



**Fuel Radionuclide Inventory Worksheet**

**I. Fuel and Template Information**

Fuel Name: TRIGA (FLIP) UNIV OF WISCONSIN  
 SNF ID #: 242  
 Fuel Units & Descr: 92 - ELEMENT  
 Heavy Metal Mass: BOL=18 032kg; EOL=15.53kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2035  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0.83

Radionuclide	m		x <sub>a</sub>		x <sub>b</sub>		b		y <sub>a</sub>		y <sub>b</sub>		Gamma Sources	
	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	2.8488E-10	2,378.33	4,756.66	0.00E+00	6.78E-07	1.36E-06	Avg MeV							
Am-241	7.5767E-03	2,378.33	4,756.66	0.00E+00	1.80E+01	3.60E+01	0.0150	7.675E+14						
Am-242m	2.4459E-05	2,378.33	4,756.66	0.00E+00	5.82E-02	1.16E-01	0.0250	1.684E+14						
Am-243	3.0983E-05	2,378.33	4,756.66	0.00E+00	7.37E-02	1.47E-01	0.0375	1.490E+14						
C-14	1.2590E-04	2,378.33	4,756.66	0.00E+00	2.99E-01	5.99E-01	0.0575	1.487E+14						
Cl-36	2.6624E-06	2,378.33	4,756.66	0.00E+00	6.33E-03	1.27E-02	0.0850	9.252E+13						
Cm-243	3.8244E-05	2,378.33	4,756.66	0.00E+00	9.10E-02	1.82E-01	0.1250	7.429E+13						
Cm-244	4.1010E-03	2,378.33	4,756.66	0.00E+00	9.75E+00	1.95E+01	0.2250	7.863E+13						
Co-60	1.2410E+00	2,378.33	4,756.66	0.00E+00	2.95E+03	5.90E+03	0.3750	3.923E+13						
Cs-134	6.5454E-01	2,378.33	4,756.66	0.00E+00	1.56E+03	3.11E+03	0.5750	6.493E+14						
Cs-135	1.9753E-05	2,378.33	4,756.66	0.00E+00	4.70E-02	9.40E-02	0.8500	1.191E+14						
Cs-137	2.7375E+00	2,378.33	4,756.66	0.00E+00	6.51E+03	1.30E+04	1.2500	4.575E+14						
Eu-154	1.2324E-01	2,378.33	4,756.66	0.00E+00	2.93E+02	5.86E+02	1.7500	6.120E+11						
Eu-155	5.3037E-02	2,378.33	4,756.66	0.00E+00	1.26E+02	2.52E+02	2.2500	4.797E+11						
Fe-55	7.9555E-01	2,378.33	4,756.66	0.00E+00	1.89E+03	3.78E+03	2.7500	4.349E+09						
H-3	1.0531E-02	2,378.33	4,756.66	0.00E+00	2.50E+01	5.01E+01	3.5000	5.118E+08						
I-129	7.1287E-07	2,378.33	4,756.66	0.00E+00	1.70E-03	3.39E-03	5.0000	1.226E+05						
Kr-85	2.4955E-01	2,378.33	4,756.66	0.00E+00	5.94E+02	1.19E+03	7.0000	1.411E+04						
Np-237	1.2121E-05	2,378.33	4,756.66	0.00E+00	2.88E-02	5.77E-02	11.0000	1.619E+03						
Pa-231	1.1230E-09	2,378.33	4,756.66	0.00E+00	2.67E-06	5.34E-06								
Pb-210	6.1636E-14	2,378.33	4,756.66	0.00E+00	1.47E-10	2.93E-10								
Pm-147	1.1302E+00	2,378.33	4,756.66	0.00E+00	2.69E+03	5.38E+03								
Pu-238	5.4826E-02	2,378.33	4,756.66	0.00E+00	1.30E+02	2.61E+02								
Pu-239	1.4056E-03	2,378.33	4,756.66	0.00E+00	3.34E+00	6.69E+00								
Pu-240	1.1536E-03	2,378.33	4,756.66	0.00E+00	2.74E+00	5.49E+00								
Pu-241	4.2995E-01	2,378.33	4,756.66	0.00E+00	1.02E+03	2.05E+03								
Pu-242	4.9910E-06	2,378.33	4,756.66	0.00E+00	1.19E-02	2.37E-02								
Ra-226	2.4008E-13	2,378.33	4,756.66	0.00E+00	5.71E-10	1.14E-09								
Ra-228	1.8220E-11	2,378.33	4,756.66	0.00E+00	4.33E-08	8.67E-08								
Ru-106	1.0343E-01	2,378.33	4,756.66	0.00E+00	2.46E+02	4.92E+02								
Se-79	1.2832E-05	2,378.33	4,756.66	0.00E+00	3.05E-02	6.10E-02								
Sn-126	1.2090E-05	2,378.33	4,756.66	0.00E+00	2.88E-02	5.75E-02								
Sr-90	2.5646E+00	2,378.33	4,756.66	0.00E+00	6.10E+03	1.22E+04								
Tc-99	4.0319E-04	2,378.33	4,756.66	0.00E+00	9.59E-01	1.92E+00								
Th-229	7.7375E-11	2,378.33	4,756.66	0.00E+00	1.84E-07	3.68E-07								
Th-230	1.2211E-10	2,378.33	4,756.66	0.00E+00	2.90E-07	5.81E-07								
Th-232	2.3842E-11	2,378.33	4,756.66	0.00E+00	5.67E-08	1.13E-07								
Ti-208	1.4313E-07	2,378.33	4,756.66	0.00E+00	3.40E-04	6.81E-04								
U-232	4.1927E-07	2,378.33	4,756.66	0.00E+00	9.97E-04	1.99E-03								
U-233	6.8491E-08	2,378.33	4,756.66	0.00E+00	1.63E-04	3.26E-04								
U-234	2.0189E-06	2,378.33	4,756.66	0.00E+00	4.80E-03	9.60E-03								
U-235	-2.6572E-06	2,378.33	0.00	2.72E-02	2.09E-02	2.72E-02								
U-236	1.3575E-05	2,378.33	4,756.66	0.00E+00	3.23E-02	6.46E-02								
U-238	-2.2698E-08	2,378.33	0.00	1.82E-03	1.77E-03	1.82E-03								
Y-90	2.5646E+00	2,378.33	4,756.66	0.00E+00	6.10E+03	1.22E+04								
Other Radionuclides					8.47E+03	1.69E+04								

**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 %:	69.89795918	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:	509.96	2,378.33	Nominal burnup calculated from the heavy metal mass destroyed
Bounding:		4,756.66	Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal:	0.39	4.66	1.00
Bounding:	0.78		

<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 TRIGA (FLIP) WSU  
 SNF ID # 243  
 Fuel Units & Descr 78 - ELEMENT  
 Heavy Metal Mass BOL=15.288kg EOL=13.291kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 2035  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0.70

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	2.8488E-10	1,897.80	3,795.60	0.00E+00	5.41E-07	1.08E-06	0.0150	6.124E+14
Am-241	7.5767E-03	1,897.80	3,795.60	0.00E+00	1.44E+01	2.88E+01	0.0250	1.344E+14
Am-242m	2.4459E-05	1,897.80	3,795.60	0.00E+00	4.64E-02	9.28E-02	0.0375	1.189E+14
Am-243	3.0983E-05	1,897.80	3,795.60	0.00E+00	5.88E-02	1.18E-01	0.0575	1.186E+14
C-14	1.2590E-04	1,897.80	3,795.60	0.00E+00	2.39E-01	4.78E-01	0.0850	7.383E+13
Cf-252	2.6624E-06	1,897.80	3,795.60	0.00E+00	5.05E-03	1.01E-02	0.1250	5.928E+13
Cm-243	3.8244E-05	1,897.80	3,795.60	0.00E+00	7.26E-02	1.45E-01	0.2250	6.274E+13
Cm-244	4.1010E-03	1,897.80	3,795.60	0.00E+00	7.78E+00	1.56E+01	0.3750	3.131E+13
Co-60	1.2410E+00	1,897.80	3,795.60	0.00E+00	2.36E+03	4.71E+03	0.5750	5.181E+14
Cs-134	6.5454E-01	1,897.80	3,795.60	0.00E+00	1.24E+03	2.48E+03	0.8500	9.505E+13
Cs-135	1.9753E-05	1,897.80	3,795.60	0.00E+00	3.75E-02	7.50E-02	1.2500	3.651E+14
Cs-137	2.7375E+00	1,897.80	3,795.60	0.00E+00	5.20E+03	1.04E+04	1.7500	4.883E+11
Eu-154	1.2324E-01	1,897.80	3,795.60	0.00E+00	2.34E+02	4.68E+02	2.2500	3.828E+11
Eu-155	5.3037E-02	1,897.80	3,795.60	0.00E+00	1.01E+02	2.01E+02	2.7500	3.470E+09
Fe-55	7.9555E-01	1,897.80	3,795.60	0.00E+00	1.51E+03	3.02E+03	3.5000	4.084E+08
H-3	1.0531E-02	1,897.80	3,795.60	0.00E+00	2.00E+01	4.00E+01	5.0000	9.784E+04
I-129	7.1287E-07	1,897.80	3,795.60	0.00E+00	1.35E-03	2.71E-03	7.0000	1.126E+04
Kr-85	2.4955E-01	1,897.80	3,795.60	0.00E+00	4.74E+02	9.47E+02	11.0000	1.292E+03
Np-237	1.2121E-05	1,897.80	3,795.60	0.00E+00	2.30E-02	4.60E-02		
Pa-231	1.1230E-09	1,897.80	3,795.60	0.00E+00	2.13E-06	4.26E-06		
Pb-210	6.1636E-14	1,897.80	3,795.60	0.00E+00	1.17E-10	2.34E-10		
Pm-147	1.1302E+00	1,897.80	3,795.60	0.00E+00	2.14E+03	4.29E+03		
Pu-238	5.4826E-02	1,897.80	3,795.60	0.00E+00	1.04E+02	2.08E+02		
Pu-239	1.4056E-03	1,897.80	3,795.60	0.00E+00	2.67E+00	5.34E+00		
Pu-240	1.1536E-03	1,897.80	3,795.60	0.00E+00	2.19E+00	4.38E+00		
Pu-241	4.2995E-01	1,897.80	3,795.60	0.00E+00	8.16E+02	1.63E+03		
Pu-242	4.9910E-06	1,897.80	3,795.60	0.00E+00	9.47E-03	1.89E-02		
Ra-226	2.4008E-13	1,897.80	3,795.60	0.00E+00	4.56E-10	9.11E-10		
Ra-228	1.8220E-11	1,897.80	3,795.60	0.00E+00	3.46E-08	6.92E-08		
Ru-106	1.0343E-01	1,897.80	3,795.60	0.00E+00	1.96E+02	3.93E+02		
Se-79	1.2832E-05	1,897.80	3,795.60	0.00E+00	2.44E-02	4.87E-02		
Sn-126	1.2090E-05	1,897.80	3,795.60	0.00E+00	2.29E-02	4.59E-02		
Sr-90	2.5646E+00	1,897.80	3,795.60	0.00E+00	4.87E+03	9.73E+03		
Tc-99	4.0319E-04	1,897.80	3,795.60	0.00E+00	7.65E-01	1.53E+00		
Th-229	7.7375E-11	1,897.80	3,795.60	0.00E+00	1.47E-07	2.94E-07		
Th-230	1.2211E-10	1,897.80	3,795.60	0.00E+00	2.32E-07	4.63E-07		
Th-232	2.3842E-11	1,897.80	3,795.60	0.00E+00	4.52E-08	9.05E-08		
Ti-208	1.4313E-07	1,897.80	3,795.60	0.00E+00	2.72E-04	5.43E-04		
U-232	4.1927E-07	1,897.80	3,795.60	0.00E+00	7.96E-04	1.59E-03		
U-233	6.8491E-08	1,897.80	3,795.60	0.00E+00	1.30E-04	2.60E-04		
U-234	2.0189E-06	1,897.80	3,795.60	0.00E+00	3.83E-03	7.66E-03		
U-235	-2.6572E-06	1,897.80	0.00	2.31E-02	1.81E-02	2.31E-02		
U-236	1.3575E-05	1,897.80	3,795.60	0.00E+00	2.68E-02	5.15E-02		
U-238	-2.2698E-08	1,897.80	0.00	1.54E-03	1.50E-03	1.54E-03		
Y-90	2.5646E+00	1,897.80	3,795.60	0.00E+00	4.87E+03	9.73E+03		
Other Radionuclides					6.76E+03	1.35E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.24E+02	2.49E+02
Total	Total

**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	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal	432.36	1,897.80	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		3,795.60	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.37	4.39	1.00
Bounding	0.73		

\*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: TRIGA (HIGH POWER) (HEU) 1 Fuel decay start date: 1970  
 SNF ID #: 998 Estimates as of: 2010  
 Fuel Units & Descr: 4 - ELEMENT Template: TRIGA-FLIP (LW/U-Zr, SST, 60 to 100%, U)  
 Heavy Metal Mass: BOL=0 117kg; EOL=0 117kg 2 Template Burnup(MWd): 66.52  
 ROD Storage Site: INEEL Template BOL Heavy Metal Mass (MT): 0.000196  
Template Decay Time: 35 years

Estimated  
 Canister usage  
 18"x10"  
 0.05

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.5469E-09	2.22	4.44	0.00E+00	3.43E-09	6.87E-09	Avg. MeV	
Am-241	1.6326E-02	2.22	4.44	0.00E+00	3.62E-02	7.25E-02	0.0150	3.071E+11
Am-242m	2.1332E-05	2.22	4.44	0.00E+00	4.74E-05	9.47E-05	0.0250	6.351E+10
Am-243	3.0893E-05	2.22	4.44	0.00E+00	6.86E-05	1.37E-04	0.0375	5.560E+10
C-14	1.2544E-04	2.22	4.44	0.00E+00	2.78E-04	5.57E-04	0.0575	6.022E+10
Cl-36	2.6624E-06	2.22	4.44	0.00E+00	5.91E-06	1.18E-05	0.0850	3.576E+10
Cm-243	1.8446E-05	2.22	4.44	0.00E+00	4.10E-05	8.19E-05	0.1250	2.389E+10
Cm-244	1.3020E-03	2.22	4.44	0.00E+00	2.89E-03	5.78E-03	0.2250	3.089E+10
Co-60	2.4053E-02	2.22	4.44	0.00E+00	5.34E-02	1.07E-01	0.3750	1.342E+10
Cs-134	2.7480E-05	2.22	4.44	0.00E+00	6.10E-05	1.22E-04	0.5750	2.264E+11
Cs-135	1.9738E-05	2.22	4.44	0.00E+00	4.38E-05	8.76E-05	0.8500	3.039E+09
Cs-137	1.3692E+00	2.22	4.44	0.00E+00	3.04E+00	6.08E+00	1.2500	9.577E+09
Eu-154	1.1001E-02	2.22	4.44	0.00E+00	2.44E-02	4.88E-02	1.7500	8.452E+07
Eu-155	8.0292E-04	2.22	4.44	0.00E+00	1.78E-03	3.57E-03	2.2500	4.822E+04
Fe-55	2.6894E-04	2.22	4.44	0.00E+00	5.97E-04	1.19E-03	2.7500	2.009E+04
H-3	1.9573E-03	2.22	4.44	0.00E+00	4.35E-03	8.69E-03	3.5000	9.161E+01
I-129	7.1287E-07	2.22	4.44	0.00E+00	1.58E-06	3.17E-06	5.0000	3.897E+01
Kr-85	3.5914E-02	2.22	4.44	0.00E+00	7.97E-02	1.59E-01	7.0000	4.467E+00
Np-237	1.2294E-05	2.22	4.44	0.00E+00	2.73E-05	5.46E-05	11.0000	5.115E-01
Pa-231	2.6383E-09	2.22	4.44	0.00E+00	5.86E-09	1.17E-08		
Pb-210	4.4648E-12	2.22	4.44	0.00E+00	9.91E-12	1.98E-11		
Pm-147	4.1025E-04	2.22	4.44	0.00E+00	9.11E-04	1.82E-03		
Pu-238	4.3265E-02	2.22	4.44	0.00E+00	9.61E-02	1.92E-01		
Pu-239	1.4044E-03	2.22	4.44	0.00E+00	3.12E-03	6.24E-03		
Pu-240	1.1563E-03	2.22	4.44	0.00E+00	2.57E-03	5.13E-03		
Pu-241	1.0156E-01	2.22	4.44	0.00E+00	2.25E-01	4.51E-01		
Pu-242	4.9910E-06	2.22	4.44	0.00E+00	1.11E-05	2.22E-05		
Ra-226	1.4301E-11	2.22	4.44	0.00E+00	3.18E-11	6.35E-11		
Ra-228	2.3767E-11	2.22	4.44	0.00E+00	5.28E-11	1.06E-10		
Ru-106	1.1521E-10	2.22	4.44	0.00E+00	2.56E-10	5.12E-10		
Se-79	1.2828E-05	2.22	4.44	0.00E+00	2.85E-05	5.70E-05		
Sn-126	1.2088E-05	2.22	4.44	0.00E+00	2.68E-05	5.37E-05		
Sr-90	1.2560E+00	2.22	4.44	0.00E+00	2.79E+00	5.58E+00		
Tc-99	4.0319E-04	2.22	4.44	0.00E+00	8.95E-04	1.79E-03		
Th-229	3.3915E-10	2.22	4.44	0.00E+00	7.53E-10	1.51E-09		
Th-230	1.8175E-09	2.22	4.44	0.00E+00	4.04E-09	8.07E-09		
Th-232	2.3873E-11	2.22	4.44	0.00E+00	5.30E-11	1.06E-10		
Th-208	1.2736E-07	2.22	4.44	0.00E+00	2.83E-07	5.66E-07		
U-232	3.4501E-07	2.22	4.44	0.00E+00	7.66E-07	1.53E-06		
U-233	7.0610E-08	2.22	4.44	0.00E+00	1.57E-07	3.14E-07		
U-234	7.1407E-06	2.22	4.44	0.00E+00	1.59E-05	3.17E-05		
U-235	-2.6572E-06	2.22	0.00	2.35E-04	2.29E-04	2.35E-04		
U-236	1.3576E-05	2.22	4.44	0.00E+00	3.01E-05	6.03E-05		
U-238	-2.2698E-08	2.22	0.00	2.69E-06	2.64E-06	2.69E-06		
Y-90	1.2563E+00	2.22	4.44	0.00E+00	2.79E+00	5.58E+00		
Other Radionuclides					3.00E+00	6.01E+00		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.93E-02	7.85E-02
Total	Total

**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	This Template was used for the following reasons: This fuel matches on all parameters except cladding (SST is conservative)
Fuel Cladding	INCOLOY	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93.152	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		2.22	Nominal burnup assumed to be 2% of BOL heavy metal mass Bounding burnup assumed to be twice nominal burnup.
Bounding		4.44	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.06		0.98
Bounding	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: TRIGA (HIGH POWER) ROMANIA  
 SNF ID #: 302  
 Fuel Units & Descr: 611 - ELEMENT  
 Heavy Metal Mass: BOL=27.067kg EOL=13 992kg  
 ROD Storage Site: INEEL

Fuel decay start date: 1978  
 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: 25 years

Estimated  
 Canister usage  
 18"x10"  
 5.50

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.0386E-09	12,427.12	24,854.25	0.00E+00	1.29E-05	2.58E-05	Avg MeV	
Am-241	1.4973E-02	12,427.12	24,854.25	0.00E+00	1.86E+02	3.72E+02	0.0150	2.185E+15
Am-242m	2.2324E-05	12,427.12	24,854.25	0.00E+00	2.77E-01	5.55E-01	0.0250	4.523E+14
Am-243	3.0923E-05	12,427.12	24,854.25	0.00E+00	3.84E-01	7.69E-01	0.0375	3.975E+14
C-14	1.2559E-04	12,427.12	24,854.25	0.00E+00	1.56E+00	3.12E+00	0.0575	4.271E+14
Cl-36	2.6624E-06	12,427.12	24,854.25	0.00E+00	3.31E-02	6.62E-02	0.0850	2.550E+14
Cm-243	2.3527E-05	12,427.12	24,854.25	0.00E+00	2.92E-01	5.85E-01	0.1250	1.741E+14
Cm-244	1.9092E-03	12,427.12	24,854.25	0.00E+00	2.37E+01	4.75E+01	0.2250	2.203E+14
Co-60	8.9552E-02	12,427.12	24,854.25	0.00E+00	1.11E+03	2.23E+03	0.3750	9.561E+13
Cs-134	7.9074E-04	12,427.12	24,854.25	0.00E+00	9.83E+00	1.97E+01	0.5750	1.598E+15
Cs-135	1.9753E-05	12,427.12	24,854.25	0.00E+00	2.45E-01	4.91E-01	0.8500	2.686E+13
Cs-137	1.7243E+00	12,427.12	24,854.25	0.00E+00	2.14E+04	4.29E+04	1.2500	1.818E+14
Eu-154	2.4609E-02	12,427.12	24,854.25	0.00E+00	3.06E+02	6.12E+02	1.7500	7.549E+11
Eu-155	3.2456E-03	12,427.12	24,854.25	0.00E+00	4.03E+01	8.07E+01	2.2500	9.182E+08
Fe-55	3.8605E-03	12,427.12	24,854.25	0.00E+00	4.80E+01	9.59E+01	2.7500	1.256E+08
H-3	3.4305E-03	12,427.12	24,854.25	0.00E+00	4.26E+01	8.53E+01	3.5000	7.303E+05
I-129	7.1287E-07	12,427.12	24,854.25	0.00E+00	8.86E-03	1.77E-02	5.0000	3.100E+05
Kr-85	6.8536E-02	12,427.12	24,854.25	0.00E+00	8.52E+02	1.70E+03	7.0000	3.599E+04
Np-237	1.2219E-06	12,427.12	24,854.25	0.00E+00	1.52E-01	3.04E-01	11.0000	4.079E+03
Pa-231	2.0701E-09	12,427.12	24,854.25	0.00E+00	2.57E-05	5.14E-05		
Pb-210	1.3279E-12	12,427.12	24,854.25	0.00E+00	1.65E-08	3.30E-08		
Pm-147	5.7517E-03	12,427.12	24,854.25	0.00E+00	7.15E+01	1.43E+02		
Pu-238	4.6828E-02	12,427.12	24,854.25	0.00E+00	5.82E+02	1.16E+03		
Pu-239	1.4048E-03	12,427.12	24,854.25	0.00E+00	1.75E+01	3.49E+01		
Pu-240	1.1563E-03	12,427.12	24,854.25	0.00E+00	1.44E+01	2.87E+01		
Pu-241	1.6431E-01	12,427.12	24,854.25	0.00E+00	2.04E+03	4.08E+03		
Pu-242	4.9910E-06	12,427.12	24,854.25	0.00E+00	6.20E-02	1.24E-01		
Ra-226	5.4390E-12	12,427.12	24,854.25	0.00E+00	6.76E-08	1.35E-07		
Ra-228	2.3437E-11	12,427.12	24,854.25	0.00E+00	2.91E-07	5.82E-07		
Ru-106	1.1115E-07	12,427.12	24,854.25	0.00E+00	1.38E-03	2.76E-03		
Se-79	1.2829E-05	12,427.12	24,854.25	0.00E+00	1.59E-01	3.19E-01		
Sn-126	1.2088E-05	12,427.12	24,854.25	0.00E+00	1.50E-01	3.00E-01		
Sr-90	1.5935E+00	12,427.12	24,854.25	0.00E+00	1.98E+04	3.96E+04		
Tc-99	4.0319E-04	12,427.12	24,854.25	0.00E+00	5.01E+00	1.00E+01		
Th-229	2.4023E-10	12,427.12	24,854.25	0.00E+00	2.99E-06	5.97E-06		
Th-230	9.6948E-10	12,427.12	24,854.25	0.00E+00	1.20E-05	2.41E-05		
Th-232	2.3857E-11	12,427.12	24,854.25	0.00E+00	2.96E-07	5.93E-07		
Ti-208	1.3982E-07	12,427.12	24,854.25	0.00E+00	1.74E-03	3.48E-03		
U-232	3.7943E-07	12,427.12	24,854.25	0.00E+00	4.72E-03	9.43E-03		
U-233	6.9814E-08	12,427.12	24,854.25	0.00E+00	8.68E-04	1.74E-03		
U-234	5.4059E-06	12,427.12	24,854.25	0.00E+00	6.72E-02	1.34E-01		
U-235	-2.6572E-06	12,427.12	0.00	5.45E-02	2.15E-02	5.45E-02		
U-236	1.3576E-05	12,427.12	24,854.25	0.00E+00	1.69E-01	3.37E-01	2.85E+02	5.70E+02
U-238	-2.2698E-08	12,427.12	0.00	6.24E-04	3.42E-04	6.24E-04		
Y-90	1.5935E+00	12,427.12	24,854.25	0.00E+00	1.98E+04	3.96E+04		
Other Radionuclides					2.11E+04	4.21E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.85E+02	5.70E+02
Total	Total

**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	This Template was used for the following reasons: This fuel matches on all parameters except cladding (SST is conservative)
Fuel Cladding	INCOLOY	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93.14	60 to 100	

Burnup Summary (MWD) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		12,427.12	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		24,854.25	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.35		1.00
Bounding	2.71		

<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 (HIGH POWER) ROMANIA  
 SNF ID #: 930  
 Fuel Units & Descr: 267 - ELEMENT  
 Heavy Metal Mass: BOL=11 828kg; EOL=5 58kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1999  
 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: 10 years

Estimated  
 Canister usage:  
 18"x10"  
 2 41

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	4.2243E-10	5,938 04	11,241 67	0 00E+00	2 51E-06	4.75E-06		
Am-241	9.9143E-03	5,938 04	11,241 67	0 00E+00	5 89E+01	1 11E+02	0 0150	1 441E+15
Am-242m	2.3903E-05	5,938 04	11,241 67	0 00E+00	1 42E-01	2 69E-01	0 0250	3 043E+14
Am-243	3 0968E-05	5,938 04	11,241 67	0 00E+00	1.84E-01	3 48E-01	0 0375	2 682E+14
C-14	1.2581E-04	5,938 04	11,241 67	0 00E+00	7.47E-01	1 41E+00	0 0575	2 797E+14
Cl-36	2 6624E-06	5,938 04	11,241 67	0 00E+00	1.58E-02	2 99E-02	0 0850	1 696E+14
Cm-243	3 3870E-05	5,938 04	11,241 67	0 00E+00	2.01E-01	3 81E-01	0 1250	1 232E+14
Cm-244	3.3870E-03	5,938 04	11,241 67	0 00E+00	2 01E+01	3 81E+01	0 2250	1 454E+14
Co-60	6.4311E-01	5,938 04	11,241 67	0 00E+00	3 82E+03	7 23E+03	0 3750	6 592E+13
Cs-134	1.2201E-01	5,938.04	11,241 67	0 00E+00	7.24E+02	1 37E+03	0 5750	1 094E+15
Cs-135	1.9753E-05	5,938 04	11,241 67	0 00E+00	1 17E-01	2 22E-01	0 8500	7 118E+13
Cs-137	2 4384E+00	5,938 04	11,241 67	0 00E+00	1 45E+04	2 74E+04	1.2500	5 594E+14
Eu-154	8.2396E-02	5,938 04	11,241 67	0 00E+00	4 89E+02	9 26E+02	1 7500	8 067E+11
Eu-155	2 6383E-02	5,938 04	11,241 67	0 00E+00	1 57E+02	2 97E+02	2.2500	1 733E+10
Fe-55	2 1001E-01	5,938 04	11,241 67	0 00E+00	1 25E+03	2 36E+03	2 7500	3 770E+08
H-3	7 9555E-03	5,938 04	11,241 67	0 00E+00	4 72E+01	8 94E+01	3.5000	3 948E+07
I-129	7 1287E-07	5,938 04	11,241 67	0 00E+00	4 23E-03	8 01E-03	5 0000	2 409E+05
Kr-85	1 8070E-01	5,938 04	11,241 67	0 00E+00	1 07E+03	2 03E+03	7 0000	2 772E+04
Np-237	1.2135E-05	5,938 04	11,241 67	0 00E+00	7 21E-02	1 36E-01	11 0000	3 180E+03
Pa-231	1.3125E-09	5,938 04	11,241 67	0 00E+00	7 79E-06	1 48E-05		
Pb-210	1 1201E-13	5,938 04	11,241.67	0 00E+00	6 65E-10	1 26E-09		
Pm-147	3 0186E-01	5,938 04	11,241.67	0 00E+00	1.79E+03	3.39E+03		
Pu-238	5 2706E-02	5,938 04	11,241 67	0 00E+00	3 13E+02	5 93E+02		
Pu-239	1 4054E-03	5,938 04	11,241 67	0 00E+00	8.35E+00	1.58E+01		
Pu-240	1 1545E-03	5,938 04	11,241 67	0 00E+00	6 86E+00	1.30E+01		
Pu-241	3 3809E-01	5,938 04	11,241 67	0 00E+00	2.01E+03	3 80E+03		
Pu-242	4 9910E-06	5,938 04	11,241 67	0 00E+00	2 96E-02	5 61E-02		
Ra-226	6 1395E-13	5,938 04	11,241 67	0 00E+00	3 65E-09	6 90E-09		
Ra-228	2 0490E-11	5,938 04	11,241 67	0 00E+00	1.22E-07	2.30E-07		
Ru-106	3 3298E-03	5,938 04	11,241 67	0 00E+00	1 98E+01	3 74E+01		
Se-79	1.2831E-05	5,938 04	11,241 67	0 00E+00	7 62E-02	1 44E-01		
Sn-126	1 2090E-05	5,938 04	11,241 67	0 00E+00	7.18E-02	1.36E-01		
Sr-90	2.2760E+00	5,938 04	11,241 67	0 00E+00	1 35E+04	2 56E+04		
Tc-99	4 0319E-04	5,938 04	11,241 67	0 00E+00	2.39E+00	4 53E+00		
Th-229	1 0973E-10	5,938 04	11,241 67	0 00E+00	6 52E-07	1.23E-06		
Th-230	2.2940E-10	5,938 04	11,241 67	0 00E+00	1 36E-06	2.58E-06		
Th-232	2 3842E-11	5,938 04	11,241 67	0 00E+00	1 42E-07	2 68E-07		
Th-208	1 4857E-07	5,938.04	11,241 67	0 00E+00	8 82E-04	1 67E-03		
U-232	4 1927E-07	5,938 04	11,241 67	0 00E+00	2 49E-03	4 71E-03		
U-233	6.8746E-08	5,938 04	11,241 67	0 00E+00	4 08E-04	7.73E-04		
U-234	2.7511E-06	5,938 04	11,241 67	0 00E+00	1 63E-02	3 09E-02		
U-235	-2 6572E-06	5,938 04	0 00	2.38E-02	8 03E-03	2 38E-02		
U-236	1 3575E-05	5,938 04	11,241 67	0 00E+00	8 06E-02	1 53E-01		
U-238	-2.2698E-08	5,938 04	0 00	2 72E-04	1 38E-04	2 72E-04		
Y-90	2 2775E+00	5,938 04	11,241 67	0 00E+00	1 35E+04	2 56E+04		
Other Radionuclides					1 44E+04	2 72E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2 50E+02	4 73E+02
Total	Total

**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	This Template was used for the following reasons: This fuel matches on all parameters except cladding (SST is conservative).
Fuel Cladding	INCOLOY	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93.14636964	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		5,938.04	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup calculated assuming all BOL heavy metal burned
Bounding		11,241 67	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 48		1 00
Bounding	2 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: TRIGA 20/20 FFCR MNRC  
 SNF ID #: 737  
 Fuel Units & Descr: 6 - ELEMENT  
 Heavy Metal Mass: BOL=2.462kg; EOL=2.462kg  
 ROD Storage Site: INEEL

Fuel decay start date: 2035  
 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"  
 0.08

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources		
							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	0.00E+00	0.00E+00	
Am-241	1.8331E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0150 2.607E+07	
Am-242m	1.4129E-06	0.00	0.00	0.00E+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	0.00E+00	0.0375 3.553E+04	
C-14	1.2871E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0575 2.174E+04	
Cl-36	2.8120E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0850 3.036E+06	
Cm-243	1.7940E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.1250 5.994E+06	
Cm-244	1.6962E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.2250 2.121E+07	
Co-60	1.2839E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.3750 5.293E+04	
Cs-134	9.0541E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.5750 2.604E+03	
Cs-135	3.2195E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.8500 4.065E+02	
Cs-137	2.7564E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.2500 2.427E+01	
Eu-154	1.5368E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.7500 1.188E+01	
Eu-155	2.9293E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.2500 6.879E+00	
Fe-55	7.7158E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.7500 3.997E+00	
H-3	1.1111E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.5000 3.573E+00	
I-129	7.3684E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.0000 1.535E+00	
Kr-85	2.5263E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.0000 1.767E-01	
Np-237	1.2427E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	11.0000 2.032E-02	
Pa-231	3.8511E-09	0.00	0.00	0.00E+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	0.00E+00		
Pm-147	2.1023E+00	0.00	0.00	0.00E+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	0.00E+00		
Pu-239	5.5293E-03	0.00	0.00	0.00E+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	0.00E+00		
Pu-241	1.0195E-01	0.00	0.00	0.00E+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	0.00E+00		
Ra-226	5.2782E-14	0.00	0.00	0.00E+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	0.00E+00		
Ru-106	9.1684E-02	0.00	0.00	0.00E+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	0.00E+00		
Sn-126	1.2167E-05	0.00	0.00	0.00E+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	0.00E+00		
Tc-99	4.4241E-04	0.00	0.00	0.00E+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	0.00E+00		
Th-230	1.8090E-11	0.00	0.00	0.00E+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	0.00E+00		
Ti-208	1.6947E-08	0.00	0.00	0.00E+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	0.00E+00		
U-233	1.2203E-07	0.00	0.00	0.00E+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	0.00E+00		
U-235	-2.6194E-06	0.00	0.00	1.05E-03	1.05E-03	1.05E-03	1.05E-03		
U-236	1.2693E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
U-238	-3.6331E-08	0.00	0.00	6.64E-04	6.64E-04	6.64E-04	6.64E-04		
Y-90	2.6060E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Other Radionuclides									

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.44E-05	4.44E-05
Total	Total

**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 %	19.76779631	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	0.00		Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup
Bounding			

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
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: TRIGA 30/20 FFCR MNRC  
 SNF ID #: 1055  
 Fuel Units & Descr: 1 - ELEMENT  
 Heavy Metal Mass: BOL=0.675kg; EOL=0.675kg  
 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

Radionuclide	m	x <sub>n</sub>	x <sub>0</sub>	b	y <sub>n</sub>	y <sub>0</sub>	Gamma Sources	
							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	7.138E+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	9.726E+03
C-14	1.2871E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0575	5.957E+03
Cf-36	2.8120E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0850	8.309E+05
Cm-243	1.7940E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.1250	1.641E+06
Cm-244	1.6962E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.2250	5.806E+06
Co-60	1.2839E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.3750	1.449E+04
Cs-134	9.0541E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.5750	7.127E+02
Cs-135	3.2195E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.8500	1.113E+02
Cs-137	2.7564E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.2500	6.652E+00
Eu-154	1.5368E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.7500	3.255E+00
Eu-155	2.9293E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.2500	1.885E+00
Fe-55	7.7158E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.7500	1.095E+00
H-3	1.1111E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	3.5000	9.793E-01
I-129	7.3684E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	5.0000	4.207E-01
Kr-85	2.5263E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	7.0000	4.843E-02
Np-237	1.2427E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	11.0000	5.568E-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		
Tl-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	2.88E-04	2.88E-04	2.88E-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	1.82E-04	1.82E-04	1.82E-04		
Y-90	2.6060E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Other Radionuclides								

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.22E-05	1.22E-05
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 %	19.74748006	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 8 5/20 FFCR	Fuel decay start date:	2035
SNF ID #	1003	Estimates as of	2010
Fuel Units & Descr	10 - ELEMENT	Template	TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=1604kg EOL=1.541kg	*Template Burnup(MWd)	665
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0.000195
		Template Decay Time:	5 years

Estimated  
Canister usage:  
18"x10"  
0.14

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	60.14	120.28	0.00E+00	5.12E-08	1.02E-07	Avg MeV	
Am-241	1.8331E-03	60.14	120.28	0.00E+00	1.10E-01	2.20E-01	0.0150	1.944E+13
Am-242m	1.4129E-06	60.14	120.28	0.00E+00	8.50E-05	1.70E-04	0.0250	4.278E+12
Am-243	1.4774E-07	60.14	120.28	0.00E+00	8.89E-06	1.78E-05	0.0375	3.643E+12
C-14	1.2871E-04	60.14	120.28	0.00E+00	7.74E-03	1.55E-02	0.0575	3.739E+12
Cl-36	2.8120E-06	60.14	120.28	0.00E+00	1.69E-04	3.38E-04	0.0850	2.316E+12
Cm-243	1.7940E-07	60.14	120.28	0.00E+00	1.08E-05	2.16E-05	0.1250	1.682E+12
Cm-244	1.6962E-06	60.14	120.28	0.00E+00	1.02E-04	2.04E-04	0.2250	1.965E+12
Co-60	1.2839E+00	60.14	120.28	0.00E+00	7.72E+01	1.54E+02	0.3750	9.972E+11
Cs-134	9.0541E-02	60.14	120.28	0.00E+00	5.45E+00	1.09E+01	0.5750	1.326E+13
Cs-135	3.2195E-05	60.14	120.28	0.00E+00	1.94E-03	3.87E-03	0.8500	5.690E+11
Cs-137	2.7564E+00	60.14	120.28	0.00E+00	1.66E+02	3.32E+02	1.2500	1.155E+13
Eu-154	1.5368E-02	60.14	120.28	0.00E+00	9.24E-01	1.85E+00	1.7500	7.702E+09
Eu-155	2.9293E-02	60.14	120.28	0.00E+00	1.76E+00	3.52E+00	2.2500	1.241E+10
Fe-55	7.7158E-01	60.14	120.28	0.00E+00	4.64E+01	9.28E+01	2.7500	9.852E+07
H-3	1.1111E-02	60.14	120.28	0.00E+00	6.68E-01	1.34E+00	3.5000	1.147E+07
I-129	7.3684E-07	60.14	120.28	0.00E+00	4.43E-05	8.86E-05	5.0000	6.404E+01
Kr-85	2.5263E-01	60.14	120.28	0.00E+00	1.52E+01	3.04E+01	7.0000	7.250E+00
Np-237	1.2427E-06	60.14	120.28	0.00E+00	7.47E-05	1.49E-04	11.0000	8.259E-01
Pa-231	3.8511E-09	60.14	120.28	0.00E+00	2.32E-07	4.63E-07		
Pb-210	7.3880E-15	60.14	120.28	0.00E+00	4.44E-13	8.89E-13		
Pm-147	2.1023E+00	60.14	120.28	0.00E+00	1.26E+02	2.53E+02		
Pu-238	1.0383E-03	60.14	120.28	0.00E+00	6.24E-02	1.25E-01		
Pu-239	5.5293E-03	60.14	120.28	0.00E+00	3.33E-01	6.65E-01		
Pu-240	2.1278E-03	60.14	120.28	0.00E+00	1.28E-01	2.56E-01		
Pu-241	1.0195E-01	60.14	120.28	0.00E+00	6.13E+00	1.23E+01		
Pu-242	2.3128E-07	60.14	120.28	0.00E+00	1.39E-05	2.78E-05		
Ra-226	5.2782E-14	60.14	120.28	0.00E+00	3.17E-12	6.35E-12		
Ra-228	1.9338E-10	60.14	120.28	0.00E+00	1.16E-08	2.33E-08		
Ru-106	9.1684E-02	60.14	120.28	0.00E+00	5.51E+00	1.10E+01		
Se-79	1.3018E-05	60.14	120.28	0.00E+00	7.83E-04	1.57E-03		
Sn-126	1.2167E-05	60.14	120.28	0.00E+00	7.32E-04	1.46E-03		
Sr-90	2.6045E+00	60.14	120.28	0.00E+00	1.57E+02	3.13E+02		
Tc-99	4.4241E-04	60.14	120.28	0.00E+00	2.66E-02	5.32E-02		
Th-229	1.3713E-10	60.14	120.28	0.00E+00	8.25E-09	1.65E-08		
Th-230	1.8090E-11	60.14	120.28	0.00E+00	1.09E-09	2.18E-09		
Th-232	2.5278E-10	60.14	120.28	0.00E+00	1.52E-08	3.04E-08		
Th-208	1.6947E-08	60.14	120.28	0.00E+00	1.02E-06	2.04E-06		
U-232	4.8737E-08	60.14	120.28	0.00E+00	2.93E-06	5.86E-06		
U-233	1.2203E-07	60.14	120.28	0.00E+00	7.34E-06	1.47E-05		
U-234	1.5925E-07	60.14	120.28	0.00E+00	9.58E-06	1.92E-05		
U-235	-2.6194E-06	60.14	0.00	6.68E-04	5.10E-04	6.68E-04		
U-236	1.2693E-05	60.14	120.28	0.00E+00	7.63E-04	1.53E-03		
U-238	-3.6331E-08	60.14	0.00	4.35E-04	4.33E-04	4.35E-04		
Y-90	2.6060E+00	60.14	120.28	0.00E+00	1.57E+02	3.13E+02		
Other Radionuclides					2.17E+02	4.34E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.50E+00	7.00E+00
Total	Total

**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 %:	19.26433915	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate*
	From SFD	
Nominal	54.71	60.14
Bounding		120.28

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	1.10	1.10	1.00
Bounding	2.20		

\*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 AFRR1  
 SNF ID #: 969  
 Fuel Units & Descr: 3 - ELEMENT  
 Heavy Metal Mass: BOL= ; EOL=0.26kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2019  
 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"  
 0.04

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	9.20	18.40	0.00E+00	7.84E-09	1.57E-08		
Am-241	1.8331E-03	9.20	18.40	0.00E+00	1.69E-02	3.37E-02	0.0150	2.974E+12
Am-242m	1.4129E-06	9.20	18.40	0.00E+00	1.30E-05	2.60E-05	0.0250	6.544E+11
Am-243	1.4774E-07	9.20	18.40	0.00E+00	1.36E-06	2.72E-06	0.0375	5.573E+11
C-14	1.2871E-04	9.20	18.40	0.00E+00	1.18E-03	2.37E-03	0.0575	5.721E+11
Cl-36	2.8120E-06	9.20	18.40	0.00E+00	2.59E-05	5.17E-05	0.0850	3.544E+11
Cm-243	1.7940E-07	9.20	18.40	0.00E+00	1.65E-06	3.30E-06	0.1250	2.574E+11
Cm-244	1.6962E-06	9.20	18.40	0.00E+00	1.56E-05	3.12E-05	0.2250	3.006E+11
Co-60	1.2839E+00	9.20	18.40	0.00E+00	1.18E+01	2.36E+01	0.3750	1.526E+11
Cs-134	9.0541E-02	9.20	18.40	0.00E+00	8.33E-01	1.67E+00	0.5750	2.028E+12
Cs-135	3.2195E-05	9.20	18.40	0.00E+00	2.96E-04	5.92E-04	0.8500	8.705E+10
Cs-137	2.7564E+00	9.20	18.40	0.00E+00	2.54E+01	5.07E+01	1.2500	1.768E+12
Eu-154	1.5368E-02	9.20	18.40	0.00E+00	1.41E-01	2.83E-01	1.7500	1.178E+09
Eu-155	2.9233E-02	9.20	18.40	0.00E+00	2.70E-01	5.39E-01	2.2500	1.899E+09
Fe-55	7.7158E-01	9.20	18.40	0.00E+00	7.10E+00	1.42E+01	2.7500	1.507E+07
H-3	1.1111E-02	9.20	18.40	0.00E+00	1.02E-01	2.04E-01	3.5000	1.754E+06
I-129	7.3684E-07	9.20	18.40	0.00E+00	6.78E-06	1.36E-05	5.0000	9.812E+00
Kr-85	2.5263E-01	9.20	18.40	0.00E+00	2.32E+00	4.65E+00	7.0000	1.111E+00
Np-237	1.2427E-06	9.20	18.40	0.00E+00	1.14E-05	2.29E-05	11.0000	1.265E-01
Pa-231	3.8511E-09	9.20	18.40	0.00E+00	3.54E-08	7.09E-08		
Pb-210	7.3880E-15	9.20	18.40	0.00E+00	6.80E-14	1.36E-13		
Pm-147	2.1023E+00	9.20	18.40	0.00E+00	1.93E+01	3.87E+01		
Pu-238	1.0383E-03	9.20	18.40	0.00E+00	9.55E-03	1.91E-02		
Pu-239	5.5293E-03	9.20	18.40	0.00E+00	5.09E-02	1.02E-01		
Pu-240	2.1278E-03	9.20	18.40	0.00E+00	1.96E-02	3.92E-02		
Pu-241	1.0195E-01	9.20	18.40	0.00E+00	9.38E-01	1.88E+00		
Pu-242	2.3128E-07	9.20	18.40	0.00E+00	2.13E-06	4.26E-06		
Ra-226	5.2782E-14	9.20	18.40	0.00E+00	4.86E-13	9.71E-13		
Ra-228	1.9338E-10	9.20	18.40	0.00E+00	1.78E-09	3.56E-09		
Ru-106	9.1684E-02	9.20	18.40	0.00E+00	8.44E-01	1.69E+00		
Se-79	1.3018E-05	9.20	18.40	0.00E+00	1.20E-04	2.40E-04		
Sn-126	1.2167E-05	9.20	18.40	0.00E+00	1.12E-04	2.24E-04		
Sr-90	2.6045E+00	9.20	18.40	0.00E+00	2.40E+01	4.79E+01		
Tc-99	4.4241E-04	9.20	18.40	0.00E+00	4.07E-03	8.14E-03		
Th-229	1.3713E-10	9.20	18.40	0.00E+00	1.26E-09	2.52E-09		
Th-230	1.8090E-11	9.20	18.40	0.00E+00	1.66E-10	3.33E-10		
Th-232	2.5278E-10	9.20	18.40	0.00E+00	2.33E-09	4.65E-09		
Ti-208	1.6947E-08	9.20	18.40	0.00E+00	1.56E-07	3.12E-07		
U-232	4.8737E-08	9.20	18.40	0.00E+00	4.48E-07	8.97E-07		
U-233	1.2203E-07	9.20	18.40	0.00E+00	1.12E-06	2.25E-06		
U-234	1.5925E-07	9.20	18.40	0.00E+00	1.47E-06	2.93E-06		
U-235	-2.6194E-06	9.20	0.00	1.17E-04	9.25E-05	1.17E-04	Nominal Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2693E-05	9.20	18.40	0.00E+00	1.17E-04	2.34E-04	5.35E-01	1.07E+00
U-238	-3.6331E-08	9.20	0.00	7.25E-05	7.22E-05	7.25E-05	Total	Total
Y-90	2.6060E+00	9.20	18.40	0.00E+00	2.40E+01	4.80E+01		
Other Radionuclides					3.32E+01	6.63E+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	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 %		10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		9.20	Nominal burnup taken from SFD and converted to MWd using BOL=0.27kg
Bounding		18.40	Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.00		1.00
Bounding	2.00		

<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 8.5/20 FFCR ENGLAND  
 SNF ID # 987  
 Fuel Units & Descr 4 - ELEMENT  
 Heavy Metal Mass: BOL=0.641kg EOL=0.624kg  
 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"  
 0.04

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	18.75	37.49	0.00E+00	1.60E-08	3.19E-08	0.0150	6.060E+12
Am-241	1.8331E-03	18.75	37.49	0.00E+00	3.44E-02	6.87E-02	0.0250	1.333E+12
Am-242m	1.4129E-06	18.75	37.49	0.00E+00	2.65E-05	5.30E-05	0.0375	1.136E+12
Am-243	1.4774E-07	18.75	37.49	0.00E+00	2.77E-06	5.54E-06	0.0575	1.166E+12
C-14	1.2871E-04	18.75	37.49	0.00E+00	2.41E-03	4.83E-03	0.0850	7.221E+11
Cl-36	2.8120E-06	18.75	37.49	0.00E+00	5.27E-05	1.05E-04	0.1250	5.244E+11
Cm-243	1.7940E-07	18.75	37.49	0.00E+00	3.36E-06	6.73E-06	0.2250	6.126E+11
Cm-244	1.6962E-06	18.75	37.49	0.00E+00	3.18E-05	6.36E-05	0.3750	3.109E+11
Co-60	1.2839E+00	18.75	37.49	0.00E+00	2.41E+01	4.81E+01	0.5750	4.133E+12
Cs-134	9.0541E-02	18.75	37.49	0.00E+00	1.70E+00	3.39E+00	0.8500	1.774E+11
Cs-135	3.2195E-05	18.75	37.49	0.00E+00	6.04E-04	1.21E-03	1.2500	3.602E+12
Cs-137	2.7564E+00	18.75	37.49	0.00E+00	5.17E+01	1.03E+02	1.7500	2.401E+09
Eu-154	1.5368E-02	18.75	37.49	0.00E+00	2.88E-01	5.76E-01	2.2500	3.870E+09
Eu-155	2.9293E-02	18.75	37.49	0.00E+00	5.49E-01	1.10E+00	2.7500	3.071E+07
Fe-55	7.7158E-01	18.75	37.49	0.00E+00	1.45E+01	2.89E+01	3.5000	3.574E+06
H-3	1.1111E-02	18.75	37.49	0.00E+00	2.08E-01	4.17E-01	5.0000	2.005E+01
I-129	7.3684E-07	18.75	37.49	0.00E+00	1.38E-05	2.76E-05	7.0000	2.270E+00
Kr-85	2.5263E-01	18.75	37.49	0.00E+00	4.74E+00	9.47E+00	11.0000	2.586E-01
Np-237	1.2427E-06	18.75	37.49	0.00E+00	2.33E-05	4.66E-05		
Pa-231	3.8511E-09	18.75	37.49	0.00E+00	7.22E-08	1.44E-07		
Pb-210	7.3880E-15	18.75	37.49	0.00E+00	1.39E-13	2.77E-13		
Pm-147	2.1023E+00	18.75	37.49	0.00E+00	3.94E+01	7.88E+01		
Pu-238	1.0383E-03	18.75	37.49	0.00E+00	1.95E-02	3.89E-02		
Pu-239	5.5293E-03	18.75	37.49	0.00E+00	1.04E-01	2.07E-01		
Pu-240	2.1278E-03	18.75	37.49	0.00E+00	3.99E-02	7.98E-02		
Pu-241	1.0195E-01	18.75	37.49	0.00E+00	1.91E+00	3.82E+00		
Pu-242	2.3128E-07	18.75	37.49	0.00E+00	4.34E-06	8.67E-06		
Ra-226	5.2782E-14	18.75	37.49	0.00E+00	9.90E-13	1.98E-12		
Ra-228	1.9338E-10	18.75	37.49	0.00E+00	3.63E-09	7.25E-09		
Ru-106	9.1684E-02	18.75	37.49	0.00E+00	1.72E+00	3.44E+00		
Se-79	1.3018E-05	18.75	37.49	0.00E+00	2.44E-04	4.88E-04		
Sn-126	1.2167E-05	18.75	37.49	0.00E+00	2.28E-04	4.56E-04		
Sr-90	2.6045E+00	18.75	37.49	0.00E+00	4.88E+01	9.77E+01		
Tc-99	4.4241E-04	18.75	37.49	0.00E+00	8.29E-03	1.66E-02		
Th-229	1.3713E-10	18.75	37.49	0.00E+00	2.57E-09	5.14E-09		
Th-230	1.8090E-11	18.75	37.49	0.00E+00	3.39E-10	6.78E-10		
Th-232	2.5278E-10	18.75	37.49	0.00E+00	4.74E-09	9.48E-09		
Th-208	1.6947E-08	18.75	37.49	0.00E+00	3.18E-07	6.35E-07		
U-232	4.8737E-08	18.75	37.49	0.00E+00	9.14E-07	1.83E-06		
U-233	1.2203E-07	18.75	37.49	0.00E+00	2.29E-06	4.58E-06		
U-234	1.5925E-07	18.75	37.49	0.00E+00	2.99E-06	5.97E-06		
U-235	-2.6194E-06	18.75	0.00	2.77E-04	2.28E-04	2.77E-04		
U-236	1.2693E-05	18.75	37.49	0.00E+00	2.38E-04	4.76E-04		
U-238	-3.6331E-08	18.75	0.00	1.72E-04	1.72E-04	1.72E-04		
Y-90	2.6060E+00	18.75	37.49	0.00E+00	4.89E+01	9.77E+01		
Other Radionuclides					6.76E+01	1.35E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.09E+00	2.18E+00
Total	Total

**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 %	19.96879875	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	18.75	16.80	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		37.49	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.86	0.90	1.00
Bounding	1.71		

<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 HEIDELBERG  
 SNF ID #: 1045  
 Fuel Units & Descr. 5 - ELEMENT  
 Heavy Metal Mass: BOL=0 801kg; EOL=0 79kg  
 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 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	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 5173E-10	15 61	31 23	0 00E+00	1 33E-08	2 66E-08	Avg MeV	
Am-241	1 8331E-03	15 61	31 23	0 00E+00	2 86E-02	5 72E-02	0 0150	5 047E+12
Am-242m	1 4129E-06	15 61	31 23	0 00E+00	2 21E-05	4 41E-05	0 0250	1 111E+12
Am-243	1 4774E-07	15 61	31 23	0 00E+00	2 31E-06	4 61E-06	0 0375	9 457E+11
C-14	1 2871E-04	15 61	31 23	0 00E+00	2 01E-03	4 02E-03	0 0575	9 707E+11
Cl-36	2 8120E-06	15 61	31 23	0 00E+00	4 39E-05	8 78E-05	0 0850	6 014E+11
Cm-243	1 7940E-07	15 61	31 23	0 00E+00	2 80E-06	5 60E-06	0 1250	4 367E+11
Cm-244	1 6962E-06	15 61	31 23	0 00E+00	2 65E-05	5 30E-05	0 2250	5 101E+11
Co-60	1 2839E+00	15 61	31 23	0 00E+00	2 00E+01	4 01E+01	0 3750	2 589E+11
Cs-134	9 0541E-02	15 61	31 23	0 00E+00	1 41E+00	2 83E+00	0 5750	3 442E+12
Cs-135	3 2195E-05	15 61	31 23	0 00E+00	5 03E-04	1 01E-03	0 8500	1 477E+11
Cs-137	2 7564E+00	15 61	31 23	0 00E+00	4 30E+01	8 61E+01	1 2500	3 000E+12
Eu-154	1 5368E-02	15 61	31 23	0 00E+00	2 40E-01	4 80E-01	1 7500	2 000E+09
Eu-155	2 9293E-02	15 61	31 23	0 00E+00	4 57E-01	9 15E-01	2 2500	3 223E+09
Fe-55	7 7158E-01	15 61	31 23	0 00E+00	1 20E+01	2 41E+01	2 7500	2 558E+07
H-3	1 1111E-02	15 61	31 23	0 00E+00	1 73E-01	3 47E-01	3 5000	2 977E+06
I-129	7 3684E-07	15 61	31 23	0 00E+00	1 15E-05	2 30E-05	5 0000	1 686E+01
Kr-85	2 5263E-01	15 61	31 23	0 00E+00	3 94E+00	7 89E+00	7 0000	1 909E+00
Np-237	1 2427E-06	15 61	31 23	0 00E+00	1 94E-05	3 88E-05	11 0000	2 176E-01
Pa-231	3 8511E-09	15 61	31 23	0 00E+00	6 01E-08	1 20E-07		
Pb-210	7 3880E-15	15 61	31 23	0 00E+00	1 15E-13	2 31E-13		
Pm-147	2 1023E+00	15 61	31 23	0 00E+00	3 28E+01	6 56E+01		
Pu-238	1 0383E-03	15 61	31 23	0 00E+00	1 62E-02	3 24E-02		
Pu-239	5 5293E-03	15 61	31 23	0 00E+00	8 63E-02	1 73E-01		
Pu-240	2 1278E-03	15 61	31 23	0 00E+00	3 32E-02	6 64E-02		
Pu-241	1 0195E-01	15 61	31 23	0 00E+00	1 59E+00	3 18E+00		
Pu-242	2 3128E-07	15 61	31 23	0 00E+00	3 61E-06	7 22E-06		
Ra-226	5 2782E-14	15 61	31 23	0 00E+00	8 24E-13	1 65E-12		
Ra-228	1 9338E-10	15 61	31 23	0 00E+00	3 02E-09	6 04E-09		
Ru-106	9 1684E-02	15 61	31 23	0 00E+00	1 43E+00	2 86E+00		
Se-79	1 3018E-05	15 61	31 23	0 00E+00	2 03E-04	4 07E-04		
Sn-126	1 2167E-05	15 61	31 23	0 00E+00	1 90E-04	3 80E-04		
Sr-90	2 6045E+00	15 61	31 23	0 00E+00	4 07E+01	8 13E+01		
Tc-99	4 4241E-04	15 61	31 23	0 00E+00	6 91E-03	1 38E-02		
Th-229	1 3713E-10	15 61	31 23	0 00E+00	2 14E-09	4 28E-09		
Th-230	1 8090E-11	15 61	31 23	0 00E+00	2 82E-10	5 65E-10		
Th-232	2 5278E-10	15 61	31 23	0 00E+00	3 95E-09	7 89E-09		
Tl-208	1 6947E-08	15 61	31 23	0 00E+00	2 65E-07	5 29E-07		
U-232	4 8737E-08	15 61	31 23	0 00E+00	7 61E-07	1 52E-06		
U-233	1 2203E-07	15 61	31 23	0 00E+00	1 91E-06	3 81E-06		
U-234	1 5925E-07	15 61	31 23	0 00E+00	2 49E-06	4 97E-06		
U-235	-2 6194E-06	15 61	0 00	3 44E-04	3 03E-04	3 44E-04		
U-236	1 2693E-05	15 61	31 23	0 00E+00	1 98E-04	3 96E-04		
U-238	-3 6331E-08	15 61	0 00	2 16E-04	2 15E-04	2 16E-04		
Y-90	2 6060E+00	15 61	31 23	0 00E+00	4 07E+01	8 14E+01		
Other Radionuclides					5 63E+01	1 13E+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 %	19 85018727	10 to 20 1	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	15 61	10 02	
Bounding		31 23	

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 64	
Bounding	1 14		

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 8.5/20 FFCR ITALY  
 SNF ID # 730  
 Fuel Units & Descr: 3 - ELEMENT  
 Heavy Metal Mass: BOL=0.484kg EOL=0.458kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1959  
 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:  
 18"x10"  
 0.04

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.4992E-09	24.34	48.68	0.00E+00	2.31E-07	4.62E-07	0.0150	2.377E+12
Am-241	4.0120E-03	24.34	48.68	0.00E+00	9.77E-02	1.95E-01	0.0250	4.937E+11
Am-242m	1.1510E-06	24.34	48.68	0.00E+00	2.80E-05	5.60E-05	0.0375	4.297E+11
Am-243	1.4713E-07	24.34	48.68	0.00E+00	3.58E-06	7.16E-06	0.0575	4.629E+11
C-14	1.2800E-04	24.34	48.68	0.00E+00	3.12E-03	6.23E-03	0.0850	2.780E+11
Cl-36	2.8120E-08	24.34	48.68	0.00E+00	6.85E-05	1.37E-04	0.1250	1.805E+11
Cm-243	6.0120E-06	24.34	48.68	0.00E+00	1.46E-06	2.93E-06	0.2250	2.395E+11
Cm-244	3.0331E-07	24.34	48.68	0.00E+00	7.38E-06	1.48E-05	0.3750	1.045E+11
Co-60	3.4647E-03	24.34	48.68	0.00E+00	8.43E-02	1.69E-01	0.5750	1.766E+12
Cs-134	2.4632E-08	24.34	48.68	0.00E+00	6.00E-07	1.20E-06	0.8500	1.738E+10
Cs-135	3.2195E-05	24.34	48.68	0.00E+00	7.84E-04	1.57E-03	1.2500	1.859E+10
Cs-137	9.7519E-01	24.34	48.68	0.00E+00	2.37E+01	4.75E+01	1.7500	4.485E+08
Eu-154	4.0947E-04	24.34	48.68	0.00E+00	9.97E-03	1.99E-02	2.2500	1.142E+05
Eu-155	5.4586E-05	24.34	48.68	0.00E+00	1.33E-03	2.66E-03	2.7500	2.060E+04
Fe-55	4.7955E-06	24.34	48.68	0.00E+00	1.17E-04	2.33E-04	3.5000	6.010E+01
H-3	8.9038E-04	24.34	48.68	0.00E+00	2.17E-02	4.33E-02	5.0000	2.530E+01
I-129	7.3684E-07	24.34	48.68	0.00E+00	1.79E-05	3.59E-05	7.0000	2.854E+00
Kr-85	1.3791E-02	24.34	48.68	0.00E+00	3.36E-01	6.71E-01	11.0000	3.245E-01
Np-237	1.3038E-06	24.34	48.68	0.00E+00	3.17E-05	6.35E-05		
Pa-231	1.5534E-08	24.34	48.68	0.00E+00	3.78E-07	7.56E-07		
Pb-210	7.1759E-13	24.34	48.68	0.00E+00	1.75E-11	3.49E-11		
Pm-147	1.4547E-05	24.34	48.68	0.00E+00	3.54E-04	7.08E-04		
Pu-238	7.2827E-04	24.34	48.68	0.00E+00	1.77E-02	3.55E-02		
Pu-239	5.5218E-03	24.34	48.68	0.00E+00	1.34E-01	2.69E-01		
Pu-240	2.1173E-03	24.34	48.68	0.00E+00	5.15E-02	1.03E-01		
Pu-241	1.1702E-02	24.34	48.68	0.00E+00	2.85E-01	5.70E-01		
Pu-242	2.3128E-07	24.34	48.68	0.00E+00	5.63E-06	1.13E-05		
Ra-226	1.6827E-12	24.34	48.68	0.00E+00	4.10E-11	8.19E-11		
Ra-228	2.5263E-10	24.34	48.68	0.00E+00	6.15E-09	1.23E-08		
Ru-106	3.4090E-15	24.34	48.68	0.00E+00	8.30E-14	1.66E-13		
Se-79	1.3012E-05	24.34	48.68	0.00E+00	3.17E-04	6.33E-04		
Sn-126	1.2162E-05	24.34	48.68	0.00E+00	2.96E-04	5.92E-04		
Sr-90	8.9323E-01	24.34	48.68	0.00E+00	2.17E+01	4.35E+01		
Tc-99	4.4241E-04	24.34	48.68	0.00E+00	1.08E-02	2.15E-02		
Th-229	7.6902E-10	24.34	48.68	0.00E+00	1.87E-08	3.74E-08		
Th-230	1.3059E-10	24.34	48.68	0.00E+00	3.18E-09	6.36E-09		
Th-232	2.5278E-10	24.34	48.68	0.00E+00	6.15E-09	1.23E-08		
Tl-208	1.1892E-08	24.34	48.68	0.00E+00	2.89E-07	5.79E-07		
U-232	3.1970E-08	24.34	48.68	0.00E+00	7.78E-07	1.56E-06		
U-233	1.2232E-07	24.34	48.68	0.00E+00	2.98E-06	5.95E-06		
U-234	2.8662E-07	24.34	48.68	0.00E+00	6.98E-06	1.40E-05		
U-235	-2.6194E-06	24.34	0.00	2.10E-04	1.46E-04	2.10E-04		
U-236	1.2696E-05	24.34	48.68	0.00E+00	3.09E-04	6.18E-04		
U-238	-3.6331E-08	24.34	0.00	1.30E-04	1.29E-04	1.30E-04		
Y-90	8.9338E-01	24.34	48.68	0.00E+00	2.17E+01	4.35E+01		
Other Radionuclides					2.40E+01	4.80E+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 %	20.04130579	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	16.51	24.34	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		48.68	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.48	1.47	1.00
Bounding	2.95		

<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: TRIGA 8 5/20 FFCH MNRC  
 SNF ID #: 703  
 Fuel Units & Descr. 5 - ELEMENT  
 Heavy Metal Mass: BOL=0 801kg EOL=0 761kg  
 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 07

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 5173E-10	39 14	78 28	0 00E+00	3 33E-08	6 67E-08	Avg MeV	
Am-241	1 8331E-03	39 14	78 28	0 00E+00	7 17E-02	1 43E-01	0 0150	1 265E+13
Am-242m	1 4129E-06	39 14	78 28	0 00E+00	5 53E-05	1 11E-04	0 0250	2 784E+12
Am-243	1 4774E-07	39 14	78 28	0 00E+00	5 78E-06	1 16E-05	0 0375	2 371E+12
C-14	1 2871E-04	39 14	78 28	0 00E+00	5 04E-03	1 01E-02	0 0575	2 433E+12
Cl-36	2 8120E-06	39 14	78 28	0 00E+00	1 10E-04	2 20E-04	0 0850	1 508E+12
Cm-243	1 7940E-07	39 14	78 28	0 00E+00	7 02E-06	1 40E-05	0 1250	1 095E+12
Cm-244	1 6962E-06	39 14	78 28	0 00E+00	6 64E-05	1 33E-04	0 2250	1 279E+12
Co-60	1 2839E+00	39 14	78 28	0 00E+00	5 03E+01	1 01E+02	0 3750	6 490E+11
Cs-134	9 0541E-02	39 14	78 28	0 00E+00	3 54E+00	7 09E+00	0 5750	8 628E+12
Cs-135	3 2195E-05	39 14	78 28	0 00E+00	1 26E-03	2 52E-03	0 8500	3 703E+11
Cs-137	2 7564E+00	39 14	78 28	0 00E+00	1 08E+02	2 16E+02	1 2500	7 520E+12
Eu-154	1 5368E-02	39 14	78 28	0 00E+00	6 02E-01	1 20E+00	1 7500	5 013E+09
Eu-155	2 9293E-02	39 14	78 28	0 00E+00	1 15E+00	2 29E+00	2 2500	8 080E+09
Fe-55	7 7158E-01	39 14	78 28	0 00E+00	3 02E+01	6 04E+01	2 7500	6 412E+07
H-3	1 1111E-02	39 14	78 28	0 00E+00	4 35E-01	8 70E-01	3 5000	7 462E+06
I-129	7 3684E-07	39 14	78 28	0 00E+00	2 88E-05	5 77E-05	5 0000	4 153E+01
Kr-85	2 5263E-01	39 14	78 28	0 00E+00	9 89E+00	1 98E+01	7 0000	4 701E+00
Np-237	1 2427E-06	39 14	78 28	0 00E+00	4 86E-05	9 73E-05	11 0000	5 355E-01
Pa-231	3 8511E-09	39 14	78 28	0 00E+00	1 51E-07	3 01E-07		
Pb-210	7 3880E-15	39 14	78 28	0 00E+00	2 89E-13	5 78E-13		
Pm-147	2 1023E+00	39 14	78 28	0 00E+00	8 23E+01	1 65E+02		
Pu-238	1 0383E-03	39 14	78 28	0 00E+00	4 06E-02	8 13E-02		
Pu-239	5 5293E-03	39 14	78 28	0 00E+00	2 16E-01	4 33E-01		
Pu-240	2 1278E-03	39 14	78 28	0 00E+00	8 33E-02	1 67E-01		
Pu-241	1 0195E-01	39 14	78 28	0 00E+00	3 99E+00	7 98E+00		
Pu-242	2 3128E-07	39 14	78 28	0 00E+00	9 05E-06	1 81E-05		
Ra-226	5 2782E-14	39 14	78 28	0 00E+00	2 07E-12	4 13E-12		
Ra-228	1 9338E-10	39 14	78 28	0 00E+00	7 57E-09	1 51E-08		
Ru-106	9 1684E-02	39 14	78 28	0 00E+00	3 59E+00	7 18E+00		
Se-79	1 3018E-05	39 14	78 28	0 00E+00	5 10E-04	1 02E-03		
Sn-126	1 2167E-05	39 14	78 28	0 00E+00	4 76E-04	9 52E-04		
Sr-90	2 6045E+00	39 14	78 28	0 00E+00	1 02E+02	2 04E+02		
Tc-99	4 4241E-04	39 14	78 28	0 00E+00	1 73E-02	3 46E-02		
Th-229	1 3713E-10	39 14	78 28	0 00E+00	5 37E-09	1 07E-08		
Th-230	1 8090E-11	39 14	78 28	0 00E+00	7 08E-10	1 42E-09		
Th-232	2 5278E-10	39 14	78 28	0 00E+00	9 89E-09	1 98E-08		
Th-208	1 6947E-08	39 14	78 28	0 00E+00	6 63E-07	1 33E-06		
U-232	4 8737E-08	39 14	78 28	0 00E+00	1 91E-06	3 82E-06		
U-233	1 2203E-07	39 14	78 28	0 00E+00	4 78E-06	9 55E-06		
U-234	1 5925E-07	39 14	78 28	0 00E+00	6 23E-06	1 25E-05		
U-235	-2 6194E-06	39 14	0 00	3 35E-04	2 32E-04	3 35E-04		
U-236	1 2693E-05	39 14	78 28	0 00E+00	4 97E-04	9 94E-04		
U-238	-3 6331E-08	39 14	0 00	2 17E-04	2 16E-04	2 17E-04		
Y-90	2 6060E+00	39 14	78 28	0 00E+00	1 02E+02	2 04E+02		
Other Radionuclides					1 41E+02	2 82E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2 28E+00	4 56E+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 34235977	10 to 20 1

Basis for Parameter Differences:

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

	From SFD	Estimated
Nominal	27.34	39 14
Bounding		78 28

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	1 43	1 43
Bounding	2 86	

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 8.5/20 FFCR OSU	Fuel decay start date	2025
SNF ID #	1041	Estimates as of	2010
Fuel Units & Descr:	2 - ELEMENT	Template	TRIGA-FLJP (LW/U-Zrx SST, 60 to 100%, U)
Heavy Metal Mass	BOL=0.392kg EOL=0.37kg	*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"  
**0.02**

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.8488E-10	20.91	41.82	0.00E+00	5.96E-09	1.19E-08	Avg MeV	
Am-241	7.5767E-03	20.91	41.82	0.00E+00	1.58E-01	3.17E-01	0.0150	6.747E+12
Am-242m	2.4459E-05	20.91	41.82	0.00E+00	5.11E-04	1.02E-03	0.0250	1.481E+12
Am-243	3.0983E-05	20.91	41.82	0.00E+00	6.48E-04	1.30E-03	0.0375	1.310E+12
C-14	1.2590E-04	20.91	41.82	0.00E+00	2.63E-03	5.27E-03	0.0575	1.307E+12
Cl-36	2.6624E-06	20.91	41.82	0.00E+00	5.57E-05	1.11E-04	0.0850	8.134E+11
Cm-243	3.8244E-05	20.91	41.82	0.00E+00	8.00E-04	1.60E-03	0.1250	6.531E+11
Cm-244	4.1010E-03	20.91	41.82	0.00E+00	8.57E-02	1.71E-01	0.2250	6.913E+11
Co-60	1.2410E+00	20.91	41.82	0.00E+00	2.59E+01	5.19E+01	0.3750	3.449E+11
Cs-134	6.5454E-01	20.91	41.82	0.00E+00	1.37E+01	2.74E+01	0.5750	5.709E+12
Cs-135	1.9753E-05	20.91	41.82	0.00E+00	4.13E-04	8.26E-04	0.8500	1.047E+12
Cs-137	2.7375E+00	20.91	41.82	0.00E+00	5.72E+01	1.14E+02	1.2500	4.023E+12
Eu-154	1.2324E-01	20.91	41.82	0.00E+00	2.58E+00	5.15E+00	1.7500	5.380E+09
Eu-155	5.3037E-02	20.91	41.82	0.00E+00	1.11E+00	2.22E+00	2.2500	4.217E+09
Fe-55	7.9555E-01	20.91	41.82	0.00E+00	1.66E+01	3.33E+01	2.7500	3.823E+07
H-3	1.0631E-02	20.91	41.82	0.00E+00	2.20E-01	4.40E-01	3.5000	4.499E+06
I-129	7.1287E-07	20.91	41.82	0.00E+00	1.49E-05	2.98E-05	5.0000	1.078E+03
Kr-85	2.4955E-01	20.91	41.82	0.00E+00	5.22E+00	1.04E+01	7.0000	1.241E+02
Np-237	1.2121E-06	20.91	41.82	0.00E+00	2.53E-04	5.07E-04	11.0000	1.424E+01
Pa-231	1.1230E-09	20.91	41.82	0.00E+00	2.35E-08	4.70E-08		
Pb-210	6.1636E-14	20.91	41.82	0.00E+00	1.29E-12	2.58E-12		
Pm-147	1.1302E+00	20.91	41.82	0.00E+00	2.36E+01	4.73E+01		
Pu-238	5.4826E-02	20.91	41.82	0.00E+00	1.15E+00	2.29E+00		
Pu-239	1.4056E-03	20.91	41.82	0.00E+00	2.94E-02	5.88E-02		
Pu-240	1.1536E-03	20.91	41.82	0.00E+00	2.41E-02	4.82E-02		
Pu-241	4.2995E-01	20.91	41.82	0.00E+00	8.99E+00	1.80E+01		
Pu-242	4.9910E-06	20.91	41.82	0.00E+00	1.04E-04	2.09E-04		
Ra-226	2.4008E-13	20.91	41.82	0.00E+00	5.02E-12	1.00E-11		
Ra-228	1.8220E-11	20.91	41.82	0.00E+00	3.81E-10	7.62E-10		
Ru-106	1.0343E-01	20.91	41.82	0.00E+00	2.16E+00	4.33E+00		
Se-79	1.2832E-05	20.91	41.82	0.00E+00	2.68E-04	5.37E-04		
Sn-126	1.2090E-05	20.91	41.82	0.00E+00	2.53E-04	5.06E-04		
Sr-90	2.5646E+00	20.91	41.82	0.00E+00	5.36E+01	1.07E+02		
Tc-99	4.0319E-04	20.91	41.82	0.00E+00	8.43E-03	1.69E-02		
Th-229	7.7375E-11	20.91	41.82	0.00E+00	1.62E-09	3.24E-09		
Th-230	1.2211E-10	20.91	41.82	0.00E+00	2.55E-09	5.11E-09		
Th-232	2.3842E-11	20.91	41.82	0.00E+00	4.99E-10	9.97E-10		
Ti-208	1.4313E-07	20.91	41.82	0.00E+00	2.99E-06	5.99E-06		
U-232	4.1927E-07	20.91	41.82	0.00E+00	8.77E-06	1.75E-05		
U-233	6.8491E-08	20.91	41.82	0.00E+00	1.43E-06	2.86E-06		
U-234	2.0189E-06	20.91	41.82	0.00E+00	4.22E-05	8.44E-05		
U-235	-2.6572E-06	20.91	0.00	5.92E-04	5.37E-04	5.92E-04		
U-236	1.3575E-05	20.91	41.82	0.00E+00	2.84E-04	5.68E-04		
U-238	-2.2698E-08	20.91	0.00	3.97E-05	3.92E-05	3.97E-05		
Y-90	2.5646E+00	20.91	41.82	0.00E+00	5.36E+01	1.07E+02		
Other Radionuclides					7.45E+01	1.49E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.37E+00	2.74E+00
Total	Total

**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 %	69.89795918	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	5.73	20.91	
Bounding		41.82	

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	0.16	3.65	
Bounding	0.31		

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: TRIGA 8 5/20 FFCR PENN STATE UNIV  
 SNF ID #: 815  
 Fuel Units & Descr: 7 - ELEMENT  
 Heavy Metal Mass: BOL=1.379kg; EOL=1.316kg  
 ROD Storage Site: INEEL

Fuel decay start date: 2035  
 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 09

**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
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	8.5173E-10	60.14	120.28	0.00E+00	5.12E-08	1.02E-07		
Am-241	1.8331E-03	60.14	120.28	0.00E+00	1.10E-01	2.20E-01	0.0150	1.944E+13
Am-242m	1.4129E-06	60.14	120.28	0.00E+00	8.50E-05	1.70E-04	0.0250	4.278E+12
Am-243	1.4774E-07	60.14	120.28	0.00E+00	8.89E-06	1.78E-05	0.0375	3.643E+12
C-14	1.2871E-04	60.14	120.28	0.00E+00	7.74E-03	1.55E-02	0.0575	3.739E+12
Cl-36	2.8120E-06	60.14	120.28	0.00E+00	1.69E-04	3.38E-04	0.0850	2.316E+12
Cm-243	1.7940E-07	60.14	120.28	0.00E+00	1.08E-05	2.16E-05	0.1250	1.682E+12
Cm-244	1.6962E-06	60.14	120.28	0.00E+00	1.02E-04	2.04E-04	0.2250	1.965E+12
Co-60	1.2839E+00	60.14	120.28	0.00E+00	7.72E+01	1.54E+02	0.3750	9.972E+11
Cs-134	9.0541E-02	60.14	120.28	0.00E+00	5.45E+00	1.09E+01	0.8750	1.326E+13
Cs-135	3.2195E-05	60.14	120.28	0.00E+00	1.94E-03	3.87E-03	0.5500	5.690E+11
Cs-137	2.7564E+00	60.14	120.28	0.00E+00	1.66E+02	3.32E+02	1.2500	1.155E+13
Eu-154	1.5368E-02	60.14	120.28	0.00E+00	9.24E-01	1.85E+00	1.7500	7.702E+09
Eu-155	2.9293E-02	60.14	120.28	0.00E+00	1.76E+00	3.52E+00	2.2500	1.241E+10
Fe-55	7.7158E-01	60.14	120.28	0.00E+00	4.64E+01	9.28E+01	2.7500	9.852E+07
H-3	1.1111E-02	60.14	120.28	0.00E+00	6.68E-01	1.34E+00	3.5000	1.147E+07
I-129	7.3684E-07	60.14	120.28	0.00E+00	4.43E-05	8.86E-05	5.0000	6.389E+01
Kr-85	2.5263E-01	60.14	120.28	0.00E+00	1.52E+01	3.04E+01	7.0000	7.233E+00
Np-237	1.2427E-06	60.14	120.28	0.00E+00	7.47E-05	1.49E-04	11.0000	8.239E-01
Pa-231	3.8511E-09	60.14	120.28	0.00E+00	2.32E-07	4.63E-07		
Pb-210	7.3880E-15	60.14	120.28	0.00E+00	4.44E-13	8.89E-13		
Pm-147	2.1023E+00	60.14	120.28	0.00E+00	1.26E+02	2.53E+02		
Pu-238	1.0383E-03	60.14	120.28	0.00E+00	6.24E-02	1.25E-01		
Pu-239	5.5293E-03	60.14	120.28	0.00E+00	3.33E-01	6.65E-01		
Pu-240	2.1278E-03	60.14	120.28	0.00E+00	1.28E-01	2.56E-01		
Pu-241	1.0195E-01	60.14	120.28	0.00E+00	6.13E+00	1.23E+01		
Pu-242	2.3128E-07	60.14	120.28	0.00E+00	1.39E-05	2.78E-05		
Ra-226	5.2782E-14	60.14	120.28	0.00E+00	3.17E-12	6.35E-12		
Ra-228	1.9338E-10	60.14	120.28	0.00E+00	1.16E-08	2.33E-08		
Ru-106	9.1684E-02	60.14	120.28	0.00E+00	5.51E+00	1.10E+01		
Se-79	1.3018E-05	60.14	120.28	0.00E+00	7.83E-04	1.57E-03		
Sn-126	1.2167E-05	60.14	120.28	0.00E+00	7.32E-04	1.46E-03		
Sr-90	2.6045E+00	60.14	120.28	0.00E+00	1.57E+02	3.13E+02		
Tc-99	4.4241E-04	60.14	120.28	0.00E+00	2.66E-02	5.32E-02		
Th-229	1.3713E-10	60.14	120.28	0.00E+00	8.25E-09	1.65E-08		
Th-230	1.8090E-11	60.14	120.28	0.00E+00	1.09E-09	2.18E-09		
Th-232	2.5278E-10	60.14	120.28	0.00E+00	1.52E-08	3.04E-08		
Tl-208	1.6947E-08	60.14	120.28	0.00E+00	1.02E-06	2.04E-06		
U-232	4.8737E-08	60.14	120.28	0.00E+00	2.93E-06	5.86E-06		
U-233	1.2203E-07	60.14	120.28	0.00E+00	7.34E-06	1.47E-05		
U-234	1.5925E-07	60.14	120.28	0.00E+00	9.58E-06	1.92E-05		
U-235	-2.6194E-06	60.14	0.00	5.90E-04	4.32E-04	5.90E-04		
U-236	1.2693E-05	60.14	120.28	0.00E+00	7.63E-04	1.53E-03		
U-238	-3.6331E-08	60.14	0.00	3.72E-04	3.70E-04	3.72E-04		
Y-90	2.6060E+00	60.14	120.28	0.00E+00	1.57E+02	3.13E+02		
Other Radionuclides					2.17E+02	4.34E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.50E+00	7.00E+00
Total	Total

**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 %	19.79695431	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	40.32	60.14	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		120.28	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.28	1.49	1.00
Bounding	2.56		

<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 SLOVENIA	Fuel decay start date	1959
SNF ID #	941	Estimates as of	2010
Fuel Units & Descr	3 - ELEMENT	Template	TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=0 473kg, EOL=0 457kg	Template Burnup(MWd)	6 65
ROD Storage Site:	INEEL	Template BOL Heavy Metal Mass (MT)	0.000195
		Template Decay Time	50 years

