 405E+01
Pa-231	1 1230E-09	64 67	129 34	0 00E+00	7.26E-08	1 45E-07		
Pb-210	6 1636E-14	64 67	129 34	0 00E+00	3 99E-12	7 97E-12		
Pm-147	1 1302E+00	64 67	129 34	0 00E+00	7.31E+01	1.46E+02		
Pu-238	5 4826E-02	64 67	129 34	0 00E+00	3.55E+00	7 09E+00		
Pu-239	1 4056E-03	64 67	129 34	0 00E+00	9 09E-02	1 82E-01		
Pu-240	1 1536E-03	64 67	129 34	0 00E+00	7 46E-02	1 49E-01		
Pu-241	4 2995E-01	64 67	129 34	0 00E+00	2.78E+01	5 56E+01		
Pu-242	4 9910E-06	64 67	129 34	0 00E+00	3.23E-04	6 46E-04		
Ra-226	2 4008E-13	64 67	129 34	0 00E+00	1 55E-11	3 11E-11		
Ra-228	1 8220E-11	64 67	129 34	0 00E+00	1 18E-09	2 36E-09		
Ru-106	1 0343E-01	64 67	129 34	0 00E+00	6 69E+00	1 34E+01		
Se-79	1 2832E-05	64 67	129 34	0 00E+00	8 30E-04	1 66E-03		
Sn-126	1 2090E-05	64 67	129 34	0 00E+00	7 82E-04	1 56E-03		
Sr-90	2 5646E+00	64 67	129.34	0 00E+00	1.66E+02	3.32E+02		
Tc-99	4 0319E-04	64 67	129 34	0 00E+00	2 61E-02	5 21E-02		
Th-229	7 7375E-11	64 67	129 34	0 00E+00	5 00E-09	1 00E-08		
Th-230	1 2211E-10	64 67	129 34	0 00E+00	7 90E-09	1 58E-08		
Th-232	2 3842E-11	64 67	129 34	0 00E+00	1 54E-09	3 08E-09		
Tl-208	1 4313E-07	64 67	129 34	0 00E+00	9 26E-06	1 85E-05		
U-232	4 1927E-07	64 67	129.34	0 00E+00	2 71E-05	5 42E-05		
U-233	6 8491E-08	64.67	129 34	0 00E+00	4 43E-06	8 86E-06	Thermal Power	
U-234	2 0189E-06	64 67	129 34	0 00E+00	1 31E-04	2 61E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-2 6572E-06	64 67	0 00	1 04E-02	1 02E-02	1 04E-02	4.24E+00	8 48E+00
U-236	1.3575E-05	64.67	129 34	0 00E+00	8 78E-04	1 76E-03	Total	Total
U-238	-2.2698E-08	64 67	0 00	6 94E-04	6 93E-04	6 94E-04		
Y-90	2 5646E+00	64 67	129 34	0 00E+00	1 66E+02	3 32E+02		
Other Radionuclides					2 30E+02	4 61E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	69 89795918	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	64 67	33.26	
Bounding		129.34	Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 03	0.51	
Bounding	0 06		1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel.

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# **Fuel Radionuclide Inventory Worksheet**

## **I. Fuel and Template Information**

Fuel Name	TRIGA (FLIP) OSU	Fuel decay start date	2025
SNF ID #	240	Estimates as of	2010
Fuel Units & Descr	87 - ELEMENT	Template	TRIGA-FLIP (LW/U-Zr, SST, 60 to 100%, U)
Heavy Metal Mass	BOL=17.052kg EOL=15.625kg	*Template Burnup(MWd)	66.52
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0.000196
		Template Decay Time	5 years

Estimated  
Canister usage  
18"x10"  
0.78

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.8488E-10	1,356.06	2,712.12	0.00E+00	3.86E-07	7.73E-07	Avg MeV	
Am-241	7.5767E-03	1,356.06	2,712.12	0.00E+00	1.03E+01	2.05E+01	0.0150	4.376E+14
Am-242m	2.4459E-05	1,356.06	2,712.12	0.00E+00	3.32E-02	6.63E-02	0.0250	9.603E+13
Am-243	3.0983E-05	1,356.06	2,712.12	0.00E+00	4.20E-02	8.40E-02	0.0375	8.494E+13
C-14	1.2590E-04	1,356.06	2,712.12	0.00E+00	1.71E-01	3.41E-01	0.0575	8.478E+13
Cl-36	2.6624E-06	1,356.06	2,712.12	0.00E+00	3.61E-03	7.22E-03	0.0850	5.275E+13
Cm-243	3.8244E-05	1,356.06	2,712.12	0.00E+00	5.19E-02	1.04E-01	0.1250	4.236E+13
Cm-244	4.1010E-03	1,356.06	2,712.12	0.00E+00	5.56E+00	1.11E+01	0.2250	4.483E+13
Co-60	1.2410E+00	1,356.06	2,712.12	0.00E+00	1.68E+03	3.37E+03	0.3750	2.237E+13
Cs-134	6.5454E-01	1,356.06	2,712.12	0.00E+00	8.88E+02	1.78E+03	0.5750	3.702E+14
Cs-135	1.9753E-05	1,356.06	2,712.12	0.00E+00	2.68E-02	5.36E-02	0.8500	6.792E+13
Cs-137	2.7375E+00	1,356.06	2,712.12	0.00E+00	3.71E+03	7.42E+03	1.2500	2.609E+14
Eu-154	1.2324E-01	1,356.06	2,712.12	0.00E+00	1.67E+02	3.34E+02	1.7500	3.489E+11
Eu-155	5.3037E-02	1,356.06	2,712.12	0.00E+00	7.19E+01	1.44E+02	2.2500	2.735E+11
Fe-55	7.9555E-01	1,356.06	2,712.12	0.00E+00	1.08E+03	2.16E+03	2.7500	2.480E+09
H-3	1.0531E-02	1,356.06	2,712.12	0.00E+00	1.43E+01	2.86E+01	3.5000	2.918E+08
I-129	7.1287E-07	1,356.06	2,712.12	0.00E+00	9.67E-04	1.93E-03	5.0000	6.991E+04
Kr-85	2.4955E-01	1,356.06	2,712.12	0.00E+00	3.38E+02	6.77E+02	7.0000	8.045E+03
Np-237	1.2121E-05	1,356.06	2,712.12	0.00E+00	1.64E-02	3.29E-02	11.0000	9.233E+02
Pa-231	1.1230E-09	1,356.06	2,712.12	0.00E+00	1.52E-06	3.05E-06		
Pb-210	6.1636E-14	1,356.06	2,712.12	0.00E+00	8.36E-11	1.67E-10		
Pm-147	1.1302E+00	1,356.06	2,712.12	0.00E+00	1.53E+03	3.07E+03		
Pu-238	5.4826E-02	1,356.06	2,712.12	0.00E+00	7.43E+01	1.49E+02		
Pu-239	1.4056E-03	1,356.06	2,712.12	0.00E+00	1.91E+00	3.81E+00		
Pu-240	1.1536E-03	1,356.06	2,712.12	0.00E+00	1.56E+00	3.13E+00		
Pu-241	4.2995E-01	1,356.06	2,712.12	0.00E+00	5.83E+02	1.17E+03		
Pu-242	4.9910E-06	1,356.06	2,712.12	0.00E+00	6.77E-03	1.35E-02		
Ra-226	2.4008E-13	1,356.06	2,712.12	0.00E+00	3.26E-10	6.51E-10		
Ra-228	1.8220E-11	1,356.06	2,712.12	0.00E+00	2.47E-08	4.94E-08		
Ru-106	1.0343E-01	1,356.06	2,712.12	0.00E+00	1.40E+02	2.81E+02		
Se-79	1.2832E-05	1,356.06	2,712.12	0.00E+00	1.74E-02	3.48E-02		
Sn-126	1.2090E-05	1,356.06	2,712.12	0.00E+00	1.64E-02	3.28E-02		
Sr-90	2.5646E+00	1,356.06	2,712.12	0.00E+00	3.48E+03	6.96E+03		
Tc-99	4.0319E-04	1,356.06	2,712.12	0.00E+00	5.47E-01	1.09E+00		
Th-229	7.7375E-11	1,356.06	2,712.12	0.00E+00	1.05E-07	2.10E-07		
Th-230	1.2211E-10	1,356.06	2,712.12	0.00E+00	1.66E-07	3.31E-07		
Th-232	2.3842E-11	1,356.06	2,712.12	0.00E+00	3.23E-08	6.47E-08		
Ti-208	1.4313E-07	1,356.06	2,712.12	0.00E+00	1.94E-04	3.88E-04		
U-232	4.1927E-07	1,356.06	2,712.12	0.00E+00	5.69E-04	1.14E-03		
U-233	6.8491E-08	1,356.06	2,712.12	0.00E+00	9.29E-05	1.86E-04		
U-234	2.0189E-06	1,356.06	2,712.12	0.00E+00	2.74E-03	5.48E-03		
U-235	-2.6572E-06	1,356.06	0.00	2.58E-02	2.22E-02	2.58E-02		
U-236	1.3575E-05	1,356.06	2,712.12	0.00E+00	1.84E-02	3.68E-02		
U-238	-2.2698E-08	1,356.06	0.00	1.73E-03	1.69E-03	1.73E-03		
Y-90	2.5646E+00	1,356.06	2,712.12	0.00E+00	3.48E+03	6.96E+03		
Other Radionuclides					4.83E+03	9.66E+03		

## **III. Template Selection Summary, Burnup Summary, and Checks**

### **Template Selection Summary**

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	69.89795918	60 to 100	

### **Burnup Summary (MWd)<sup>1</sup>**

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	482.25	1,356.06	
Bounding		2,712.12	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

### **Checks**

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.23	2.81	
Bounding	0.47		

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) SLOVENIA  
SNF ID #: 495  
Fuel Units & Descr: 26 - ELEMENT  
Heavy Metal Mass: BOL=4 987kg, EOL=4 69kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1999  
Estimates as of: 2010  
Template: TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd) 66 52  
Template BOL Heavy Metal Mass (MT): 0 000196  
Template Decay Time 10 years