Estimated  
Canister usage  
18"x10"  
0 04

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9 4992E-09	16 14	32 28	0 00E+00	1 53E-07	3 07E-07	Avg MeV	
Am-241	4 0120E-03	16 14	32 28	0 00E+00	6 47E-02	1 29E-01	0 0150	1 576E+12
Am-242m	1 1510E-06	16 14	32 28	0 00E+00	1 86E-05	3 71E-05	0 0250	3 273E+11
Am-243	1 4713E-07	16 14	32 28	0 00E+00	2 37E-06	4 75E-06	0 0375	2 849E+11
C-14	1 2800E-04	16 14	32 28	0 00E+00	2 07E-03	4 13E-03	0 0575	3 069E+11
Cl-36	2 8120E-06	16 14	32 28	0 00E+00	4 54E-05	9 08E-05	0 0850	1 843E+11
Cm-243	6 0120E-08	16 14	32 28	0 00E+00	9 70E-07	1 94E-06	0 1250	1 197E+11
Cm-244	3 0331E-07	16 14	32 28	0 00E+00	4 89E-06	9 79E-06	0 2250	1 588E+11
Co-60	3 4647E-03	16 14	32 28	0 00E+00	5 59E-02	1 12E-01	0 3750	6 926E+10
Cs-134	2 4632E-08	16 14	32 28	0 00E+00	3 98E-07	7 95E-07	0 5750	1 171E+12
Cs-135	3 2195E-05	16 14	32 28	0 00E+00	5 20E-04	1 04E-03	0 8500	1 152E+10
Cs-137	9 7519E-01	16 14	32 28	0 00E+00	1 57E+01	3 15E+01	1 2500	1 232E+10
Eu-154	4 0947E-04	16 14	32 28	0 00E+00	6 61E-03	1 32E-02	1 7500	2 973E+08
Eu-155	5 4586E-05	16 14	32 28	0 00E+00	8 81E-04	1 76E-03	2 2500	7 573E+04
Fe-55	4 7955E-06	16 14	32 28	0 00E+00	7 74E-05	1 55E-04	2 7500	1 366E+04
H-3	8 9038E-04	16 14	32 28	0 00E+00	1 44E-02	2 87E-02	3 5000	4 007E+01
I-129	7 3684E-07	16 14	32 28	0 00E+00	1 19E-05	2 38E-05	5 0000	1 687E+01
Kr-85	1 3791E-02	16 14	32 28	0 00E+00	2 23E-01	4 45E-01	7 0000	1 903E+00
Np-237	1 3038E-06	16 14	32 28	0 00E+00	2 10E-05	4 21E-05	11.0000	2 164E-01
Pa-231	1 5534E-08	16 14	32 28	0 00E+00	2 51E-07	5 01E-07		
Pb-210	7 1759E-13	16 14	32 28	0 00E+00	1 16E-11	2 32E-11		
Pm-147	1 4547E-05	16 14	32 28	0 00E+00	2 35E-04	4 70E-04		
Pu-238	7 2827E-04	16 14	32 28	0 00E+00	1 18E-02	2 35E-02		
Pu-239	5 5218E-03	16 14	32 28	0 00E+00	8 91E-02	1 78E-01		
Pu-240	2 1173E-03	16 14	32 28	0 00E+00	3 42E-02	6 83E-02		
Pu-241	1 1702E-02	16 14	32 28	0 00E+00	1 89E-01	3 78E-01		
Pu-242	2 3128E-07	16 14	32 28	0 00E+00	3 73E-06	7 46E-06		
Ra-226	1 6827E-12	16 14	32 28	0 00E+00	2 72E-11	5 43E-11		
Ra-228	2 5263E-10	16 14	32 28	0 00E+00	4 08E-09	8 15E-09		
Ru-106	3 4090E-15	16 14	32 28	0 00E+00	5 50E-14	1 10E-13		
Se-79	1 3012E-05	16 14	32 28	0 00E+00	2 10E-04	4 20E-04		
Sn-126	1 2162E-05	16 14	32 28	0 00E+00	1 96E-04	3 93E-04		
Sr-90	8 9323E-01	16 14	32 28	0 00E+00	1 44E+01	2 88E+01		
Tc-99	4 4241E-04	16 14	32 28	0 00E+00	7 14E-03	1 43E-02		
Th-229	7 6902E-10	16 14	32 28	0 00E+00	1 24E-08	2 48E-08		
Th-230	1 3059E-10	16 14	32 28	0 00E+00	2 11E-09	4 21E-09		
Th-232	2 5278E-10	16 14	32 28	0 00E+00	4 08E-09	8 16E-09		
Ti-208	1 1892E-08	16 14	32 28	0 00E+00	1 92E-07	3 84E-07		
U-232	3 1970E-08	16 14	32 28	0 00E+00	5 16E-07	1 03E-06		
U-233	1 2232E-07	16 14	32 28	0 00E+00	1 97E-06	3 95E-06		
U-234	2 8662E-07	16 14	32 28	0 00E+00	4 63E-06	9 25E-06		
U-235	-2.6194E-06	16 14	0 00	2 03E-04	1 61E-04	2 03E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1 2696E-05	16 14	32 28	0 00E+00	2 05E-04	4 10E-04	1.81E-01	3.61E-01
U-238	-3 6331E-08	16 14	0 00	1 27E-04	1 27E-04	1 27E-04	Total	Total
Y-90	8 9338E-01	16 14	32 28	0 00E+00	1 44E+01	2 88E+01		
Other Radionuclides					1.59E+01	3 18E+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 %	19.87312476	10 to 20 1	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	16 14	15 46	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		32 28	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 00	0 96	1 00
Bounding	2 00		

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

<sup>3</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 SO KOREA  
 SNF ID #: 734  
 Fuel Units & Descr: 3- ELEMENT  
 Heavy Metal Mass: BOL=0.48kg, EOL=0.472kg  
 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): 665  
 Template BOL Heavy Metal Mass (MT): 0.000195  
 Template Decay Time: 10 years

Estimated  
 Canister usage:  
 18"x10"  
 0.04

Radionuclide	m		x <sub>n</sub>		x <sub>b</sub>		b		y <sub>n</sub>		y <sub>b</sub>		Gamma Sources	
	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)	Avg MeV					
Ac-227	1.3731E-09	11.70	23.39	0.00E+00	1.61E-08	3.21E-08								
Am-241	2.3865E-03	11.70	23.39	0.00E+00	2.79E-02	5.58E-02								
Am-242m	1.3812E-06	11.70	23.39	0.00E+00	1.62E-05	3.23E-05								
Am-243	1.4767E-07	11.70	23.39	0.00E+00	1.73E-06	3.45E-06								
C-14	1.2863E-04	11.70	23.39	0.00E+00	1.50E-03	3.01E-03								
Cl-36	2.8120E-06	11.70	23.39	0.00E+00	3.29E-05	6.58E-05								
Cr-243	1.5895E-07	11.70	23.39	0.00E+00	1.86E-06	3.72E-06								
Cr-244	1.4008E-06	11.70	23.39	0.00E+00	1.64E-05	3.28E-05								
Co-60	6.6541E-01	11.70	23.39	0.00E+00	7.78E+00	1.56E+01								
Cs-134	1.6887E-02	11.70	23.39	0.00E+00	1.97E-01	3.95E-01								
Cs-135	3.2195E-05	11.70	23.39	0.00E+00	3.77E-04	7.53E-04								
Cs-137	2.4556E+00	11.70	23.39	0.00E+00	2.87E+01	5.74E+01								
Eu-154	1.0268E-02	11.70	23.39	0.00E+00	1.20E-01	2.40E-01								
Eu-155	1.4570E-02	11.70	23.39	0.00E+00	1.70E-01	3.41E-01								
Fe-55	2.0361E-01	11.70	23.39	0.00E+00	2.38E+00	4.76E+00								
H-3	8.3940E-03	11.70	23.39	0.00E+00	9.82E-02	1.96E-01								
I-129	7.3684E-07	11.70	23.39	0.00E+00	8.62E-06	1.72E-05								
Kr-85	1.8286E-01	11.70	23.39	0.00E+00	2.14E+00	4.28E+00								
Np-237	1.2462E-06	11.70	23.39	0.00E+00	1.46E-05	2.91E-05								
Pa-231	4.9143E-09	11.70	23.39	0.00E+00	5.75E-08	1.15E-07								
Pb-210	1.7173E-14	11.70	23.39	0.00E+00	2.01E-13	4.02E-13								
Pm-147	5.6165E-01	11.70	23.39	0.00E+00	6.57E+00	1.31E+01								
Pu-238	9.9820E-04	11.70	23.39	0.00E+00	1.17E-02	2.33E-02								
Pu-239	5.5293E-03	11.70	23.39	0.00E+00	6.47E-02	1.29E-01								
Pu-240	2.1263E-03	11.70	23.39	0.00E+00	2.49E-02	4.97E-02								
Pu-241	8.0165E-02	11.70	23.39	0.00E+00	9.38E-01	1.88E+00								
Pu-242	2.3128E-07	11.70	23.39	0.00E+00	2.70E-06	5.41E-06								
Ra-226	9.9774E-14	11.70	23.39	0.00E+00	1.17E-12	2.33E-12								
Ra-228	2.1729E-10	11.70	23.39	0.00E+00	2.54E-09	5.08E-09								
Ru-106	2.9519E-03	11.70	23.39	0.00E+00	3.45E-02	6.90E-02								
Se-79	1.3017E-05	11.70	23.39	0.00E+00	1.52E-04	3.04E-04								
Sn-126	1.2167E-05	11.70	23.39	0.00E+00	1.42E-04	2.85E-04								
Sr-90	2.3128E+00	11.70	23.39	0.00E+00	2.70E+01	5.41E+01								
Tc-99	4.4241E-04	11.70	23.39	0.00E+00	5.17E-03	1.03E-02								
Th-229	1.9459E-10	11.70	23.39	0.00E+00	2.28E-09	4.55E-09								
Th-230	2.5564E-11	11.70	23.39	0.00E+00	2.99E-10	5.98E-10								
Th-232	2.5278E-10	11.70	23.39	0.00E+00	2.96E-09	5.91E-09								
Tl-208	1.6947E-08	11.70	23.39	0.00E+00	1.98E-07	3.96E-07								
U-232	4.6812E-08	11.70	23.39	0.00E+00	5.47E-07	1.09E-06								
U-233	1.2206E-07	11.70	23.39	0.00E+00	1.43E-06	2.86E-06								
U-234	1.7323E-07	11.70	23.39	0.00E+00	2.03E-06	4.05E-06								
U-235	-2.6194E-06	11.70	0.00	2.07E-04	1.77E-04	2.07E-04								
U-236	1.2693E-05	11.70	23.39	0.00E+00	1.48E-04	2.97E-04								
U-238	-3.6331E-08	11.70	0.00	1.29E-04	1.29E-04	1.29E-04								
Y-90	2.3128E+00	11.70	23.39	0.00E+00	2.70E+01	5.41E+01								
Other Radionuclides					2.87E+01	5.73E+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	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	11.70	7.45	
Bounding		23.39	

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	0.71	0.64	
Bounding	1.43		

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 8 5/20 FFCR U OF AZ  
 SNF ID #: 974  
 Fuel Units & Descr: 2 - ELEMENT  
 Heavy Metal Mass: BOL=0.32kg EOL=0.319kg  
 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"  
 0.03

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	0.95	1.91	0.00E+00	8.13E-10	1.63E-09	0.0150	3.086E+11
Am-241	1.8331E-03	0.95	1.91	0.00E+00	1.75E-03	3.50E-03	0.0250	6.790E+10
Am-242m	1.4129E-06	0.95	1.91	0.00E+00	1.35E-06	2.70E-06	0.0375	5.782E+10
Am-243	1.4774E-07	0.95	1.91	0.00E+00	1.41E-07	2.82E-07	0.0575	5.935E+10
C-14	1.2871E-04	0.95	1.91	0.00E+00	1.23E-04	2.46E-04	0.0850	3.677E+10
Cl-36	2.8120E-06	0.95	1.91	0.00E+00	2.68E-06	5.37E-06	0.1250	2.670E+10
Cm-243	1.7940E-07	0.95	1.91	0.00E+00	1.71E-07	3.43E-07	0.2250	3.119E+10
Cm-244	1.6962E-06	0.95	1.91	0.00E+00	1.62E-06	3.24E-06	0.3750	1.583E+10
Co-60	1.2839E+00	0.95	1.91	0.00E+00	1.23E+00	2.45E+00	0.5750	1.223E+08
Cs-134	9.0541E-02	0.95	1.91	0.00E+00	8.64E-02	1.73E-01	2.2500	1.971E+08
Cs-135	3.2195E-05	0.95	1.91	0.00E+00	3.07E-05	6.15E-05	2.7500	1.564E+06
Cs-137	2.7564E+00	0.95	1.91	0.00E+00	2.63E+00	5.26E+00	3.5000	1.820E+05
Eu-154	1.5368E-02	0.95	1.91	0.00E+00	1.47E-02	2.93E-02	5.0000	1.200E+00
Eu-155	2.9293E-02	0.95	1.91	0.00E+00	2.80E-02	5.59E-02	7.0000	1.362E-01
Fe-55	7.7158E-01	0.95	1.91	0.00E+00	7.37E-01	1.47E+00	11.0000	1.553E-02
H-3	1.1111E-02	0.95	1.91	0.00E+00	1.06E-02	2.12E-02		
I-129	7.3684E-07	0.95	1.91	0.00E+00	7.03E-07	1.41E-06		
Kr-85	2.5263E-01	0.95	1.91	0.00E+00	2.41E-01	4.82E-01		
Np-237	1.2427E-06	0.95	1.91	0.00E+00	1.19E-06	2.37E-06		
Pa-231	3.8511E-09	0.95	1.91	0.00E+00	3.68E-09	7.35E-09		
Pb-210	7.3880E-15	0.95	1.91	0.00E+00	7.05E-15	1.41E-14		
Pm-147	2.1023E+00	0.95	1.91	0.00E+00	2.01E+00	4.01E+00		
Pu-238	1.0383E-03	0.95	1.91	0.00E+00	9.91E-04	1.98E-03		
Pu-239	5.5293E-03	0.95	1.91	0.00E+00	5.28E-03	1.06E-02		
Pu-240	2.1278E-03	0.95	1.91	0.00E+00	2.03E-03	4.06E-03		
Pu-241	1.0195E-01	0.95	1.91	0.00E+00	9.73E-02	1.95E-01		
Pu-242	2.3128E-07	0.95	1.91	0.00E+00	2.21E-07	4.42E-07		
Ra-226	5.2782E-14	0.95	1.91	0.00E+00	5.04E-14	1.01E-13		
Ra-228	1.9338E-10	0.95	1.91	0.00E+00	1.85E-10	3.69E-10		
Ru-106	9.1684E-02	0.95	1.91	0.00E+00	8.75E-02	1.75E-01		
Se-79	1.3018E-05	0.95	1.91	0.00E+00	1.24E-05	2.49E-05		
Sn-126	1.2167E-05	0.95	1.91	0.00E+00	1.16E-05	2.32E-05		
Sr-90	2.6045E+00	0.95	1.91	0.00E+00	2.49E+00	4.97E+00		
Tc-99	4.4241E-04	0.95	1.91	0.00E+00	4.22E-04	8.45E-04		
Th-229	1.3713E-10	0.95	1.91	0.00E+00	1.31E-10	2.62E-10		
Th-230	1.8090E-11	0.95	1.91	0.00E+00	1.73E-11	3.45E-11		
Th-232	2.5278E-10	0.95	1.91	0.00E+00	2.41E-10	4.83E-10		
Tl-208	1.6947E-08	0.95	1.91	0.00E+00	1.62E-08	3.24E-08		
U-232	4.8737E-08	0.95	1.91	0.00E+00	4.65E-08	9.30E-08		
U-233	1.2203E-07	0.95	1.91	0.00E+00	1.16E-07	2.33E-07		
U-234	1.5925E-07	0.95	1.91	0.00E+00	1.52E-07	3.04E-07		
U-235	-2.6194E-06	0.95	0.00	1.37E-04	1.35E-04	1.37E-04		
U-236	1.2693E-05	0.95	1.91	0.00E+00	1.21E-05	2.42E-05		
U-238	-3.6331E-08	0.95	0.00	8.62E-05	8.61E-05	8.62E-05		
Y-90	2.6060E+00	0.95	1.91	0.00E+00	2.49E+00	4.98E+00		
Other Radionuclides					3.44E+00	6.88E+00		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.56E-02	1.11E-01
Total	Total

**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 %	19.875	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	0.78	0.95	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		1.91	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.09	1.22	1.00
Bounding	0.17		

<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: TRIGA 8.520 FFCR U OF IL  
 SNF ID #: 448  
 Fuel Units & Descr: 4 - ELEMENT  
 Heavy Metal Mass: BOL=0.8kg; EOL=0.751kg  
 ROD Storage Site: INEEL

Fuel decay start date: 2035  
 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"  
 0.05

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	8.5173E-10	46.58	93.17	0.00E+00	3.97E-08	7.94E-08	Avg MeV	
Am-241	1.8331E-03	46.58	93.17	0.00E+00	8.54E-02	1.71E-01	0.0150	1.506E+13
Am-242m	1.4129E-06	46.58	93.17	0.00E+00	6.58E-05	1.32E-04	0.0250	3.313E+12
Am-243	1.4774E-07	46.58	93.17	0.00E+00	6.88E-06	1.38E-05	0.0375	2.822E+12
C-14	1.2871E-04	46.58	93.17	0.00E+00	6.00E-03	1.20E-02	0.0575	2.896E+12
Cf-252	2.8120E-06	46.58	93.17	0.00E+00	1.31E-04	2.62E-04	0.0850	1.794E+12
Cm-243	1.7940E-07	46.58	93.17	0.00E+00	8.36E-06	1.67E-05	0.1250	1.303E+12
Cm-244	1.6962E-06	46.58	93.17	0.00E+00	7.90E-05	1.58E-04	0.2250	1.522E+12
Co-60	1.2839E+00	46.58	93.17	0.00E+00	5.98E+01	1.20E+02	0.3750	7.724E+11
Cs-134	9.0541E-02	46.58	93.17	0.00E+00	4.22E+00	8.44E+00	0.5750	1.027E+13
Cs-135	3.2195E-05	46.58	93.17	0.00E+00	1.50E-03	3.00E-03	0.8500	4.407E+11
Cs-137	2.7564E+00	46.58	93.17	0.00E+00	1.28E+02	2.57E+02	1.2500	8.950E+12
Eu-154	1.5368E-02	46.58	93.17	0.00E+00	7.16E-01	1.43E+00	1.7500	5.966E+09
Eu-155	2.9293E-02	46.58	93.17	0.00E+00	1.36E+00	2.73E+00	2.2500	9.617E+09
Fe-55	7.7158E-01	46.58	93.17	0.00E+00	3.59E+01	7.19E+01	2.7500	7.631E+07
H-3	1.1111E-02	46.58	93.17	0.00E+00	5.18E-01	1.04E+00	3.5000	8.881E+06
I-129	7.3684E-07	46.58	93.17	0.00E+00	3.43E-05	6.87E-05	5.0000	4.932E+01
Kr-85	2.5263E-01	46.58	93.17	0.00E+00	1.18E+01	2.35E+01	7.0000	5.583E+00
Np-237	1.2427E-06	46.58	93.17	0.00E+00	5.79E-05	1.16E-04	11.0000	6.360E-01
Pa-231	3.8511E-09	46.58	93.17	0.00E+00	1.79E-07	3.59E-07		
Pb-210	7.3880E-15	46.58	93.17	0.00E+00	3.44E-13	6.88E-13		
Pm-147	2.1023E+00	46.58	93.17	0.00E+00	9.79E+01	1.96E+02		
Pu-238	1.0383E-03	46.58	93.17	0.00E+00	4.84E-02	9.67E-02		
Pu-239	5.5293E-03	46.58	93.17	0.00E+00	2.58E-01	5.15E-01		
Pu-240	2.1278E-03	46.58	93.17	0.00E+00	9.91E-02	1.98E-01		
Pu-241	1.0195E-01	46.58	93.17	0.00E+00	4.75E+00	9.50E+00		
Pu-242	2.3128E-07	46.58	93.17	0.00E+00	1.08E-05	2.15E-05		
Ra-226	5.2782E-14	46.58	93.17	0.00E+00	2.46E-12	4.92E-12		
Ra-228	1.9338E-10	46.58	93.17	0.00E+00	9.01E-09	1.80E-08		
Ru-106	9.1684E-02	46.58	93.17	0.00E+00	4.27E+00	8.54E+00		
Se-79	1.3018E-05	46.58	93.17	0.00E+00	6.06E-04	1.21E-03		
Sn-126	1.2167E-05	46.58	93.17	0.00E+00	5.67E-04	1.13E-03		
Sr-90	2.6045E+00	46.58	93.17	0.00E+00	1.21E+02	2.43E+02		
Tc-99	4.4241E-04	46.58	93.17	0.00E+00	2.06E-02	4.12E-02		
Th-229	1.3713E-10	46.58	93.17	0.00E+00	6.39E-09	1.28E-08		
Th-230	1.8090E-11	46.58	93.17	0.00E+00	8.43E-10	1.69E-09		
Th-232	2.5278E-10	46.58	93.17	0.00E+00	1.18E-08	2.36E-08		
Th-238	1.6947E-08	46.58	93.17	0.00E+00	7.89E-07	1.58E-06		
U-232	4.8737E-08	46.58	93.17	0.00E+00	2.27E-06	4.54E-06		
U-233	1.2203E-07	46.58	93.17	0.00E+00	5.68E-06	1.14E-05		
U-234	1.5925E-07	46.58	93.17	0.00E+00	7.42E-06	1.48E-05		
U-235	-2.6194E-06	46.58	0.00	3.46E-04	2.24E-04	3.46E-04		
U-236	1.2693E-05	46.58	93.17	0.00E+00	5.91E-04	1.18E-03		
U-238	-3.6331E-08	46.58	0.00	2.15E-04	2.13E-04	2.15E-04		
Y-90	2.6060E+00	46.58	93.17	0.00E+00	1.21E+02	2.43E+02		
Other Radionuclides					1.68E+02	3.36E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.71E+00	5.42E+00
Total	Total

**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 %	20.00000115	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	19.49	46.58	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		93.17	Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.71	2.39	1.00
Bounding	3.42		

<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 U OF TX AUSTIN  
 SNF ID #: 825  
 Fuel Units & Descr: 3 - ELEMENT  
 Heavy Metal Mass: BOL=0.48kg EOL=0.48kg  
 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"  
 0.04

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	8.5173E-10	9.16	18.33	0.00E+00	7.81E-09	1.56E-08	18.33	2.962E+12	
Am-241	1.8331E-03	9.16	18.33	0.00E+00	1.68E-02	3.36E-02	0.0150	6.518E+11	
Am-242m	1.4129E-06	9.16	18.33	0.00E+00	1.29E-05	2.59E-05	0.0375	5.551E+11	
Am-243	1.4774E-07	9.16	18.33	0.00E+00	1.35E-06	2.71E-06	0.0250	5.698E+11	
C-14	1.2871E-04	9.16	18.33	0.00E+00	1.18E-03	2.36E-03	0.0575	3.530E+11	
Cl-36	2.8120E-06	9.16	18.33	0.00E+00	2.58E-05	5.15E-05	0.0850	2.563E+11	
Cm-243	1.7940E-07	9.16	18.33	0.00E+00	1.64E-06	3.29E-06	0.1250	2.994E+11	
Cm-244	1.6962E-06	9.16	18.33	0.00E+00	1.55E-05	3.11E-05	0.2250	1.520E+11	
Co-60	1.2839E+00	9.16	18.33	0.00E+00	1.18E+01	2.35E+01	0.3750	2.020E+12	
Cs-134	9.0541E-02	9.16	18.33	0.00E+00	8.30E-01	1.66E+00	0.5750	8.670E+10	
Cs-135	3.2195E-05	9.16	18.33	0.00E+00	2.95E-04	5.90E-04	0.8500	1.761E+12	
Cs-137	2.7564E+00	9.16	18.33	0.00E+00	2.53E+01	5.05E+01	1.2500	1.174E+09	
Eu-154	1.5368E-02	9.16	18.33	0.00E+00	1.41E-01	2.82E-01	1.7500	1.892E+09	
Eu-155	2.9293E-02	9.16	18.33	0.00E+00	2.68E-01	5.37E-01	2.2500	1.501E+07	
Fe-55	7.7158E-01	9.16	18.33	0.00E+00	7.07E+00	1.41E+01	3.5000	9.905E+00	
H-3	1.1111E-02	9.16	18.33	0.00E+00	1.02E-01	2.04E-01	5.0000	1.122E+00	
I-129	7.3684E-07	9.16	18.33	0.00E+00	6.75E-06	1.35E-05	7.0000	1.278E-01	
Kr-85	2.5263E-01	9.16	18.33	0.00E+00	2.32E+00	4.63E+00	11.0000		
Np-237	1.2427E-06	9.16	18.33	0.00E+00	1.14E-05	2.28E-05			
Pa-231	3.8511E-09	9.16	18.33	0.00E+00	3.53E-08	7.06E-08			
Pb-210	7.3880E-15	9.16	18.33	0.00E+00	6.77E-14	1.35E-13			
Pm-147	2.1023E+00	9.16	18.33	0.00E+00	1.93E+01	3.85E+01			
Pu-238	1.0383E-03	9.16	18.33	0.00E+00	9.52E-03	1.90E-02			
Pu-239	5.5293E-03	9.16	18.33	0.00E+00	5.07E-02	1.01E-01			
Pu-240	2.1278E-03	9.16	18.33	0.00E+00	1.95E-02	3.90E-02			
Pu-241	1.0195E-01	9.16	18.33	0.00E+00	9.34E-01	1.87E+00			
Pu-242	2.3128E-07	9.16	18.33	0.00E+00	2.12E-06	4.24E-06			
Ra-226	5.2782E-14	9.16	18.33	0.00E+00	4.84E-13	9.67E-13			
Ra-228	1.9338E-10	9.16	18.33	0.00E+00	1.77E-09	3.54E-09			
Ru-106	9.1684E-02	9.16	18.33	0.00E+00	8.40E-01	1.68E+00			
Se-79	1.3018E-05	9.16	18.33	0.00E+00	1.19E-04	2.39E-04			
Sn-126	1.2167E+05	9.16	18.33	0.00E+00	1.12E-04	2.23E-04			
Sr-90	2.6045E+00	9.16	18.33	0.00E+00	2.39E+01	4.77E+01			
Tc-99	4.4241E-04	9.16	18.33	0.00E+00	4.05E-03	8.11E-03			
Th-229	1.3713E-10	9.16	18.33	0.00E+00	1.26E-09	2.51E-09			
Th-230	1.8090E-11	9.16	18.33	0.00E+00	1.66E-10	3.32E-10			
Th-232	2.5278E-10	9.16	18.33	0.00E+00	2.32E-09	4.63E-09			
Ti-208	1.6947E-08	9.16	18.33	0.00E+00	1.55E-07	3.11E-07			
U-232	4.8737E-08	9.16	18.33	0.00E+00	4.47E-07	8.93E-07			
U-233	1.2203E-07	9.16	18.33	0.00E+00	1.12E-06	2.24E-06			
U-234	1.5925E-07	9.16	18.33	0.00E+00	1.46E-06	2.92E-06			
U-235	-2.6194E-06	9.16	0.00	2.05E-04	1.81E-04	2.05E-04			
U-236	1.2693E-05	9.16	18.33	0.00E+00	1.16E-04	2.33E-04			
U-238	-3.6331E-08	9.16	0.00	1.29E-04	1.29E-04	1.29E-04			
Y-90	2.6060E+00	9.16	18.33	0.00E+00	2.39E+01	4.78E+01			
Other Radionuclides							3.30E+01	6.61E+01	

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.33E-01	1.07E+00
Total	Total

**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	
	19.7916875	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		9.16	Nominal burnup assumed to be 2% of BOL heavy metal mass
Bounding		18.33	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.56		0.98
Bounding	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: TRIGA 8.5/20 FFCR ZAIRE  
 SNF ID #: 735  
 Fuel Units & Descr: 4 - ELEMENT  
 Heavy Metal Mass: BOL=0.638kg; EOL=0.638kg  
 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"  
 0.04

Radionuclide	m		x <sub>n</sub>		y <sub>n</sub>		Gamma Sources	
	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	8.5173E-10	6.22	12.44	0.00E+00	5.30E-09	1.06E-08	Avg MeV	
Am-241	1.8331E-03	6.22	12.44	0.00E+00	1.14E-02	2.28E-02	0.0150	2.010E+12
Am-242m	1.4129E-06	6.22	12.44	0.00E+00	8.79E-06	1.76E-05	0.0250	4.423E+11
Am-243	1.4774E-07	6.22	12.44	0.00E+00	9.19E-07	1.84E-06	0.0375	3.766E+11
C-14	1.2871E-04	6.22	12.44	0.00E+00	8.00E-04	1.60E-03	0.0575	3.866E+11
Cl-36	2.8120E-06	6.22	12.44	0.00E+00	1.75E-05	3.50E-05	0.0850	2.395E+11
Cm-243	1.7940E-07	6.22	12.44	0.00E+00	1.12E-06	2.23E-06	0.1250	1.739E+11
Cm-244	1.6962E-06	6.22	12.44	0.00E+00	1.05E-05	2.11E-05	0.2250	2.032E+11
Co-60	1.2839E+00	6.22	12.44	0.00E+00	7.98E+00	1.60E+01	0.3750	1.031E+11
Cs-134	9.0541E-02	6.22	12.44	0.00E+00	5.63E-01	1.13E+00	0.5750	1.371E+12
Cs-135	3.2195E-05	6.22	12.44	0.00E+00	2.00E-04	4.00E-04	0.8500	5.883E+10
Cs-137	2.7564E+00	6.22	12.44	0.00E+00	1.71E+01	3.43E+01	1.2500	1.195E+12
Eu-154	1.5368E-02	6.22	12.44	0.00E+00	9.56E-02	1.91E-01	1.7500	7.963E+08
Eu-155	2.9293E-02	6.22	12.44	0.00E+00	1.82E-01	3.64E-01	2.2500	1.284E+09
Fe-55	7.7158E-01	6.22	12.44	0.00E+00	4.80E+00	9.60E+00	2.7500	1.019E+07
H-3	1.1111E-02	6.22	12.44	0.00E+00	6.91E-02	1.38E-01	3.5000	1.185E+06
I-129	7.3684E-07	6.22	12.44	0.00E+00	4.58E-06	9.16E-06	5.0000	6.914E+00
Kr-85	2.5263E-01	6.22	12.44	0.00E+00	1.57E+00	3.14E+00	7.0000	7.832E-01
Np-237	1.2427E-06	6.22	12.44	0.00E+00	7.73E-06	1.55E-05	11.0000	8.926E-02
Pa-231	3.8511E-09	6.22	12.44	0.00E+00	2.39E-08	4.79E-08		
Pb-210	7.3880E-15	6.22	12.44	0.00E+00	4.59E-14	9.19E-14		
Pm-147	2.1023E+00	6.22	12.44	0.00E+00	1.31E+01	2.61E+01		
Pu-238	1.0383E-03	6.22	12.44	0.00E+00	6.46E-03	1.29E-02		
Pu-239	5.5293E-03	6.22	12.44	0.00E+00	3.44E-02	6.88E-02		
Pu-240	2.1278E-03	6.22	12.44	0.00E+00	1.32E-02	2.65E-02		
Pu-241	1.0195E-01	6.22	12.44	0.00E+00	6.34E-01	1.27E+00		
Pu-242	2.3128E-07	6.22	12.44	0.00E+00	1.44E-06	2.88E-06		
Ra-226	5.2782E-14	6.22	12.44	0.00E+00	3.28E-13	6.56E-13		
Ra-228	1.9338E-10	6.22	12.44	0.00E+00	1.20E-09	2.40E-09		
Ru-106	9.1684E-02	6.22	12.44	0.00E+00	5.70E-01	1.14E+00		
Sr-90	1.3018E-05	6.22	12.44	0.00E+00	8.09E-05	1.62E-04		
Sn-126	1.2167E-05	6.22	12.44	0.00E+00	7.57E-05	1.51E-04		
Sr-90	2.6045E+00	6.22	12.44	0.00E+00	1.62E+01	3.24E+01		
Tc-99	4.4241E-04	6.22	12.44	0.00E+00	2.75E-03	5.50E-03		
Th-229	1.3713E-10	6.22	12.44	0.00E+00	8.53E-10	1.71E-09		
Th-230	1.8090E-11	6.22	12.44	0.00E+00	1.12E-10	2.25E-10		
Th-232	2.5278E-10	6.22	12.44	0.00E+00	1.57E-09	3.14E-09		
Tl-208	1.6947E-08	6.22	12.44	0.00E+00	1.05E-07	2.11E-07		
U-232	4.8737E-08	6.22	12.44	0.00E+00	3.03E-07	6.06E-07		
U-233	1.2203E-07	6.22	12.44	0.00E+00	7.59E-07	1.52E-06		
U-234	1.5925E-07	6.22	12.44	0.00E+00	9.90E-07	1.98E-06		
U-235	-2.6194E-06	6.22	0.00	2.76E-04	2.59E-04	2.76E-04		
U-236	1.2693E-05	6.22	12.44	0.00E+00	7.89E-05	1.58E-04		
U-238	-3.6331E-08	6.22	0.00	1.72E-04	1.71E-04	1.72E-04		
Y-90	2.6060E+00	6.22	12.44	0.00E+00	1.62E+01	3.24E+01		
Other Radionuclides					2.24E+01	4.48E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.62E-01	7.24E-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 %	20.0000041	10 to 20.1

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal	6.22	
Bounding		12.44

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	0.00
Bounding	0.57	0.99

Estimated EOL HM/Given EOL HM

<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 (ACPR)	Fuel decay start date	2035
SNF ID #	895	Estimates as of	2010
Fuel Units & Descr	182- ELEMENT	Template	TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=48.357kg, EOL=48.357kg	*Template Burnup(MWd)	6.65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0.000195
		Template Decay Time	5 years

Estimated Canister usage 18"x10" 1.64
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**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</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	8.5173E-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	5.162E+08
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	7.043E+05
C-14	1.2871E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0575	4.276E+05
Cl-36	2.8120E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0850	6.017E+07
Cm-243	1.7940E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.1250	1.188E+08
Cm-244	1.6962E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.2250	4.204E+08
Co-60	1.2839E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.3750	1.049E+06
Cs-134	9.0541E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.5750	5.161E+04
Cs-135	3.2195E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.8500	8.046E+03
Cs-137	2.7564E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.2500	4.756E+02
Eu-154	1.5368E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.7500	2.327E+02
Eu-155	2.9293E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.2500	1.348E+02
Fe-55	7.7158E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.7500	7.832E+01
H-3	1.1111E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	3.5000	7.002E+01
I-129	7.3684E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	5.0000	3.008E+01
Kr-85	2.5263E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	7.0000	3.463E+00
Np-237	1.2427E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	11.0000	3.981E-01
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		
Tl-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	2.08E-02	2.08E-02	2.08E-02		
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	1.30E-02	1.30E-02	1.30E-02		
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	0.00E+00		

**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 %	19.95031243	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate: Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup
	From SFD	Estimated	
Nominal	0.00		

Checks			Estimated EOL HM/Given EOL HM 1.00
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	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: TRIGA STD (ALUM) ARRR  
 SNF ID #: 238  
 Fuel Units & Descr: 71 - ELEMENT  
 Heavy Metal Mass: BOL=13.376kg, EOL=9 322kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2035  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 64

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 0632E-10	3,869 71	7,739 43	0 00E+00	3 12E-06	6 24E-06	Avg. MeV	
Am-241	2 2586E-03	3,869 71	7,739 43	0 00E+00	8.74E+00	1 75E+01	0.0150	1.310E+15
Am-242m	1 9925E-06	3,869 71	7,739 43	0 00E+00	7 71E-03	1 54E-02	0.0250	2.843E+14
Am-243	2 3323E-07	3,869 71	7,739 43	0 00E+00	9 03E-04	1 81E-03	0.0375	3.541E+14
C-14	4 3308E-05	3,869 71	7,739 43	0 00E+00	1 68E-01	3.35E-01	0.0575	2.715E+14
Cl-36	4 3023E-08	3,869 71	7,739 43	0 00E+00	1 66E-04	3.33E-04	0.0850	1.900E+14
Cm-243	2.7429E-07	3,869 71	7,739 43	0 00E+00	1 06E-03	2 12E-03	0.1250	2.842E+14
Cm-244	3.1504E-06	3,869 71	7,739 43	0 00E+00	1 22E-02	2 44E-02	0.2250	1.586E+14
Co-60	3 1008E-02	3,869.71	7,739 43	0 00E+00	1 20E+02	2.40E+02	0.3750	7.061E+13
Cs-134	1 0367E-01	3,869.71	7,739 43	0 00E+00	4 01E+02	8 02E+02	0.5750	8.952E+14
Cs-135	3 1549E-05	3,869.71	7,739 43	0 00E+00	1.22E-01	2 44E-01	0.8500	2.204E+14
Cs-137	2 7564E+00	3,869.71	7,739 43	0 00E+00	1 07E+04	2 13E+04	1.2500	2.284E+14
Eu-154	1 3490E+00	3,869 71	7,739 43	0 00E+00	5.22E+03	1 04E+04	1.7500	6.537E+12
Eu-155	4 3880E-01	3,869 71	7,739 43	0 00E+00	1 70E+03	3 40E+03	2.2500	7.946E+11
Fe-55	8 6782E-03	3,869 71	7,739 43	0 00E+00	3 36E+01	6 72E+01	2.7500	6.454E+09
H-3	1 0805E-02	3,869 71	7,739 43	0 00E+00	4 18E+01	8 36E+01	3.5000	7.543E+08
I-129	7 3805E-07	3 869 71	7,739 43	0 00E+00	2 86E-03	5 71E-03	5.0000	4.423E+03
Kr-85	2 5218E-01	3 869 71	7,739 43	0 00E+00	9 76E+02	1 95E+03	7.0000	5.006E+02
Np-237	1 4463E-06	3,869 71	7,739 43	0 00E+00	5 60E-03	1 12E-02	11.0000	5.701E+01
Pa-231	3 5970E-09	3,869 71	7,739 43	0 00E+00	1 39E-05	2.78E-05		
Pb-210	8.2511E-15	3,869 71	7,739 43	0 00E+00	3 19E-11	6.39E-11		
Pm-147	2 0767E+00	3,869 71	7,739 43	0 00E+00	8 04E+03	1 61E+04		
Pu-238	1.3514E-03	3,869 71	7,739 43	0 00E+00	5 23E+00	1.05E+01		
Pu-239	5 6947E-03	3,869 71	7,739 43	0 00E+00	2 20E+01	4 41E+01		
Pu-240	2.2647E-03	3,869 71	7,739 43	0 00E+00	8 76E+00	1.75E+01		
Pu-241	1.2574E-01	3,869.71	7,739 43	0 00E+00	4 87E+02	9 73E+02		
Pu-242	3 0602E-07	3,869.71	7,739 43	0 00E+00	1 18E-03	2 37E-03		
Ra-226	5 7353E-14	3,869.71	7,739 43	0 00E+00	2.22E-10	4 44E-10		
Ra-228	1 8150E-10	3,869 71	7,739 43	0 00E+00	7 02E-07	1 40E-06		
Ru-106	9 3744E-02	3,869 71	7,739 43	0 00E+00	3 63E+02	7 26E+02		
Se-79	1 2938E-05	3,869 71	7,739 43	0 00E+00	5 01E-02	1 00E-01		
Sn-126	1 2239E-05	3,869 71	7,739 43	0 00E+00	4.74E-02	9 47E-02		
Sr-90	2 6000E+00	3,869 71	7,739 43	0 00E+00	1 01E+04	2 01E+04		
Tc-99	4 4120E-04	3,869 71	7,739 43	0 00E+00	1 71E+00	3 41E+00		
Th-229	1 4749E-10	3,869 71	7,739 43	0 00E+00	5 71E-07	1 14E-06		
Th-230	1 9549E-11	3,869 71	7,739 43	0 00E+00	7 56E-08	1.51E-07		
Th-232	2.3744E-10	3,869 71	7,739 43	0 00E+00	9 19E-07	1 84E-06		
Tl-208	1 9459E-08	3,869 71	7,739 43	0 00E+00	7 53E-05	1 51E-04		
U-232	5 6015E-08	3,869 71	7,739 43	0.00E+00	2 17E-04	4 34E-04		
U-233	1.3132E-07	3,869 71	7,739 43	0 00E+00	5 08E-04	1 02E-03		
U-234	1.7323E-07	3,869 71	7,739 43	0 00E+00	6 70E-04	1 34E-03		
U-235	-2 6159E-06	3,869 71	0 00	5 67E-03	0 00E+00	5 67E-03		
U-236	1.2717E-05	3,869 71	7,739 43	0 00E+00	4 92E-02	9 84E-02		
U-238	-3 8857E-08	3,869.71	0 00	3 61E-03	3 46E-03	3 61E-03		
Y-90	2 6015E+00	3,869.71	7,739 43	0 00E+00	1 01E+04	2 01E+04		
Other Radionuclides					1 47E+04	2 94E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.94E+02	3.89E+02
Total	Total

**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:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	19 62614987	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	494.30	3 869 71	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		7 739 43	

Checks			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	7.83	7.83	1.23
Bounding	15.66		

<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) AUSTRIA	Fuel decay start date	2010
SNF ID #	462	Estimates as of	2010
Fuel Units & Descr	66 - ELEMENT	Template	TRIGA-AI (LW/U-Zrx, Alum , 10 to 20%, U)
Heavy Metal Mass	BOL=11.88kg EOL=11.814kg	Template Burnup(MWd)	665
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0.00018
		Template Decay Time	-5 years

Estimated  
Canister usage  
18"x10"  
0.59

**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)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	63.00	126.00	0.00E+00	5.08E-08	1.02E-07	Avg MeV	
Am-241	2.2586E-03	63.00	126.00	0.00E+00	1.42E-01	2.85E-01	0.0150	2.132E+13
Am-242m	1.9925E-06	63.00	126.00	0.00E+00	1.26E-04	2.51E-04	0.0250	4.628E+12
Am-243	2.3323E-07	63.00	126.00	0.00E+00	1.47E-05	2.94E-05	0.0375	5.765E+12
C-14	4.3308E-05	63.00	126.00	0.00E+00	2.73E-03	5.46E-03	0.0575	4.420E+12
Cl-36	4.3023E-08	63.00	126.00	0.00E+00	2.71E-06	5.42E-06	0.0850	3.094E+12
Cm-243	2.7429E-07	63.00	126.00	0.00E+00	1.73E-05	3.46E-05	0.1250	4.627E+12
Cm-244	3.1504E-06	63.00	126.00	0.00E+00	1.98E-04	3.97E-04	0.2250	2.583E+12
Co-60	3.1008E-02	63.00	126.00	0.00E+00	1.95E+00	3.91E+00	0.3750	1.149E+12
Cs-134	3.1008E-02	63.00	126.00	0.00E+00	6.53E+00	1.31E+01	0.5750	1.457E+13
Cs-135	3.1549E-05	63.00	126.00	0.00E+00	1.99E-03	3.98E-03	0.8500	3.587E+12
Cs-137	2.7564E+00	63.00	126.00	0.00E+00	1.74E+02	3.47E+02	1.2500	3.718E+12
Eu-154	1.3490E+00	63.00	126.00	0.00E+00	8.50E+01	1.70E+02	1.7500	1.064E+11
Eu-155	4.3880E-01	63.00	126.00	0.00E+00	2.76E+01	5.53E+01	2.2500	1.294E+10
Fe-55	8.6782E-03	63.00	126.00	0.00E+00	5.47E-01	1.09E+00	2.7500	1.051E+08
H-3	1.0805E-02	63.00	126.00	0.00E+00	6.81E-01	1.36E+00	3.5000	1.228E+07
I-129	7.3805E-07	63.00	126.00	0.00E+00	4.65E-05	9.30E-05	5.0000	7.926E+01
Kr-85	2.5218E-01	63.00	126.00	0.00E+00	1.59E+01	3.18E+01	7.0000	8.983E+00
Np-237	1.4463E-06	63.00	126.00	0.00E+00	9.11E-05	1.82E-04	11.0000	1.024E+00
Pa-231	3.5970E-09	63.00	126.00	0.00E+00	2.27E-07	4.53E-07		
Pb-210	8.2511E-15	63.00	126.00	0.00E+00	5.20E-13	1.04E-12		
Pm-147	2.0767E+00	63.00	126.00	0.00E+00	1.31E+02	2.62E+02		
Pu-238	1.3514E-03	63.00	126.00	0.00E+00	8.51E-02	1.70E-01		
Pu-239	5.6947E-03	63.00	126.00	0.00E+00	3.59E-01	7.18E-01		
Pu-240	2.2647E-03	63.00	126.00	0.00E+00	1.43E-01	2.85E-01		
Pu-241	1.2574E-01	63.00	126.00	0.00E+00	7.92E+00	1.58E+01		
Pu-242	3.0602E-07	63.00	126.00	0.00E+00	1.93E-05	3.86E-05		
Ra-226	5.7353E-14	63.00	126.00	0.00E+00	3.61E-12	7.23E-12		
Ra-228	1.8150E-10	63.00	126.00	0.00E+00	1.14E-08	2.29E-08		
Ru-106	9.3744E-02	63.00	126.00	0.00E+00	5.91E+00	1.18E+01		
Se-79	1.2938E-05	63.00	126.00	0.00E+00	8.15E-04	1.63E-03		
Sn-126	1.2239E-05	63.00	126.00	0.00E+00	7.71E-04	1.54E-03		
Sr-90	2.6000E+00	63.00	126.00	0.00E+00	1.64E+02	3.28E+02		
Tc-99	4.4120E-04	63.00	126.00	0.00E+00	2.78E-02	5.56E-02		
Th-229	1.4749E-10	63.00	126.00	0.00E+00	9.29E-09	1.86E-08		
Th-230	1.9549E-11	63.00	126.00	0.00E+00	1.23E-09	2.46E-09		
Th-232	2.3744E-10	63.00	126.00	0.00E+00	1.50E-08	2.99E-08		
Th-208	1.9459E-08	63.00	126.00	0.00E+00	1.23E-06	2.45E-06		
U-232	5.6015E-08	63.00	126.00	0.00E+00	3.53E-06	7.06E-06		
U-233	1.3132E-07	63.00	126.00	0.00E+00	8.27E-06	1.65E-05		
U-234	1.7323E-07	63.00	126.00	0.00E+00	1.09E-05	2.18E-05		
U-235	-2.6159E-06	63.00	0.00	5.13E-03	4.97E-03	5.13E-03		
U-236	1.2717E-05	63.00	126.00	0.00E+00	8.01E-04	1.60E-03		
U-238	-3.8857E-08	63.00	0.00	3.19E-03	3.19E-03	3.19E-03		
Y-90	2.6015E+00	63.00	126.00	0.00E+00	1.64E+02	3.28E+02		
Other Radionuclides					2.39E+02	4.79E+02		

**Thermal Power**  
Nominal Heat Output (Watts)    Bounding Heat Output (Watts)  
3.17E+00    6.33E+00  
Total    Total

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

<b>Template Selection Summary</b>			<b>Basis for Parameter Differences:</b>
Reactor Moderator:	From SFD: LW AND U ZIRC HYDRIDE	Used: LW AND U ZIRC HYDRIDE	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %	20	10 to 20.1	
<b>Burnup Summary (MWd)<sup>2</sup></b>			<b>Basis for burnup used in estimate</b>
	From SFD	Estimated	
Nominal	57.89	63.00	
Bounding		126.00	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
<b>Checks</b>			<b>Estimated EOL HM/Given EOL HM</b>
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.14	1.09	
Bounding	0.29		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 (ALUM) BRAZIL  
 SNF ID #: 471  
 Fuel Units & Descr: 59 - ELEMENT  
 Heavy Metal Mass: BOL=11 086kg; EOL=10 585kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2006  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zr, Alum, 10 to 20%, U)  
<sup>2</sup>Template Burnup (MWd): 6 65  
 Template BOL Heavy Metal Mass (MT): 0 00018  
 Template Decay Time<sup>3</sup>: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0.53

Radionuclide	II. Estimates		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	
	Ci/MWd From Template	m						Photon Energy Group	Photons/sec (bounding)
Ac-227	8 0632E-10	478 69	957.38	0 00E+00	3 86E-07	7 72E-07	Avg MeV		
Am-241	2 2586E-03	478 69	957.38	0 00E+00	1 08E+00	2 16E+00	0 0150	1 620E+14	
Am-242m	1 9925E-06	478 69	957.38	0 00E+00	9 54E-04	1 91E-03	0 0250	3 517E+13	
Am-243	2 3323E-07	478 69	957.38	0 00E+00	1 12E-04	2 23E-04	0 0375	4 381E+13	
C-14	4 3308E-05	478 69	957.38	0 00E+00	2 07E-02	4 15E-02	0 0575	3 358E+13	
Cl-36	4 3023E-08	478 69	957.38	0 00E+00	2 06E-05	4 12E-05	0 0850	2 351E+13	
Cm-243	2 7429E-07	478 69	957.38	0 00E+00	1 31E-04	2 63E-04	0 1250	3 516E+13	
Cm-244	3 1504E-06	478 69	957.38	0 00E+00	1 51E-03	3 02E-03	0 2250	1 962E+13	
Co-60	3 1008E-02	478 69	957.38	0 00E+00	1 48E+01	2 97E+01	0 3750	8 734E+12	
Cs-134	1 0367E-01	478 69	957.38	0 00E+00	4 96E+01	9 93E+01	0 5750	1 107E+14	
Cs-135	3 1549E-05	478 69	957.38	0 00E+00	1 51E-02	3 02E-02	0 8500	2 726E+13	
Cs-137	2 7564E+00	478 69	957.38	0 00E+00	1 32E+03	2 64E+03	1 2500	2 825E+13	
Eu-154	1 3490E+00	478 69	957.38	0 00E+00	6 46E+02	1 29E+03	1 7500	8 066E+11	
Eu-155	4 3890E-01	478 69	957.38	0 00E+00	2 10E+02	4 20E+02	2 2500	9 829E+10	
Fe-55	8 6782E-03	478 69	957.38	0 00E+00	4 15E+00	8 31E+00	2 7500	7 983E+08	
H-3	1 0805E-02	478 69	957.38	0 00E+00	5 17E+00	1 03E+01	3 5000	9 331E+07	
I-129	7 3805E-07	478 69	957.38	0 00E+00	3 53E-04	7 07E-04	5 0000	5 531E+02	
Kr-85	2 5218E-01	478 69	957.38	0 00E+00	1 21E+02	2 41E+02	7 0000	6 260E+01	
Np-237	1 4463E-06	478 69	957.38	0 00E+00	6 92E-04	1 38E-03	11 0000	7 130E+00	
Pa-231	3 5970E-09	478 69	957.38	0 00E+00	1 72E-06	3 44E-06			
Pb-210	8 2511E-15	478 69	957.38	0 00E+00	3 95E-12	7 90E-12			
Pm-147	2 0767E+00	478 69	957.38	0 00E+00	9 94E+02	1 99E+03			
Pu-238	1 3514E-03	478 69	957.38	0 00E+00	6 47E-01	1 29E+00			
Pu-239	5 6947E-03	478 69	957.38	0 00E+00	2 73E+00	5 45E+00			
Pu-240	2 2647E-03	478 69	957.38	0 00E+00	1 08E+00	2 17E+00			
Pu-241	1 2574E-01	478 69	957.38	0 00E+00	6 02E+01	1 20E+02			
Pu-242	3 0602E-07	478 69	957.38	0 00E+00	1 46E-04	2 93E-04			
Ra-226	5 7353E-14	478 69	957.38	0 00E+00	2 75E-11	5 49E-11			
Ra-228	1 8150E-10	478 69	957.38	0 00E+00	8 69E-08	1 74E-07			
Ru-106	9 3744E-02	478 69	957.38	0 00E+00	4 49E+01	8 97E+01			
Se-79	1 2938E-05	478 69	957.38	0 00E+00	6 19E-03	1 24E-02			
Sn-126	1 2239E-05	478 69	957.38	0 00E+00	5 86E-03	1 17E-02			
Sr-90	2 6000E+00	478 69	957.38	0 00E+00	1 24E+03	2 49E+03			
Tc-99	4 4120E-04	478 69	957.38	0 00E+00	2 11E-01	4 22E-01			
Th-229	1 4749E-10	478 69	957.38	0 00E+00	7 06E-08	1 41E-07			
Th-230	1 9549E-11	478 69	957.38	0 00E+00	9 36E-09	1 87E-08			
Th-232	2 3744E-10	478 69	957.38	0 00E+00	1 14E-07	2 27E-07			
Th-208	1 9459E-08	478 69	957.38	0 00E+00	9 31E-06	1 86E-05			
U-232	5 6015E-08	478 69	957.38	0 00E+00	2 68E-05	5 36E-05			
U-233	1 3132E-07	478 69	957.38	0 00E+00	6 29E-05	1 26E-04			
U-234	1 7323E-07	478 69	957.38	0 00E+00	8 29E-05	1 66E-04			
U-235	-2 6159E-06	478 69	0 00	4 75E-03	3 49E-03	4 75E-03			
U-236	1 2717E-06	478 69	957.38	0 00E+00	6 09E-03	1 22E-02			
U-238	-3 8857E-08	478 69	0 00	2 99E-03	2 97E-03	2 99E-03			
Y-90	2 6015E+00	478 69	957.38	0 00E+00	1 25E+03	2 49E+03	Total	Total	
Other Radionuclides					1 82E+03	3 64E+03			

**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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 81	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	108 05	478 69	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		957 38	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 17	4 43	1 00
Bounding	2 34		

<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) CORNELL  
 SNF ID # 1047  
 Fuel Units & Descr. 7 - ELEMENT  
 Heavy Metal Mass BOL=1.295kg EOL=1.263kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 2002  
 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 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.06

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	30.07	60.13	0.00E+00	2.42E-08	4.85E-08	Avg MeV	
Am-241	2.2586E-03	30.07	60.13	0.00E+00	6.79E-02	1.36E-01	0.0150	1.017E+13
Am-242m	1.9925E-06	30.07	60.13	0.00E+00	5.99E-05	1.20E-04	0.0250	2.209E+12
Am-243	2.3323E-07	30.07	60.13	0.00E+00	7.01E-06	1.40E-05	0.0375	2.752E+12
C-14	4.3308E-05	30.07	60.13	0.00E+00	1.30E-03	2.60E-03	0.0575	2.109E+12
Cl-36	4.3023E-08	30.07	60.13	0.00E+00	1.29E-06	2.59E-06	0.0850	1.477E+12
Cm-243	2.7429E-07	30.07	60.13	0.00E+00	8.25E-06	1.65E-05	0.1250	2.208E+12
Cm-244	3.1504E-06	30.07	60.13	0.00E+00	9.47E-05	1.89E-04	0.2250	1.233E+12
Co-60	3.1008E-02	30.07	60.13	0.00E+00	9.32E-01	1.86E+00	0.3750	5.486E+11
Cs-134	1.0367E-01	30.07	60.13	0.00E+00	3.12E+00	6.23E+00	0.5750	6.955E+12
Cs-135	3.1549E-05	30.07	60.13	0.00E+00	9.49E-04	1.90E-03	0.8500	1.712E+12
Cs-137	2.7564E+00	30.07	60.13	0.00E+00	8.29E+01	1.66E+02	1.2500	1.775E+12
Eu-154	1.3490E+00	30.07	60.13	0.00E+00	4.06E+01	8.11E+01	1.7500	5.079E+10
Eu-155	4.3880E-01	30.07	60.13	0.00E+00	1.32E+01	2.64E+01	2.2500	6.174E+09
Fe-55	8.6782E-03	30.07	60.13	0.00E+00	2.61E-01	5.22E-01	2.7500	5.015E+07
H-3	1.0805E-02	30.07	60.13	0.00E+00	3.25E-01	6.50E-01	3.5000	5.861E+06
I-129	7.3805E-07	30.07	60.13	0.00E+00	2.22E-05	4.44E-05	5.0000	3.511E+01
Kr-85	2.5218E-01	30.07	60.13	0.00E+00	7.58E+00	1.52E+01	7.0000	3.974E+00
Np-237	1.4463E-06	30.07	60.13	0.00E+00	4.35E-05	8.70E-05	11.0000	4.527E-01
Pa-231	3.5970E-09	30.07	60.13	0.00E+00	1.08E-07	2.16E-07		
Pb-210	8.2511E-15	30.07	60.13	0.00E+00	2.48E-13	4.96E-13		
Pm-147	2.0767E+00	30.07	60.13	0.00E+00	6.24E+01	1.25E+02		
Pu-238	1.3514E-03	30.07	60.13	0.00E+00	4.06E-02	8.13E-02		
Pu-239	5.6947E-03	30.07	60.13	0.00E+00	1.71E-01	3.42E-01		
Pu-240	2.2647E-03	30.07	60.13	0.00E+00	6.81E-02	1.36E-01		
Pu-241	1.2574E-01	30.07	60.13	0.00E+00	3.78E+00	7.56E+00		
Pu-242	3.0602E-07	30.07	60.13	0.00E+00	9.20E-06	1.84E-05		
Ra-226	5.7353E-14	30.07	60.13	0.00E+00	1.72E-12	3.45E-12		
Ra-228	1.8150E-10	30.07	60.13	0.00E+00	5.46E-09	1.09E-08		
Ru-106	9.3744E-02	30.07	60.13	0.00E+00	2.82E+00	5.64E+00		
Se-79	1.2938E-05	30.07	60.13	0.00E+00	3.89E-04	7.78E-04		
Sn-126	1.2239E-05	30.07	60.13	0.00E+00	3.68E-04	7.36E-04		
Sr-90	2.6000E+00	30.07	60.13	0.00E+00	7.82E+01	1.56E+02		
Tc-99	4.4120E-04	30.07	60.13	0.00E+00	1.33E-02	2.65E-02		
Th-229	1.4749E-10	30.07	60.13	0.00E+00	4.43E-09	8.87E-09		
Th-230	1.9549E-11	30.07	60.13	0.00E+00	5.88E-10	1.18E-09		
Th-232	2.3744E-10	30.07	60.13	0.00E+00	7.14E-09	1.43E-08		
Tl-208	1.9459E-08	30.07	60.13	0.00E+00	5.85E-07	1.17E-06		
U-232	5.6015E-08	30.07	60.13	0.00E+00	1.68E-06	3.37E-06		
U-233	1.3132E-07	30.07	60.13	0.00E+00	3.95E-06	7.90E-06		
U-234	1.7323E-07	30.07	60.13	0.00E+00	5.21E-06	1.04E-05		
U-235	-2.6159E-06	30.07	0.00	5.60E-04	4.81E-04	5.60E-04		
U-236	1.2717E-05	30.07	60.13	0.00E+00	3.82E-04	7.65E-04		
U-238	-3.8857E-08	30.07	0.00	3.48E-04	3.47E-04	3.48E-04		
Y-90	2.6015E+00	30.07	60.13	0.00E+00	7.82E+01	1.56E+02		
Other Radionuclides					1.14E+02	2.29E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.51E+00	3.02E+00
Total	Total

**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	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	20	10 to 20.1

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate:
From SFD	Estimated	
Nominal	6.31	30.07
Bounding		60.13

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

Checks		Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	
	0.63	4.76
Bounding	1.26	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 (ALUM) CORNELL UNIV  
 SNF ID #: 235  
 Fuel Units & Descr: 65 - ELEMENT  
 Heavy Metal Mass: BOL=12.025kg; EOL=11.94kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1973  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zr, Alum 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.00018  
 Template Decay Time: 35 years

Estimated  
 Canister usage  
**18"x10"**  
 0.59

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	Total Photons/sec (bounding)						
Ac-227	6.1504E-09	80.66	161.31	0.00E+00	4.96E-07	9.92E-07	Avg. MeV							
Am-241	4.8165E-03	80.66	161.31	0.00E+00	3.88E-01	7.77E-01	0.0150	1.138E+13						
Am-242m	1.7383E-06	80.66	161.31	0.00E+00	1.40E-04	2.80E-04	0.0250	2.355E+12						
Am-243	2.3263E-07	80.66	161.31	0.00E+00	1.88E-05	3.75E-05	0.0375	2.222E+12						
C-14	4.3158E-05	80.66	161.31	0.00E+00	3.48E-03	6.96E-03	0.0575	2.239E+12						
Cl-36	4.3023E-08	80.66	161.31	0.00E+00	3.47E-06	6.94E-06	0.0850	1.336E+12						
Cm-243	1.3229E-07	80.66	161.31	0.00E+00	1.07E-05	2.13E-05	0.1250	1.154E+12						
Cm-244	1.0000E-06	80.66	161.31	0.00E+00	8.07E-05	1.61E-04	0.2250	1.194E+12						
Co-60	6.0120E-04	80.66	161.31	0.00E+00	4.85E-02	9.70E-02	0.3750	5.067E+11						
Cs-134	4.3534E-06	80.66	161.31	0.00E+00	3.51E-04	7.02E-04	0.5750	8.346E+12						
Cs-135	3.1549E-05	80.66	161.31	0.00E+00	2.54E-03	5.09E-03	0.8500	4.259E+11						
Cs-137	1.3788E+00	80.66	161.31	0.00E+00	1.11E+02	2.22E+02	1.2500	4.178E+11						
Eu-154	1.2041E-01	80.66	161.31	0.00E+00	9.71E+00	1.94E+01	1.7500	1.344E+10						
Eu-155	6.6451E-03	80.66	161.31	0.00E+00	5.36E-01	1.07E+00	2.2500	2.652E+05						
Fe-55	2.9338E-06	80.66	161.31	0.00E+00	2.37E-04	4.73E-04	2.7500	8.973E+04						
H-3	2.0075E-03	80.66	161.31	0.00E+00	1.62E-01	3.24E-01	3.5000	2.310E+02						
I-129	7.3805E-07	80.66	161.31	0.00E+00	5.95E-05	1.19E-04	5.0000	9.729E+01						
Kr-85	3.6301E-02	80.66	161.31	0.00E+00	2.93E+00	5.86E+00	7.0000	1.098E+01						
Np-237	1.4977E-06	80.66	161.31	0.00E+00	1.21E-04	2.42E-04	11.0000	1.249E+00						
Pa-231	1.1275E-08	80.66	161.31	0.00E+00	9.09E-07	1.82E-06								
Pb-210	3.8932E-13	80.66	161.31	0.00E+00	3.14E-11	6.28E-11								
Pm-147	7.5383E-04	80.66	161.31	0.00E+00	6.08E-02	1.22E-01								
Pu-238	1.0668E-03	80.66	161.31	0.00E+00	8.60E-02	1.72E-01								
Pu-239	5.6902E-03	80.66	161.31	0.00E+00	4.59E-01	9.18E-01								
Pu-240	2.2571E-03	80.66	161.31	0.00E+00	1.82E-01	3.64E-01								
Pu-241	2.9699E-02	80.66	161.31	0.00E+00	2.40E+00	4.79E+00								
Pu-242	3.0602E-07	80.66	161.31	0.00E+00	2.47E-05	4.94E-05								
Ra-226	1.0704E-12	80.66	161.31	0.00E+00	8.63E-11	1.73E-10								
Ra-228	2.3654E-10	80.66	161.31	0.00E+00	1.91E-08	3.82E-08								
Ru-106	1.0444E-10	80.66	161.31	0.00E+00	8.42E-09	1.68E-08								
Sg-79	1.2934E-05	80.66	161.31	0.00E+00	1.04E-03	2.09E-03								
Sn-126	1.2236E-05	80.66	161.31	0.00E+00	9.87E-04	1.97E-03								
Sr-90	1.2740E+00	80.66	161.31	0.00E+00	1.03E+02	2.06E+02								
Tc-99	4.4120E-04	80.66	161.31	0.00E+00	3.56E-02	7.12E-02								
Th-229	6.4226E-10	80.66	161.31	0.00E+00	5.18E-08	1.04E-07								
Th-230	1.0594E-10	80.66	161.31	0.00E+00	8.54E-09	1.71E-08								
Th-232	2.3744E-10	80.66	161.31	0.00E+00	1.92E-08	3.83E-08								
Th-208	1.5774E-08	80.66	161.31	0.00E+00	1.27E-06	2.54E-06								
U-232	4.2511E-08	80.66	161.31	0.00E+00	3.43E-06	6.86E-06								
U-233	1.3155E-07	80.66	161.31	0.00E+00	1.06E-05	2.12E-05								
U-234	3.0030E-07	80.66	161.31	0.00E+00	2.42E-05	4.84E-05								
U-235	-2.6144E-06	80.66	0.00	5.20E-03	4.99E-03	5.20E-03								
U-236	1.2720E-05	80.66	161.31	0.00E+00	1.03E-03	2.05E-03								
U-238	-3.8857E-08	80.66	0.00	3.23E-03	3.23E-03	3.23E-03								
Y-90	1.2744E+00	80.66	161.31	0.00E+00	1.03E+02	2.06E+02								
Other Radionuclides					1.23E+02	2.46E+02								

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.36E+00	2.71E+00
Total	Total

**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	ALUM	ALUM	
BOL Enrichment %	U	U	
	20	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	58.60	80.66	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		161.31	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.18	1.38	1.00
Bounding	0.36		

<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) FINLAND  
 SNF ID #: 463  
 Fuel Units & Descr: 69 - ELEMENT  
 Heavy Metal Mass: BOL=12.42kg, EOL=12.344kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zr, Alum, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.00018  
 Template Decay Time: 5 years

Estimated  
 Canister usage,  
 18"x10"  
 0.62

Radionuclide	II. Estimates		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	
	m	x <sub>a</sub>						Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	72.45	144.90	144.90	0.00E+00	5.84E-08	1.17E-07	Avg. MeV	
Am-241	2.2586E-03	72.45	144.90	144.90	0.00E+00	1.64E-01	3.27E-01	0.0150	2.452E+13
Am-242m	1.9925E-06	72.45	144.90	144.90	0.00E+00	1.44E-04	2.89E-04	0.0250	5.323E+12
Am-243	2.3323E-07	72.45	144.90	144.90	0.00E+00	1.69E-05	3.38E-05	0.0375	6.630E+12
C-14	4.3308E-05	72.45	144.90	144.90	0.00E+00	3.14E-03	6.28E-03	0.0575	5.083E+12
Cl-36	4.3023E-08	72.45	144.90	144.90	0.00E+00	3.12E-06	6.23E-06	0.0850	3.558E+12
Cm-243	2.7429E-07	72.45	144.90	144.90	0.00E+00	1.99E-05	3.97E-05	0.1250	5.321E+12
Cm-244	3.1504E-06	72.45	144.90	144.90	0.00E+00	2.28E-04	4.56E-04	0.2250	2.970E+12
Co-60	3.1008E-02	72.45	144.90	144.90	0.00E+00	2.25E+00	4.49E+00	0.3750	1.322E+12
Cs-134	1.0367E-01	72.45	144.90	144.90	0.00E+00	7.51E+00	1.50E+01	0.5750	1.676E+13
Cs-135	3.1549E-05	72.45	144.90	144.90	0.00E+00	2.29E-03	4.57E-03	0.8500	4.125E+12
Cs-137	2.7564E+00	72.45	144.90	144.90	0.00E+00	2.00E+02	3.99E+02	1.2500	4.276E+12
Eu-154	1.3490E+00	72.45	144.90	144.90	0.00E+00	9.77E+01	1.95E+02	1.7500	1.224E+11
Eu-155	4.3880E-01	72.45	144.90	144.90	0.00E+00	3.18E+01	6.36E+01	2.2500	1.488E+10
Fe-55	8.6782E-03	72.45	144.90	144.90	0.00E+00	6.29E-01	1.26E+00	2.7500	1.208E+08
H-3	1.0805E-02	72.45	144.90	144.90	0.00E+00	7.83E-01	1.57E+00	3.5000	1.412E+07
I-129	7.3805E-07	72.45	144.90	144.90	0.00E+00	5.35E-05	1.07E-04	5.0000	9.038E+01
Kr-85	2.5218E-01	72.45	144.90	144.90	0.00E+00	1.83E+01	3.65E+01	7.0000	1.024E+01
Np-237	1.4463E-06	72.45	144.90	144.90	0.00E+00	1.05E-04	2.10E-04	11.0000	1.167E+00
Pa-231	3.5970E-09	72.45	144.90	144.90	0.00E+00	2.61E-07	5.21E-07		
Pb-210	8.2511E-15	72.45	144.90	144.90	0.00E+00	5.98E-13	1.20E-12		
Pm-147	2.0767E+00	72.45	144.90	144.90	0.00E+00	1.50E+02	3.01E+02		
Pu-238	1.3514E-03	72.45	144.90	144.90	0.00E+00	9.79E-02	1.96E-01		
Pu-239	5.6947E-03	72.45	144.90	144.90	0.00E+00	4.13E-01	8.25E-01		
Pu-240	2.2647E-03	72.45	144.90	144.90	0.00E+00	1.64E-01	3.28E-01		
Pu-241	1.2574E-01	72.45	144.90	144.90	0.00E+00	9.11E+00	1.82E+01		
Pu-242	3.0602E-07	72.45	144.90	144.90	0.00E+00	2.22E-05	4.43E-05		
Ra-226	5.7353E-14	72.45	144.90	144.90	0.00E+00	4.16E-12	8.31E-12		
Ra-228	1.8150E-10	72.45	144.90	144.90	0.00E+00	1.31E-08	2.63E-08		
Ru-106	9.3744E-02	72.45	144.90	144.90	0.00E+00	6.79E+00	1.36E+01		
Sa-79	1.2938E-05	72.45	144.90	144.90	0.00E+00	9.37E-04	1.87E-03		
Sn-126	1.2239E-05	72.45	144.90	144.90	0.00E+00	8.87E-04	1.77E-03		
Sr-90	2.6000E+00	72.45	144.90	144.90	0.00E+00	1.88E+02	3.77E+02		
Tc-99	4.4120E-04	72.45	144.90	144.90	0.00E+00	3.20E-02	6.39E-02		
Th-229	1.4749E-10	72.45	144.90	144.90	0.00E+00	1.07E-08	2.14E-08		
Th-230	1.9549E-11	72.45	144.90	144.90	0.00E+00	1.42E-09	2.83E-09		
Th-232	2.3744E-10	72.45	144.90	144.90	0.00E+00	1.72E-08	3.44E-08		
Th-208	1.9459E-08	72.45	144.90	144.90	0.00E+00	1.41E-06	2.82E-06		
U-232	5.6015E-08	72.45	144.90	144.90	0.00E+00	4.06E-06	8.12E-06		
U-233	1.3132E-07	72.45	144.90	144.90	0.00E+00	9.51E-06	1.90E-05		
U-234	1.7323E-07	72.45	144.90	144.90	0.00E+00	1.26E-05	2.51E-05		
U-235	-2.6159E-06	72.45	0.00	0.00	5.37E-03	5.18E-03	5.37E-03		
U-236	1.2717E-05	72.45	144.90	144.90	0.00E+00	9.21E-04	1.84E-03		
U-238	-3.8857E-08	72.45	0.00	0.00	3.34E-03	3.34E-03	3.34E-03		
Y-90	2.6015E+00	72.45	144.90	144.90	0.00E+00	1.88E+02	3.77E+02		
Other Radionuclides						2.75E+02	5.51E+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:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	20	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	60.52	72.45	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		144.90	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.16	1.20	1.00
Bounding	0.32		

<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) GA  
 SNF ID # 728  
 Fuel Units & Descr: 52 - ELEMENT  
 Heavy Metal Mass BOL=9 412kg EOL=9 329kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 2035  
 Estimates as of 2010  
 Template TRIGA-AI (LW/U-Zr, Alum 10 to 20% U)  
<sup>2</sup>Template Burnup(MWd): 6 65  
 Template BOL Heavy Metal Mass (MT) 0 00018  
 Template Decay Time 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 47

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	8.0632E-10	91.73	183.46	0.00E+00	7.40E-08	1.48E-07	Avg MeV	
Am-241	2.2586E-03	91.73	183.46	0.00E+00	2.07E-01	4.14E-01	0.0150	3.104E+13
Am-242m	1.9925E-06	91.73	183.46	0.00E+00	1.83E-04	3.66E-04	0.0250	6.739E+12
Am-243	2.3323E-07	91.73	183.46	0.00E+00	2.14E-05	4.28E-05	0.0375	8.395E+12
C-14	4.3308E-05	91.73	183.46	0.00E+00	3.97E-03	7.95E-03	0.0575	6.435E+12
Cl-36	4.3023E-08	91.73	183.46	0.00E+00	3.95E-06	7.89E-06	0.0850	4.505E+12
Cm-243	2.7429E-07	91.73	183.46	0.00E+00	2.52E-05	5.03E-05	0.1250	6.737E+12
Cm-244	3.1504E-06	91.73	183.46	0.00E+00	2.89E-04	5.78E-04	0.2250	3.761E+12
Co-60	3.1008E-02	91.73	183.46	0.00E+00	2.84E+00	5.69E+00	0.3750	1.674E+12
Cs-134	1.0367E-01	91.73	183.46	0.00E+00	9.51E+00	1.90E+01	0.5750	2.122E+13
Cs-135	3.1549E-05	91.73	183.46	0.00E+00	2.89E-03	5.79E-03	0.8500	5.223E+12
Cs-137	2.7564E+00	91.73	183.46	0.00E+00	2.53E+02	5.06E+02	1.2500	5.414E+12
Eu-154	1.3490E+00	91.73	183.46	0.00E+00	1.24E+02	2.47E+02	1.7500	1.550E+11
Eu-155	4.3880E-01	91.73	183.46	0.00E+00	4.03E+01	8.05E+01	2.2500	1.884E+10
Fe-55	8.6782E-03	91.73	183.46	0.00E+00	7.96E-01	1.59E+00	2.7500	1.530E+08
H-3	1.0805E-02	91.73	183.46	0.00E+00	9.91E-01	1.98E+00	3.5000	1.788E+07
I-129	7.3805E-07	91.73	183.46	0.00E+00	6.77E-05	1.35E-04	5.0000	1.105E+02
Kr-85	2.5218E-01	91.73	183.46	0.00E+00	2.31E+01	4.63E+01	7.0000	1.252E+01
Np-237	1.4463E-06	91.73	183.46	0.00E+00	1.33E-04	2.65E-04	11.0000	1.426E+00
Pa-231	3.5970E-09	91.73	183.46	0.00E+00	3.30E-07	6.60E-07		
Pb-210	8.2511E-15	91.73	183.46	0.00E+00	7.57E-13	1.51E-12		
Pm-147	2.0767E+00	91.73	183.46	0.00E+00	1.90E+02	3.81E+02		
Pu-238	1.3514E-03	91.73	183.46	0.00E+00	1.24E-01	2.48E-01		
Pu-239	5.6947E-03	91.73	183.46	0.00E+00	5.22E-01	1.04E+00		
Pu-240	2.2647E-03	91.73	183.46	0.00E+00	2.08E-01	4.15E-01		
Pu-241	1.2574E-01	91.73	183.46	0.00E+00	1.15E+01	2.31E+01		
Pu-242	3.0602E-07	91.73	183.46	0.00E+00	2.81E-05	5.61E-05		
Ra-226	5.7353E-14	91.73	183.46	0.00E+00	5.26E-12	1.05E-11		
Ra-228	1.8150E-10	91.73	183.46	0.00E+00	1.66E-08	3.33E-08		
Ru-106	9.3744E-02	91.73	183.46	0.00E+00	8.60E+00	1.72E+01		
Se-79	1.2938E-06	91.73	183.46	0.00E+00	1.19E-03	2.37E-03		
Sn-126	1.2239E-05	91.73	183.46	0.00E+00	1.12E-03	2.25E-03		
Sr-90	2.6000E+00	91.73	183.46	0.00E+00	2.38E+02	4.77E+02		
Tc-99	4.4120E-04	91.73	183.46	0.00E+00	4.05E-02	8.09E-02		
Th-229	1.4749E-10	91.73	183.46	0.00E+00	1.35E-08	2.71E-08		
Th-230	1.9549E-11	91.73	183.46	0.00E+00	1.79E-09	3.59E-09		
Th-232	2.3744E-10	91.73	183.46	0.00E+00	2.18E-08	4.36E-08		
Tl-208	1.9459E-08	91.73	183.46	0.00E+00	1.78E-06	3.57E-06		
U-232	5.6015E-08	91.73	183.46	0.00E+00	5.14E-06	1.03E-05		
U-233	1.3132E-07	91.73	183.46	0.00E+00	1.20E-05	2.41E-05		
U-234	1.7323E-07	91.73	183.46	0.00E+00	1.59E-05	3.18E-05		
U-235	-2.6159E-06	91.73	0.00	4.03E-03	3.79E-03	4.03E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2717E-05	91.73	183.46	0.00E+00	1.17E-03	2.33E-03	4.61E+00	9.22E+00
U-238	-3.8857E-08	91.73	0.00	2.54E-03	2.53E-03	2.54E-03	Total	Total
Y-90	2.6015E+00	91.73	183.46	0.00E+00	2.39E+02	4.77E+02		
Other Radionuclides					3.49E+02	6.97E+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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.8109242	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	91.73	79.42	Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup assumed to be twice nominal burnup
Bounding		183.46	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.26	0.87	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: TRIGA STD (ALUM) GA  
 SNF ID #: 870  
 Fuel Units & Descr: 246 - ELEMENT  
 Heavy Metal Mass: BOL=46 74kg, EOL=45 19kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1973  
 Estimates as of: 2010  
 Template: TRIGA-AJ (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: 35 years

Estimated  
 Canister usage:  
 18"x10"  
 2 22

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	6 1504E-09	1,479 31	2,958 63	0 00E+00	9 10E-06	1 82E-05	Avg MeV	
Am-241	4 8165E-03	1,479 31	2,958 63	0 00E+00	7 13E+00	1 43E+01	0 0150	2 087E+14
Am-242m	1 7383E-06	1,479 31	2,958 63	0 00E+00	2 57E-03	5 14E-03	0 0250	4 319E+13
Am-243	2 3263E-07	1,479 31	2,958 63	0 00E+00	3 44E-04	6 88E-04	0 0375	4 075E+13
C-14	4 3158E-05	1,479 31	2,958 63	0 00E+00	6 38E-02	1 28E-01	0 0575	4 106E+13
Cl-36	4 3023E-08	1,479 31	2,958 63	0 00E+00	6 36E-05	1 27E-04	0 0850	2 451E+13
Cm-243	1 3229E-07	1,479 31	2,958 63	0 00E+00	1 96E-04	3 91E-04	0 1250	2 117E+13
Cm-244	1 0000E-06	1,479 31	2,958 63	0 00E+00	1 48E-03	2 96E-03	0 2250	2 189E+13
Co-60	6 0120E-04	1,479 31	2,958 63	0 00E+00	8 89E-01	1 78E+00	0 3750	9 292E+12
Cs-134	4 3534E-06	1,479 31	2,958 63	0 00E+00	6 44E-03	1 29E-02	0 5750	1 531E+14
Cs-135	3 1549E-05	1,479 31	2,958 63	0 00E+00	4 67E-02	9 33E-02	0 8500	7 811E+12
Cs-137	1 3788E+00	1,479 31	2,958 63	0 00E+00	2 04E+03	4 08E+03	1 2500	7 664E+12
Eu-154	1 2041E-01	1,479 31	2,958 63	0 00E+00	1 78E+02	3 56E+02	1 7500	2 466E+11
Eu-155	6 6451E-03	1,479 31	2,958 63	0 00E+00	9 83E+00	1 97E+01	2 2500	4 863E+06
Fe-55	2 9338E-06	1,479 31	2,958 63	0 00E+00	4 34E-03	8 68E-03	2 7500	1 645E+06
H-3	2 0075E-03	1,479 31	2,958 63	0 00E+00	2 97E+00	5 94E+00	3 5000	3 984E+03
I-129	7 3805E-07	1,479 31	2,958 63	0 00E+00	1 09E-03	2 18E-03	5 0000	1 676E+03
Kr-85	3 6301E-02	1,479 31	2,958 63	0 00E+00	5 37E+01	1 07E+02	7 0000	1 890E+02
Np-237	1 4977E-06	1,479 31	2,958 63	0 00E+00	2 22E-03	4 43E-03	11 0000	2 148E+01
Pa-231	1 1275E-08	1,479 31	2,958 63	0 00E+00	1 67E-05	3 34E-05		
Pb-210	3 8932E-13	1,479 31	2,958 63	0 00E+00	5 76E-10	1 15E-09		
Pm-147	7 5383E-04	1,479 31	2,958 63	0 00E+00	1 12E+00	2 23E+00		
Pu-238	1 0668E-03	1,479 31	2,958 63	0 00E+00	1 58E+00	3 16E+00		
Pu-239	5 6902E-03	1,479 31	2,958 63	0 00E+00	8 42E+00	1 68E+01		
Pu-240	2 2571E-03	1,479 31	2,958 63	0 00E+00	3 34E+00	6 68E+00		
Pu-241	2 9699E-02	1,479 31	2,958 63	0 00E+00	4 39E+01	8 79E+01		
Pu-242	3 0602E-07	1,479 31	2,958 63	0 00E+00	4 53E-04	9 05E-04		
Ra-226	1 0704E-12	1,479 31	2,958 63	0 00E+00	1 58E-09	3 17E-09		
Ra-228	2 3654E-10	1,479 31	2,958 63	0 00E+00	3 50E-07	7 00E-07		
Ru-106	1 0444E-10	1,479 31	2,958 63	0 00E+00	1 54E-07	3 09E-07		
Se-79	1 2934E-05	1,479 31	2,958 63	0 00E+00	1 91E-02	3 83E-02		
Sn-126	1 2236E-05	1,479 31	2,958 63	0 00E+00	1 81E-02	3 62E-02		
Sr-90	1 2740E+00	1,479 31	2,958 63	0 00E+00	1 88E+03	3 77E+03		
Tc-99	4 4120E-04	1,479 31	2,958 63	0 00E+00	6 53E-01	1 31E+00		
Th-229	6 4226E-10	1,479 31	2,958 63	0 00E+00	9 50E-07	1 90E-06		
Th-230	1 0594E-10	1,479 31	2,958 63	0 00E+00	1 57E-07	3 13E-07		
Th-232	2 3744E-10	1,479 31	2,958 63	0 00E+00	3 51E-07	7 03E-07		
Tl-208	1 5774E-08	1,479 31	2,958 63	0 00E+00	2 33E-05	4 67E-05		
U-232	4 2511E-08	1,479 31	2,958 63	0 00E+00	6 29E-05	1 26E-04		
U-233	1 3155E-07	1,479 31	2,958 63	0 00E+00	1 95E-04	3 89E-04		
U-234	3 0030E-07	1,479 31	2,958 63	0 00E+00	4 44E-04	8 88E-04		
U-235	-2 6144E-06	1,479 31	0 00	2 01E-02	1 62E-02	2 01E-02		
U-236	1 2720E-05	1,479 31	2,958 63	0 00E+00	1 88E-02	3 76E-02		
U-238	-3 8857E-08	1,479 31	0 00	1 26E-02	1 25E-02	1 26E-02		
Y-90	1 2744E+00	1,479 31	2,958 63	0 00E+00	1 89E+03	3 77E+03		
Other Radionuclides					2 25E+03	4 51E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2 49E+01	4 98E+01
Total	Total