Estimated  
Canister usage,  
18"x10"  
0.23

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4 2243E-10	281 70	563 41	0 00E+00	1 19E-07	2 38E-07	Avg. MeV	
Am-241	9 9143E-03	281 70	563 41	0 00E+00	2 79E+00	5 59E+00	0 0150	7 224E+13
Am-242m	2 3903E-05	281 70	563 41	0 00E+00	6 73E-03	1 35E-02	0 0250	1 525E+13
Am-243	3 0968E-05	281 70	563 41	0 00E+00	8 72E-03	1 74E-02	0 0375	1 344E+13
C-14	1 2581E-04	281 70	563 41	0 00E+00	3 54E-02	7 09E-02	0 0575	1 402E+13
Cl-36	2 6624E-06	281 70	563 41	0 00E+00	7 50E-04	1 50E-03	0 0850	8 500E+12
Cm-243	3 3870E-05	281 70	563 41	0 00E+00	9 54E-03	1 91E-02	0 1250	6 174E+12
Cm-244	3 3870E-03	281 70	563 41	0 00E+00	9 54E-01	1 91E+00	0 2250	7 288E+12
Co-60	6 4311E-01	281 70	563 41	0 00E+00	1 81E+02	3 62E+02	0 3750	3 304E+12
Cs-134	1 2201E-01	281 70	563 41	0 00E+00	3 44E+01	6 87E+01	0 5750	5 483E+13
Cs-135	1 9753E-05	281 70	563 41	0 00E+00	5 56E-03	1 11E-02	0 8500	3 568E+12
Cs-137	2 4384E+00	281 70	563 41	0 00E+00	6 87E+02	1 37E+03	1 2500	2 804E+13
Eu-154	8 2396E-02	281 70	563 41	0 00E+00	2 32E+01	4 64E+01	1 7500	4 043E+10
Eu-155	2 6383E-02	281 70	563 41	0 00E+00	7 43E+00	1 49E+01	2 2500	8 688E+08
Fe-55	2 1001E-01	281 70	563 41	0 00E+00	5 92E+01	1 18E+02	2 7500	1 889E+07
H-3	7 9555E-03	281 70	563 41	0 00E+00	2 24E+00	4 48E+00	3 5000	1 979E+06
I-129	7 1287E-07	281 70	563 41	0 00E+00	2 01E-04	4 02E-04	5 0000	1 208E+04
Kr-85	1 8070E-01	281 70	563 41	0 00E+00	5 09E+01	1 02E+02	7 0000	1 389E+03
Np-237	1 2135E-05	281 70	563 41	0 00E+00	3 42E-03	6 84E-03	11 0000	1 594E+02
Pa-231	1 3125E-09	281 70	563 41	0 00E+00	3 70E-07	7 39E-07		
Pb-210	1 1201E-13	281 70	563 41	0 00E+00	3 16E-11	6 31E-11		
Pm-147	3 0186E-01	281 70	563 41	0 00E+00	8 50E+01	1 70E+02		
Pu-238	5 2706E-02	281 70	563 41	0 00E+00	1 48E+01	2 97E+01		
Pu-239	1 4054E-03	281 70	563 41	0 00E+00	3 96E-01	7 92E-01		
Pu-240	1 1545E-03	281 70	563 41	0 00E+00	3 25E-01	6 50E-01		
Pu-241	3 3809E-01	281 70	563 41	0 00E+00	9 52E+01	1 90E+02		
Pu-242	4 9910E-06	281 70	563 41	0 00E+00	1 41E-03	2 81E-03		
Ra-226	6 1395E-13	281 70	563 41	0 00E+00	1 73E-10	3 46E-10		
Ra-228	2 0490E-11	281 70	563 41	0 00E+00	5 77E-09	1 15E-08		
Ru-106	3 3298E-03	281 70	563 41	0 00E+00	9 38E-01	1 88E+00		
Se-79	1 2831E-05	281 70	563 41	0 00E+00	3 61E-03	7 23E-03		
Sn-126	1 2090E-05	281 70	563 41	0 00E+00	3 41E-03	6 81E-03		
Sr-90	2 2760E+00	281 70	563 41	0 00E+00	6 41E+02	1 28E+03		
Tc-99	4 0319E-04	281 70	563 41	0 00E+00	1 14E-01	2 27E-01		
Th-229	1 0973E-10	281 70	563 41	0 00E+00	3 09E-08	6 18E-08		
Th-230	2 2940E-10	281 70	563 41	0 00E+00	6 46E-08	1 29E-07		
Th-232	2 3842E-11	281 70	563 41	0 00E+00	6 72E-09	1 34E-08		
Th-208	1 4857E-07	281 70	563 41	0 00E+00	4 19E-05	8 37E-05		
U-232	4 1927E-07	281 70	563 41	0 00E+00	1 18E-04	2 36E-04		
U-233	6 8746E-08	281 70	563 41	0 00E+00	1 94E-05	3 87E-05		
U-234	2 7511E-06	281 70	563 41	0 00E+00	7 75E-04	1 55E-03		
U-235	-2 6572E-06	281.70	0.00	7 54E-03	6 79E-03	7 54E-03		
U-236	1 3575E-05	281.70	563 41	0 00E+00	3 82E-03	7 65E-03		
U-238	-2 2698E-08	281.70	0 00	5 03E-04	4 97E-04	5 03E-04		
Y-90	2 2775E+00	281.70	563 41	0 00E+00	6 42E+02	1 28E+03		
Other Radionuclides					6 82E+02	1 36E+03		

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	69 96306689	60 to 100	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	94 02	281 70	
Bounding		563 41	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 17	3 00	
Bounding	0 33		1 00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA (FLIP) SO KOREA  
SNF ID # 494  
Fuel Units & Descr: 114 - ELEMENT  
Heavy Metal Mass BOL=21 66kg, EOL=19 106kg  
ROD Storage Site INEEL

Fuel decay start date 1996  
Estimates as of 2010  
Template TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100% U)  
Template Burnup (MWd) 66 52  
Template BOL Heavy Metal Mass (MT) 0 000196  
Template Decay Time 10 years

Estimated  
Canister usage  
18"x10"  
1 03

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources
	CI/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group Avg MeV Total Photons/sec (bounding)
Ac-227	4.2243E-10	2,426 99	4,853 99	0 00E+00	1 03E-06	2 05E-06	0 0150 6.224E+14
Am-241	9 9143E-03	2,426 99	4,853 99	0 00E+00	2 41E+01	4 81E+01	0 0250 1 314E+14
Am-242m	2.3903E-05	2,426 99	4,853 99	0 00E+00	5 80E-02	1 16E-01	0 0375 1 158E+14
Am-243	3 0968E-05	2,426 99	4,853 99	0 00E+00	7 52E-02	1 50E-01	0 0575 1 208E+14
C-14	1.2581E-04	2,426 99	4,853 99	0 00E+00	3 05E-01	6 11E-01	0 0850 7.323E+13
Cl-36	2 6624E-06	2,426 99	4,853 99	0 00E+00	6 46E-03	1.29E-02	0 1250 5 319E+13
Cm-243	3.3870E-05	2,426 99	4,853 99	0 00E+00	8 22E-02	1 64E-01	0 2250 6.279E+13
Cm-244	3.3870E-03	2,426 99	4,853 99	0 00E+00	8 22E+00	1 64E+01	0 3750 2 846E+13
Co-60	6 4311E-01	2,426 99	4,853 99	0 00E+00	1 56E+03	3 12E+03	0 5750 4 724E+14
Cs-134	1.2201E-01	2,426 99	4,853 99	0 00E+00	2 96E+02	5 92E+02	0 8500 3 074E+13
Cs-135	1 9753E-05	2,426 99	4,853 99	0 00E+00	4 79E-02	9 59E-02	1 2500 2 415E+14
Cs-137	2 4384E+00	2,426 99	4,853 99	0 00E+00	5 92E+03	1 18E+04	1 7500 3 483E+11
Eu-154	8 2396E-02	2,426 99	4,853 99	0 00E+00	2 00E+02	4 00E+02	2 2500 7 485E+09
Eu-155	2 6383E-02	2,426 99	4,853 99	0 00E+00	6 40E+01	1.28E+02	2 7500 1 628E+08
Fe-55	2 1001E-01	2,426 99	4,853 99	0 00E+00	5 10E+02	1 02E+03	3 5000 1 705E+07
H-3	7 9555E-03	2,426 99	4,853 99	0 00E+00	1 93E+01	3 86E+01	5 0000 1 040E+05
I-129	7 1287E-07	2,426 99	4,853 99	0 00E+00	1.73E-03	3 46E-03	7 0000 1 197E+04
Kr-85	1 8070E-01	2,426 99	4,853 99	0 00E+00	4 39E+02	8 77E+02	11 0000 1 373E+03
Np-237	1 2135E-05	2,426 99	4,853 99	0 00E+00	2.95E-02	5 89E-02	
Pa-231	1 3125E-09	2,426 99	4,853 99	0 00E+00	3.19E-06	6.37E-06	
Pb-210	1 1201E-13	2,426 99	4,853 99	0 00E+00	2.72E-10	5.44E-10	
Pm-147	3 0186E-01	2,426 99	4,853 99	0 00E+00	7.33E+02	1 47E+03	
Pu-238	5 2706E-02	2,426 99	4,853 99	0 00E+00	1.28E+02	2.56E+02	
Pu-239	1 4054E-03	2,426 99	4,853 99	0 00E+00	3 41E+00	6 82E+00	
Pu-240	1 1545E-03	2,426 99	4,853 99	0 00E+00	2.80E+00	5 60E+00	
Pu-241	3 3809E-01	2,426 99	4,853 99	0 00E+00	8.21E+02	1 64E+03	
Pu-242	4 9910E-06	2,426 99	4,853 99	0 00E+00	1.21E-02	2 42E-02	
Ra-226	6 1395E-13	2,426 99	4,853 99	0 00E+00	1.49E-09	2 98E-09	
Ra-228	2 0490E-11	2,426 99	4,853 99	0 00E+00	4 97E-08	9 95E-08	
Ru-106	3 3298E-03	2,426 99	4,853 99	0 00E+00	8 08E+00	1 62E+01	
Se-79	1 2831E-05	2,426 99	4,853 99	0 00E+00	3 11E-02	6 23E-02	
Sn-126	1 2090E-05	2,426 99	4,853 99	0 00E+00	2 93E-02	5 87E-02	
Sr-90	2.2760E+00	2,426 99	4,853 99	0 00E+00	5.52E+03	1 10E+04	
Tc-99	4 0319E-04	2,426 99	4,853 99	0 00E+00	9 79E-01	1 96E+00	
Th-229	1 0973E-10	2,426 99	4,853 99	0 00E+00	2 66E-07	5 33E-07	
Th-230	2.2940E-10	2,426 99	4,853 99	0 00E+00	5 57E-07	1 11E-06	
Th-232	2.3842E-11	2,426 99	4,853 99	0 00E+00	5 79E-08	1 16E-07	
Th-208	1 4857E-07	2,426 99	4,853 99	0 00E+00	3 61E-04	7.21E-04	
U-232	4 1927E-07	2,426 99	4,853 99	0 00E+00	1 02E-03	2 04E-03	
U-233	6 8746E-08	2,426 99	4,853 99	0 00E+00	1 67E-04	3 34E-04	
U-234	2.7511E-06	2,426 99	4,853 99	0 00E+00	6 68E-03	1.34E-02	
U-235	-2 6572E-06	2,426 99	0 00	3.28E-02	2 63E-02	3.28E-02	
U-236	1.3575E-05	2,426 99	4,853 99	0 00E+00	3 29E-02	6.59E-02	
U-238	-2.2698E-08	2,426 99	0 00	2.18E-03	2 13E-03	2.18E-03	
Y-90	2.2775E+00	2,426 99	4,853 99	0 00E+00	5 53E+03	1 11E+04	
Other Radionuclides					5 87E+03	1.17E+04	