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

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
	From SFD	Used	
Reactor Moderator:	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 9	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	455 53	1 479 31	
Bounding		2 958 63	

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 86	3 25	1 00
Bounding	1 71		

<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) GERMANY  
 SNF ID # 465  
 Fuel Units & Descr 65 - ELEMENT  
 Heavy Metal Mass BOL=11 7kg EOL=11 635kg  
 ROD Storage Site INEEL

Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template TRIGA-AI (LW/U-Zrx, Alum, 10 to 20%, U)  
 \*Template Burnup(MWd) 6.65  
 Template BOL Heavy Metal Mass (MT) 0.00018  
 Template Decay Time 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.59

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
	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	8.0632E-10	62.04	124.09	0.00E+00	5.00E-08	1.00E-07	Avg MeV	
Am-241	2.2586E-03	62.04	124.09	0.00E+00	1.40E-01	2.80E-01	0.0150	2.100E+13
Am-242m	1.9925E-06	62.04	124.09	0.00E+00	1.24E-04	2.47E-04	0.0250	4.558E+12
Am-243	2.3323E-07	62.04	124.09	0.00E+00	1.45E-05	2.89E-05	0.0375	5.678E+12
C-14	4.3308E-05	62.04	124.09	0.00E+00	2.69E-03	5.37E-03	0.0575	4.353E+12
Cl-36	4.3023E-08	62.04	124.09	0.00E+00	2.67E-06	5.34E-06	0.0850	3.047E+12
Cm-243	2.7429E-07	62.04	124.09	0.00E+00	1.70E-05	3.40E-05	0.1250	4.557E+12
Cm-244	3.1504E-06	62.04	124.09	0.00E+00	1.95E-04	3.91E-04	0.2250	2.544E+12
Co-60	3.1008E-02	62.04	124.09	0.00E+00	1.92E+00	3.85E+00	0.3750	1.132E+12
Cs-134	1.0367E-01	62.04	124.09	0.00E+00	6.43E+00	1.29E+01	0.5750	1.435E+13
Cs-135	3.1549E-05	62.04	124.09	0.00E+00	1.96E-03	3.91E-03	0.8500	3.533E+12
Cs-137	2.7564E+00	62.04	124.09	0.00E+00	1.71E+02	3.42E+02	1.2500	3.662E+12
Eu-154	1.3490E+00	62.04	124.09	0.00E+00	8.37E+01	1.67E+02	1.7500	1.048E+11
Eu-155	4.3880E-01	62.04	124.09	0.00E+00	2.72E+01	5.44E+01	2.2500	1.274E+10
Fe-55	8.6782E-03	62.04	124.09	0.00E+00	5.38E-01	1.08E+00	2.7500	1.035E+08
H-3	1.0805E-02	62.04	124.09	0.00E+00	6.70E-01	1.34E+00	3.5000	1.209E+07
I-129	7.3805E-07	62.04	124.09	0.00E+00	4.58E-05	9.16E-05	5.0000	7.806E+01
Kr-85	2.5218E-01	62.04	124.09	0.00E+00	1.56E+01	3.13E+01	7.0000	8.847E+00
Np-237	1.4463E-06	62.04	124.09	0.00E+00	8.97E-05	1.79E-04	11.0000	1.009E+00
Pa-231	3.5970E-09	62.04	124.09	0.00E+00	2.23E-07	4.46E-07		
Pb-210	8.2511E-15	62.04	124.09	0.00E+00	5.12E-13	1.02E-12		
Pm-147	2.0767E+00	62.04	124.09	0.00E+00	1.29E+02	2.58E+02		
Pu-238	1.3514E-03	62.04	124.09	0.00E+00	8.38E-02	1.68E-01		
Pu-239	5.6947E-03	62.04	124.09	0.00E+00	3.53E-01	7.07E-01		
Pu-240	2.2647E-03	62.04	124.09	0.00E+00	1.41E-01	2.81E-01		
Pu-241	1.2574E-01	62.04	124.09	0.00E+00	7.80E+00	1.56E+01		
Pu-242	3.0602E-07	62.04	124.09	0.00E+00	1.90E-05	3.80E-05		
Ra-226	5.7353E-14	62.04	124.09	0.00E+00	3.56E-12	7.12E-12		
Ra-228	1.8150E-10	62.04	124.09	0.00E+00	1.13E-08	2.25E-08		
Ru-106	9.3744E-02	62.04	124.09	0.00E+00	5.82E+00	1.16E+01		
Se-79	1.2938E-05	62.04	124.09	0.00E+00	8.03E-04	1.61E-03		
Sn-126	1.2239E-05	62.04	124.09	0.00E+00	7.59E-04	1.52E-03		
Sr-90	2.6000E+00	62.04	124.09	0.00E+00	1.61E+02	3.23E+02		
Tc-99	4.4120E-04	62.04	124.09	0.00E+00	2.74E-02	5.47E-02		
Th-229	1.4749E-10	62.04	124.09	0.00E+00	9.15E-09	1.83E-08		
Th-230	1.9549E-11	62.04	124.09	0.00E+00	1.21E-09	2.43E-09		
Th-232	2.3744E-10	62.04	124.09	0.00E+00	1.47E-08	2.95E-08		
Ti-208	1.9459E-08	62.04	124.09	0.00E+00	1.21E-06	2.41E-06		
U-232	5.6015E-08	62.04	124.09	0.00E+00	3.48E-06	6.95E-06		
U-233	1.3132E-07	62.04	124.09	0.00E+00	8.15E-06	1.63E-05		
U-234	1.7323E-07	62.04	124.09	0.00E+00	1.07E-05	2.15E-05		
U-235	-2.6159E-06	62.04	0.00	5.06E-03	4.89E-03	5.06E-03		
U-236	1.2717E-05	62.04	124.09	0.00E+00	7.89E-04	1.58E-03		
U-238	-3.8857E-08	62.04	0.00	3.15E-03	3.14E-03	3.15E-03		
Y-90	2.6015E+00	62.04	124.09	0.00E+00	1.61E+02	3.23E+02		
Other Radionuclides					2.36E+02	4.72E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.12E+00	6.23E+00
Total	Total

**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:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	20	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:	57.01	62.04	Nominal burnup calculated from the heavy metal mass destroyed
Bounding:		124.09	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.14	1.09	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: TRIGA STD (ALUM) HANFORD  
 SNF ID #: 876  
 Fuel Units & Descr: 59 - ELEMENT  
 Heavy Metal Mass: BOL=10 915kg, EOL=10 838kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1973  
 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<sup>3</sup>: 35 years

Estimated  
 Canister usage  
 18"x10"  
 0 53

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 1504E-09	73.21	146 42	0 00E+00	4 50E-07	9 01E-07	Avg MeV	
Am-241	4 8165E-03	73.21	146 42	0 00E+00	3 53E-01	7 05E-01	0 0150	1 033E+13
Am-242m	1 7383E-06	73.21	146 42	0 00E+00	1 27E-04	2 55E-04	0 0250	2 138E+12
Am-243	2 3263E-07	73.21	146 42	0 00E+00	1 70E-05	3 41E-05	0 0375	2 017E+12
C-14	4 3158E-05	73.21	146 42	0 00E+00	3 16E-03	6 32E-03	0 0575	2 032E+12
Cl-36	4 3023E-08	73.21	146 42	0 00E+00	3 15E-06	6 30E-06	0 0850	1 213E+12
Cr-243	1 3229E-07	73.21	146 42	0 00E+00	9 68E-06	1 94E-05	0 1250	1 048E+12
Cr-244	1 0000E-06	73.21	146 42	0 00E+00	7 32E-05	1 46E-04	0 2250	1 084E+12
Co-60	6 0120E-04	73.21	146 42	0 00E+00	4 40E-02	8 80E-02	0 3750	4 599E+11
Cs-134	4 3534E-06	73.21	146 42	0 00E+00	3 19E-04	6 37E-04	0 5750	7 576E+12
Cs-135	3 1549E-05	73 21	146 42	0 00E+00	2 31E-03	4 62E-03	0 8500	3 866E+11
Cs-137	1 3788E+00	73 21	146 42	0 00E+00	1 01E+02	2 02E+02	1 2500	3 793E+11
Eu-154	1 2041E-01	73 21	146 42	0 00E+00	8 82E+00	1 76E+01	1 7500	1 220E+10
Eu-155	6 6451E-03	73 21	146 42	0 00E+00	4 86E-01	9 73E-01	2 2500	2 407E+05
Fe-55	2 9338E-06	73 21	146 42	0 00E+00	2 15E-04	4 30E-04	2 7500	8 145E+04
H-3	2 0075E-03	73 21	146 42	0 00E+00	1 47E-01	2 94E-01	3 5000	2 096E+02
I-129	7 3805E-07	73 21	146 42	0 00E+00	5 40E-05	1 08E-04	5 0000	8 831E+01
Kr-85	3 6301E-02	73 21	146 42	0 00E+00	2 66E+00	5 32E+00	7 0000	9 970E+00
Np-237	1 4977E-06	73 21	146 42	0 00E+00	1 10E-04	2 19E-04	11 0000	1 134E+00
Pa-231	1 1275E-08	73 21	146 42	0 00E+00	8 25E-07	1 65E-06		
Pb-210	3 8932E-13	73 21	146 42	0 00E+00	2 85E-11	5 70E-11		
Pm-147	7 5383E-04	73 21	146 42	0 00E+00	5 52E-02	1 10E-01		
Pu-238	1 0668E-03	73 21	146 42	0 00E+00	7 81E-02	1 56E-01		
Pu-239	5 6902E-03	73 21	146 42	0 00E+00	4 17E-01	8 33E-01		
Pu-240	2 2571E-03	73 21	146 42	0 00E+00	1 65E-01	3 30E-01		
Pu-241	2 9699E-02	73 21	146 42	0 00E+00	2 17E+00	4 35E+00		
Pu-242	3 0602E-07	73 21	146 42	0 00E+00	2 24E-05	4 48E-05		
Ra-226	1 0704E-12	73 21	146 42	0 00E+00	7 84E-11	1 57E-10		
Ra-228	2 3654E-10	73 21	146 42	0 00E+00	1 73E-08	3 46E-08		
Ru-106	1 0444E-10	73 21	146 42	0 00E+00	7 65E-09	1 53E-08		
Se-79	1 2934E-05	73 21	146 42	0 00E+00	9 47E-04	1 89E-03		
Sn-126	1 2236E-05	73 21	146 42	0 00E+00	8 96E-04	1 79E-03		
Sr-90	1 2740E+00	73 21	146 42	0 00E+00	9 33E+01	1 87E+02		
Tc-99	4 4120E-04	73 21	146 42	0 00E+00	3 23E-02	6 46E-02		
Th-229	6 4226E-10	73 21	146 42	0 00E+00	4 70E-08	9 40E-08		
Th-230	1 0594E-10	73 21	146 42	0 00E+00	7 76E-09	1 55E-08		
Th-232	2 3744E-10	73 21	146 42	0 00E+00	1 74E-08	3 48E-08		
Th-208	1 5774E-08	73 21	146 42	0 00E+00	1 15E-06	2 31E-06		
U-232	4 2511E-08	73 21	146 42	0 00E+00	3 11E-06	6 22E-06		
U-233	1 3155E-07	73 21	146 42	0 00E+00	9 63E-06	1 93E-05		
U-234	3 0030E-07	73 21	146 42	0 00E+00	2 20E-05	4 40E-05		
U-235	-2 6144E-06	73 21	0 00	4 72E-03	4 53E-03	4 72E-03		
U-236	1 2720E-05	73 21	146 42	0 00E+00	9 31E-04	1 86E-03		
U-238	-3 8857E-08	73 21	0 00	2 93E-03	2 93E-03	2 93E-03		
Y-90	1 2744E+00	73 21	146 42	0 00E+00	9 33E+01	1 87E+02		
Other Radionuclides					1 12E+02	2 23E+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:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	20	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	53 19	73 21	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		146 42	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 18	1 38	1 00
Bounding	0 36		

<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) HANNOVER	Fuel decay start date	1996
SNF ID #	303	Estimates as of	2010
Fuel Units & Descr	71 - ELEMENT	Template	TRIGA-AI (LW/U-Zrx, Alum., 10 to 20%, U)
Heavy Metal Mass	BOL=13 561kg EOL=13 419kg	Template Burnup(MWd)	6 65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0 00018
		Template Decay Time	10 years

Estimated Canister usage 18"x10" 0 64
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Radionuclide	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)
	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 2892E-09	135 54	271 08	0 00E+00	1 75E-07	3 49E-07	0 0150	3 644E+13
Am-241	2 9429E-03	135 54	271 08	0 00E+00	3 99E-01	7 98E-01	0 0250	7 622E+12
Am-242m	1 9489E-06	135 54	271 08	0 00E+00	2 64E-04	5 28E-04	0 0375	9 000E+12
Am-243	2 3308E-07	135 54	271 08	0 00E+00	3 16E-05	6 32E-05	0 0575	7 443E+12
C-14	4 3278E-05	135 54	271 08	0 00E+00	5 87E-03	1 17E-02	0 0850	4 838E+12
Cl-36	4 3023E-08	135 54	271 08	0 00E+00	5 83E-06	1 17E-05	0 1250	6 695E+12
Cm-243	2 4286E-07	135 54	271 08	0 00E+00	3 29E-05	6 58E-05	0 2250	4 247E+12
Cm-244	2 6015E-06	135 54	271 08	0 00E+00	3 53E-04	7 05E-04	0 3750	1 748E+12
Co-60	1 6075E-02	135 54	271 08	0 00E+00	2 18E+00	4 36E+00	0 5750	2 604E+13
Cs-134	1 9323E-02	135 54	271 08	0 00E+00	2 62E+00	5 24E+00	0 8500	4 744E+12
Cs-135	3 1549E-05	135 54	271 08	0 00E+00	4 28E-03	8 55E-03	1 2500	5 215E+12
Cs-137	2 4556E+00	135 54	271 08	0 00E+00	3 33E+02	6 66E+02	1 7500	1 495E+11
Eu-154	9 0180E-01	135 54	271 08	0 00E+00	1 22E+02	2 44E+02	2 2500	3 558E+08
Eu-155	2 1820E-01	135 54	271 08	0 00E+00	2 96E+01	5 91E+01	2 7500	6 976E+06
Fe-55	2 2902E-03	135 54	271 08	0 00E+00	3 10E-01	6 21E-01	3 5000	8 510E+05
H-3	8 1609E-03	135 54	271 08	0 00E+00	1 11E+00	2 21E+00	5 0000	1 620E+02
I-129	7 3805E-07	135 54	271 08	0 00E+00	1 00E-04	2 00E-04	7 0000	1 833E+01
Kr-85	1 8256E-01	135 54	271 08	0 00E+00	2 47E+01	4 95E+01	11 0000	2 087E+00
Np-237	1 4505E-06	135 54	271 08	0 00E+00	1 97E-04	3 93E-04		
Pa-231	4 5564E-09	135 54	271 08	0 00E+00	6 18E-07	1 24E-06		
Pb-210	1 8842E-14	135 54	271 08	0 00E+00	2 55E-12	5 11E-12		
Pm-147	5 5459E-01	135 54	271 08	0 00E+00	7 52E+01	1 50E+02		
Pu-238	1 2992E-03	135 54	271 08	0 00E+00	1 76E-01	3 52E-01		
Pu-239	5 6932E-03	135 54	271 08	0 00E+00	7 72E-01	1 54E+00		
Pu-240	2 2632E-03	135 54	271 08	0 00E+00	3 07E-01	6 14E-01		
Pu-241	9 8857E-02	135 54	271 08	0 00E+00	1 34E+01	2 68E+01		
Pu-242	3 0602E-07	135 54	271 08	0 00E+00	4 15E-05	8 30E-05		
Ra-226	1 0823E-13	135 54	271 08	0 00E+00	1 47E-11	2 93E-11		
Ra-228	2 0406E-10	135 54	271 08	0 00E+00	2 77E-08	5 53E-08		
Ru-106	3 0180E-03	135 54	271 08	0 00E+00	4 09E-01	8 18E-01		
Se-79	1 2937E-05	135 54	271 08	0 00E+00	1 75E-03	3 51E-03		
Sn-126	1 2238E-05	135 54	271 08	0 00E+00	1 66E-03	3 32E-03		
Sr-90	2 3098E+00	135 54	271 08	0 00E+00	3 13E+02	6 26E+02		
Tc-99	4 4120E-04	135 54	271 08	0 00E+00	5 98E-02	1 20E-01		
Th-229	2 0932E-10	135 54	271 08	0 00E+00	2 84E-08	5 67E-08		
Th-230	2 7744E-11	135 54	271 08	0 00E+00	3 76E-09	7 52E-09		
Th-232	2 3744E-10	135 54	271 08	0 00E+00	3 22E-08	6 44E-08		
Tl-208	1 9459E-08	135 54	271 08	0 00E+00	2 64E-06	5 27E-06		
U-232	5 3850E-08	135 54	271 08	0 00E+00	7 30E-06	1 46E-05		
U-233	1 3135E-07	135 54	271 08	0 00E+00	1 78E-05	3 56E-05		
U-234	1 9143E-07	135 54	271 08	0 00E+00	2 59E-05	5 19E-05		
U-235	-2 6159E-06	135 54	0 00	5 86E-03	5 51E-03	5 86E-03		
U-236	1 2719E-05	135 54	271 08	0 00E+00	1 72E-03	3 45E-03		
U-238	-3 8857E-08	135 54	0 00	3 65E-03	3 64E-03	3 65E-03		
Y-90	2 3098E+00	135 54	271 08	0 00E+00	3 13E+02	6 26E+02		
Other Radionuclides					3 58E+02	7 15E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 03E+00	1 01E+01
Total	Total

**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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20 00391594	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	132 17	135 54	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		271 08	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0 27	1 03	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: TRIGA STD (ALUM) HEIDELBERG  
 SNF ID #: 464  
 Fuel Units & Descr: 65 - ELEMENT  
 Heavy Metal Mass: BOL=11 648kg; EOL=11 401kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zr, Alum, 10 to 20% U)  
<sup>2</sup>Template Burnup(MWd): 6 65  
 Template BOL Heavy Metal Mass (MT): 0 00018  
 Template Decay Time: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0 59

Radionuclide	m		x <sub>a</sub>		x <sub>b</sub>		b		y <sub>a</sub>		y <sub>b</sub>		Gamma Sources	
	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 0632E-10	283 80	567 61	0 00E+00	2 29E-07	4 58E-07	Avg MeV							
Am-241	2 2586E-03	283 80	567 61	0 00E+00	6 41E-01	1 28E+00	0 0150	9 604E+13						
Am-242m	1 9925E-06	283 80	567 61	0 00E+00	5 65E-04	1 13E-03	0 0250	2 085E+13						
Am-243	2 3323E-07	283 80	567 61	0 00E+00	6 62E-05	1 32E-04	0 0375	2 597E+13						
C-14	4 3308E-05	283 80	567 61	0 00E+00	1 23E-02	2 46E-02	0 0575	1 991E+13						
Cl-36	4 3023E-08	283 80	567 61	0 00E+00	1 22E-05	2 44E-05	0 0850	1 394E+13						
Cm-243	2 7429E-07	283 80	567 61	0 00E+00	7 78E-05	1 56E-04	0 1250	2 084E+13						
Cm-244	3 1504E-06	283 80	567 61	0 00E+00	8 94E-04	1 79E-03	0 2250	1 163E+13						
Co-60	3 1008E-02	283 80	567 61	0 00E+00	8 80E+00	1 76E+01	0 3750	5 178E+12						
Cs-134	1 0367E-01	283 80	567 61	0 00E+00	2 94E+01	5 88E+01	0 5750	6 565E+13						
Cs-135	3 1549E-05	283 80	567 61	0 00E+00	8 95E-03	1 79E-02	0 8500	1 616E+13						
Cs-137	2 7564E+00	283 80	567 61	0 00E+00	7 82E+02	1 56E+03	1 2500	1 675E+13						
Eu-154	1 3490E+00	283 80	567 61	0 00E+00	3 83E+02	7 66E+02	1 7500	4 794E+11						
Eu-155	4 3880E-01	283 80	567 61	0 00E+00	1 25E+02	2 49E+02	2 2500	5 828E+10						
Fe-55	8 6782E-03	283 80	567 61	0 00E+00	2 46E+00	4 93E+00	2 7500	4 733E+08						
H-3	1 0805E-02	283 80	567 61	0 00E+00	3 07E+00	6 13E+00	3 5000	5 532E+07						
I-129	7 3805E-07	283 80	567 61	0 00E+00	2 09E-04	4 19E-04	5 0000	3 310E+02						
Kr-85	2 5218E-01	283 80	567 61	0 00E+00	7 16E+01	1 43E+02	7 0000	3 747E+01						
Np-237	1 4463E-06	283 80	567 61	0 00E+00	4 10E-04	8 21E-04	11 0000	4 269E+00						
Pa-231	3 5970E-09	283 80	567 61	0 00E+00	1 02E-06	2 04E-06								
Pb-210	8 2511E-15	283 80	567 61	0 00E+00	2 34E-12	4 68E-12								
Pm-147	2 0767E+00	283 80	567 61	0 00E+00	5 89E+02	1 18E+03								
Pu-238	1 3514E-03	283 80	567 61	0 00E+00	3 84E-01	7 67E-01								
Pu-239	5 6947E-03	283 80	567 61	0 00E+00	1 62E+00	3 23E+00								
Pu-240	2 2647E-03	283 80	567 61	0 00E+00	6 43E-01	1 29E+00								
Pu-241	1 2574E-01	283 80	567 61	0 00E+00	3 57E+01	7 14E+01								
Pu-242	3 0602E-07	283 80	567 61	0 00E+00	8 68E-05	1 74E-04								
Ra-226	5 7353E-14	283 80	567 61	0 00E+00	1 63E-11	3 26E-11								
Ra-228	1 8150E-10	283 80	567 61	0 00E+00	5 15E-08	1 03E-07								
Ru-106	9 3744E-02	283 80	567 61	0 00E+00	2 66E+01	5 32E+01								
Se-79	1 2938E-05	283 80	567 61	0 00E+00	3 67E-03	7 34E-03								
Sn-126	1 2239E-05	283 80	567 61	0 00E+00	3 47E-03	6 95E-03								
Sr-90	2 6000E+00	283 80	567 61	0 00E+00	7 38E+02	1 48E+03								
Tc-99	4 4120E-04	283 80	567 61	0 00E+00	1 25E-01	2 50E-01								
Th-229	1 4749E-10	283 80	567 61	0 00E+00	4 19E-08	8 37E-08								
Th-230	1 9549E-11	283 80	567 61	0 00E+00	5 55E-09	1 11E-08								
Th-232	2 3744E-10	283 80	567 61	0 00E+00	6 74E-08	1 35E-07								
Tl-208	1 9459E-08	283 80	567 61	0 00E+00	5 52E-06	1 10E-05								
U-232	5 6015E-08	283 80	567 61	0 00E+00	1 59E-05	3 18E-05								
U-233	1 3132E-07	283 80	567 61	0 00E+00	3 73E-05	7 45E-05								
U-234	1 7323E-07	283 80	567 61	0 00E+00	4 92E-05	9 83E-05								
U-235	-2 6159E-06	283 80	0 00	5 06E-03	4 31E-03	5 06E-03								
U-236	1 2717E-05	283 80	567 61	0 00E+00	3 61E-03	7 22E-03								
U-238	-3 8857E-08	283 80	0 00	3 13E-03	3 12E-03	3 13E-03								
Y-90	2 6015E+00	283 80	567 61	0 00E+00	7 38E+02	1 48E+03								
Other Radionuclides					1 08E+03	2 16E+03								

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

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
	From SFD	Used	
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20 08410778	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	283 80	235 77	Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup assumed to be twice nominal burnup
Bounding		567 61	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0 66	0 83	1 00
Bounding	1 32		

<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) ITALY  
 SNF ID # 466  
 Fuel Units & Descr: 60 - ELEMENT  
 Heavy Metal Mass: BOL=10.8kg EOL=10.74kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 2010  
 Estimates as of 2010  
 Template TRIGA-AI (LW/U-Zr Alum, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd) 6.65  
 Template BOL Heavy Metal Mass (MT) 0.00018  
 Template Decay Time 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0.54

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	57.27	114.54	0.00E+00	4.62E-08	9.24E-08	Avg MeV	
Am-241	2.2586E-03	57.27	114.54	0.00E+00	1.29E-01	2.59E-01	0.0150	1.938E+13
Am-242m	1.9925E-06	57.27	114.54	0.00E+00	1.14E-04	2.28E-04	0.0250	4.208E+12
Am-243	2.3323E-07	57.27	114.54	0.00E+00	1.34E-05	2.67E-05	0.0375	5.241E+12
C-14	4.3308E-05	57.27	114.54	0.00E+00	2.48E-03	4.96E-03	0.0575	4.018E+12
Cf-252	4.3023E-08	57.27	114.54	0.00E+00	2.46E-06	4.93E-06	0.0850	2.812E+12
Cm-243	2.7429E-07	57.27	114.54	0.00E+00	1.57E-05	3.14E-05	0.1250	4.206E+12
Cm-244	3.1504E-06	57.27	114.54	0.00E+00	1.80E-04	3.61E-04	0.2250	2.348E+12
Co-60	3.1008E-02	57.27	114.54	0.00E+00	1.78E+00	3.55E+00	0.3750	1.045E+12
Cs-134	1.0367E-01	57.27	114.54	0.00E+00	5.94E+00	1.19E+01	0.5750	1.325E+13
Cs-135	3.1549E-05	57.27	114.54	0.00E+00	1.81E-03	3.61E-03	0.8500	3.261E+12
Cs-137	2.7564E+00	57.27	114.54	0.00E+00	1.58E+02	3.16E+02	1.2500	3.380E+12
Eu-154	1.3490E+00	57.27	114.54	0.00E+00	7.73E+01	1.55E+02	1.7500	9.675E+10
Eu-155	4.3880E-01	57.27	114.54	0.00E+00	2.51E+01	5.03E+01	2.2500	1.176E+10
Fe-55	6.6782E-03	57.27	114.54	0.00E+00	4.97E-01	9.94E-01	2.7500	9.552E+07
H-3	1.0805E-02	57.27	114.54	0.00E+00	6.19E-01	1.24E+00	3.5000	1.116E+07
I-129	7.3805E-07	57.27	114.54	0.00E+00	4.23E-05	8.45E-05	5.0000	7.206E+01
Kr-85	2.5218E-01	57.27	114.54	0.00E+00	1.44E+01	2.89E+01	7.0000	8.167E+00
Np-237	1.4463E-06	57.27	114.54	0.00E+00	8.28E-05	1.66E-04	11.0000	9.309E-01
Pa-231	3.5970E-09	57.27	114.54	0.00E+00	2.06E-07	4.12E-07		
Pb-210	8.2511E-15	57.27	114.54	0.00E+00	4.73E-13	9.45E-13		
Pm-147	2.0767E+00	57.27	114.54	0.00E+00	1.19E+02	2.38E+02		
Pu-238	1.3514E-03	57.27	114.54	0.00E+00	7.74E-02	1.55E-01		
Pu-239	5.6947E-03	57.27	114.54	0.00E+00	3.26E-01	6.52E-01		
Pu-240	2.2647E-03	57.27	114.54	0.00E+00	1.30E-01	2.59E-01		
Pu-241	1.2574E-01	57.27	114.54	0.00E+00	7.20E+00	1.44E+01		
Pu-242	3.0602E-07	57.27	114.54	0.00E+00	1.75E-05	3.51E-05		
Ra-226	5.7353E-14	57.27	114.54	0.00E+00	3.28E-12	6.57E-12		
Ra-228	1.8150E-10	57.27	114.54	0.00E+00	1.04E-08	2.08E-08		
Ru-106	9.3744E-02	57.27	114.54	0.00E+00	5.37E+00	1.07E+01		
Se-79	1.2938E-05	57.27	114.54	0.00E+00	7.41E-04	1.48E-03		
Sn-126	1.2239E-05	57.27	114.54	0.00E+00	7.01E-04	1.40E-03		
Sr-90	2.6000E+00	57.27	114.54	0.00E+00	1.49E+02	2.98E+02		
Tc-99	4.4120E-04	57.27	114.54	0.00E+00	2.53E-02	5.05E-02		
Th-229	1.4749E-10	57.27	114.54	0.00E+00	8.45E-09	1.69E-08		
Th-230	1.9549E-11	57.27	114.54	0.00E+00	1.12E-09	2.24E-09		
Th-232	2.3744E-10	57.27	114.54	0.00E+00	1.36E-08	2.72E-08		
Ti-208	1.9459E-08	57.27	114.54	0.00E+00	1.11E-06	2.23E-06		
U-232	5.6015E-08	57.27	114.54	0.00E+00	3.21E-06	6.42E-06		
U-233	1.3132E-07	57.27	114.54	0.00E+00	7.52E-06	1.50E-05		
U-234	1.7323E-07	57.27	114.54	0.00E+00	9.92E-06	1.98E-05		
U-235	-2.6159E-06	57.27	0.00	4.67E-03	4.52E-03	4.67E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2717E-05	57.27	114.54	0.00E+00	7.28E-04	1.46E-03	2.88E+00	5.76E+00
U-238	-3.8857E-08	57.27	0.00	2.90E-03	2.90E-03	2.90E-03	Total	Total
Y-90	2.6015E+00	57.27	114.54	0.00E+00	1.49E+02	2.98E+02		
Other Radionuclides					2.18E+02	4.35E+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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20	10 to 20.1	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal	52.63	57.27	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		114.54	
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.14	1.09	1.00
Bounding	0.29		

\*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) ITALY  
 SNF ID #: 467  
 Fuel Units & Descr: 64 - ELEMENT  
 Heavy Metal Mass: BOL=11 93kg, EOL=11 904kg  
 ROD Storage Site: INEEL

Fuel decay start date: 1997  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zrx, Alum., 10 to 20%, U)  
 \*Template Burnup(MWd): 6 65  
 Template BOL Heavy Metal Mass (MT): 0 00018  
 Template Decay Time: 10 years

Estimated  
 Canister usage:  
 18"x10"  
 0 58

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 2892E-09	58 13	116 27	0 00E+00	7 49E-08	1 50E-07	Avg. MeV	
Am-241	2 9429E-03	58 13	116 27	0 00E+00	1 71E-01	3 42E-01	0.0150	1 563E+13
Am-242m	1 9489E-06	58 13	116 27	0 00E+00	1 13E-04	2 27E-04	0.0250	3 269E+12
Am-243	2 3308E-07	58 13	116 27	0 00E+00	1 35E-05	2 71E-05	0.0375	3 860E+12
C-14	4 3278E-05	58 13	116 27	0 00E+00	2 52E-03	5 03E-03	0.0575	3 192E+12
Cf-252	4 3023E-08	58 13	116 27	0 00E+00	2 50E-06	5 00E-06	0.0850	2 871E+12
Cm-243	2 4286E-07	58 13	116 27	0 00E+00	1 41E-05	2 82E-05	0 1250	2 075E+12
Cm-244	2 6015E-06	58 13	116 27	0 00E+00	1 51E-04	3 02E-04	0 2250	1 822E+12
Co-60	1 6075E-02	58 13	116 27	0 00E+00	9 34E-01	1 87E+00	0 3750	7 496E+11
Cs-134	1 9323E-02	58 13	116 27	0 00E+00	1 12E+00	2 25E+00	0 5750	1 117E+13
Cs-135	3 1549E-05	58 13	116 27	0 00E+00	1 83E-03	3 67E-03	0 8500	2 035E+12
Cs-137	2 4556E+00	58 13	116 27	0 00E+00	1 43E+02	2 86E+02	1 2500	2 237E+12
Eu-154	9 0180E-01	58 13	116 27	0 00E+00	5 24E+01	1 05E+02	1 7500	6 414E+10
Eu-155	2 1820E-01	58 13	116 27	0 00E+00	1 27E+01	2 54E+01	2 2500	1 526E+08
Fe-55	2 2902E-03	58 13	116 27	0 00E+00	1 33E-01	2 66E-01	2 7500	2 992E+06
H-3	8 1609E-03	58 13	116 27	0 00E+00	4 74E-01	9 49E-01	3 5000	3 650E+05
I-129	7 3805E-07	58 13	116 27	0 00E+00	4 29E-05	8 58E-05	5 0000	7 331E+01
Kr-85	1 8256E-01	58 13	116 27	0 00E+00	1 06E+01	2 12E+01	7 0000	8 302E+00
Np-237	1 4505E-06	58 13	116 27	0 00E+00	8 43E-05	1 69E-04	11 0000	9 459E-01
Pa-231	4 5564E-09	58 13	116 27	0 00E+00	2 65E-07	5 30E-07		
Pb-210	1 8842E-14	58 13	116 27	0 00E+00	1 10E-12	2 19E-12		
Pm-147	5 5459E-01	58 13	116 27	0 00E+00	3 22E+01	6 45E+01		
Pu-238	1 2992E-03	58 13	116 27	0 00E+00	7 55E-02	1 51E-01		
Pu-239	5 6932E-03	58 13	116 27	0 00E+00	3 31E-01	6 62E-01		
Pu-240	2 2632E-03	58 13	116 27	0 00E+00	1 32E-01	2 63E-01		
Pu-241	9 8857E-02	58 13	116 27	0 00E+00	5 75E+00	1 15E+01		
Pu-242	3 0602E-07	58 13	116 27	0 00E+00	1 78E-05	3 56E-05		
Ra-226	1 0823E-13	58 13	116 27	0 00E+00	6 29E-12	1 26E-11		
Ra-228	2 0406E-10	58 13	116 27	0 00E+00	1 19E-08	2 37E-08		
Ru-106	3 0180E-03	58 13	116 27	0 00E+00	1 75E-01	3 51E-01		
Se-79	1 2937E-05	58 13	116 27	0 00E+00	7 52E-04	1 50E-03		
Sn-126	1 2238E-05	58 13	116 27	0 00E+00	7 11E-04	1 42E-03		
Sr-90	2 3098E+00	58 13	116 27	0 00E+00	1 34E+02	2 69E+02		
Tc-99	4 4120E-04	58 13	116 27	0 00E+00	2 56E-02	5 13E-02		
Th-229	2 0932E-10	58 13	116 27	0 00E+00	1 22E-08	2 43E-08		
Th-230	2 7744E-11	58 13	116 27	0 00E+00	1 61E-09	3 23E-09		
Th-232	2 3744E-10	58 13	116 27	0 00E+00	1 38E-08	2 76E-08		
Tl-208	1 9459E-08	58 13	116 27	0 00E+00	1 13E-06	2 26E-06		
U-232	5 3850E-08	58 13	116 27	0 00E+00	3 13E-06	6 26E-06		
U-233	1 3135E-07	58 13	116 27	0 00E+00	7 64E-06	1 53E-05		
U-234	1 9143E-07	58 13	116 27	0 00E+00	1 11E-05	2 23E-05		
U-235	-2 6159E-06	58 13	0 00	5 10E-03	4 94E-03	5 10E-03		
U-236	1 2719E-05	58 13	116 27	0 00E+00	7 39E-04	1 48E-03		
U-238	-3 8857E-08	58 13	0 00	3 22E-03	3 21E-03	3 22E-03		
Y-90	2 3098E+00	58 13	116 27	0 00E+00	1 34E+02	2 69E+02		
Other Radionuclides					1 53E+02	3 07E+02		
							<b>Thermal Power</b>	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							2 16E+00	4 31E+00
							Total	Total

**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:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %	19 76448407	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	58 13	24 44	
Bounding		116 27	

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 13	0 42	
Bounding	0 26		

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 (ALUM) JAPAN	<sup>1</sup> Fuel decay start date	2010
SNF ID #	481	Estimates as of	2010
Fuel Units & Descr	71 - ELEMENT	Template	TRIGA-AI (LW/U-Zrx Alum, 10 to 20%, U)
Heavy Metal Mass	BOL=13.845kg EOL=13 774kg	<sup>2</sup> Template Burnup(MWd)	6 65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0 00018
		Template Decay Time	5 years

Estimated Canister usage 18"x10" 0 64
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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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 0632E-10	134 93	269 87	0 00E+00	1 09E-07	2 18E-07	Avg MeV	
Am-241	2 2586E-03	134 93	269 87	0 00E+00	3 05E-01	6 10E-01	0 0150	4.566E+13
Am-242m	1 9925E-06	134 93	269 87	0 00E+00	2 69E-04	5 38E-04	0 0250	9 913E+12
Am-243	2 3323E-07	134 93	269 87	0 00E+00	3 15E-05	6 29E-05	0 0375	1.235E+13
C-14	4 3308E-05	134 93	269 87	0 00E+00	5 84E-03	1 17E-02	0 0575	9 466E+12
Cl-36	4 3023E-08	134 93	269 87	0 00E+00	5 81E-06	1 16E-05	0 0850	6 626E+12
Cm-243	2 7429E-07	134 93	269 87	0 00E+00	3 70E-05	7 40E-05	0 1250	9 911E+12
Cm-244	3 1504E-06	134 93	269 87	0 00E+00	4 25E-04	8 50E-04	0 2250	5.532E+12
Co-60	3 1008E-02	134 93	269 87	0 00E+00	4 18E+00	8 37E+00	0 3750	2.462E+12
Cs-134	1 0367E-01	134 93	269 87	0 00E+00	1 40E+01	2 80E+01	0 5750	3 121E+13
Cs-135	3 1549E-05	134 93	269 87	0 00E+00	4 26E-03	8 51E-03	0 8500	7.683E+12
Cs-137	2 7564E+00	134 93	269 87	0 00E+00	3 72E+02	7 44E+02	1 2500	7.965E+12
Eu-154	1 3490E+00	134 93	269 87	0 00E+00	1 82E+02	3 64E+02	1 7500	2.279E+11
Eu-155	4 3880E-01	134 93	269 87	0 00E+00	5 92E+01	1 18E+02	2 2500	2 771E+10
Fe-55	8 6782E-03	134 93	269 87	0 00E+00	1 17E+00	2 34E+00	2 7500	2 250E+08
H-3	1 0805E-02	134 93	269 87	0 00E+00	1 46E+00	2 92E+00	3 5000	2 630E+07
I-129	7 3805E-07	134 93	269 87	0 00E+00	9 96E-05	1 99E-04	5 0000	1 626E+02
Kr-85	2 5218E-01	134 93	269 87	0 00E+00	3 40E+01	6 81E+01	7 0000	1 841E+01
Np-237	1 4463E-06	134 93	269 87	0 00E+00	1 95E-04	3 90E-04	11 0000	2 098E+00
Pa-231	3 5970E-09	134 93	269 87	0 00E+00	4 85E-07	9 71E-07		
Pb-210	8 2511E-15	134 93	269 87	0 00E+00	1 11E-12	2 23E-12		
Pm-147	2 0767E+00	134 93	269 87	0 00E+00	2 80E+02	5 60E+02		
Pu-238	1 3514E-03	134 93	269 87	0 00E+00	1 82E-01	3 65E-01		
Pu-239	5 6947E-03	134 93	269 87	0 00E+00	7 68E-01	1 54E+00		
Pu-240	2 2647E-03	134 93	269 87	0 00E+00	3 06E-01	6 11E-01		
Pu-241	1 2574E-01	134 93	269 87	0 00E+00	1 70E+01	3 39E+01		
Pu-242	3 0602E-07	134 93	269 87	0 00E+00	4 13E-05	8 26E-05		
Ra-226	5 7353E-14	134 93	269 87	0 00E+00	7 74E-12	1 55E-11		
Ra-228	1 8150E-10	134 93	269 87	0 00E+00	2 45E-08	4 90E-08		
Ru-106	9 3744E-02	134 93	269 87	0 00E+00	1 26E+01	2 53E+01		
Se-79	1 2938E-05	134 93	269 87	0 00E+00	1 75E-03	3 49E-03		
Sn-126	1 2239E-05	134 93	269 87	0 00E+00	1 65E-03	3 30E-03		
Sr-90	2 6000E+00	134 93	269 87	0 00E+00	3 51E+02	7 02E+02		
Tc-99	4 4120E-04	134 93	269 87	0 00E+00	5 95E-02	1 19E-01		
Th-229	1 4749E-10	134 93	269 87	0 00E+00	1 99E-08	3 98E-08		
Th-230	1 9549E-11	134 93	269 87	0 00E+00	2 64E-09	5 28E-09		
Th-232	2 3744E-10	134 93	269 87	0 00E+00	3 20E-08	6 41E-08		
Tl-208	1 9459E-08	134 93	269 87	0 00E+00	2 63E-06	5 25E-06		
U-232	5 6015E-08	134 93	269 87	0 00E+00	7 56E-06	1 51E-05		
U-233	1 3132E-07	134 93	269 87	0 00E+00	1 77E-05	3 54E-05		
U-234	1 7323E-07	134 93	269 87	0 00E+00	2 34E-05	4 67E-05		
U-235	-2 6159E-06	134 93	0 00	5 98E-03	5 63E-03	5 98E-03		
U-236	1 2717E-05	134 93	269 87	0 00E+00	1 72E-03	3 43E-03		
U-238	-3 8857E-08	134 93	0 00	3 72E-03	3 72E-03	3 72E-03		
Y-90	2 6015E+00	134 93	269 87	0 00E+00	3 51E+02	7 02E+02		
Other Radionuclides					5 13E+02	1 03E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6 78E+00	1 36E+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	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	20 00000073	10 to 20 1

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal	134 93	67 77
Bounding		269 87

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	0.26	0.50
Bounding	0.53	

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 (ALUM) KANSAS STATE UNIV  
 SNF ID #: 804  
 Fuel Units & Descr: 3 - ELEMENT  
 Heavy Metal Mass: BOL=0.54kg; EOL=0.513kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2035  
 Estimates as of: 2010  
 Template: TRIGA-AI (LWAJ-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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.03

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	25.77	51.54	0.00E+00	2.08E-08	4.16E-08	Avg MeV	
Am-241	2.2586E-03	25.77	51.54	0.00E+00	5.82E-02	1.16E-01	0.0150	8.721E+12
Am-242m	1.9925E-06	25.77	51.54	0.00E+00	5.14E-05	1.03E-04	0.0250	1.893E+12
Am-243	2.3323E-07	25.77	51.54	0.00E+00	6.01E-06	1.20E-05	0.0375	2.359E+12
C-14	4.3308E-05	25.77	51.54	0.00E+00	1.12E-03	2.23E-03	0.0575	1.808E+12
Cl-36	4.3023E-08	25.77	51.54	0.00E+00	1.11E-06	2.22E-06	0.0850	1.266E+12
Cm-243	2.7429E-07	25.77	51.54	0.00E+00	7.07E-06	1.41E-05	0.1250	1.893E+12
Cm-244	3.1504E-06	25.77	51.54	0.00E+00	8.12E-05	1.62E-04	0.2250	1.057E+12
Co-60	3.1008E-02	25.77	51.54	0.00E+00	7.99E-01	1.60E+00	0.3750	4.702E+11
Cs-134	1.0367E-01	25.77	51.54	0.00E+00	2.67E+00	5.34E+00	0.5750	5.962E+12
Cs-135	3.1549E-05	25.77	51.54	0.00E+00	8.13E-04	1.63E-03	0.8500	1.468E+12
Cs-137	2.7564E+00	25.77	51.54	0.00E+00	7.10E+01	1.42E+02	1.2500	1.521E+12
Eu-154	1.3490E+00	25.77	51.54	0.00E+00	3.48E+01	6.95E+01	1.7500	4.354E+10
Eu-155	4.3880E-01	25.77	51.54	0.00E+00	1.13E+01	2.26E+01	2.2500	5.292E+09
Fe-55	8.6782E-03	25.77	51.54	0.00E+00	2.24E-01	4.47E-01	2.7500	4.298E+07
H-3	1.0805E-02	25.77	51.54	0.00E+00	2.78E-01	5.57E-01	3.5000	5.024E+06
I-129	7.3805E-07	25.77	51.54	0.00E+00	1.90E-05	3.80E-05	5.0000	2.974E+01
Kr-85	2.5218E-01	25.77	51.54	0.00E+00	6.50E+00	1.30E+01	7.0000	3.366E+00
Np-237	1.4463E-06	25.77	51.54	0.00E+00	3.73E-05	7.45E-05	11.0000	3.834E-01
Pa-231	3.5970E-09	25.77	51.54	0.00E+00	9.27E-08	1.85E-07		
Pb-210	8.2511E-15	25.77	51.54	0.00E+00	2.13E-13	4.25E-13		
Pm-147	2.0767E+00	25.77	51.54	0.00E+00	5.35E+01	1.07E+02		
Pu-238	1.3514E-03	25.77	51.54	0.00E+00	3.48E-02	6.97E-02		
Pu-239	5.6947E-03	25.77	51.54	0.00E+00	1.47E-01	2.94E-01		
Pu-240	2.2647E-03	25.77	51.54	0.00E+00	5.84E-02	1.17E-01		
Pu-241	1.2574E-01	25.77	51.54	0.00E+00	3.24E+00	6.48E+00		
Pu-242	3.0602E-07	25.77	51.54	0.00E+00	7.89E-06	1.58E-05		
Ra-226	5.7353E-14	25.77	51.54	0.00E+00	1.48E-12	2.96E-12		
Ra-228	1.8150E-10	25.77	51.54	0.00E+00	4.68E-09	9.36E-09		
Ru-106	9.3744E-02	25.77	51.54	0.00E+00	2.42E+00	4.83E+00		
Se-79	1.2938E-05	25.77	51.54	0.00E+00	3.33E-04	6.67E-04		
Sn-126	1.2239E-05	25.77	51.54	0.00E+00	3.15E-04	6.31E-04		
Sr-90	2.6000E+00	25.77	51.54	0.00E+00	6.70E+01	1.34E+02		
Tc-99	4.4120E-04	25.77	51.54	0.00E+00	1.14E-02	2.27E-02		
Th-229	1.4749E-10	25.77	51.54	0.00E+00	3.80E-09	7.60E-09		
Th-230	1.9549E-11	25.77	51.54	0.00E+00	5.04E-10	1.01E-09		
Th-232	2.3744E-10	25.77	51.54	0.00E+00	6.12E-09	1.22E-08		
Ti-208	1.9459E-08	25.77	51.54	0.00E+00	5.01E-07	1.00E-06		
U-232	5.6015E-08	25.77	51.54	0.00E+00	1.44E-06	2.89E-06		
U-233	1.3132E-07	25.77	51.54	0.00E+00	3.38E-06	6.77E-06		
U-234	1.7323E-07	25.77	51.54	0.00E+00	4.46E-06	8.93E-06		
U-235	2.6159E-06	25.77	0.00	2.33E-04	1.66E-04	2.33E-04		
U-236	1.2717E-05	25.77	51.54	0.00E+00	3.28E-04	6.55E-04		
U-238	-3.8857E-08	25.77	0.00	1.45E-04	1.44E-04	1.45E-04		
Y-90	2.6015E+00	25.77	51.54	0.00E+00	6.70E+01	1.34E+02		
Other Radionuclides					9.80E+01	1.96E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.29E+00	2.59E+00
Total	Total

**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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.99999834	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		25.77	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		51.54	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.29		1.00
Bounding	2.58		

<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 STD (ALUM) KSU  
 SNF ID #: 871  
 Fuel Units & Descr: 61 - ELEMENT  
 Heavy Metal Mass: BOL=11.285kg EOL=11.206kg  
 ROD Storage Site: INEEL

Fuel decay start date: 1973  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zrx Alum, 10 to 20% U)  
 \*Template Burnup (MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.00018  
 Template Decay Time: 35 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	
							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	6.1504E-09	109.98	219.97	0.00E+00	6.76E-07	1.35E-06		
Am-241	4.8165E-03	109.98	219.97	0.00E+00	5.30E-01	1.06E+00	0.0150	1.551E+13
Am-242m	1.7383E-06	109.98	219.97	0.00E+00	1.91E-04	3.82E-04	0.0250	3.211E+12
Am-243	2.3263E-07	109.98	219.97	0.00E+00	2.56E-05	5.12E-05	0.0375	3.030E+12
C-14	4.3158E-05	109.98	219.97	0.00E+00	4.75E-03	9.49E-03	0.0575	3.053E+12
Cl-36	4.3023E-08	109.98	219.97	0.00E+00	4.73E-06	9.46E-06	0.0850	1.822E+12
Cm-243	1.3229E-07	109.98	219.97	0.00E+00	1.45E-05	2.91E-05	0.1250	1.574E+12
Cm-244	1.0000E-06	109.98	219.97	0.00E+00	1.10E-04	2.20E-04	0.2250	1.628E+12
Co-60	6.0120E-04	109.98	219.97	0.00E+00	6.61E-02	1.32E-01	0.3750	6.909E+11
Cs-134	4.3534E-06	109.98	219.97	0.00E+00	4.79E-04	9.58E-04	0.5750	1.138E+13
Cs-135	3.1549E-05	109.98	219.97	0.00E+00	3.47E-03	6.94E-03	0.8500	5.807E+11
Cs-137	1.3788E+00	109.98	219.97	0.00E+00	1.52E+02	3.03E+02	1.2500	5.698E+11
Eu-154	1.2041E-01	109.98	219.97	0.00E+00	1.32E+01	2.65E+01	1.7500	1.833E+10
Eu-155	6.6451E-03	109.98	219.97	0.00E+00	7.31E-01	1.46E+00	2.2500	3.616E+05
Fe-55	2.9338E-06	109.98	219.97	0.00E+00	3.23E-04	6.45E-04	2.7500	1.223E+05
H-3	2.0075E-03	109.98	219.97	0.00E+00	2.21E-01	4.42E-01	3.5000	3.075E+02
I-129	7.3805E-07	109.98	219.97	0.00E+00	8.12E-05	1.62E-04	5.0000	1.295E+02
Kr-85	3.6301E-02	109.98	219.97	0.00E+00	3.99E+00	7.98E+00	7.0000	1.461E+01
Np-237	1.4977E-06	109.98	219.97	0.00E+00	1.65E-04	3.29E-04	11.0000	1.661E+00
Pa-231	1.1275E-08	109.98	219.97	0.00E+00	1.24E-06	2.48E-06		
Pb-210	3.8932E-13	109.98	219.97	0.00E+00	4.28E-11	8.56E-11		
Pm-147	7.5383E-04	109.98	219.97	0.00E+00	8.29E-02	1.66E-01		
Pu-238	1.0668E-03	109.98	219.97	0.00E+00	1.17E-01	2.35E-01		
Pu-239	5.6902E-03	109.98	219.97	0.00E+00	6.26E-01	1.25E+00		
Pu-240	2.2571E-03	109.98	219.97	0.00E+00	2.48E-01	4.96E-01		
Pu-241	2.9699E-02	109.98	219.97	0.00E+00	3.27E+00	6.53E+00		
Pu-242	3.0602E-07	109.98	219.97	0.00E+00	3.37E-05	6.73E-05		
Ra-226	1.0704E-12	109.98	219.97	0.00E+00	1.18E-10	2.35E-10		
Ra-228	2.3654E-10	109.98	219.97	0.00E+00	2.60E-08	5.20E-08		
Ru-106	1.0444E-10	109.98	219.97	0.00E+00	1.15E-08	2.30E-08		
Se-79	1.2934E-05	109.98	219.97	0.00E+00	1.42E-03	2.85E-03		
Sn-126	1.2236E-05	109.98	219.97	0.00E+00	1.35E-03	2.69E-03		
Sr-90	1.2740E+00	109.98	219.97	0.00E+00	1.40E+02	2.80E+02		
Tc-99	4.4120E-04	109.98	219.97	0.00E+00	4.85E-02	9.71E-02		
Th-229	6.4226E-10	109.98	219.97	0.00E+00	7.06E-08	1.41E-07		
Th-230	1.0594E-10	109.98	219.97	0.00E+00	1.17E-08	2.33E-08		
Th-232	2.3744E-10	109.98	219.97	0.00E+00	2.61E-08	5.22E-08		
Ti-208	1.5774E-08	109.98	219.97	0.00E+00	1.73E-06	3.47E-06		
U-232	4.2511E-08	109.98	219.97	0.00E+00	4.68E-06	9.35E-06		
U-233	1.3155E-07	109.98	219.97	0.00E+00	1.45E-05	2.89E-05		
U-234	3.0030E-07	109.98	219.97	0.00E+00	3.30E-05	6.61E-05		
U-235	-2.6144E-06	109.98	0.00	4.88E-03	4.59E-03	4.88E-03		
U-236	1.2720E-05	109.98	219.97	0.00E+00	1.40E-03	2.80E-03		
U-238	-3.8857E-08	109.98	0.00	3.03E-03	3.03E-03	3.03E-03		
U-90	1.2744E+00	109.98	219.97	0.00E+00	1.40E+02	2.80E+02		
Other Radionuclides					1.68E+02	3.35E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.85E+00	3.70E+00
Total	Total

**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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	109.98	75.69	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		219.97	Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.26	0.69	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: TRIGA STD (ALUM) MSU  
 SNF ID #: 878  
 Fuel Units & Descr: 58 - ELEMENT  
 Heavy Metal Mass. BOL=10 73kg; EOL=10 655kg  
 ROD Storage Site. INEEL

Fuel decay start date: 1973  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zrx, Alum, 10 to 20%, U)  
 \*Template Burnup(MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.00018  
 Template Decay Time: 35 years

Estimated  
 Canister usage  
 18"x10"  
 0.52

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.1504E-09	71.97	143.94	0.00E+00	4.43E-07	8.85E-07	Avg MeV	
Am-241	4.8165E-03	71.97	143.94	0.00E+00	3.47E-01	6.93E-01	0.0150	1.015E+13
Am-242m	1.7383E-06	71.97	143.94	0.00E+00	1.25E-04	2.50E-04	0.0250	2.101E+12
Am-243	2.3263E-07	71.97	143.94	0.00E+00	1.67E-05	3.35E-05	0.0375	1.983E+12
C-14	4.3158E-05	71.97	143.94	0.00E+00	3.11E-03	6.21E-03	0.0575	1.998E+12
Cl-36	4.3023E-08	71.97	143.94	0.00E+00	3.10E-06	6.19E-06	0.0850	1.192E+12
Cm-243	1.3229E-07	71.97	143.94	0.00E+00	9.52E-06	1.90E-05	0.1250	1.030E+12
Cm-244	1.0000E-06	71.97	143.94	0.00E+00	7.20E-05	1.44E-04	0.2250	1.065E+12
Co-60	6.0120E-04	71.97	143.94	0.00E+00	4.33E-02	8.65E-02	0.3750	4.521E+11
Cs-134	4.3534E-06	71.97	143.94	0.00E+00	3.13E-04	6.27E-04	0.5750	7.447E+12
Cs-135	3.1549E-05	71.97	143.94	0.00E+00	2.27E-03	4.54E-03	0.8500	3.800E+11
Cs-137	1.3788E+00	71.97	143.94	0.00E+00	9.92E+01	1.98E+02	1.2500	3.728E+11
Eu-154	1.2041E-01	71.97	143.94	0.00E+00	8.67E+00	1.73E+01	1.7500	1.200E+10
Eu-155	6.6451E-03	71.97	143.94	0.00E+00	4.78E-01	9.57E-01	2.2500	2.366E+05
Fe-55	2.9338E-06	71.97	143.94	0.00E+00	2.11E-04	4.22E-04	2.7500	8.007E+04
H-3	2.0075E-03	71.97	143.94	0.00E+00	1.44E-01	2.89E-01	3.5000	2.061E+02
I-129	7.3805E-07	71.97	143.94	0.00E+00	5.31E-05	1.06E-04	5.0000	8.681E+01
Kr-85	3.6301E-02	71.97	143.94	0.00E+00	2.61E+00	5.23E+00	7.0000	9.801E+00
Np-237	1.4977E-06	71.97	143.94	0.00E+00	1.08E-04	2.16E-04	11.0000	1.115E+00
Pa-231	1.1275E-08	71.97	143.94	0.00E+00	8.11E-07	1.62E-06		
Pb-210	3.8932E-13	71.97	143.94	0.00E+00	2.80E-11	5.60E-11		
Pm-147	7.5383E-04	71.97	143.94	0.00E+00	5.43E-02	1.09E-01		
Pu-238	1.0668E-03	71.97	143.94	0.00E+00	7.68E-02	1.54E-01		
Pu-239	5.6902E-03	71.97	143.94	0.00E+00	4.10E-01	8.19E-01		
Pu-240	2.2571E-03	71.97	143.94	0.00E+00	1.62E-01	3.25E-01		
Pu-241	2.9699E-02	71.97	143.94	0.00E+00	2.14E+00	4.27E+00		
Pu-242	3.0602E-07	71.97	143.94	0.00E+00	2.20E-05	4.40E-05		
Ra-226	1.0704E-12	71.97	143.94	0.00E+00	7.70E-11	1.54E-10		
Ra-228	2.3654E-10	71.97	143.94	0.00E+00	1.70E-08	3.40E-08		
Ru-106	1.0444E-10	71.97	143.94	0.00E+00	7.52E-09	1.50E-08		
Se-79	1.2934E-05	71.97	143.94	0.00E+00	9.31E-04	1.86E-03		
Sn-126	1.2236E-05	71.97	143.94	0.00E+00	8.81E-04	1.76E-03		
Sr-90	1.2740E+00	71.97	143.94	0.00E+00	9.17E+01	1.83E+02		
Tc-99	4.4120E-04	71.97	143.94	0.00E+00	3.18E-02	6.35E-02		
Th-229	6.4226E-10	71.97	143.94	0.00E+00	4.62E-08	9.24E-08		
Th-230	1.0594E-10	71.97	143.94	0.00E+00	7.62E-09	1.52E-08		
Th-232	2.3744E-10	71.97	143.94	0.00E+00	1.71E-08	3.42E-08		
Ti-208	1.5774E-08	71.97	143.94	0.00E+00	1.14E-06	2.27E-06		
U-232	4.2511E-08	71.97	143.94	0.00E+00	3.06E-06	6.12E-06		
U-233	1.3155E-07	71.97	143.94	0.00E+00	9.47E-06	1.89E-05		
U-234	3.0030E-07	71.97	143.94	0.00E+00	2.16E-05	4.32E-05		
U-235	-2.6144E-06	71.97	0.00	4.64E-03	4.45E-03	4.64E-03		
U-236	1.2720E-05	71.97	143.94	0.00E+00	9.15E-04	1.83E-03		
U-238	-3.6857E-08	71.97	0.00	2.89E-03	2.88E-03	2.89E-03		
Y-90	1.2744E+00	71.97	143.94	0.00E+00	9.17E+01	1.83E+02		
Other Radionuclides					1.10E+02	2.19E+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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20	10 to 20 %	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	52.29	71.97	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		143.94	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.18	1.38	1.00
Bounding	0.36		

<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) REED COLLEGE  
 SNF ID #: 256  
 Fuel Units & Descr: 58 - ELEMENT  
 Heavy Metal Mass BOL=10.927kg EOL=10.887kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 2026  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zirc Alum, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.00018  
 Template Decay Time: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.52

Radionuclide	m Ci/MWd From Template	x <sub>n</sub> Nominal Fuel Burnup (MWd) <sup>2</sup>	x <sub>b</sub> Bounding Fuel Burnup (MWd) <sup>2</sup>	b Initial Activity (Ci)	y <sub>n</sub> Nominal Fuel Inventories(Ci)	y <sub>b</sub> Bounding Fuel Inventories(Ci)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	53.25	106.50	0.00E+00	4.29E-08	8.59E-08	Avg MeV	
Am-241	2.2586E-03	53.25	106.50	0.00E+00	1.20E-01	2.41E-01	0.0150	1.802E+13
Am-242m	1.9925E-06	53.25	106.50	0.00E+00	1.06E-04	2.12E-04	0.0250	3.912E+12
Am-243	2.3323E-07	53.25	106.50	0.00E+00	1.24E-05	2.48E-05	0.0375	4.873E+12
C-14	4.3308E-05	53.25	106.50	0.00E+00	2.31E-03	4.61E-03	0.0575	3.736E+12
Cf-252	4.3023E-08	53.25	106.50	0.00E+00	2.29E-06	4.58E-06	0.0850	2.615E+12
Cm-243	2.7429E-07	53.25	106.50	0.00E+00	1.46E-05	2.92E-05	0.1250	3.911E+12
Cm-244	3.1504E-06	53.25	106.50	0.00E+00	1.68E-04	3.36E-04	0.2250	2.183E+12
Co-60	3.1008E-02	53.25	106.50	0.00E+00	1.65E+00	3.30E+00	0.3750	9.716E+11
Cs-134	1.0367E-01	53.25	106.50	0.00E+00	5.52E+00	1.10E+01	0.5750	1.232E+13
Cs-135	3.1549E-05	53.25	106.50	0.00E+00	1.68E-03	3.36E-03	0.8500	3.032E+12
Cs-137	2.7564E+00	53.25	106.50	0.00E+00	1.47E+02	2.94E+02	1.2500	3.143E+12
Eu-154	1.3490E+00	53.25	106.50	0.00E+00	7.18E+01	1.44E+02	1.7500	8.995E+10
Eu-155	4.3880E-01	53.25	106.50	0.00E+00	2.34E+01	4.67E+01	2.2500	1.093E+10
Fe-55	8.6782E-03	53.25	106.50	0.00E+00	4.62E-01	9.24E-01	2.7500	8.881E+07
H-3	1.0805E-02	53.25	106.50	0.00E+00	5.75E-01	1.15E+00	3.5000	1.038E+07
I-129	7.3805E-07	53.25	106.50	0.00E+00	3.93E-05	7.86E-05	5.0000	6.755E+01
Kr-85	2.5218E-01	53.25	106.50	0.00E+00	1.34E+01	2.69E+01	7.0000	7.658E+00
Np-237	1.4463E-06	53.25	106.50	0.00E+00	7.70E-05	1.54E-04	11.0000	8.730E-01
Pa-231	3.5970E-09	53.25	106.50	0.00E+00	1.92E-07	3.83E-07		
Pb-210	8.2511E-15	53.25	106.50	0.00E+00	4.39E-13	8.79E-13		
Pm-147	2.0767E+00	53.25	106.50	0.00E+00	1.11E+02	2.21E+02		
Pu-238	1.3514E-03	53.25	106.50	0.00E+00	7.20E-02	1.44E-01		
Pu-239	5.6947E-03	53.25	106.50	0.00E+00	3.03E-01	6.06E-01		
Pu-240	2.2647E-03	53.25	106.50	0.00E+00	1.21E-01	2.41E-01		
Pu-241	1.2574E-01	53.25	106.50	0.00E+00	6.70E+00	1.34E+01		
Pu-242	3.0602E-07	53.25	106.50	0.00E+00	1.63E-05	3.26E-05		
Ra-226	5.7353E-14	53.25	106.50	0.00E+00	3.05E-12	6.11E-12		
Ra-228	1.8150E-10	53.25	106.50	0.00E+00	9.66E-09	1.93E-08		
Ru-106	9.3744E-02	53.25	106.50	0.00E+00	4.99E+00	9.98E+00		
Se-79	1.2938E-05	53.25	106.50	0.00E+00	6.89E-04	1.38E-03		
Sn-126	1.2239E-05	53.25	106.50	0.00E+00	6.52E-04	1.30E-03		
Sr-90	2.6000E+00	53.25	106.50	0.00E+00	1.38E+02	2.77E+02		
Tc-99	4.4120E-04	53.25	106.50	0.00E+00	2.35E-02	4.70E-02		
Th-229	1.4749E-10	53.25	106.50	0.00E+00	7.85E-09	1.57E-08		
Th-230	1.9549E-11	53.25	106.50	0.00E+00	1.04E-09	2.08E-09		
Th-232	2.3744E-10	53.25	106.50	0.00E+00	1.26E-08	2.53E-08		
Ti-208	1.9459E-08	53.25	106.50	0.00E+00	1.04E-06	2.07E-06		
U-232	5.6015E-08	53.25	106.50	0.00E+00	2.98E-06	5.97E-06		
U-233	1.3132E-07	53.25	106.50	0.00E+00	6.99E-06	1.40E-05		
U-234	1.7323E-07	53.25	106.50	0.00E+00	9.22E-06	1.84E-05		
U-235	-2.6159E-06	53.25	0.00	4.70E-03	4.56E-03	4.70E-03		
U-236	1.2717E-05	53.25	106.50	0.00E+00	6.77E-04	1.35E-03		
U-238	-3.8857E-08	53.25	0.00	2.94E-03	2.94E-03	2.94E-03		
Y-90	2.6015E+00	53.25	106.50	0.00E+00	1.39E+02	2.77E+02		
Other Radionuclides					2.02E+02	4.05E+02		

**Thermal Power**  
 Nominal Heat Output (Watts): 2.68E+00  
 Bounding Heat Output (Watts): 5.35E+00  
 Total

**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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.89205598	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate:	
	From SFD	Estimated	
Nominal	53.25	38.75	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		106.50	Bounding burnup assumed to be twice nominal burnup

Checks		Estimated EOL HM/Given EOL HM	
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.13	0.73	1.00
Bounding	0.26		

<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) SLOVENIA  
 SNF ID #: 468  
 Fuel Units & Descr: 67 - ELEMENT  
 Heavy Metal Mass: BOL=11 879kg, EOL=11 531kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1999  
 Estimates as of: 2010  
 Template: TRIGA-AI (LW/U-Zr, Alum, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd)<sup>3</sup>: 6.65  
 Template BOL Heavy Metal Mass (MT)<sup>4</sup>: 0.00018  
 Template Decay Time<sup>5</sup>: 10 years

Estimated  
 Canister usage:  
 18"x10"  
 0.60

**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</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	Total Photons/sec (bounding)
Ac-227	1.2892E-09	405.21	810.42	0.00E+00	5.22E-07	1.04E-06	Avg MeV	
Am-241	2.9429E-03	405.21	810.42	0.00E+00	1.19E+00	2.38E+00	0.0150	1.090E+14
Am-242m	1.9489E-06	405.21	810.42	0.00E+00	7.90E-04	1.58E-03	0.0250	2.279E+13
Am-243	2.3308E-07	405.21	810.42	0.00E+00	9.44E-05	1.89E-04	0.0375	2.691E+13
C-14	4.3278E-05	405.21	810.42	0.00E+00	1.75E-02	3.51E-02	0.0675	2.225E+13
Cl-36	4.3023E-08	405.21	810.42	0.00E+00	1.74E-05	3.49E-05	0.0850	1.446E+13
Cm-243	2.4286E-07	405.21	810.42	0.00E+00	9.84E-05	1.97E-04	0.1250	2.001E+13
Cm-244	2.6015E-06	405.21	810.42	0.00E+00	1.05E-03	2.11E-03	0.2250	1.270E+13
Co-60	1.6075E-02	405.21	810.42	0.00E+00	6.51E+00	1.30E+01	0.3750	5.225E+12
Cs-134	1.9323E-02	405.21	810.42	0.00E+00	7.83E+00	1.57E+01	0.5750	7.784E+13
Cs-135	3.1549E-05	405.21	810.42	0.00E+00	1.28E-02	2.56E-02	0.8500	1.418E+13
Cs-137	2.4556E+00	405.21	810.42	0.00E+00	9.95E+02	1.99E+03	1.2500	1.559E+13
Eu-154	9.0180E-01	405.21	810.42	0.00E+00	3.65E+02	7.31E+02	1.7500	4.471E+11
Eu-155	2.1820E-01	405.21	810.42	0.00E+00	8.84E+01	1.77E+02	2.2500	1.064E+09
Fe-55	2.2902E-03	405.21	810.42	0.00E+00	9.28E-01	1.86E+00	2.7500	2.086E+07
H-3	8.1609E-03	405.21	810.42	0.00E+00	3.31E+00	6.61E+00	3.5000	2.544E+06
I-129	7.3805E-07	405.21	810.42	0.00E+00	2.99E-04	5.98E-04	5.0000	4.665E+02
Kr-85	1.8256E-01	405.21	810.42	0.00E+00	7.40E+01	1.48E+02	7.0000	5.275E+01
Np-237	1.4505E-06	405.21	810.42	0.00E+00	5.88E-04	1.18E-03	11.0000	6.005E+00
Pa-231	4.5564E-09	405.21	810.42	0.00E+00	1.85E-06	3.69E-06		
Pb-210	1.8842E-14	405.21	810.42	0.00E+00	7.63E-12	1.53E-11		
Pm-147	5.5459E-01	405.21	810.42	0.00E+00	2.25E+02	4.49E+02		
Pu-238	1.2992E-03	405.21	810.42	0.00E+00	5.26E-01	1.05E+00		
Pu-239	5.6932E-03	405.21	810.42	0.00E+00	2.31E+00	4.61E+00		
Pu-240	2.2632E-03	405.21	810.42	0.00E+00	9.17E-01	1.83E+00		
Pu-241	9.8857E-02	405.21	810.42	0.00E+00	4.01E+01	8.01E+01		
Pu-242	3.0602E-07	405.21	810.42	0.00E+00	1.24E-04	2.48E-04		
Ra-226	1.0823E-13	405.21	810.42	0.00E+00	4.39E-11	8.77E-11		
Ra-228	2.0406E-10	405.21	810.42	0.00E+00	8.27E-08	1.65E-07		
Ru-106	3.0180E-03	405.21	810.42	0.00E+00	1.22E+00	2.45E+00		
Se-79	1.2937E-05	405.21	810.42	0.00E+00	5.24E-03	1.05E-02		
Sn-126	1.2238E-05	405.21	810.42	0.00E+00	4.96E-03	9.92E-03		
Sr-90	2.3098E+00	405.21	810.42	0.00E+00	9.36E+02	1.87E+03		
Tc-99	4.4120E-04	405.21	810.42	0.00E+00	1.79E-01	3.58E-01		
Th-229	2.0932E-10	405.21	810.42	0.00E+00	8.48E-08	1.70E-07		
Th-230	2.7744E-11	405.21	810.42	0.00E+00	1.12E-08	2.25E-08		
Th-232	2.3744E-10	405.21	810.42	0.00E+00	9.62E-08	1.92E-07		
Th-208	1.9459E-08	405.21	810.42	0.00E+00	7.88E-06	1.58E-05		
U-232	5.3850E-08	405.21	810.42	0.00E+00	2.18E-05	4.36E-05		
U-233	1.3135E-07	405.21	810.42	0.00E+00	5.32E-05	1.06E-04		
U-234	1.9143E-07	405.21	810.42	0.00E+00	7.76E-05	1.55E-04		
U-235	-2.6159E-06	405.21	0.00	5.14E-03	4.08E-03	5.14E-03		
U-236	1.2719E-05	405.21	810.42	0.00E+00	5.15E-03	1.03E-02		
U-238	-3.8857E-08	405.21	0.00	3.19E-03	3.18E-03	3.19E-03		
Y-90	2.3098E+00	405.21	810.42	0.00E+00	9.36E+02	1.87E+03		
Other Radionuclides					1.07E+03	2.14E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.50E+01	3.01E+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:	ALUM	ALUM
BOL HM Constituents:	U	U
BOL Enrichment %:	20.00337313	10 to 20.1

Basis for Parameter Differences:

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

	From SFD	Estimated
Nominal	405.21	332.55
Bounding		810.42

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	0.92	0.82
Bounding	1.85	

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) SO KOREA  
 SNF ID # 483  
 Fuel Units & Descr 69 - ELEMENT  
 Heavy Metal Mass: BOL=13 11kg EOL=12.958kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1972  
 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 35 years

Estimated  
 Canister usage  
 18"x10"  
 0 62

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	6 1504E-09	383 31	766 62	0 00E+00	2 36E-06	4.72E-06	0 0150	5 407E+13
Am-241	4 8165E-03	383 31	766 62	0 00E+00	1 85E+00	3.69E+00	0 0250	1 119E+13
Am-242m	1 7383E-06	383 31	766 62	0 00E+00	6 66E-04	1.33E-03	0 0375	1 056E+13
Am-243	2 3263E-07	383 31	766 62	0 00E+00	8 92E-05	1 78E-04	0 0575	1 064E+13
C-14	4.3158E-05	383.31	766 62	0 00E+00	1 65E-02	3 31E-02	0 0850	6.350E+12
Cl-36	4 3023E-08	383 31	766 62	0 00E+00	1 65E-05	3 30E-05	0 1250	5 485E+12
Cr-243	1.3229E-07	383 31	766 62	0 00E+00	5 07E-05	1.01E-04	0 2250	5 673E+12
Cr-244	1 0000E-06	383 31	766 62	0 00E+00	3 83E-04	7 67E-04	0 3750	2 408E+12
Co-60	6 0120E-04	383 31	766 62	0 00E+00	2.30E-01	4 61E-01	0 5750	3 966E+13
Cs-134	4 3534E-06	383 31	766 62	0 00E+00	1 67E-03	3 34E-03	0 8500	2 024E+12
Cs-135	3 1549E-05	383 31	766 62	0 00E+00	1 21E-02	2 42E-02	1 2500	1 986E+12
Cs-137	1.3788E+00	383 31	766 62	0 00E+00	5 29E+02	1 06E+03	1 7500	6 389E+10
Eu-154	1 2041E-01	383 31	766 62	0 00E+00	4 62E+01	9 23E+01	2 2500	1 260E+06
Eu-155	6 6451E-03	383 31	766 62	0 00E+00	2 55E+00	5 09E+00	2 7500	4 264E+05
Fe-55	2 9338E-06	383 31	766 62	0 00E+00	1.12E-03	2 25E-03	3 5000	1 034E+03
H-3	2 0075E-03	383 31	766 62	0 00E+00	7 70E-01	1 54E+00	5 0000	4.350E+02
I-129	7.3805E-07	383 31	766 62	0 00E+00	2 83E-04	5 66E-04	7 0000	4.905E+01
Kr-85	3 6301E-02	383 31	766 62	0 00E+00	1 39E+01	2 78E+01	11 0000	5.574E+00
Np-237	1 4977E-06	383 31	766 62	0 00E+00	5 74E-04	1 15E-03		
Pa-231	1 1275E-08	383 31	766 62	0 00E+00	4 32E-06	8 64E-06		
Pb-210	3 8932E-13	383 31	766 62	0 00E+00	1.49E-10	2 98E-10		
Pm-147	7.5383E-04	383 31	766 62	0 00E+00	2 89E-01	5 78E-01		
Pu-238	1 0668E-03	383 31	766 62	0 00E+00	4 09E-01	8 18E-01		
Pu-239	5 6902E-03	383 31	766 62	0 00E+00	2 18E+00	4.36E+00		
Pu-240	2 2571E-03	383 31	766 62	0 00E+00	8 65E-01	1 73E+00		
Pu-241	2 9699E-02	383 31	766 62	0 00E+00	1 14E+01	2 28E+01		
Pu-242	3 0602E-07	383 31	766 62	0 00E+00	1.17E-04	2 35E-04		
Ra-226	1.0704E-12	383 31	766 62	0 00E+00	4 10E-10	8 21E-10		
Ra-228	2.3654E-10	383 31	766 62	0 00E+00	9 07E-08	1 81E-07		
Ru-106	1 0444E-10	383 31	766 62	0 00E+00	4 00E-08	8 01E-08		
Se-79	1.2934E-05	383 31	766 62	0 00E+00	4 96E-03	9 92E-03		
Sn-126	1 2236E-05	383 31	766 62	0 00E+00	4 69E-03	9 38E-03		
Sr-90	1.2740E+00	383 31	766 62	0 00E+00	4 88E+02	9 77E+02		
Tc-99	4 4120E-04	383 31	766 62	0 00E+00	1 69E-01	3 38E-01		
Th-229	6 4226E-10	383 31	766 62	0 00E+00	2 46E-07	4 92E-07		
Th-230	1 0594E-10	383 31	766 62	0 00E+00	4 06E-08	8 12E-08		
Th-232	2 3744E-10	383 31	766 62	0 00E+00	9 10E-08	1 82E-07		
Ti-208	1 5774E-08	383 31	766 62	0 00E+00	6 05E-06	1 21E-05		
U-232	4.2511E-08	383 31	766 62	0 00E+00	1 63E-05	3 26E-05		
U-233	1.3155E-07	383 31	766 62	0 00E+00	5 04E-05	1 01E-04		
U-234	3 0030E-07	383 31	766 62	0 00E+00	1 15E-04	2 30E-04		
U-235	-2 6144E-06	383 31	0 00	5 67E-03	4 66E-03	5 67E-03		
U-236	1 2720E-05	383 31	766 62	0 00E+00	4.88E-03	9 75E-03		
U-238	-3 8857E-08	383 31	0 00	3 53E-03	3 51E-03	3 53E-03		
Y-90	1.2744E+00	383 31	766 62	0 00E+00	4 89E+02	9 77E+02		
Other Radionuclides					5 84E+02	1.17E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.45E+00	1.29E+01
Total	Total

**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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	383.31	144 90	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup
Bounding		766 62	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0 79	0 38	0 98
Bounding	1 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: TRIGA STD (ALUM) U OF IL  
 SNF ID #: 447  
 Fuel Units & Descr: 58 - ELEMENT  
 Heavy Metal Mass BOL=10 44kg; EOL=10 057kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2035  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 52

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 0632E-10	365 39	730 78	0 00E+00	2 95E-07	5 89E-07	Avg MeV	
Am-241	2 2586E-03	365 39	730 78	0 00E+00	8 25E-01	1 65E+00	0 0150	1 236E+14
Am-242m	1 9925E-06	365 39	730 78	0 00E+00	7 28E-04	1 46E-03	0 0250	2 684E+13
Am-243	2 3323E-07	365 39	730 78	0 00E+00	8 52E-05	1 70E-04	0 0375	3 344E+13
C-14	4 3308E-05	365 39	730 78	0 00E+00	1 58E-02	3 16E-02	0 0575	2 563E+13
Cl-36	4 3023E-08	365 39	730 78	0 00E+00	1 57E-05	3 14E-05	0 0850	1 794E+13
Cm-243	2 7429E-07	365 39	730 78	0 00E+00	1 00E-04	2 00E-04	0 1250	2 684E+13
Cm-244	3 1504E-06	365 39	730 78	0 00E+00	1 15E-03	2 30E-03	0 2250	1 498E+13
Co-60	3 1008E-02	365 39	730 78	0 00E+00	1 13E+01	2 27E+01	0 3750	6 667E+12
Cs-134	1 0367E-01	365 39	730 78	0 00E+00	3 79E+01	7 58E+01	0 5750	8 452E+13
Cs-135	3 1549E-05	365 39	730 78	0 00E+00	1 15E-02	2 31E-02	0 8500	2 081E+13
Cs-137	2 7564E+00	365 39	730 78	0 00E+00	1 01E+03	2 01E+03	1 2500	2 157E+13
Eu-154	1 3490E+00	365 39	730 78	0 00E+00	4 93E+02	9 86E+02	1 7500	6 172E+11
Eu-155	4 3880E-01	365 39	730 78	0 00E+00	1 60E+02	3 21E+02	2 2500	7 503E+10
Fe-55	8 6782E-03	365 39	730 78	0 00E+00	3 17E+00	6 34E+00	2 7500	6 094E+08
H-3	1 0805E-02	365 39	730 78	0 00E+00	3 95E+00	7 90E+00	3 5000	7 123E+07
I-129	7 3805E-07	365 39	730 78	0 00E+00	2 70E-04	5 39E-04	5 0000	4 234E+02
Kr-85	2 5218E-01	365 39	730 78	0 00E+00	9 21E+01	1 84E+02	7 0000	4 792E+01
Np-237	1 4463E-06	365 39	730 78	0 00E+00	5 28E-04	1 06E-03	11 0000	5 458E+00
Pa-231	3 5970E-09	365 39	730 78	0 00E+00	1 31E-06	2 63E-06		
Pb-210	8 2511E-15	365 39	730 78	0 00E+00	3 01E-12	6 03E-12		
Pm-147	2 0767E+00	365 39	730 78	0 00E+00	7 59E+02	1 52E+03		
Pu-238	1 3514E-03	365 39	730 78	0 00E+00	4 94E-01	9 88E-01		
Pu-239	5 6947E-03	365 39	730 78	0 00E+00	2 08E+00	4 16E+00		
Pu-240	2 2647E-03	365 39	730 78	0 00E+00	8 27E-01	1 65E+00		
Pu-241	1 2574E-01	365 39	730 78	0 00E+00	4 59E+01	9 19E+01		
Pu-242	3 0602E-07	365 39	730 78	0 00E+00	1 12E-04	2 24E-04		
Ra-226	5 7353E-14	365 39	730 78	0 00E+00	2 10E-11	4 19E-11		
Ra-228	1 8150E-10	365 39	730 78	0 00E+00	6 63E-08	1 33E-07		
Ru-106	9 3744E-02	365 39	730 78	0 00E+00	3 43E+01	6 85E+01		
Se-79	1 2938E-05	365 39	730 78	0 00E+00	4 73E-03	9 46E-03		
Sn-126	1 2239E-05	365 39	730 78	0 00E+00	4 47E-03	8 94E-03		
Sr-90	2 6000E+00	365 39	730 78	0 00E+00	9 50E+02	1 90E+03		
Tc-99	4 4120E-04	365 39	730 78	0 00E+00	1 61E-01	3 22E-01		
Th-229	1 4749E-10	365 39	730 78	0 00E+00	5 39E-08	1 08E-07		
Th-230	1 9549E-11	365 39	730 78	0 00E+00	7 14E-09	1 43E-08		
Th-232	2 3744E-10	365 39	730 78	0 00E+00	8 68E-08	1 74E-07		
Tl-208	1 9459E-08	365 39	730 78	0 00E+00	7 11E-06	1 42E-05		
U-232	5 6015E-08	365 39	730 78	0 00E+00	2 05E-05	4 09E-05		
U-233	1 3132E-07	365 39	730 78	0 00E+00	4 80E-05	9 60E-05		
U-234	1 7323E-07	365 39	730 78	0 00E+00	6 33E-05	1 27E-04		
U-235	2 6159E-06	365 39	0 00	4 51E-03	3 56E-03	4 51E-03		
U-236	1 2717E-05	365 39	730 78	0 00E+00	4 65E-03	9 29E-03		
U-238	3 8857E-08	365 39	0 00	2 81E-03	2 79E-03	2 81E-03		
Y-90	2 6015E+00	365 39	730 78	0 00E+00	9 51E+02	1 90E+03		
Other Radionuclides					1 39E+03	2 78E+03		

Thermal Power  
 Nominal Heat Output (Watts): 1.84E+01  
 Bounding Heat Output (Watts): 3.67E+01  
 Total

**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:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	19 9999834	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	203.50	365.39	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		730 78	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 95	1 80	1 00
Bounding	1 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 TRIGA STD (ALUM) U OF IL  
 SNF ID # 501  
 Fuel Units & Descr 1 - ELEMENT  
 Heavy Metal Mass BOL=0 18kg EOL=0 173kg  
 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

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	6.30	12.60	0.00E+00	5.37E-09	1.07E-08	0.0150	2.037E+12
Am-241	1.8331E-03	6.30	12.60	0.00E+00	1.15E-02	2.31E-02	0.0250	4.481E+11
Am-242m	1.4129E-06	6.30	12.60	0.00E+00	8.90E-06	1.78E-05	0.0375	3.816E+11
Am-243	1.4774E-07	6.30	12.60	0.00E+00	9.31E-07	1.86E-06	0.0575	3.917E+11
C-14	1.2871E-04	6.30	12.60	0.00E+00	8.11E-04	1.62E-03	0.0850	2.427E+11
Cl-36	2.8120E-06	6.30	12.60	0.00E+00	1.77E-05	3.54E-05	0.1250	1.762E+11
Cm-243	1.7940E-07	6.30	12.60	0.00E+00	1.13E-06	2.26E-06	0.2250	2.059E+11
Cm-244	1.6962E-06	6.30	12.60	0.00E+00	1.07E-05	2.14E-05	0.3750	1.045E+11
Co-60	1.2839E+00	6.30	12.60	0.00E+00	8.09E+00	1.62E+01	0.5750	1.389E+12
Cs-134	9.0541E-02	6.30	12.60	0.00E+00	5.70E-01	1.14E+00	0.8500	5.961E+10
Cs-135	3.2195E-05	6.30	12.60	0.00E+00	2.03E-04	4.06E-04	1.2500	1.211E+12
Cs-137	2.7564E+00	6.30	12.60	0.00E+00	1.74E+01	3.47E+01	1.7500	8.069E+08
Eu-154	1.5368E-02	6.30	12.60	0.00E+00	9.68E-02	1.94E-01	2.2500	1.301E+09
Eu-155	2.9293E-02	6.30	12.60	0.00E+00	1.85E-01	3.69E-01	2.7500	1.032E+07
Fe-55	7.7158E-01	6.30	12.60	0.00E+00	4.86E+00	9.72E+00	3.5000	1.201E+06
H-3	1.1111E-02	6.30	12.60	0.00E+00	7.00E-02	1.40E-01	5.0000	6.716E+00
I-129	7.3684E-07	6.30	12.60	0.00E+00	4.64E-06	9.28E-06	7.0000	7.602E-01
Kr-85	2.5263E-01	6.30	12.60	0.00E+00	1.59E+00	3.18E+00	11.0000	8.661E-02
Np-237	1.2427E-06	6.30	12.60	0.00E+00	7.83E-06	1.57E-05		
Pa-231	3.8511E-09	6.30	12.60	0.00E+00	2.43E-08	4.85E-08		
Pb-210	7.3880E-15	6.30	12.60	0.00E+00	4.65E-14	9.31E-14		
Pm-147	2.1023E+00	6.30	12.60	0.00E+00	1.32E+01	2.65E+01		
Pu-238	1.0383E-03	6.30	12.60	0.00E+00	6.54E-03	1.31E-02		
Pu-239	5.5293E-03	6.30	12.60	0.00E+00	3.48E-02	6.97E-02		
Pu-240	2.1278E-03	6.30	12.60	0.00E+00	1.34E-02	2.68E-02		
Pu-241	1.0195E-01	6.30	12.60	0.00E+00	6.42E-01	1.28E+00		
Pu-242	2.3128E-07	6.30	12.60	0.00E+00	1.48E-06	2.91E-06		
Ra-226	5.2782E-14	6.30	12.60	0.00E+00	3.33E-13	6.65E-13		
Ra-228	1.9338E-10	6.30	12.60	0.00E+00	1.22E-09	2.44E-09		
Ru-106	9.1684E-02	6.30	12.60	0.00E+00	5.78E-01	1.16E+00		
Se-79	1.3018E-05	6.30	12.60	0.00E+00	8.20E-05	1.64E-04		
Sn-126	1.2167E-05	6.30	12.60	0.00E+00	7.67E-05	1.53E-04		
Sr-90	2.6045E+00	6.30	12.60	0.00E+00	1.64E+01	3.28E+01		
Tc-99	4.4241E-04	6.30	12.60	0.00E+00	2.79E-03	5.57E-03		
Th-229	1.3713E-10	6.30	12.60	0.00E+00	8.64E-10	1.73E-09		
Th-230	1.8090E-11	6.30	12.60	0.00E+00	1.14E-10	2.28E-10		
Th-232	2.5278E-10	6.30	12.60	0.00E+00	1.59E-09	3.19E-09		
Tl-208	1.6947E-08	6.30	12.60	0.00E+00	1.07E-07	2.14E-07		
U-232	4.8737E-08	6.30	12.60	0.00E+00	3.07E-07	6.14E-07		
U-233	1.2203E-07	6.30	12.60	0.00E+00	7.69E-07	1.54E-06		
U-234	1.5925E-07	6.30	12.60	0.00E+00	1.00E-06	2.01E-06		
U-235	-2.6194E-06	6.30	0.00	7.78E-05	6.13E-05	7.78E-05		
U-236	1.2693E-05	6.30	12.60	0.00E+00	8.00E-05	1.60E-04		
U-238	-3.6331E-08	6.30	0.00	4.84E-05	4.82E-05	4.84E-05		
Y-90	2.6060E+00	6.30	12.60	0.00E+00	1.64E+01	3.28E+01		
Other Radionuclides					2.27E+01	4.54E+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 %	19.9999834	10 to 20.1

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate:
From SFD	Estimated	
Nominal	3.51	Nominal burnup calculated from the heavy metal mass destroyed
Bounding	12.60	Bounding burnup assumed to be twice nominal burnup

Checks		Estimated EOL HM/Given EOL HM
Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.03	1.00
Bounding	2.05	

<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: TRIGA STD (ALUM) U OF UTAH  
 SNF ID #: 699  
 Fuel Units & Descr: 63 - ELEMENT  
 Heavy Metal Mass: BOL=11kg EOL=10 723kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2035  
 Estimates as of: 2010  
 Template: TRIGA-AJ (LW/U-Zr, Alum., 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd): 6.65  
 Template BOL Heavy Metal Mass (MT): 0.00018  
 Template Decay Time: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0.57

Radionuclide	II. Estimates		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	
	m	x <sub>a</sub>						Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	264.59	264.59	529.19	0.00E+00	2.13E-07	4.27E-07	Avg MeV	
Am-241	2.2586E-03	264.59	264.59	529.19	0.00E+00	5.98E-01	1.20E+00	0.0150	8.954E+13
Am-242m	1.9925E-06	264.59	264.59	529.19	0.00E+00	5.27E-04	1.05E-03	0.0250	1.944E+13
Am-243	2.3323E-07	264.59	264.59	529.19	0.00E+00	6.17E-05	1.23E-04	0.0375	2.421E+13
C-14	4.3308E-05	264.59	264.59	529.19	0.00E+00	1.15E-02	2.29E-02	0.0675	1.856E+13
Cl-36	4.3023E-08	264.59	264.59	529.19	0.00E+00	1.14E-05	2.28E-05	0.0850	1.299E+13
Cm-243	2.7429E-07	264.59	264.59	529.19	0.00E+00	7.26E-05	1.45E-04	0.1250	1.943E+13
Cm-244	3.1504E-06	264.59	264.59	529.19	0.00E+00	8.34E-04	1.67E-03	0.2250	1.085E+13
Co-60	3.1008E-02	264.59	264.59	529.19	0.00E+00	8.20E+00	1.64E+01	0.3750	4.828E+12
Cs-134	1.0367E-01	264.59	264.59	529.19	0.00E+00	2.74E+01	5.49E+01	0.5750	6.121E+13
Cs-135	3.1549E-05	264.59	264.59	529.19	0.00E+00	8.35E-03	1.67E-02	0.8500	1.507E+13
Cs-137	2.7564E+00	264.59	264.59	529.19	0.00E+00	7.29E+02	1.46E+03	1.2500	1.562E+13
Eu-154	1.3490E+00	264.59	264.59	529.19	0.00E+00	3.57E+02	7.14E+02	1.7500	4.470E+11
Eu-155	4.3880E-01	264.59	264.59	529.19	0.00E+00	1.16E+02	2.32E+02	2.2500	5.433E+10
Fe-55	8.6782E-03	264.59	264.59	529.19	0.00E+00	2.30E+00	4.59E+00	2.7500	4.413E+08
H-3	1.0805E-02	264.59	264.59	529.19	0.00E+00	2.86E+00	5.72E+00	3.5000	5.158E+07
I-129	7.3805E-07	264.59	264.59	529.19	0.00E+00	1.95E-04	3.91E-04	5.0000	3.087E+02
Kr-85	2.5218E-01	264.59	264.59	529.19	0.00E+00	6.67E+01	1.33E+02	7.0000	3.495E+01
Np-237	1.4463E-06	264.59	264.59	529.19	0.00E+00	3.83E-04	7.65E-04	11.0000	3.981E+00
Pa-231	3.5970E-09	264.59	264.59	529.19	0.00E+00	9.52E-07	1.90E-06		
Pb-210	8.2511E-15	264.59	264.59	529.19	0.00E+00	2.18E-12	4.37E-12		
Pm-147	2.0767E+00	264.59	264.59	529.19	0.00E+00	5.49E+02	1.10E+03		
Pu-238	1.3514E-03	264.59	264.59	529.19	0.00E+00	3.58E-01	7.15E-01		
Pu-239	5.6947E-03	264.59	264.59	529.19	0.00E+00	1.51E+00	3.01E+00		
Pu-240	2.2647E-03	264.59	264.59	529.19	0.00E+00	5.99E-01	1.20E+00		
Pu-241	1.2574E-01	264.59	264.59	529.19	0.00E+00	3.33E+01	6.65E+01		
Pu-242	3.0602E-07	264.59	264.59	529.19	0.00E+00	8.10E-05	1.62E-04		
Ra-226	5.7353E-14	264.59	264.59	529.19	0.00E+00	1.52E-11	3.04E-11		
Ra-228	1.8150E-10	264.59	264.59	529.19	0.00E+00	4.80E-08	9.60E-08		
Ru-106	9.3744E-02	264.59	264.59	529.19	0.00E+00	2.48E+01	4.96E+01		
Se-79	1.2938E-05	264.59	264.59	529.19	0.00E+00	3.42E-03	6.85E-03		
Sn-126	1.2239E-05	264.59	264.59	529.19	0.00E+00	3.24E-03	6.48E-03		
Sr-90	2.6000E+00	264.59	264.59	529.19	0.00E+00	6.88E+02	1.38E+03		
Tc-99	4.4120E-04	264.59	264.59	529.19	0.00E+00	1.17E-01	2.33E-01		
Th-229	1.4749E-10	264.59	264.59	529.19	0.00E+00	3.90E-08	7.80E-08		
Th-230	1.9549E-11	264.59	264.59	529.19	0.00E+00	5.17E-09	1.03E-08		
Th-232	2.3744E-10	264.59	264.59	529.19	0.00E+00	6.28E-08	1.26E-07		
Ti-208	1.9459E-08	264.59	264.59	529.19	0.00E+00	5.15E-06	1.03E-05		
U-232	5.6015E-08	264.59	264.59	529.19	0.00E+00	1.48E-05	2.96E-05		
U-233	1.3132E-07	264.59	264.59	529.19	0.00E+00	3.47E-05	6.95E-05		
U-234	1.7323E-07	264.59	264.59	529.19	0.00E+00	4.58E-05	9.17E-05		
U-235	-2.6159E-06	264.59	0.00	4.73E-03	4.04E-03	4.73E-03	4.73E-03		
U-236	1.2717E-05	264.59	264.59	529.19	0.00E+00	3.36E-03	6.73E-03	1.33E+01	2.66E+01
U-238	-3.8857E-08	264.59	0.00	2.96E-03	2.95E-03	2.96E-03	2.96E-03	Total	Total
Y-90	2.6015E+00	264.59	264.59	529.19	0.00E+00	6.88E+02	1.38E+03		
Other Radionuclides						1.01E+03	2.01E+03		

**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	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	19.89699819	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal:	214.41	264.59	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding:		529.19	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal:	0.65	1.23	1.00
Bounding:	1.30		

\*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 STD (ALUM) UNIV OF TEXAS  
 SNF ID #: 877  
 Fuel Units & Descr: 69 - ELEMENT  
 Heavy Metal Mass BOL=12.765kg EOL=12.675kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1973  
 Estimates as of: 2010  
 Template TRIGA-AJ (LW/U-Zr, Alum, 10 to 20%, U)  
<sup>2</sup>Template Burnup(MWd) 6.65  
 Template BOL Heavy Metal Mass (MT) 0.00018  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 18"x10"  
 0.62

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	6.1504E-09	85.62	171.24	0.00E+00	5.27E-07	1.05E-06	0.0150	1.208E+13
Am-241	4.8165E-03	85.62	171.24	0.00E+00	4.12E-01	8.25E-01	0.0250	2.500E+12
Am-242m	1.7383E-06	85.62	171.24	0.00E+00	1.49E-04	2.98E-04	0.0375	2.359E+12
Am-243	2.3263E-07	85.62	171.24	0.00E+00	1.99E-05	3.98E-05	0.0575	2.376E+12
C-14	4.3158E-05	85.62	171.24	0.00E+00	3.70E-03	7.39E-03	0.0850	1.418E+12
Cl-36	4.3023E-08	85.62	171.24	0.00E+00	3.68E-06	7.37E-06	0.1250	1.225E+12
Cm-243	1.3229E-07	85.62	171.24	0.00E+00	1.13E-05	2.27E-05	0.2250	1.267E+12
Cm-244	1.0000E-06	85.62	171.24	0.00E+00	8.56E-05	1.71E-04	0.3750	5.378E+11
Co-60	6.0120E-04	85.62	171.24	0.00E+00	5.15E-02	1.03E-01	0.5750	8.860E+12
Cs-134	4.3534E-06	85.62	171.24	0.00E+00	3.73E-04	7.45E-04	0.8500	4.521E+11
Cs-135	3.1549E-05	85.62	171.24	0.00E+00	2.70E-03	5.40E-03	1.2500	4.436E+11
Cs-137	1.3788E+00	85.62	171.24	0.00E+00	1.18E+02	2.36E+02	1.7500	1.427E+10
Eu-154	1.2041E-01	85.62	171.24	0.00E+00	1.03E+01	2.06E+01	2.2500	2.815E+05
Eu-155	6.6451E-03	85.62	171.24	0.00E+00	5.69E-01	1.14E+00	2.7500	9.525E+04
Fe-55	2.9338E-06	85.62	171.24	0.00E+00	2.51E-04	5.02E-04	3.5000	2.452E+02
H-3	2.0075E-03	85.62	171.24	0.00E+00	1.72E-01	3.44E-01	5.0000	1.033E+02
I-129	7.3805E-07	85.62	171.24	0.00E+00	6.32E-05	1.26E-04	7.0000	1.166E+01
Kr-85	3.6301E-02	85.62	171.24	0.00E+00	3.11E+00	6.22E+00	11.0000	1.326E+00
Np-237	1.4977E-06	85.62	171.24	0.00E+00	1.28E-04	2.56E-04		
Pa-231	1.1275E-08	85.62	171.24	0.00E+00	9.65E-07	1.93E-06		
Pb-210	3.8932E-13	85.62	171.24	0.00E+00	3.33E-11	6.67E-11		
Pm-147	7.5383E-04	85.62	171.24	0.00E+00	6.45E-02	1.29E-01		
Pu-238	1.0668E-03	85.62	171.24	0.00E+00	9.13E-02	1.83E-01		
Pu-239	5.6902E-03	85.62	171.24	0.00E+00	4.87E-01	9.74E-01		
Pu-240	2.2571E-03	85.62	171.24	0.00E+00	1.93E-01	3.87E-01		
Pu-241	2.9699E-02	85.62	171.24	0.00E+00	2.54E+00	5.09E+00		
Pu-242	3.0602E-07	85.62	171.24	0.00E+00	2.62E-05	5.24E-05		
Ra-226	1.0704E-12	85.62	171.24	0.00E+00	9.16E-11	1.83E-10		
Ra-228	2.3654E-10	85.62	171.24	0.00E+00	2.03E-08	4.05E-08		
Ru-106	1.0444E-10	85.62	171.24	0.00E+00	8.94E-09	1.79E-08		
Se-79	1.2934E-05	85.62	171.24	0.00E+00	1.11E-03	2.21E-03		
Sn-126	1.2236E-05	85.62	171.24	0.00E+00	1.05E-03	2.10E-03		
Sr-90	1.2740E+00	85.62	171.24	0.00E+00	1.09E+02	2.18E+02		
Tc-99	4.4120E-04	85.62	171.24	0.00E+00	3.78E-02	7.56E-02		
Th-229	6.4226E-10	85.62	171.24	0.00E+00	5.50E-08	1.10E-07		
Th-230	1.0594E-10	85.62	171.24	0.00E+00	9.07E-09	1.81E-08		
Th-232	2.3744E-10	85.62	171.24	0.00E+00	2.03E-08	4.07E-08		
Th-208	1.5774E-08	85.62	171.24	0.00E+00	1.35E-06	2.70E-06		
U-232	4.2511E-08	85.62	171.24	0.00E+00	3.64E-06	7.28E-06		
U-233	1.3155E-07	85.62	171.24	0.00E+00	1.13E-05	2.25E-05		
U-234	3.0030E-07	85.62	171.24	0.00E+00	2.57E-05	5.14E-05		
U-235	-2.6144E-06	85.62	0.00	5.52E-03	5.29E-03	5.52E-03	1.44E+00	2.88E+00
U-236	1.2720E-05	85.62	171.24	0.00E+00	1.09E-03	2.18E-03	Total	Total
U-238	-3.8857E-08	85.62	0.00	3.43E-03	3.43E-03	3.43E-03		
Y-90	1.2744E+00	85.62	171.24	0.00E+00	1.09E+02	2.18E+02		
Other Radionuclides					1.30E+02	2.61E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.44E+00	2.88E+00
Total	Total

**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:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	20	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	62.20	85.62	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		171.24	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.18	1.38	1.00
Bounding	0.36		

<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) USGS  
SNF ID # 267

Fuel Units & Descr: 222 - ELEMENT

Heavy Metal Mass: BOL=42.224kg, EOL=41.292kg  
ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 2035  
Estimates as of: 2010

Template: TRIGA-AI (LW/U-Zr, Alum., 10 to 20%, U)

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

Template BOL Heavy Metal Mass (MT) 0.00018

Template Decay Time: 5 years

Estimated  
Canister usage  
18"x10"  
2.00

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	889.99	1,779.99	0.00E+00	7.18E-07	1.44E-06	Avg. MeV	
Am-241	2.2586E-03	889.99	1,779.99	0.00E+00	2.01E+00	4.02E+00	0.0150	3.012E+14
Am-242m	1.9925E-06	889.99	1,779.99	0.00E+00	1.77E-03	3.55E-03	0.0250	6.539E+13
Am-243	2.3323E-07	889.99	1,779.99	0.00E+00	2.08E-04	4.15E-04	0.0375	8.145E+13
C-14	4.3308E-05	889.99	1,779.99	0.00E+00	3.85E-02	7.71E-02	0.0575	6.244E+13
Cl-36	4.3023E-08	889.99	1,779.99	0.00E+00	3.83E-05	7.66E-05	0.0850	4.371E+13
Cr-243	2.7429E-07	889.99	1,779.99	0.00E+00	2.44E-04	4.88E-04	0.1250	6.537E+13
Cr-244	3.1504E-06	889.99	1,779.99	0.00E+00	2.80E-03	5.61E-03	0.2250	3.649E+13
Co-60	3.1008E-02	889.99	1,779.99	0.00E+00	2.76E+01	5.52E+01	0.3750	1.624E+13
Cs-134	1.0367E-01	889.99	1,779.99	0.00E+00	9.23E+01	1.85E+02	0.5750	2.059E+14
Cs-135	3.1549E-05	889.99	1,779.99	0.00E+00	2.81E-02	5.62E-02	0.8500	5.068E+13
Cs-137	2.7564E+00	889.99	1,779.99	0.00E+00	2.45E+03	4.91E+03	1.2500	5.253E+13
Eu-154	1.3490E+00	889.99	1,779.99	0.00E+00	1.20E+03	2.40E+03	1.7500	1.503E+12
Eu-155	4.3880E-01	889.99	1,779.99	0.00E+00	3.91E+02	7.81E+02	2.2500	1.827E+11
Fe-55	8.6782E-03	889.99	1,779.99	0.00E+00	7.72E+00	1.54E+01	2.7500	1.484E+09
H-3	1.0805E-02	889.99	1,779.99	0.00E+00	9.62E+00	1.92E+01	3.5000	1.735E+08
I-129	7.3805E-07	889.99	1,779.99	0.00E+00	6.57E-04	1.31E-03	5.0000	1.042E+03
Kr-85	2.5218E-01	889.99	1,779.99	0.00E+00	2.24E+02	4.49E+02	7.0000	1.179E+02
Np-237	1.4463E-06	889.99	1,779.99	0.00E+00	1.29E-03	2.57E-03	11.0000	1.343E+01
Pa-231	3.5970E-09	889.99	1,779.99	0.00E+00	3.20E-06	6.40E-06		
Pb-210	8.2511E-15	889.99	1,779.99	0.00E+00	7.34E-12	1.47E-11		
Pm-147	2.0767E+00	889.99	1,779.99	0.00E+00	1.85E+03	3.70E+03		
Pu-238	1.3514E-03	889.99	1,779.99	0.00E+00	1.20E+00	2.41E+00		
Pu-239	5.6947E-03	889.99	1,779.99	0.00E+00	5.07E+00	1.01E+01		
Pu-240	2.2647E-03	889.99	1,779.99	0.00E+00	2.02E+00	4.03E+00		
Pu-241	1.2574E-01	889.99	1,779.99	0.00E+00	1.12E+02	2.24E+02		
Pu-242	3.0602E-07	889.99	1,779.99	0.00E+00	2.72E-04	5.45E-04		
Ra-226	5.7353E-14	889.99	1,779.99	0.00E+00	5.10E-11	1.02E-10		
Ra-228	1.8150E-10	889.99	1,779.99	0.00E+00	1.62E-07	3.23E-07		
Ru-106	9.3744E-02	889.99	1,779.99	0.00E+00	8.34E+01	1.67E+02		
Se-79	1.2938E-05	889.99	1,779.99	0.00E+00	1.15E-02	2.30E-02		
Sn-126	1.2239E-05	889.99	1,779.99	0.00E+00	1.09E-02	2.18E-02		
Sr-90	2.6000E+00	889.99	1,779.99	0.00E+00	2.31E+03	4.63E+03		
Tc-99	4.4120E-04	889.99	1,779.99	0.00E+00	3.93E-01	7.85E-01		
Th-229	1.4749E-10	889.99	1,779.99	0.00E+00	1.31E-07	2.63E-07		
Th-230	1.9549E-11	889.99	1,779.99	0.00E+00	1.74E-08	3.48E-08		
Th-232	2.3744E-10	889.99	1,779.99	0.00E+00	2.11E-07	4.23E-07		
Tl-208	1.9459E-08	889.99	1,779.99	0.00E+00	1.73E-05	3.46E-05		
U-232	5.6015E-08	889.99	1,779.99	0.00E+00	4.99E-05	9.97E-05		
U-233	1.3132E-07	889.99	1,779.99	0.00E+00	1.17E-04	2.34E-04		
U-234	1.7323E-07	889.99	1,779.99	0.00E+00	1.54E-04	3.08E-04		
U-235	-2.6159E-06	889.99	0.00	1.82E-02	1.58E-02	1.82E-02		
U-236	1.2717E-05	889.99	1,779.99	0.00E+00	1.13E-02	2.26E-02		
U-238	-3.8857E-08	889.99	0.00	1.14E-02	1.13E-02	1.14E-02		
Y-90	2.6015E+00	889.99	1,779.99	0.00E+00	2.32E+03	4.63E+03		
Other Radionuclides					3.38E+03	6.77E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.47E+01	8.94E+01
Total	Total

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

**Template Selection Summary**

	From SFD	Used	Basis for Parameter Differences:
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Reactor Moderator			
Fuel Cladding	ALUM	ALUM	
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:
	102.86	889.99	
Nominal			Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		1,779.99	Bounding burnup assumed to be twice nominal burnup

**Checks**

	Burnup Multiplier	Estimated Burnup/Given Burnup	Estimated EOL HM/Given EOL HM
	0.57	8.65	
Nominal			1.00
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 TRIGA STD (ALUM) ZAIRE  
 SNF ID #: 487  
 Fuel Units & Descr: 56 - ELEMENT  
 Heavy Metal Mass BOL=10 06kg EOL=10 052kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 2010  
 Estimates as of 2010  
 Template TRIGA-AJ (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 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 50

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 0632E-10	147.36	294 72	0 00E+00	1.19E-07	2 38E-07	Avg MeV	
Am-241	2.2586E-03	147.36	294 72	0 00E+00	3.33E-01	6 66E-01	0 0150	4 987E+13
Am-242m	1 9925E-06	147.36	294 72	0.00E+00	2 94E-04	5 87E-04	0 0250	1 083E+13
Am-243	2 3323E-07	147.36	294 72	0 00E+00	3 44E-05	6 87E-05	0 0375	1 349E+13
C-14	4 3308E-05	147.36	294 72	0 00E+00	6 38E-03	1.28E-02	0.0575	1 034E+13
Cf-36	4 3023E-08	147.36	294 72	0 00E+00	6 34E-06	1.27E-05	0 0850	7.237E+12
Cm-243	2.7429E-07	147.36	294 72	0 00E+00	4 04E-05	8 08E-05	0 1250	1 082E+13
Cm-244	3 1504E-06	147.36	294 72	0 00E+00	4 64E-04	9 28E-04	0.2250	6 041E+12
Co-60	3 1008E-02	147.36	294 72	0 00E+00	4 57E+00	9.14E+00	0 3750	2.689E+12
Cs-134	1 0367E-01	147.36	294 72	0 00E+00	1.53E+01	3 06E+01	0 5750	3 409E+13
Cs-135	3 1549E-05	147.36	294 72	0 00E+00	4 65E-03	9 30E-03	0 8500	8.391E+12
Cs-137	2 7564E+00	147.36	294 72	0 00E+00	4 06E+02	8 12E+02	1.2500	8 698E+12
Eu-154	1 3490E+00	147.36	294 72	0 00E+00	1 99E+02	3 98E+02	1 7500	2 489E+11
Eu-155	4 3880E-01	147.36	294 72	0 00E+00	6 47E+01	1 29E+02	2.2500	3 026E+10
Fe-55	8 6782E-03	147.36	294 72	0 00E+00	1.28E+00	2 56E+00	2 7500	2 458E+08
H-3	1 0805E-02	147.36	294 72	0 00E+00	1 59E+00	3 18E+00	3.5000	2.873E+07
I-129	7.3805E-07	147.36	294 72	0 00E+00	1 09E-04	2 18E-04	5 0000	1 744E+02
Kr-85	2.5218E-01	147.36	294 72	0 00E+00	3 72E+01	7.43E+01	7 0000	1.975E+01
Np-237	1.4463E-06	147.36	294 72	0 00E+00	2.13E-04	4 26E-04	11 0000	2.250E+00
Pa-231	3 5970E-09	147.36	294.72	0 00E+00	5.30E-07	1 06E-06		
Pb-210	8.2511E-15	147.36	294 72	0 00E+00	1.22E-12	2 43E-12		
Pm-147	2 0767E+00	147.36	294 72	0 00E+00	3 06E+02	6 12E+02		
Pu-238	1 3514E-03	147.36	294 72	0 00E+00	1 99E-01	3 98E-01		
Pu-239	5 6947E-03	147.36	294 72	0 00E+00	8 39E-01	1 68E+00		
Pu-240	2.2647E-03	147.36	294 72	0 00E+00	3 34E-01	6 67E-01		
Pu-241	1.2574E-01	147.36	294 72	0 00E+00	1 85E+01	3 71E+01		
Pu-242	3 0602E-07	147.36	294 72	0 00E+00	4 51E-05	9 02E-05		
Ra-226	5 7353E-14	147.36	294 72	0 00E+00	8 45E-12	1 69E-11		
Ra-228	1.8150E-10	147.36	294 72	0 00E+00	2.67E-08	5 35E-08		
Ru-106	9 3744E-02	147.36	294 72	0 00E+00	1.38E+01	2 76E+01		
Se-79	1.2938E-05	147.36	294 72	0 00E+00	1 91E-03	3 81E-03		
Sn-126	1.2239E-05	147.36	294 72	0 00E+00	1 80E-03	3 61E-03		
Sr-90	2 6000E+00	147.36	294 72	0.00E+00	3 83E+02	7 66E+02		
Tc-99	4 4120E-04	147.36	294 72	0 00E+00	6 50E-02	1.30E-01		
Th-229	1 4749E-10	147.36	294 72	0 00E+00	2 17E-08	4 35E-08		
Th-230	1 9549E-11	147.36	294 72	0 00E+00	2 88E-09	5 76E-09		
Th-232	2.3744E-10	147.36	294 72	0 00E+00	3.50E-08	7 00E-08		
Th-208	1.9459E-08	147.36	294 72	0 00E+00	2.87E-06	5 73E-06		
U-232	5 6015E-08	147.36	294 72	0 00E+00	8.25E-06	1 65E-05		
U-233	1.3132E-07	147.36	294 72	0 00E+00	1 94E-05	3 87E-05		
U-234	1.7323E-07	147.36	294 72	0 00E+00	2 55E-05	5 11E-05		
U-235	-2 6159E-06	147.36	0 00	4.36E-03	3 97E-03	4.36E-03		
U-236	1.2717E-05	147.36	294 72	0 00E+00	1 87E-03	3 75E-03		
U-238	-3.8857E-08	147.36	0 00	2 71E-03	2 70E-03	2 71E-03		
Y-90	2 6015E+00	147.36	294 72	0 00E+00	3 83E+02	7 67E+02		
Other Radionuclides					5 60E+02	1 12E+03		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.40E+00	1.48E+01
Total	Total

**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	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	20	10 to 20 1

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate:
	From SFD	Estimated
Nominal	147.36	26 73
Bounding		294 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
	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 40	0 18
Bounding	0 79	0 99

\*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 12/20 ROMANIA  
 SNF ID #: 1078  
 Fuel Units & Descr: 498 - ELEMENT  
 Heavy Metal Mass: BOL=124.5kg, EOL=121 462kg  
 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"  
 4 49

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8 5173E-10	2,899 91	5,799 81	0 00E+00	2 47E-06	4 94E-06		
Am-241	1 8331E-03	2,899 91	5,799 81	0 00E+00	5 32E+00	1 06E+01	0 0150	9 374E+14
Am-242m	1 4129E-06	2,899 91	5,799 81	0 00E+00	4 10E-03	8 19E-03	0 0250	2 063E+14
Am-243	1 4774E-07	2,899 91	5,799 81	0 00E+00	4 28E-04	8 57E-04	0 0375	1 757E+14
C-14	1 2871E-04	2,899 91	5,799 81	0 00E+00	3 73E-01	7 46E-01	0 0575	1 803E+14
Cl-36	2 8120E-06	2,899 91	5,799 81	0 00E+00	8 15E-03	1 63E-02	0 0850	1 117E+14
Cm-243	1 7940E-07	2,899 91	5,799 81	0 00E+00	5 20E-04	1 04E-03	0 1250	8 111E+13
Cm-244	1 6962E-06	2,899 91	5,799 81	0 00E+00	4 92E-03	9 84E-03	0 2250	9 475E+13
Co-60	1 2839E+00	2,899 91	5,799 81	0 00E+00	3.72E+03	7 45E+03	0 3750	4 808E+13
Cs-134	9 0541E-02	2,899 91	5,799 81	0 00E+00	2 63E+02	5 25E+02	0 5750	6 392E+14
Cs-135	3 2195E-05	2,899 91	5,799 81	0 00E+00	9 34E-02	1 87E-01	0 8500	2 744E+13
Cs-137	2 7564E+00	2,899 91	5,799 81	0 00E+00	7 99E+03	1 60E+04	1 2500	5 572E+14
Eu-154	1 5368E-02	2,899 91	5,799 81	0 00E+00	4 46E+01	8 91E+01	1 7500	3 714E+11
Eu-155	2 9293E-02	2,899 91	5,799 81	0 00E+00	8 49E+01	1 70E+02	2 2500	5 986E+11
Fe-55	7 7158E-01	2,899 91	5,799 81	0 00E+00	2 24E+03	4 48E+03	2 7500	4 751E+09
H-3	1 1111E-02	2,899 91	5,799 81	0 00E+00	3.22E+01	6 44E+01	3 5000	5 529E+08
I-129	7 3684E-07	2,899 91	5,799 81	0 00E+00	2 14E-03	4 27E-03	5 0000	3 117E+03
Kr-85	2 5263E-01	2,899 91	5,799 81	0 00E+00	7 33E+02	1 47E+03	7 0000	3 529E+02
Np-237	1 2427E-06	2,899 91	5,799 81	0 00E+00	3 60E-03	7 21E-03	11 0000	4 021E+01
Pa-231	3 8511E-09	2,899 91	5,799 81	0 00E+00	1 12E-05	2 23E-05		
Pb-210	7 3880E-15	2,899 91	5,799 81	0 00E+00	2 14E-11	4 28E-11		
Pm-147	2 1023E+00	2,899 91	5,799 81	0 00E+00	6 10E+03	1 22E+04		
Pu-238	1 0383E-03	2,899 91	5,799 81	0 00E+00	3 01E+00	6 02E+00		
Pu-239	5 5293E-03	2,899 91	5,799 81	0 00E+00	1 60E+01	3 21E+01		
Pu-240	2 1278E-03	2,899 91	5,799 81	0 00E+00	6 17E+00	1 23E+01		
Pu-241	1 0195E-01	2,899 91	5,799 81	0 00E+00	2 96E+02	5 91E+02		
Pu-242	2 3128E-07	2,899 91	5,799 81	0 00E+00	6 71E-04	1 34E-03		
Ra-226	5 2782E-14	2,899 91	5,799 81	0 00E+00	1 53E-10	3 06E-10		
Ra-228	1 9338E-10	2,899 91	5,799 81	0 00E+00	5 61E-07	1 12E-06		
Ru-106	9 1684E-02	2,899 91	5,799 81	0 00E+00	2 66E+02	5 32E+02		
Se-79	1 3018E-05	2,899 91	5,799 81	0 00E+00	3 78E-02	7 55E-02		
Sn-126	1 2167E-05	2,899 91	5,799 81	0 00E+00	3 53E-02	7 06E-02		
Sr-90	2 6045E+00	2,899 91	5,799 81	0 00E+00	7 55E+03	1 51E+04		
Tc-99	4 4241E-04	2,899 91	5,799 81	0 00E+00	1 28E+00	2 57E+00		
Th-229	1 3713E-10	2,899 91	5,799 81	0 00E+00	3 98E-07	7 95E-07		
Th-230	1 8090E-11	2,899 91	5,799 81	0 00E+00	5 25E-08	1 05E-07		
Th-232	2 5278E-10	2,899 91	5,799 81	0 00E+00	7 33E-07	1 47E-06		
Ti-208	1 6947E-08	2,899 91	5,799 81	0 00E+00	4 91E-05	9 83E-05		
U-232	4 8737E-08	2,899 91	5,799 81	0 00E+00	1 41E-04	2 83E-04		
U-233	1 2203E-07	2,899 91	5,799 81	0 00E+00	3 54E-04	7 08E-04		
U-234	1 5925E-07	2,899 91	5,799 81	0 00E+00	4 62E-04	9 24E-04		
U-235	-2 6194E-06	2,899 91	0 00	5 35E-02	4 59E-02	5 35E-02		
U-236	1 2693E-05	2,899 91	5,799 81	0 00E+00	3 68E-02	7 36E-02		
U-238	-3 6331E-08	2,899 91	0 00	3 35E-02	3 34E-02	3 35E-02		
Y-90	2 6060E+00	2,899 91	5,799 81	0 00E+00	7 56E+03	1 51E+04		
Other Radionuclides					1 05E+04	2 09E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 69E+02	3 38E+02
Total	Total

**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 %	19 9	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	1 213 38	2 899 91	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		5 799 81	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0 68	2 39	1 00
Bounding	1 37		

<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 20/20 (IFE) ENGLAND  
 SNF ID # 1043  
 Fuel Units & Descr: 2 - ELEMENT  
 Heavy Metal Mass: BOL=0.376kg, EOL=0.367kg  
 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"  
 0.02

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	10.63	21.27	0.00E+00	9.06E-09	1.81E-08	0.0150	3.437E+12
Am-241	1.8331E-03	10.63	21.27	0.00E+00	1.95E-02	3.90E-02	0.0250	7.563E+11
Am-242m	1.4129E-06	10.63	21.27	0.00E+00	1.50E-05	3.00E-05	0.0375	6.441E+11
Am-243	1.4774E-07	10.63	21.27	0.00E+00	1.57E-06	3.14E-06	0.0575	6.611E+11
C-14	1.2871E-04	10.63	21.27	0.00E+00	1.37E-03	2.74E-03	0.0850	4.096E+11
Ct-36	2.8120E-06	10.63	21.27	0.00E+00	2.99E-05	5.98E-05	0.1250	2.974E+11
Cm-243	1.7940E-07	10.63	21.27	0.00E+00	1.91E-06	3.82E-06	0.2250	3.474E+11
Cm-244	1.6962E-06	10.63	21.27	0.00E+00	1.80E-05	3.61E-05	0.3750	1.763E+11
Co-60	1.2839E+00	10.63	21.27	0.00E+00	1.37E+01	2.73E+01	0.5750	2.344E+12
Cs-134	9.0541E-02	10.63	21.27	0.00E+00	9.63E-01	1.93E+00	0.8500	1.006E+11
Cs-135	3.2195E-05	10.63	21.27	0.00E+00	3.42E-04	6.85E-04	1.2500	2.043E+12
Cs-137	2.7564E+00	10.63	21.27	0.00E+00	2.93E+01	5.86E+01	1.7500	1.362E+09
Eu-154	1.5368E-02	10.63	21.27	0.00E+00	1.63E-01	3.27E-01	2.2500	2.195E+09
Eu-155	2.9293E-02	10.63	21.27	0.00E+00	3.11E-01	6.23E-01	2.7500	1.742E+07
Fe-55	7.7158E-01	10.63	21.27	0.00E+00	8.20E+00	1.64E+01	3.5000	2.027E+06
H-3	1.1111E-02	10.63	21.27	0.00E+00	1.18E-01	2.36E-01	5.0000	1.138E+01
I-129	7.3684E-07	10.63	21.27	0.00E+00	7.84E-06	1.57E-05	7.0000	1.288E+00
Kr-85	2.5263E-01	10.63	21.27	0.00E+00	2.69E+00	5.37E+00	11.0000	1.468E-01
Np-237	1.2427E-06	10.63	21.27	0.00E+00	1.32E-05	2.64E-05		
Pa-231	3.8511E-09	10.63	21.27	0.00E+00	4.10E-08	8.19E-08		
Pb-210	7.3880E-15	10.63	21.27	0.00E+00	7.86E-14	1.57E-13		
Pm-147	2.1023E+00	10.63	21.27	0.00E+00	2.24E+01	4.47E+01		
Pu-238	1.0383E-03	10.63	21.27	0.00E+00	1.10E-02	2.21E-02		
Pu-239	5.5293E-03	10.63	21.27	0.00E+00	5.88E-02	1.18E-01		
Pu-240	2.1278E-03	10.63	21.27	0.00E+00	2.26E-02	4.53E-02		
Pu-241	1.0195E-01	10.63	21.27	0.00E+00	1.08E+00	2.17E+00		
Pu-242	2.3128E-07	10.63	21.27	0.00E+00	2.46E-06	4.92E-06		
Ra-226	5.2782E-14	10.63	21.27	0.00E+00	5.61E-13	1.12E-12		
Ra-228	1.9338E-10	10.63	21.27	0.00E+00	2.06E-09	4.11E-09		
Ru-106	9.1684E-02	10.63	21.27	0.00E+00	9.75E-01	1.95E+00		
Se-79	1.3018E-05	10.63	21.27	0.00E+00	1.38E-04	2.77E-04		
Sn-126	1.2167E-05	10.63	21.27	0.00E+00	1.29E-04	2.59E-04		
Sr-90	2.6045E+00	10.63	21.27	0.00E+00	2.77E+01	5.54E+01		
Tc-99	4.4241E-04	10.63	21.27	0.00E+00	4.70E-03	9.41E-03		
Th-229	1.3713E-10	10.63	21.27	0.00E+00	1.46E-09	2.92E-09		
Th-230	1.8090E-11	10.63	21.27	0.00E+00	1.92E-10	3.85E-10		
Th-232	2.5278E-10	10.63	21.27	0.00E+00	2.69E-09	5.38E-09		
Tl-208	1.6947E-08	10.63	21.27	0.00E+00	1.80E-07	3.60E-07		
U-232	4.8737E-08	10.63	21.27	0.00E+00	5.18E-07	1.04E-06		
U-233	1.2203E-07	10.63	21.27	0.00E+00	1.30E-06	2.60E-06		
U-234	1.5925E-07	10.63	21.27	0.00E+00	1.69E-06	3.39E-06		
U-235	-2.6194E-06	10.63	0.00	1.62E-04	1.34E-04	1.62E-04		
U-236	1.2693E-05	10.63	21.27	0.00E+00	1.35E-04	2.70E-04		
U-238	-3.6331E-08	10.63	0.00	1.01E-04	1.01E-04	1.01E-04		
Y-90	2.6060E+00	10.63	21.27	0.00E+00	2.77E+01	5.54E+01		
Y-90					3.83E+01	7.67E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.19E+01	1.24E+00
Total	Total

**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 %	19.94680851	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	10.63	8.97	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		21.27	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.83	0.84	1.00
Bounding	1.66		

<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 20/20 ARRR  
 SNF ID #: 780  
 Fuel Units & Descr: 15 - ELEMENT  
 Heavy Metal Mass: BOL=10.275kg, EOL=3.179kg  
 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"  
 0.14

**II. Estimates**

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
	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	2,000.38	4,000.76	0.00E+00	1.70E-06	3.41E-06	Avg. MeV	
Am-241	1.8331E-03	2,000.38	4,000.76	0.00E+00	3.67E+00	7.33E+00	0.0150	6.466E+14
Am-242m	1.4129E-06	2,000.38	4,000.76	0.00E+00	2.83E-03	5.65E-03	0.0250	1.423E+14
Am-243	1.4774E-07	2,000.38	4,000.76	0.00E+00	2.96E-04	5.91E-04	0.0375	1.212E+14
C-14	1.2871E-04	2,000.38	4,000.76	0.00E+00	2.57E-01	5.15E-01	0.0575	1.244E+14
Cl-36	2.8120E-06	2,000.38	4,000.76	0.00E+00	5.63E-03	1.13E-02	0.0850	7.705E+13
Cm-243	1.7940E-07	2,000.38	4,000.76	0.00E+00	3.59E-04	7.18E-04	0.1250	5.595E+13
Cm-244	1.6962E-06	2,000.38	4,000.76	0.00E+00	3.39E-03	6.79E-03	0.2250	6.536E+13
Co-60	1.2839E+00	2,000.38	4,000.76	0.00E+00	2.57E+03	5.14E+03	0.3750	3.317E+13
Cs-134	9.0541E-02	2,000.38	4,000.76	0.00E+00	1.81E+02	3.62E+02	0.5750	4.410E+14
Cs-135	3.2195E-05	2,000.38	4,000.76	0.00E+00	6.44E-02	1.29E-01	0.8500	1.893E+13
Cs-137	2.7564E+00	2,000.38	4,000.76	0.00E+00	5.51E+03	1.10E+04	1.2500	3.843E+14
Eu-154	1.5368E-02	2,000.38	4,000.76	0.00E+00	3.07E+01	6.15E+01	1.7500	2.562E+11
Eu-155	2.9293E-02	2,000.38	4,000.76	0.00E+00	5.86E+01	1.17E+02	2.2500	4.129E+11
Fe-55	7.7158E-01	2,000.38	4,000.76	0.00E+00	1.54E+03	3.09E+03	2.7500	3.277E+09
H-3	1.1111E-02	2,000.38	4,000.76	0.00E+00	2.22E+01	4.45E+01	3.5000	3.814E+08
I-129	7.3684E-07	2,000.38	4,000.76	0.00E+00	1.47E-03	2.95E-03	5.0000	2.103E+03
Kr-85	2.5263E-01	2,000.38	4,000.76	0.00E+00	5.05E+02	1.01E+03	7.0000	2.380E+02
Np-237	1.2427E-06	2,000.38	4,000.76	0.00E+00	2.49E-03	4.97E-03	11.0000	2.711E+01
Pa-231	3.8511E-09	2,000.38	4,000.76	0.00E+00	7.70E-06	1.54E-05		
Pb-210	7.3880E-15	2,000.38	4,000.76	0.00E+00	1.48E-11	2.96E-11		
Pm-147	2.1023E+00	2,000.38	4,000.76	0.00E+00	4.21E+03	8.41E+03		
Pu-238	1.0383E-03	2,000.38	4,000.76	0.00E+00	2.08E+00	4.15E+00		
Pu-239	5.5293E-03	2,000.38	4,000.76	0.00E+00	1.11E+01	2.21E+01		
Pu-240	2.1278E-03	2,000.38	4,000.76	0.00E+00	4.26E+00	8.51E+00		
Pu-241	1.0195E-01	2,000.38	4,000.76	0.00E+00	2.04E+02	4.08E+02		
Pu-242	2.3128E-07	2,000.38	4,000.76	0.00E+00	4.63E-04	9.25E-04		
Ra-226	5.2782E-14	2,000.38	4,000.76	0.00E+00	1.06E-10	2.11E-10		
Ra-228	1.9338E-10	2,000.38	4,000.76	0.00E+00	3.87E-07	7.74E-07		
Ru-106	9.1684E-02	2,000.38	4,000.76	0.00E+00	1.83E+02	3.67E+02		
Se-79	1.3018E-05	2,000.38	4,000.76	0.00E+00	2.60E-02	5.21E-02		
Sn-126	1.2167E-05	2,000.38	4,000.76	0.00E+00	2.43E-02	4.87E-02		
Sr-90	2.6045E+00	2,000.38	4,000.76	0.00E+00	5.21E+03	1.04E+04		
Tc-99	4.4241E-04	2,000.38	4,000.76	0.00E+00	8.85E-01	1.77E+00		
Th-229	1.3713E-10	2,000.38	4,000.76	0.00E+00	2.74E-07	5.49E-07		
Th-230	1.8090E-11	2,000.38	4,000.76	0.00E+00	3.62E-08	7.24E-08		
Th-232	2.5278E-10	2,000.38	4,000.76	0.00E+00	5.06E-07	1.01E-06		
Th-208	1.6947E-08	2,000.38	4,000.76	0.00E+00	3.39E-05	6.78E-05		
U-232	4.8737E-08	2,000.38	4,000.76	0.00E+00	9.75E-05	1.95E-04		
U-233	1.2203E-07	2,000.38	4,000.76	0.00E+00	2.44E-04	4.88E-04		
U-234	1.5925E-07	2,000.38	4,000.76	0.00E+00	3.19E-04	6.37E-04		
U-235	-2.6194E-06	2,000.38	0.00	4.36E-03	0.00E+00	4.36E-03		
U-236	1.2693E-05	2,000.38	4,000.76	0.00E+00	2.54E-02	5.08E-02		
U-238	-3.6331E-08	2,000.38	0.00	2.77E-03	2.70E-03	2.77E-03		
Y-90	2.6066E+00	2,000.38	4,000.76	0.00E+00	5.21E+03	1.04E+04		
Other Radionuclides					7.21E+03	1.44E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.16E+02	2.33E+02
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 %	19.64963504	10 to 20.1

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>1</sup>		
	From SFD	Estimated
Nominal	581.16	2,000.38
Bounding		4,000.76

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	5.71	3.44
Bounding	11.42	

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 TRIGA STD 2020 MNRC  
 SNF ID # 1053  
 Fuel Units & Descr 8 - ELEMENT  
 Heavy Metal Mass BOL=3 962kg, EOL=3 962kg  
 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 07

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8 5173E-10	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0150	4 193E+07
Am-241	1 8331E-03	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0250	0 000E+00
Am-242m	1 4129E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0375	5 713E+04
Am-243	1 4774E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0575	3 498E+04
C-14	1 2871E-04	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 0850	4 881E+06
Cl-36	2 8120E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 1250	9 636E+06
Cm-243	1 7940E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 2250	3 410E+07
Cm-244	1 6962E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 3750	8 510E+04
Co-60	1 2839E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 5750	4 186E+03
Cs-134	9 0541E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	0 8500	6 537E+02
Cs-135	3 2195E-05	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	1 2500	3 906E+01
Cs-137	2 7564E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	1 7500	1 911E+01
Eu-154	1 5368E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	2 2500	1 107E+01
Eu-155	2 9293E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	2 7500	6 433E+00
Fe-55	7 7158E-01	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	3 5000	5 751E+00
H-3	1 1111E-02	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	5 0000	2 471E+00
I-129	7 3684E-07	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	7 0000	2 844E-01
Kr-85	2 5263E-01	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	11 0000	3 270E-02
Np-237	1 2427E-06	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		
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	1 69E-03	1 69E-03	1 69E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1 2693E-05	0 00	0 00	0 00E+00	0 00E+00	0 00E+00	7.14E-05	7.14E-05
U-238	-3 6331E-08	0 00	0 00	1 07E-03	1 07E-03	1 07E-03	Total	Total
Y-90	2 6060E+00	0 00	0 00	0 00E+00	0 00E+00	0 00E+00		

Other Radionuclides

**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 %	19 74990819	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	0 00		Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup
Bounding			

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
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: TRIGA STD 2020 MNRC  
 SNF ID #: 1054  
 Fuel Units & Descr: 84 - ELEMENT  
 Heavy Metal Mass: BOL=41 605kg; EOL=40 555kg  
 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 76

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 5173E-10	1,002.34	2,004.68	0 00E+00	8 54E-07	1 71E-06	Avg MeV	
Am-241	1 8331E-03	1,002.34	2,004.68	0 00E+00	1 84E+00	3 67E+00	0 0150	3 240E+14
Am-242m	1 4129E-06	1,002.34	2,004.68	0 00E+00	1 42E-03	2 83E-03	0 0250	7 129E+13
Am-243	1 4774E-07	1,002.34	2,004.68	0 00E+00	1 48E-04	2 96E-04	0 0375	6 071E+13
C-14	1 2871E-04	1,002.34	2,004.68	0 00E+00	1 29E-01	2 58E-01	0 0575	6 232E+13
Cl-36	2 8120E-06	1,002.34	2,004.68	0 00E+00	2 82E-03	5 64E-03	0 0850	3 861E+13
Cm-243	1 7940E-07	1,002.34	2,004.68	0 00E+00	1 80E-04	3 60E-04	0 1250	2 804E+13
Cm-244	1 6962E-06	1,002.34	2,004.68	0 00E+00	1 70E-03	3 40E-03	0 2250	3 275E+13
Co-60	1 2839E+00	1,002.34	2,004.68	0 00E+00	1 29E+03	2 57E+03	0 3750	1 662E+13
Cs-134	9 0541E-02	1,002.34	2,004.68	0 00E+00	9 08E+01	1 82E+02	0 5750	2 210E+14
Cs-135	3 2195E-05	1,002.34	2,004.68	0 00E+00	3 23E-02	6 45E-02	0 8500	9 483E+12
Cs-137	2 7564E+00	1,002.34	2,004.68	0 00E+00	2 76E+03	5 53E+03	1 2500	1 926E+14
Eu-154	1 5368E-02	1,002.34	2,004.68	0 00E+00	1 54E+01	3 08E+01	1 7500	1 284E+11
Eu-155	2 9293E-02	1,002.34	2,004.68	0 00E+00	2 94E+01	5 87E+01	2 2500	2 069E+11
Fe-55	7 7158E-01	1,002.34	2,004.68	0 00E+00	7 73E+02	1 55E+03	2 7500	1 642E+09
H-3	1 1111E-02	1,002.34	2,004.68	0 00E+00	1 11E+01	2 23E+01	3 5000	1 911E+08
I-129	7 3684E-07	1,002.34	2,004.68	0 00E+00	7 39E-04	1 48E-03	5 0000	1 077E+03
Kr-85	2 5263E-01	1,002.34	2,004.68	0 00E+00	2 53E+02	5 06E+02	7 0000	1 219E+02
Np-237	1 2427E-06	1,002.34	2,004.68	0 00E+00	1 25E-03	2 49E-03	11 0000	1 389E+01
Pa-231	3 8511E-09	1,002.34	2,004.68	0 00E+00	3 86E-06	7 72E-06		
Pb-210	7 3880E-15	1,002.34	2,004.68	0 00E+00	7 41E-12	1 48E-11		
Pm-147	2 1023E+00	1,002.34	2,004.68	0 00E+00	2 11E+03	4 21E+03		
Pu-238	1 0383E-03	1,002.34	2,004.68	0 00E+00	1 04E+00	2 08E+00		
Pu-239	5 5293E-03	1,002.34	2,004.68	0 00E+00	5 54E+00	1 11E+01		
Pu-240	2 1278E-03	1,002.34	2,004.68	0 00E+00	2 13E+00	4 27E+00		
Pu-241	1 0195E-01	1,002.34	2,004.68	0 00E+00	1 02E+02	2 04E+02		
Pu-242	2 3128E-07	1,002.34	2,004.68	0 00E+00	2 32E-04	4 64E-04		
Ra-226	5 2782E-14	1,002.34	2,004.68	0 00E+00	5 29E-11	1 06E-10		
Ra-228	1 9338E-10	1,002.34	2,004.68	0 00E+00	1 94E-07	3 88E-07		
Ru-106	9 1684E-02	1,002.34	2,004.68	0 00E+00	9 19E+01	1 84E+02		
Se-79	1 3018E-05	1,002.34	2,004.68	0 00E+00	1 30E-02	2 61E-02		
Sn-126	1 2167E-05	1,002.34	2,004.68	0 00E+00	1 22E-02	2 44E-02		
Sr-90	2 6045E+00	1,002.34	2,004.68	0 00E+00	2 61E+03	5 22E+03		
Tc-99	4 4241E-04	1,002.34	2,004.68	0 00E+00	4 43E-01	8 87E-01		
Th-229	1 3713E-04	1,002.34	2,004.68	0 00E+00	1 37E-07	2 75E-07		
Th-230	1 8090E-11	1,002.34	2,004.68	0 00E+00	1 81E-08	3 63E-08		
Th-232	2 5278E-10	1,002.34	2,004.68	0 00E+00	2 53E-07	5 07E-07		
Th-208	1 6947E-08	1,002.34	2,004.68	0 00E+00	1 70E-05	3 40E-05		
U-232	4 8737E-08	1,002.34	2,004.68	0 00E+00	4 89E-05	9 77E-05		
U-233	1 2203E-07	1,002.34	2,004.68	0 00E+00	1 22E-04	2 45E-04		
U-234	1 5925E-07	1,002.34	2,004.68	0 00E+00	1 60E-04	3 19E-04		
U-235	-2 6194E-06	1,002.34	0 00	1 78E-02	1 51E-02	1 78E-02		
U-236	1 2693E-05	1,002.34	2,004.68	0 00E+00	1 27E-02	2 54E-02		
U-238	-3 6331E-08	1,002.34	0 00	1 12E-02	1 12E-02	1 12E-02		
Y-90	2 6060E+00	1,002.34	2,004.68	0 00E+00	2 61E+03	5 22E+03		
Other Radionuclides					3 61E+03	7 23E+03		

**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 %:	19 74990819	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	784 42	1 002 34	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		2 004 68	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal:	0 71	1 28	1 00
Bounding:	1 41		

<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 20/20 SOLVENIA  
 SNF ID # 731  
 Fuel Units & Descr: 10 - ELEMENT  
 Heavy Metal Mass: BOL=4 949kg, EOL=4 754kg  
 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"  
 0 09

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	186 62	373 23	0 00E+00	1 59E-07	3 18E-07	Avg MeV	
Am-241	1 8331E-03	186 62	373 23	0 00E+00	3 42E-01	6 84E-01	0 0150	6.032E+13
Am-242m	1 4129E-06	186 62	373.23	0 00E+00	2 64E-04	5.27E-04	0 0250	1.327E+13
Am-243	1 4774E-07	186 62	373.23	0 00E+00	2 76E-05	5 51E-05	0 0375	1 130E+13
C-14	1.2871E-04	186 62	373.23	0 00E+00	2 40E-02	4 80E-02	0 0575	1 160E+13
Cl-36	2 8120E-06	186 62	373.23	0 00E+00	5 25E-04	1 05E-03	0 0850	7 188E+12
Cm-243	1 7940E-07	186 62	373.23	0 00E+00	3 35E-05	6 70E-05	0 1250	5.220E+12
Cm-244	1 6962E-06	186 62	373.23	0 00E+00	3 17E-04	6 33E-04	0.2250	6 098E+12
Co-60	1.2839E+00	186 62	373.23	0 00E+00	2 40E+02	4 79E+02	0.3750	3 094E+12
Cs-134	9 0541E-02	186 62	373 23	0 00E+00	1 69E+01	3 38E+01	0 5750	4 114E+13
Cs-135	3.2195E+05	186 62	373 23	0 00E+00	6 01E-03	1 20E-02	0 8500	1 766E+13
Cs-137	2 7564E+00	186 62	373 23	0 00E+00	5.14E+02	1 03E+03	1.2500	3 586E+12
Eu-154	1 5368E-02	186 62	373 23	0 00E+00	2 87E+00	5 74E+00	1 7500	2.390E+10
Eu-155	2 9293E-02	186 62	373 23	0 00E+00	5.47E+00	1 09E+01	2.2500	3.852E+10
Fe-55	7 7158E-01	186 62	373 23	0 00E+00	1 44E+02	2 88E+02	2 7500	3 057E+08
H-3	1 1111E-02	186 62	373 23	0 00E+00	2 07E+00	4 15E+00	3.5000	3 558E+07
I-129	7.3684E-07	186 62	373.23	0 00E+00	1 38E-04	2.75E-04	5 0000	1.987E+02
Kr-85	2.5263E-01	186 62	373.23	0 00E+00	4 71E+01	9 43E+01	7 0000	2.249E+01
Np-237	1.2427E-06	186 62	373.23	0 00E+00	2 32E-04	4 64E-04	11.0000	2.562E+00
Pa-231	3.8511E-09	186 62	373.23	0 00E+00	7.19E-07	1 44E-06		
Pb-210	7.3880E-15	186 62	373.23	0 00E+00	1.38E-12	2 76E-12		
Pm-147	2.1023E+00	186 62	373.23	0 00E+00	3 92E+02	7 85E+02		
Pu-238	1 0383E-03	186 62	373 23	0 00E+00	1.94E-01	3 88E-01		
Pu-239	5 5293E-03	186 62	373 23	0 00E+00	1 03E+00	2 06E+00		
Pu-240	2 1278E-03	186 62	373 23	0 00E+00	3 97E-01	7.94E-01		
Pu-241	1 0195E-01	186 62	373 23	0 00E+00	1.90E+01	3 81E+01		
Pu-242	2 3128E-07	186 62	373 23	0 00E+00	4 32E-05	8 63E-05		
Ra-226	5 2782E-14	186 62	373 23	0 00E+00	9 85E-12	1.97E-11		
Ra-228	1 9338E-10	186 62	373 23	0 00E+00	3 61E-08	7.22E-08		
Ru-106	9 1684E-02	186 62	373.23	0 00E+00	1 71E+01	3 42E+01		
Se-79	1 3018E-05	186 62	373 23	0 00E+00	2 43E-03	4 86E-03		
Sn-126	1 2167E-05	186 62	373.23	0 00E+00	2 27E-03	4 54E-03		
Sr-90	2 6045E+00	186 62	373.23	0 00E+00	4 86E+02	9 72E+02		
Tc-99	4 4241E-04	186 62	373 23	0 00E+00	8 26E-02	1 65E-01		
Th-229	1.3713E-10	186 62	373.23	0.00E+00	2.56E-08	5 12E-08		
Th-230	1.8090E-11	186 62	373.23	0 00E+00	3 38E-09	6 75E-09		
Th-232	2.5278E-10	186 62	373.23	0 00E+00	4.72E-08	9 43E-08		
Th-208	1.6947E-08	186 62	373.23	0 00E+00	3.16E-06	6 33E-06		
U-232	4 8737E-08	186 62	373 23	0 00E+00	9 10E-06	1.82E-05		
U-233	1.2203E-07	186 62	373 23	0 00E+00	2.28E-05	4.55E-05		
U-234	1 5925E-07	186 62	373 23	0 00E+00	2 97E-05	5 94E-05		
U-235	-2 6194E-06	186 62	0.00	2 11E-03	1 63E-03	2 11E-03		
U-236	1.2693E-05	186.62	373.23	0 00E+00	2 37E-03	4 74E-03		
U-238	-3 6331E-08	186.62	0 00	1.33E-03	1 33E-03	1 33E-03		
Y-90	2 6060E+00	186 62	373.23	0 00E+00	4 86E+02	9 73E+02		
Other Radionuclides					6 73E+02	1 35E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 09E+01	2 17E+01
Total	Total

**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 %:	19 76747705	10 to 20 1	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	186 62	186 15	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		373.23	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 11	1 00	1.00
Bounding	2.21		

<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: TRIGA STD 30/20  
 SNF ID #: 995  
 Fuel Units & Descr: 19 - ELEMENT  
 Heavy Metal Mass: BOL=16 625kg; EOL=16 433kg  
 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 17

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	183 19	366 38	0 00E+00	1.56E-07	3.12E-07	Avg MeV	
Am-241	1 8331E-03	183 19	366 38	0 00E+00	3.36E-01	6.72E-01	0 0150	5 922E+13
Am-242m	1 4129E-06	183 19	366 38	0 00E+00	2.59E-04	5.18E-04	0 0250	1 303E+13
Am-243	1 4774E-07	183 19	366 38	0 00E+00	2.71E-05	5.41E-05	0 0375	1 110E+13
C-14	1 2871E-04	183 19	366 38	0 00E+00	2.36E-02	4.72E-02	0 0575	1 139E+13
Cf-254	2 8120E-06	183 19	366 38	0 00E+00	5.15E-04	1 03E-03	0 0850	7 056E+12
Cm-243	1 7940E-07	183 19	366 38	0 00E+00	3 29E-05	6 57E-05	0 1250	5 124E+12
Cm-244	1 6962E-06	183 19	366 38	0 00E+00	3 11E-04	6 21E-04	0 2250	5 986E+12
Co-60	1 2839E+00	183 19	366 38	0 00E+00	2 35E+02	4 70E+02	0 3750	3 038E+12
Cs-134	9 0541E-02	183 19	366 38	0 00E+00	1 66E+01	3 32E+01	0 5750	4 038E+13
Cs-135	3 2195E-05	183 19	366 38	0 00E+00	5 90E-03	1 18E-02	0 8500	1 733E+12
Cs-137	2 7564E+00	183 19	366 38	0 00E+00	5 05E+02	1 01E+03	1.2500	3 520E+13
Eu-154	1 5368E-02	183 19	366 38	0 00E+00	2 82E+00	5 63E+00	1 7500	2 346E+10
Eu-155	2 9293E-02	183 19	366 38	0 00E+00	5 37E+00	1 07E+01	2.2500	3 782E+10
Fe-55	7 7158E-01	183 19	366 38	0 00E+00	1 41E+02	2 83E+02	2 7500	3 001E+08
H-3	1 1111E-02	183 19	366 38	0 00E+00	2 04E+00	4 07E+00	3 5000	3 493E+07
I-129	7 3684E-07	183 19	366 38	0 00E+00	1 35E-04	2 70E-04	5 0000	2 023E+02
Kr-85	2.5263E-01	183 19	366 38	0 00E+00	4 63E+01	9 26E+01	7 0000	2 292E+01
Np-237	1.2427E-06	183 19	366 38	0 00E+00	2 28E-04	4 55E-04	11 0000	2 612E+00
Pa-231	3 8511E-09	183 19	366 38	0 00E+00	7 05E-07	1 41E-06		
Pb-210	7.3880E-15	183 19	366 38	0 00E+00	1 35E-12	2 71E-12		
Pm-147	2.1023E+00	183 19	366 38	0 00E+00	3 85E+02	7 70E+02		
Pu-238	1 0383E-03	183 19	366 38	0 00E+00	1 90E-01	3 80E-01		
Pu-239	5 5293E-03	183 19	366 38	0 00E+00	1 01E+00	2 03E+00		
Pu-240	2 1278E-03	183 19	366 38	0 00E+00	3 90E-01	7 80E-01		
Pu-241	1 0195E-01	183 19	366 38	0 00E+00	1 87E+01	3 74E+01		
Pu-242	2 3128E-07	183 19	366 38	0 00E+00	4 24E-05	8 47E-05		
Ra-226	5 2782E-14	183 19	366 38	0 00E+00	9 67E-12	1 93E-11		
Ra-228	1 9338E-10	183 19	366 38	0 00E+00	3 54E-08	7 09E-08		
Ru-106	9 1684E-02	183 19	366 38	0 00E+00	1 68E+01	3 36E+01		
Se-79	1 3018E-05	183 19	366 38	0 00E+00	2 38E-03	4 77E-03		
Sn-126	1 2167E-05	183 19	366 38	0 00E+00	2 23E-03	4 46E-03		
Sr-90	2 6045E+00	183 19	366 38	0 00E+00	4.77E+02	9.54E+02		
Tc-99	4 4241E-04	183 19	366 38	0 00E+00	8 10E-02	1 62E-01		
Th-229	1 3713E-10	183 19	366 38	0 00E+00	2 51E-08	5 02E-08		
Th-230	1 8090E-11	183 19	366 38	0 00E+00	3 31E-09	6 63E-09		
Th-232	2 5278E-10	183 19	366 38	0 00E+00	4 63E-08	9.26E-08		
Th-208	1 6947E-08	183 19	366 38	0.00E+00	3.10E-06	6.21E-06		
U-232	4 8737E-08	183 19	366 38	0 00E+00	8 93E-06	1.79E-05		
U-233	1 2203E-07	183 19	366 38	0 00E+00	2.24E-05	4.47E-05		
U-234	1 5925E-07	183 19	366 38	0 00E+00	2 92E-05	5 83E-05		
U-235	-2 6194E-06	183 19	0 00	7.19E-03	6 71E-03	7.19E-03		
U-236	1 2693E-05	183 19	366 38	0 00E+00	2.33E-03	4 65E-03		
U-238	-3 6331E-08	183 19	0 00	4 47E-03	4 46E-03	4.47E-03		
Y-90	2 6060E+00	183 19	366 38	0 00E+00	4 77E+02	9 55E+02		
Other Radionuclides					6 60E+02	1 32E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 07E+01	2.13E+01
Total	Total

**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	10 to 20 %	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		183 19	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		366 38	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0 32		1 00
Bounding	0 65		

<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 30/20 MNRG  
 SNF ID # 704  
 Fuel Units & Descr 6 - ELEMENT  
 Heavy Metal Mass BOL=4.974kg EOL=4.974kg  
 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"  
 0.05

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources		
							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	8.5173E-10	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0150	5.280E+07
Am-241	1.8331E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0250	0.000E+00
Am-242m	1.4129E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0375	7.199E+04
Am-243	1.4774E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0575	4.394E+04
C-14	1.2871E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0850	6.150E+06
Cl-36	2.8120E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.1250	1.214E+07
Cm-243	1.7940E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.2250	4.297E+07
Cm-244	1.6962E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.3750	1.072E+05
Co-60	1.2839E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.5750	5.275E+03
Cs-134	9.0541E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.8500	8.232E+02
Cs-135	3.2195E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.2500	4.899E+01
Cs-137	2.7564E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.7500	2.397E+01
Eu-154	1.5368E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.2500	1.389E+01
Eu-155	2.9293E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.7500	8.068E+00
Fe-55	7.7158E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.5000	7.213E+00
H-3	1.1111E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.0000	3.099E+00
I-129	7.3684E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.0000	3.567E-01
Kr-85	2.5263E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	11.0000	4.101E-02
Np-237	1.2427E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
Pa-231	3.8511E-09	0.00	0.00	0.00E+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	0.00E+00		
Pm-147	2.1023E+00	0.00	0.00	0.00E+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	0.00E+00		
Pu-239	5.5293E-03	0.00	0.00	0.00E+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	0.00E+00		
Pu-241	1.0195E-01	0.00	0.00	0.00E+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	0.00E+00		
Ra-226	5.2782E-14	0.00	0.00	0.00E+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	0.00E+00		
Ru-106	9.1684E-02	0.00	0.00	0.00E+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	0.00E+00		
Sn-126	1.2167E-05	0.00	0.00	0.00E+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	0.00E+00		
Tc-99	4.4241E-04	0.00	0.00	0.00E+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	0.00E+00		
Th-230	1.8090E-11	0.00	0.00	0.00E+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	0.00E+00		
Th-208	1.6947E-08	0.00	0.00	0.00E+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	0.00E+00		
U-233	1.2203E-07	0.00	0.00	0.00E+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	0.00E+00		
U-235	-2.6194E-06	0.00	0.00	2.13E-03	2.13E-03	2.13E-03	2.13E-03	8.98E-05	8.98E-05
U-236	1.2693E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		
U-238	-3.6331E-08	0.00	0.00	1.34E-03	1.34E-03	1.34E-03	1.34E-03		
Y-90	2.6060E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.98E-05	8.98E-05
Total	Total

**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 %	19.82495894	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal	0.00		Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup
Bounding			

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.00		1.00
Bounding	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: TRIGA STD 8.5/20  
 SNF ID #: 252  
 Fuel Units & Descr: 50 - ELEMENT  
 Heavy Metal Mass: BOL=9.37kg; EOL=9.07kg  
 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"  
 0.45

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	286.38	572.76	0.00E+00	2.44E-07	4.88E-07	Avg MeV	
Am-241	1.8331E-03	286.38	572.76	0.00E+00	5.25E-01	1.05E+00	0.0150	9.257E+13
Am-242m	1.4129E-06	286.38	572.76	0.00E+00	4.05E-04	8.09E-04	0.0250	2.037E+13
Am-243	1.4774E-07	286.38	572.76	0.00E+00	4.23E-05	8.46E-05	0.0375	1.735E+13
C-14	1.2871E-04	286.38	572.76	0.00E+00	3.69E-02	7.37E-02	0.0575	1.781E+13
Cl-36	2.8120E-06	286.38	572.76	0.00E+00	8.05E-04	1.61E-03	0.0850	1.103E+13
Cm-243	1.7940E-07	286.38	572.76	0.00E+00	5.14E-05	1.03E-04	0.1250	8.010E+12
Cm-244	1.6962E-06	286.38	572.76	0.00E+00	4.86E-04	9.72E-04	0.2250	9.357E+12
Co-60	1.2839E+00	286.38	572.76	0.00E+00	3.68E+02	7.35E+02	0.3750	4.749E+12
Cs-134	9.0541E-02	286.38	572.76	0.00E+00	2.59E+01	5.19E+01	0.5750	6.313E+13
Cs-135	3.2195E-05	286.38	572.76	0.00E+00	9.22E-03	1.84E-02	0.8500	2.709E+13
Cs-137	2.7564E+00	286.38	572.76	0.00E+00	7.89E+02	1.58E+03	1.2500	5.502E+13
Eu-154	1.5368E-02	286.38	572.76	0.00E+00	4.40E+00	8.80E+00	1.7500	3.668E+10
Eu-155	2.9293E-02	286.38	572.76	0.00E+00	8.39E+00	1.68E+01	2.2500	5.912E+10
Fe-55	7.7158E-01	286.38	572.76	0.00E+00	2.21E+02	4.42E+02	2.7500	4.691E+08
H-3	1.1111E-02	286.38	572.76	0.00E+00	3.18E+00	6.36E+00	3.5000	5.460E+07
I-129	7.3684E-07	286.38	572.76	0.00E+00	2.11E-04	4.22E-04	5.0000	3.060E+02
Kr-85	2.5263E-01	286.38	572.76	0.00E+00	7.23E+01	1.45E+02	7.0000	3.465E+01
Np-237	1.2427E-06	286.38	572.76	0.00E+00	3.56E-04	7.12E-04	11.0000	3.947E+00
Pa-231	3.8511E-09	286.38	572.76	0.00E+00	1.10E-06	2.21E-06		
Pb-210	7.3880E-15	286.38	572.76	0.00E+00	2.12E-12	4.23E-12		
Pm-147	2.1023E+00	286.38	572.76	0.00E+00	6.02E+02	1.20E+03		
Pu-238	1.0383E-03	286.38	572.76	0.00E+00	2.97E-01	5.95E-01		
Pu-239	5.5293E-03	286.38	572.76	0.00E+00	1.58E+00	3.17E+00		
Pu-240	2.1278E-03	286.38	572.76	0.00E+00	6.09E-01	1.22E+00		
Pu-241	1.0195E-01	286.38	572.76	0.00E+00	2.92E+01	5.84E+01		
Pu-242	2.3128E-07	286.38	572.76	0.00E+00	6.62E-05	1.32E-04		
Ra-226	5.2782E-14	286.38	572.76	0.00E+00	1.51E-11	3.02E-11		
Ra-228	1.9338E-10	286.38	572.76	0.00E+00	5.54E-08	1.11E-07		
Ru-106	9.1684E-02	286.38	572.76	0.00E+00	2.63E+01	5.25E+01		
Se-79	1.3018E-05	286.38	572.76	0.00E+00	3.73E-03	7.46E-03		
Sn-126	1.2167E-05	286.38	572.76	0.00E+00	3.48E-03	6.97E-03		
Sr-90	2.6045E+00	286.38	572.76	0.00E+00	7.46E+02	1.49E+03		
Tc-99	4.4241E-04	286.38	572.76	0.00E+00	1.27E-01	2.53E-01		
Th-229	1.3713E-10	286.38	572.76	0.00E+00	3.93E-08	7.85E-08		
Th-230	1.8090E-11	286.38	572.76	0.00E+00	5.18E-09	1.04E-08		
Th-232	2.5278E-10	286.38	572.76	0.00E+00	7.24E-08	1.45E-07		
Th-208	1.6947E-08	286.38	572.76	0.00E+00	4.85E-06	9.71E-06		
U-232	4.8737E-08	286.38	572.76	0.00E+00	1.40E-05	2.79E-05		
U-233	1.2203E-07	286.38	572.76	0.00E+00	3.49E-05	6.99E-05		
U-234	1.5925E-07	286.38	572.76	0.00E+00	4.56E-05	9.12E-05		
U-235	-2.6194E-06	286.38	0.00	3.95E-03	3.20E-03	3.95E-03		
U-236	1.2693E-05	286.38	572.76	0.00E+00	3.64E-03	7.27E-03		
U-238	-3.6331E-08	286.38	0.00	2.54E-03	2.53E-03	2.54E-03		
Y-90	2.6060E+00	286.38	572.76	0.00E+00	7.46E+02	1.49E+03		
Other Radionuclides					1.03E+03	2.06E+03		

**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 %	19.49184744	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	273.96	286.38	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		572.76	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal:	0.90	1.05	1.00
Bounding:	1.79		

<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 (IFE) ITALY  
 SNF ID # 929  
 Fuel Units & Descr 2 - ELEMENT  
 Heavy Metal Mass BOL=0.383kg EOL=0.372kg  
 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"  
 0.02

Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Actvity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3731E-09	13.06	26.13	0.00E+00	1.79E-08	3.59E-08	Avg MeV	
Am-241	2.3865E-03	13.06	26.13	0.00E+00	3.12E-02	6.24E-02	0.0150	3.376E+12
Am-242m	1.3812E-06	13.06	26.13	0.00E+00	1.80E-05	3.61E-05	0.0250	7.151E+11
Am-243	1.4767E-07	13.06	26.13	0.00E+00	1.93E-06	3.86E-06	0.0375	6.108E+11
C-14	1.2863E-04	13.06	26.13	0.00E+00	1.68E-03	3.36E-03	0.0575	6.510E+11
Cl-36	2.8120E-06	13.06	26.13	0.00E+00	3.67E-05	7.35E-05	0.0850	3.950E+11
Cm-243	1.5895E-07	13.06	26.13	0.00E+00	2.08E-06	4.15E-06	0.1250	2.596E+11
Cm-244	1.4008E-06	13.06	26.13	0.00E+00	1.83E-05	3.66E-05	0.2250	3.369E+11
Co-60	6.6541E-01	13.06	26.13	0.00E+00	8.69E+00	1.74E+01	0.3750	1.547E+11
Cs-134	1.6887E-02	13.06	26.13	0.00E+00	2.21E-01	4.41E-01	0.5750	2.424E+12
Cs-135	3.2195E-05	13.06	26.13	0.00E+00	4.21E-04	8.41E-04	0.8500	4.328E+10
Cs-137	2.4556E+00	13.06	26.13	0.00E+00	3.21E+01	6.42E+01	1.2500	1.301E+12
Eu-154	1.0268E-02	13.06	26.13	0.00E+00	1.34E-01	2.68E-01	1.7500	7.830E+08
Eu-155	1.4570E-02	13.06	26.13	0.00E+00	1.90E-01	3.81E-01	2.2500	4.090E+08
Fe-55	2.0361E-01	13.06	26.13	0.00E+00	2.66E+00	5.32E+00	2.7500	6.770E+05
H-3	8.3940E-03	13.06	26.13	0.00E+00	1.10E-01	2.19E-01	3.5000	8.022E+04
I-129	7.3684E-07	13.06	26.13	0.00E+00	9.63E-06	1.93E-05	5.0000	1.387E+01
Kr-85	1.8286E-01	13.06	26.13	0.00E+00	2.39E+00	4.78E+00	7.0000	1.569E+00
Np-237	1.2462E-06	13.06	26.13	0.00E+00	1.63E-05	3.26E-05	11.0000	1.787E-01
Pa-231	4.9143E-09	13.06	26.13	0.00E+00	6.42E-08	1.28E-07		
Pb-210	1.7173E-14	13.06	26.13	0.00E+00	2.24E-13	4.49E-13		
Pm-147	5.6165E-01	13.06	26.13	0.00E+00	7.34E+00	1.47E+01		
Pu-238	9.9820E-04	13.06	26.13	0.00E+00	1.30E-02	2.61E-02		
Pu-239	5.5293E-03	13.06	26.13	0.00E+00	7.22E-02	1.44E-01		
Pu-240	2.1263E-03	13.06	26.13	0.00E+00	2.78E-02	5.56E-02		
Pu-241	8.0165E-02	13.06	26.13	0.00E+00	1.05E+00	2.09E+00		
Pu-242	2.3128E-07	13.06	26.13	0.00E+00	3.02E-06	6.04E-06		
Ra-226	9.9774E-14	13.06	26.13	0.00E+00	1.30E-12	2.61E-12		
Ra-228	2.1729E-10	13.06	26.13	0.00E+00	2.84E-09	5.68E-09		
Ru-106	2.9519E-03	13.06	26.13	0.00E+00	3.86E-02	7.71E-02		
Se-79	1.3017E-05	13.06	26.13	0.00E+00	1.70E-04	3.40E-04		
Sn-126	1.2167E-05	13.06	26.13	0.00E+00	1.59E-04	3.18E-04		
Sr-90	2.3128E+00	13.06	26.13	0.00E+00	3.02E+01	6.04E+01		
Tc-99	4.4241E-04	13.06	26.13	0.00E+00	5.78E-03	1.16E-02		
Th-229	1.9459E-10	13.06	26.13	0.00E+00	2.54E-09	5.08E-09		
Th-230	2.5564E-11	13.06	26.13	0.00E+00	3.34E-10	6.68E-10		
Th-232	2.5278E-10	13.06	26.13	0.00E+00	3.30E-09	6.60E-09		
Ti-208	1.6947E-08	13.06	26.13	0.00E+00	2.21E-07	4.43E-07		
U-232	4.6812E-08	13.06	26.13	0.00E+00	6.12E-07	1.22E-06		
U-233	1.2206E-07	13.06	26.13	0.00E+00	1.59E-06	3.19E-06		
U-234	1.7323E-07	13.06	26.13	0.00E+00	2.26E-06	4.53E-06		
U-235	-2.6194E-06	13.06	0.00	1.66E-04	1.32E-04	1.66E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2693E-05	13.06	26.13	0.00E+00	1.66E-04	3.32E-04	5.12E-01	1.02E+00
U-238	-3.6331E-08	13.06	0.00	1.03E-04	1.02E-04	1.03E-04	Total	Total
Y-90	2.3128E+00	13.06	26.13	0.00E+00	3.02E+01	6.04E+01		

Other Radionuclides

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

**Template Selection Summary**

Reactor Moderator	From SFD LW AND U ZIRC HYDRIDE	Used LW AND U ZIRC HYDRIDE	Basis for Parameter Differences This Template was used for the following reasons This fuel matches on all parameters except enrichment (very close to 20%)
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20.10443864	10 to 20.1	

**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	13.06	10.50	
Bounding		26.13	

**Checks**

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 0.99
Nominal	1.00	0.80	
Bounding	2.00		

<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 (IFE) OSU  
 SNF ID #: 1040  
 Fuel Units & Descr: 2 - ELEMENT  
 Heavy Metal Mass: BOL=0.39kg; EOL=0.38kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2025  
 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"  
 0.02