## III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences*
Reactor Moderator:	From SFD	Used	
Fuel Cladding	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
BOL HM Constituents:	SST	SST	
BOL Enrichment %	U	U	
	70	60 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	816 76	2,426 99	
Bounding		4 853 99	

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

  

Checks		
	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.33	2.97
Bounding	0 66	

Estimated EOL HM/Given EOL HM 1.00

\*Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

\*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) TEXAS A&M  
SNF ID #: 239  
Fuel Units & Descr: 7 - ELEMENT  
Heavy Metal Mass: BOL=1.372kg, EOL=1.182kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1976  
Estimates as of: 2010  
Template: TRIGA-FLIP (LW/U-Zr, SST, 60 to 100%, U)  
<sup>2</sup>Template Burnup(MWd): 66.52  
Template BOL Heavy Metal Mass (MT): 0.000196  
Template Decay Time: 25 years

Estimated  
Canister usage  
18"x10"  
0.06

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.0386E-09	180.29	360.59	0.00E+00	1.87E-07	3.75E-07	Avg MeV	
Am-241	1.4973E-02	180.29	360.59	0.00E+00	2.70E+00	5.40E+00	0.0150	3.170E+13
Am-242m	2.2324E-05	180.29	360.59	0.00E+00	4.02E-03	8.05E-03	0.0250	6.562E+12
Am-243	3.0923E-05	180.29	360.59	0.00E+00	5.58E-03	1.12E-02	0.0375	5.767E+12
C-14	1.2559E-04	180.29	360.59	0.00E+00	2.26E-02	4.53E-02	0.0575	6.196E+12
Cl-36	2.6624E-06	180.29	360.59	0.00E+00	4.80E-04	9.60E-04	0.0850	3.699E+12
Cm-243	2.3527E-05	180.29	360.59	0.00E+00	4.24E-03	8.48E-03	0.1250	2.526E+12
Cm-244	1.9092E-03	180.29	360.59	0.00E+00	3.44E-01	6.88E-01	0.2250	3.196E+12
Co-60	8.9552E-02	180.29	360.59	0.00E+00	1.61E+01	3.23E+01	0.3750	1.387E+12
Cs-134	7.9074E-04	180.29	360.59	0.00E+00	1.43E-01	2.85E-01	0.5750	2.319E+13
Cs-135	1.9753E-05	180.29	360.59	0.00E+00	3.56E-03	7.12E-03	0.8500	3.897E+11
Cs-137	1.7243E+00	180.29	360.59	0.00E+00	3.11E+02	6.22E+02	1.2500	2.638E+12
Eu-154	2.4609E-02	180.29	360.59	0.00E+00	4.44E+00	8.87E+00	1.7500	1.095E+10
Eu-155	3.2456E-03	180.29	360.59	0.00E+00	5.85E-01	1.17E+00	2.2500	1.332E+07
Fe-55	3.8605E-03	180.29	360.59	0.00E+00	6.96E-01	1.39E+00	2.7500	1.822E+06
H-3	3.4305E-03	180.29	360.59	0.00E+00	6.19E-01	1.24E+00	3.5000	1.060E+04
I-129	7.1287E-07	180.29	360.59	0.00E+00	1.29E-04	2.57E-04	5.0000	4.497E+03
Kr-85	6.8536E-02	180.29	360.59	0.00E+00	1.24E+01	2.47E+01	7.0000	5.163E+02
Np-237	1.2219E-05	180.29	360.59	0.00E+00	2.20E-03	4.41E-03	11.0000	5.918E+01
Pa-231	2.0701E-09	180.29	360.59	0.00E+00	3.73E-07	7.46E-07		
Pb-210	1.3279E-12	180.29	360.59	0.00E+00	2.39E-10	4.79E-10		
Pm-147	5.7517E-03	180.29	360.59	0.00E+00	1.04E+00	2.07E+00		
Pu-238	4.6828E-02	180.29	360.59	0.00E+00	8.44E+00	1.69E+01		
Pu-239	1.4048E-03	180.29	360.59	0.00E+00	2.53E-01	5.07E-01		
Pu-240	1.1563E-03	180.29	360.59	0.00E+00	2.08E-01	4.17E-01		
Pu-241	1.6431E-01	180.29	360.59	0.00E+00	2.96E+01	5.92E+01		
Pu-242	4.9910E-06	180.29	360.59	0.00E+00	9.00E-04	1.80E-03		
Ra-226	5.4390E-12	180.29	360.59	0.00E+00	9.81E-10	1.96E-09		
Ra-228	2.3437E-11	180.29	360.59	0.00E+00	4.23E-09	8.45E-09		
Ru-106	1.1115E-07	180.29	360.59	0.00E+00	2.00E-05	4.01E-05		
Se-79	1.2829E-05	180.29	360.59	0.00E+00	2.31E-03	4.63E-03		
Sr-126	1.2088E-05	180.29	360.59	0.00E+00	2.18E-03	4.36E-03		
Sr-90	1.5935E+00	180.29	360.59	0.00E+00	2.87E+02	5.75E+02		
Tc-99	4.0319E-04	180.29	360.59	0.00E+00	7.27E-02	1.45E-01		
Th-229	2.4023E-10	180.29	360.59	0.00E+00	4.33E-08	8.66E-08		
Th-230	9.6948E-10	180.29	360.59	0.00E+00	1.75E-07	3.50E-07		
Th-232	2.3857E-11	180.29	360.59	0.00E+00	4.30E-09	8.60E-09		
Ti-208	1.3982E-07	180.29	360.59	0.00E+00	2.52E-05	5.04E-05		
U-232	3.7943E-07	180.29	360.59	0.00E+00	6.84E-05	1.37E-04		
U-233	6.9814E-08	180.29	360.59	0.00E+00	1.26E-05	2.52E-05		
U-234	5.4059E-06	180.29	360.59	0.00E+00	9.75E-04	1.95E-03		
U-235	-2.6572E-06	180.29	0.00	2.07E-03	1.59E-03	2.07E-03		
U-236	1.3576E-05	180.29	360.59	0.00E+00	2.45E-03	4.90E-03		
U-238	-2.2698E-08	180.29	0.00	1.39E-04	1.35E-04	1.39E-04		
Y-90	1.5935E+00	180.29	360.59	0.00E+00	2.87E+02	5.75E+02		
Other Radionuclides					3.05E+02	6.11E+02		