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	9.55	19.09	0.00E+00	8.13E-09	1.63E-08	0.0150	3.086E+12
Am-241	1.8331E-03	9.55	19.09	0.00E+00	1.75E-02	3.50E-02	0.0250	6.790E+11
Am-242m	1.4129E-06	9.55	19.09	0.00E+00	1.35E-05	2.70E-05	0.0375	5.782E+11
Am-243	1.4774E-07	9.55	19.09	0.00E+00	1.41E-06	2.82E-06	0.0575	5.935E+11
C-14	1.2871E-04	9.55	19.09	0.00E+00	1.23E-03	2.46E-03	0.0850	3.677E+11
Cf-254	2.8120E-06	9.55	19.09	0.00E+00	2.68E-05	5.37E-05	0.1250	2.670E+11
Cm-243	1.7940E-07	9.55	19.09	0.00E+00	1.71E-06	3.43E-06	0.2250	3.119E+11
Cm-244	1.6962E-06	9.55	19.09	0.00E+00	1.62E-05	3.24E-05	0.3750	1.583E+11
Co-60	1.2839E+00	9.55	19.09	0.00E+00	1.23E+01	2.45E+01	0.5750	2.104E+12
Cs-134	9.0541E-02	9.55	19.09	0.00E+00	8.64E-01	1.73E+00	0.8500	9.031E+10
Cs-135	3.2195E-05	9.55	19.09	0.00E+00	3.07E-04	6.15E-04	1.2500	1.834E+12
Cs-137	2.7564E+00	9.55	19.09	0.00E+00	2.63E+01	5.26E+01	1.7500	1.223E+09
Eu-154	1.5368E-02	9.55	19.09	0.00E+00	1.47E-01	2.93E-01	2.2500	1.971E+09
Eu-155	2.9293E-02	9.55	19.09	0.00E+00	2.80E-01	5.59E-01	2.7500	1.564E+07
Fe-55	7.7158E-01	9.55	19.09	0.00E+00	7.37E+00	1.47E+01	3.5000	1.820E+06
H-3	1.1111E-02	9.55	19.09	0.00E+00	1.06E-01	2.12E-01	5.0000	1.025E+01
I-129	7.3684E-07	9.55	19.09	0.00E+00	7.03E-06	1.41E-05	7.0000	1.160E+00
Kr-85	2.5263E-01	9.55	19.09	0.00E+00	2.41E+00	4.82E+00	11.0000	1.322E-01
Np-237	1.2427E-06	9.55	19.09	0.00E+00	1.19E-05	2.37E-05		
Pa-231	3.8511E-09	9.55	19.09	0.00E+00	3.68E-08	7.35E-08		
Pb-210	7.3880E-15	9.55	19.09	0.00E+00	7.05E-14	1.41E-13		
Pm-147	2.1023E+00	9.55	19.09	0.00E+00	2.01E+01	4.01E+01		
Pu-238	1.0383E-03	9.55	19.09	0.00E+00	9.91E-03	1.98E-02		
Pu-239	5.5293E-03	9.55	19.09	0.00E+00	5.28E-02	1.06E-01		
Pu-240	2.1278E-03	9.55	19.09	0.00E+00	2.03E-02	4.06E-02		
Pu-241	1.0195E-01	9.55	19.09	0.00E+00	9.73E-01	1.95E+00		
Pu-242	2.3128E-07	9.55	19.09	0.00E+00	2.21E-06	4.42E-06		
Ra-226	5.2782E-14	9.55	19.09	0.00E+00	5.04E-13	1.01E-12		
Ra-228	1.9338E-10	9.55	19.09	0.00E+00	1.85E-09	3.69E-09		
Ru-106	9.1684E-02	9.55	19.09	0.00E+00	8.75E-01	1.75E+00		
Se-79	1.3018E-05	9.55	19.09	0.00E+00	1.24E-04	2.49E-04		
Sn-126	1.2167E-05	9.55	19.09	0.00E+00	1.16E-04	2.32E-04		
Sr-90	2.6045E+00	9.55	19.09	0.00E+00	2.49E+01	4.97E+01		
Tc-99	4.4241E-04	9.55	19.09	0.00E+00	4.22E-03	8.45E-03		
Th-229	1.3713E-10	9.55	19.09	0.00E+00	1.31E-09	2.62E-09		
Th-230	1.8090E-11	9.55	19.09	0.00E+00	1.73E-10	3.45E-10		
Th-232	2.5278E-10	9.55	19.09	0.00E+00	2.41E-09	4.83E-09		
Tl-208	1.6947E-08	9.55	19.09	0.00E+00	1.62E-07	3.24E-07		
U-232	4.8737E-08	9.55	19.09	0.00E+00	4.65E-07	9.30E-07		
U-233	1.2203E-07	9.55	19.09	0.00E+00	1.16E-06	2.33E-06		
U-234	1.5925E-07	9.55	19.09	0.00E+00	1.52E-06	3.04E-06		
U-235	-2.6194E-06	9.55	0.00	1.68E-04	1.43E-04	1.68E-04		
U-236	1.2693E-05	9.55	19.09	0.00E+00	1.21E-04	2.42E-04		
U-238	-3.6331E-08	9.55	0.00	1.05E-04	1.05E-04	1.05E-04		
Y-90	2.6060E+00	9.55	19.09	0.00E+00	2.49E+01	4.98E+01		
Other Radionuclides					3.44E+01	6.88E+01		
							<b>Thermal Power</b>	
							<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>
							5.56E+01	1.11E+00
							<b>Total</b>	<b>Total</b>

**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 %	19.9	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	3.80	9.55	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		19.09	Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.72	2.51	1.00
Bounding	1.44		

<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 (IFE) U OF AZ	Fuel decay start date	1998
SNF ID #:	972	Estimates as of	2010
Fuel Units & Descr:	1 - ELEMENT	Template	TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=0 195kg, EOL=0 188kg	Template Burnup(MWd)	6.65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0.000195
		Template Decay Time	10 years

Estimated  
Canister usage  
18"x10"  
0.01

Radionuclide	m		x <sub>n</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	Total Photons/sec (bounding)	Avg MeV			
Ac-227	1.3731E-09	6.68	13.36	0.00E+00	9.18E-09	1.84E-08						
Am-241	2.3865E-03	6.68	13.36	0.00E+00	1.59E-02	3.19E-02						
Am-242m	1.3912E-06	6.68	13.36	0.00E+00	9.23E-06	1.85E-05						
Am-243	1.4767E-07	6.68	13.36	0.00E+00	9.87E-07	1.97E-06						
C-14	1.2863E-04	6.68	13.36	0.00E+00	8.60E-04	1.72E-03						
Cl-36	2.8120E-06	6.68	13.36	0.00E+00	1.88E-05	3.76E-05						
Cm-243	1.5895E-07	6.68	13.36	0.00E+00	1.06E-06	2.12E-06						
Cm-244	1.4008E-06	6.68	13.36	0.00E+00	9.36E-06	1.87E-05						
Co-60	6.6541E-01	6.68	13.36	0.00E+00	4.45E+00	8.89E+00						
Cs-134	1.6887E-02	6.68	13.36	0.00E+00	1.13E-01	2.26E-01						
Cs-135	3.2195E-05	6.68	13.36	0.00E+00	2.15E-04	4.30E-04						
Cs-137	2.4556E+00	6.68	13.36	0.00E+00	1.64E+01	3.28E+01						
Eu-154	1.0268E-02	6.68	13.36	0.00E+00	6.86E-02	1.37E-01						
Eu-155	1.4570E-02	6.68	13.36	0.00E+00	9.74E-02	1.95E-01						
Fe-55	2.0361E-01	6.68	13.36	0.00E+00	1.36E+00	2.72E+00						
H-3	8.3940E-03	6.68	13.36	0.00E+00	5.61E-02	1.12E-01						
I-129	7.3684E-07	6.68	13.36	0.00E+00	4.92E-06	9.85E-06						
Kr-85	1.8286E-01	6.68	13.36	0.00E+00	1.22E+00	2.44E+00						
Np-237	1.2462E-06	6.68	13.36	0.00E+00	8.33E-06	1.67E-05						
Pa-231	4.9143E-09	6.68	13.36	0.00E+00	3.28E-08	6.57E-08						
Pb-210	1.7173E-14	6.68	13.36	0.00E+00	1.15E-13	2.30E-13						
Pm-147	5.6165E-01	6.68	13.36	0.00E+00	3.75E+00	7.51E+00						
Pu-238	9.9820E-04	6.68	13.36	0.00E+00	6.67E-03	1.33E-02						
Pu-239	5.5293E-03	6.68	13.36	0.00E+00	3.69E-02	7.39E-02						
Pu-240	2.1263E-03	6.68	13.36	0.00E+00	1.42E-02	2.84E-02						
Pu-241	8.0165E-02	6.68	13.36	0.00E+00	5.36E-01	1.07E+00						
Pu-242	2.3128E-07	6.68	13.36	0.00E+00	1.55E-06	3.09E-06						
Ra-226	9.9774E-14	6.68	13.36	0.00E+00	6.67E-13	1.33E-12						
Ra-228	2.1729E-10	6.68	13.36	0.00E+00	1.45E-09	2.90E-09						
Ru-106	2.9519E-03	6.68	13.36	0.00E+00	1.97E-02	3.95E-02						
Sa-79	1.3017E-05	6.68	13.36	0.00E+00	8.70E-05	1.74E-04						
Sn-126	1.2167E-05	6.68	13.36	0.00E+00	8.13E-05	1.63E-04						
Sr-90	2.3128E+00	6.68	13.36	0.00E+00	1.55E+01	3.09E+01						
Tc-99	4.4241E-04	6.68	13.36	0.00E+00	2.96E-03	5.91E-03						
Th-229	1.9459E-10	6.68	13.36	0.00E+00	1.30E-09	2.60E-09						
Th-230	2.5564E-11	6.68	13.36	0.00E+00	1.71E-10	3.42E-10						
Th-232	2.5278E-10	6.68	13.36	0.00E+00	1.69E-09	3.38E-09						
Ti-208	1.6947E-08	6.68	13.36	0.00E+00	1.13E-07	2.26E-07						
U-232	4.6812E-08	6.68	13.36	0.00E+00	3.13E-07	6.26E-07						
U-233	1.2206E-07	6.68	13.36	0.00E+00	8.16E-07	1.63E-06						
U-234	1.7323E-07	6.68	13.36	0.00E+00	1.16E-06	2.32E-06						
U-235	-2.6194E-06	6.68	0.00	8.43E-05	6.68E-05	8.43E-05						
U-236	1.2693E-05	6.68	13.36	0.00E+00	8.48E-05	1.70E-04						
U-238	-3.6331E-08	6.68	0.00	5.24E-05	5.22E-05	5.24E-05						
Y-90	2.3128E+00	6.68	13.36	0.00E+00	1.55E+01	3.09E+01						
Other Radionuclides					1.64E+01	3.28E+01						

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.62E-01	5.23E-01
Total	Total

**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	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	1.90	6.68	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		13.36	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.00	3.52	1.00
Bounding	2.01		

<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: TRIGA STD 8.5/20 (IFE) U OF AZ  
 SNF ID #: 973  
 Fuel Units & Descr: 2 - ELEMENT  
 Heavy Metal Mass: BOL=0.39kg; EOL=0.378kg  
 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 02

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
	Cu/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Actvity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	11 46	22 91	0 00E+00	9 76E-09	1 95E-08	Avg MeV	
Am-241	1 8331E-03	11 46	22 91	0 00E+00	2 10E-02	4 20E-02	0 0150	3 703E+12
Am-242m	1 4129E-06	11 46	22 91	0 00E+00	1 62E-05	3 24E-05	0 0250	8 148E+11
Am-243	1 4774E-07	11 46	22 91	0 00E+00	1 69E-06	3 38E-06	0 0375	6 939E+11
C-14	1 2871E-04	11 46	22 91	0 00E+00	1 47E-03	2 95E-03	0 0575	7 122E+11
Cl-36	2 8120E-06	11 46	22 91	0 00E+00	3 22E-05	6 44E-05	0 0850	4 412E+11
Cm-243	1 7940E-07	11 46	22 91	0 00E+00	2 06E-06	4 11E-06	0 1250	3 204E+11
Cm-244	1 6962E-06	11 46	22 91	0 00E+00	1 94E-05	3 89E-05	0 2250	3 743E+11
Co-60	1 2839E+00	11 46	22 91	0 00E+00	1 47E+01	2 94E+01	0 3750	1 899E+11
Cs-134	9 0541E-02	11 46	22 91	0 00E+00	1 04E+00	2 07E+00	0 5750	2 525E+12
Cs-135	3 2195E-05	11 46	22 91	0 00E+00	3 69E-04	7 38E-04	0 8500	1 084E+11
Cs-137	2 7564E+00	11 46	22 91	0 00E+00	3 16E+01	6 32E+01	1 2500	2 201E+12
Eu-154	1 5368E-02	11 46	22 91	0 00E+00	1 76E-01	3 52E-01	1 7500	1 467E+09
Eu-155	2 9293E-02	11 46	22 91	0 00E+00	3 36E-01	6 71E-01	2 2500	2 365E+09
Fe-55	7 7158E-01	11 46	22 91	0 00E+00	8 84E+00	1 77E+01	2 7500	1 877E+07
H-3	1 1111E-02	11 46	22 91	0 00E+00	1 27E-01	2 55E-01	3 5000	2 184E+06
I-129	7 3684E-07	11 46	22 91	0 00E+00	8 44E-06	1 69E-05	5 0000	1 225E+01
Kr-85	2 5263E-01	11 46	22 91	0 00E+00	2 89E+00	5 79E+00	7 0000	1 387E+00
Np-237	1 2427E-06	11 46	22 91	0 00E+00	1 42E-05	2 85E-05	11 0000	1 580E-01
Pa-231	3 8511E-09	11 46	22 91	0 00E+00	4 41E-08	8 82E-08		
Pb-210	7 3880E-15	11 46	22 91	0 00E+00	8 46E-14	1 69E-13		
Pm-147	2 1023E+00	11 46	22 91	0 00E+00	2 41E+01	4 82E+01		
Pu-238	1 0383E-03	11 46	22 91	0 00E+00	1 19E-02	2 38E-02		
Pu-239	5 5293E-03	11 46	22 91	0 00E+00	6 33E-02	1 27E-01		
Pu-240	2 1278E-03	11 46	22 91	0 00E+00	2 44E-02	4 87E-02		
Pu-241	1 0195E-01	11 46	22 91	0 00E+00	1 17E+00	2 34E+00		
Pu-242	2 3128E-07	11 46	22 91	0 00E+00	2 65E-06	5 30E-06		
Ra-226	5 2782E-14	11 46	22 91	0 00E+00	6 05E-13	1 21E-12		
Ra-228	1 9338E-10	11 46	22 91	0 00E+00	2 22E-09	4 43E-09		
Ru-106	9 1684E-02	11 46	22 91	0 00E+00	1 05E+00	2 10E+00		
Se-79	1 3018E-05	11 46	22 91	0 00E+00	1 49E-04	2 98E-04		
Sn-126	1 2167E-05	11 46	22 91	0 00E+00	1 39E-04	2 79E-04		
Sr-90	2 6045E+00	11 46	22 91	0 00E+00	2 98E+01	5 97E+01		
Tc-99	4 4241E-04	11 46	22 91	0 00E+00	5 07E-03	1 01E-02		
Th-229	1 3713E-10	11 46	22 91	0 00E+00	1 57E-09	3 14E-09		
Th-230	1 8090E-11	11 46	22 91	0 00E+00	2 07E-10	4 14E-10		
Th-232	2 5278E-10	11 46	22 91	0 00E+00	2 90E-09	5 79E-09		
Tl-208	1 6947E-08	11 46	22 91	0 00E+00	1 94E-07	3 88E-07		
U-232	4 8737E-08	11 46	22 91	0 00E+00	5 58E-07	1 12E-06		
U-233	1 2203E-07	11 46	22 91	0 00E+00	1 40E-06	2 80E-06		
U-234	1 5925E-07	11 46	22 91	0 00E+00	1 82E-06	3 65E-06		
U-235	-2 6194E-06	11 46	0 00	1 69E-04	1 39E-04	1 69E-04		
U-236	1 2693E-05	11 46	22 91	0 00E+00	1 45E-04	2 91E-04		
U-238	-3 6331E-08	11 46	0 00	1 05E-04	1 04E-04	1 05E-04		
Y-90	2 6060E+00	11 46	22 91	0 00E+00	2 99E+01	5 97E+01		
Other Radionuclides					4 13E+01	8 26E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6 67E-01	1 33E+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 %	20	10 to 20 1

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal	1 90	11 46
Bounding		22 91

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 85	6 03
Bounding	1 72	

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 (IFE) U OF IL  
 SNF ID #: 1048  
 Fuel Units & Descr: 8 - ELEMENT  
 Heavy Metal Mass BOL=1.56kg, EOL=1.52kg  
 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"  
 0.07

Radionuclide	m		x <sub>a</sub>		x <sub>b</sub>		b		y <sub>a</sub>		y <sub>b</sub>		Gamma Sources	
	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)	Avg MeV					
Ac-227	8.5173E-10	38.18	76.37	0.00E+00	3.25E-08	6.50E-08	0.0150	1.234E+13	0.0150					
Am-241	1.8331E-03	38.18	76.37	0.00E+00	7.00E-02	1.40E-01	0.0250	2.716E+12	0.0250					
Am-242m	1.4129E-06	38.18	76.37	0.00E+00	5.40E-05	1.08E-04	0.0375	2.313E+12	0.0375					
Am-243	1.4774E-07	38.18	76.37	0.00E+00	5.64E-06	1.13E-05	0.0575	2.374E+12	0.0575					
C-14	1.2871E-04	38.18	76.37	0.00E+00	4.91E-03	9.83E-03	0.0850	1.471E+12	0.0850					
Cl-36	2.8120E-06	38.18	76.37	0.00E+00	4.91E-03	9.83E-03	0.1250	1.068E+12	0.1250					
Cm-243	1.7940E-07	38.18	76.37	0.00E+00	6.85E-06	1.37E-05	0.2250	1.248E+12	0.2250					
Cm-244	1.6962E-06	38.18	76.37	0.00E+00	6.48E-05	1.30E-04	0.3750	6.331E+11	0.3750					
Co-60	1.2839E+00	38.18	76.37	0.00E+00	4.90E+01	9.81E+01	0.5750	8.417E+12	0.5750					
Cs-134	9.0541E-02	38.18	76.37	0.00E+00	3.46E+00	6.91E+00	0.8500	3.613E+11	0.8500					
Cs-135	3.2195E-05	38.18	76.37	0.00E+00	1.23E-03	2.46E-03	1.2500	7.336E+12	1.2500					
Cs-137	2.7564E+00	38.18	76.37	0.00E+00	1.05E+02	2.11E+02	1.7500	4.890E+09	1.7500					
Eu-154	1.5368E-02	38.18	76.37	0.00E+00	5.87E-01	1.17E+00	2.2500	7.883E+09	2.2500					
Eu-155	2.9293E-02	38.18	76.37	0.00E+00	1.12E+00	2.24E+00	2.7500	6.255E+07	2.7500					
Fe-55	7.7158E-01	38.18	76.37	0.00E+00	2.95E+01	5.89E+01	3.5000	7.280E+06	3.5000					
H-3	1.1111E-02	38.18	76.37	0.00E+00	4.24E-01	8.49E-01	5.0000	4.099E+01	5.0000					
I-129	7.3684E-07	38.18	76.37	0.00E+00	2.81E-05	5.63E-05	7.0000	4.641E+00	7.0000					
Kr-85	2.5263E-01	38.18	76.37	0.00E+00	9.65E+00	1.93E+01	11.0000	5.288E-01	11.0000					
Np-237	1.2427E-06	38.18	76.37	0.00E+00	4.75E-05	9.49E-05								
Pa-231	3.8511E-09	38.18	76.37	0.00E+00	1.47E-07	2.94E-07								
Pb-210	7.3880E-15	38.18	76.37	0.00E+00	2.82E-13	5.64E-13								
Pm-147	2.1023E+00	38.18	76.37	0.00E+00	8.03E+01	1.61E+02								
Pu-238	1.0383E-03	38.18	76.37	0.00E+00	3.96E-02	7.93E-02								
Pu-239	5.5293E-03	38.18	76.37	0.00E+00	2.11E-01	4.22E-01								
Pu-240	2.1278E-03	38.18	76.37	0.00E+00	8.12E-02	1.62E-01								
Pu-241	1.0195E-01	38.18	76.37	0.00E+00	3.89E+00	7.79E+00								
Pu-242	2.3128E-07	38.18	76.37	0.00E+00	8.83E-06	1.77E-05								
Ra-226	5.2782E-14	38.18	76.37	0.00E+00	2.02E-12	4.03E-12								
Ra-228	1.9338E-10	38.18	76.37	0.00E+00	7.38E-09	1.48E-08								
Ru-106	9.1684E-02	38.18	76.37	0.00E+00	3.50E+00	7.00E+00								
Se-79	1.3018E-05	38.18	76.37	0.00E+00	4.97E-04	9.94E-04								
Sn-126	1.2167E-05	38.18	76.37	0.00E+00	4.65E-04	9.29E-04								
Sr-90	2.6045E+00	38.18	76.37	0.00E+00	9.95E+01	1.99E+02								
Tc-99	4.4241E-04	38.18	76.37	0.00E+00	1.69E-02	3.38E-02								
Th-229	1.3713E-10	38.18	76.37	0.00E+00	5.24E-09	1.05E-08								
Th-230	1.8090E-11	38.18	76.37	0.00E+00	6.91E-10	1.38E-09								
Th-232	2.5278E-10	38.18	76.37	0.00E+00	9.65E-09	1.93E-08								
Th-208	1.6947E-08	38.18	76.37	0.00E+00	6.47E-07	1.29E-06								
U-232	4.8737E-08	38.18	76.37	0.00E+00	1.86E-06	3.72E-06								
U-233	1.2203E-07	38.18	76.37	0.00E+00	4.66E-06	9.32E-06								
U-234	1.5925E-07	38.18	76.37	0.00E+00	6.08E-06	1.22E-05								
U-235	-2.6194E-06	38.18	0.00	6.74E-04	5.74E-04	6.74E-04								
U-236	1.2693E-05	38.18	76.37	0.00E+00	4.85E-04	9.69E-04								
U-238	-3.6331E-08	38.18	0.00	4.19E-04	4.18E-04	4.19E-04								
Y-90	2.6060E+00	38.18	76.37	0.00E+00	9.95E+01	1.99E+02								
Other Radionuclides														

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.22E+00	4.44E+00
Total	Total

**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	
	20	10 to 20.1	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal	30.41	38.18	
Bounding		76.37	

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.72	1.26	
Bounding	1.44		

\*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 STD 8.520 (IFE) UNIV OF CAL-IRVINE  
 SNF ID #: 824  
 Fuel Units & Descr: 5 - ELEMENT  
 Heavy Metal Mass: BOL=0.916kg; EOL=0.916kg  
 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"  
 0.05

**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</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	Total Photons/sec (bounding)
Ac-227	8.5173E-10	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Am-241	1.8331E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	Avg. MeV	
Am-242m	1.4129E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0150	9.804E+06
Am-243	1.4774E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0250	0.000E+00
C-14	1.2871E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0375	1.338E+04
Cl-36	2.8120E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0575	8.107E+03
Cm-243	1.7940E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0850	1.143E+06
Cm-244	1.6962E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.1250	2.257E+06
Co-60	1.2839E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.2250	7.988E+06
Cs-134	9.0541E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.3750	1.993E+04
Cs-135	3.2195E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.5750	9.805E+02
Cs-137	2.7564E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.8500	1.528E+02
Eu-154	1.5368E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.2500	9.009E+00
Eu-155	2.9293E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.7500	4.408E+00
Fe-55	7.7158E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.2500	2.553E+00
H-3	1.1111E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.7500	1.484E+00
I-129	7.3684E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	3.5000	1.326E+00
Kr-85	2.5263E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	5.0000	5.698E-01
Np-237	1.2427E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	7.0000	6.559E-02
Pa-231	3.8511E-09	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	11.0000	7.541E-03
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		
Ti-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	3.96E-04	3.96E-04	3.96E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2693E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.66E-05	1.66E-05
U-238	-3.6331E-08	0.00	0.00	2.46E-04	2.46E-04	2.46E-04	Total	Total
Y-90	2.6060E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Other Radionuclides								

**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 %	19.99996708	10 to 20.1	

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

	From SFD	Estimated	Basis for burnup used in estimate.
Nominal	0.00		Nominal burnup taken directly from SFD (converted to MWd)
Bounding			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 TRIGA STD 8 5/20 (IFE) UNIV OF CAL-IRVINE <sup>1</sup>Fuel decay start date: 2035  
 SNF ID #: 1051 Estimates as of 2010  
 Fuel Units & Descr: 1 - ELEMENT Template TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
 Heavy Metal Mass BOL=0.192kg: EOL=0.19kg <sup>2</sup>Template Burnup(MWd) 6.65  
 ROD Storage Site INEEL Template BOL Heavy Metal Mass (MT) 0.000195  
 Template Decay Time 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.01

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	1.87	3.73	0.00E+00	1.59E-09	3.18E-09	Avg MeV	
Am-241	1.8331E-03	1.87	3.73	0.00E+00	3.42E-03	6.85E-03	0.0150	6.036E+11
Am-242m	1.4129E-06	1.87	3.73	0.00E+00	2.64E-06	5.28E-06	0.0250	1.328E+11
Am-243	1.4774E-07	1.87	3.73	0.00E+00	2.76E-07	5.52E-07	0.0375	1.131E+11
C-14	1.2871E-04	1.87	3.73	0.00E+00	2.40E-04	4.81E-04	0.0575	1.161E+11
Cf-252	2.8120E-06	1.87	3.73	0.00E+00	5.25E-06	1.05E-05	0.0850	7.192E+10
Cm-243	1.7940E-07	1.87	3.73	0.00E+00	3.35E-07	6.70E-07	0.1250	5.223E+10
Cm-244	1.6962E-06	1.87	3.73	0.00E+00	3.17E-06	6.33E-06	0.2250	6.101E+10
Co-60	1.2839E+00	1.87	3.73	0.00E+00	2.40E+00	4.79E+00	0.3750	3.096E+10
Cs-134	9.0541E-02	1.87	3.73	0.00E+00	1.69E-01	3.38E-01	0.5750	4.116E+11
Cs-135	3.2195E-05	1.87	3.73	0.00E+00	6.01E-05	1.20E-04	0.8500	5.767E+10
Cs-137	2.7564E+00	1.87	3.73	0.00E+00	5.15E+00	1.03E+01	1.2500	3.588E+11
Eu-154	1.5368E-02	1.87	3.73	0.00E+00	2.87E-02	5.74E-02	1.7500	2.392E+08
Eu-155	2.9293E-02	1.87	3.73	0.00E+00	5.47E-02	1.09E-01	2.2500	3.855E+08
Fe-55	7.7158E-01	1.87	3.73	0.00E+00	1.44E+00	2.88E+00	2.7500	3.059E+06
H-3	1.1111E-02	1.87	3.73	0.00E+00	2.07E-02	4.15E-02	3.5000	3.560E+05
I-129	7.3684E-07	1.87	3.73	0.00E+00	1.38E-06	2.75E-06	5.0000	2.076E+00
Kr-85	2.5263E-01	1.87	3.73	0.00E+00	4.72E-01	9.43E-01	7.0000	2.352E-01
Np-237	1.2427E-06	1.87	3.73	0.00E+00	2.32E-06	4.64E-06	11.0000	2.681E-02
Pa-231	3.8511E-09	1.87	3.73	0.00E+00	7.19E-09	1.44E-08		
Pb-210	7.3880E-15	1.87	3.73	0.00E+00	1.38E-14	2.76E-14		
Pm-147	2.1023E+00	1.87	3.73	0.00E+00	3.93E+00	7.85E+00		
Pu-238	1.0383E-03	1.87	3.73	0.00E+00	1.94E-03	3.88E-03		
Pu-239	5.5293E-03	1.87	3.73	0.00E+00	1.03E-02	2.07E-02		
Pu-240	2.1278E-03	1.87	3.73	0.00E+00	3.97E-03	7.95E-03		
Pu-241	1.0195E-01	1.87	3.73	0.00E+00	1.90E-01	3.81E-01		
Pu-242	2.3128E-07	1.87	3.73	0.00E+00	4.32E-07	8.64E-07		
Ra-226	5.2782E-14	1.87	3.73	0.00E+00	9.86E-14	1.97E-13		
Ra-228	1.9338E-10	1.87	3.73	0.00E+00	3.61E-10	7.22E-10		
Ru-106	9.1684E-02	1.87	3.73	0.00E+00	1.71E-01	3.42E-01		
Se-79	1.3018E-05	1.87	3.73	0.00E+00	2.43E-05	4.86E-05		
Sn-126	1.2167E-05	1.87	3.73	0.00E+00	2.27E-05	4.54E-05		
Sr-90	2.6045E+00	1.87	3.73	0.00E+00	4.86E+00	9.73E+00		
Tc-99	4.4241E-04	1.87	3.73	0.00E+00	8.26E-04	1.65E-03		
Th-229	1.3713E-10	1.87	3.73	0.00E+00	2.56E-10	5.12E-10		
Th-230	1.8090E-11	1.87	3.73	0.00E+00	3.38E-11	6.76E-11		
Th-232	2.5278E-10	1.87	3.73	0.00E+00	4.72E-10	9.44E-10		
Ti-208	1.6947E-08	1.87	3.73	0.00E+00	3.16E-08	6.33E-08		
U-232	4.8737E-08	1.87	3.73	0.00E+00	9.10E-08	1.82E-07		
U-233	1.2203E-07	1.87	3.73	0.00E+00	2.28E-07	4.56E-07		
U-234	1.5925E-07	1.87	3.73	0.00E+00	2.97E-07	5.95E-07		
U-235	-2.6194E-06	1.87	0.00	8.28E-05	7.79E-05	8.28E-05		
U-236	1.2693E-05	1.87	3.73	0.00E+00	2.37E-05	4.74E-05		
U-238	-3.6331E-08	1.87	0.00	5.15E-05	5.14E-05	5.15E-05		
Y-90	2.6060E+00	1.87	3.73	0.00E+00	4.87E+00	9.73E+00		
Other Radionuclides					6.73E+00	1.35E+01		

**Thermal Power**  
 Nominal Heat Output (Watts) 1.09E-01  
 Bounding Heat Output (Watts) 2.17E-01  
 Total Total

**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 %	20.00002088	10 to 20.1	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate <sup>2</sup>
	From SFD	Estimated	
Nominal	1.87	1.43	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		3.73	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	1.00
Bounding	0.57		

<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 STD 8 5/20 AFRR1  
 SNF ID # 250  
 Fuel Units & Descr: 95 - ELEMENT  
 Heavy Metal Mass: BOL=18.525kg, EOL=18 012kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2019  
 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 86

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	489 71	979 43	0 00E+00	4 17E-07	8 34E-07	Avg MeV	
Am-241	1 8331E-03	489 71	979 43	0 00E+00	8 98E-01	1 80E+00	0 0150	1 583E+14
Am-242m	1 4129E-06	489 71	979 43	0 00E+00	6 92E-04	1 38E-03	0 0250	3 483E+13
Am-243	1 4774E-07	489 71	979 43	0 00E+00	7 24E-05	1 45E-04	0 0375	2 966E+13
C-14	1 2871E-04	489 71	979 43	0 00E+00	6 30E-02	1 26E-01	0 0575	3 045E+13
Cl-36	2 8120E-06	489 71	979 43	0 00E+00	1 38E-03	2 75E-03	0 0850	1 886E+13
Cm-243	1 7940E-07	489 71	979 43	0 00E+00	8 79E-05	1 76E-04	0 1250	1 370E+13
Cm-244	1 6962E-06	489 71	979 43	0 00E+00	8 31E-04	1 66E-03	0 2250	1 600E+13
Co-60	1 2839E+00	489 71	979 43	0 00E+00	6 29E+02	1 26E+03	0 3750	8 120E+12
Cs-134	9 0541E-02	489 71	979 43	0 00E+00	4 43E+01	8 87E+01	0 5750	1 080E+14
Cs-135	3 2195E-05	489 71	979 43	0 00E+00	1 58E-02	3 15E-02	0 8500	4 633E+12
Cs-137	2 7564E+00	489 71	979 43	0 00E+00	1 35E+03	2 70E+03	1 2500	9 409E+13
Eu-154	1 5368E-02	489 71	979 43	0 00E+00	7 53E+00	1 51E+01	1 7500	6 272E+10
Eu-155	2 9293E-02	489 71	979 43	0 00E+00	1 43E+01	2 87E+01	2 2500	1 011E+11
Fe-55	7 7158E-01	489 71	979 43	0 00E+00	3 78E+02	7 56E+02	2 7500	8 022E+08
H-3	1 1111E-02	489 71	979 43	0 00E+00	5 44E+00	1 09E+01	3 5000	9 336E+07
I-129	7 3684E-07	489 71	979 43	0 00E+00	3 61E-04	7 22E-04	5 0000	5 248E+02
Kr-85	2 5263E-01	489 71	979 43	0 00E+00	1 24E+02	2 47E+02	7 0000	5 942E+01
Np-237	1 2427E-06	489 71	979 43	0 00E+00	6 09E-04	1 22E-03	11 0000	6 769E+00
Pa-231	3 8511E-09	489 71	979 43	0 00E+00	1 89E-06	3 77E-06		
Pb-210	7 3880E-15	489 71	979 43	0 00E+00	3 62E-12	7 24E-12		
Pm-147	2 1023E+00	489 71	979 43	0 00E+00	1 03E+03	2 06E+03		
Pu-238	1 0383E-03	489 71	979 43	0 00E+00	5 08E-01	1 02E+00		
Pu-239	5 5293E-03	489 71	979 43	0 00E+00	2 71E+00	5 42E+00		
Pu-240	2 1278E-03	489 71	979 43	0 00E+00	1 04E+00	2 08E+00		
Pu-241	1 0195E-01	489 71	979 43	0 00E+00	4 99E+01	9 99E+01		
Pu-242	2 3128E-07	489 71	979 43	0 00E+00	1 13E-04	2 27E-04		
Ra-226	5 2782E-14	489 71	979 43	0 00E+00	2 58E-11	5 17E-11		
Ra-228	1 9338E-10	489 71	979 43	0 00E+00	9 47E-08	1 89E-07		
Ru-106	9 1684E-02	489 71	979 43	0 00E+00	4 49E+01	8 98E+01		
Se-79	1 3018E-05	489 71	979 43	0 00E+00	6 38E-03	1 28E-02		
Sn-126	1 2167E-05	489 71	979 43	0 00E+00	5 96E-03	1 19E-02		
Sr-90	2 6045E+00	489 71	979 43	0 00E+00	1 28E+03	2 55E+03		
Tc-99	4 4241E-04	489 71	979 43	0 00E+00	2 17E-01	4 33E-01		
Th-229	1 3713E-10	489 71	979 43	0 00E+00	6 72E-08	1 34E-07		
Th-230	1 8090E-11	489 71	979 43	0 00E+00	8 86E-09	1 77E-08		
Th-232	2 5278E-10	489 71	979 43	0 00E+00	1 24E-07	2 48E-07		
Tl-208	1 6947E-08	489 71	979 43	0 00E+00	8 30E-06	1 66E-05		
U-232	4 8737E-08	489 71	979 43	0 00E+00	2 39E-05	4 77E-05		
U-233	1 2203E-07	489 71	979 43	0 00E+00	5 98E-05	1 20E-04		
U-234	1 5925E-07	489 71	979 43	0 00E+00	7 80E-05	1 56E-04		
U-235	-2 6194E-06	489 71	0 00	8 01E-03	6 72E-03	8 01E-03		
U-236	1 2693E-05	489 71	979 43	0 00E+00	6 22E-03	1 24E-02		
U-238	-3 6331E-08	489 71	0 00	4 98E-03	4 96E-03	4 98E-03		
Y-90	2 6060E+00	489 71	979 43	0 00E+00	1 28E+03	2 55E+03		
Other Radionuclides					1 77E+03	3 53E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.85E+01	5.70E+01
Total	Total

**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	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	90.27	489 71	
Bounding		979 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	0.78	5.42	
Bounding	1.55		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 ANL-W  
 SNF ID #: 353  
 Fuel Units & Descr: 2 - ELEMENT  
 Heavy Metal Mass BOL=0 39kg EOL=0 17kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1994  
 Estimates as of 2010  
 Template TRIGA-SS (LWAU-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\* 15 years

Estimated  
 Canister usage  
 18"x10"  
 0.02

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.9744E-09	209.82	372.30	0.00E+00	4.14E-07	7.35E-07	Avg MeV	
Am-241	2.8150E-03	209.82	372.30	0.00E+00	5.91E-01	1.05E+00	0.0150	4.223E+13
Am-242m	1.3501E-06	209.82	372.30	0.00E+00	2.83E-04	5.03E-04	0.0250	8.827E+12
Am-243	1.4761E-07	209.82	372.30	0.00E+00	3.10E-05	5.50E-05	0.0375	7.620E+12
C-14	1.2854E-04	209.82	372.30	0.00E+00	2.70E-02	4.79E-02	0.0575	8.176E+12
Cl-36	2.8120E-06	209.82	372.30	0.00E+00	5.90E-04	1.05E-03	0.0850	4.945E+12
Cm-243	1.4075E-07	209.82	372.30	0.00E+00	2.95E-05	5.24E-05	0.1250	3.239E+12
Cm-244	1.1570E-06	209.82	372.30	0.00E+00	2.43E-04	4.31E-04	0.2250	4.234E+12
Co-60	3.4481E-01	209.82	372.30	0.00E+00	7.23E+01	1.28E+02	0.3750	1.877E+12
Cs-134	3.1474E-03	209.82	372.30	0.00E+00	6.60E-01	1.17E+00	0.5750	3.046E+13
Cs-135	3.2195E-05	209.82	372.30	0.00E+00	6.76E-03	1.20E-02	0.8500	3.853E+11
Cs-137	2.1880E-03	209.82	372.30	0.00E+00	4.59E+02	8.15E+02	1.2500	9.656E+12
Eu-154	6.8647E-03	209.82	372.30	0.00E+00	1.44E+00	2.56E+00	1.7500	9.200E+09
Eu-155	7.2481E-03	209.82	372.30	0.00E+00	1.52E+00	2.70E+00	2.2500	5.808E+07
Fe-55	5.3744E-02	209.82	372.30	0.00E+00	1.13E+01	2.00E+01	2.7500	6.581E+05
H-3	6.3414E-03	209.82	372.30	0.00E+00	1.33E+00	2.36E+00	3.5000	3.725E+04
I-129	7.3684E-07	209.82	372.30	0.00E+00	1.55E-04	2.74E-04	5.0000	1.940E+02
Kr-85	1.3236E-01	209.82	372.30	0.00E+00	2.78E+01	4.93E+01	7.0000	2.192E+01
Np-237	1.2504E-06	209.82	372.30	0.00E+00	2.62E-04	4.66E-04	11.0000	2.495E+00
Pa-231	5.9774E-09	209.82	372.30	0.00E+00	1.25E-06	2.23E-06		
Pb-210	3.3534E-14	209.82	372.30	0.00E+00	7.04E-12	1.25E-11		
Pm-147	1.5002E-01	209.82	372.30	0.00E+00	3.15E+01	5.59E+01		
Pu-238	9.5970E-04	209.82	372.30	0.00E+00	2.01E-01	3.57E-01		
Pu-239	5.5278E-03	209.82	372.30	0.00E+00	1.16E+00	2.06E+00		
Pu-240	2.1248E-03	209.82	372.30	0.00E+00	4.46E-01	7.91E-01		
Pu-241	6.3023E-02	209.82	372.30	0.00E+00	1.32E+01	2.35E+01		
Pu-242	2.3128E-07	209.82	372.30	0.00E+00	4.85E-05	8.61E-05		
Ra-226	1.6346E-13	209.82	372.30	0.00E+00	3.43E-11	6.09E-11		
Ra-228	2.3173E-10	209.82	372.30	0.00E+00	4.86E-08	8.63E-08		
Ru-106	9.5038E-05	209.82	372.30	0.00E+00	1.99E-02	3.54E-02		
Se-79	1.3017E-05	209.82	372.30	0.00E+00	2.73E-03	4.85E-03		
Sn-126	1.2165E-05	209.82	372.30	0.00E+00	2.55E-03	4.53E-03		
Sr-90	2.0541E+00	209.82	372.30	0.00E+00	4.31E+02	7.65E+02		
Tc-99	4.4241E-04	209.82	372.30	0.00E+00	9.28E-02	1.65E-01		
Th-229	2.5218E-10	209.82	372.30	0.00E+00	5.29E-08	9.39E-08		
Th-230	3.3654E-11	209.82	372.30	0.00E+00	7.06E-09	1.25E-08		
Th-232	2.5278E-10	209.82	372.30	0.00E+00	5.30E-08	9.41E-08		
Tl-208	1.6511E-08	209.82	372.30	0.00E+00	3.46E-06	6.15E-06		
U-232	4.4722E-08	209.82	372.30	0.00E+00	9.38E-06	1.66E-05		
U-233	1.2209E-07	209.82	372.30	0.00E+00	2.56E-05	4.55E-05		
U-234	1.8662E-07	209.82	372.30	0.00E+00	3.92E-05	6.95E-05		
U-235	-2.6194E-06	209.82	0.00	1.69E-04	0.00E+00	1.69E-04		
U-236	1.2693E-05	209.82	372.30	0.00E+00	2.66E-03	4.73E-03		
U-238	-3.6331E-08	209.82	0.00	1.05E-04	9.72E-05	1.05E-04		
Y-90	2.0541E+00	209.82	372.30	0.00E+00	4.31E+02	7.65E+02		
Other Radionuclides					4.54E+02	8.05E+02		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.40E+00	1.14E+01
Total	Total

**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	10 to 20.1

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate:
From SFD	Estimated	
Nominal	13.30	Nominal burnup calculated from the heavy metal mass destroyed
Bounding	15.99	Bounding burnup calculated assuming all BOL heavy metal burned

Checks		Estimated EOL HM/Given EOL HM
Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	15.78	2.07
Bounding	27.99	23.28

<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: TRIGA STD 8 5/20 ANL-W  
 SNF ID # 370  
 Fuel Units & Descr. 40 - ELEMENT  
 Heavy Metal Mass BOL=7 12kg; EOL=6 86kg  
 ROD Storage Site: INEEL

Fuel decay start date: 1994  
 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: 15 years

Estimated  
 Canister usage:  
 18"x10"  
 0 36

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 9744E-09	248 20	496 40	0 00E+00	4 90E-07	9 80E-07	Avg MeV	
Am-241	2 8150E-03	248 20	496 40	0 00E+00	6 99E-01	1 40E+00	0 0150	5 630E+13
Am-242m	1 3501E-06	248 20	496 40	0 00E+00	3 35E-04	6 70E-04	0 0250	1 177E+13
Am-243	1 4761E-07	248 20	496 40	0 00E+00	3 66E-05	7 33E-05	0 0375	1 016E+13
C-14	1 2854E-04	248 20	496 40	0 00E+00	3 19E-02	6 38E-02	0 0575	1 090E+13
Cl-36	2 8120E-06	248 20	496 40	0 00E+00	6 98E-04	1 40E-03	0 0850	6 594E+12
Cm-243	1 4075E-07	248 20	496 40	0 00E+00	3 49E-05	6 99E-05	0 1250	4 318E+12
Cm-244	1 1570E-06	248 20	496 40	0 00E+00	2 87E-04	5 74E-04	0 2250	5 646E+12
Co-60	3 4481E-01	248 20	496 40	0 00E+00	8 56E+01	1 71E+02	0 3750	2 503E+12
Cs-134	3 1474E-03	248 20	496 40	0 00E+00	7 81E-01	1 56E+00	0 5750	4 061E+13
Cs-135	3 2195E-05	248 20	496 40	0 00E+00	7 99E-03	1 60E-02	0 8500	5 138E+11
Cs-137	2 1880E+00	248 20	496 40	0 00E+00	5 43E+02	1 09E+03	1 2500	1 287E+13
Eu-154	6 8647E-03	248 20	496 40	0 00E+00	1 70E+00	3 41E+00	1 7500	1 227E+10
Eu-155	7 2481E-03	248 20	496 40	0 00E+00	1 80E+00	3 60E+00	2 2500	7 744E+07
Fe-55	5 3744E-02	248 20	496 40	0 00E+00	1 33E+01	2 67E+01	2 7500	8 774E+05
H-3	6 3414E-03	248 20	496 40	0 00E+00	1 57E+00	3 15E+00	3 5000	4 967E+04
I-129	7 3684E-07	248 20	496 40	0 00E+00	1 83E-04	3 66E-04	5 0000	2 628E+02
Kr-85	1 3236E-01	248 20	496 40	0 00E+00	3 29E+01	6 57E+01	7 0000	2 970E+01
Np-237	1 2504E-06	248 20	496 40	0 00E+00	3 10E-04	6 21E-04	11 0000	3 381E+00
Pa-231	5 9774E-09	248 20	496 40	0 00E+00	1 48E-06	2 97E-06		
Pb-210	3 3534E-14	248 20	496 40	0 00E+00	8 32E-12	1 66E-11		
Pm-147	1 5002E-01	248 20	496 40	0 00E+00	3 72E+01	7 45E+01		
Pu-238	9 5970E-04	248 20	496 40	0 00E+00	2 38E-01	4 76E-01		
Pu-239	5 5278E-03	248 20	496 40	0 00E+00	1 37E+00	2 74E+00		
Pu-240	2 1248E-03	248 20	496 40	0 00E+00	5 27E-01	1 05E+00		
Pu-241	6 3023E-02	248 20	496 40	0 00E+00	1 56E+01	3 13E+01		
Pu-242	2 3128E-07	248 20	496 40	0 00E+00	5 74E-05	1 15E-04		
Ra-226	1 6346E-13	248 20	496 40	0 00E+00	4 06E-11	8 11E-11		
Ra-228	2 3173E-10	248 20	496 40	0 00E+00	5 75E-08	1 15E-07		
Ru-106	9 5038E-05	248 20	496 40	0 00E+00	2 36E-02	4 72E-02		
Se-79	1 3017E-05	248 20	496 40	0 00E+00	3 23E-03	6 46E-03		
Sn-126	1 2165E-05	248 20	496 40	0 00E+00	3 02E-03	6 04E-03		
Sr-90	2 0541E+00	248 20	496 40	0 00E+00	5 10E+02	1 02E+03		
Tc-99	4 4241E-04	248 20	496 40	0 00E+00	1 10E-01	2 20E-01		
Th-229	2 5218E-10	248 20	496 40	0 00E+00	6 26E-08	1 25E-07		
Th-230	3 3654E-11	248 20	496 40	0 00E+00	8 35E-09	1 67E-08		
Th-232	2 5278E-10	248 20	496 40	0 00E+00	6 27E-08	1 25E-07		
Tl-208	1 6511E-08	248 20	496 40	0 00E+00	4 10E-06	8 20E-06		
U-232	4 4722E-08	248 20	496 40	0 00E+00	1 11E-05	2 22E-05		
U-233	1 2209E-07	248 20	496 40	0 00E+00	3 03E-05	6 06E-05		
U-234	1 8662E-07	248 20	496 40	0 00E+00	4 63E-05	9 26E-05		
U-235	-2 6194E-06	248 20	0 00	3 03E-03	2 38E-03	3 03E-03		
U-236	1 2693E-05	248 20	496 40	0 00E+00	3 15E-03	6 30E-03		
U-238	-3 6331E-08	248 20	0 00	1 92E-03	1 91E-03	1 92E-03		
Y-90	2 0541E+00	248 20	496 40	0 00E+00	5 10E+02	1 02E+03		
Other Radionuclides					5 37E+02	1 07E+03		
							Thermal Power	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							7 57E+00	1 51E+01
							Total	Total

**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 66292135	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	173 48	248 20	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.
Bounding	291 92	496 40	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 02	1 43	1 00
Bounding	2 04	1 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 STD 8 5/20 AUSTRIA  
 SNF ID #: 469  
 Fuel Units & Descr: 30 - ELEMENT  
 Heavy Metal Mass BOL=5.85kg EOL=5.643kg  
 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): 665  
 Template BOL Heavy Metal Mass (MT): 0.000195  
 Template Decay Time: 5 years

Estimated  
 Canister usage  
 18"x10"  
 027

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	197.60	395.21	0.00E+00	1.68E-07	3.37E-07		
Am-241	1.8331E-03	197.60	395.21	0.00E+00	3.62E-01	7.24E-01	0.0150	6.388E+13
Am-242m	1.4129E-06	197.60	395.21	0.00E+00	2.79E-04	5.58E-04	0.0250	1.406E+13
Am-243	1.4774E-07	197.60	395.21	0.00E+00	2.92E-05	5.84E-05	0.0375	1.197E+13
C-14	1.2871E-04	197.60	395.21	0.00E+00	2.54E-02	5.09E-02	0.0575	1.229E+13
Cl-36	2.8120E-06	197.60	395.21	0.00E+00	5.56E-04	1.11E-03	0.0850	7.611E+12
Cm-243	1.7940E-07	197.60	395.21	0.00E+00	3.54E-05	7.09E-05	0.1250	5.527E+12
Cm-244	1.6962E-06	197.60	395.21	0.00E+00	3.35E-04	6.70E-04	0.2250	6.457E+12
Co-60	1.2839E+00	197.60	395.21	0.00E+00	2.54E+02	5.07E+02	0.3750	3.277E+12
Cs-134	9.0541E-02	197.60	395.21	0.00E+00	1.79E+01	3.58E+01	0.5750	4.356E+13
Cs-135	3.2195E-05	197.60	395.21	0.00E+00	6.36E-03	1.27E-02	0.8500	1.869E+12
Cs-137	2.7564E+00	197.60	395.21	0.00E+00	5.45E+02	1.09E+03	1.2500	3.797E+13
Eu-154	1.5368E-02	197.60	395.21	0.00E+00	3.04E+00	6.07E+00	1.7500	2.531E+10
Eu-155	2.9293E-02	197.60	395.21	0.00E+00	5.79E+00	1.16E+01	2.2500	4.079E+10
Fe-55	7.7158E-01	197.60	395.21	0.00E+00	1.52E+02	3.05E+02	2.7500	3.237E+08
H-3	1.1111E-02	197.60	395.21	0.00E+00	2.20E+00	4.39E+00	3.5000	3.767E+07
I-129	7.3684E-07	197.60	395.21	0.00E+00	1.46E-04	2.91E-04	5.0000	2.108E+02
Kr-85	2.5263E-01	197.60	395.21	0.00E+00	4.99E+01	9.98E+01	7.0000	2.386E+01
Np-237	1.2427E-06	197.60	395.21	0.00E+00	2.46E-04	4.91E-04	11.0000	2.718E+00
Pa-231	3.8511E-09	197.60	395.21	0.00E+00	7.61E-07	1.52E-06		
Pb-210	7.3880E-15	197.60	395.21	0.00E+00	1.46E-12	2.92E-12		
Pm-147	2.1023E+00	197.60	395.21	0.00E+00	4.15E+02	8.31E+02		
Pu-238	1.0383E-03	197.60	395.21	0.00E+00	2.05E-01	4.10E-01		
Pu-239	5.5293E-03	197.60	395.21	0.00E+00	1.09E+00	2.19E+00		
Pu-240	2.1278E-03	197.60	395.21	0.00E+00	4.20E-01	8.41E-01		
Pu-241	1.0195E-01	197.60	395.21	0.00E+00	2.01E+01	4.03E+01		
Pu-242	2.3128E-07	197.60	395.21	0.00E+00	4.57E-05	9.14E-05		
Ra-226	5.2782E-14	197.60	395.21	0.00E+00	1.04E-11	2.09E-11		
Ra-228	1.9338E-10	197.60	395.21	0.00E+00	3.82E-08	7.64E-08		
Ru-106	9.1684E-02	197.60	395.21	0.00E+00	1.81E+01	3.62E+01		
Se-79	1.3018E-05	197.60	395.21	0.00E+00	2.57E-03	5.14E-03		
Sn-126	1.2167E-05	197.60	395.21	0.00E+00	2.40E-03	4.81E-03		
Sr-90	2.6045E+00	197.60	395.21	0.00E+00	5.15E+02	1.03E+03		
Tc-99	4.4241E-04	197.60	395.21	0.00E+00	8.74E-02	1.75E-01		
Th-229	1.3713E-10	197.60	395.21	0.00E+00	2.71E-08	5.42E-08		
Th-230	1.8090E-11	197.60	395.21	0.00E+00	3.57E-09	7.15E-09		
Th-232	2.5278E-10	197.60	395.21	0.00E+00	5.00E-08	9.99E-08		
Ti-208	1.6947E-08	197.60	395.21	0.00E+00	3.35E-06	6.70E-06		
U-232	4.8737E-08	197.60	395.21	0.00E+00	9.63E-06	1.93E-05		
U-233	1.2203E-07	197.60	395.21	0.00E+00	2.41E-05	4.82E-05		
U-234	1.5925E-07	197.60	395.21	0.00E+00	3.15E-05	6.29E-05		
U-235	-2.6194E-06	197.60	0.00	2.53E-03	2.01E-03	2.53E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2693E-05	197.60	395.21	0.00E+00	2.51E-03	5.02E-03	1.15E+01	2.30E+01
U-238	-3.6331E-08	197.60	0.00	1.57E-03	1.57E-03	1.57E-03	Total	Total
Y-90	2.6060E+00	197.60	395.21	0.00E+00	5.15E+02	1.03E+03		
Other Radonucleides					7.12E+02	1.42E+03		

**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 %	20.00000041	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	57.01	197.60	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		395.21	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.99	3.47	1.00
Bounding	1.98		

<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 BRAZIL  
 SNF ID #: 1063  
 Fuel Units & Descr: 9 - ELEMENT  
 Heavy Metal Mass: BOL=1755kg, EOL=1741kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2006  
 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"  
 0.08

II, Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	17.10	34.21	0.00E+00	1.46E-08	2.91E-08		
Am-241	1.8331E-03	17.10	34.21	0.00E+00	3.14E-02	6.27E-02	0.0150	5.529E+12
Am-242m	1.4129E-06	17.10	34.21	0.00E+00	2.42E-05	4.83E-05	0.0250	1.217E+12
Am-243	1.4774E-07	17.10	34.21	0.00E+00	2.53E-06	5.05E-06	0.0375	1.036E+12
C-14	1.2871E-04	17.10	34.21	0.00E+00	2.20E-03	4.40E-03	0.0575	1.063E+12
Cf-252	2.8120E-06	17.10	34.21	0.00E+00	4.81E-05	9.62E-05	0.0850	6.588E+11
Cm-243	1.7940E-07	17.10	34.21	0.00E+00	3.07E-06	6.14E-06	0.1250	4.784E+11
Cm-244	1.6962E-06	17.10	34.21	0.00E+00	2.90E-05	5.80E-05	0.2250	5.589E+11
Co-60	1.2839E+00	17.10	34.21	0.00E+00	2.20E+01	4.39E+01	0.3750	2.836E+11
Cs-134	9.0541E-02	17.10	34.21	0.00E+00	1.55E+00	3.10E+00	0.5750	3.770E+12
Cs-135	3.2195E-05	17.10	34.21	0.00E+00	5.51E-04	1.10E-03	0.8500	1.618E+11
Cs-137	2.7564E+00	17.10	34.21	0.00E+00	4.71E+01	9.43E+01	1.2500	3.286E+12
Eu-154	1.5368E-02	17.10	34.21	0.00E+00	2.63E-01	5.26E-01	1.7500	2.191E+09
Eu-155	2.9293E-02	17.10	34.21	0.00E+00	5.01E-01	1.00E+00	2.2500	3.531E+09
Fe-55	7.7158E-01	17.10	34.21	0.00E+00	1.32E+01	2.64E+01	2.7500	2.802E+07
H-3	1.1111E-02	17.10	34.21	0.00E+00	1.90E-01	3.80E-01	3.5000	3.261E+06
I-129	7.3684E-07	17.10	34.21	0.00E+00	1.26E-05	2.52E-05	5.0000	1.902E+01
Kr-85	2.5263E-01	17.10	34.21	0.00E+00	4.32E+00	8.64E+00	7.0000	2.155E+00
Np-237	1.2427E-06	17.10	34.21	0.00E+00	2.13E-05	4.25E-05	11.0000	2.455E-01
Pa-231	3.8511E-09	17.10	34.21	0.00E+00	6.59E-08	1.32E-07		
Pb-210	7.3880E-15	17.10	34.21	0.00E+00	1.26E-13	2.53E-13		
Pm-147	2.1023E+00	17.10	34.21	0.00E+00	3.60E+01	7.19E+01		
Pu-238	1.0383E-03	17.10	34.21	0.00E+00	1.78E-02	3.55E-02		
Pu-239	5.5293E-03	17.10	34.21	0.00E+00	9.46E-02	1.89E-01		
Pu-240	2.1278E-03	17.10	34.21	0.00E+00	3.64E-02	7.28E-02		
Pu-241	1.0195E-01	17.10	34.21	0.00E+00	1.74E+00	3.49E+00		
Pu-242	2.3128E-07	17.10	34.21	0.00E+00	3.96E-06	7.91E-06		
Ra-226	5.2782E-14	17.10	34.21	0.00E+00	9.03E-13	1.81E-12		
Ra-228	1.9338E-10	17.10	34.21	0.00E+00	3.31E-09	6.62E-09		
Ru-106	9.1684E-02	17.10	34.21	0.00E+00	1.57E+00	3.14E+00		
Sa-79	1.3018E-05	17.10	34.21	0.00E+00	2.23E-04	4.45E-04		
Sn-126	1.2167E-05	17.10	34.21	0.00E+00	2.08E-04	4.16E-04		
Sr-90	2.6045E+00	17.10	34.21	0.00E+00	4.45E+01	8.91E+01		
Tc-99	4.4241E-04	17.10	34.21	0.00E+00	7.57E-03	1.51E-02		
Th-229	1.3713E-10	17.10	34.21	0.00E+00	2.35E-09	4.69E-09		
Th-230	1.8090E-11	17.10	34.21	0.00E+00	3.09E-10	6.19E-10		
Th-232	2.5278E-10	17.10	34.21	0.00E+00	4.32E-09	8.65E-09		
Th-208	1.6947E-08	17.10	34.21	0.00E+00	2.90E-07	5.80E-07		
U-232	4.8737E-08	17.10	34.21	0.00E+00	8.34E-07	1.67E-06		
U-233	1.2203E-07	17.10	34.21	0.00E+00	2.09E-06	4.17E-06		
U-234	1.5925E-07	17.10	34.21	0.00E+00	2.72E-06	5.45E-06		
U-235	-2.6194E-06	17.10	0.00	7.59E-04	7.14E-04	7.59E-04		
U-236	1.2693E-05	17.10	34.21	0.00E+00	2.17E-04	4.34E-04		
U-238	-3.6331E-08	17.10	0.00	4.72E-04	4.71E-04	4.72E-04		
Y-90	2.6060E+00	17.10	34.21	0.00E+00	4.46E+01	8.91E+01		
Other Radionuclides					6.17E+01	1.23E+02		
							<b>Thermal Power</b>	
							<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>
							9.95E-01	1.99E+00
							<b>Total</b>	<b>Total</b>

**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	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:	17.10	13.75	Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup assumed to be twice nominal burnup.
Bounding:		34.21	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal:	0.29	0.80	1.00
Bounding:	0.57		

<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 STD 8.5/20 CORNELL  
 SNF ID # 246  
 Fuel Units & Descr: 115 - ELEMENT  
 Heavy Metal Mass: BOL=21.896kg, EOL=21.586kg  
 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"  
 1 04

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	8.5173E-10	320.10	640.20	0.00E+00	2.73E-07	5.45E-07	Avg MeV	
Am-241	1.8331E-03	320.10	640.20	0.00E+00	5.87E-01	1.17E+00	0.0150	1.035E+14
Am-242m	1.4129E-06	320.10	640.20	0.00E+00	4.52E-04	9.05E-04	0.0250	2.277E+13
Am-243	1.4774E-07	320.10	640.20	0.00E+00	4.73E-05	9.46E-05	0.0375	1.939E+13
C-14	1.2871E-04	320.10	640.20	0.00E+00	4.12E-02	8.24E-02	0.0575	1.990E+13
Cf-252	2.8120E-06	320.10	640.20	0.00E+00	9.00E-04	1.80E-03	0.0850	1.233E+13
Cm-243	1.7940E-07	320.10	640.20	0.00E+00	5.74E-05	1.15E-04	0.1250	8.953E+12
Cm-244	1.6962E-06	320.10	640.20	0.00E+00	5.43E-04	1.09E-03	0.2250	1.046E+13
Co-60	1.2839E+00	320.10	640.20	0.00E+00	4.11E+02	8.22E+02	0.3750	5.308E+12
Cs-134	9.0541E-02	320.10	640.20	0.00E+00	2.90E+01	5.80E+01	0.5750	7.056E+13
Cs-135	3.2195E-05	320.10	640.20	0.00E+00	1.03E-02	2.06E-02	0.8500	3.028E+12
Cs-137	2.7564E+00	320.10	640.20	0.00E+00	8.82E+02	1.76E+03	1.2500	6.150E+13
Eu-154	1.5368E-02	320.10	640.20	0.00E+00	4.92E+00	9.84E+00	1.7500	4.100E+10
Eu-155	2.9293E-02	320.10	640.20	0.00E+00	9.38E+00	1.88E+01	2.2500	6.608E+10
Fe-55	7.7158E-01	320.10	640.20	0.00E+00	2.47E+02	4.94E+02	2.7500	5.244E+08
H-3	1.1111E-02	320.10	640.20	0.00E+00	3.56E+00	7.11E+00	3.5000	6.103E+07
I-129	7.3684E-07	320.10	640.20	0.00E+00	2.36E-04	4.72E-04	5.0000	3.491E+02
Kr-85	2.5263E-01	320.10	640.20	0.00E+00	8.09E+01	1.62E+02	7.0000	3.954E+01
Np-237	1.2427E-06	320.10	640.20	0.00E+00	3.98E-04	7.96E-04	11.0000	4.505E+00
Pa-231	3.8511E-09	320.10	640.20	0.00E+00	1.23E-06	2.47E-06		
Pb-210	7.3880E-15	320.10	640.20	0.00E+00	2.36E-12	4.73E-12		
Pm-147	2.1023E+00	320.10	640.20	0.00E+00	6.73E+02	1.35E+03		
Pu-238	1.0383E-03	320.10	640.20	0.00E+00	3.32E-01	6.65E-01		
Pu-239	5.5293E-03	320.10	640.20	0.00E+00	1.77E+00	3.54E+00		
Pu-240	2.1278E-03	320.10	640.20	0.00E+00	6.81E-01	1.36E+00		
Pu-241	1.0195E-01	320.10	640.20	0.00E+00	3.26E+01	6.53E+01		
Pu-242	2.3128E-07	320.10	640.20	0.00E+00	7.40E-05	1.48E-04		
Ra-226	5.2782E-14	320.10	640.20	0.00E+00	1.69E-11	3.38E-11		
Ra-228	1.9338E-10	320.10	640.20	0.00E+00	6.19E-08	1.24E-07		
Ru-106	9.1684E-02	320.10	640.20	0.00E+00	2.93E+01	5.87E+01		
Se-79	1.3018E-05	320.10	640.20	0.00E+00	4.17E-03	8.33E-03		
Sn-126	1.2167E-05	320.10	640.20	0.00E+00	3.89E-03	7.79E-03		
Sr-90	2.6045E+00	320.10	640.20	0.00E+00	8.34E+02	1.67E+03		
Tc-99	4.4241E-04	320.10	640.20	0.00E+00	1.42E-01	2.83E-01		
Th-229	1.3713E-10	320.10	640.20	0.00E+00	4.39E-08	8.78E-08		
Th-230	1.8090E-11	320.10	640.20	0.00E+00	5.79E-09	1.16E-08		
Th-232	2.5278E-10	320.10	640.20	0.00E+00	8.09E-08	1.62E-07		
Th-208	1.6947E-08	320.10	640.20	0.00E+00	5.42E-06	1.08E-05		
U-232	4.8737E-08	320.10	640.20	0.00E+00	1.56E-05	3.12E-05		
U-233	1.2203E-07	320.10	640.20	0.00E+00	3.91E-05	7.81E-05		
U-234	1.5925E-07	320.10	640.20	0.00E+00	5.10E-05	1.02E-04		
U-235	-2.6194E-06	320.10	0.00	9.45E-03	8.61E-03	9.45E-03		
U-236	1.2693E-05	320.10	640.20	0.00E+00	4.06E-03	8.13E-03		
U-238	-3.6331E-08	320.10	0.00	5.89E-03	5.88E-03	5.89E-03		
Y-90	2.6060E+00	320.10	640.20	0.00E+00	8.34E+02	1.67E+03		
Other Radionuclides					1.15E+03	2.31E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.86E+01	3.73E+01
Total	Total

**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 %	19.97350572	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal	320.10	296.41	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		640.20	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.43	0.93	1.00
Bounding	0.86		

<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 DOW

SNF ID #: 251

Fuel Units & Descr: 77 - ELEMENT

Heavy Metal Mass: BOL=15 015kg EOL=14 63kg

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 69

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	367 52	735 05	0 00E+00	3 13E-07	6 26E-07	Avg MeV	
Am-241	1 8331E-03	367 52	735 05	0 00E+00	6 74E-01	1 35E+00	0.0150	1 188E+14
Am-242m	1 4129E-06	367 52	735 05	0 00E+00	5 19E-04	1 04E-03	0 0250	2 614E+13
Am-243	1 4774E-07	367 52	735 05	0 00E+00	5 43E-05	1 09E-04	0 0375	2 226E+13
C-14	1 2871E-04	367 52	735 05	0 00E+00	4.73E-02	9 46E-02	0 0575	2 285E+13
Ct-36	2 8120E-06	367 52	735.05	0 00E+00	1 03E-03	2 07E-03	0 0850	1 416E+13
Cm-243	1 7940E-07	367 52	735 05	0 00E+00	6 59E-05	1 32E-04	0 1250	1 028E+13
Cm-244	1 6962E-06	367.52	735.05	0 00E+00	6.23E-04	1.25E-03	0.2250	1.201E+13
Co-60	1.2839E+00	367.52	735 05	0 00E+00	4 72E+02	9 44E+02	0 3750	6 094E+12
Cs-134	9 0541E-02	367.52	735 05	0 00E+00	3 33E+01	6 66E+01	0 5750	8 102E+13
Cs-135	3.2195E-05	367 52	735 05	0 00E+00	1 18E-02	2.37E-02	0 8500	3 477E+12
Cs-137	2 7564E+00	367.52	735 05	0 00E+00	1 01E+03	2 03E+03	1.2500	7 061E+13
Eu-154	1.5368E-02	367 52	735 05	0 00E+00	5 65E+00	1 13E+01	1 7500	4 707E+10
Eu-155	2 9293E-02	367 52	735 05	0 00E+00	1 08E+01	2 15E+01	2.2500	7.587E+10
Fe-55	7 7158E-01	367 52	735 05	0 00E+00	2 84E+02	5 67E+02	2 7500	6 021E+08
H-3	1 1111E-02	367 52	735 05	0 00E+00	4 08E+00	8 17E+00	3.5000	7 007E+07
I-129	7 3684E-07	367 52	735 05	0 00E+00	2 71E-04	5 42E-04	5.0000	3 946E+02
Kr-85	2 5263E-01	367 52	735 05	0 00E+00	9.28E+01	1 86E+02	7.0000	4 467E+01
Np-237	1 2427E-06	367 52	735 05	0 00E+00	4 57E-04	9 13E-04	11 0000	5 089E+00
Pa-231	3 8511E-09	367 52	735 05	0 00E+00	1 42E-06	2 83E-06		
Pb-210	7 3880E-15	367 52	735 05	0 00E+00	2.72E-12	5 43E-12		
Pm-147	2 1023E+00	367 52	735 05	0 00E+00	7 73E+02	1 55E+03		
Pu-238	1 0383E-03	367 52	735 05	0 00E+00	3 82E-01	7 63E-01		
Pu-239	5 5293E-03	367 52	735 05	0 00E+00	2 03E+00	4 06E+00		
Pu-240	2 1278E-03	367 52	735 05	0 00E+00	7 82E-01	1.56E+00		
Pu-241	1 0195E-01	367 52	735 05	0 00E+00	3 75E+01	7 49E+01		
Pu-242	2 3128E-07	367.52	735 05	0 00E+00	8 50E-05	1.70E-04		
Ra-226	5.2782E-14	367.52	735 05	0 00E+00	1 94E-11	3 88E-11		
Ra-228	1 9338E-10	367.52	735 05	0 00E+00	7 11E-08	1 42E-07		
Ru-106	9 1684E-02	367.52	735 05	0 00E+00	3 37E+01	6 74E+01		
Se-79	1.3018E-05	367.52	735 05	0 00E+00	4 78E-03	9 57E-03		
Sn-126	1.2167E-05	367 52	735 05	0 00E+00	4 47E-03	8 94E-03		
Sr-90	2 6045E+00	367 52	735 05	0 00E+00	9 57E+02	1 91E+03		
Tc-99	4 4241E-04	367 52	735 05	0 00E+00	1 63E-01	3.25E-01		
Th-229	1 3713E-10	367 52	735 05	0 00E+00	5 04E-08	1 01E-07		
Th-230	1 8090E-11	367 52	735 05	0 00E+00	6 65E-09	1 33E-08		
Th-232	2 5278E-10	367 52	735 05	0 00E+00	9.29E-08	1 86E-07		
Tl-208	1 6947E-08	367 52	735 05	0 00E+00	6.23E-06	1 25E-05		
U-232	4 8737E-08	367 52	735 05	0 00E+00	1.79E-05	3 58E-05		
U-233	1 2203E-07	367 52	735 05	0 00E+00	4 48E-05	8 97E-05		
U-234	1 5925E-07	367 52	735 05	0 00E+00	5 85E-05	1 17E-04		
U-235	-2 6194E-06	367.52	0 00	6 49E-03	5 53E-03	6 49E-03		
U-236	1.2693E-05	367.52	735 05	0 00E+00	4 67E-03	9 33E-03		
U-238	-3 6331E-08	367.52	0 00	4 04E-03	4 02E-03	4 04E-03		
Y-90	2 6060E+00	367 52	735 05	0 00E+00	9 58E+02	1 92E+03		
Other Radionuclides					1 33E+03	2 65E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.14E+01	4.28E+01
Total	Total

**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	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	219.50	367 52	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		735 05	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 72	1 67	1 00
Bounding	1 44		

<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 ENGLAND  
 SNF ID #: 485  
 Fuel Units & Descr: 84 - ELEMENT  
 Heavy Metal Mass: BOL=16 187kg EOL=15 826kg  
 ROD Storage Site: INEEL

Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template: TRIGA-SS (LWA/Zrx SST, 10 to 20% U)  
 \*Template Burnup(MWd): 665  
 Template BOL Heavy Metal Mass (MT): 0.000195  
 Template Decay Time: 5 years

Estimated  
 Canister usage  
 18"x10"  
 076

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources		
							Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	8.5173E-10	394.39	788.78	0.00E+00	3.36E-07	6.72E-07	Avg MeV		
Am-241	1.8331E-03	394.39	788.78	0.00E+00	7.23E-01	1.45E+00	0.0150	1.275E+14	
Am-242m	1.4129E-06	394.39	788.78	0.00E+00	5.57E-04	1.11E-03	0.0250	2.805E+13	
Am-243	1.4774E-07	394.39	788.78	0.00E+00	5.83E-05	1.17E-04	0.0375	2.389E+13	
C-14	1.2871E-04	394.39	788.78	0.00E+00	5.08E-02	1.02E-01	0.0575	2.452E+13	
Cl-36	2.8120E-06	394.39	788.78	0.00E+00	1.11E-03	2.22E-03	0.0850	1.519E+13	
Cm-243	1.7940E-07	394.39	788.78	0.00E+00	7.08E-05	1.42E-04	0.1250	1.103E+13	
Cm-244	1.6962E-06	394.39	788.78	0.00E+00	6.69E-04	1.34E-03	0.2250	1.289E+13	
Co-60	1.2839E+00	394.39	788.78	0.00E+00	5.06E+02	1.01E+03	0.3750	6.540E+12	
Cs-134	9.0541E-02	394.39	788.78	0.00E+00	3.57E+01	7.14E+01	0.5750	8.694E+13	
Cs-135	3.2195E-05	394.39	788.78	0.00E+00	1.27E-02	2.54E-02	0.8500	3.731E+12	
Cs-137	2.7564E+00	394.39	788.78	0.00E+00	1.09E+03	2.17E+03	1.2500	7.578E+13	
Eu-154	1.5368E-02	394.39	788.78	0.00E+00	6.06E+00	1.21E+01	1.7500	5.051E+10	
Eu-155	2.9293E-02	394.39	788.78	0.00E+00	1.16E+01	2.31E+01	2.2500	8.142E+10	
Fe-55	7.7158E-01	394.39	788.78	0.00E+00	3.04E+02	6.09E+02	2.7500	6.461E+08	
H-3	1.1111E-02	394.39	788.78	0.00E+00	4.38E+00	8.76E+00	3.5000	7.519E+07	
I-129	7.3684E-07	394.39	788.78	0.00E+00	2.91E-04	5.81E-04	5.0000	4.235E+02	
Kr-85	2.5263E-01	394.39	788.78	0.00E+00	9.96E+01	1.99E+02	7.0000	4.794E+01	
Np-237	1.2427E-06	394.39	788.78	0.00E+00	4.90E-04	9.80E-04	11.0000	5.462E+00	
Pa-231	3.8511E-09	394.39	788.78	0.00E+00	1.52E-06	3.04E-06			
Pb-210	7.3880E-15	394.39	788.78	0.00E+00	2.91E-12	5.83E-12			
Pm-147	2.1023E+00	394.39	788.78	0.00E+00	8.29E+02	1.66E+03			
Pu-238	1.0383E-03	394.39	788.78	0.00E+00	4.10E-01	8.19E-01			
Pu-239	5.5293E-03	394.39	788.78	0.00E+00	2.18E+00	4.36E+00			
Pu-240	2.1278E-03	394.39	788.78	0.00E+00	8.39E-01	1.68E+00			
Pu-241	1.0195E-01	394.39	788.78	0.00E+00	4.02E+01	8.04E+01			
Pu-242	2.3128E-07	394.39	788.78	0.00E+00	9.12E-05	1.82E-04			
Ra-226	5.2782E-14	394.39	788.78	0.00E+00	2.08E-11	4.16E-11			
Ra-228	1.9338E-10	394.39	788.78	0.00E+00	7.63E-08	1.53E-07			
Ru-106	9.1684E-02	394.39	788.78	0.00E+00	3.62E+01	7.23E+01			
Se-79	1.3018E-05	394.39	788.78	0.00E+00	5.13E-03	1.03E-02			
Sn-126	1.2167E-05	394.39	788.78	0.00E+00	4.80E-03	9.60E-03			
Sr-90	2.6045E+00	394.39	788.78	0.00E+00	1.03E+03	2.05E+03			
Tc-99	4.4241E-04	394.39	788.78	0.00E+00	1.74E-01	3.49E-01			
Th-229	1.3713E-10	394.39	788.78	0.00E+00	5.41E-08	1.08E-07			
Th-230	1.8090E-11	394.39	788.78	0.00E+00	7.13E-09	1.43E-08			
Th-232	2.5278E-10	394.39	788.78	0.00E+00	9.97E-08	1.99E-07			
Tl-208	1.6947E-08	394.39	788.78	0.00E+00	6.68E-06	1.34E-05			
U-232	4.8737E-08	394.39	788.78	0.00E+00	1.92E-05	3.84E-05			
U-233	1.2203E-07	394.39	788.78	0.00E+00	4.81E-05	9.63E-05			
U-234	1.5925E-07	394.39	788.78	0.00E+00	6.28E-05	1.26E-04			
U-235	-2.6194E-06	394.39	0.00	6.93E-03	5.90E-03	6.93E-03			
U-236	1.2693E-05	394.39	788.78	0.00E+00	5.01E-03	1.00E-02			
U-238	-3.6331E-08	394.39	0.00	4.36E-03	4.35E-03	4.36E-03			
Y-90	2.6060E+00	394.39	788.78	0.00E+00	1.03E+03	2.06E+03			
Other Radionuclides							1.42E+03	2.84E+03	

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.30E+01	4.59E+01
Total	Total

**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 %	19.80853811	10 to 20.1	

Burnup Summary (MWd)			Basis for burnup used in estimate.
	From SFD	Estimated	
Nominal	394.39	344.80	
Bounding		788.78	

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	0.71	0.87	
Bounding	1.43		

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).