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	SST	SST
BOL HM Constituents	U	U
BOL Enrichment %	69.89795918	60 to 100

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal:	38.80	180.29
Bounding:		360.59

Basis for burnup used in estimate:

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup.

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.39	4.65
Bounding	0.77	

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other data confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT).

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name: TRIGA (FLIP) TEXAS A&M  
SNF ID #: 241

Fuel Units & Descr: 96 - ELEMENT

Heavy Metal Mass: BOL=16 819kg; EOL=14 63kg

ROD Storage Site: INEEL

Fuel decay start date: 2035

Estimates as of: 2010

Template: TRIGA FLIP (LW/U-Zrx, SST, 60 to 100%, U)

Template Burnup(MWd): 66 52

Template BOL Heavy Metal Mass (MT): 0 000196

Template Decay Time: 5 years

Estimated  
Canister usage  
18"x10"  
0 86

## II. Estimates

	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 8488E-10	2,080.28	4,160.56	0 00E+00	5 93E-07	1 19E-06	Avg MeV	
Am-241	7 5767E-03	2,080.28	4,160.56	0 00E+00	1 58E+01	3 15E+01	0 0150	6 713E+14
Am-242m	2 4459E-05	2,080.28	4,160.56	0 00E+00	5 09E-02	1 02E-01	0 0250	1 473E+14
Am-243	3 0983E-05	2,080.28	4,160.56	0 00E+00	6 45E-02	1 29E-01	0 0375	1 303E+14
C-14	1 2590E-04	2,080.28	4,160.56	0 00E+00	2 62E-01	5 24E-01	0 0575	1 301E+14
Cl-36	2 6624E-06	2,080.28	4,160.56	0 00E+00	5 54E-03	1 11E-02	0 0850	8 093E+13
Cm-243	3 8244E-05	2,080.28	4,160.56	0 00E+00	7 96E-02	1 59E-01	0 1250	6 498E+13
Cm-244	4 1010E-03	2,080.28	4,160.56	0 00E+00	8 53E+00	1 71E+01	0 2250	6 877E+13
Co-60	1 2410E+00	2,080.28	4,160.56	0 00E+00	2 58E+03	5 16E+03	0 3750	3 432E+13
Cs-134	6 5454E-01	2,080.28	4,160.56	0 00E+00	1 36E+03	2 72E+03	0 5750	5 680E+14
Cs-135	1 9753E-05	2,080.28	4,160.56	0 00E+00	4 11E-02	8 22E-02	0 8500	1 042E+14
Cs-137	2 7375E+00	2,080.28	4,160.56	0 00E+00	5 69E+03	1 14E+04	1 2500	4 002E+14
Eu-154	1 2324E-01	2,080.28	4,160.56	0 00E+00	2 56E+02	5 13E+02	1 7500	5 353E+11
Eu-155	5 3037E-02	2,080.28	4,160.56	0 00E+00	1 10E+02	2 21E+02	2 2500	4 196E+11
Fe-55	7 9555E-01	2,080.28	4,160.56	0 00E+00	1 65E+03	3 31E+03	2 7500	3 804E+09
H-3	1 0531E-02	2,080.28	4,160.56	0 00E+00	2 19E+01	4 38E+01	3 5000	4 477E+08
I-129	7 1287E-07	2,080.28	4,160.56	0 00E+00	1 48E-03	2 97E-03	5 0000	1 072E+05
Kr-85	2 4955E-01	2,080.28	4,160.56	0 00E+00	5 19E+02	1 04E+03	7 0000	1 234E+04
Np-237	1 2121E-05	2,080.28	4,160.56	0 00E+00	2 52E-02	5 04E-02	11 0000	1 416E+03
Pa-231	1 1230E-09	2,080.28	4,160.56	0 00E+00	2 34E-06	4 67E-06		
Pb-210	6 1636E-14	2,080.28	4,160.56	0 00E+00	1 28E-10	2 56E-10		
Pm-147	1 1302E+00	2,080.28	4,160.56	0 00E+00	2 35E+03	4 70E+03		
Pu-238	5 4826E-02	2,080.28	4,160.56	0 00E+00	1 14E+02	2 28E+02		
Pu-239	1 4066E-03	2,080.28	4,160.56	0 00E+00	2 92E+00	5 85E+00		
Pu-240	1 1536E-03	2,080.28	4,160.56	0 00E+00	2 40E+00	4 80E+00		
Pu-241	4 2995E-01	2,080.28	4,160.56	0 00E+00	8 94E+02	1 79E+03		
Pu-242	4 9910E-06	2,080.28	4,160.56	0 00E+00	1 04E-02	2 08E-02		
Ra-226	2 4008E-13	2,080.28	4,160.56	0 00E+00	4 99E-10	9 99E-10		
Ra-228	1 8220E-11	2,080.28	4,160.56	0 00E+00	3 79E-08	7 58E-08		
Ru-106	1 0343E-01	2,080.28	4,160.56	0 00E+00	2 15E+02	4 30E+02		
Se-79	1 2832E-05	2,080.28	4,160.56	0 00E+00	2 67E-02	5 34E-02		
Sn-126	1 2090E-05	2,080.28	4,160.56	0 00E+00	2 51E-02	5 03E-02		
Sr-90	2 5646E+00	2,080.28	4,160.56	0 00E+00	5 34E+03	1 07E+04		
Tc-99	4 0319E-04	2,080.28	4,160.56	0 00E+00	8 39E-01	1 68E+00		
Th-229	7 7375E-11	2,080.28	4,160.56	0 00E+00	1 61E-07	3 22E-07		
Th-230	1 2211E-10	2,080.28	4,160.56	0 00E+00	2 54E-07	5 08E-07		
Th-232	2 3842E-11	2,080.28	4,160.56	0 00E+00	4 96E-08	9 92E-08		
Th-208	1 4313E-07	2,080.28	4,160.56	0 00E+00	2 98E-04	5 96E-04		
U-232	4 1927E-07	2,080.28	4,160.56	0 00E+00	8 72E-04	1 74E-03	Thermal Power	
U-233	6 8491E-08	2,080.28	4,160.56	0 00E+00	1 42E-04	2 85E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	2 0189E-06	2,080.28	4,160.56	0 00E+00	4 20E-03	8 40E-03	1 36E+02	2 73E+02
U-235	-2 6572E-06	2,080.28	0 00	2 54E-02	1 99E-02	2 54E-02	Total	Total
U-236	1 3575E-05	2,080.28	4,160.56	0 00E+00	2 82E-02	5 65E-02		
U-238	-2 2698E-08	2,080.28	0 00	1 70E-03	1 65E-03	1 70E-03		
Y-90	2 5646E+00	2,080.28	4,160.56	0 00E+00	5 34E+03	1 07E+04		
Other Radionuclides					7 41E+03	1 48E+04		

Other Radionuclides

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	SST	SST
BOL HM Constituents	U	U
BOL Enrichment %	70 00179205	60 to 100

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	792.76	2,080.28
Bounding		4,160.56

Basis for burnup used in estimate:

Nominal burnup calculated from the heavy metal mass destroyed  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 36	2 62
Bounding	0 73	

Estimated EOL HM/ Given EOL HM

1 00

<sup>1</sup>Reactor shutdown, core removal storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

# Fuel Radionuclide Inventory Worksheet

## I. Fuel and Template Information

Fuel Name TRIGA (FLIP) TEXAS A&M - DAMAGED  
SNF ID #: 844  
Fuel Units & Descr: 5 - ELEMENT  
Heavy Metal Mass BOL=0.879kg; EOL=0.812kg  
ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2035  
Estimates as of: 2010  
Template: TRIGA-FLIP (LW/U-Zrx, SST, 60 to 100% U)  
<sup>2</sup>Template Burnup(MWd): 66.52  
Template BOL Heavy Metal Mass (MT): 0.000196  
Template Decay Time: 5 years