**Fuel Radionuclide Inventory Worksheet**

**I. Fuel and Template Information**

Fuel Name: TRIGA STD 8.5/20 FINLAND  
 SNF ID #: 472  
 Fuel Units & Descr: 102 - ELEMENT  
 Heavy Metal Mass: BOL=19 89kg EOL=19 686kg  
 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 92

Radionuclide	m		x <sub>n</sub>		b		y <sub>n</sub>		y <sub>b</sub>		Gamma Sources	
	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)	Avg MeV			
Ac-227	8 5173E-10	194 74	389 48	0 00E+00	1 66E-07	3 32E-07						
Am-241	1 8331E-03	194 74	389 48	0 00E+00	3 57E-01	7 14E-01	0 0150	6 295E+13				
Am-242m	1 4129E-06	194 74	389 48	0 00E+00	2 75E-04	5 50E-04	0 0250	1 385E+13				
Am-243	1 4774E-07	194 74	389 48	0 00E+00	2 88E-05	5 75E-05	0 0375	1 180E+13				
C-14	1 2871E-04	194 74	389 48	0 00E+00	2 51E-02	5 01E-02	0 0575	1 211E+13				
Cl-36	2 8120E-06	194 74	389 48	0 00E+00	5 48E-04	1 10E-03	0 0850	7 501E+12				
Cm-243	1 7940E-07	194 74	389 48	0 00E+00	3 49E-05	6 99E-05	0 1250	5 447E+12				
Cm-244	1 6962E-06	194 74	389 48	0 00E+00	3 30E-04	6 61E-04	0 2250	6 363E+12				
Co-60	1 2839E+00	194 74	389 48	0 00E+00	2 50E+02	5 00E+02	0 3750	3 229E+12				
Cs-134	9 0541E-02	194 74	389 48	0 00E+00	1 76E+01	3 53E+01	0 5750	4 293E+13				
Cs-135	3 2195E-05	194 74	389 48	0 00E+00	6 27E-03	1 25E-02	0 8500	1 842E+12				
Cs-137	2 7564E+00	194 74	389 48	0 00E+00	5 37E+02	1 07E+03	1 2500	3 742E+13				
Eu-154	1 5368E-02	194 74	389 48	0 00E+00	2 99E+00	5 99E+00	1 7500	2 494E+10				
Eu-155	2 9293E-02	194 74	389 48	0 00E+00	5 70E+00	1 14E+01	2 2500	4 020E+10				
Fe-55	7 7158E-01	194 74	389 48	0 00E+00	1 50E+02	3 01E+02	2 7500	3 190E+08				
H-3	1 1111E-02	194 74	389 48	0 00E+00	2 16E+00	4 33E+00	3 5000	3 713E+07				
I-129	7 3684E-07	194 74	389 48	0 00E+00	1 43E-04	2 87E-04	5 0000	2 165E+02				
Kr-85	2 5263E-01	194 74	389 48	0 00E+00	4 92E+01	9 84E+01	7 0000	2 452E+01				
Np-237	1 2427E-06	194 74	389 48	0 00E+00	2 42E-04	4 84E-04	11 0000	2 795E+00				
Pa-231	3 8511E-09	194 74	389 48	0 00E+00	7 50E-07	1 50E-06						
Pb-210	7 3880E-15	194 74	389 48	0 00E+00	1 44E-12	2 88E-12						
Pm-147	2 1023E+00	194 74	389 48	0 00E+00	4 09E+02	8 19E+02						
Pu-238	1 0383E-03	194 74	389 48	0 00E+00	2 02E-01	4 04E-01						
Pu-239	5 5293E-03	194 74	389 48	0 00E+00	1 08E+00	2 15E+00						
Pu-240	2 1278E-03	194 74	389 48	0 00E+00	4 14E-01	8 29E-01						
Pu-241	1 0195E-01	194 74	389 48	0 00E+00	1 99E+01	3 97E+01						
Pu-242	2 3128E-07	194 74	389 48	0 00E+00	4 50E-05	9 01E-05						
Ra-226	5 2782E-14	194 74	389 48	0 00E+00	1 03E-11	2 06E-11						
Ra-228	1 9338E-10	194 74	389 48	0 00E+00	3 77E-08	7 53E-08						
Ru-106	9 1684E-02	194 74	389 48	0 00E+00	1 79E+01	3 57E+01						
Se-79	1 3018E-05	194 74	389 48	0 00E+00	2 54E-03	5 07E-03						
Sn-126	1 2167E-05	194 74	389 48	0 00E+00	2 37E-03	4 74E-03						
Sr-90	2 6045E+00	194 74	389 48	0 00E+00	5 07E+02	1 01E+03						
Tc-99	4 4241E-04	194 74	389 48	0 00E+00	8 62E-02	1 72E-01						
Th-229	1 3713E-10	194 74	389 48	0 00E+00	2 67E-08	5 34E-08						
Th-230	1 8090E-11	194 74	389 48	0 00E+00	3 52E-09	7 05E-09						
Th-232	2 5278E-10	194 74	389 48	0 00E+00	4 92E-08	9 85E-08						
Th-208	1 6947E-08	194 74	389 48	0 00E+00	3 30E-06	6 60E-06						
U-232	4 8737E-08	194 74	389 48	0 00E+00	9 49E-06	1 90E-05						
U-233	1 2203E-07	194 74	389 48	0 00E+00	2 38E-05	4 75E-05						
U-234	1 5925E-07	194 74	389 48	0 00E+00	3 10E-05	6 20E-05						
U-235	-2 6194E-06	194 74	0 00	8 60E-03	8 09E-03	8 60E-03						
U-236	1 2693E-05	194 74	389 48	0 00E+00	2 47E-03	4 94E-03	1 13E+01	2 27E+01				
U-238	-3 6331E-08	194 74	0 00	5 35E-03	5 34E-03	5 35E-03	Total	Total				
Y-90	2 6060E+00	194 74	389 48	0 00E+00	5 07E+02	1 01E+03						
Other Radionuclides					7 02E+02	1 40E+03						

**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 00000041	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	193.85	194 74	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		389 48	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 29	1 00	1 00
Bounding	0 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 STD 8 5/20 GA  
 SNF ID #: 244  
 Fuel Units & Descr: 114 - ELEMENT  
 Heavy Metal Mass BOL=22.23kg EOL=19 688kg  
 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)<sup>3</sup> 0.000195  
 Template Decay Time 25 years

Estimated  
 Canister usage  
 18"x10"  
 1 03

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	4.1459E-09	2,426.80	4,853.61	0.00E+00	1.01E-05	2.01E-05	Avg MeV	
Am-241	3.5850E-03	2,426.80	4,853.61	0.00E+00	8.70E+00	1.74E+01	0.0150	4.308E+14
Am-242m	1.2899E-06	2,426.80	4,853.61	0.00E+00	3.13E-03	6.26E-03	0.0250	8.956E+13
Am-243	1.4747E-07	2,426.80	4,853.61	0.00E+00	3.58E-04	7.16E-04	0.0375	7.771E+13
C-14	1.2839E-04	2,426.80	4,853.61	0.00E+00	3.12E-01	6.23E-01	0.0575	8.368E+13
Cl-36	2.8120E-06	2,426.80	4,853.61	0.00E+00	6.82E-03	1.36E-02	0.0850	5.044E+13
Cm-243	1.1038E-07	2,426.80	4,853.61	0.00E+00	2.68E-04	5.36E-04	0.1250	3.291E+13
Cm-244	7.8917E-07	2,426.80	4,853.61	0.00E+00	1.92E-03	3.83E-03	0.2250	4.338E+13
Co-60	9.2647E-02	2,426.80	4,853.61	0.00E+00	2.25E+02	4.50E+02	0.3750	1.895E+13
Cs-134	1.0940E-04	2,426.80	4,853.61	0.00E+00	2.65E-01	5.31E-01	0.5750	3.141E+14
Cs-135	3.2195E-05	2,426.80	4,853.61	0.00E+00	7.81E-02	1.56E-01	0.8500	3.372E+12
Cs-137	1.7368E+00	2,426.80	4,853.61	0.00E+00	4.21E+03	8.43E+03	1.2500	3.462E+13
Eu-154	3.0677E-03	2,426.80	4,853.61	0.00E+00	7.44E+00	1.49E+01	1.7500	8.776E+10
Eu-155	1.7925E-03	2,426.80	4,853.61	0.00E+00	4.35E+00	8.70E+00	2.2500	1.851E+08
Fe-55	3.7444E-03	2,426.80	4,853.61	0.00E+00	9.09E+00	1.82E+01	2.7500	3.129E+06
H-3	3.6180E-03	2,426.80	4,853.61	0.00E+00	8.78E+00	1.76E+01	3.5000	6.507E+03
I-129	7.3684E-07	2,426.80	4,853.61	0.00E+00	1.79E-03	3.58E-03	5.0000	2.531E+03
Kr-85	6.9368E-02	2,426.80	4,853.61	0.00E+00	1.68E+02	3.37E+02	7.0000	2.857E+02
Np-237	1.2662E-06	2,426.80	4,853.61	0.00E+00	3.07E-03	6.15E-03	11.0000	3.249E+01
Pa-231	9.1654E-09	2,426.80	4,853.61	0.00E+00	2.22E-05	4.45E-05		
Pb-210	1.3728E-13	2,426.80	4,853.61	0.00E+00	3.33E-10	6.66E-10		
Pm-147	1.0702E-02	2,426.80	4,853.61	0.00E+00	2.60E+01	5.19E+01		
Pu-238	8.8692E-04	2,426.80	4,853.61	0.00E+00	2.15E+00	4.30E+00		
Pu-239	5.5263E-03	2,426.80	4,853.61	0.00E+00	1.34E+01	2.68E+01		
Pu-240	2.1233E-03	2,426.80	4,853.61	0.00E+00	5.15E+00	1.03E+01		
Pu-241	3.8962E-02	2,426.80	4,853.61	0.00E+00	9.46E+01	1.89E+02		
Pu-242	2.3128E-07	2,426.80	4,853.61	0.00E+00	5.61E-04	1.12E-03		
Ra-226	4.6752E-13	2,426.80	4,853.61	0.00E+00	1.13E-09	2.27E-09		
Ra-228	2.4827E-10	2,426.80	4,853.61	0.00E+00	6.03E-07	1.21E-06		
Ru-106	9.8526E-08	2,426.80	4,853.61	0.00E+00	2.39E-04	4.78E-04		
Se-79	1.3015E-05	2,426.80	4,853.61	0.00E+00	3.16E-02	6.32E-02		
Sn-126	1.2165E-05	2,426.80	4,853.61	0.00E+00	2.95E-02	5.90E-02		
Sr-90	1.6195E+00	2,426.80	4,853.61	0.00E+00	3.93E+03	7.86E+03		
Tc-99	4.4241E-04	2,426.80	4,853.61	0.00E+00	1.07E+00	2.15E+00		
Th-229	4.2451E-10	2,426.80	4,853.61	0.00E+00	1.03E-06	2.06E-06		
Th-230	6.1398E-11	2,426.80	4,853.61	0.00E+00	1.49E-07	2.98E-07		
Th-232	2.5278E-10	2,426.80	4,853.61	0.00E+00	6.13E-07	1.23E-06		
Th-208	1.5098E-08	2,426.80	4,853.61	0.00E+00	3.66E-05	7.33E-05		
U-232	4.0662E-08	2,426.80	4,853.61	0.00E+00	9.87E-05	1.97E-04		
U-233	1.2217E-07	2,426.80	4,853.61	0.00E+00	2.96E-04	5.93E-04		
U-234	2.2391E-07	2,426.80	4,853.61	0.00E+00	5.43E-04	1.09E-03		
U-235	-2.6194E-06	2,426.80	0.00	9.61E-03	3.25E-03	9.61E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2695E-05	2,426.80	4,853.61	0.00E+00	3.08E-02	6.16E-02	5.15E+01	1.03E+02
U-238	-3.6331E-08	2,426.80	0.00	5.98E-03	5.89E-03	5.98E-03	Total	Total
Y-90	1.6195E+00	2,426.80	4,853.61	0.00E+00	3.93E+03	7.86E+03		
Other Radionuclides					4.18E+03	8.35E+03		

**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	10 to 20.1	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal	758.29	2,426.80	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		4,853.61	

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	3.20	3.20	1.00
Bounding	6.40		

\*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 STD 8 5/20 GERMANY  
 SNF ID #: 305  
 Fuel Units & Descr: 15 - ELEMENT  
 Heavy Metal Mass: BOL=2.925kg, EOL=2.883kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template: TRIGA-SS (LW/U-Zrc, 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"  
 0.14

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	40.09	80.19	0.00E+00	3.41E-08	6.83E-08		
Am-241	1.8331E-03	40.09	80.19	0.00E+00	7.35E-02	1.47E-01	0.0150	1.296E+13
Am-242m	1.4129E-06	40.09	80.19	0.00E+00	5.66E-05	1.13E-04	0.0250	2.852E+12
Am-243	1.4774E-07	40.09	80.19	0.00E+00	5.92E-06	1.18E-05	0.0375	2.429E+12
C-14	1.2871E-04	40.09	80.19	0.00E+00	5.16E-03	1.03E-02	0.0575	2.493E+12
Cl-36	2.8120E-06	40.09	80.19	0.00E+00	1.13E-04	2.25E-04	0.0850	1.544E+12
Cm-243	1.7940E-07	40.09	80.19	0.00E+00	7.19E-06	1.44E-05	0.1250	1.121E+12
Cm-244	1.6962E-06	40.09	80.19	0.00E+00	6.80E-05	1.36E-04	0.2250	1.310E+12
Co-60	1.2839E+00	40.09	80.19	0.00E+00	5.15E+01	1.03E+02	0.3750	6.648E+11
Cs-134	9.0541E-02	40.09	80.19	0.00E+00	3.63E+00	7.26E+00	0.5750	8.838E+12
Cs-135	3.2195E-05	40.09	80.19	0.00E+00	1.29E-03	2.58E-03	0.8500	3.793E+11
Cs-137	2.7564E+00	40.09	80.19	0.00E+00	1.11E+02	2.21E+02	1.2500	7.703E+12
Eu-154	1.5368E-02	40.09	80.19	0.00E+00	6.16E+01	1.23E+00	1.7500	5.135E+09
Eu-155	2.9293E-02	40.09	80.19	0.00E+00	1.17E+00	2.35E+00	2.2500	8.277E+09
Fe-55	7.7158E-01	40.09	80.19	0.00E+00	3.09E+01	6.19E+01	2.7500	6.568E+07
H-3	1.1111E-02	40.09	80.19	0.00E+00	4.45E-01	8.91E-01	3.5000	7.644E+06
I-129	7.3684E-07	40.09	80.19	0.00E+00	2.95E-05	5.91E-05	5.0000	4.384E+01
Kr-85	2.5263E-01	40.09	80.19	0.00E+00	1.01E+01	2.03E+01	7.0000	4.965E+00
Np-237	1.2427E-06	40.09	80.19	0.00E+00	4.98E-05	9.96E-05	11.0000	5.658E-01
Pa-231	3.8511E-09	40.09	80.19	0.00E+00	1.54E-07	3.09E-07		
Pb-210	7.3880E-15	40.09	80.19	0.00E+00	2.96E-13	5.92E-13		
Pm-147	2.1023E+00	40.09	80.19	0.00E+00	8.43E-01	1.69E+02		
Pu-238	1.0383E-03	40.09	80.19	0.00E+00	4.16E-02	8.33E-02		
Pu-239	5.5293E-03	40.09	80.19	0.00E+00	2.22E-01	4.43E-01		
Pu-240	2.1278E-03	40.09	80.19	0.00E+00	8.53E-02	1.71E-01		
Pu-241	1.0195E-01	40.09	80.19	0.00E+00	4.09E+00	8.18E+00		
Pu-242	2.3128E-07	40.09	80.19	0.00E+00	9.27E-06	1.85E-05		
Ra-226	5.2782E-14	40.09	80.19	0.00E+00	2.12E-12	4.23E-12		
Ra-228	1.9338E-10	40.09	80.19	0.00E+00	7.75E-09	1.55E-08		
Ru-106	9.1684E-02	40.09	80.19	0.00E+00	3.68E+00	7.35E+00		
Se-79	1.3018E-05	40.09	80.19	0.00E+00	5.22E-04	1.04E-03		
Sn-126	1.2167E-05	40.09	80.19	0.00E+00	4.88E-04	9.76E-04		
Sr-90	2.6045E+00	40.09	80.19	0.00E+00	1.04E+02	2.09E+02		
Tc-99	4.4241E-04	40.09	80.19	0.00E+00	1.77E-02	3.55E-02		
Th-229	1.3713E-10	40.09	80.19	0.00E+00	5.50E-09	1.10E-08		
Th-230	1.8090E-11	40.09	80.19	0.00E+00	7.25E-10	1.45E-09		
Th-232	2.5278E-10	40.09	80.19	0.00E+00	1.01E-08	2.03E-08		
Th-208	1.6947E-08	40.09	80.19	0.00E+00	6.79E-07	1.36E-06		
U-232	4.8737E-08	40.09	80.19	0.00E+00	1.95E-06	3.91E-06		
U-233	1.2203E-07	40.09	80.19	0.00E+00	4.89E-06	9.79E-06		
U-234	1.5925E-07	40.09	80.19	0.00E+00	6.38E-06	1.28E-05		
U-235	-2.6194E-06	40.09	0.00	1.26E-03	1.16E-03	1.26E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2693E-05	40.09	80.19	0.00E+00	5.09E-04	1.02E-03	2.33E+00	4.87E+00
U-238	-3.6331E-08	40.09	0.00	7.86E-04	7.85E-04	7.86E-04	Total	Total
Y-90	2.6060E+00	40.09	80.19	0.00E+00	1.04E+02	2.09E+02		
Other Radionuclides					1.45E+02	2.89E+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 %	20.00000041	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	28.51	40.09	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		80.19	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.40	1.41	1.00
Bounding	0.80		

<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: TRIGA STD 8 5/20 GERMANY  
 SNF ID #: 474  
 Fuel Units & Descr: 70 - ELEMENT  
 Heavy Metal Mass: BOL=13 65kg EOL=13.377kg  
 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"  
 0 63

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 5173E-10	260 61	521 22	0 00E+00	2 22E-07	4 44E-07	Avg MeV	
Am-241	1 8331E-03	260 61	521 22	0 00E+00	4 78E-01	9 55E-01	0 0150	8 424E+13
Am-242m	1 4129E-06	260 61	521 22	0 00E+00	3 68E-04	7 36E-04	0 0250	1 854E+13
Am-243	1 4774E-07	260 61	521 22	0 00E+00	3 85E-05	7 70E-05	0 0375	1 579E+13
C-14	1 2871E-04	260 61	521 22	0 00E+00	3 35E-02	6 71E-02	0 0575	1 620E+13
Cl-36	2 8120E-07	260 61	521 22	0 00E+00	7 33E-04	1 47E-03	0 0850	1 004E+13
Cm-243	1 7940E-07	260 61	521 22	0 00E+00	4 68E-05	9 35E-05	0 1250	7 289E+12
Cm-244	1 6962E-06	260 61	521 22	0 00E+00	4 42E-04	8 84E-04	0 2250	8 515E+12
Co-60	1 2839E+00	260 61	521 22	0 00E+00	3 35E+02	6 69E+02	0 3750	4 321E+12
Cs-134	9 0541E-02	260 61	521 22	0 00E+00	2 36E+01	4 72E+01	0 5750	5 745E+13
Cs-135	3 2195E-05	260 61	521 22	0 00E+00	8 39E-03	1 68E-02	0 8500	2 466E+12
Cs-137	2 7564E+00	260 61	521 22	0 00E+00	7 18E+02	1 44E+03	1 2500	5 007E+13
Eu-154	1 5368E-02	260 61	521 22	0 00E+00	4 01E+00	8 01E+00	1 7500	3 338E+10
Eu-155	2 9293E-02	260 61	521 22	0 00E+00	7 63E+00	1 53E+01	2 2500	5 380E+10
Fe-55	7 7158E-01	260 61	521 22	0 00E+00	2 01E+02	4 02E+02	2 7500	4 269E+08
H-3	1 1111E-02	260 61	521 22	0 00E+00	2 90E+00	5 79E+00	3 5000	4 969E+07
I-129	7 3684E-07	260 61	521 22	0 00E+00	1 92E-04	3 84E-04	5 0000	2 816E+02
Kr-85	2 5263E-01	260 61	521 22	0 00E+00	6 58E+01	1 32E+02	7 0000	3 189E+01
Np-237	1 2427E-06	260 61	521 22	0 00E+00	3 24E-04	6 48E-04	11 0000	3 633E+00
Pa-231	3 8511E-09	260 61	521 22	0 00E+00	1 00E-06	2 01E-06		
Pb-210	7 3880E-15	260 61	521 22	0 00E+00	1 93E-12	3 85E-12		
Pm-147	2 1023E+00	260 61	521 22	0 00E+00	5 48E+02	1 10E+03		
Pu-238	1 0383E-03	260 61	521 22	0 00E+00	2 71E-01	5 41E-01		
Pu-239	5 5293E-03	260 61	521 22	0 00E+00	1 44E+00	2 88E+00		
Pu-240	2 1278E-03	260 61	521 22	0 00E+00	5 55E-01	1 11E+00		
Pu-241	1 0195E-01	260 61	521 22	0 00E+00	2 66E+01	5 31E+01		
Pu-242	2 3128E-07	260 61	521 22	0 00E+00	6 03E-05	1 21E-04		
Ra-226	5 2782E-14	260 61	521 22	0 00E+00	1 38E-11	2 75E-11		
Ra-228	1 9338E-10	260 61	521 22	0 00E+00	5 04E-08	1 01E-07		
Ru-106	9 1684E-02	260 61	521 22	0 00E+00	2 39E+01	4 78E+01		
Se-79	1 3018E-05	260 61	521 22	0 00E+00	3 39E-03	6 79E-03		
Sr-90	1 2167E-05	260 61	521 22	0 00E+00	3 17E-03	6 34E-03		
Sr-90	2 6045E+00	260 61	521 22	0 00E+00	6 79E+02	1 36E+03		
Tc-99	4 4241E-04	260 61	521 22	0 00E+00	1 15E-01	2 31E-01		
Th-229	1 3713E-10	260 61	521 22	0 00E+00	3 57E-08	7 15E-08		
Th-230	1 8090E-11	260 61	521 22	0 00E+00	4 71E-09	9 43E-09		
Th-232	2 5278E-10	260 61	521 22	0 00E+00	6 59E-08	1 32E-07		
Ti-208	1 6947E-08	260 61	521 22	0 00E+00	4 42E-06	8 83E-06		
U-232	4 8737E-08	260 61	521 22	0 00E+00	1 27E-05	2 54E-05		
U-233	1 2203E-07	260 61	521 22	0 00E+00	3 18E-05	6 36E-05		
U-234	1 5925E-07	260 61	521 22	0 00E+00	4 15E-05	8 30E-05		
U-235	-2 6194E-06	260 61	0 00	5 90E-03	5 22E-03	5 90E-03		
U-236	1 2693E-05	260 61	521 22	0 00E+00	3 31E-03	6 62E-03		
U-238	-3 6331E-08	260 61	0 00	3 67E-03	3 66E-03	3 67E-03		
Y-90	2 6060E+00	260 61	521 22	0 00E+00	6 79E+02	1 36E+03		
Other Radionuclides					9 40E+02	1 88E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.52E+01	3.03E+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 %:	20 00000041	10 to 20 1

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal	133.03	260 61
Bounding		521.22

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 56	1 96
Bounding	1 12	

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 STD 8.5/20 HANNOVER  
 SNF ID #: 473  
 Fuel Units & Descr: 5 - ELEMENT  
 Heavy Metal Mass: BOL=0.972kg; EOL=0.95kg  
 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"  
 0.05

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
	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	21.48	42.96	0.00E+00	2.95E-08	5.90E-08	Avg MeV	
Am-241	2.3865E-03	21.48	42.96	0.00E+00	5.13E-02	1.03E-01	0.0150	5.550E+12
Am-242m	1.3812E-06	21.48	42.96	0.00E+00	2.97E-05	5.93E-05	0.0250	1.176E+12
Am-243	1.4767E-07	21.48	42.96	0.00E+00	3.17E-06	6.34E-06	0.0375	1.004E+12
C-14	1.2863E-04	21.48	42.96	0.00E+00	2.76E-03	5.53E-03	0.0575	1.070E+12
Cl-36	2.8120E-06	21.48	42.96	0.00E+00	6.04E-05	1.21E-04	0.0850	6.493E+11
Cm-243	1.5895E-07	21.48	42.96	0.00E+00	3.41E-06	6.83E-06	0.1250	4.268E+11
Cm-244	1.4008E-06	21.48	42.96	0.00E+00	3.01E-05	6.02E-05	0.2250	5.538E+11
Co-60	6.6541E-01	21.48	42.96	0.00E+00	1.43E+01	2.86E+01	0.3750	2.544E+11
Cs-134	1.6887E-02	21.48	42.96	0.00E+00	3.63E-01	7.25E-01	0.5750	3.985E+12
Cs-135	3.2195E-05	21.48	42.96	0.00E+00	6.92E-04	1.38E-03	0.8500	7.115E+10
Cs-137	2.4556E+00	21.48	42.96	0.00E+00	5.27E+01	1.05E+02	1.2500	2.139E+12
Eu-154	1.0268E-02	21.48	42.96	0.00E+00	2.21E-01	4.41E-01	1.7500	1.287E+09
Eu-155	1.4570E-02	21.48	42.96	0.00E+00	3.13E-01	6.26E-01	2.2500	6.724E+07
Fe-55	2.0361E-01	21.48	42.96	0.00E+00	4.37E+00	8.75E+00	2.7500	1.113E+06
H-3	8.3940E-03	21.48	42.96	0.00E+00	1.80E-01	3.61E-01	3.5000	1.319E+05
I-129	7.3684E-07	21.48	42.96	0.00E+00	1.58E-05	3.17E-05	5.0000	2.302E+01
Kr-85	1.8286E-01	21.48	42.96	0.00E+00	3.93E+00	7.86E+00	7.0000	2.604E+00
Nb-237	1.2462E-06	21.48	42.96	0.00E+00	2.68E-05	5.35E-05	11.0000	2.966E-01
Pa-231	4.9143E-09	21.48	42.96	0.00E+00	1.06E-07	2.11E-07		
Pb-210	1.7173E-14	21.48	42.96	0.00E+00	3.69E-13	7.38E-13		
Pm-147	5.6165E-01	21.48	42.96	0.00E+00	1.21E+01	2.41E+01		
Pu-238	9.9820E-04	21.48	42.96	0.00E+00	2.14E-02	4.29E-02		
Pu-239	5.5293E-03	21.48	42.96	0.00E+00	1.19E-01	2.38E-01		
Pu-240	2.1263E-03	21.48	42.96	0.00E+00	4.57E-02	9.13E-02		
Pu-241	8.0165E-02	21.48	42.96	0.00E+00	1.72E+00	3.44E+00		
Pu-242	2.3128E-07	21.48	42.96	0.00E+00	4.97E-06	9.94E-06		
Ra-226	9.9774E-14	21.48	42.96	0.00E+00	2.14E-12	4.29E-12		
Ra-228	2.1729E-10	21.48	42.96	0.00E+00	4.67E-09	9.33E-09		
Ru-106	2.9519E-03	21.48	42.96	0.00E+00	6.34E-02	1.27E-01		
Se-79	1.3017E-05	21.48	42.96	0.00E+00	2.80E-04	5.59E-04		
Sn-126	1.2167E-05	21.48	42.96	0.00E+00	2.61E-04	5.23E-04		
Sr-90	2.3128E+00	21.48	42.96	0.00E+00	4.97E+01	9.94E+01		
Tc-99	4.4241E-04	21.48	42.96	0.00E+00	9.50E-03	1.90E-02		
Th-229	1.9459E-10	21.48	42.96	0.00E+00	4.18E-09	8.36E-09		
Th-230	2.5564E-11	21.48	42.96	0.00E+00	5.49E-10	1.10E-09		
Th-232	2.5278E-10	21.48	42.96	0.00E+00	5.43E-09	1.09E-08		
Th-208	1.6947E-08	21.48	42.96	0.00E+00	3.64E-07	7.28E-07		
U-232	4.6812E-08	21.48	42.96	0.00E+00	1.01E-06	2.01E-06		
U-233	1.2206E-07	21.48	42.96	0.00E+00	2.62E-06	5.24E-06		
U-234	1.7323E-07	21.48	42.96	0.00E+00	3.72E-06	7.44E-06		
U-235	-2.6194E-06	21.48	0.00	4.16E-04	3.60E-04	4.16E-04		
U-236	1.2693E-05	21.48	42.96	0.00E+00	2.73E-04	5.45E-04		
U-238	-3.6331E-08	21.48	0.00	2.62E-04	2.61E-04	2.62E-04		
Y-90	2.3128E+00	21.48	42.96	0.00E+00	4.97E+01	9.94E+01		
Other Radionuclides					5.27E+01	1.05E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.41E+01	1.68E+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 %	19.81481481	10 to 20.1

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>1</sup>		
	From SFD	Estimated
Nominal	2.37	21.48
Bounding		42.96

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	0.65	9.07
Bounding	1.30	

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 8.520 HEIDELBERG <sup>1</sup>Fuel decay start date 2006  
 SNF ID # 1044 Estimates as of 2010  
 Fuel Units & Descr. 56 - ELEMENT Template TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
 Heavy Metal Mass BOL=10 713kg EOL=10.556kg <sup>2</sup>Template Burnup(MWd): 6.65  
 ROD Storage Site INEEL Template BOL Heavy Metal Mass (MT) 0 000195  
 Template Decay Time 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 50

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8 5173E-10	208 81	417 63	0 00E+00	1 78E-07	3 56E-07		
Am-241	1 8331E-03	208 81	417 63	0 00E+00	3 83E-01	7 66E-01	0 0150	6 750E+13
Am-242m	1 4129E-06	208 81	417 63	0 00E+00	2 95E-04	5 90E-04	0 0250	1 485E+13
Am-243	1 4774E-07	208 81	417 63	0 00E+00	3 09E-05	6 17E-05	0 0375	1 265E+13
C-14	1 2871E-04	208 81	417 63	0 00E+00	2 69E-02	5 38E-02	0 0675	1 298E+13
Cl-36	2 8120E-06	208 81	417 63	0 00E+00	5 87E-04	1 17E-03	0 0850	8 043E+12
Cm-243	1 7940E-07	208 81	417 63	0 00E+00	3 75E-05	7 49E-05	0 1250	5 841E+12
Cm-244	1 6962E-06	208 81	417 63	0 00E+00	3 54E-04	7 08E-04	0 2250	6 823E+12
Co-60	1 2839E+00	208 81	417 63	0 00E+00	2 68E+02	5 36E+02	0 3750	3 462E+12
Cs-134	9 0541E-02	208 81	417 63	0 00E+00	1 89E+01	3 78E+01	0 5750	4 603E+13
Cs-135	3 2195E-05	208 81	417 63	0 00E+00	6 72E-03	1 34E-02	0 8500	1 976E+12
Cs-137	2 7564E+00	208 81	417 63	0 00E+00	5 76E+02	1 15E+03	1 2500	4 012E+13
Eu-154	1 5368E-02	208 81	417 63	0 00E+00	3 21E+00	6 42E+00	1 7500	2 674E+10
Eu-155	2 9293E-02	208 81	417 63	0 00E+00	6 12E+00	1 22E+01	2 2500	4 311E+10
Fe-55	7 7158E-01	208 81	417 63	0 00E+00	1 61E+02	3 22E+02	2 7500	3 421E+08
H-3	1 1111E-02	208 81	417 63	0 00E+00	2 32E+00	4 64E+00	3 5000	3 981E+07
I-129	7 3684E-07	208 81	417 63	0 00E+00	1 54E-04	3 08E-04	5 0000	2 255E+02
Kr-85	2 5263E-01	208 81	417 63	0 00E+00	5 28E+01	1 06E+02	7 0000	2 554E+01
Np-237	1 2427E-06	208 81	417 63	0 00E+00	2 59E-04	5 19E-04	11 0000	2 910E+00
Pa-231	3 8511E-09	208 81	417 63	0 00E+00	8 04E-07	1 61E-06		
Pb-210	7 3880E-15	208 81	417 63	0 00E+00	1 54E-12	3 09E-12		
Pm-147	2 1023E+00	208 81	417 63	0 00E+00	4 39E+02	8 78E+02		
Pu-238	1 0383E-03	208 81	417 63	0 00E+00	2 17E-01	4 34E-01		
Pu-239	5 5293E-03	208 81	417 63	0 00E+00	1 15E+00	2 31E+00		
Pu-240	2 1278E-03	208 81	417 63	0 00E+00	4 44E-01	8 89E-01		
Pu-241	1 0195E-01	208 81	417 63	0 00E+00	2 13E+01	4 26E+01		
Pu-242	2 3128E-07	208 81	417 63	0 00E+00	4 83E-05	9 66E-05		
Ra-226	5 2782E-14	208 81	417 63	0 00E+00	1 10E-11	2 20E-11		
Ra-228	1 9338E-10	208 81	417 63	0 00E+00	4 04E-08	8 08E-08		
Ru-106	9 1684E-02	208 81	417 63	0 00E+00	1 91E+01	3 83E+01		
Se-79	1 3018E-05	208 81	417 63	0 00E+00	2 72E-03	5 44E-03		
Sn-126	1 2167E-05	208 81	417 63	0 00E+00	2 54E-03	5 08E-03		
Sr-90	2 6045E+00	208 81	417 63	0 00E+00	5 44E+02	1 09E+03		
Tc-99	4 4241E-04	208 81	417 63	0 00E+00	9 24E-02	1 85E-01		
Th-229	1 3713E-10	208 81	417 63	0 00E+00	2 86E-08	5 73E-08		
Th-230	1 8090E-11	208 81	417 63	0 00E+00	3 78E-09	7 55E-09		
Th-232	2 5278E-10	208 81	417 63	0 00E+00	5 28E-08	1 06E-07		
Tl-208	1 6947E-08	208 81	417 63	0 00E+00	3 54E-06	7 08E-06		
U-232	4 8737E-08	208 81	417 63	0 00E+00	1 02E-05	2 04E-05		
U-233	1 2203E-07	208 81	417 63	0 00E+00	2 55E-05	5 10E-05		
U-234	1 5925E-07	208 81	417 63	0 00E+00	3 33E-05	6 65E-05		
U-235	-2 6194E-06	208 81	0 00	4 57E-03	4 02E-03	4 57E-03		
U-236	1 2693E-05	208 81	417 63	0 00E+00	2 65E-03	5 30E-03		
U-238	-3 6331E-08	208 81	0 00	2 89E-03	2 88E-03	2 89E-03	1 22E+01	2 43E+01
Y-90	2 6060E+00	208 81	417 63	0 00E+00	5 44E+02	1 09E+03	Total	Total
Other Radionuclides					7 53E+02	1 51E+03		

**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 %	19 72849245	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	208 81	149 68	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		417 63	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 72	0 99
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: TRIGA STD 8.5/20 INDONESIA  
 SNF ID # 475  
 Fuel Units & Descr: 174 - ELEMENT  
 Heavy Metal Mass: BOL=33 93kg, EOL=33.251kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template: TRIGA-SS (LWA/J-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 57

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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 5173E-10	647 80	1 295 59	0 00E+00	5 52E-07	1 10E-06		
Am-241	1 8331E-03	647 80	1 295 59	0 00E+00	1 19E+00	2 37E+00	0 0150	2 094E+14
Am-242m	1 4129E-06	647 80	1 295 59	0 00E+00	9 15E-04	1 83E-03	0 0250	4 608E+13
Am-243	1 4774E-07	647 80	1 295 59	0 00E+00	9 57E-05	1 91E-04	0 0375	3 924E+13
C-14	1 2871E-04	647 80	1 295 59	0 00E+00	8 34E-02	1 67E-01	0 0575	4 027E+13
Cl-36	2 8120E-06	647 80	1 295 59	0 00E+00	1 82E-03	3 64E-03	0 0850	2 495E+13
Cm-243	1 7940E-07	647 80	1 295 59	0 00E+00	1 16E-04	2 32E-04	0 1250	1 812E+13
Cm-244	1 6962E-06	647 80	1 295 59	0 00E+00	1 10E-03	2 20E-03	0 2250	2 117E+13
Co-60	1 2839E+00	647 80	1 295 59	0 00E+00	8 32E+02	1 66E+03	0 3750	1 074E+13
Cs-134	9 0541E-02	647 80	1 295 59	0 00E+00	5 87E+01	1 17E+02	0 5750	1 428E+14
Cs-135	3 2195E-05	647 80	1 295 59	0 00E+00	2 09E-02	4 17E-02	0 8500	6 129E+12
Cs-137	2 7564E+00	647 80	1 295 59	0 00E+00	1 79E+03	3 57E+03	1 2500	1 245E+14
Eu-154	1 5368E-02	647 80	1 295 59	0 00E+00	9 96E+00	1 99E+01	1 7500	8 296E+10
Eu-155	2 9293E-02	647 80	1 295 59	0 00E+00	1 90E+01	3 80E+01	2 2500	1 337E+11
Fe-55	7 7158E-01	647 80	1 295 59	0 00E+00	5 00E+02	1 00E+03	2 7500	1 061E+09
H-3	1 1111E-02	647 80	1 295 59	0 00E+00	7 20E+00	1 44E+01	3 5000	1 235E+08
I-129	7 3684E-07	647 80	1 295 59	0 00E+00	4 77E-04	9 55E-04	5 0000	7 001E+02
Kr-85	2 5263E-01	647 80	1 295 59	0 00E+00	1 64E+02	3 27E+02	7 0000	7 927E+01
Np-237	1 2427E-06	647 80	1 295 59	0 00E+00	8 05E-04	1 61E-03	11 0000	9 032E+00
Pa-231	3 8511E-09	647 80	1 295 59	0 00E+00	2 49E-06	4 99E-06		
Pb-210	7 3880E-15	647 80	1 295 59	0 00E+00	4 79E-12	9 57E-12		
Pm-147	2 1023E+00	647 80	1 295 59	0 00E+00	1 36E+03	2 72E+03		
Pu-238	1 0383E-03	647 80	1 295 59	0 00E+00	6 73E-01	1 35E+00		
Pu-239	5 5293E-03	647 80	1 295 59	0 00E+00	3 58E+00	7 16E+00		
Pu-240	2 1278E-03	647 80	1 295 59	0 00E+00	1 38E+00	2 76E+00		
Pu-241	1 0195E-01	647 80	1 295 59	0 00E+00	6 60E+01	1 32E+02		
Pu-242	2 3128E-07	647 80	1 295 59	0 00E+00	1 50E-04	3 00E-04		
Ra-226	5 2782E-14	647 80	1 295 59	0 00E+00	3 42E-11	6 84E-11		
Ra-228	1 9338E-10	647 80	1 295 59	0 00E+00	1 25E-07	2 51E-07		
Ru-106	9 1684E-02	647 80	1 295 59	0 00E+00	5 94E+01	1 19E+02		
Se-79	1 3018E-05	647 80	1 295 59	0 00E+00	8 43E-03	1 69E-02		
Sn-126	1 2167E-05	647 80	1 295 59	0 00E+00	7 88E-03	1 58E-02		
Sr-90	2 6045E+00	647 80	1 295 59	0 00E+00	1 69E+03	3 37E+03		
Tc-99	4 4241E-04	647 80	1 295 59	0 00E+00	2 87E-01	5 73E-01		
Th-229	1 3713E-10	647 80	1 295 59	0 00E+00	8 88E-08	1 78E-07		
Th-230	1 8090E-11	647 80	1 295 59	0 00E+00	1 17E-08	2 34E-08		
Th-232	2 5278E-10	647 80	1 295 59	0 00E+00	1 64E-07	3 28E-07		
Ti-208	1 6947E-08	647 80	1 295 59	0 00E+00	1 10E-05	2 20E-05		
U-232	4 8737E-08	647 80	1 295 59	0 00E+00	3 16E-05	6 31E-05		
U-233	1 2203E-07	647 80	1 295 59	0 00E+00	7 91E-05	1 58E-04		
U-234	1 5925E-07	647 80	1 295 59	0 00E+00	1 03E-04	2 06E-04		
U-235	2 6194E-06	647.80	0 00	1 47E-02	1 30E-02	1 47E-02		
U-236	1 2693E-05	647.80	1 295 59	0 00E+00	8 22E-03	1 64E-02		
U-238	-3 6331E-08	647.80	0 00	9 12E-03	9 10E-03	9 12E-03		
Y-90	2 6060E+00	647.80	1 295 59	0 00E+00	1 69E+03	3 38E+03		
Other Radionuclides					2 34E+03	4 67E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 77E+01	7 54E+01
Total	Total

**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 0000041	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:	330 68	647 80	
Bounding:		1 295 59	

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 56	1 96	1 00
Bounding:	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 TRIGA STD 8 5/20 INDONESIA  
 SNF ID # 476  
 Fuel Units & Descr. 71 - ELEMENT  
 Heavy Metal Mass BOL=13 845kg EOL=13.568kg  
 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"  
 0 64

Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci) <sup>1</sup>	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	264.33	528.66	0.00E+00	2.25E-07	4.50E-07	0.0150	8.544E+13
Am-241	1.8331E-03	264.33	528.66	0.00E+00	4.85E-01	9.69E-01	0.0250	1.880E+13
Am-242m	1.4129E-06	264.33	528.66	0.00E+00	3.73E-04	7.47E-04	0.0375	1.601E+13
Am-243	1.4774E-07	264.33	528.66	0.00E+00	3.91E-05	7.81E-05	0.0575	1.643E+13
C-14	1.2871E-04	264.33	528.66	0.00E+00	3.40E-02	6.80E-02	0.0850	1.018E+13
Ci-36	2.8120E-06	264.33	528.66	0.00E+00	7.43E-04	1.49E-03	0.1250	7.393E+12
Cm-243	1.7940E-07	264.33	528.66	0.00E+00	4.74E-05	9.48E-05	0.2250	8.637E+12
Cm-244	1.6962E-06	264.33	528.66	0.00E+00	4.48E-04	8.97E-04	0.3750	4.383E+12
Co-60	1.2839E+00	264.33	528.66	0.00E+00	3.39E+02	6.79E+02	0.5750	5.827E+13
Cs-134	9.0541E-02	264.33	528.66	0.00E+00	2.39E+01	4.79E+01	0.8500	2.501E+12
Cs-135	3.2195E-05	264.33	528.66	0.00E+00	8.51E-03	1.70E-02	1.2500	5.079E+13
Cs-137	2.7564E+00	264.33	528.66	0.00E+00	7.29E+02	1.46E+03	1.7500	3.385E+10
Eu-154	1.5368E-02	264.33	528.66	0.00E+00	4.06E+00	8.12E+00	2.2500	5.457E+10
Eu-155	2.9293E-02	264.33	528.66	0.00E+00	7.74E+00	1.55E+01	2.7500	4.330E+08
Fe-55	7.7158E-01	264.33	528.66	0.00E+00	2.04E+02	4.08E+02	3.5000	5.039E+07
H-3	1.1111E-02	264.33	528.66	0.00E+00	2.94E+00	5.87E+00	5.0000	2.857E+02
I-129	7.3684E-07	264.33	528.66	0.00E+00	1.95E-04	3.90E-04	7.0000	3.235E+01
Kr-85	2.5263E-01	264.33	528.66	0.00E+00	6.68E+01	1.34E+02	11.0000	3.685E+00
Np-237	1.2427E-06	264.33	528.66	0.00E+00	3.28E-04	6.57E-04		
Pa-231	3.8511E-09	264.33	528.66	0.00E+00	1.02E-06	2.04E-06		
Pb-210	7.3880E-15	264.33	528.66	0.00E+00	1.95E-12	3.91E-12		
Pm-147	2.1023E+00	264.33	528.66	0.00E+00	5.56E+02	1.11E+03		
Pu-238	1.0383E-03	264.33	528.66	0.00E+00	2.74E-01	5.49E-01		
Pu-239	5.5293E-03	264.33	528.66	0.00E+00	1.46E+00	2.92E+00		
Pu-240	2.1278E-03	264.33	528.66	0.00E+00	5.62E-01	1.12E+00		
Pu-241	1.0195E-01	264.33	528.66	0.00E+00	2.69E+01	5.39E+01		
Pu-242	2.3128E-07	264.33	528.66	0.00E+00	6.11E-05	1.22E-04		
Ra-226	5.2782E-14	264.33	528.66	0.00E+00	1.40E-11	2.79E-11		
Ra-228	1.9338E-10	264.33	528.66	0.00E+00	5.11E-08	1.02E-07		
Ru-106	9.1684E-02	264.33	528.66	0.00E+00	2.42E+01	4.85E+01		
Se-79	1.3018E-05	264.33	528.66	0.00E+00	3.44E-03	6.88E-03		
Sn-126	1.2167E-05	264.33	528.66	0.00E+00	3.22E-03	6.43E-03		
Sr-90	2.6045E+00	264.33	528.66	0.00E+00	6.88E+02	1.38E+03		
Tc-99	4.4241E-04	264.33	528.66	0.00E+00	1.17E-01	2.34E-01		
Th-229	1.3713E-10	264.33	528.66	0.00E+00	3.62E-08	7.25E-08		
Th-230	1.8090E-11	264.33	528.66	0.00E+00	4.78E-09	9.56E-09		
Th-232	2.5278E-10	264.33	528.66	0.00E+00	6.68E-08	1.34E-07		
Tl-208	1.6947E-08	264.33	528.66	0.00E+00	4.48E-06	8.96E-06		
U-232	4.8737E-08	264.33	528.66	0.00E+00	1.29E-05	2.58E-05		
U-233	1.2203E-07	264.33	528.66	0.00E+00	3.23E-05	6.45E-05		
U-234	1.5925E-07	264.33	528.66	0.00E+00	4.21E-05	8.42E-05		
U-235	-2.6194E-06	264.33	0.00	5.98E-03	5.29E-03	5.98E-03		
U-236	1.2693E-05	264.33	528.66	0.00E+00	3.36E-03	6.71E-03		
U-238	-3.6331E-08	264.33	0.00	3.72E-03	3.71E-03	3.72E-03		
Y-90	2.6060E+00	264.33	528.66	0.00E+00	6.89E+02	1.38E+03		
Other Radionuclides					9.53E+02	1.91E+03		

**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	
Fuel Cladding	SST	
BOL HM Constituents	U	
BOL Enrichment %	20 0000041	

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate
From SFD	Estimated	
Nominal	134.93	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding	528.66	

Checks		Estimated EOL HM/Given EOL HM
Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.56	1.00
Bounding	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: TRIGA STD 8 520 ITALY  
 SNF ID #: 477  
 Fuel Units & Descr: 48 - ELEMENT  
 Heavy Metal Mass: BOL=9.36kg; EOL=9.173kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2010  
 Estimates as of: 2010  
 Template: TRIGA-SS (LWAJ-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"  
 0.43

Radionuclide	m	x <sub>n</sub>	x <sub>s</sub>	b	y <sub>n</sub>	y <sub>s</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	178.70	357.41	0.00E+00	1.52E-07	3.04E-07	Avg MeV	
Am-241	1.8331E-03	178.70	357.41	0.00E+00	3.28E-01	6.55E-01	0.0150	5.777E+13
Am-242m	1.4129E-06	178.70	357.41	0.00E+00	2.52E-04	5.05E-04	0.0250	1.271E+13
Am-243	1.4774E-07	178.70	357.41	0.00E+00	2.64E-05	5.28E-05	0.0375	1.082E+13
C-14	1.2871E-04	178.70	357.41	0.00E+00	2.30E-02	4.60E-02	0.0575	1.111E+13
Cl-36	2.8120E-06	178.70	357.41	0.00E+00	5.03E-04	1.01E-03	0.0850	6.883E+12
Cm-243	1.7940E-07	178.70	357.41	0.00E+00	3.21E-05	6.41E-05	0.1250	4.998E+12
Cm-244	1.6962E-06	178.70	357.41	0.00E+00	3.03E-04	6.06E-04	0.2250	5.839E+12
Co-60	1.2839E+00	178.70	357.41	0.00E+00	2.29E+02	4.59E+02	0.3750	2.963E+12
Cs-134	9.0541E-02	178.70	357.41	0.00E+00	1.62E+01	3.24E+01	0.5750	3.939E+13
Cs-135	3.2195E-05	178.70	357.41	0.00E+00	5.75E-03	1.15E-02	0.8500	1.691E+12
Cs-137	2.7564E+00	178.70	357.41	0.00E+00	4.93E+02	9.85E+02	1.2500	3.433E+13
Eu-154	1.5368E-02	178.70	357.41	0.00E+00	2.75E+00	5.49E+00	1.7500	2.289E+10
Eu-155	2.9293E-02	178.70	357.41	0.00E+00	5.23E+00	1.05E+01	2.2500	3.689E+10
Fe-55	7.7158E-01	178.70	357.41	0.00E+00	1.38E+02	2.76E+02	2.7500	2.927E+08
H-3	1.1111E-02	178.70	357.41	0.00E+00	1.99E+00	3.97E+00	3.5000	3.407E+07
I-129	7.3684E-07	178.70	357.41	0.00E+00	1.32E-04	2.63E-04	5.0000	1.931E+02
Kr-85	2.5263E-01	178.70	357.41	0.00E+00	4.51E+01	9.03E+01	7.0000	2.187E+01
Np-237	1.2427E-06	178.70	357.41	0.00E+00	2.22E-04	4.44E-04	11.0000	2.492E+00
Pa-231	3.8511E-09	178.70	357.41	0.00E+00	6.88E-07	1.38E-06		
Pb-210	7.3880E-15	178.70	357.41	0.00E+00	1.32E-12	2.64E-12		
Pm-147	2.1023E+00	178.70	357.41	0.00E+00	3.76E+02	7.51E+02		
Pu-238	1.0383E-03	178.70	357.41	0.00E+00	1.86E-01	3.71E-01		
Pu-239	5.5293E-03	178.70	357.41	0.00E+00	9.88E-01	1.98E+00		
Pu-240	2.1278E-03	178.70	357.41	0.00E+00	3.80E-01	7.60E-01		
Pu-241	1.0195E-01	178.70	357.41	0.00E+00	1.82E+01	3.64E+01		
Pu-242	2.3128E-07	178.70	357.41	0.00E+00	4.13E-05	8.27E-05		
Ra-226	5.2782E-14	178.70	357.41	0.00E+00	9.43E-12	1.89E-11		
Ra-228	1.9338E-10	178.70	357.41	0.00E+00	3.46E-08	6.91E-08		
Ru-106	9.1684E-02	178.70	357.41	0.00E+00	1.64E+01	3.28E+01		
Se-79	1.3018E-05	178.70	357.41	0.00E+00	2.33E-03	4.65E-03		
Sn-126	1.2167E-05	178.70	357.41	0.00E+00	2.17E-03	4.35E-03		
Sr-90	2.6045E+00	178.70	357.41	0.00E+00	4.65E+02	9.31E+02		
Tc-99	4.4241E-04	178.70	357.41	0.00E+00	7.91E-02	1.58E-01		
Th-229	1.3713E-10	178.70	357.41	0.00E+00	2.45E-08	4.90E-08		
Th-230	1.8090E-11	178.70	357.41	0.00E+00	3.23E-09	6.47E-09		
Th-232	2.5278E-10	178.70	357.41	0.00E+00	4.52E-08	9.03E-08		
Tl-208	1.6947E-08	178.70	357.41	0.00E+00	3.03E-06	6.06E-06		
U-232	4.8737E-08	178.70	357.41	0.00E+00	8.71E-06	1.74E-05		
U-233	1.2203E-07	178.70	357.41	0.00E+00	2.18E-05	4.36E-05		
U-234	1.5925E-07	178.70	357.41	0.00E+00	2.85E-05	5.69E-05		
U-235	-2.6194E-06	178.70	0.00	4.05E-03	3.58E-03	4.05E-03		
U-236	1.2693E-05	178.70	357.41	0.00E+00	2.27E-03	4.54E-03		
U-238	-3.6331E-08	178.70	0.00	2.52E-03	2.51E-03	2.52E-03		
Y-90	2.6060E+00	178.70	357.41	0.00E+00	4.66E+02	9.31E+02		
Other Radionuclides					6.44E+02	1.29E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.04E+01	2.08E+01
Total	Total

**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	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	91.22	178.70	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.
Bounding		357.41	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.56	1.96	1.00
Bounding	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 TRIGA STD 8.5/20 ITALY  
 SNF ID #: 478  
 Fuel Units & Descr: 71 - ELEMENT  
 Heavy Metal Mass BOL=13.639kg EOL=12.837kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1999  
 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 10 years

Estimated  
 Canister usage  
 18"x10"  
 0.64

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3731E-09	765.88	1,531.76	0.00E+00	1.05E-06	2.10E-06	Avg MeV	
Am-241	2.3865E-03	765.88	1,531.76	0.00E+00	1.83E+00	3.66E+00	0.0150	1.979E+14
Am-242m	1.3812E-06	765.88	1,531.76	0.00E+00	1.06E-03	2.12E-03	0.0250	4.192E+13
Am-243	1.4767E-07	765.88	1,531.76	0.00E+00	1.13E-04	2.26E-04	0.0375	3.581E+13
C-14	1.2863E-04	765.88	1,531.76	0.00E+00	9.85E-02	1.97E-01	0.0575	3.816E+13
Cl-36	2.8120E-06	765.88	1,531.76	0.00E+00	2.15E-03	4.31E-03	0.0850	2.315E+13
Cr-243	1.5895E-07	765.88	1,531.76	0.00E+00	1.22E-04	2.43E-04	0.1250	1.522E+13
Cr-244	1.4008E-06	765.88	1,531.76	0.00E+00	1.07E-03	2.15E-03	0.2250	1.975E+13
Co-60	6.6541E-01	765.88	1,531.76	0.00E+00	5.10E+02	1.02E+03	0.3750	9.071E+12
Cs-134	1.6887E-02	765.88	1,531.76	0.00E+00	1.29E+01	2.59E+01	0.5750	1.421E+14
Cs-135	3.2195E-05	765.88	1,531.76	0.00E+00	2.47E-02	4.93E-02	0.8500	2.537E+12
Cs-137	2.4556E+00	765.88	1,531.76	0.00E+00	1.88E+03	3.76E+03	1.2500	7.628E+13
Eu-154	1.0268E-02	765.88	1,531.76	0.00E+00	7.86E+00	1.57E+01	1.7500	4.590E+10
Eu-155	1.4570E-02	765.88	1,531.76	0.00E+00	1.12E+01	2.23E+01	2.2500	2.397E+09
Fe-55	2.0361E-01	765.88	1,531.76	0.00E+00	1.56E+02	3.12E+02	2.7500	3.969E+07
H-3	8.3940E-03	765.88	1,531.76	0.00E+00	6.43E+00	1.29E+01	3.5000	4.703E+06
I-129	7.3684E-07	765.88	1,531.76	0.00E+00	5.64E-04	1.13E-03	5.0000	8.078E+02
Kr-85	1.8286E-01	765.88	1,531.76	0.00E+00	1.40E+02	2.80E+02	7.0000	9.136E+01
Np-237	1.2462E-06	765.88	1,531.76	0.00E+00	9.54E-04	1.91E-03	11.0000	1.040E+01
Pa-231	4.9143E-09	765.88	1,531.76	0.00E+00	3.76E-06	7.53E-06		
Pb-210	1.7173E-14	765.88	1,531.76	0.00E+00	1.32E-11	2.63E-11		
Pm-147	5.6165E-01	765.88	1,531.76	0.00E+00	4.30E+02	8.60E+02		
Pu-238	9.9820E-04	765.88	1,531.76	0.00E+00	7.64E-01	1.53E+00		
Pu-239	5.5293E-03	765.88	1,531.76	0.00E+00	4.23E+00	8.47E+00		
Pu-240	2.1263E-03	765.88	1,531.76	0.00E+00	1.63E+00	3.26E+00		
Pu-241	8.0165E-02	765.88	1,531.76	0.00E+00	6.14E+01	1.23E+02		
Pu-242	2.3128E-07	765.88	1,531.76	0.00E+00	1.77E-04	3.54E-04		
Ra-226	9.9774E-14	765.88	1,531.76	0.00E+00	7.64E-11	1.53E-10		
Ra-228	2.1729E-10	765.88	1,531.76	0.00E+00	1.66E-07	3.33E-07		
Ru-106	2.9519E-03	765.88	1,531.76	0.00E+00	2.26E+00	4.52E+00		
Se-79	1.3017E-05	765.88	1,531.76	0.00E+00	9.97E-03	1.99E-02		
Sn-126	1.2167E-05	765.88	1,531.76	0.00E+00	9.32E-03	1.86E-02		
Sr-90	2.3128E+00	765.88	1,531.76	0.00E+00	1.77E+03	3.54E+03		
Tc-99	4.4241E-04	765.88	1,531.76	0.00E+00	3.39E-01	6.78E-01		
Th-229	1.9459E-10	765.88	1,531.76	0.00E+00	1.49E-07	2.98E-07		
Th-230	2.5564E-11	765.88	1,531.76	0.00E+00	1.96E-08	3.92E-08		
Th-232	2.5278E-10	765.88	1,531.76	0.00E+00	1.94E-07	3.87E-07		
Ti-208	1.6947E-08	765.88	1,531.76	0.00E+00	1.30E-05	2.60E-05		
U-232	4.6812E-08	765.88	1,531.76	0.00E+00	3.59E-05	7.17E-05		
U-233	1.2206E-07	765.88	1,531.76	0.00E+00	9.35E-05	1.87E-04		
U-234	1.7323E-07	765.88	1,531.76	0.00E+00	1.33E-04	2.65E-04		
U-235	-2.6194E-06	765.88	0.00	5.90E-03	3.90E-03	5.90E-03		
U-236	1.2693E-05	765.88	1,531.76	0.00E+00	9.72E-03	1.94E-02		
U-238	-3.6331E-08	765.88	0.00	3.67E-03	3.64E-03	3.67E-03		
Y-90	2.3128E+00	765.88	1,531.76	0.00E+00	1.77E+03	3.54E+03		
Other Radionuclides					1.88E+03	3.76E+03		

**Thermal Power**  
 Nominal Heat Output (Watts) 3.00E+01  
 Bounding Heat Output (Watts) 6.00E+01  
 Total Total

**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	
BOL HM Constituents:	U	
BOL Enrichment %:	20.02640698	10 to 20.1

Burnup Summary (MWd) <sup>2</sup>		Basis for burnup used in estimate:
Nominal	From SFD: 465.24	Estimated: 765.88
Bounding		1,531.76

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: 1.65	Estimated Burnup/Given Burnup: 1.65
Bounding	3.29	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 ITALY  
 SNF ID #: 1080  
 Fuel Units & Descr.: 140 - ELEMENT  
 Heavy Metal Mass: BOL=26.894kg EOL=25.312kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 2006  
 Estimates as of: 2010

<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"  
 1.26

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	8.5173E-10	1,510.19	3,020.38	0.00E+00	1.29E-06	2.57E-06	0.0150	4.882E+14
Am-241	1.8331E-03	1,510.19	3,020.38	0.00E+00	2.77E+00	5.54E+00	0.0250	1.074E+14
Am-242m	1.4129E-06	1,510.19	3,020.38	0.00E+00	2.13E-03	4.27E-03	0.0375	9.147E+13
Am-243	1.4774E-07	1,510.19	3,020.38	0.00E+00	2.23E-04	4.46E-04	0.0575	9.389E+13
C-14	1.2871E-04	1,510.19	3,020.38	0.00E+00	1.94E-01	3.89E-01	0.0850	5.817E+13
Ct-36	2.8120E-06	1,510.19	3,020.38	0.00E+00	4.25E-03	8.49E-03	0.1250	4.224E+13
Cm-243	1.7940E-07	1,510.19	3,020.38	0.00E+00	2.71E-04	5.42E-04	0.2250	4.934E+13
Cm-244	1.6962E-06	1,510.19	3,020.38	0.00E+00	2.56E-03	5.12E-03	0.3750	2.504E+13
Co-60	1.2839E+00	1,510.19	3,020.38	0.00E+00	1.94E+03	3.88E+03	0.5750	3.329E+14
Cs-134	9.0541E-02	1,510.19	3,020.38	0.00E+00	1.37E+02	2.73E+02	0.8500	1.429E+14
Cs-135	3.2195E-05	1,510.19	3,020.38	0.00E+00	4.86E-02	9.72E-02	1.2500	2.902E+14
Cs-137	2.7564E+00	1,510.19	3,020.38	0.00E+00	4.16E+03	8.33E+03	1.7500	1.934E+11
Eu-154	1.5368E-02	1,510.19	3,020.38	0.00E+00	2.32E+01	4.64E+01	2.2500	3.118E+11
Eu-155	2.9293E-02	1,510.19	3,020.38	0.00E+00	4.42E+01	8.85E+01	2.7500	2.474E+09
Fe-55	7.7158E-01	1,510.19	3,020.38	0.00E+00	1.17E+03	2.33E+03	3.5000	2.879E+08
H-3	1.1111E-02	1,510.19	3,020.38	0.00E+00	1.68E+01	3.36E+01	5.0000	1.600E+03
I-129	7.3684E-07	1,510.19	3,020.38	0.00E+00	1.11E-03	2.23E-03	7.0000	1.811E+02
Kr-85	2.5263E-01	1,510.19	3,020.38	0.00E+00	3.82E+02	7.63E+02	11.0000	2.063E+01
Np-237	1.2427E-06	1,510.19	3,020.38	0.00E+00	1.88E-03	3.75E-03		
Pa-231	3.8511E-09	1,510.19	3,020.38	0.00E+00	5.82E-06	1.16E-05		
Pb-210	7.3880E-15	1,510.19	3,020.38	0.00E+00	1.12E-11	2.23E-11		
Pm-147	2.1023E+00	1,510.19	3,020.38	0.00E+00	3.17E+03	6.35E+03		
Pu-238	1.0383E-03	1,510.19	3,020.38	0.00E+00	1.57E+00	3.14E+00		
Pu-239	5.5293E-03	1,510.19	3,020.38	0.00E+00	8.35E+00	1.67E+01		
Pu-240	2.1278E-03	1,510.19	3,020.38	0.00E+00	3.21E+00	6.43E+00		
Pu-241	1.0195E-01	1,510.19	3,020.38	0.00E+00	1.54E+02	3.08E+02		
Pu-242	2.3128E-07	1,510.19	3,020.38	0.00E+00	3.49E-04	6.99E-04		
Ra-226	5.2782E-14	1,510.19	3,020.38	0.00E+00	7.97E-11	1.59E-10		
Ra-228	1.9338E-10	1,510.19	3,020.38	0.00E+00	2.92E-07	5.84E-07		
Ru-106	9.1684E-02	1,510.19	3,020.38	0.00E+00	1.38E+02	2.77E+02		
Se-79	1.3018E-05	1,510.19	3,020.38	0.00E+00	1.97E-02	3.93E-02		
Sn-126	1.2167E-05	1,510.19	3,020.38	0.00E+00	1.84E-02	3.67E-02		
Sr-90	2.6045E+00	1,510.19	3,020.38	0.00E+00	3.93E+03	7.87E+03		
Tc-99	4.4241E-04	1,510.19	3,020.38	0.00E+00	6.68E-01	1.34E+00		
Th-229	1.3713E-10	1,510.19	3,020.38	0.00E+00	2.07E-07	4.14E-07		
Th-230	1.8090E-11	1,510.19	3,020.38	0.00E+00	2.73E-08	5.46E-08		
Th-232	2.5278E-10	1,510.19	3,020.38	0.00E+00	3.82E-07	7.63E-07		
Tl-208	1.6947E-08	1,510.19	3,020.38	0.00E+00	2.56E-05	5.12E-05		
U-232	4.8737E-08	1,510.19	3,020.38	0.00E+00	7.36E-05	1.47E-04		
U-233	1.2203E-07	1,510.19	3,020.38	0.00E+00	1.84E-04	3.69E-04		
U-234	1.5925E-07	1,510.19	3,020.38	0.00E+00	2.40E-04	4.81E-04		
U-235	-2.6194E-06	1,510.19	0.00	1.16E-02	7.68E-03	1.16E-02		
U-236	1.2693E-05	1,510.19	3,020.38	0.00E+00	1.92E-02	3.83E-02		
U-238	-3.6331E-08	1,510.19	0.00	7.23E-03	7.17E-03	7.23E-03		
Y-90	2.6060E+00	1,510.19	3,020.38	0.00E+00	3.94E+03	7.87E+03		
Other Radionuclides					5.44E+03	1.09E+04		

**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 %	20.026	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	917.38	1,510.19	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		3,020.38	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.65	1.65	1.00
Bounding	3.29		

<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 TRIGA STD 8 5/20 JAPAN  
 SNF ID # 479  
 Fuel Units & Descr 73 - ELEMENT  
 Heavy Metal Mass BOL=14.235kg EOL=14 089kg  
 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"  
 0.66

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	139.37	278.75	0.00E+00	1.19E-07	2.37E-07	Avg MeV	
Am-241	1.8331E-03	139.37	278.75	0.00E+00	2.55E-01	5.11E-01	0.0150	4.505E+13
Am-242m	1.4129E-06	139.37	278.75	0.00E+00	1.97E-04	3.94E-04	0.0250	9.913E+12
Am-243	1.4774E-07	139.37	278.75	0.00E+00	2.06E-05	4.12E-05	0.0375	8.442E+12
C-14	1.2871E-04	139.37	278.75	0.00E+00	1.79E-02	3.59E-02	0.0575	8.665E+12
Cf-252	2.8120E-06	139.37	278.75	0.00E+00	3.92E-04	7.84E-04	0.0850	5.368E+12
Cm-243	1.7940E-07	139.37	278.75	0.00E+00	2.50E-05	5.00E-05	0.1250	3.898E+12
Cm-244	1.6962E-06	139.37	278.75	0.00E+00	2.36E-04	4.73E-04	0.2250	4.554E+12
Co-60	1.2839E+00	139.37	278.75	0.00E+00	1.79E+02	3.58E+02	0.3750	2.311E+12
Co-134	9.0541E-02	139.37	278.75	0.00E+00	1.26E+01	2.52E+01	0.6750	3.072E+13
Cs-135	3.2195E-05	139.37	278.75	0.00E+00	4.49E-03	8.97E-03	0.8500	1.319E+12
Cs-137	2.7564E+00	139.37	278.75	0.00E+00	3.84E+02	7.68E+02	1.2500	2.678E+13
Eu-154	1.5368E-02	139.37	278.75	0.00E+00	2.14E+00	4.28E+00	1.7500	1.785E+10
Eu-155	2.9293E-02	139.37	278.75	0.00E+00	4.08E+00	8.17E+00	2.2500	2.877E+10
Fe-55	7.7158E-01	139.37	278.75	0.00E+00	1.08E+02	2.15E+02	2.7500	2.283E+08
H-3	1.1111E-02	139.37	278.75	0.00E+00	1.55E+00	3.10E+00	3.5000	2.657E+07
I-129	7.3684E-07	139.37	278.75	0.00E+00	1.03E-04	2.05E-04	5.0000	1.549E+02
Kr-85	2.5263E-01	139.37	278.75	0.00E+00	3.52E+01	7.04E+01	7.0000	1.755E+01
Np-237	1.2427E-06	139.37	278.75	0.00E+00	1.73E-04	3.46E-04	11.0000	2.000E+00
Pa-231	3.8511E-09	139.37	278.75	0.00E+00	5.37E-07	1.07E-06		
Pb-210	7.3880E-15	139.37	278.75	0.00E+00	1.03E-12	2.06E-12		
Pm-147	2.1023E+00	139.37	278.75	0.00E+00	2.93E+02	5.86E+02		
Pu-238	1.0383E-03	139.37	278.75	0.00E+00	1.45E-01	2.89E-01		
Pu-239	5.5293E-03	139.37	278.75	0.00E+00	7.71E-01	1.54E+00		
Pu-240	2.1278E-03	139.37	278.75	0.00E+00	2.97E-01	5.93E-01		
Pu-241	1.0195E-01	139.37	278.75	0.00E+00	1.42E+01	2.84E+01		
Pu-242	2.3128E-07	139.37	278.75	0.00E+00	3.22E-05	6.45E-05		
Ra-226	5.2782E-14	139.37	278.75	0.00E+00	7.36E-12	1.47E-11		
Ra-228	1.9338E-10	139.37	278.75	0.00E+00	2.70E-08	5.39E-08		
Ru-106	9.1684E-02	139.37	278.75	0.00E+00	1.28E+01	2.56E+01		
Se-79	1.3018E-05	139.37	278.75	0.00E+00	1.81E-03	3.63E-03		
Sn-126	1.2167E-05	139.37	278.75	0.00E+00	1.70E-03	3.39E-03		
Sr-90	2.6045E+00	139.37	278.75	0.00E+00	3.63E+02	7.26E+02		
Tc-99	4.4241E-04	139.37	278.75	0.00E+00	6.17E-02	1.23E-01		
Th-229	1.3713E-10	139.37	278.75	0.00E+00	1.91E-08	3.82E-08		
Th-230	1.8090E-11	139.37	278.75	0.00E+00	2.52E-09	5.04E-09		
Th-232	2.5278E-10	139.37	278.75	0.00E+00	3.52E-08	7.05E-08		
Ti-208	1.6947E-08	139.37	278.75	0.00E+00	2.36E-06	4.72E-06		
U-232	4.8737E-08	139.37	278.75	0.00E+00	6.79E-06	1.36E-05		
U-233	1.2203E-07	139.37	278.75	0.00E+00	1.70E-05	3.40E-05		
U-234	1.5925E-07	139.37	278.75	0.00E+00	2.22E-05	4.44E-05		
U-235	-2.6194E-06	139.37	0.00	6.15E-03	5.79E-03	6.15E-03		
U-236	1.2693E-05	139.37	278.75	0.00E+00	1.77E-03	3.54E-03	8.11E+00	1.82E+01
U-238	-3.6331E-08	139.37	0.00	3.83E-03	3.82E-03	3.83E-03	Total	Total
Y-90	2.6060E+00	139.37	278.75	0.00E+00	3.63E+02	7.26E+02		
Other Radionuclides					5.02E+02	1.00E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.11E+00	1.82E+01
Total	Total

**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	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	138.73	139.37	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		278.75	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.29	1.00	1.00
Bounding	0.57		

<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 STD 8 5/20 KANSAS STATE UNIV  
 SNF ID #: 253  
 Fuel Units & Descr: 163 - ELEMENT  
 Heavy Metal Mass: BOL=31 785kg, EOL=30 481kg  
 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"  
 1.47

II. Estimates							Gamma Sources	
	m	x <sub>m</sub>	x <sub>b</sub>	b	y <sub>m</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	8.5173E-10	1,244.81	2,489.62	0.00E+00	1.06E-06	2.12E-06		
Am-241	1.8331E-03	1,244.81	2,489.62	0.00E+00	2.28E+00	4.56E+00	0.0150	4.024E+14
Am-242m	1.4129E-06	1,244.81	2,489.62	0.00E+00	1.76E-03	3.52E-03	0.0250	8.854E+13
Am-243	1.4774E-07	1,244.81	2,489.62	0.00E+00	1.84E-04	3.68E-04	0.0375	7.540E+13
C-14	1.2871E-04	1,244.81	2,489.62	0.00E+00	1.60E-01	3.20E-01	0.0575	7.739E+13
Cl-36	2.8120E-06	1,244.81	2,489.62	0.00E+00	3.50E-03	7.00E-03	0.0850	4.795E+13
Cm-243	1.7940E-07	1,244.81	2,489.62	0.00E+00	2.23E-04	4.47E-04	0.1250	3.482E+13
Cm-244	1.6962E-06	1,244.81	2,489.62	0.00E+00	2.11E-03	4.22E-03	0.2250	4.067E+13
Co-60	1.2839E+00	1,244.81	2,489.62	0.00E+00	1.60E+03	3.20E+03	0.3750	2.064E+13
Cs-134	9.0541E-02	1,244.81	2,489.62	0.00E+00	1.13E+02	2.25E+02	0.5750	2.744E+14
Cs-135	3.2195E-05	1,244.81	2,489.62	0.00E+00	4.01E-02	8.02E-02	0.8500	1.178E+13
Cs-137	2.7564E+00	1,244.81	2,489.62	0.00E+00	3.43E+03	6.86E+03	1.2500	2.392E+14
Eu-154	1.5368E-02	1,244.81	2,489.62	0.00E+00	1.91E+01	3.83E+01	1.7500	1.594E+11
Eu-155	2.9293E-02	1,244.81	2,489.62	0.00E+00	3.65E+01	7.29E+01	2.2500	2.570E+11
Fe-55	7.7158E-01	1,244.81	2,489.62	0.00E+00	9.60E+02	1.92E+03	2.7500	2.039E+09
H-3	1.1111E-02	1,244.81	2,489.62	0.00E+00	1.38E+01	2.77E+01	3.5000	2.373E+08
I-129	7.3684E-07	1,244.81	2,489.62	0.00E+00	9.17E-04	1.83E-03	5.0000	1.324E+03
Kr-85	2.5263E-01	1,244.81	2,489.62	0.00E+00	3.14E+02	6.29E+02	7.0000	1.499E+02
Np-237	1.2427E-06	1,244.81	2,489.62	0.00E+00	1.55E-03	3.09E-03	11.0000	1.708E+01
Pa-231	3.8511E-09	1,244.81	2,489.62	0.00E+00	4.79E-06	9.59E-06		
Pb-210	7.3880E-15	1,244.81	2,489.62	0.00E+00	9.20E-12	1.84E-11		
Pm-147	2.1023E+00	1,244.81	2,489.62	0.00E+00	2.62E+03	5.23E+03		
Pu-238	1.0383E-03	1,244.81	2,489.62	0.00E+00	1.29E+00	2.59E+00		
Pu-239	5.5293E-03	1,244.81	2,489.62	0.00E+00	6.88E+00	1.38E+01		
Pu-240	2.1278E-03	1,244.81	2,489.62	0.00E+00	2.65E+00	5.30E+00		
Pu-241	1.0195E-01	1,244.81	2,489.62	0.00E+00	1.27E+02	2.54E+02		
Pu-242	2.3128E-07	1,244.81	2,489.62	0.00E+00	2.88E-04	5.76E-04		
Ra-226	5.2782E-14	1,244.81	2,489.62	0.00E+00	6.57E-11	1.31E-10		
Ra-228	1.9338E-10	1,244.81	2,489.62	0.00E+00	2.41E-07	4.81E-07		
Ru-106	9.1684E-02	1,244.81	2,489.62	0.00E+00	1.14E+02	2.28E+02		
Se-79	1.3018E-05	1,244.81	2,489.62	0.00E+00	1.62E-02	3.24E-02		
Sn-126	1.2167E-05	1,244.81	2,489.62	0.00E+00	1.51E-02	3.03E-02		
Sr-90	2.6045E+00	1,244.81	2,489.62	0.00E+00	3.24E+03	6.48E+03		
Tc-99	4.4241E-04	1,244.81	2,489.62	0.00E+00	5.51E-01	1.10E+00		
Th-229	1.3713E-10	1,244.81	2,489.62	0.00E+00	1.71E-07	3.41E-07		
Th-230	1.8090E-11	1,244.81	2,489.62	0.00E+00	2.25E-08	4.50E-08		
Th-232	2.5278E-10	1,244.81	2,489.62	0.00E+00	3.15E-07	6.29E-07		
Tl-208	1.6947E-08	1,244.81	2,489.62	0.00E+00	2.11E-05	4.22E-05		
U-232	4.8737E-08	1,244.81	2,489.62	0.00E+00	6.07E-05	1.21E-04		
U-233	1.2203E-07	1,244.81	2,489.62	0.00E+00	1.52E-04	3.04E-04		
U-234	1.5925E-07	1,244.81	2,489.62	0.00E+00	1.98E-04	3.96E-04		
U-235	-2.6194E-06	1,244.81	0.00	1.37E-02	1.05E-02	1.37E-02		
U-236	1.2693E-05	1,244.81	2,489.62	0.00E+00	1.58E-02	3.16E-02		
U-238	-3.6331E-08	1,244.81	0.00	8.55E-03	8.50E-03	8.55E-03		
Y-90	2.6060E+00	1,244.81	2,489.62	0.00E+00	3.24E+03	6.49E+03		
Other Radionuclides					4.49E+03	8.98E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.24E+01	1.45E+02
Total	Total

**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	10 to 20.1	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	774.44	1,244.81	
Bounding		2,489.62	

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	1.15	1.61	
Bounding	2.30		

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 MEXICO	<sup>1</sup> Fuel decay start date	2006
SNF ID #	482	Estimates as of	2010
Fuel Units & Descr:	151 - ELEMENT	Template	TRIGA-SS (LW/U-Zrx, SST, 10 to 20% U)
Heavy Metal Mass	BOL=29 445kg EOL=28 403kg	<sup>2</sup> Template Burnup(MWd):	6 65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0 000195
		Template Decay Time	5 years

Estimated Canister usage 18"x10" 1 36
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Radionuclide	m		x <sub>a</sub>		x <sub>b</sub>		b		y <sub>a</sub>		y <sub>b</sub>		Gamma Sources	
	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)	Avg MeV					
Ac-227	8 5173E-10	994 60	1,989.21	0 00E+00	8 47E-07	1.69E-06								
Am-241	1 8331E-03	994 60	1,989.21	0 00E+00	1.82E+00	3 65E+00								
Am-242m	1 4129E-06	994 60	1,989.21	0 00E+00	1 41E-03	2 81E-03								
Am-243	1 4774E-07	994 60	1,989.21	0 00E+00	1 47E-04	2 94E-04								
C-14	1 2871E-04	994 60	1,989.21	0 00E+00	1 28E-01	2 56E-01								
Cf-252	2 8120E-06	994 60	1,989.21	0 00E+00	2 80E-03	5 59E-03								
Cm-243	1 7940E-07	994 60	1,989.21	0 00E+00	1 78E-04	3 57E-04								
Cm-244	1 6962E-06	994 60	1,989.21	0 00E+00	1 69E-03	3 37E-03								
Co-60	1 2839E+00	994 60	1,989.21	0 00E+00	1 28E+03	2 55E+03								
Cs-134	9 0541E-02	994 60	1,989.21	0 00E+00	9 01E+01	1 80E+02								
Cs-135	3 2195E-05	994 60	1,989.21	0 00E+00	3 20E-02	6 40E-02								
Cs-137	2 7564E+00	994 60	1,989.21	0 00E+00	2 74E+03	5 48E+03								
Eu-154	1 5368E-02	994 60	1,989.21	0 00E+00	1 53E+01	3 06E+01								
Eu-155	2 9293E-02	994 60	1,989.21	0 00E+00	2 91E+01	5 83E+01								
Fe-55	7 7158E-01	994 60	1,989.21	0 00E+00	7 67E+02	1 53E+03								
H-3	1 1111E-02	994 60	1,989.21	0 00E+00	1 11E+01	2 21E+01								
I-129	7 3684E-07	994 60	1,989.21	0 00E+00	7 33E-04	1 47E-03								
Kr-85	2 5263E-01	994 60	1,989.21	0 00E+00	2 51E+02	5 03E+02								
Np-237	1 2427E-06	994 60	1,989.21	0 00E+00	1 24E-03	2 47E-03								
Pa-231	3 8511E-09	994 60	1,989.21	0 00E+00	3 83E-06	7 66E-06								
Pb-210	7 3880E-15	994 60	1,989.21	0 00E+00	7 35E-12	1 47E-11								
Pm-147	2 1023E+00	994 60	1,989.21	0 00E+00	2 09E+03	4 18E+03								
Pu-238	1 0383E-03	994 60	1,989.21	0 00E+00	1 03E+00	2 07E+00								
Pu-239	5 5293E-03	994 60	1,989.21	0 00E+00	5 50E+00	1 10E+01								
Pu-240	2 1278E-03	994 60	1,989.21	0 00E+00	2 12E+00	4 23E+00								
Pu-241	1 0195E-01	994 60	1,989.21	0 00E+00	1 01E+02	2 03E+02								
Pu-242	2 3128E-07	994 60	1,989.21	0 00E+00	2 30E-04	4 60E-04								
Ra-226	5 2782E-14	994 60	1,989.21	0 00E+00	5 25E-11	1 05E-10								
Ra-228	1 9338E-10	994 60	1,989.21	0 00E+00	1 92E-07	3 85E-07								
Ru-106	9 1684E-02	994 60	1,989.21	0 00E+00	9 12E+01	1 82E+02								
Se-79	1 3018E-05	994 60	1,989.21	0 00E+00	1 29E-02	2 59E-02								
Sn-126	1 2167E-05	994 60	1,989.21	0 00E+00	1 21E-02	2 42E-02								
Sr-90	2 6045E+00	994 60	1,989.21	0 00E+00	2 59E+03	5 18E+03								
Tc-99	4 4241E-04	994 60	1,989.21	0 00E+00	4 40E-01	8 80E-01								
Th-229	1 3713E-10	994 60	1,989.21	0 00E+00	1 36E-07	2 73E-07								
Th-230	1 8090E-11	994 60	1,989.21	0 00E+00	1 80E-08	3 60E-08								
Th-232	2 5278E-10	994 60	1,989.21	0 00E+00	2 51E-07	5 03E-07								
Ti-208	1 6947E-08	994 60	1,989.21	0 00E+00	1 69E-05	3 37E-05								
U-232	4 8737E-08	994 60	1,989.21	0 00E+00	4 85E-05	9 69E-05								
U-233	1 2203E-07	994 60	1,989.21	0 00E+00	1 21E-04	2 43E-04								
U-234	1 5925E-07	994 60	1,989.21	0 00E+00	1 58E-04	3 17E-04								
U-235	-2 6194E-06	994 60	0 00	1 27E-02	1 01E-02	1 27E-02								
U-236	1 2693E-05	994 60	1,989.21	0 00E+00	1 26E-02	2 52E-02								
U-238	-3 6331E-08	994 60	0 00	7 92E-03	7 88E-03	7 92E-03								
Y-90	2 6060E+00	994 60	1,989.21	0 00E+00	2 59E+03	5 18E+03								
Other Radionuclides					3 59E+03	7 17E+03								

**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 0000041	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		994 60	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		1,989.21	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 99		1 00
Bounding	1 98		

\*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 MNRC  
SNF ID #: 254

Fuel Units & Descr: 96 - ELEMENT

Heavy Metal Mass: BOL=17 99kg, EOL=17 933kg  
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 86

**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 5173E-10	350 58	701 16	0 00E+00	2 99E-07	5 97E-07	Avg MeV	
Am-241	1 8331E-03	350 58	701 16	0 00E+00	6 43E-01	1 29E+00	0 0150	1 133E+14
Am-242m	1 4129E-06	350 58	701.16	0 00E+00	4 95E-04	9 91E-04	0 0250	2 494E+13
Am-243	1 4774E-07	350 58	701.16	0 00E+00	5 18E-05	1 04E-04	0 0375	2 124E+13
C-14	1 2871E-04	350 58	701.16	0 00E+00	4 51E-02	9 02E-02	0 0575	2 180E+13
Cl-36	2 8120E-06	350 58	701.16	0 00E+00	9 86E-04	1 97E-03	0 0850	1 350E+13
Cm-243	1 7940E-07	350 58	701.16	0 00E+00	6 29E-05	1 26E-04	0 1250	9 806E+12
Cm-244	1 6962E-06	350 58	701 16	0 00E+00	5 95E-04	1 19E-03	0 2250	1 145E+13
Co-60	1 2839E+00	350 58	701 16	0 00E+00	4 50E+02	9 00E+02	0 3750	5 813E+12
Cs-134	9 0541E-02	350 58	701 16	0 00E+00	3 17E+01	6 35E+01	0 5750	7 728E+13
Cs-135	3 2195E-05	350 58	701 16	0 00E+00	1 13E-02	2 26E-02	0 8500	3 317E+12
Cs-137	2 7564E+00	350 58	701 16	0 00E+00	9 66E+02	1 93E+03	1 2500	6 736E+13
Eu-154	1 5368E-02	350 58	701 16	0 00E+00	5 39E+00	1 08E+01	1 7500	4 490E+10
Eu-155	2 9293E-02	350 58	701 16	0 00E+00	1 03E+01	2 05E+01	2 2500	7 237E+10
Fe-55	7 7158E-01	350 58	701 16	0 00E+00	2 70E+02	5 41E+02	2 7500	5 743E+08
H-3	1 1111E-02	350 58	701 16	0 00E+00	3 90E+00	7 79E+00	3 5000	6 684E+07
I-129	7 3684E-07	350 58	701 16	0 00E+00	2 58E-04	5 17E-04	5 0000	3 787E+02
Kr-85	2 5263E-01	350 58	701 16	0 00E+00	8 86E+01	1 77E+02	7 0000	4 288E+01
Np-237	1 2427E-06	350 58	701 16	0 00E+00	4 36E-04	8 71E-04	11 0000	4 886E+00
Pa-231	3 8511E-09	350 58	701 16	0 00E+00	1 35E-06	2 70E-06		
Pb-210	7 3880E-15	350 58	701 16	0 00E+00	2 59E-12	5 18E-12		
Pm-147	2 1023E+00	350 58	701.16	0 00E+00	7 37E+02	1 47E+03		
Pu-238	1 0383E-03	350 58	701.16	0 00E+00	3 64E-01	7 28E-01		
Pu-239	5 5293E-03	350 58	701.16	0 00E+00	1 94E+00	3 88E+00		
Pu-240	2 1278E-03	350 58	701.16	0 00E+00	7 46E-01	1 49E+00		
Pu-241	1 0195E-01	350 58	701 16	0 00E+00	3 57E+01	7 15E+01		
Pu-242	2 3128E-07	350 58	701 16	0 00E+00	8 11E-05	1 62E-04		
Ra-226	5 2782E-14	350 58	701 16	0 00E+00	1 85E-11	3 70E-11		
Ra-228	1 9338E-10	350 58	701 16	0 00E+00	6 78E-08	1 36E-07		
Ru-106	9 1684E-02	350 58	701 16	0 00E+00	3 21E+01	6 43E+01		
Se-79	1 3018E-05	350 58	701 16	0 00E+00	4 56E-03	9 13E-03		
Sn-126	1 2167E-06	350 58	701 16	0 00E+00	4 27E-03	8 53E-03		
Sr-90	2 6045E+00	350 58	701 16	0 00E+00	9 13E+02	1 83E+03		
Tc-99	4 4241E-04	350 58	701.16	0 00E+00	1 55E-01	3 10E-01		
Th-229	1 3713E-10	350 58	701 16	0 00E+00	4 81E-08	9 61E-08		
Th-230	1 8090E-11	350 58	701.16	0 00E+00	6 34E-09	1 27E-08		
Th-232	2 5278E-10	350 58	701.16	0 00E+00	8 86E-08	1 77E-07		
Tl-208	1 6947E-08	350 58	701.16	0 00E+00	5 94E-06	1 19E-05		
U-232	4 8737E-08	350 58	701.16	0 00E+00	1 71E-05	3 42E-05		
U-233	1 2203E-07	350 58	701.16	0 00E+00	4 28E-05	8 56E-05		
U-234	1 5925E-07	350 58	701.16	0 00E+00	5 58E-05	1 12E-04		
U-235	-2 6194E-06	350 58	0 00	7 58E-03	6 66E-03	7 58E-03		
U-236	1 2693E-05	350 58	701 16	0 00E+00	4 45E-03	8 90E-03		
U-238	-3 6331E-08	350 58	0 00	4 87E-03	4 86E-03	4 87E-03		
Y-90	2 6060E+00	350 58	701.16	0 00E+00	9 14E+02	1 83E+03		
Other Radionuclides					1 26E+02	2 53E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.04E+01	4.08E+01
Total	Total

**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 %	19 48980681	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	350 58	54 99	Nominal burnup taken directly from SFD (converted to MWd). Bounding burnup assumed to be twice nominal burnup.
Bounding		701 16	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 57	0 16	0 98
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: TRIGA STD 8 5/20 MSU	Fuel decay start date: 1982	Estimated Canister usage: 18"x10" 0.43
SNF ID #: 873	Estimates as of: 2010	
Fuel Units & Descr: 48 - ELEMENT	Template: TRIGA-SS (LW/U-Zrx, SST, 10 to 20% U)	
Heavy Metal Mass: BOL=9.36kg EOL=8.29kg	*Template Burnup(MWd): 6.65	
ROD Storage Site: INEEL	Template BOL Heavy Metal Mass (MT): 0.000195	
	Template Decay Time: 25 years	

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		
							Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	4.1459E-09	1,021.81	2,043.62	0.00E+00	4.24E-06	8.47E-06	Avg MeV		
Am-241	3.5850E-03	1,021.81	2,043.62	0.00E+00	3.66E+00	7.33E+00	0.0150	1.814E+14	
Am-242m	1.2899E-06	1,021.81	2,043.62	0.00E+00	1.32E-03	2.64E-03	0.0250	3.771E+13	
Am-243	1.4747E-07	1,021.81	2,043.62	0.00E+00	1.51E-04	3.01E-04	0.0375	3.272E+13	
C-14	1.2839E-04	1,021.81	2,043.62	0.00E+00	1.31E-01	2.62E-01	0.0875	3.523E+13	
Cf-252	2.8120E-06	1,021.81	2,043.62	0.00E+00	2.87E-03	5.75E-03	0.0550	2.124E+13	
Cm-243	1.1038E-07	1,021.81	2,043.62	0.00E+00	1.13E-04	2.26E-04	0.1250	1.388E+13	
Cm-244	7.8917E-07	1,021.81	2,043.62	0.00E+00	8.06E-04	1.61E-03	0.2250	1.827E+13	
Co-60	9.2647E-02	1,021.81	2,043.62	0.00E+00	9.47E+01	1.89E+02	0.3750	7.977E+12	
Cs-134	1.0940E-04	1,021.81	2,043.62	0.00E+00	1.12E-01	2.24E-01	0.5750	1.322E+14	
Cs-135	3.2195E-05	1,021.81	2,043.62	0.00E+00	3.29E-02	6.58E-02	0.8500	1.420E+12	
Cs-137	1.7368E+00	1,021.81	2,043.62	0.00E+00	1.77E+03	3.55E+03	1.2500	1.458E+13	
Eu-154	3.0677E-03	1,021.81	2,043.62	0.00E+00	3.13E+00	6.27E+00	1.7500	3.695E+10	
Eu-155	1.7925E-03	1,021.81	2,043.62	0.00E+00	1.83E+00	3.66E+00	2.2500	7.793E+07	
Fe-55	3.7444E-03	1,021.81	2,043.62	0.00E+00	3.83E+00	7.65E+00	2.7500	1.318E+06	
H-3	3.6180E-03	1,021.81	2,043.62	0.00E+00	3.70E+00	7.39E+00	3.5000	2.740E+03	
I-129	7.3684E-07	1,021.81	2,043.62	0.00E+00	7.53E-04	1.51E-03	5.0000	1.666E+03	
Kr-85	6.9368E-02	1,021.81	2,043.62	0.00E+00	7.09E+01	1.42E+02	7.0000	1.203E+02	
Np-237	1.2662E-06	1,021.81	2,043.62	0.00E+00	1.29E-03	2.59E-03	11.0000	1.368E+01	
Pa-231	9.1654E-09	1,021.81	2,043.62	0.00E+00	9.37E-06	1.87E-05			
Pb-210	1.3728E-13	1,021.81	2,043.62	0.00E+00	1.40E-10	2.81E-10			
Pm-147	1.0702E-02	1,021.81	2,043.62	0.00E+00	1.09E+01	2.19E+01			
Pu-238	8.8692E-04	1,021.81	2,043.62	0.00E+00	9.06E-01	1.81E+00			
Pu-239	5.5263E-03	1,021.81	2,043.62	0.00E+00	5.65E+00	1.13E+01			
Pu-240	2.1233E-03	1,021.81	2,043.62	0.00E+00	2.17E+00	4.34E+00			
Pu-241	3.8962E-02	1,021.81	2,043.62	0.00E+00	3.98E+01	7.96E+01			
Pu-242	2.3128E-07	1,021.81	2,043.62	0.00E+00	2.36E-04	4.73E-04			
Ra-226	4.6752E-13	1,021.81	2,043.62	0.00E+00	4.78E-10	9.55E-10			
Ra-228	2.4827E-10	1,021.81	2,043.62	0.00E+00	2.54E-07	5.07E-07			
Ru-106	9.8526E-08	1,021.81	2,043.62	0.00E+00	1.01E-04	2.01E-04			
Se-79	1.3015E-05	1,021.81	2,043.62	0.00E+00	1.33E-02	2.66E-02			
Sn-126	1.2165E-05	1,021.81	2,043.62	0.00E+00	1.24E-02	2.49E-02			
Sr-90	1.6195E+00	1,021.81	2,043.62	0.00E+00	1.65E+03	3.31E+03			
Tc-99	4.4241E-04	1,021.81	2,043.62	0.00E+00	4.52E-01	9.04E-01			
Th-229	4.2451E-10	1,021.81	2,043.62	0.00E+00	4.34E-07	8.68E-07			
Th-230	6.1398E-11	1,021.81	2,043.62	0.00E+00	6.27E-08	1.25E-07			
Th-232	2.5278E-10	1,021.81	2,043.62	0.00E+00	2.58E-07	5.17E-07			
Th-208	1.5098E-08	1,021.81	2,043.62	0.00E+00	1.54E-05	3.09E-05			
U-232	4.0662E-08	1,021.81	2,043.62	0.00E+00	4.15E-05	8.31E-05			
U-233	1.2217E-07	1,021.81	2,043.62	0.00E+00	1.25E-04	2.50E-04			
U-234	2.2391E-07	1,021.81	2,043.62	0.00E+00	2.29E-04	4.58E-04			
U-235	-2.6194E-06	1,021.81	0.00	4.05E-03	1.37E-03	4.05E-03			
U-236	1.2695E-05	1,021.81	2,043.62	0.00E+00	1.30E-02	2.59E-02			
U-238	-3.6331E-08	1,021.81	0.00	2.52E-03	2.48E-03	2.52E-03			
Y-90	1.6195E+00	1,021.81	2,043.62	0.00E+00	1.65E+03	3.31E+03			
Other Radionuclides							1.76E+03	3.52E+03	

**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	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,021.81	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		2,043.62	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	3.20		1.00
Bounding	6.40		

<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: TRIGA STD 8 5/20 PENN STATE UNIV.