Estimated  
Canister usage  
18"x10"  
0.05

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.8488E-10	63.68	127.36	0.00E+00	1.81E-08	3.63E-08	Avg MeV	
Am-241	7.5767E-03	63.68	127.36	0.00E+00	4.82E-01	9.65E-01	0.0150	2.055E+13
Am-242m	2.4459E-05	63.68	127.36	0.00E+00	1.56E-03	3.11E-03	0.0250	4.509E+12
Am-243	3.0983E-05	63.68	127.36	0.00E+00	1.97E-03	3.95E-03	0.0375	3.989E+12
C-14	1.2590E-04	63.68	127.36	0.00E+00	8.02E-03	1.60E-02	0.0575	3.981E+12
Cl-36	2.6624E-06	63.68	127.36	0.00E+00	1.70E-04	3.39E-04	0.0850	2.477E+12
Cm-243	3.8244E-05	63.68	127.36	0.00E+00	2.44E-03	4.87E-03	0.1250	1.989E+12
Cm-244	4.1010E-03	63.68	127.36	0.00E+00	2.61E-01	5.22E-01	0.2250	2.105E+12
Co-60	1.2410E+00	63.68	127.36	0.00E+00	7.90E+01	1.58E+02	0.3750	1.050E+12
Cs-134	6.5454E-01	63.68	127.36	0.00E+00	4.17E+01	8.34E+01	0.5750	1.739E+13
Cs-135	1.9753E-05	63.68	127.36	0.00E+00	1.26E-03	2.52E-03	0.8500	3.189E+12
Cs-137	2.7375E+00	63.68	127.36	0.00E+00	1.74E+02	3.49E+02	1.2500	1.225E+13
Eu-154	1.2324E-01	63.68	127.36	0.00E+00	7.85E+00	1.57E+01	1.7500	1.639E+10
Eu-155	5.3037E-02	63.68	127.36	0.00E+00	3.38E+00	6.75E+00	2.2500	1.284E+10
Fe-55	7.9555E-01	63.68	127.36	0.00E+00	5.07E+01	1.01E+02	2.7500	1.164E+08
H-3	1.0531E-02	63.68	127.36	0.00E+00	6.71E-01	1.34E+00	3.5000	1.370E+07
I-129	7.1287E-07	63.68	127.36	0.00E+00	4.54E-05	9.08E-05	5.0000	3.283E+03
Kr-85	2.4955E-01	63.68	127.36	0.00E+00	1.59E+01	3.18E+01	7.0000	3.778E+02
Np-237	1.1212E-05	63.68	127.36	0.00E+00	7.72E-04	1.54E-03	11.0000	4.336E+01
Pa-231	1.1230E-09	63.68	127.36	0.00E+00	7.15E-08	1.43E-07		
Pb-210	6.1636E-14	63.68	127.36	0.00E+00	3.92E-12	7.85E-12		
Pm-147	1.1302E+00	63.68	127.36	0.00E+00	7.20E+01	1.44E+02		
Pu-238	5.4826E-02	63.68	127.36	0.00E+00	3.49E+00	6.98E+00		
Pu-239	1.4056E-03	63.68	127.36	0.00E+00	8.95E-02	1.79E-01		
Pu-240	1.1536E-03	63.68	127.36	0.00E+00	7.35E-02	1.47E-01		
Pu-241	4.2995E-01	63.68	127.36	0.00E+00	2.74E+01	5.48E+01		
Pu-242	4.9910E-06	63.68	127.36	0.00E+00	3.18E-04	6.36E-04		
Ra-226	2.4008E-13	63.68	127.36	0.00E+00	1.53E-11	3.06E-11		
Ra-228	1.8220E-11	63.68	127.36	0.00E+00	1.16E-09	2.32E-09		
Ru-106	1.0343E-01	63.68	127.36	0.00E+00	6.59E+00	1.32E+01		
Se-79	1.2832E-05	63.68	127.36	0.00E+00	8.17E-04	1.63E-03		
Sn-126	1.2090E-05	63.68	127.36	0.00E+00	7.70E-04	1.54E-03		
Sr-90	2.5646E+00	63.68	127.36	0.00E+00	1.63E+02	3.27E+02		
Tc-99	4.0319E-04	63.68	127.36	0.00E+00	2.57E-02	5.13E-02		
Th-229	7.7375E-11	63.68	127.36	0.00E+00	4.93E-09	9.85E-09		
Th-230	1.2211E-10	63.68	127.36	0.00E+00	7.78E-09	1.56E-08		
Th-232	2.3842E-11	63.68	127.36	0.00E+00	1.52E-09	3.04E-09		
Ti-208	1.4313E-07	63.68	127.36	0.00E+00	9.11E-06	1.82E-05		
U-232	4.1927E-07	63.68	127.36	0.00E+00	2.67E-05	5.34E-05		
U-233	6.8491E-08	63.68	127.36	0.00E+00	4.36E-06	8.72E-06		
U-234	2.0189E-06	63.68	127.36	0.00E+00	1.29E-04	2.57E-04		
U-235	-2.6572E-06	63.68	0.00	1.33E-03	1.16E-03	1.33E-03		
U-236	1.3575E-05	63.68	127.36	0.00E+00	8.64E-04	1.73E-03		
U-238	-2.2698E-08	63.68	0.00	8.87E-05	8.73E-05	8.87E-05		
Y-90	2.5646E+00	63.68	127.36	0.00E+00	1.63E+02	3.27E+02		
Other Radionuclides					2.27E+02	4.54E+02		
							Thermal Power	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							4.18E+00	8.35E+00
							Total	Total

## III. Template Selection Summary, Burnup Summary, and Checks

### Template Selection Summary

	From SFD	Used
Reactor Moderator:	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding:	SST	SST
BOL HM Constituents:	U	U
BOL Enrichment %:	69.96587031	60 to 100

Basis for Parameter Differences:

### Burnup Summary (MWd)<sup>2</sup>

	From SFD	Estimated
Nominal	24.86	63.68
Bounding		127.36

Basis for burnup used in estimate:

Nominal burnup calculated from the heavy metal mass destroyed.  
Bounding burnup assumed to be twice nominal burnup

### Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.21	2.56
Bounding	0.43	

Estimated EOL HM/Given EOL HM

1.00

<sup>1</sup>Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel

<sup>2</sup>Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)