SNF ID #: 237

Fuel Units & Descr: 203 - ELEMENT

Heavy Metal Mass: BOL=39 991kg. EOL=37 575kg

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"

1 83

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 5173E-10	2,306 04	4,612 09	0 00E+00	1 96E-06	3 93E-06	Avg. MeV	
Am-241	1 8331E-03	2,306 04	4,612 09	0 00E+00	4 23E+00	8 45E+00	0 0150	7 454E+14
Am-242m	1 4129E-06	2,306 04	4,612 09	0 00E+00	3 26E-03	6 52E-03	0 0250	1 640E+14
Am-243	1 4774E-07	2,306 04	4,612 09	0 00E+00	3 41E-04	6 81E-04	0 0375	1 397E+14
C-14	1 2871E-04	2,306 04	4,612 09	0 00E+00	2 97E-01	5 94E-01	0 0575	1 434E+14
Cl-36	2 8120E-06	2,306 04	4,612 09	0 00E+00	6 48E-03	1 30E-02	0 0850	8 882E+13
Cm-243	1 7940E-07	2,306 04	4,612 09	0 00E+00	4 14E-04	8 27E-04	0 1250	6 450E+13
Cm-244	1 6962E-06	2,306 04	4,612 09	0 00E+00	3 91E-03	7 82E-03	0 2250	7 535E+13
Co-60	1 2839E+00	2,306 04	4,612 09	0 00E+00	2 96E+03	5 92E+03	0 3750	3 824E+13
Cs-134	9 0541E-02	2,306 04	4,612 09	0 00E+00	2 09E+02	4 18E+02	0 5750	5 083E+14
Cs-135	3 2195E-05	2,306 04	4,612 09	0 00E+00	7 42E-02	1 48E-01	0 8500	2 182E+13
Cs-137	2 7564E+00	2,306 04	4,612 09	0 00E+00	6 36E+03	1 27E+04	1 2500	4 431E+14
Eu-154	1 5368E-02	2,306 04	4,612 09	0 00E+00	3 54E+01	7 09E+01	1 7500	2 953E+11
Eu-155	2 9293E-02	2,306 04	4,612 09	0 00E+00	6 76E+01	1 35E+02	2 2500	4 760E+11
Fe-55	7 7158E-01	2,306 04	4,612 09	0 00E+00	1 78E+03	3 56E+03	2 7500	3 778E+09
H-3	1 1111E-02	2,306 04	4,612 09	0 00E+00	2 56E+01	5 12E+01	3 5000	4 396E+08
I-129	7 3684E-07	2,306 04	4,612 09	0 00E+00	1 70E-03	3 40E-03	5 0000	2 442E+03
Kr-85	2 5263E-01	2,306 04	4,612 09	0 00E+00	5 83E+02	1 17E+03	7 0000	2 764E+02
Np-237	1 2427E-06	2,306 04	4,612 09	0 00E+00	2 87E-03	5 73E-03	11 0000	3 149E+01
Pa-231	3 8511E-09	2,306 04	4,612 09	0 00E+00	8 88E-06	1 78E-05		
Pb-210	7 3880E-15	2,306 04	4,612 09	0 00E+00	1 70E-11	3 41E-11		
Pm-147	2 1023E+00	2,306 04	4,612 09	0 00E+00	4 85E+03	9 70E+03		
Pu-238	1 0383E-03	2,306 04	4,612 09	0 00E+00	2 39E+00	4 79E+00		
Pu-239	5 5293E-03	2,306 04	4,612 09	0 00E+00	1 28E+01	2 55E+01		
Pu-240	2 1278E-03	2,306 04	4,612 09	0 00E+00	4 91E+00	9 81E+00		
Pu-241	1 0195E-01	2,306 04	4,612 09	0 00E+00	2 35E+02	4 70E+02		
Pu-242	2 3128E-07	2,306 04	4,612 09	0 00E+00	5 33E-04	1 07E-03		
Ra-226	5 2782E-14	2,306 04	4,612 09	0 00E+00	1 22E-10	2 43E-10		
Ra-228	1 9338E-10	2,306 04	4,612 09	0 00E+00	4 46E-07	8 92E-07		
Ru-106	9 1684E-02	2,306 04	4,612 09	0 00E+00	2 11E+02	4 23E+02		
Se-79	1 3018E-05	2,306 04	4,612 09	0 00E+00	3 00E-02	6 00E-02		
Sn-126	1 2167E-05	2,306 04	4,612 09	0 00E+00	2 81E-02	5 61E-02		
Sr-90	2 6045E+00	2,306 04	4,612 09	0 00E+00	6 01E+03	1 20E+04		
Tc-99	4 4241E-04	2,306 04	4,612 09	0 00E+00	1 02E+00	2 04E+00		
Th-229	1 3713E-10	2,306 04	4,612 09	0 00E+00	3 16E-07	6 32E-07		
Th-230	1 8090E-11	2,306 04	4,612 09	0 00E+00	4 17E-08	8 34E-08		
Th-232	2 5278E-10	2,306 04	4,612 09	0 00E+00	5 83E-07	1 17E-06		
Tl-208	1 6947E-08	2,306 04	4,612 09	0 00E+00	3 91E-05	7 82E-05		
U-232	4 8737E-08	2,306 04	4,612 09	0 00E+00	1 12E-04	2 25E-04		
U-233	1 2203E-07	2,306 04	4,612 09	0 00E+00	2 81E-04	5 63E-04		
U-234	1 5925E-07	2,306 04	4,612 09	0 00E+00	3 67E-04	7 34E-04		
U-235	-2 6194E-06	2,306 04	0 00	1 71E-02	1 11E-02	1 71E-02		
U-236	1 2693E-05	2,306 04	4,612 09	0 00E+00	2 93E-02	5 85E-02		
U-238	-3 6331E-08	2,306 04	0 00	1 08E-02	1 07E-02	1 08E-02		
Y-90	2 6060E+00	2,306 04	4,612 09	0 00E+00	6 01E+03	1 20E+04		
Other Radionuclides					8 31E+03	1 66E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 34E+02	2 68E+02
Total	Total

**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 %	19 79695431	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		2,306 04	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		4,612 09	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 69		1 00
Bounding	3 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	TRIGA STD 8/5/20 REED COLLEGE	<sup>1</sup> Fuel decay start date	2026
SNF ID #	775	Estimates as of	2010
Fuel Units & Descr	9 - ELEMENT	Template	TRIGA-SS (LW/U-Zr, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=1 719kg, EOL=1 706kg	<sup>2</sup> Template Burnup(MWd)	6 65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT):	0 000195
		Template Decay Time	5 years

Estimated Canister usage 18"x10" 0 12
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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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	12.89	25.77	0.00E+00	1.10E-08	2.20E-08	Avg MeV	
Am-241	1.8331E-03	12.89	25.77	0.00E+00	2.36E-02	4.72E-02	0.0150	4.166E+12
Am-242m	1.4129E-06	12.89	25.77	0.00E+00	1.82E-05	3.64E-05	0.0250	9.166E+11
Am-243	1.4774E-07	12.89	25.77	0.00E+00	1.90E-06	3.81E-06	0.0375	7.806E+11
C-14	1.2871E-04	12.89	25.77	0.00E+00	1.66E-03	3.32E-03	0.0575	8.012E+11
Cl-36	2.8120E-06	12.89	25.77	0.00E+00	3.62E-05	7.25E-05	0.0850	4.964E+11
Cm-243	1.7940E-07	12.89	25.77	0.00E+00	2.31E-06	4.62E-06	0.1250	3.605E+11
Cm-244	1.6962E-06	12.89	25.77	0.00E+00	2.19E-05	4.37E-05	0.2250	4.211E+11
Co-60	1.2839E+00	12.89	25.77	0.00E+00	1.65E+01	3.31E+01	0.3750	2.137E+11
Cs-134	9.0541E-02	12.89	25.77	0.00E+00	1.17E+00	2.33E+00	0.5750	2.841E+12
Cs-135	3.2195E-05	12.89	25.77	0.00E+00	4.15E-04	8.30E-04	0.8500	1.219E+11
Cs-137	2.7564E+00	12.89	25.77	0.00E+00	3.55E+01	7.10E+01	1.2500	2.476E+12
Eu-154	1.5368E-02	12.89	25.77	0.00E+00	1.98E-01	3.96E-01	1.7500	1.650E+09
Eu-155	2.9293E-02	12.89	25.77	0.00E+00	3.78E-01	7.55E-01	2.2500	2.660E+09
Fe-55	7.7158E-01	12.89	25.77	0.00E+00	9.94E+00	1.99E+01	2.7500	2.111E+07
H-3	1.1111E-02	12.89	25.77	0.00E+00	1.43E-01	2.86E-01	3.5000	2.457E+06
I-129	7.3684E-07	12.89	25.77	0.00E+00	9.50E-06	1.90E-05	5.0000	1.457E+01
Kr-85	2.5263E-01	12.89	25.77	0.00E+00	3.26E+00	6.51E+00	7.0000	1.651E+00
Np-237	1.2427E-06	12.89	25.77	0.00E+00	1.60E-05	3.20E-05	11.0000	1.882E-01
Pa-231	3.8511E-09	12.89	25.77	0.00E+00	4.96E-08	9.93E-08		
Pb-210	7.3880E-15	12.89	25.77	0.00E+00	9.52E-14	1.90E-13		
Pm-147	2.1023E+00	12.89	25.77	0.00E+00	2.71E+01	5.42E+01		
Pu-238	1.0383E-03	12.89	25.77	0.00E+00	1.34E-02	2.68E-02		
Pu-239	5.5293E-03	12.89	25.77	0.00E+00	7.13E-02	1.43E-01		
Pu-240	2.1278E-03	12.89	25.77	0.00E+00	2.74E-02	5.48E-02		
Pu-241	1.0195E-01	12.89	25.77	0.00E+00	1.31E+00	2.63E+00		
Pu-242	2.3128E-07	12.89	25.77	0.00E+00	2.98E-06	5.96E-06		
Ra-226	5.2782E-14	12.89	25.77	0.00E+00	6.80E-13	1.36E-12		
Ra-228	1.9338E-10	12.89	25.77	0.00E+00	2.49E-09	4.98E-09		
Ru-106	9.1684E-02	12.89	25.77	0.00E+00	1.18E+00	2.36E+00		
Se-79	1.3018E-05	12.89	25.77	0.00E+00	1.68E-04	3.36E-04		
Sn-126	1.2167E-05	12.89	25.77	0.00E+00	1.57E-04	3.14E-04		
Sr-90	2.6045E+00	12.89	25.77	0.00E+00	3.36E+01	6.71E+01		
Tc-99	4.4241E-04	12.89	25.77	0.00E+00	5.70E-03	1.14E-02		
Th-229	1.3713E-10	12.89	25.77	0.00E+00	1.77E-09	3.53E-09		
Th-230	1.8090E-11	12.89	25.77	0.00E+00	2.33E-10	4.66E-10		
Th-232	2.5278E-10	12.89	25.77	0.00E+00	3.26E-09	6.52E-09		
Tl-208	1.6947E-08	12.89	25.77	0.00E+00	2.18E-07	4.37E-07		
U-232	4.8737E-08	12.89	25.77	0.00E+00	6.28E-07	1.26E-06		
U-233	1.2203E-07	12.89	25.77	0.00E+00	1.57E-06	3.15E-06		
U-234	1.5925E-07	12.89	25.77	0.00E+00	2.05E-06	4.10E-06		
U-235	-2.6194E-06	12.89	0.00	7.49E-04	7.15E-04	7.49E-04		
U-236	1.2693E-05	12.89	25.77	0.00E+00	1.64E-04	3.27E-04		
U-238	-3.6331E-08	12.89	0.00	4.61E-04	4.61E-04	4.61E-04		
Y-90	2.6060E+00	12.89	25.77	0.00E+00	3.36E+01	6.72E+01		
Other Radionuclides					4.65E+01	9.29E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.50E-01	1.50E+00
Total	Total

**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	This Template was used for the following reasons: This fuel matches on all parameters except enrichment (very close to 20%)
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	20 15706806	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate <sup>3</sup>
	From SFD	Estimated	
Nominal		12.89	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		25.77	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.22		1.00
Bounding	0.44		

<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 SLOVENIA  
 SNF ID #: 488  
 Fuel Units & Descr: 122 - ELEMENT  
 Heavy Metal Mass: BOL=23 4kg; EOL=22.594kg  
 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"  
 1 10

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
	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	8 5173E-10	768 65	1,537 30	0 00E+00	6 55E-07	1 31E-06	0 0150	2 485E+14
Am-241	1 8331E-03	768 65	1,537 30	0 00E+00	1 41E+00	2 82E+00	0 0250	5 467E+13
Am-242m	1 4129E-06	768 65	1,537 30	0 00E+00	1 09E-03	2 17E-03	0 0375	4 656E+13
Am-243	1 4774E-07	768 65	1,537 30	0 00E+00	1 14E-04	2 27E-04	0 0675	4 779E+13
C-14	1 2871E-04	768 65	1,537 30	0 00E+00	9 89E-02	1 98E-01	0 0575	4 779E+13
Cl-36	2 8120E-06	768 65	1,537 30	0 00E+00	2 16E-03	4 32E-03	0 0850	2 961E+13
Cm-243	1 7940E-07	768 65	1,537 30	0 00E+00	1 38E-04	2 76E-04	0 1250	2 150E+13
Cm-244	1 6962E-06	768 65	1,537 30	0 00E+00	1 30E-03	2 61E-03	0 2250	2 511E+13
Co-60	1 2839E+00	768 65	1,537 30	0 00E+00	9 87E+02	1 97E+03	0 3750	1 275E+13
Cs-134	9 0541E-02	768 65	1,537 30	0 00E+00	6 96E+01	1 39E+02	0 5750	1 694E+14
Cs-135	3 2195E-05	768 65	1,537 30	0 00E+00	2 47E-02	4 95E-02	0 8500	7 272E+12
Cs-137	2 7564E+00	768 65	1,537 30	0 00E+00	2 12E+03	4 24E+03	1 2500	1 477E+14
Eu-154	1 5368E-02	768 65	1,537 30	0 00E+00	1 18E+01	2 36E+01	1 7500	9 844E+10
Eu-155	2 9293E-02	768 65	1,537 30	0 00E+00	2 25E+01	4 50E+01	2 2500	1 587E+11
Fe-55	7 7158E-01	768 65	1,537 30	0 00E+00	5 93E+02	1 19E+03	2 7500	1 259E+09
H-3	1 1111E-02	768 65	1,537 30	0 00E+00	8 54E+00	1 71E+01	3 5000	1 465E+08
I-129	7 3684E-07	768 65	1,537 30	0 00E+00	5 66E-04	1 13E-03	5 0000	8 202E+02
Kr-85	2 5263E-01	768 65	1,537 30	0 00E+00	1 94E+02	3 88E+02	7 0000	9 286E+01
Np-237	1 2427E-06	768 65	1,537 30	0 00E+00	9 55E-04	1 91E-03	11 0000	1 058E+01
Pa-231	3 8511E-09	768 65	1,537 30	0 00E+00	2 96E-06	5 92E-06		
Pb-210	7 3880E-15	768 65	1,537 30	0 00E+00	5 68E-12	1 14E-11		
Pm-147	2 1023E+00	768 65	1,537 30	0 00E+00	1 62E+03	3 23E+03		
Pu-238	1 0383E-03	768 65	1,537 30	0 00E+00	7 98E-01	1 60E+00		
Pu-239	5 5293E-03	768 65	1,537 30	0 00E+00	4 25E+00	8 50E+00		
Pu-240	2 1278E-03	768 65	1,537 30	0 00E+00	1 64E+00	3 27E+00		
Pu-241	1 0195E-01	768 65	1,537 30	0 00E+00	7 84E+01	1 57E+02		
Pu-242	2 3128E-07	768 65	1,537 30	0 00E+00	1 78E-04	3 56E-04		
Ra-226	5 2782E-14	768 65	1,537 30	0 00E+00	4 06E-11	8 11E-11		
Ra-228	1 9338E-10	768 65	1,537 30	0 00E+00	1 49E-07	2 97E-07		
Ru-106	9 1684E-02	768 65	1,537 30	0 00E+00	7 05E+01	1 41E+02		
Se-79	1 3018E-05	768 65	1,537 30	0 00E+00	1 00E-02	2 00E-02		
Sn-126	1 2167E-05	768 65	1,537 30	0 00E+00	9 35E-03	1 87E-02		
Sr-90	2 6045E+00	768 65	1,537 30	0 00E+00	2 00E+03	4 00E+03		
Tc-99	4 4241E-04	768 65	1,537 30	0 00E+00	3 40E-01	6 80E-01		
Th-229	1 3713E-10	768 65	1,537 30	0 00E+00	1 05E-07	2 11E-07		
Th-230	1 8090E-11	768 65	1,537 30	0 00E+00	1 39E-08	2 78E-08		
Th-232	2 5278E-10	768 65	1,537 30	0 00E+00	1 94E-07	3 89E-07		
Ti-208	1 6947E-08	768 65	1,537 30	0 00E+00	1 30E-05	2 61E-05		
U-232	4 8737E-08	768 65	1,537 30	0 00E+00	3 75E-05	7 49E-05		
U-233	1 2203E-07	768 65	1,537 30	0 00E+00	9 38E-05	1 88E-04		
U-234	1 5925E-07	768 65	1,537 30	0 00E+00	1 22E-04	2 45E-04		
U-235	2 6194E-06	768 65	0 00	1 01E-02	8 04E-03	1 01E-02		
U-236	1 2693E-05	768 65	1,537 30	0 00E+00	9 76E-03	1 95E-02		
U-238	-3 6331E-08	768 65	0 00	6 30E-03	6 27E-03	6 30E-03		
Y-90	2 6060E+00	768 65	1,537 30	0 00E+00	2 00E+03	4 01E+03		
Other Radionuclides					2 77E+03	5 54E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.47E+01	8.95E+01
Total	Total

**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 %	19 8857762	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		768 65	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		1 537 30	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 96		1 00
Bounding	1 93		

<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 STD 8 S/20 SLOVENIA  
**SNF ID #:** 1079  
**Fuel Units & Descr:** 149 - ELEMENT  
**Heavy Metal Mass:** BOL=28.578kg EOL=27 446kg  
**ROD Storage Site:** INEEL

**Fuel decay start date:** 2010  
**Estimates as of:** 2010  
**Template:** TRIGA-SS (LW/U-Zirc, 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"  
 1 34

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 Actrvty (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	1,081 00	2,161 99	0 00E+00	9 21E-07	1 84E-06	Avg MeV	
Am-241	1.8331E-03	1,081 00	2,161 99	0 00E+00	1 98E+00	3 96E+00	0.0150	3 494E+14
Am-242m	1 4129E-06	1,081 00	2,161 99	0 00E+00	1 53E-03	3 05E-03	0 0250	7 689E+13
Am-243	1 4774E-07	1,081 00	2,161 99	0 00E+00	1 60E-04	3 19E-04	0 0375	6 548E+13
C-14	1 2871E-04	1,081 00	2,161 99	0 00E+00	1 39E-01	2 78E-01	0.0575	6 721E+13
Cl-36	2 8120E-06	1,081 00	2,161 99	0 00E+00	3 04E-03	6 08E-03	0 0850	4 164E+13
Cr-243	1 7940E-07	1,081 00	2,161 99	0 00E+00	1.94E-04	3 88E-04	0 1250	3 024E+13
Cr-244	1 6962E-06	1,081 00	2,161 99	0 00E+00	1 83E-03	3 67E-03	0.2250	3.532E+13
Co-60	1.2839E+00	1,081 00	2,161 99	0 00E+00	1.39E+03	2.78E+03	0.3750	1 792E+13
Cs-134	9 0541E-02	1,081 00	2,161 99	0 00E+00	9 79E+01	1 96E+02	0 5750	2.383E+14
Cs-135	3.2195E-05	1,081 00	2,161 99	0 00E+00	3 48E-02	6 96E-02	0 8500	1 023E+13
Cs-137	2.7564E+00	1,081 00	2,161 99	0 00E+00	2 98E+03	5 96E+03	1 2500	2.077E+14
Eu-154	1.5368E-02	1,081 00	2,161 99	0 00E+00	1 66E+01	3 32E+01	1 7500	1 384E+11
Eu-155	2 9293E-02	1,081 00	2,161 99	0 00E+00	3 17E+01	6 33E+01	2.2500	2.232E+11
Fe-55	7 7158E-01	1,081 00	2,161 99	0 00E+00	8 34E+02	1 67E+03	2.7500	1 771E+09
H-3	1 1111E-02	1,081 00	2,161 99	0 00E+00	1.20E+01	2 40E+01	3.5000	2.061E+08
I-129	7.3684E-07	1,081 00	2,161 99	0 00E+00	7.97E-04	1.59E-03	5.0000	1 151E+03
Kr-85	2 5263E-01	1,081 00	2,161 99	0 00E+00	2.73E+02	5 46E+02	7 0000	1.303E+02
Np-237	1.2427E-06	1,081 00	2,161 99	0 00E+00	1.34E-03	2 69E-03	11 0000	1 484E+01
Pa-231	3 8511E-09	1,081 00	2,161 99	0 00E+00	4 16E-06	8 33E-06		
Pb-210	7.3880E-15	1,081 00	2,161 99	0 00E+00	7 99E-12	1 60E-11		
Pm-147	2.1023E+00	1,081 00	2,161 99	0 00E+00	2 27E+03	4 55E+03		
Pu-238	1 0383E-03	1,081 00	2,161 99	0 00E+00	1 12E+00	2 24E+00		
Pu-239	5 5293E-03	1,081 00	2,161 99	0 00E+00	5 98E+00	1 20E+01		
Pu-240	2 1278E-03	1,081 00	2,161 99	0 00E+00	2 30E+00	4 60E+00		
Pu-241	1 0195E-01	1,081 00	2,161 99	0 00E+00	1 10E+02	2 20E+02		
Pu-242	2 3128E-07	1,081 00	2,161 99	0 00E+00	2.50E-04	5 00E-04		
Ra-226	5 2782E-14	1,081 00	2,161 99	0 00E+00	5 71E-11	1 14E-10		
Ra-228	1 9338E-10	1,081 00	2,161 99	0 00E+00	2 09E-07	4 18E-07		
Ru-106	9 1684E-02	1,081 00	2,161 99	0 00E+00	9 91E+01	1 98E+02		
Se-79	1.3018E-05	1,081 00	2,161 99	0 00E+00	1 41E-02	2 81E-02		
Sn-126	1.2167E-05	1,081 00	2,161 99	0 00E+00	1 32E-02	2 63E-02		
Sr-90	2 6045E+00	1,081 00	2,161 99	0 00E+00	2 82E+03	5 63E+03		
Tc-99	4 4241E-04	1,081 00	2,161 99	0 00E+00	4 78E-01	9 56E-01		
Th-229	1 3713E-10	1,081 00	2,161 99	0 00E+00	1.48E-07	2 96E-07		
Th-230	1 8090E-11	1,081 00	2,161 99	0 00E+00	1.96E-08	3 91E-08		
Th-232	2 5278E-10	1,081 00	2,161 99	0 00E+00	2 73E-07	5 47E-07		
Tl-208	1 6947E-08	1,081 00	2,161 99	0 00E+00	1 83E-05	3 66E-05		
U-232	4 8737E-08	1,081 00	2,161 99	0 00E+00	5.27E-05	1 05E-04		
U-233	1.2203E-07	1,081 00	2,161 99	0 00E+00	1 32E-04	2 64E-04		
U-234	1.5925E-07	1,081 00	2,161 99	0 00E+00	1 72E-04	3 44E-04		
U-235	-2 6194E-06	1,081 00	0 00	1.23E-02	9 45E-03	1 23E-02		
U-236	1.2693E-05	1,081 00	2,161 99	0 00E+00	1.37E-02	2 74E-02		
U-238	-3 6331E-08	1,081 00	0 00	7.70E-03	7 66E-03	7 70E-03		
Y-90	2 6060E+00	1,081 00	2,161 99	0 00E+00	2 82E+03	5 63E+03		
Other Radionuclides					3 90E+03	7 79E+03		

Thermal Power	
Nominal Heat	Bounding Heat Output
Output (Watts)	Heat Output (Watts)
6.29E+01	1.26E+02
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 %	19 886	10 to 20

Basis for Parameter Differences:

  

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal		1,081 00
Bounding		2,161 99

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	1 11	
Bounding	2 22	

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 SO KOREA  
 SNF ID #: 484  
 Fuel Units & Descr: 104 - ELEMENT  
 Heavy Metal Mass: BOL=19.76kg; EOL=19.261kg  
 ROD Storage Site: INEEL

Fuel decay start date: 1996  
 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"  
 0.94

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3731E-09	476.54	953.08	0.00E+00	6.54E-07	1.31E-06	Avg MeV	
Am-241	2.3865E-03	476.54	953.08	0.00E+00	1.14E+00	2.27E+00	0.0150	1.231E+14
Am-242m	1.3812E-06	476.54	953.08	0.00E+00	6.58E-04	1.32E-03	0.0250	2.608E+13
Am-243	1.4767E-07	476.54	953.08	0.00E+00	7.04E-05	1.41E-04	0.0375	2.228E+13
C-14	1.2863E-04	476.54	953.08	0.00E+00	6.13E-02	1.23E-01	0.0575	2.375E+13
Cl-36	2.8120E-06	476.54	953.08	0.00E+00	1.34E-03	2.68E-03	0.0850	1.441E+13
Cm-243	1.5895E-07	476.54	953.08	0.00E+00	7.57E-05	1.51E-04	0.1250	9.470E+12
Cm-244	1.4008E-06	476.54	953.08	0.00E+00	6.68E-04	1.34E-03	0.2250	1.229E+13
Co-60	6.6541E-01	476.54	953.08	0.00E+00	3.17E+02	6.34E+02	0.3750	5.644E+12
Cs-134	1.6887E-02	476.54	953.08	0.00E+00	8.05E+00	1.61E+01	0.5750	8.842E+13
Cs-135	3.2195E-05	476.54	953.08	0.00E+00	1.53E-02	3.07E-02	0.8500	1.579E+12
Cs-137	2.4556E+00	476.54	953.08	0.00E+00	1.17E+03	2.34E+03	1.2500	4.746E+13
Eu-154	1.0268E-02	476.54	953.08	0.00E+00	4.89E+00	9.79E+00	1.7500	2.856E+10
Eu-155	1.4570E-02	476.54	953.08	0.00E+00	6.94E+00	1.39E+01	2.2500	1.492E+09
Fe-55	2.0361E-01	476.54	953.08	0.00E+00	9.70E+01	1.94E+02	2.7500	2.469E+07
H-3	8.3940E-03	476.54	953.08	0.00E+00	4.00E+00	8.00E+00	3.5000	2.926E+06
I-129	7.3684E-07	476.54	953.08	0.00E+00	3.51E-04	7.02E-04	5.0000	5.096E+02
Kr-85	1.8286E-01	476.54	953.08	0.00E+00	8.71E+01	1.74E+02	7.0000	5.765E+01
Np-237	1.2462E-06	476.54	953.08	0.00E+00	5.94E-04	1.19E-03	11.0000	6.564E+00
Pa-231	4.9143E-09	476.54	953.08	0.00E+00	2.34E-06	4.68E-06		
Pb-210	1.7173E-14	476.54	953.08	0.00E+00	8.18E-12	1.64E-11		
Pm-147	5.6165E-01	476.54	953.08	0.00E+00	2.68E+02	5.35E+02		
Pu-238	9.9820E-04	476.54	953.08	0.00E+00	4.76E-01	9.51E-01		
Pu-239	5.5293E-03	476.54	953.08	0.00E+00	2.63E+00	5.27E+00		
Pu-240	2.1263E-03	476.54	953.08	0.00E+00	1.01E+00	2.03E+00		
Pu-241	8.0165E-02	476.54	953.08	0.00E+00	3.82E+01	7.64E+01		
Pu-242	2.3128E-07	476.54	953.08	0.00E+00	1.10E-04	2.20E-04		
Ra-226	9.9774E-14	476.54	953.08	0.00E+00	4.75E-11	9.51E-11		
Ra-228	2.1729E-10	476.54	953.08	0.00E+00	1.04E-07	2.07E-07		
Ru-106	2.9519E-03	476.54	953.08	0.00E+00	1.41E+00	2.81E+00		
Se-79	1.3017E-05	476.54	953.08	0.00E+00	6.20E-03	1.24E-02		
Sn-126	1.2167E-05	476.54	953.08	0.00E+00	5.80E-03	1.16E-02		
Sr-90	2.3128E+00	476.54	953.08	0.00E+00	1.10E+03	2.20E+03		
Tc-99	4.4241E-04	476.54	953.08	0.00E+00	2.11E-01	4.22E-01		
Th-229	1.9459E-10	476.54	953.08	0.00E+00	9.27E-08	1.85E-07		
Th-230	2.5564E-11	476.54	953.08	0.00E+00	1.22E-08	2.44E-08		
Th-232	2.5278E-10	476.54	953.08	0.00E+00	1.20E-07	2.41E-07		
Th-208	1.6947E-08	476.54	953.08	0.00E+00	8.08E-06	1.62E-05		
U-232	4.6812E-08	476.54	953.08	0.00E+00	2.23E-05	4.46E-05		
U-233	1.2206E-07	476.54	953.08	0.00E+00	5.82E-05	1.16E-04		
U-234	1.7323E-07	476.54	953.08	0.00E+00	8.26E-05	1.65E-04		
U-235	-2.6194E-06	476.54	0.00	8.54E-03	7.29E-03	8.54E-03		
U-236	-1.2693E-05	476.54	953.08	0.00E+00	6.05E-03	1.21E-02		
U-238	-3.6331E-08	476.54	0.00	5.31E-03	5.30E-03	5.31E-03		
Y-90	2.3128E+00	476.54	953.08	0.00E+00	1.10E+03	2.20E+03		
Other Radionuclides					1.17E+03	2.34E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.87E+01	3.73E+01
Total	Total

**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	10 to 20 ±	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		476.54	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		953.08	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.71		1.00
Bounding	1.41		

<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 TEXAS A&M  
 SNF ID # 258  
 Fuel Units & Descr. 85 - ELEMENT  
 Heavy Metal Mass BOL=14 875kg EOL=14.34kg  
 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 77

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8.5173E-10	511.19	1,022.38	0.00E+00	4.35E-07	8.71E-07	0.0150	1.652E+14
Am-241	1.8331E-03	511.19	1,022.38	0.00E+00	9.37E-01	1.87E+00	0.0250	3.636E+13
Am-242m	1.4129E-06	511.19	1,022.38	0.00E+00	7.22E-04	1.44E-03	0.0375	3.096E+13
Am-243	1.4774E-07	511.19	1,022.38	0.00E+00	7.55E-05	1.51E-04	0.0575	3.178E+13
C-14	1.2871E-04	511.19	1,022.38	0.00E+00	6.58E-02	1.32E-01	0.0850	1.969E+13
Cl-36	2.8120E-06	511.19	1,022.38	0.00E+00	1.44E-03	2.87E-03	0.1250	1.430E+13
Cm-243	1.7940E-07	511.19	1,022.38	0.00E+00	9.17E-05	1.83E-04	0.2250	1.670E+13
Cm-244	1.6962E-06	511.19	1,022.38	0.00E+00	8.67E-04	1.73E-03	0.3750	8.476E+12
Co-60	1.2839E+00	511.19	1,022.38	0.00E+00	6.56E+02	1.31E+03	0.5750	1.127E+14
Cs-134	9.0541E-02	511.19	1,022.38	0.00E+00	4.63E+01	9.26E+01	0.8500	4.836E+12
Cs-135	3.2195E-05	511.19	1,022.38	0.00E+00	1.65E-02	3.29E-02	1.2500	9.822E+13
Cs-137	2.7564E+00	511.19	1,022.38	0.00E+00	1.41E+03	2.82E+03	1.7500	6.547E+10
Eu-154	1.5368E-02	511.19	1,022.38	0.00E+00	7.86E+00	1.57E+01	2.2500	1.055E+11
Eu-155	2.9293E-02	511.19	1,022.38	0.00E+00	1.50E+01	2.99E+01	2.7500	8.374E+08
Fe-55	7.7158E-01	511.19	1,022.38	0.00E+00	3.94E+02	7.89E+02	3.5000	9.746E+07
H-3	1.1111E-02	511.19	1,022.38	0.00E+00	5.68E+00	1.14E+01	5.0000	5.450E+02
I-129	7.3684E-07	511.19	1,022.38	0.00E+00	3.77E-04	7.53E-04	7.0000	6.170E+01
Kr-85	2.5263E-01	511.19	1,022.38	0.00E+00	1.29E+02	2.58E+02	11.0000	7.029E+00
Np-237	1.2427E-06	511.19	1,022.38	0.00E+00	6.35E-04	1.27E-03		
Pa-231	3.8511E-09	511.19	1,022.38	0.00E+00	1.97E-06	3.94E-06		
Pb-210	7.3880E-15	511.19	1,022.38	0.00E+00	3.78E-12	7.55E-12		
Pm-147	2.1023E+00	511.19	1,022.38	0.00E+00	1.07E+03	2.15E+03		
Pu-238	1.0383E-03	511.19	1,022.38	0.00E+00	5.31E-01	1.06E+00		
Pu-239	5.5293E-03	511.19	1,022.38	0.00E+00	2.83E+00	5.65E+00		
Pu-240	2.1278E-03	511.19	1,022.38	0.00E+00	1.09E+00	2.18E+00		
Pu-241	1.0195E-01	511.19	1,022.38	0.00E+00	5.21E+01	1.04E+02		
Pu-242	2.3128E-07	511.19	1,022.38	0.00E+00	1.18E-04	2.36E-04		
Ra-226	5.2782E-14	511.19	1,022.38	0.00E+00	2.70E-11	5.40E-11		
Ra-228	1.9338E-10	511.19	1,022.38	0.00E+00	9.89E-08	1.98E-07		
Ru-106	9.1684E-02	511.19	1,022.38	0.00E+00	4.69E+01	9.37E+01		
Se-79	1.3018E-05	511.19	1,022.38	0.00E+00	6.65E-03	1.33E-02		
Sn-126	1.2167E-05	511.19	1,022.38	0.00E+00	6.22E-03	1.24E-02		
Sr-90	2.6045E+00	511.19	1,022.38	0.00E+00	1.33E+03	2.66E+03		
Tc-99	4.4241E-04	511.19	1,022.38	0.00E+00	2.26E-01	4.52E-01		
Th-229	1.3713E-10	511.19	1,022.38	0.00E+00	7.01E-08	1.40E-07		
Th-230	1.8090E-11	511.19	1,022.38	0.00E+00	9.25E-09	1.85E-08		
Th-232	2.5278E-10	511.19	1,022.38	0.00E+00	1.29E-07	2.58E-07		
Ti-208	1.6947E-08	511.19	1,022.38	0.00E+00	8.66E-06	1.73E-05		
U-232	4.8737E-08	511.19	1,022.38	0.00E+00	2.49E-05	4.98E-05		
U-233	1.2203E-07	511.19	1,022.38	0.00E+00	6.24E-05	1.25E-04		
U-234	1.5925E-07	511.19	1,022.38	0.00E+00	8.14E-05	1.63E-04		
U-235	-2.6194E-06	511.19	0 00	6.43E-03	5.09E-03	6.43E-03	2.98E+01	5.95E+01
U-236	1.2693E-05	511.19	1,022.38	0.00E+00	6.49E-03	1.30E-02		
U-238	-3.6331E-08	511.19	0 00	4.00E-03	3.98E-03	4.00E-03	Total	Total
Y-90	2.6060E+00	511.19	1,022.38	0.00E+00	1.33E+03	2.66E+03		
					1.84E+03	3.69E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.98E+01	5.95E+01
Total	Total

Other Radionuclides

**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	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		511.19	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		1,022.38	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.01		1.00
Bounding	2.02		

<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: TRIGA STD 8 5/20 THAILAND  
 SNF ID #: 489  
 Fuel Units & Descr: 100 - ELEMENT  
 Heavy Metal Mass: BOL=19.5kg, EOL=19.3kg  
 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

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
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	8.5173E-10	190.92	381.84	0.00E+00	1.63E-07	3.25E-07		
Am-241	1.8331E-03	190.92	381.84	0.00E+00	3.50E-01	7.00E-01	0.0150	6.172E+13
Am-242m	1.4129E-06	190.92	381.84	0.00E+00	2.70E-04	5.40E-04	0.0250	1.358E+13
Am-243	1.4774E-07	190.92	381.84	0.00E+00	2.82E-05	5.64E-05	0.0375	1.156E+13
C-14	1.2871E-04	190.92	381.84	0.00E+00	2.46E-02	4.91E-02	0.0575	1.187E+13
Cl-36	2.8120E-06	190.92	381.84	0.00E+00	5.37E-04	1.07E-03	0.0850	7.354E+12
Cm-243	1.7940E-07	190.92	381.84	0.00E+00	3.43E-05	6.85E-05	0.1250	5.340E+12
Cm-244	1.6962E-06	190.92	381.84	0.00E+00	3.24E-04	6.48E-04	0.2250	6.238E+12
Co-60	1.2839E+00	190.92	381.84	0.00E+00	2.45E+02	4.90E+02	0.3750	3.166E+12
Cs-134	9.0541E-02	190.92	381.84	0.00E+00	1.73E+01	3.46E+01	0.5750	4.209E+13
Cs-135	3.2195E-05	190.92	381.84	0.00E+00	6.15E-03	1.23E-02	0.8500	1.806E+12
Cs-137	2.7564E+00	190.92	381.84	0.00E+00	5.26E+02	1.05E+03	1.2500	3.668E+13
Eu-154	1.5368E-02	190.92	381.84	0.00E+00	2.93E+00	5.87E+00	1.7500	2.445E+10
Eu-155	2.9293E-02	190.92	381.84	0.00E+00	5.59E+00	1.12E+01	2.2500	3.941E+10
Fe-55	7.7158E-01	190.92	381.84	0.00E+00	1.47E+02	2.95E+02	2.7500	3.128E+08
H-3	1.1111E-02	190.92	381.84	0.00E+00	2.12E+00	4.24E+00	3.5000	3.640E+07
I-129	7.3684E-07	190.92	381.84	0.00E+00	1.41E-04	2.81E-04	5.0000	2.122E+02
Kr-85	2.5263E-01	190.92	381.84	0.00E+00	4.82E+01	9.65E+01	7.0000	2.404E+01
Np-237	1.2427E-06	190.92	381.84	0.00E+00	2.37E-04	4.75E-04	11.0000	2.740E+00
Pa-231	3.8511E-09	190.92	381.84	0.00E+00	7.35E-07	1.47E-06		
Pb-210	7.3880E-15	190.92	381.84	0.00E+00	1.41E-12	2.82E-12		
Pm-147	2.1023E+00	190.92	381.84	0.00E+00	4.01E+02	8.03E+02		
Pu-238	1.0383E-03	190.92	381.84	0.00E+00	1.98E-01	3.96E-01		
Pu-239	5.5293E-03	190.92	381.84	0.00E+00	1.06E+00	2.11E+00		
Pu-240	2.1278E-03	190.92	381.84	0.00E+00	4.06E-01	8.12E-01		
Pu-241	1.0195E-01	190.92	381.84	0.00E+00	1.95E+01	3.89E+01		
Pu-242	2.3128E-07	190.92	381.84	0.00E+00	4.42E-05	8.83E-05		
Ra-226	5.2782E-14	190.92	381.84	0.00E+00	1.01E-11	2.02E-11		
Ra-228	1.9338E-10	190.92	381.84	0.00E+00	3.69E-08	7.38E-08		
Ru-106	9.1684E-02	190.92	381.84	0.00E+00	1.75E+01	3.50E+01		
Se-79	1.3018E-05	190.92	381.84	0.00E+00	2.49E-03	4.97E-03		
Sn-126	1.2167E-05	190.92	381.84	0.00E+00	2.32E-03	4.65E-03		
Sr-90	2.6045E+00	190.92	381.84	0.00E+00	4.97E+02	9.95E+02		
Tc-99	4.4241E-04	190.92	381.84	0.00E+00	8.45E-02	1.69E-01		
Th-229	1.3713E-10	190.92	381.84	0.00E+00	2.62E-08	5.24E-08		
Th-230	1.8090E-11	190.92	381.84	0.00E+00	3.45E-09	6.91E-09		
Th-232	2.5278E-10	190.92	381.84	0.00E+00	4.83E-08	9.65E-08		
Th-208	1.6947E-08	190.92	381.84	0.00E+00	3.24E-06	6.47E-06		
U-232	4.8737E-08	190.92	381.84	0.00E+00	9.30E-06	1.86E-05		
U-233	1.2203E-07	190.92	381.84	0.00E+00	2.33E-05	4.66E-05		
U-234	1.5925E-07	190.92	381.84	0.00E+00	3.04E-05	6.08E-05		
U-235	-2.6194E-06	190.92	0.00	8.43E-03	7.93E-03	8.43E-03		
U-236	1.2693E-05	190.92	381.84	0.00E+00	2.42E-03	4.85E-03		
U-238	-3.6331E-08	190.92	0.00	5.24E-03	5.24E-03	5.24E-03		
Y-90	2.6060E+00	190.92	381.84	0.00E+00	4.98E+02	9.95E+02		
Other Radionuclides					6.88E+02	1.38E+03		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.11E+01	2.22E+01
<b>Total</b>	<b>Total</b>

**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	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		190.92	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		381.84	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.29		1.00
Bounding	0.57		

<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 STD 8 5/20 TURKEY	<sup>1</sup> Fuel decay start date	2010
SNF ID #:	490	Estimates as of	2010
Fuel Units & Descr:	79 - ELEMENT	Template	TRIGA-SS (LW/U-Zr, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=15.405kg EOL=15.247kg	<sup>2</sup> Template Burnup(MWd)	6.65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0.000195
		Template Decay Time	5 years

Estimated  
Canister usage  
18"x10"  
**0.71**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	150.83	301.66	0.00E+00	1.28E-07	2.57E-07	Avg MeV	
Am-241	1.8331E-03	150.83	301.66	0.00E+00	2.76E-01	5.53E-01	0.0150	4.876E+13
Am-242m	1.4129E-06	150.83	301.66	0.00E+00	2.13E-04	4.26E-04	0.0250	1.073E+13
Am-243	1.4774E-07	150.83	301.66	0.00E+00	2.23E-05	4.46E-05	0.0375	9.136E+12
C-14	1.2871E-04	150.83	301.66	0.00E+00	1.94E-02	3.88E-02	0.0575	9.377E+12
Cl-36	2.8120E-06	150.83	301.66	0.00E+00	4.24E-04	8.48E-04	0.0850	5.809E+12
Cm-243	1.7940E-07	150.83	301.66	0.00E+00	2.71E-05	5.41E-05	0.1250	4.219E+12
Cm-244	1.6962E-06	150.83	301.66	0.00E+00	2.56E-04	5.12E-04	0.2250	4.928E+12
Co-60	1.2839E+00	150.83	301.66	0.00E+00	1.94E+02	3.87E+02	0.3750	2.501E+12
Cs-134	9.0541E-02	150.83	301.66	0.00E+00	1.37E+01	2.73E+01	0.5750	3.325E+13
Cs-135	3.2195E-05	150.83	301.66	0.00E+00	4.86E-03	9.71E-03	0.8500	1.427E+12
Cs-137	2.7564E+00	150.83	301.66	0.00E+00	4.16E+02	8.31E+02	1.2500	2.898E+13
Eu-154	1.5368E-02	150.83	301.66	0.00E+00	2.32E+00	4.64E+00	1.7500	1.932E+10
Eu-155	2.9293E-02	150.83	301.66	0.00E+00	4.42E+00	8.84E+00	2.2500	3.114E+10
Fe-55	7.7158E-01	150.83	301.66	0.00E+00	1.16E+02	2.33E+02	2.7500	2.471E+08
H-3	1.1111E-02	150.83	301.66	0.00E+00	1.68E+00	3.35E+00	3.5000	2.876E+07
I-129	7.3684E-07	150.83	301.66	0.00E+00	1.11E-04	2.22E-04	5.0000	1.677E+02
Kr-85	2.5263E-01	150.83	301.66	0.00E+00	3.81E+01	7.62E+01	7.0000	1.899E+01
Np-237	1.2427E-06	150.83	301.66	0.00E+00	1.87E-04	3.75E-04	11.0000	2.165E+00
Pa-231	3.8511E-09	150.83	301.66	0.00E+00	5.81E-07	1.16E-06		
Pb-210	7.3880E-15	150.83	301.66	0.00E+00	1.11E-12	2.23E-12		
Pm-147	2.1023E+00	150.83	301.66	0.00E+00	3.17E+02	6.34E+02		
Pu-238	1.0383E-03	150.83	301.66	0.00E+00	1.57E-01	3.13E-01		
Pu-239	5.5293E-03	150.83	301.66	0.00E+00	8.34E-01	1.67E+00		
Pu-240	2.1278E-03	150.83	301.66	0.00E+00	3.21E-01	6.42E-01		
Pu-241	1.0195E-01	150.83	301.66	0.00E+00	1.54E+01	3.08E+01		
Pu-242	2.3128E-07	150.83	301.66	0.00E+00	3.49E-05	6.98E-05		
Ra-226	5.2782E-14	150.83	301.66	0.00E+00	7.96E-12	1.59E-11		
Ra-228	1.9338E-10	150.83	301.66	0.00E+00	2.92E-08	5.83E-08		
Ru-106	9.1684E-02	150.83	301.66	0.00E+00	1.38E+01	2.77E+01		
Se-79	1.3018E-05	150.83	301.66	0.00E+00	1.96E-03	3.93E-03		
Sn-126	1.2167E-05	150.83	301.66	0.00E+00	1.84E-03	3.67E-03		
Sr-90	2.6045E+00	150.83	301.66	0.00E+00	3.93E+02	7.86E+02		
Tc-99	4.4241E-04	150.83	301.66	0.00E+00	6.67E-02	1.33E-01		
Th-229	1.3713E-10	150.83	301.66	0.00E+00	2.07E-08	4.14E-08		
Th-230	1.8090E-11	150.83	301.66	0.00E+00	2.73E-09	5.46E-09		
Th-232	2.5278E-10	150.83	301.66	0.00E+00	3.81E-08	7.63E-08		
Ti-208	1.6947E-08	150.83	301.66	0.00E+00	2.56E-06	5.11E-06		
U-232	4.8737E-08	150.83	301.66	0.00E+00	7.35E-06	1.47E-05		
U-233	1.2203E-07	150.83	301.66	0.00E+00	1.84E-05	3.68E-05		
U-234	1.5925E-07	150.83	301.66	0.00E+00	2.40E-05	4.80E-05		
U-235	-2.6194E-06	150.83	0.00	6.66E-03	6.26E-03	6.66E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2693E-05	150.83	301.66	0.00E+00	1.91E-03	3.83E-03	8.78E+00	1.76E+01
U-238	-3.6331E-08	150.83	0.00	4.14E-03	4.14E-03	4.14E-03	Total	Total
Y-90	2.6060E+00	150.83	301.66	0.00E+00	3.93E+02	7.86E+02		
Other Radionuclides					5.44E+02	1.09E+03		

**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	10 to 20.1	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:		150.83	Nominal burnup calculated from the heavy metal mass destroyed
Bounding:		301.66	Bounding burnup assumed to be twice nominal burnup

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal:	0.29		1.00
Bounding:	0.57		

<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 STD 8 5/20 U OF AZ  
SNF ID #: 59

Fuel Units & Descr: 84 - ELEMENT  
Heavy Metal Mass: BOL=16.38kg, EOL=15.75kg  
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"  
0.76

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	601.40	1,202.81	0.00E+00	5.12E-07	1.02E-06	Avg MeV	
Am-241	1.8331E-03	601.40	1,202.81	0.00E+00	1.10E+00	2.20E+00	0.0150	1.944E+14
Am-242m	1.4129E-06	601.40	1,202.81	0.00E+00	8.50E-04	1.70E-03	0.0250	4.278E+13
Am-243	1.4774E-07	601.40	1,202.81	0.00E+00	8.89E-05	1.78E-04	0.0375	3.643E+13
C-14	1.2871E-04	601.40	1,202.81	0.00E+00	7.74E-02	1.55E-01	0.0575	3.739E+13
Cl-36	2.8120E-06	601.40	1,202.81	0.00E+00	1.69E-03	3.38E-03	0.0850	2.316E+13
Cm-243	1.7940E-07	601.40	1,202.81	0.00E+00	1.08E-04	2.16E-04	0.1250	1.682E+13
Cm-244	1.6962E-06	601.40	1,202.81	0.00E+00	1.02E-03	2.04E-03	0.2250	1.965E+13
Co-60	1.2839E+00	601.40	1,202.81	0.00E+00	7.72E+02	1.54E+03	0.3750	9.972E+12
Cs-134	9.0541E-02	601.40	1,202.81	0.00E+00	5.45E+01	1.09E+02	0.5750	1.326E+14
Cs-135	3.2195E-05	601.40	1,202.81	0.00E+00	1.94E-02	3.87E-02	0.8500	5.690E+12
Cs-137	2.7564E+00	601.40	1,202.81	0.00E+00	1.66E+03	3.32E+03	1.2500	1.155E+14
Eu-154	1.5368E-02	601.40	1,202.81	0.00E+00	9.24E+00	1.85E+01	1.7500	7.702E+10
Eu-155	2.9293E-02	601.40	1,202.81	0.00E+00	1.76E+01	3.52E+01	2.2500	1.241E+11
Fe-55	7.7158E-01	601.40	1,202.81	0.00E+00	4.64E+02	9.28E+02	2.7500	9.852E+08
H-3	1.1111E-02	601.40	1,202.81	0.00E+00	6.68E+00	1.34E+01	3.5000	1.147E+08
I-129	7.3684E-07	601.40	1,202.81	0.00E+00	4.43E-04	8.86E-04	5.0000	6.405E+02
Kr-85	2.5263E-01	601.40	1,202.81	0.00E+00	1.52E+02	3.04E+02	7.0000	7.251E+01
Np-237	1.2427E-06	601.40	1,202.81	0.00E+00	7.47E-04	1.49E-03	11.0000	8.260E+00
Pa-231	3.8511E-09	601.40	1,202.81	0.00E+00	2.32E-06	4.63E-06		
Pb-210	7.3880E-15	601.40	1,202.81	0.00E+00	4.44E-12	8.89E-12		
Pm-147	2.1023E+00	601.40	1,202.81	0.00E+00	1.26E+03	2.53E+03		
Pu-238	1.0383E-03	601.40	1,202.81	0.00E+00	6.24E-01	1.25E+00		
Pu-239	5.5293E-03	601.40	1,202.81	0.00E+00	3.33E+00	6.65E+00		
Pu-240	2.1278E-03	601.40	1,202.81	0.00E+00	1.28E+00	2.56E+00		
Pu-241	1.0195E-01	601.40	1,202.81	0.00E+00	6.13E+01	1.23E+02		
Pu-242	2.3128E-07	601.40	1,202.81	0.00E+00	1.39E-04	2.78E-04		
Ra-226	5.2782E-14	601.40	1,202.81	0.00E+00	3.17E-11	6.35E-11		
Ra-228	1.9338E-10	601.40	1,202.81	0.00E+00	1.16E-07	2.33E-07		
Ru-106	9.1684E-02	601.40	1,202.81	0.00E+00	5.51E+01	1.10E+02		
Se-79	1.3018E-05	601.40	1,202.81	0.00E+00	7.83E-03	1.57E-02		
Sn-126	1.2167E-05	601.40	1,202.81	0.00E+00	7.32E-03	1.46E-02		
Sr-90	2.6045E+00	601.40	1,202.81	0.00E+00	1.57E+03	3.13E+03		
Tc-99	4.4241E-04	601.40	1,202.81	0.00E+00	2.66E-01	5.32E-01		
Th-229	1.3713E-10	601.40	1,202.81	0.00E+00	8.25E-08	1.65E-07		
Th-230	1.8090E-11	601.40	1,202.81	0.00E+00	1.09E-08	2.18E-08		
Th-232	2.5278E-10	601.40	1,202.81	0.00E+00	1.52E-07	3.04E-07		
Tl-208	1.6947E-08	601.40	1,202.81	0.00E+00	1.02E-05	2.04E-05		
U-232	4.8737E-08	601.40	1,202.81	0.00E+00	2.93E-05	5.86E-05		
U-233	1.2203E-07	601.40	1,202.81	0.00E+00	7.34E-05	1.47E-04		
U-234	1.5925E-07	601.40	1,202.81	0.00E+00	9.58E-05	1.92E-04		
U-235	-2.6194E-06	601.40	0.00	7.08E-03	5.50E-03	7.08E-03		
U-236	1.2693E-05	601.40	1,202.81	0.00E+00	7.63E-03	1.53E-02		
U-238	-3.6331E-08	601.40	0.00	4.40E-03	4.38E-03	4.40E-03		
Y-90	2.6060E+00	601.40	1,202.81	0.00E+00	1.57E+03	3.13E+03		
Other Radionuclides					2.17E+03	4.34E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.50E+01	7.00E+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 %:	20	10 to 20.1

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal		601.40
Bounding		1,202.81

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	1.08	
Bounding	2.15	

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 U OF AZ  
 SNF ID #: 975  
 Fuel Units & Descr: 8 - ELEMENT  
 Heavy Metal Mass BOL=1.497kg; EOL=1.497kg  
 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"  
 0.07

**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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	28.58	57.15	0.00E+00	2.43E-08	4.87E-08	Avg MeV	
Am-241	1.8331E-03	28.58	57.15	0.00E+00	5.24E-02	1.05E-01	0.0150	9.238E+12
Am-242m	1.4129E-06	28.58	57.15	0.00E+00	4.04E-05	8.08E-05	0.0250	2.033E+12
Am-243	1.4774E-07	28.58	57.15	0.00E+00	4.22E-06	8.44E-06	0.0375	1.731E+12
C-14	1.2871E-04	28.58	57.15	0.00E+00	3.68E-03	7.36E-03	0.0575	1.777E+12
Cl-36	2.8120E-06	28.58	57.15	0.00E+00	8.04E-05	1.61E-04	0.0850	1.101E+12
Cm-243	1.7940E-07	28.58	57.15	0.00E+00	5.13E-06	1.03E-05	0.1250	7.993E+11
Cm-244	1.6962E-06	28.58	57.15	0.00E+00	4.85E-05	9.69E-05	0.2250	9.337E+11
Co-60	1.2839E+00	28.58	57.15	0.00E+00	3.67E+01	7.34E+01	0.3750	4.738E+11
Cs-134	9.0541E-02	28.58	57.15	0.00E+00	2.59E+00	5.17E+00	0.5750	6.299E+12
Cs-135	3.2195E-05	28.58	57.15	0.00E+00	9.20E-04	1.84E-03	0.8500	2.704E+11
Cs-137	2.7564E+00	28.58	57.15	0.00E+00	7.88E+01	1.58E+02	1.2500	5.491E+12
Eu-154	1.5368E-02	28.58	57.15	0.00E+00	4.39E-01	8.78E-01	1.7500	3.660E+09
Eu-155	2.9293E-02	28.58	57.15	0.00E+00	8.37E-01	1.67E+00	2.2500	5.899E+09
Fe-55	7.7158E-01	28.58	57.15	0.00E+00	2.20E+01	4.41E+01	2.7500	4.681E+07
H-3	1.1111E-02	28.58	57.15	0.00E+00	3.18E-01	6.35E-01	3.5000	5.448E+06
I-129	7.3684E-07	28.58	57.15	0.00E+00	2.11E-05	4.21E-05	5.0000	3.090E+01
Kr-85	2.5263E-01	28.58	57.15	0.00E+00	7.22E+00	1.44E+01	7.0000	3.499E+00
Np-237	1.2427E-06	28.58	57.15	0.00E+00	3.55E-05	7.10E-05	11.0000	3.987E-01
Pa-231	3.8511E-09	28.58	57.15	0.00E+00	1.10E-07	2.20E-07		
Pb-210	7.3880E-15	28.58	57.15	0.00E+00	2.11E-13	4.22E-13		
Pm-147	2.1023E+00	28.58	57.15	0.00E+00	6.01E+01	1.20E+02		
Pu-238	1.0383E-03	28.58	57.15	0.00E+00	2.97E-02	5.93E-02		
Pu-239	5.5293E-03	28.58	57.15	0.00E+00	1.58E-01	3.16E-01		
Pu-240	2.1278E-03	28.58	57.15	0.00E+00	6.08E-02	1.22E-01		
Pu-241	1.0195E-01	28.58	57.15	0.00E+00	2.91E+00	5.83E+00		
Pu-242	2.3128E-07	28.58	57.15	0.00E+00	6.61E-06	1.32E-05		
Ra-226	5.2782E-14	28.58	57.15	0.00E+00	1.51E-12	3.02E-12		
Ra-228	1.9338E-10	28.58	57.15	0.00E+00	5.53E-09	1.11E-08		
Ru-106	9.1684E-02	28.58	57.15	0.00E+00	2.62E+00	5.24E+00		
Se-79	1.3018E-05	28.58	57.15	0.00E+00	3.72E-04	7.44E-04		
Sn-126	1.2167E-05	28.58	57.15	0.00E+00	3.48E-04	6.95E-04		
Sr-90	2.6045E+00	28.58	57.15	0.00E+00	7.44E+01	1.49E+02		
Tc-99	4.4241E-04	28.58	57.15	0.00E+00	1.26E-02	2.53E-02		
Th-229	1.3713E-10	28.58	57.15	0.00E+00	3.92E-09	7.84E-09		
Th-230	1.8090E-11	28.58	57.15	0.00E+00	5.17E-10	1.03E-09		
Th-232	2.5278E-10	28.58	57.15	0.00E+00	7.22E-09	1.44E-08		
Ti-208	1.6947E-08	28.58	57.15	0.00E+00	4.84E-07	9.69E-07		
U-232	4.8737E-08	28.58	57.15	0.00E+00	1.39E-06	2.79E-06		
U-233	1.2203E-07	28.58	57.15	0.00E+00	3.49E-06	6.97E-06		
U-234	1.5925E-07	28.58	57.15	0.00E+00	4.55E-06	9.10E-06		
U-235	-2.6194E-06	28.58	0.00	5.95E-04	5.20E-04	5.95E-04		
U-236	1.2693E-05	28.58	57.15	0.00E+00	3.63E-04	7.25E-04		
U-238	-3.6331E-08	28.58	0.00	4.11E-04	4.09E-04	4.11E-04		
Y-90	2.6060E+00	28.58	57.15	0.00E+00	7.45E+01	1.49E+02		
Other Radionuclides					1.03E+02	2.06E+02		

**Thermal Power**  
 Nominal Heat Output (Watts) 1.66E+00  
 Bounding Heat Output (Watts) 3.33E+00  
 Total Total

**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 %	18.3974873	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		28.58	Nominal burnup assumed to be 2% of BOL heavy metal mass
Bounding		57.15	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.56		0.98
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: TRIGA STD 8.5/20 U OF IL  
 SNF ID #: 449  
 Fuel Units & Descr: 139 - ELEMENT  
 Heavy Metal Mass: BOL=27.8kg; EOL=26.41kg  
 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"  
 1.25

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5173E-10	1,326.90	2,653.81	0.00E+00	1.13E-06	2.26E-06	Avg. MeV	
Am-241	1.8331E-03	1,326.90	2,653.81	0.00E+00	2.43E+00	4.86E+00	0.0150	4.289E+14
Am-242m	1.4129E-06	1,326.90	2,653.81	0.00E+00	1.87E-03	3.75E-03	0.0250	9.438E+13
Am-243	1.4774E-07	1,326.90	2,653.81	0.00E+00	1.96E-04	3.92E-04	0.0375	8.037E+13
C-14	1.2871E-04	1,326.90	2,653.81	0.00E+00	1.71E-01	3.42E-01	0.0575	8.250E+13
Cl-36	2.8120E-06	1,326.90	2,653.81	0.00E+00	3.73E-03	7.46E-03	0.0850	5.111E+13
Cm-243	1.7940E-07	1,326.90	2,653.81	0.00E+00	2.38E-04	4.76E-04	0.1250	3.711E+13
Cm-244	1.6962E-06	1,326.90	2,653.81	0.00E+00	2.25E-03	4.50E-03	0.2250	4.336E+13
Co-60	1.2839E+00	1,326.90	2,653.81	0.00E+00	1.70E+03	3.41E+03	0.3750	2.200E+13
Cs-134	9.0541E-02	1,326.90	2,653.81	0.00E+00	1.20E+02	2.40E+02	0.5750	2.925E+13
Cs-135	3.2195E-05	1,326.90	2,653.81	0.00E+00	4.27E-02	8.54E-02	0.8500	1.255E+14
Cs-137	2.7564E+00	1,326.90	2,653.81	0.00E+00	3.66E+03	7.31E+03	1.2500	2.549E+14
Eu-154	1.5368E-02	1,326.90	2,653.81	0.00E+00	2.04E+01	4.08E+01	1.7500	1.699E+11
Eu-155	2.9293E-02	1,326.90	2,653.81	0.00E+00	3.89E+01	7.77E+01	2.2500	2.739E+11
Fe-55	7.7158E-01	1,326.90	2,653.81	0.00E+00	1.02E+03	2.05E+03	2.7500	2.174E+09
H-3	1.1111E-02	1,326.90	2,653.81	0.00E+00	1.47E+01	2.95E+01	3.5000	2.530E+06
I-129	7.3684E-07	1,326.90	2,653.81	0.00E+00	9.78E-04	1.96E-03	5.0000	1.408E+03
Kr-85	2.5263E-01	1,326.90	2,653.81	0.00E+00	3.35E+02	6.70E+02	7.0000	1.594E+02
Np-237	1.2427E-06	1,326.90	2,653.81	0.00E+00	1.65E-03	3.30E-03	11.0000	1.816E+01
Pa-231	3.8511E-09	1,326.90	2,653.81	0.00E+00	5.11E-06	1.02E-05		
Pb-210	7.3880E-15	1,326.90	2,653.81	0.00E+00	9.80E-12	1.96E-11		
Pm-147	2.1023E+00	1,326.90	2,653.81	0.00E+00	2.79E+03	5.58E+03		
Pu-238	1.0383E-03	1,326.90	2,653.81	0.00E+00	1.38E+00	2.76E+00		
Pu-239	5.5293E-03	1,326.90	2,653.81	0.00E+00	7.34E+00	1.47E+01		
Pu-240	2.1278E-03	1,326.90	2,653.81	0.00E+00	2.82E+00	5.65E+00		
Pu-241	1.0195E-01	1,326.90	2,653.81	0.00E+00	1.35E+02	2.71E+02		
Pu-242	2.3128E-07	1,326.90	2,653.81	0.00E+00	3.07E-04	6.14E-04		
Ra-226	5.2782E-14	1,326.90	2,653.81	0.00E+00	7.00E-11	1.40E-10		
Ra-228	1.9338E-10	1,326.90	2,653.81	0.00E+00	2.57E-07	5.13E-07		
Ru-106	9.1684E-02	1,326.90	2,653.81	0.00E+00	1.22E+02	2.43E+02		
Se-79	1.3018E-05	1,326.90	2,653.81	0.00E+00	1.73E-02	3.45E-02		
Sn-126	1.2167E-05	1,326.90	2,653.81	0.00E+00	1.61E-02	3.23E-02		
Sr-90	2.6045E+00	1,326.90	2,653.81	0.00E+00	3.46E+03	6.91E+03		
Tc-99	4.4241E-04	1,326.90	2,653.81	0.00E+00	5.87E-01	1.17E+00		
Th-229	1.3713E-10	1,326.90	2,653.81	0.00E+00	1.82E-07	3.64E-07		
Th-230	1.8090E-11	1,326.90	2,653.81	0.00E+00	2.40E-08	4.80E-08		
Th-232	2.5278E-10	1,326.90	2,653.81	0.00E+00	3.35E-07	6.71E-07		
Tl-208	1.6947E-08	1,326.90	2,653.81	0.00E+00	2.25E-05	4.50E-05		
U-232	4.8737E-08	1,326.90	2,653.81	0.00E+00	6.47E-05	1.29E-04		
U-233	1.2203E-07	1,326.90	2,653.81	0.00E+00	1.62E-04	3.24E-04		
U-234	1.5925E-07	1,326.90	2,653.81	0.00E+00	2.11E-04	4.23E-04		
U-235	-2.6194E-06	1,326.90	0.00	1.20E-02	8.54E-03	1.20E-02		
U-236	1.2693E-05	1,326.90	2,653.81	0.00E+00	1.68E-02	3.37E-02		
U-238	-3.6331E-08	1,326.90	0.00	7.47E-03	7.43E-03	7.47E-03		
Y-90	2.6060E+00	1,326.90	2,653.81	0.00E+00	3.46E+03	6.92E+03		
Other Radionuclides					4.78E+03	9.57E+03		

**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 %	20.00000115	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,326.90	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		2,653.81	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.40		1.00
Bounding	2.80		

<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: TRIGA STD 8 5/20 U OF TX AUSTIN  
 SNF ID #: 265  
 Fuel Units & Descr: 156 - ELEMENT  
 Heavy Metal Mass: BOL=30 124kg EOL=29 765kg  
 ROD Storage Site: INEEL

Fuel decay start date: 2035  
 Estimates as of: 2010  
 Template: TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)  
 Template Burnup (MWD): 665  
 Template BOL Heavy Metal Mass (MT): 0 000195  
 Template Decay Time: 5 years

Estimated  
 Canister usage  
 18"x10"  
 141

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 5173E-10	342 51	685 03	0 00E+00	2 92E-07	5 83E-07	Avg MeV	
Am-241	1 8331E-03	342 51	685 03	0 00E+00	6 28E-01	1 26E+00	0 0150	1 107E+14
Am-242m	1 4129E-06	342 51	685 03	0 00E+00	4 84E-04	9 68E-04	0 0250	2 436E+13
Am-243	1 4774E-07	342 51	685 03	0 00E+00	5 06E-05	1 01E-04	0 0375	2 075E+13
C-14	1 2871E-04	342 51	685 03	0 00E+00	4 41E-02	8 82E-02	0 0575	2 129E+13
Cl-36	2 8120E-06	342 51	685 03	0 00E+00	9 63E-04	1 93E-03	0 0850	1 319E+13
Cm-243	1 7940E-07	342 51	685 03	0 00E+00	6 14E-05	1 23E-04	0 1250	9 580E+12
Cm-244	1 6962E-06	342 51	685 03	0 00E+00	5 81E-04	1 16E-03	0 2250	1 119E+13
Co-60	1 2839E+00	342 51	685 03	0 00E+00	4 40E+02	8 80E+02	0 3750	5 679E+12
Cs-134	9 0541E-02	342 51	685 03	0 00E+00	3 10E+01	6 20E+01	0 5750	7 550E+13
Cs-135	3 2195E-05	342 51	685 03	0 00E+00	1 10E-02	2 21E-02	0 8500	3 240E+12
Cs-137	2 7564E+00	342 51	685 03	0 00E+00	9 44E+02	1 89E+03	1 2500	6 581E+13
Eu-154	1 5368E-02	342 51	685 03	0 00E+00	5 26E+00	1 05E+01	1 7500	4 387E+10
Eu-155	2 9293E-02	342 51	685 03	0 00E+00	1 00E+01	2 01E+01	2 2500	7 071E+10
Fe-55	7 7158E-01	342 51	685 03	0 00E+00	2 64E+02	5 29E+02	2 7500	5 611E+08
H-3	1 1111E-02	342 51	685 03	0 00E+00	3 81E+00	7 61E+00	3 5000	6 530E+07
I-129	7 3684E-07	342 51	685 03	0 00E+00	2 52E-04	5 05E-04	5 0000	3 778E+02
Kr-85	2 5263E-01	342 51	685 03	0 00E+00	8 65E+01	1 73E+02	7 0000	4 279E+01
Np-237	1 2427E-06	342 51	685 03	0 00E+00	4 26E-04	8 51E-04	11 0000	4 876E+00
Pa-231	3 8511E-09	342 51	685 03	0 00E+00	1 32E-06	2 64E-06		
Pb-210	7 3880E-15	342 51	685 03	0 00E+00	2 53E-12	5 06E-12		
Pm-147	2 1023E+00	342 51	685 03	0 00E+00	7 20E+02	1 44E+03		
Pu-238	1 0383E-03	342 51	685 03	0 00E+00	3 56E-01	7 11E-01		
Pu-239	5 5293E-03	342 51	685 03	0 00E+00	1 89E+00	3 79E+00		
Pu-240	2 1278E-03	342 51	685 03	0 00E+00	7 29E-01	1 46E+00		
Pu-241	1 0195E-01	342 51	685 03	0 00E+00	3 49E+01	6 98E+01		
Pu-242	2 3128E-07	342 51	685 03	0 00E+00	7 92E-05	1 58E-04		
Ra-226	5 2782E-14	342 51	685 03	0 00E+00	1 81E-11	3 62E-11		
Ra-228	1 9338E-10	342 51	685 03	0 00E+00	6 62E-08	1 32E-07		
Ru-106	9 1684E-02	342 51	685 03	0 00E+00	3 14E+01	6 28E+01		
Se-79	1 3018E-05	342 51	685 03	0 00E+00	4 46E-03	8 92E-03		
Sn-126	1 2167E-05	342 51	685 03	0 00E+00	4 17E-03	8 33E-03		
Sr-90	2 6045E+00	342 51	685 03	0 00E+00	8 92E+02	1 78E+03		
Tc-99	4 4241E-04	342 51	685 03	0 00E+00	1 52E-01	3 03E-01		
Th-229	1 3713E-10	342 51	685 03	0 00E+00	4 70E-08	9 39E-08		
Th-230	1 8090E-11	342 51	685 03	0 00E+00	6 20E-09	1 24E-08		
Th-232	2 5278E-10	342 51	685 03	0 00E+00	8 66E-08	1 73E-07		
Ti-208	1 6947E-08	342 51	685 03	0 00E+00	5 80E-06	1 16E-05		
U-232	4 8737E-08	342 51	685 03	0 00E+00	1 67E-05	3 34E-05		
U-233	1 2203E-07	342 51	685 03	0 00E+00	4 18E-05	8 36E-05		
U-234	1 5925E-07	342 51	685 03	0 00E+00	5 45E-05	1 09E-04		
U-235	-2 6194E-06	342 51	0 00	1 29E-02	1 20E-02	1 29E-02		
U-236	1 2693E-05	342 51	685 03	0 00E+00	4 35E-03	8 70E-03		
U-238	-3 6331E-08	342 51	0 00	8 12E-03	8 11E-03	8 12E-03		
Y-90	2 6060E+00	342 51	685 03	0 00E+00	8 93E+02	1 79E+03		
Other Radionuclides					1 23E+03	2 47E+03		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 99E+01	3 99E+01
Total	Total

**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 %	19 78958118	10 to 20 1	

Burnup Summary (MWD) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		342 51	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		685 03	Bounding burnup assumed to be twice nominal burnup

Checks			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0 33		1 00
Bounding	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: TRIGA STD 8 5/20 U OF UTAH  
 SNF ID #: 261  
 Fuel Units & Descr: 85 - ELEMENT  
 Heavy Metal Mass BOL=14 773kg EOL=14 518kg  
 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 77

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</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	Total Photons/sec (bounding)
Ac-227	8.5173E-10	243 42	486 85	0 00E+00	2 07E-07	4 15E-07	Avg. MeV	
Am-241	1 8331E-03	243 42	486 85	0 00E+00	4 46E-01	8 92E-01	0 0150	7 869E+13
Am-242m	1 4129E-06	243 42	486 85	0 00E+00	3 44E-04	6 88E-04	0 0250	1 731E+13
Am-243	1 4774E-07	243 42	486 85	0 00E+00	3 60E-05	7 19E-05	0 0375	1 474E+13
C-14	1.2871E-04	243 42	486 85	0 00E+00	3.13E-02	6 27E-02	0 0575	1 513E+13
Cl-36	2 8120E-06	243 42	486 85	0 00E+00	6.85E-04	1 37E-03	0 0850	9 376E+12
Cr-243	1 7940E-07	243 42	486 85	0 00E+00	4.37E-05	8 73E-05	0 1250	6 809E+12
Cr-244	1 6962E-06	243 42	486 85	0 00E+00	4.13E-04	8 26E-04	0 2250	7 954E+12
Co-60	1 2839E+00	243 42	486 85	0 00E+00	3 13E+02	6 25E+02	0 3750	4 036E+12
Cs-134	9 0541E-02	243 42	486.85	0 00E+00	2 20E+01	4 41E+01	0 5750	5 366E+13
Cs-135	3.2195E-05	243 42	486 85	0 00E+00	7 84E-03	1 57E-02	0 8500	2 303E+12
Cs-137	2 7564E+00	243 42	486 85	0 00E+00	6 71E+02	1 34E+03	1 2500	4 677E+13
Eu-154	1 5368E-02	243 42	486 85	0 00E+00	3 74E+00	7 48E+00	1 7500	3 118E+10
Eu-155	2 9293E-02	243 42	486.85	0 00E+00	7 13E+00	1 43E+01	2 2500	5 025E+10
Fe-55	7 7158E-01	243 42	486.85	0 00E+00	1 88E+02	3 76E+02	2 7500	3 988E+08
H-3	1 1111E-02	243 42	486 85	0 00E+00	2 70E+00	5 41E+00	3 5000	4 641E+07
I-129	7 3684E-07	243 42	486 85	0 00E+00	1 79E-04	3 59E-04	5 0000	2 643E+02
Kr-85	2 5263E-01	243 42	486 85	0 00E+00	6 15E+01	1 23E+02	7 0000	2 993E+01
Np-237	1 2427E-06	243 42	486 85	0 00E+00	3 03E-04	6 05E-04	11 0000	3 411E+00
Pa-231	3 8511E-09	243 42	486 85	0 00E+00	9 37E-07	1 87E-06		
Pb-210	7 3880E-15	243 42	486 85	0 00E+00	1 80E-12	3 60E-12		
Pm-147	2 1023E+00	243 42	486 85	0 00E+00	5 12E+02	1 02E+03		
Pu-238	1 0383E-03	243 42	486 85	0 00E+00	2 53E-01	5 06E-01		
Pu-239	5 5293E-03	243 42	486 85	0 00E+00	1 35E+00	2 69E+00		
Pu-240	2 1278E-03	243 42	486 85	0 00E+00	5 18E-01	1 04E+00		
Pu-241	1 0195E-01	243 42	486 85	0 00E+00	2 48E+01	4 96E+01		
Pu-242	2 3128E-07	243 42	486 85	0 00E+00	5 63E-05	1 13E-04		
Ra-226	5 2782E-14	243 42	486 85	0 00E+00	1 28E-11	2 57E-11		
Ra-228	1 9338E-10	243 42	486 85	0 00E+00	4 71E-08	9 41E-08		
Ru-106	9 1684E-02	243 42	486 85	0 00E+00	2 23E+01	4 46E+01		
Sa-79	1 3018E-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 6045E+00	243 42	486 85	0 00E+00	6 34E+02	1 27E+03		
Tc-99	4 4241E-04	243 42	486 85	0 00E+00	1 08E-01	2 15E-01		
Th-229	1 3713E-10	243 42	486 85	0 00E+00	3 34E-08	6 68E-08		
Th-230	1 8090E-11	243 42	486 85	0 00E+00	4 40E-09	8 81E-09		
Th-232	2 5278E-10	243 42	486 85	0 00E+00	6 15E-08	1 23E-07		
Tl-208	1 6947E-08	243 42	486 85	0 00E+00	4 13E-06	8 25E-06		
U-232	4 8737E-08	243 42	486 85	0 00E+00	1 19E-05	2 37E-05		
U-233	1 2203E-07	243 42	486 85	0 00E+00	2 97E-05	5 94E-05		
U-234	1 5925E-07	243 42	486 85	0 00E+00	3 88E-05	7 75E-05		
U-235	-2 6194E-06	243 42	0 00	6 35E-03	5 72E-03	6 35E-03		
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 98E-03	3 97E-03	3 98E-03		
Y-90	2 6060E+00	243 42	486.85	0 00E+00	6 34E+02	1 27E+03		
Other Radionuclides					8 78E+02	1 76E+03		

**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 %:	19 8999888	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:		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 48		1 00
Bounding	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: TRIGA STD 8.5/20 UC @ Berkeley  
 SNF ID #: 874  
 Fuel Units & Descr: 111 - ELEMENT  
 Heavy Metal Mass BOL=21 645kg, EOL=19 17kg  
 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"  
 1 00

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	4 1459E-09	2,362 94	4,725 88	0 00E+00	9 80E-06	1 96E-05	Avg MeV	
Am-241	3 5850E-03	2,362 94	4,725 88	0 00E+00	8 47E+00	1 69E+01	0 0150	4 195E+14
Am-242m	1 2899E-06	2,362 94	4,725 88	0 00E+00	3 05E-03	6 10E-03	0 0250	8 721E+13
Am-243	1 4747E-07	2,362 94	4,725 88	0 00E+00	3 48E-04	6 97E-04	0 0375	7 566E+13
C-14	1 2839E-04	2,362 94	4,725 88	0 00E+00	3 03E-01	6 07E-01	0 0575	8 148E+13
Cf-252	2 8120E-06	2,362 94	4,725 88	0 00E+00	6 64E-03	1 33E-02	0 0850	4 911E+13
Cm-243	1 1038E-07	2,362 94	4,725 88	0 00E+00	2 61E-04	5 22E-04	0 1250	3 204E+13
Cm-244	7 8917E-07	2,362 94	4,725 88	0 00E+00	1 86E-03	3 73E-03	0 2250	4 224E+13
Co-60	9 2647E-02	2,362 94	4,725 88	0 00E+00	2 19E+02	4 38E+02	0 3750	1 845E+13
Cs-134	1 0940E-04	2,362 94	4,725 88	0 00E+00	2 59E-01	5 17E-01	0 5750	3 058E+14
Cs-135	3 2195E-05	2,362 94	4,725 88	0 00E+00	7 61E-02	1 52E-01	0 8500	3 283E+12
Cs-137	1 7368E+00	2,362 94	4,725 88	0 00E+00	4 10E+03	8 21E+03	1 2500	3 371E+13
Eu-154	3 0677E-03	2,362 94	4,725 88	0 00E+00	7 25E+00	1 45E+01	1 7500	8 546E+10
Eu-155	1 7925E-03	2,362 94	4,725 88	0 00E+00	4 24E+00	8 47E+00	2 2500	1 802E+08
Fe-55	3 7444E-03	2,362 94	4,725 88	0 00E+00	8 85E+00	1 77E+01	2 7500	3 047E+06
H-3	3 6180E-03	2,362 94	4,725 88	0 00E+00	8 55E+00	1 71E+01	3 5000	6 336E+03
I-129	7 3684E-07	2,362 94	4,725 88	0 00E+00	1 74E-03	3 48E-03	5 0000	2 465E+03
Kr-85	6 9368E-02	2,362 94	4,725 88	0 00E+00	1 64E+02	3 28E+02	7 0000	2 782E+02
Np-237	1 2662E-06	2,362 94	4,725 88	0 00E+00	2 99E-03	5 98E-03	11 0000	3 163E+01
Pa-231	9 1654E-09	2,362 94	4,725 88	0 00E+00	2 17E-05	4 33E-05		
Pb-210	1 3728E-13	2,362 94	4,725 88	0 00E+00	3 24E-10	6 49E-10		
Pm-147	1 0702E-02	2,362 94	4,725 88	0 00E+00	2 53E+01	5 06E+01		
Pu-238	8 8692E-04	2,362 94	4,725 88	0 00E+00	2 10E+00	4 19E+00		
Pu-239	5 5263E-03	2,362 94	4,725 88	0 00E+00	1 31E+01	2 61E+01		
Pu-240	2 1233E-03	2,362 94	4,725 88	0 00E+00	5 02E+00	1 00E+01		
Pu-241	3 8962E-02	2,362 94	4,725 88	0 00E+00	9 21E+01	1 84E+02		
Pu-242	2 3128E-07	2,362 94	4,725 88	0 00E+00	5 46E-04	1 09E-03		
Ra-226	4 6752E-13	2,362 94	4,725 88	0 00E+00	1 10E-09	2 21E-09		
Ra-228	2 4827E-10	2,362 94	4,725 88	0 00E+00	5 87E-07	1 17E-06		
Ru-106	9 8526E-08	2,362 94	4,725 88	0 00E+00	2 33E-04	4 66E-04		
Se-79	1 3015E-05	2,362 94	4,725 88	0 00E+00	3 08E-02	6 15E-02		
Sn-126	1 2165E-05	2,362 94	4,725 88	0 00E+00	2 87E-02	5 75E-02		
Sr-90	1 6195E+00	2,362 94	4,725 88	0 00E+00	3 83E+03	7 65E+03		
Tc-99	4 4241E-04	2,362 94	4,725 88	0 00E+00	1 05E+00	2 09E+00		
Th-229	4 2451E-10	2,362 94	4,725 88	0 00E+00	1 00E-06	2 01E-06		
Th-230	6 1398E-11	2,362 94	4,725 88	0 00E+00	1 45E-07	2 90E-07		
Th-232	2 5278E-10	2,362 94	4,725 88	0 00E+00	5 97E-07	1 19E-06		
Tl-208	1 5098E-08	2,362 94	4,725 88	0 00E+00	3 57E-05	7 14E-05		
U-232	4 0662E-08	2,362 94	4 725 88	0 00E+00	9 61E-05	1 92E-04		
U-233	1 2217E-07	2,362 94	4 725 88	0 00E+00	2 89E-04	5 77E-04		
U-234	2 2391E-07	2,362 94	4 725 88	0 00E+00	5 29E-04	1 08E-03		
U-235	-2 6194E-06	2,362 94	0 00	9 35E-03	3 17E-03	9 35E-03		
U-236	1 2695E-05	2,362 94	4 725 88	0 00E+00	3 00E-02	6 00E-02		
U-238	-3 6331E-08	2,362 94	0 00	5 82E-03	5 73E-03	5 82E-03		
Y-90	1 6195E+00	2,362 94	4 725 88	0 00E+00	3 83E+03	7 65E+03		
Other Radionuclides					4 07E+03	8 13E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 01E+01	1 00E+02
Total	Total

**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	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		2,362 94	
Bounding		4,725 88	

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	3.20		
Bounding	6.40		

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 UNIV OF MARYLAND  
 SNF ID #: 260  
 Fuel Units & Descr: 93 - ELEMENT  
 Heavy Metal Mass: BOL=17.205kg, EOL=16 489kg  
 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 B4

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	Total Photons/sec (bounding)						
Ac-227	8 5173E-10	683 59	1,367.19	0 00E+00	5 82E-07	1 16E-06	Avg MeV							
Am-241	1 8331E-03	683 59	1,367.19	0 00E+00	1 25E+00	2 51E+00	0 0150	2 210E+14						
Am-242m	1 4129E-06	683 59	1,367.19	0 00E+00	9 66E-04	1 93E-03	0 0250	4 862E+13						
Am-243	1 4774E-07	683 59	1,367.19	0 00E+00	1 01E-04	2 02E-04	0 0375	4 141E+13						
C-14	1 2871E-04	683 59	1,367.19	0 00E+00	8 80E-02	1 76E-01	0 0575	4 250E+13						
Cl-36	2 8120E-06	683 59	1,367.19	0 00E+00	1 92E-03	3 84E-03	0 0850	2 633E+13						
Cm-243	1 7940E-07	683 59	1,367 19	0 00E+00	1 23E-04	2 45E-04	0 1250	1 912E+13						
Cm-244	1 6962E-06	683 59	1,367 19	0 00E+00	1 16E-03	2 32E-03	0 2250	2 234E+13						
Co-60	1 2839E+00	683 59	1,367.19	0 00E+00	8 78E+02	1 76E+03	0 3750	1 133E+13						
Cs-134	9 0541E-02	683 59	1,367 19	0 00E+00	6 19E+01	1 24E+02	0 5750	1 507E+14						
Cs-135	3 2195E-05	683 59	1,367 19	0 00E+00	2 20E-02	4 40E-02	0 8500	6 467E+12						
Cs-137	2 7564E+00	683 59	1,367 19	0 00E+00	1 88E+03	3 77E+03	1 2500	1 313E+14						
Eu-154	1 5368E-02	683 59	1,367 19	0 00E+00	1 05E+01	2 10E+01	1 7500	8 755E+10						
Eu-155	2 9293E-02	683 59	1,367 19	0 00E+00	2 00E+01	4 00E+01	2 2500	1 411E+11						
Fe-55	7 7158E-01	683 59	1,367 19	0 00E+00	5 27E+02	1 05E+03	2 7500	1 120E+09						
H-3	1 1111E-02	683 59	1,367 19	0 00E+00	7 60E+00	1 52E+01	3 5000	1 303E+08						
I-129	7 3684E-07	683 59	1,367 19	0 00E+00	5 04E-04	1 01E-03	5 0000	7 272E+02						
Kr-85	2 5263E-01	683 59	1,367 19	0 00E+00	1 73E+02	3 45E+02	7 0000	8 232E+01						
Np-237	1 2427E-06	683 59	1,367 19	0 00E+00	8 50E-04	1 70E-03	11 0000	9 378E+00						
Pa-231	3 8511E-09	683 59	1,367 19	0 00E+00	2 63E-06	5 27E-06								
Pb-210	7 3880E-15	683 59	1,367 19	0 00E+00	5 05E-12	1 01E-11								
Pm-147	2 1023E+00	683 59	1,367 19	0 00E+00	1 44E+03	2 87E+03								
Pu-238	1 0383E-03	683 59	1,367.19	0 00E+00	7 10E-01	1 42E+00								
Pu-239	5 5293E-03	683 59	1,367.19	0 00E+00	3 78E+00	7 56E+00								
Pu-240	2 1278E-03	683 59	1,367.19	0 00E+00	1 45E+00	2 91E+00								
Pu-241	1 0195E-01	683 59	1,367.19	0 00E+00	6 97E+01	1 39E+02								
Pu-242	2 3128E-07	683 59	1,367.19	0 00E+00	1 58E-04	3 16E-04								
Ra-226	5 2782E-14	683 59	1,367.19	0 00E+00	3 61E-11	7 22E-11								
Ra-228	1 9338E-10	683 59	1,367.19	0 00E+00	1 32E-07	2 64E-07								
Ru-106	9 1684E-02	683 59	1,367.19	0 00E+00	6 27E+01	1 25E+02								
Se-79	1 3018E-05	683 59	1,367.19	0 00E+00	8 90E-03	1 78E-02								
Sn-126	1 2167E-05	683 59	1,367.19	0 00E+00	8 32E-03	1 66E-02								
Sr-90	2 6045E+00	683 59	1,367.19	0 00E+00	1 78E+03	3 56E+03								
Tc-99	4 4241E-04	683 59	1,367 19	0 00E+00	3 02E-01	6 05E-01								
Th-229	1 3713E-10	683 59	1,367 19	0 00E+00	9 37E-08	1 87E-07								
Th-230	1 8090E-11	683 59	1,367 19	0 00E+00	1 24E-08	2 47E-08								
Th-232	2 5278E-10	683 59	1,367 19	0 00E+00	1 73E-07	3 46E-07								
Th-208	1 6947E-08	683 59	1,367.19	0 00E+00	1 16E-05	2 32E-05								
U-232	4 8737E-08	683 59	1,367 19	0 00E+00	3 33E-05	6 66E-05								
U-233	1 2203E-07	683 59	1,367.19	0 00E+00	8 34E-05	1 67E-04								
U-234	1 5925E-07	683 59	1,367 19	0 00E+00	1 09E-04	2 18E-04								
U-235	-2 6194E-06	683 59	0 00	7 44E-03	5 65E-03	7 44E-03								
U-236	1 2693E-05	683 59	1,367 19	0 00E+00	8 68E-03	1 74E-02								
U-238	-3 6331E-08	683 59	0 00	4 63E-03	4 60E-03	4 63E-03								
Y-90	2 6060E+00	683 59	1,367.19	0 00E+00	1 78E+03	3 56E+03								
Other Radionuclides					2 46E+03	4 93E+03								

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.98E+01	7.96E+01
Total	Total

**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	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		683 59	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		1,367 19	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 17		1 00
Bounding	2 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: TRIGA STD 8.5/20 UNIV OF CAL-IRVINE  
 SNF ID #: 264  
 Fuel Units & Descr: 104 - ELEMENT  
 Heavy Metal Mass BOL=19 926kg, EOL=19 77kg  
 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"  
 0.94

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	8.5173E-10	148.92	297.84	0.00E+00	1.27E-07	2.54E-07	Avg MeV	
Am-241	1.8331E-03	148.92	297.84	0.00E+00	2.73E-01	5.46E-01	0.0150	4.814E+13
Am-242m	1.4129E-06	148.92	297.84	0.00E+00	2.10E-04	4.21E-04	0.0250	1.059E+13
Am-243	1.4774E-07	148.92	297.84	0.00E+00	2.20E-05	4.40E-05	0.0375	9.020E+12
C-14	1.2871E-04	148.92	297.84	0.00E+00	1.92E-02	3.83E-02	0.0575	9.259E+12
Cl-36	2.8120E-06	148.92	297.84	0.00E+00	4.19E-04	8.38E-04	0.0850	5.736E+12
Cm-243	1.7940E-07	148.92	297.84	0.00E+00	2.67E-05	5.34E-05	0.1250	4.165E+12
Cm-244	1.6962E-06	148.92	297.84	0.00E+00	2.53E-04	5.05E-04	0.2250	4.866E+12
Co-60	1.2839E+00	148.92	297.84	0.00E+00	1.91E+02	3.82E+02	0.3750	2.469E+12
Cs-134	9.0541E-02	148.92	297.84	0.00E+00	1.35E+01	2.70E+01	0.5750	3.283E+13
Cs-135	3.2195E-05	148.92	297.84	0.00E+00	4.79E-03	9.59E-03	0.8500	1.409E+12
Cs-137	2.7564E+00	148.92	297.84	0.00E+00	4.10E+02	8.21E+02	1.2500	2.861E+13
Eu-154	1.5368E-02	148.92	297.84	0.00E+00	2.29E+00	4.58E+00	1.7500	1.907E+10
Eu-155	2.9293E-02	148.92	297.84	0.00E+00	4.36E+00	8.72E+00	2.2500	3.074E+10
Fe-55	7.7158E-01	148.92	297.84	0.00E+00	1.15E+02	2.30E+02	2.7500	2.440E+08
H-3	1.1111E-02	148.92	297.84	0.00E+00	1.65E+00	3.31E+00	-3.5000	2.839E+07
I-129	7.3684E-07	148.92	297.84	0.00E+00	1.10E-04	2.19E-04	5.0000	1.685E+02
Kr-85	2.5263E-01	148.92	297.84	0.00E+00	3.76E+01	7.52E+01	7.0000	1.909E+01
Np-237	1.2427E-06	148.92	297.84	0.00E+00	1.85E-04	3.70E-04	11.0000	2.176E+00
Pa-231	3.8511E-09	148.92	297.84	0.00E+00	5.74E-07	1.15E-06		
Pb-210	7.3880E-15	148.92	297.84	0.00E+00	1.10E-12	2.20E-12		
Pm-147	2.1023E+00	148.92	297.84	0.00E+00	3.13E+02	6.26E+02		
Pu-238	1.0383E-03	148.92	297.84	0.00E+00	1.55E-01	3.09E-01		
Pu-239	5.5293E-03	148.92	297.84	0.00E+00	8.23E-01	1.65E+00		
Pu-240	2.1278E-03	148.92	297.84	0.00E+00	3.17E-01	6.34E-01		
Pu-241	1.0195E-01	148.92	297.84	0.00E+00	1.52E+01	3.04E+01		
Pu-242	2.3128E-07	148.92	297.84	0.00E+00	3.44E-05	6.89E-05		
Ra-226	5.2782E-14	148.92	297.84	0.00E+00	7.86E-12	1.57E-11		
Ra-228	1.9338E-10	148.92	297.84	0.00E+00	2.88E-08	5.76E-08		
Ru-106	9.1684E-02	148.92	297.84	0.00E+00	1.37E+01	2.73E+01		
Se-79	1.3018E-05	148.92	297.84	0.00E+00	1.94E-03	3.88E-03		
Sn-126	1.2167E-05	148.92	297.84	0.00E+00	1.81E-03	3.62E-03		
Sr-90	2.6045E+00	148.92	297.84	0.00E+00	3.88E+02	7.76E+02		
Tc-99	4.4241E-04	148.92	297.84	0.00E+00	6.59E-02	1.32E-01		
Th-229	1.3713E-10	148.92	297.84	0.00E+00	2.04E-08	4.08E-08		
Th-230	1.8090E-11	148.92	297.84	0.00E+00	2.69E-09	5.39E-09		
Th-232	2.5278E-10	148.92	297.84	0.00E+00	3.76E-08	7.53E-08		
Tl-208	1.6947E-08	148.92	297.84	0.00E+00	2.52E-06	5.05E-06		
U-232	4.8737E-08	148.92	297.84	0.00E+00	7.26E-06	1.45E-05	Thermal Power	
U-233	1.2203E-07	148.92	297.84	0.00E+00	1.82E-05	3.63E-05	Nominal Heat	Bounding
U-234	1.5925E-07	148.92	297.84	0.00E+00	2.37E-05	4.74E-05	Output	Heat Output
U-235	-2.6194E-06	148.92	0.00	8.61E-03	8.22E-03	8.61E-03	(Watts)	(Watts)
U-236	1.2693E-05	148.92	297.84	0.00E+00	1.89E-03	3.78E-03	8.67E+00	1.73E+01
U-238	-3.6331E-08	148.92	0.00	5.36E-03	5.35E-03	-5.36E-03	Total	Total
Y-90	2.6060E+00	148.92	297.84	0.00E+00	3.88E+02	7.76E+02		
Other Radionuclides					5.37E+02	1.07E+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 %	20.00002088	10 to 20.1	

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

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		148.92	
Bounding		297.84	

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	0.22		
Bounding	0.44		

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 UNIV OF WISCONSIN  
 SNF ID #: 262  
 Fuel Units & Descr: 128 - ELEMENT  
 Heavy Metal Mass: BOL=24 96kg, EOL=22.182kg  
 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"  
 1 15

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	Total
Ac-227	8 5173E-10	2,651 52	5,303 03	0 00E+00	2 26E-06	4 52E-06		
Am-241	1 8331E-03	2,651 52	5,303 03	0 00E+00	4 86E+00	9 72E+00	0.0150	8 571E+14
Am-242m	1 4129E-06	2,651 52	5,303 03	0 00E+00	3 75E-03	7 49E-03	0.0250	1.886E+14
Am-243	1 4774E-07	2,651 52	5,303 03	0 00E+00	3 92E-04	7 83E-04	0.0375	1 606E+14
C-14	1 2871E-04	2,651 52	5,303 03	0 00E+00	3 41E-01	6 83E-01	0.0575	1 649E+14
Cl-36	2 8120E-06	2,651 52	5,303 03	0 00E+00	7 46E-03	1 49E-02	0.0850	1 021E+14
Cm-243	1 7940E-07	2,651 52	5,303 03	0 00E+00	4 76E-04	9 51E-04	0.1250	7 416E+13
Cm-244	1 6962E-06	2,651 52	5,303 03	0 00E+00	4 50E-03	9 00E-03	0.2250	8 664E+13
Co-60	1 2839E+00	2,651 52	5,303 03	0 00E+00	3 40E+03	6 81E+03	0.3750	4.397E+13
Cs-134	9 0541E-02	2,651 52	5,303 03	0 00E+00	2 40E+02	4 80E+02	0.5750	5 845E+14
Cs-135	3 2195E-05	2,651 52	5,303 03	0 00E+00	8 54E-02	1 71E-01	0.8500	2 509E+13
Cs-137	2 7564E+00	2,651 52	5,303 03	0 00E+00	7 31E+03	1 46E+04	1.2500	5 094E+14
Eu-154	1 5368E-02	2,651 52	5,303 03	0 00E+00	4 07E+01	8 15E+01	1.7500	3 396E+11
Eu-155	2 9293E-02	2,651 52	5,303 03	0 00E+00	7 77E+01	1 55E+02	2.2500	5 474E+11
Fe-55	7 7158E-01	2,651 52	5,303 03	0 00E+00	2 05E+03	4 09E+03	2.7500	4 344E+09
H-3	1 1111E-02	2,651 52	5,303 03	0 00E+00	2 95E+01	5 89E+01	3.5000	5 055E+08
I-129	7.3684E-07	2,651 52	5,303 03	0 00E+00	1 95E-03	3 91E-03	5.0000	2 795E+03
Kr-85	2.5263E-01	2,651 52	5,303 03	0 00E+00	6 70E+02	1 34E+03	7.0000	3 163E+02
Np-237	1.2427E-06	2,651 52	5,303 03	0 00E+00	3 30E-03	6 59E-03	11.0000	3 603E+01
Pa-231	3 8511E-09	2,651 52	5,303 03	0 00E+00	1 02E-05	2 04E-05		
Pb-210	7 3880E-15	2,651 52	5,303 03	0 00E+00	1 96E-11	3 92E-11		
Pm-147	2 1023E+00	2,651 52	5,303 03	0 00E+00	5 57E+03	1.11E+04		
Pu-238	1 0383E-03	2,651 52	5,303 03	0 00E+00	2 75E+00	5 51E+00		
Pu-239	5 5293E-03	2,651 52	5,303 03	0 00E+00	1 47E+01	2 93E+01		
Pu-240	2 1278E-03	2,651 52	5,303 03	0 00E+00	5 64E+00	1 13E+01		
Pu-241	1 0195E-01	2,651 52	5,303 03	0 00E+00	2 70E+02	5 41E+02		
Pu-242	2.3128E-07	2,651 52	5,303 03	0 00E+00	6 13E-04	1.23E-03		
Ra-226	5.2782E-14	2,651 52	5,303 03	0 00E+00	1 40E-10	2 80E-10		
Ra-228	1 9338E-10	2,651 52	5,303 03	0 00E+00	5 13E-07	1 03E-06		
Ru-106	9 1684E-02	2,651 52	5,303 03	0 00E+00	2 43E+02	4 86E+02		
Se-79	1.3018E-05	2,651 52	5,303 03	0 00E+00	3 45E-02	6 90E-02		
Sn-126	1 2167E-05	2,651 52	5,303 03	0 00E+00	3 23E-02	6 45E-02		
Sr-90	2 6045E+00	2,651 52	5,303 03	0 00E+00	6 91E+03	1 38E+04		
Tc-99	4 4241E-04	2,651 52	5,303 03	0 00E+00	1 17E+00	2 35E+00		
Th-229	1.3713E-10	2,651 52	5,303 03	0 00E+00	3 64E-07	7.27E-07		
Th-230	1 8090E-11	2,651 52	5,303 03	0 00E+00	4 80E-08	9.59E-08		
Th-232	2 5278E-10	2,651 52	5,303 03	0 00E+00	6 70E-07	1.34E-06		
Ti-208	1 6947E-08	2,651 52	5,303 03	0 00E+00	4 49E-05	8 99E-05		
U-232	4 8737E-08	2,651 52	5,303 03	0 00E+00	1 29E-04	2.58E-04		
U-233	1.2203E-07	2,651 52	5,303 03	0 00E+00	3 24E-04	6.47E-04		
U-234	1 5925E-07	2,651 52	5,303 03	0 00E+00	4 22E-04	8.44E-04		
U-235	-2 6194E-06	2,651 52	0 00	1 08E-02	3 84E-03	1.08E-02		
U-236	1.2693E-05	2,651 52	5,303 03	0 00E+00	3 37E-02	6.73E-02		
U-238	-3 6331E-08	2,651 52	0 00	6 71E-03	6 61E-03	6.71E-03		
Y-90	2 6060E+00	2,651 52	5,303 03	0 00E+00	6 91E+03	1 38E+04		
Other Radionuclides					9 56E+03	1 91E+04		
							<b>Thermal Power</b>	
							<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>
							1 54E+02	3 09E+02
							<b>Total</b>	<b>Total</b>

**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	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		2 651 52	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		5 303 03	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	3 12		1 00
Bounding	6.23		

<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 STD 8.5/20 USGS	Fuel decay start date	2035
SNF ID #	964	Estimates as of	2010
Fuel Units & Descr	1 - ELEMENT	Template	TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=0 184kg EOL=0 183kg	Template Burnup (MWd)	6.65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0.000195
		Template Decay Time	5 years

Estimated  
Canister usage:  
**18"x10"**  
**0 01**

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	8.5173E-10	0.76	1.53	0.00E+00	6.50E-10	1.30E-09	Avg MeV	
Am-241	1.8331E-03	0.76	1.53	0.00E+00	1.40E-03	2.80E-03	0.0150	2.469E+11
Am-242m	1.4129E-06	0.76	1.53	0.00E+00	1.08E-06	2.16E-06	0.0250	5.432E+10
Am-243	1.4774E-07	0.76	1.53	0.00E+00	1.13E-07	2.26E-07	0.0375	4.626E+10
C-14	1.2871E-04	0.76	1.53	0.00E+00	9.83E-05	1.97E-04	0.0575	4.748E+10
Cl-36	2.8120E-06	0.76	1.53	0.00E+00	2.15E-06	4.30E-06	0.0850	2.942E+10
Cm-243	1.7940E-07	0.76	1.53	0.00E+00	1.37E-07	2.74E-07	0.1250	2.136E+10
Cm-244	1.6962E-06	0.76	1.53	0.00E+00	1.30E-06	2.59E-06	0.2250	2.495E+10
Co-60	1.2839E+00	0.76	1.53	0.00E+00	9.81E-01	1.96E+00	0.3750	1.266E+10
Cs-134	9.0541E-02	0.76	1.53	0.00E+00	6.91E-02	1.38E-01	0.5750	1.683E+11
Cs-135	3.2195E-05	0.76	1.53	0.00E+00	2.46E-05	4.92E-05	0.8500	7.225E+09
Cs-137	2.7564E+00	0.76	1.53	0.00E+00	2.11E+00	4.21E+00	1.2500	1.467E+11
Eu-154	1.5368E-02	0.76	1.53	0.00E+00	1.17E-02	2.35E-02	1.7500	9.781E+07
Eu-155	2.9293E-02	0.76	1.53	0.00E+00	2.24E-02	4.47E-02	2.2500	1.577E+08
Fe-55	7.7158E-01	0.76	1.53	0.00E+00	5.89E-01	1.18E+00	2.7500	1.251E+06
H-3	1.1111E-02	0.76	1.53	0.00E+00	8.49E-03	1.70E-02	3.5000	1.456E+05
I-129	7.3684E-07	0.76	1.53	0.00E+00	5.63E-07	1.13E-06	5.0000	9.154E-01
Kr-85	2.5263E-01	0.76	1.53	0.00E+00	1.93E-01	3.86E-01	7.0000	1.038E-01
Np-237	1.2427E-06	0.76	1.53	0.00E+00	9.49E-07	1.90E-06	11.0000	1.184E-02
Pa-231	3.8511E-09	0.76	1.53	0.00E+00	2.94E-09	5.88E-09		
Pb-210	7.3880E-15	0.76	1.53	0.00E+00	5.64E-15	1.13E-14		
Pm-147	2.1023E+00	0.76	1.53	0.00E+00	-1.61E+00	3.21E+00		
Pu-238	1.0383E-03	0.76	1.53	0.00E+00	7.93E-04	1.59E-03		
Pu-239	5.5293E-03	0.76	1.53	0.00E+00	4.22E-03	8.45E-03		
Pu-240	2.1278E-03	0.76	1.53	0.00E+00	1.62E-03	3.25E-03		
Pu-241	1.0195E-01	0.76	1.53	0.00E+00	7.79E-02	1.56E-01		
Pu-242	2.3128E-07	0.76	1.53	0.00E+00	1.77E-07	3.53E-07		
Ra-226	5.2782E-14	0.76	1.53	0.00E+00	4.03E-14	8.06E-14		
Ra-228	1.9338E-10	0.76	1.53	0.00E+00	1.48E-10	2.95E-10		
Ru-106	9.1684E-02	0.76	1.53	0.00E+00	7.00E-02	1.40E-01		
Se-79	1.3018E-05	0.76	1.53	0.00E+00	9.94E-06	1.99E-05		
Sn-126	1.2167E-05	0.76	1.53	0.00E+00	9.29E-06	1.86E-05		
Sr-90	2.6045E+00	0.76	1.53	0.00E+00	1.99E+00	3.98E+00		
Tc-99	4.4241E-04	0.76	1.53	0.00E+00	3.38E-04	6.76E-04		
Th-229	1.3713E-10	0.76	1.53	0.00E+00	1.05E-10	2.09E-10		
Th-230	1.8090E-11	0.76	1.53	0.00E+00	1.38E-11	2.76E-11		
Th-232	2.5278E-10	0.76	1.53	0.00E+00	1.93E-10	3.86E-10		
Ti-208	1.6947E-08	0.76	1.53	0.00E+00	1.29E-08	2.59E-08		
U-232	4.8737E-08	0.76	1.53	0.00E+00	3.72E-08	7.44E-08		
U-233	1.2203E-07	0.76	1.53	0.00E+00	9.32E-08	1.86E-07		
U-234	1.5925E-07	0.76	1.53	0.00E+00	1.22E-07	2.43E-07		
U-235	-2.6194E-06	0.76	0.00	7.79E-05	7.59E-05	7.79E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.2693E-05	0.76	1.53	0.00E+00	9.69E-06	1.94E-05	4.44E-02	8.89E-02
U-238	-3.6331E-08	0.76	0.00	4.97E-05	4.97E-05	4.97E-05	Total	Total
Y-90	2.6060E+00	0.76	1.53	0.00E+00	1.99E+00	3.98E+00		
Other Radionuclides					2.75E+00	5.51E+00		

**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 %	19.58243102	10 to 20.1	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		0.76	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		1.53	Bounding burnup assumed to be twice nominal burnup

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.12		1.00
Bounding	0.24		

<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 WSU  
 SNF ID #: 268  
 Fuel Units & Descr: 137 - ELEMENT  
 Heavy Metal Mass: BOL=26 715kg; EOL=23.482kg  
 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"  
 1.23

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
	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	3,086 44	6,172 87	0 00E+00	2,63E-06	5,26E-06	Avg MeV	
Am-241	1 8331E-03	3,086 44	6,172 87	0 00E+00	5 66E+00	1 13E+01	0 0150	9 977E+14
Am-242m	1 4129E-06	3,086 44	6,172 87	0 00E+00	4 36E-03	8,72E-03	0 0250	2 195E+14
Am-243	1,4774E-07	3,086 44	6,172 87	0 00E+00	4 56E-04	9,12E-04	0 0375	1 869E+14
C-14	1,2871E-04	3,086 44	6,172 87	0 00E+00	3 97E-01	7 94E-01	0 0575	1 919E+14
Cl-36	2 8120E-06	3,086 44	6,172 87	0 00E+00	8 68E-03	1,74E-02	0 0850	1 189E+14
Cm-243	1,7940E-07	3,086 44	6,172 87	0 00E+00	5 54E-04	1,11E-03	0 1250	8 633E+13
Cm-244	1 6962E-06	3,086 44	6,172 87	0 00E+00	5 24E-03	1 05E-02	0,2250	1 008E+14
Co-60	1,2839E+00	3,086 44	6,172 87	0 00E+00	3 96E+03	7 93E+03	0 3750	5 118E+13
Cs-134	9 0541E-02	3,086 44	6,172 87	0 00E+00	2 79E+02	5 59E+02	0 5750	6 804E+14
Cs-135	3,2195E-05	3,086 44	6,172 87	0 00E+00	9 94E-02	1 99E-01	0 8500	2,920E+13
Cs-137	2 7564E+00	3,086 44	6,172 87	0 00E+00	8 51E+03	1 70E+04	1,2500	5 930E+14
Eu-154	1 5368E-02	3,086 44	6,172 87	0 00E+00	4 74E+01	9 49E+01	1 7500	3 953E+11
Eu-155	2 9293E-02	3,086 44	6,172 87	0 00E+00	9 04E+01	1 81E+02	2,2500	6,371E+11
Fe-55	7 7158E-01	3,086 44	6,172 87	0 00E+00	2 38E+03	4 76E+03	2 7500	5 056E+09
H-3	1 1111E-02	3 086 44	6,172 87	0 00E+00	3 43E+01	6 86E+01	3 5000	5,884E+08
I-129	7 3684E-07	3,086 44	6,172 87	0 00E+00	2 27E-03	4 55E-03	5 0000	3,252E+03
Kr-85	2 5263E-01	3,086 44	6,172 87	0 00E+00	7 80E+02	1 56E+03	7 0000	3 690E+02
Np-237	1 2427E-06	3,086 44	6,172 87	0 00E+00	3 84E-03	7 67E-03	11 0000	4 192E+01
Pa-231	3 8511E-09	3 086 44	6,172 87	0 00E+00	1 19E-05	2 38E-05		
Pb-210	7 3880E-15	3,086 44	6,172 87	0 00E+00	2 28E-11	4 56E-11		
Pm-147	2 1023E+00	3,086 44	6,172 87	0 00E+00	6,49E+03	1 30E+04		
Pu-238	1 0383E-03	3,086 44	6,172 87	0 00E+00	3,20E+00	6 41E+00		
Pu-239	5 5293E-03	3,086 44	6,172 87	0 00E+00	1,71E+01	3 41E+01		
Pu-240	2 1278E-03	3,086 44	6,172 87	0 00E+00	6,57E+00	1,31E+01		
Pu-241	1 0195E-01	3,086,44	6,172,87	0 00E+00	3,15E+02	6,29E+02		
Pu-242	2 3128E-07	3,086,44	6,172,87	0 00E+00	7,14E-04	1 43E-03		
Ra-226	5 2782E-14	3,086,44	6,172,87	0 00E+00	1,63E-10	3,26E-10		
Ra-228	1 9338E-10	3,086 44	6,172 87	0 00E+00	5,97E-07	1,19E-06		
Ru-106	9 1684E-02	3,086 44	6,172 87	0 00E+00	2 83E+02	5 66E+02		
Se-79	1 3018E-05	3,086 44	6,172 87	0 00E+00	4 02E-02	8 04E-02		
Sn-126	1 2167E-05	3,086 44	6,172 87	0 00E+00	3,76E-02	7,51E-02		
Sr-90	2 6045E+00	3,086 44	6,172 87	0 00E+00	8 04E+03	1 61E+04		
Tc-99	4 4241E-04	3,086 44	6,172 87	0 00E+00	1 37E+00	2 73E+00		
Th-229	1,3713E-10	3,086 44	6,172 87	0 00E+00	4 23E-07	8 46E-07		
Th-230	1 8090E-11	3,086 44	6,172 87	0 00E+00	5 58E-08	1 12E-07		
Th-232	2 5278E-10	3,086 44	6,172 87	0 00E+00	7 80E-07	1 56E-06		
Tl-208	1 6947E-08	3,086 44	6,172 87	0 00E+00	5 23E-05	1 05E-04		
U-232	4 8737E-08	3,086 44	6,172 87	0 00E+00	1 50E-04	3 01E-04		
U-233	1,2203E-07	3,086 44	6,172 87	0 00E+00	3 77E-04	7 53E-04		
U-234	1,5925E-07	3,086 44	6,172 87	0 00E+00	4 92E-04	9 83E-04		
U-235	-2 6194E-06	3,086 44	0 00	1 14E-02	3 35E-03	1 14E-02		
U-236	1,2693E-05	3,086 44	6,172 87	0 00E+00	3 92E-02	7 84E-02		
U-238	-3 6331E-08	3,086 44	0 00	7 20E-03	7 09E-03	7 20E-03		
Y-90	2 6060E+00	3,086 44	6,172 87	0 00E+00	8 04E+03	1 61E+04		
Other Radionuclides					1,11E+04	2,23E+04		

Thermal Power	
Nominal Output (Watts)	Bounding Heat Output (Watts)
1,80E+02	3,59E+02
Total	Total

**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 %	19.8	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3,086 44	
Bounding		6 172,87	

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	3.39		
Bounding	6.78		

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 ZAIRE	<sup>1</sup> Fuel decay start date	2010
SNF ID #	486	Estimates as of	2010
Fuel Units & Descr	80 - ELEMENT	Template	TRIGA-SS (LW/U-Zrx, SST, 10 to 20%, U)
Heavy Metal Mass	BOL=15 448kg EOL=15.288kg	<sup>2</sup> Template Burnup(MWd)	6 65
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0 000195
		Template Decay Time	5 years

Estimated  
Canister usage:  
**18"x10"**  
**0 72**

**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 5173E-10	152.74	305 47	0 00E+00	1 30E-07	2 60E-07	Avg MeV	
Am-241	1.8331E-03	152.74	305 47	0 00E+00	2 80E-01	5 60E-01	0 0150	4 937E+13
Am-242m	1.4129E-06	152.74	305 47	0 00E+00	2 16E-04	4.32E-04	0 0250	1 086E+13
Am-243	1.4774E-07	152.74	305 47	0 00E+00	2 26E-05	4.51E-05	0 0375	9.252E+12
C-14	1.2871E-04	152.74	305 47	0 00E+00	1 97E-02	3.93E-02	0 0575	9 496E+12
Cl-36	2 8120E-06	152.74	305 47	0 00E+00	4.30E-04	8.59E-04	0 0850	5.883E+12
Cm-243	1 7940E-07	152.74	305 47	0 00E+00	2.74E-05	5 48E-05	0 1250	4 272E+12
Cm-244	1 6962E-06	152.74	305 47	0.00E+00	2.59E-04	5 18E-04	0.2250	4 991E+12
Co-60	1 2839E+00	152.74	305 47	0 00E+00	1 96E+02	3 92E+02	0 3750	2.533E+12
Cs-134	9 0541E-02	152.74	305 47	0 00E+00	1.38E+01	2.77E+01	0 5750	3 367E+13
Cs-135	3 2195E-05	152.74	305 47	0 00E+00	4 92E-03	9 83E-03	0.8500	1 445E+12
Cs-137	2 7564E+00	152.74	305 47	0 00E+00	4.21E+02	8 42E+02	1.2500	2 935E+13
Eu-154	1.5368E-02	152.74	305 47	0 00E+00	2.35E+00	4 69E+00	1 7500	1 956E+10
Eu-155	2.9293E-02	152.74	305 47	0 00E+00	4 47E+00	8 95E+00	2.2500	3 153E+10
Fe-55	7 7158E-01	152.74	305 47	0 00E+00	1 18E+02	2 36E+02	2 7500	2 502E+08
H-3	1 1111E-02	152.74	305 47	0 00E+00	1 70E+00	3 39E+00	3.5000	2 912E+07
I-129	7 3684E-07	152.74	305 47	0 00E+00	1 13E-04	2.25E-04	5 0000	1 697E+02
Kr-85	2 5263E-01	152.74	305 47	0 00E+00	3 86E+01	7 72E+01	7 0000	1 922E+01
Np-237	1 2427E-06	152.74	305 47	0 00E+00	1.90E-04	3 80E-04	11 0000	2.191E+00
Pa-231	3 8511E-09	152.74	305 47	0 00E+00	5.88E-07	1 18E-06		
Pb-210	7 3880E-15	152.74	305 47	0 00E+00	1 13E-12	2.26E-12		
Pm-147	2 1023E+00	152.74	305 47	0 00E+00	3.21E+02	6 42E+02		
Pu-238	1 0383E-03	152.74	305 47	0 00E+00	1.59E-01	3 17E-01		
Pu-239	5 5293E-03	152.74	305 47	0 00E+00	8 45E-01	1 69E+00		
Pu-240	2.1278E-03	152.74	305 47	0 00E+00	3 25E-01	6 50E-01		
Pu-241	1 0195E-01	152.74	305 47	0 00E+00	1 56E+01	3 11E+01		
Pu-242	2.3128E-07	152.74	305 47	0 00E+00	3 53E-05	7 06E-05		
Ra-226	5.2782E-14	152.74	305 47	0 00E+00	8 06E-12	1 61E-11		
Ra-228	1 9338E-10	152.74	305 47	0 00E+00	2 95E-08	5 91E-08		
Ru-106	9 1684E-02	152.74	305 47	0 00E+00	1 40E+01	2 80E+01		
Se-79	1 3018E-05	152.74	305 47	0.00E+00	1.99E-03	3 98E-03		
Sn-126	1 2167E-05	152.74	305 47	0 00E+00	1.86E-03	3 72E-03		
Sr-90	2 6045E+00	152.74	305 47	0 00E+00	3 98E+02	7.96E+02		
Tc-99	4 4241E-04	152.74	305 47	0 00E+00	6 76E-02	1.35E-01		
Th-229	1.3713E-10	152.74	305 47	0 00E+00	2 09E-08	4 19E-08		
Th-230	1 8090E-11	152.74	305 47	0 00E+00	2 76E-09	5 53E-09		
Th-232	2.5278E-10	152.74	305 47	0 00E+00	3 86E-08	7 72E-08		
Tl-208	1.6947E-08	152.74	305 47	0 00E+00	2 59E-06	5 18E-06		
U-232	4 8737E-08	152.74	305 47	0 00E+00	7 44E-06	1 49E-05		
U-233	1.2203E-07	152.74	305 47	0 00E+00	1 86E-05	3 73E-05		
U-234	1 5925E-07	152.74	305 47	0 00E+00	2 43E-05	4.86E-05		
U-235	-2 6194E-06	152.74	0 00	6 68E-03	6.28E-03	6 68E-03		
U-236	1 2693E-05	152.74	305 47	0 00E+00	1.94E-03	3 88E-03		
U-238	-3.6331E-08	152.74	0 00	4 15E-03	4 15E-03	4 15E-03		
Y-90	2 6060E+00	152.74	305 47	0 00E+00	3 98E+02	7 96E+02		
Other Radionuclides					5 51E+02	1 10E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.89E+00	1.78E+01
Total	Total

**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 00000041	10 to 20 1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		152.74	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		305 47	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.29		1.00
Bounding	0.58		

<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: TRU SCRAP SNF (MOX)  
 SNF ID #: 368  
 Fuel Units & Descr: 1 - CANISTER OF SCRAP  
 Heavy Metal Mass: BOL= ; EOL=106 338kg  
 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  
 MIC  
 1 00

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	1 3735E-12	106,140.24	106,140.24	0 00E+00	1 46E-07	1 46E-07	Avg MeV	
Am-241	7 9527E-02	106,140.24	106,140.24	4 10E+02	8 85E+03	8 85E+03	0 0150	5 280E+15
Am-242m	2 1053E-03	106,140.24	106,140.24	0 00E+00	2 23E+02	2 23E+02	0 0250	1 150E+15
Am-243	1 0760E-04	106,140.24	106,140.24	0 00E+00	1 14E+01	1 14E+01	0 0375	1 316E+15
C-14	2 6141E-05	106,140.24	106,140.24	0 00E+00	2 77E+00	2 77E+00	0 0575	1 105E+15
Cl-36	3 4243E-10	106,140.24	106,140.24	0 00E+00	3 63E-05	3 63E-05	0 0850	6 557E+14
Cm-243	6 6092E-04	106,140.24	106,140.24	0 00E+00	7 02E+01	7 02E+01	0 1250	4 897E+14
Cm-244	2 9933E-03	106,140.24	106,140.24	0 00E+00	3 18E+02	3 18E+02	0 2250	4 966E+14
Co-60	1 5934E-02	106,140.24	106,140.24	0 00E+00	1 69E+03	1 69E+03	0 3750	2 553E+14
Cs-134	4 6356E-02	106,140.24	106,140.24	0 00E+00	4 92E+03	4 92E+03	0 5750	8 530E+15
Cs-135	4 7693E-05	106,140.24	106,140.24	0 00E+00	5 06E+00	5 06E+00	0 8500	2 855E+14
Cs-137	2 1113E+00	106,140.24	106,140.24	0 00E+00	2 24E+05	2 24E+05	1 2500	2 486E+14
Eu-154	4 8092E-02	106,140.24	106,140.24	0 00E+00	5 10E+03	5 10E+03	1 7500	4 083E+12
Eu-155	6 8447E-02	106,140.24	106,140.24	0 00E+00	7 26E+03	7 26E+03	2 2500	1 374E+11
Fe-55	5 8479E-03	106,140.24	106,140.24	0 00E+00	6 21E+02	6 21E+02	2 7500	1 433E+10
H-3	8 9300E-03	106,140.24	106,140.24	0 00E+00	9 48E+02	9 48E+02	3 5000	1 616E+09
I-129	1 2891E-06	106,140.24	106,140.24	0 00E+00	1 37E-01	1 37E-01	5 0000	2 967E+06
Kr-85	7 0941E-02	106,140.24	106,140.24	0 00E+00	7 53E+03	7 53E+03	7 0000	3 402E+05
Np-237	2 6541E-06	106,140.24	106,140.24	0 00E+00	2 82E-01	2 82E-01	11 0000	3 898E+04
Pa-231	4 8970E-12	106,140.24	106,140.24	0 00E+00	5 20E-07	5 20E-07		
Pb-210	2 2170E-13	106,140.24	106,140.24	0 00E+00	2 35E-08	2 35E-08		
Pm-147	2 3617E-01	106,140.24	106,140.24	0 00E+00	2 51E+04	2 51E+04		
Pu-238	2 8636E-02	106,140.24	106,140.24	0 00E+00	3 04E+03	3 04E+03		
Pu-239	-3 5520E-02	106,140.24	0 00	3 37E+03	0 00E+00	3 37E+03		
Pu-240	2 0790E-02	106,140.24	106,140.24	1 71E+03	3 92E+03	3 92E+03		
Pu-241	-4 8316E-01	106,140.24	0 00	7 68E+04	2 55E+04	7 68E+04		
Pu-242	1 1052E-05	106,140.24	106,140.24	4 56E-01	1 63E+00	1 63E+00		
Ra-226	5 7471E-13	106,140.24	106,140.24	0 00E+00	6 10E-08	6 10E-08		
Ra-228	5 4957E-17	106,140.24	106,140.24	0 00E+00	5 83E-12	5 83E-12		
Ru-106	1 4582E-02	106,140.24	106,140.24	0 00E+00	1 55E+03	1 55E+03		
Se-79	1 0137E-05	106,140.24	106,140.24	0 00E+00	1 08E+00	1 08E+00		
Sn-126	4 3922E-05	106,140.24	106,140.24	0 00E+00	4 66E+00	4 66E+00		
Sr-90	7 6329E-01	106,140.24	106,140.24	0 00E+00	8 10E+04	8 10E+04		
Tc-99	3 9412E-04	106,140.24	106,140.24	0 00E+00	4 18E+01	4 18E+01		
Th-229	1 6457E-12	106,140.24	106,140.24	0 00E+00	1 75E-07	1 75E-07		
Th-230	1 8822E-10	106,140.24	106,140.24	0 00E+00	2 00E-05	2 00E-05		
Th-232	9 7601E-17	106,140.24	106,140.24	0 00E+00	1 04E-11	1 04E-11		
Th-208	5 2722E-07	106,140.24	106,140.24	0 00E+00	5 60E-02	5 60E-02		
U-232	1 4925E-06	106,140.24	106,140.24	0 00E+00	1 58E-01	1 58E-01		
U-233	2 1113E-10	106,140.24	106,140.24	0 00E+00	2 24E-05	2 24E-05		
U-234	1 9528E-06	106,140.24	106,140.24	0 00E+00	2 07E-01	2 07E-01		
U-235	-9 7920E-09	106,140.24	0 00	6 91E-04	0 00E+00	6 91E-04		
U-236	1 1570E-07	106,140.24	106,140.24	0 00E+00	1 23E-02	1 23E-02		
U-238	-1 7914E-07	106,140.24	0 00	5 03E-02	3 13E-02	5 03E-02		
Y-90	7 6329E-01	106,140.24	106,140.24	0 00E+00	8 10E+04	8 10E+04		
Other Radionuclides					2 30E+05	2 30E+05		

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

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD: FAST	Used: FAST	
Fuel Cladding	UNKNOWN	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		106 140.24	
Bounding		106 140.24	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier: 3.28	Estimated Burnup/Given Burnup	
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 TRU SCRAP SNF (U METAL)      <sup>1</sup>Fuel decay start date 1994  
 SNF ID # 904      Estimates as of 2010  
 Fuel Units & Descr 1 - CANISTER OF SCRAP      Template FERMI (Fast, Zirc, 10 to 40%, U)  
 Heavy Metal Mass BOL= , EOL=106 338kg      <sup>2</sup>Template Burnup(MWd) 58 6725048  
 ROD Storage Site INEEL      Template BOL Heavy Metal Mass (MT) 0 018774  
 Template Decay Time 15 years

Estimated  
 Canister usage  
 HIC  
 4 00

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	2 1509E-08	93,768 99	93,768 99	0 00E+00	2 02E-03	2 02E-03	Avg MeV	
Am-241	4 6529E-07	93,768 99	93,768 99	0 00E+00	4 36E-02	4 36E-02	0 0150	1 005E+16
Am-242m	0 0000E+00	93,768 99	93,768 99	0 00E+00	0 00E+00	0 00E+00	0 0250	2 131E+15
Am-243	8 3923E-15	93,768 99	93,768 99	0 00E+00	7 87E-10	7 87E-10	0 0375	1 852E+15
C-14	2 1765E-05	93,768 99	93,768 99	0 00E+00	2 04E+00	2 04E+00	0 0575	1 945E+15
Cl-36	5 5188E-08	93,768 99	93,768 99	0 00E+00	5 17E-03	5 17E-03	0 0850	1 196E+15
Cm-243	2 5208E-14	93,768 99	93,768 99	0 00E+00	2 36E-09	2 36E-09	0 1250	7 729E+14
Cm-244	1 1259E-15	93,768 99	93,768 99	0 00E+00	1 06E-10	1 06E-10	0 2250	1 009E+15
Co-60	2 9094E-02	93,768 99	93,768 99	0 00E+00	2 73E+03	2 73E+03	0 3750	4 620E+14
Cs-134	5 1932E-04	93,768 99	93,768 99	0 00E+00	4 87E+01	4 87E+01	0 5750	7 659E+15
Cs-136	4 4996E-05	93,768 99	93,768 99	0 00E+00	4 22E+00	4 22E+00	0 8500	7 397E+13
Cs-137	2 1867E-00	93,768 99	93,768 99	0 00E+00	2 05E+05	2 05E+05	1 2500	2 271E+14
Eu-154	9 2837E-04	93,768 99	93,768 99	0 00E+00	8 71E+01	8 71E+01	1 7500	1 880E+12
Eu-155	2 3180E-02	93,768 99	93,768 99	0 00E+00	2 17E+03	2 17E+03	2 2500	5 378E+09
Fe-55	2 9332E-03	93,768 99	93,768 99	0 00E+00	2 75E+02	2 75E+02	2 7500	2 457E+08
H-3	1 0871E-02	93,768 99	93,768 99	0 00E+00	1 02E+03	1 02E+03	3 5000	2 836E+07
I-129	1 1426E-06	93,768 99	93,768 99	0 00E+00	1 07E-01	1 07E-01	5 0000	5 353E+03
Kr-85	1 4068E-01	93,768 99	93,768 99	0 00E+00	1 32E+04	1 32E+04	7 0000	4 351E+02
Np-237	3 3099E-06	93,768 99	93,768 99	0 00E+00	3 10E-01	3 10E-01	11 0000	3 798E+01
Pa-231	7 8640E-08	93,768 99	93,768 99	0 00E+00	7 37E-03	7 37E-03		
Pb-210	7 4277E-13	93,768 99	93,768 99	0 00E+00	6 96E-08	6 96E-08		
Pm-147	2 2856E-01	93,768 99	93,768 99	0 00E+00	2 14E+04	2 14E+04		
Pu-238	2 0095E-04	93,768 99	93,768 99	0 00E+00	1 88E+01	1 88E+01		
Pu-239	1 9481E-02	93,768 99	93,768 99	0 00E+00	1 83E+03	1 83E+03		
Pu-240	6 8056E-05	93,768 99	93,768 99	0 00E+00	6 38E+00	6 38E+00		
Pu-241	1 0939E-05	93,768 99	93,768 99	0 00E+00	1 03E+00	1 03E+00		
Pu-242	4 3751E-13	93,768 99	93,768 99	0 00E+00	4 10E-08	4 10E-08		
Ra-226	4 0428E-12	93,768 99	93,768 99	0 00E+00	3 79E-07	3 79E-07		
Ra-228	2 1032E-11	93,768 99	93,768 99	0 00E+00	1 97E-06	1 97E-06		
Ru-106	2 9077E-04	93,768 99	93,768 99	0 00E+00	2 73E+01	2 73E+01		
Se-79	1 6492E-05	93,768 99	93,768 99	0 00E+00	1 55E+00	1 55E+00		
Sn-126	3 7564E-05	93,768 99	93,768 99	0 00E+00	3 52E+00	3 52E+00		
Sr-90	1 9396E+00	93,768 99	93,768 99	0 00E+00	1 82E+05	1 82E+05		
Tc-99	4 4842E-04	93,768 99	93,768 99	0 00E+00	4 20E+01	4 20E+01		
Th-229	1 8544E-11	93,768 99	93,768 99	0 00E+00	1 74E-06	1 74E-06		
Th-230	9 0605E-10	93,768 99	93,768 99	0 00E+00	8 50E-05	8 50E-05		
Th-232	2 3674E-11	93,768 99	93,768 99	0 00E+00	2 22E-06	2 22E-06		
Th-234	7 0323E-09	93,768 99	93,768 99	0 00E+00	6 59E-04	6 59E-04		
U-232	1 9106E-08	93,768 99	93,768 99	0 00E+00	1 79E-03	1 79E-03		
U-233	9 6774E-09	93,768 99	93,768 99	0 00E+00	9 07E-04	9 07E-04		
U-234	4 8796E-06	93,768 99	93,768 99	0 00E+00	4 58E-01	4 58E-01		
U-235	2 3191E-06	93,768 99	0 00	1 18E-01	0 00E+00	1 18E-01		
U-236	1 2633E-05	93,768 99	93,768 99	0 00E+00	1 18E+00	1 18E+00		
U-238	-9 5407E-08	93,768 99	0 00	5 32E-02	4 42E-02	5 32E-02		
Y-90	1 9396E+00	93,768 99	93,768 99	0 00E+00	1 82E+05	1 82E+05		
Other Radionuclides					2 04E+05	2 04E+05		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.35E+03	2.35E+03
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator:	FAST	FAST	This Template was used for the following reasons: This fuel matches on all parameters except cladding (unknown) and enrichment (unknown)
Fuel Cladding	UNKNOWN	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %		10 to 40	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		93,768 99	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Bounding		93 768 99	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	141 08		1 69
Bounding	141 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: TURKEY POINT  
 SNF ID #: 271  
 Fuel Units & Descr. 5 - 15 X 15 ROD ARRAY  
 Heavy Metal Mass. BOL=2285kg, EOL=2221 6kg  
 ROD Storage Site INEEL

Fuel decay start date: 1977  
 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:  
 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	6 6376E-10	63,036 30	63,666 96	0 00E+00	4 18E-05	4 23E-05	Avg MeV	
Am-241	1 3144E-01	63,036 30	63,666 96	0 00E+00	8 29E+03	8 37E+03	0 0150	4 330E+15
Am-242m	3 0039E-04	63,036 30	63,666 96	0 00E+00	1 89E+01	1 91E+01	0 0250	8 769E+14
Am-243	6 2629E-04	63,036 30	63,666 96	0 00E+00	3 95E+01	3 99E+01	0 0375	8 486E+14
C-14	4 7965E-05	63,036 30	63,666 96	0 00E+00	3 02E+00	3 05E+00	0 0575	9 258E+14
Cf-252	8 0297E-07	63,036 30	63,666 96	0 00E+00	5 06E-02	5 11E-02	0 0850	4 906E+14
Cm-243	3 1993E-04	63,036 30	63,666 96	0 00E+00	2 02E+01	2 04E+01	0 1250	3 584E+14
Cm-244	7 1851E-02	63,036 30	63,666 96	0 00E+00	4 53E+03	4 57E+03	0 2250	4 211E+14
Co-60	9 5220E-03	63,036 30	63,666 96	0 00E+00	6 00E+02	6 06E+02	0 3750	1 807E+14
Cs-134	1 1662E-03	63,036 30	63,666 96	0 00E+00	7 35E+01	7 42E+01	0 5750	4 152E+15
Cs-135	1 4433E-05	63,036 30	63,666 96	0 00E+00	9 10E-01	9 19E-01	0 8500	8 196E+13
Cs-137	1 7603E+00	63,036 30	63,666 96	0 00E+00	1 11E+05	1 12E+05	1 2500	1 107E+14
Eu-154	4 5203E-02	63,036 30	63,666 96	0 00E+00	2 85E+03	2 88E+03	1 7500	2 426E+12
Eu-155	7 1479E-03	63,036 30	63,666 96	0 00E+00	4 51E+02	4 55E+02	2 2500	4 480E+08
Fe-55	6 1919E-04	63,036 30	63,666 96	0 00E+00	3 90E+01	3 94E+01	2 7500	5 036E+08
H-3	3 6386E-02	63,036 30	63,666 96	0 00E+00	2 29E+03	2 32E+03	3 5000	6 598E+07
I-129	9 8288E-07	63,036 30	63,666 96	0 00E+00	6 20E-02	6 26E-02	5 0000	2 820E+07
Kr-85	5 3844E-02	63,036 30	63,666 96	0 00E+00	3 39E+03	3 43E+03	7 0000	3 251E+06
Np-237	1 0546E-05	63,036 30	63,666 96	0 00E+00	6 65E-01	6 71E-01	11 0000	3 734E+05
Pa-231	1 1370E-09	63,036 30	63,666 96	0 00E+00	7 17E-05	7 24E-05		
Pb-210	3 3624E-11	63,036 30	63,666 96	0 00E+00	2 12E-06	2 14E-06		
Pm-147	5 1211E-03	63,036 30	63,666 96	0 00E+00	3 23E+02	3 26E+02		
Pu-238	8 0669E-02	63,036 30	63,666 96	0 00E+00	5 09E+03	5 14E+03		
Pu-239	1 1626E-02	63,036 30	63,666 96	0 00E+00	7 33E+02	7 40E+02		
Pu-240	1 5097E-02	63,036 30	63,666 96	0 00E+00	9 52E+02	9 61E+02		
Pu-241	1 4567E+00	63,036 30	63,666 96	0 00E+00	9 18E+04	9 27E+04		
Pu-242	6 4260E-05	63,036 30	63,666 96	0 00E+00	4 05E+00	4 09E+00		
Ra-226	1 1392E-10	63,036 30	63,666 96	0 00E+00	7 18E-06	7 25E-06		
Ra-228	5 1841E-12	63,036 30	63,666 96	0 00E+00	3 27E-07	3 30E-07		
Ru-106	5 9012E-07	63,036 30	63,666 96	0 00E+00	3 72E-02	3 76E-02		
Se-79	1 2379E-05	63,036 30	63,666 96	0 00E+00	7 80E-01	7 88E-01		
Sn-126	2 5210E-05	63,036 30	63,666 96	0 00E+00	1 59E+00	1 61E+00		
Sr-90	1 1630E+00	63,036 30	63,666 96	0 00E+00	7 33E+04	7 40E+04		
Tc-99	3 9357E-04	63,036 30	63,666 96	0 00E+00	2 48E+01	2 51E+01		
Th-229	8 5691E-11	63,036 30	63,666 96	0 00E+00	5 40E-06	5 46E-06		
Th-230	1 4493E-08	63,036 30	63,666 96	0 00E+00	9 14E-04	9 23E-04		
Th-232	5 2923E-12	63,036 30	63,666 96	0 00E+00	3 34E-07	3 37E-07		
Tl-208	1 9202E-07	63,036 30	63,666 96	0 00E+00	1 21E-02	1 22E-02		
U-232	5 2083E-07	63,036 30	63,666 96	0 00E+00	3 28E-02	3 32E-02		
U-233	2 4386E-08	63,036 30	63,666 96	0 00E+00	1 54E-03	1 55E-03		
U-234	4 7012E-05	63,036 30	63,666 96	0 00E+00	2 96E+00	2 99E+00		
U-235	-1 4492E-06	63,036 30	0 00	1 26E-01	3 51E-02	1 26E-01		
U-236	7 5759E-06	63,036 30	63,666 96	0 00E+00	4 78E-01	4 82E-01		
U-238	-2 6129E-07	63,036 30	0 00	7 48E-01	7 32E-01	7 48E-01		
Y-90	1 1631E+00	63,036 30	63,666 96	0 00E+00	7 33E+04	7 41E+04		
Other Radionuclides					1 06E+05	1 08E+05		

**Thermal Power**  
 Nominal Heat Output (Watts): 1 73E+03  
 Bounding Heat Output (Watts): 1 75E+03  
 Total

**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 %	2.55999934	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	63,036 30	60,290 40	Nominal burnup taken directly from SFD (converted to MWd)
Bounding	63 666 96	120 580 80	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 96	1 00
Bounding	0 80	1 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 USUK FUEL PINS  
 SNF ID # 356  
 Fuel Units & Descr 66 - ROD  
 Heavy Metal Mass BOL= ; EOL=8 039kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1994  
 Estimates as of 2010  
 Template (Worst Case)  
<sup>2</sup>Template Burnup(MWd) 625  
 Template BOL Heavy Metal Mass (MT): 0 00186865  
 Template Decay Time<sup>3</sup> 15 years

Estimated  
 Canister usage  
 18"x10"  
 0 51

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
	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 4157E-06	7,639 69	7,639 69	0 00E+00	1 08E-02	1.08E-02	0 0150	2 005E+16
Am-241	6 2608E+00	7,639 69	7,639 69	0 00E+00	4 78E+04	4.78E+04	0 0250	3 913E+15
Am-242m	1 8448E-02	7,639 69	7,639 69	0 00E+00	1 41E+02	1.41E+02	0 0375	3 495E+15
Am-243	1 6352E-02	7,639 69	7,639 69	0 00E+00	1 25E+02	1.25E+02	0 0575	4 034E+15
C-14	1 2112E-01	7,639 69	7,639 69	0 00E+00	9 25E+02	9.25E+02	0 0850	1 943E+15
Cl-36	2 2860E-03	7,639 69	7,639 69	0 00E+00	1 75E+01	1.75E+01	0 1250	1 890E+15
Cm-243	1 4088E-03	7,639 69	7,639 69	0 00E+00	1 08E+01	1.08E+01	0 2250	1 528E+15
Cm-244	3 6224E-01	7,639 69	7,639 69	0 00E+00	2 77E+03	2.77E+03	0 3750	6 379E+14
Co-60	3 8998E+02	7,639 69	7,639 69	0 00E+00	2 98E+06	2.98E+06	0 5750	9 797E+15
Cs-134	2 8276E-01	7,639 69	7,639 69	0 00E+00	2 16E+03	2.16E+03	0 8500	1 021E+15
Cs-135	4 3976E-04	7,639 69	7,639 69	0 00E+00	3 36E+00	3.36E+00	1 2500	2 214E+17
Cs-137	3 3405E+01	7,639 69	7,639 69	0 00E+00	2 55E+05	2.55E+05	1 7500	3 044E+13
Eu-154	6 2585E+00	7,639 69	7,639 69	0 00E+00	4 78E+04	4.78E+04	2 2500	1 174E+12
Eu-155	1 1271E+00	7,639 69	7,639 69	0 00E+00	8 61E+03	8.61E+03	2 7500	3 233E+10
Fe-55	6 0624E+01	7,639 69	7,639 69	0 00E+00	4 63E+05	4.63E+05	3 5000	6 992E+07
H-3	7 4678E-01	7,639 69	7,639 69	0 00E+00	5 71E+03	5.71E+03	5 0000	1 698E+07
I-129	1 0618E-05	7,639 69	7,639 69	0 00E+00	8 11E-02	8.11E-02	7 0000	1 953E+06
Kr-85	2 1802E+00	7,639 69	7,639 69	0 00E+00	1 67E+04	1.67E+04	11 0000	2 241E+05
Np-237	1 5626E-04	7,639 69	7,639 69	0 00E+00	1 19E+00	1.19E+00		
Pa-231	2 8608E-06	7,639 69	7,639 69	0 00E+00	2 19E-02	2.19E-02		
Pb-210	2 0448E-09	7,639 69	7,639 69	0 00E+00	1 56E-05	1.56E-05		
Pm-147	3 3212E+00	7,639 69	7,639 69	0 00E+00	2 54E+04	2.54E+04		
Pu-238	-3 5400E-01	7,639 69	0 00	2 07E+03	0 00E+00	2 07E+03		
Pu-239	-4 8280E-02	7,639 69	0 00	2 50E+02	0 00E+00	2 50E+02		
Pu-240	-3 0095E-01	7,639 69	0 00	3 19E+02	0 00E+00	3 19E+02		
Pu-241	-2 5280E+01	7,639 69	0 00	8 22E+04	0 00E+00	8 22E+04		
Pu-242	-1 1381E-04	7,639 69	0 00	1 38E+00	5 12E-01	1 38E+00		
Ra-226	1 0977E-08	7,639 69	7,639 69	0 00E+00	8 39E-05	8.39E-05		
Ra-228	5 4624E-07	7,639 69	7,639 69	0 00E+00	4 17E-03	4.17E-03		
Ru-106	3 7939E-03	7,639 69	7,639 69	0 00E+00	2 90E+01	2.90E+01		
Se-79	1 9186E-04	7,639 69	7,639 69	0 00E+00	1 47E+00	1.47E+00		
Sn-126	1 6673E-04	7,639 69	7,639 69	0 00E+00	1 27E+00	1.27E+00		
Sr-90	3 1860E+01	7,639 69	7,639 69	0 00E+00	2 43E+05	2.43E+05		
Tc-99	6 7678E-03	7,639 69	7,639 69	0 00E+00	5 17E+01	5.17E+01		
Th-229	7 2928E-07	7,639 69	7,639 69	0 00E+00	5 57E-03	5.57E-03		
Th-230	2 4191E-06	7,639 69	7,639 69	0 00E+00	1 85E-02	1.85E-02		
Th-232	6 0208E-07	7,639 69	7,639 69	0 00E+00	4 60E-03	4.60E-03		
Tl-208	1 0599E-04	7,639 69	7,639 69	0 00E+00	8 10E-01	8.10E-01		
U-232	2 8743E-04	7,639 69	7,639 69	0 00E+00	2 20E+00	2.20E+00		
U-233	3 6128E-04	7,639 69	7,639 69	0 00E+00	2 76E+00	2.76E+00		
U-234	1 2788E-02	7,639 69	7,639 69	0 00E+00	9 77E+01	9.77E+01		
U-235	5 7486E-04	7,639 69	7,639 69	6 92E-03	4 40E+00	4.40E+00		
U-236	2 3485E-04	7,639 69	7,639 69	0 00E+00	1 79E+00	1.79E+00		
U-238	1 1581E-04	7,639 69	7,639 69	8 61E-04	8 86E-01	8.86E-01		
Y-90	3 1860E+01	7,639 69	7,639 69	0 00E+00	2 43E+05	2.43E+05		
Other Radionuclides					6 14E+05	6.14E+05		

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

Template Selection Summary			Basis for Parameter Differences <sup>4</sup>
	From SFD	Used	
Reactor Moderator	GRAPHITE	(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		7,639 69	Nominal burnup set equal to bounding burnup
Bounding		7 639 69	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>4</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: VBWR (GENEVA)  
 SNF ID #: 285  
 Fuel Units & Descr: 4 - 6 X 6 ROD ARRAY  
 Heavy Metal Mass: BOL=12.536kg; EOL=12.392kg  
 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"  
 0.31

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	Total Photons/sec (bounding)						
Ac-227	2.3344E-08	135.65	271.30	0.00E+00	3.17E-06	6.33E-06	Avg MeV							
Am-241	1.1135E-04	135.65	271.30	0.00E+00	1.51E-02	3.02E-02	0.0150	2.025E+13						
Am-242m	8.5075E-09	135.65	271.30	0.00E+00	1.15E-06	2.31E-06	0.0250	4.208E+12						
Am-243	9.8519E-10	135.65	271.30	0.00E+00	1.34E-07	2.67E-07	0.0375	3.640E+12						
C-14	2.3012E-04	135.65	271.30	0.00E+00	3.12E-02	6.24E-02	0.0575	3.923E+12						
Cl-38	1.2261E-06	135.65	271.30	0.00E+00	1.66E-04	3.33E-04	0.0850	2.370E+12						
Cm-243	2.4875E-10	135.65	271.30	0.00E+00	3.37E-08	6.75E-08	0.1250	1.539E+12						
Cm-244	2.3178E-09	135.65	271.30	0.00E+00	3.14E-07	6.29E-07	0.2250	2.040E+12						
Co-60	7.0849E-02	135.65	271.30	0.00E+00	9.61E+00	1.92E+01	0.3750	8.900E+11						
Cs-134	3.0266E-06	135.65	271.30	0.00E+00	4.11E-04	8.21E-04	0.5750	1.466E+13						
Cs-135	3.0316E-05	135.65	271.30	0.00E+00	4.11E-03	8.22E-03	0.8500	1.484E+11						
Cs-137	1.4511E+00	135.65	271.30	0.00E+00	1.97E+02	3.94E+02	1.2500	1.475E+12						
Eu-154	6.6955E-04	135.65	271.30	0.00E+00	9.08E-02	1.82E-01	1.7500	3.828E+09						
Eu-155	6.9850E-04	135.65	271.30	0.00E+00	9.48E-02	1.90E-01	2.2500	7.947E+06						
Fe-55	1.2318E-03	135.65	271.30	0.00E+00	1.67E-01	3.34E-01	2.7500	2.297E+05						
H-3	2.5141E-03	135.65	271.30	0.00E+00	3.41E-01	6.82E-01	3.5000	3.378E+01						
I-129	7.3195E-07	135.65	271.30	0.00E+00	9.93E-05	1.99E-04	5.0000	1.421E+01						
Kr-85	4.1281E-02	135.65	271.30	0.00E+00	5.60E+00	1.12E+01	7.0000	1.605E+00						
Np-237	1.1489E-06	135.65	271.30	0.00E+00	1.56E-04	3.12E-04	11.0000	1.825E-01						
Pa-231	4.5241E-08	135.65	271.30	0.00E+00	6.14E-06	1.23E-05								
Pb-210	6.4476E-13	135.65	271.30	0.00E+00	8.75E-11	1.75E-10								
Pm-147	1.1651E-03	135.65	271.30	0.00E+00	1.58E-01	3.16E-01								
Pu-238	2.9517E-04	135.65	271.30	0.00E+00	4.00E-02	8.01E-02								
Pu-239	6.6772E-04	135.65	271.30	0.00E+00	9.06E-02	1.81E-01								
Pu-240	8.6839E-05	135.65	271.30	0.00E+00	1.18E-02	2.36E-02								
Pu-241	7.1514E-04	135.65	271.30	0.00E+00	9.70E-02	1.94E-01								
Pu-242	1.9717E-09	135.65	271.30	0.00E+00	2.67E-07	5.35E-07								
Ra-226	1.7654E-12	135.65	271.30	0.00E+00	2.39E-10	4.79E-10								
Ra-228	8.2928E-12	135.65	271.30	0.00E+00	1.12E-09	2.25E-09								
Ru-106	1.8419E-10	135.65	271.30	0.00E+00	2.50E-08	5.00E-08								
Se-79	1.3223E-05	135.65	271.30	0.00E+00	1.79E-03	3.59E-03								
Sn-126	1.1493E-05	135.65	271.30	0.00E+00	1.56E-03	3.12E-03								
Sr-90	1.3649E+00	135.65	271.30	0.00E+00	1.85E+02	3.70E+02								
Tc-99	4.6656E-04	135.65	271.30	0.00E+00	6.33E-02	1.27E-01								
Th-229	1.4547E-11	135.65	271.30	0.00E+00	1.97E-09	3.95E-09								
Th-230	1.6617E-10	135.65	271.30	0.00E+00	2.25E-08	4.51E-08								
Th-232	8.3361E-12	135.65	271.30	0.00E+00	1.13E-09	2.26E-09								
Th-208	2.1664E-08	135.65	271.30	0.00E+00	2.94E-06	5.88E-06								
U-232	5.8669E-08	135.65	271.30	0.00E+00	7.96E-06	1.59E-05								
U-233	3.1847E-09	135.65	271.30	0.00E+00	4.32E-07	8.64E-07								
U-234	3.8769E-07	135.65	271.30	0.00E+00	5.26E-05	1.05E-04								
U-235	-2.7761E-06	135.65	0.00	5.99E-03	5.62E-03	5.99E-03								
U-236	1.6190E-05	135.65	271.30	0.00E+00	2.20E-03	4.39E-03								
U-238	-2.8547E-09	135.65	0.00	3.28E-03	3.28E-03	3.28E-03								
Y-90	1.3652E+00	135.65	271.30	0.00E+00	1.85E+02	3.70E+02								
Other Radionuclides					2.24E+02	4.48E+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	LIGHT WATER	This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
BOL HM Constituents	SST	SST	
BOL Enrichment %	U	U	
	22.12897667	60 to 100	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		135.65	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.
		271.30	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
Bounding	0.23		1.00
	0.46		

<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 VEPCO Fuel decay start date 1983  
 SNF ID # 286 Estimates as of 2010  
 Fuel Units & Descr 20 - 15 X 15 ROD ARRAY Template PWR (Light Water, Zirc, 0 to 5% U)  
 Heavy Metal Mass BOL=9148.286kg EOL=8832 178kg Template Burnup(MWd) 61.92  
 ROD Storage Site INEEL Template BOL Heavy Metal Mass (MT) 0.00176911  
Template Decay Time 25 years

Estimated  
 Canister Usage  
 Bare Fuel Transfer

Radionuclide	m C/MWd From Template	x <sub>n</sub> Nominal Fuel Burnup (MWd) <sup>2</sup>	x <sub>b</sub> Bounding Fuel Burnup (MWd) <sup>2</sup>	b Initial Activity (Ci)	y <sub>n</sub> Nominal Fuel Inventories(Ci)	y <sub>b</sub> Bounding Fuel Inventories(Ci)	Gamma Sources		
							Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	6.6376E-10	300,603.76	601,207.51	0.00E+00	2.00E-04	3.99E-04	Avg MeV		
Am-241	1.3144E-01	300,603.76	601,207.51	0.00E+00	3.95E+04	7.90E+04	0.0150	4.088E+16	
Am-242m	3.0039E-04	300,603.76	601,207.51	0.00E+00	9.03E+01	1.81E+02	0.0250	8.280E+15	
Am-243	6.2629E-04	300,603.76	601,207.51	0.00E+00	1.88E+02	3.77E+02	0.0375	8.014E+15	
C-14	4.7965E-05	300,603.76	601,207.51	0.00E+00	1.44E+01	2.88E+01	0.0575	8.742E+15	
Cl-36	8.0297E-07	300,603.76	601,207.51	0.00E+00	2.41E-01	4.83E-01	0.0850	4.632E+15	
Cm-243	3.1993E-04	300,603.76	601,207.51	0.00E+00	9.62E+01	1.92E+02	0.1250	3.384E+15	
Cm-244	7.1851E-02	300,603.76	601,207.51	0.00E+00	2.16E+04	4.32E+04	0.2250	3.977E+15	
Co-60	9.5220E-03	300,603.76	601,207.51	0.00E+00	2.86E+03	5.72E+03	0.3750	1.706E+15	
Cs-134	1.1662E-03	300,603.76	601,207.51	0.00E+00	3.51E+02	7.01E+02	0.5750	3.921E+16	
Cs-135	1.4433E-05	300,603.76	601,207.51	0.00E+00	4.34E+00	8.68E+00	0.8500	7.739E+14	
Cs-137	1.7603E+00	300,603.76	601,207.51	0.00E+00	5.29E+05	1.06E+06	1.2500	1.045E+15	
Eu-154	4.5203E-02	300,603.76	601,207.51	0.00E+00	1.36E+04	2.72E+04	1.7500	2.290E+13	
Eu-155	7.1479E-03	300,603.76	601,207.51	0.00E+00	2.15E+03	4.30E+03	2.2500	4.231E+09	
Fe-55	6.1919E-04	300,603.76	601,207.51	0.00E+00	1.86E+02	3.72E+02	2.7500	4.755E+09	
H-3	3.6386E-02	300,603.76	601,207.51	0.00E+00	1.09E+04	2.19E+04	3.5000	6.231E+08	
I-129	9.8288E-07	300,603.76	601,207.51	0.00E+00	2.95E-01	5.91E-01	5.0000	2.663E+08	
Kr-85	5.3844E-02	300,603.76	601,207.51	0.00E+00	1.62E+04	3.24E+04	7.0000	3.070E+07	
Np-237	1.0546E-05	300,603.76	601,207.51	0.00E+00	3.17E+00	6.34E+00	11.0000	3.526E+06	
Pa-231	1.1370E-09	300,603.76	601,207.51	0.00E+00	3.42E-04	6.84E-04			
Pb-210	3.3624E-11	300,603.76	601,207.51	0.00E+00	1.01E-05	2.02E-05			
Pm-147	5.1211E-03	300,603.76	601,207.51	0.00E+00	1.54E+03	3.08E+03			
Pu-238	8.0669E-02	300,603.76	601,207.51	0.00E+00	2.42E+04	4.85E+04			
Pu-239	1.1626E-02	300,603.76	601,207.51	0.00E+00	3.49E+03	6.99E+03			
Pu-240	1.5097E-02	300,603.76	601,207.51	0.00E+00	4.54E+03	9.08E+03			
Pu-241	1.4567E+00	300,603.76	601,207.51	0.00E+00	4.38E+05	8.76E+05			
Pu-242	6.4260E-05	300,603.76	601,207.51	0.00E+00	1.93E+01	3.86E+01			
Ra-226	1.1392E-10	300,603.76	601,207.51	0.00E+00	3.42E-05	6.85E-05			
Ra-228	5.1841E-12	300,603.76	601,207.51	0.00E+00	1.56E-06	3.12E-06			
Ru-106	5.9012E-07	300,603.76	601,207.51	0.00E+00	1.77E-01	3.55E-01			
Se-79	1.2379E-05	300,603.76	601,207.51	0.00E+00	3.72E+00	7.44E+00			
Sn-126	2.5210E-05	300,603.76	601,207.51	0.00E+00	7.58E+00	1.52E+01			
Sr-90	1.1630E+00	300,603.76	601,207.51	0.00E+00	3.50E+05	6.99E+05			
Tc-99	3.9357E-04	300,603.76	601,207.51	0.00E+00	1.18E+02	2.37E+02			
Th-229	8.5691E-11	300,603.76	601,207.51	0.00E+00	2.58E-05	5.15E-05			
Th-230	1.4493E-08	300,603.76	601,207.51	0.00E+00	4.36E-03	8.71E-03			
Th-232	5.2923E-12	300,603.76	601,207.51	0.00E+00	1.59E-06	3.18E-06			
Tl-208	1.9202E-07	300,603.76	601,207.51	0.00E+00	5.77E-02	1.15E-01			
U-232	5.2083E-07	300,603.76	601,207.51	0.00E+00	1.57E-01	3.13E-01			
U-233	2.4386E-08	300,603.76	601,207.51	0.00E+00	7.33E-03	1.47E-02			
U-234	4.7012E-05	300,603.76	601,207.51	0.00E+00	1.41E+01	2.83E+01			
U-235	-1.4492E-06	300,603.76	0.00	5.90E-01	1.55E-01	5.90E-01			
U-236	7.5759E-06	300,603.76	601,207.51	0.00E+00	2.28E+00	4.55E+00			
U-238	-2.6129E-07	300,603.76	0.00	2.98E+00	2.90E+00	2.98E+00			
Y-90	1.1631E+00	300,603.76	601,207.51	0.00E+00	3.50E+05	6.99E+05			
Other Radionuclides					5.08E+05	1.02E+06			
							<b>Thermal Power</b>		
							<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>	
							8.24E+03	1.85E+04	
							<b>Total</b>	<b>Total</b>	

**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 %	2.986167273	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	268,593.68	300,603.76	
Bounding	288,637.57	601,207.51	

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	0.94	1.12	
Bounding	1.88	2.08	

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: VEPCO  
 SNF ID #: 700  
 Fuel Units & Descr: 12 - 15 X 15 ROD ARRAY  
 Heavy Metal Mass: BOL=5488.2kg, EOL=5313.52kg  
 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  
 Bare Fuel Transfer

Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>3</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	6 6376E-10	166,112 80	332,225 60	0 00E+00	1 10E-04	2 21E-04	Avg MeV	
Am-241	1 3144E-01	166,112 80	332,225 60	0 00E+00	2 18E+04	4 37E+04	0 0150	2.259E+16
Am-242m	3 0039E-04	166,112 80	332,225 60	0 00E+00	4 99E+01	9 98E+01	0 0250	4 576E+15
Am-243	6 2629E-04	166,112 80	332,225 60	0 00E+00	1 04E+02	2 08E+02	0 0375	4 428E+15
C-14	4 7965E-05	166,112 80	332,225 60	0 00E+00	7.97E+00	1 59E+01	0 0575	4 831E+15
Cl-36	8 0297E-07	166,112 80	332,225 60	0 00E+00	1 33E-01	2 67E-01	0 0850	2 560E+15
Cm-243	3 1993E-04	166,112 80	332,225 60	0 00E+00	5 31E+01	1 06E+02	0 1250	1 870E+15
Cm-244	7 1851E-02	166,112 80	332,225 60	0 00E+00	1 19E+04	2 39E+04	0.2250	2.198E+15
Co-60	9 5220E-03	166,112 80	332,225 60	0 00E+00	1 58E+03	3 16E+03	0 3750	9 429E+14
Cs-134	1 1662E-03	166,112 80	332,225 60	0 00E+00	1 94E+02	3 87E+02	0 5750	2.167E+16
Cs-135	1 4439E-05	166,112 80	332,225 60	0 00E+00	2 40E+00	4 80E+00	0 8500	4.277E+14
Cs-137	1 7603E+00	166,112 80	332,225 60	0 00E+00	2.92E+05	5 85E+05	1 2500	5 777E+14
Eu-154	4 5203E-02	166,112 80	332,225 60	0 00E+00	7 51E+03	1 50E+04	1 7500	1 266E+13
Eu-155	7 1479E-03	166,112 80	332,225 60	0 00E+00	1 19E+03	2 37E+03	2.2500	2.338E+09
Fe-55	6 1919E-04	166,112 80	332,225 60	0 00E+00	1 03E+02	2 06E+02	2 7500	2 628E+09
H-3	3 6386E-02	166,112 80	332,225 60	0 00E+00	6 04E+03	1 21E+04	3 5000	3 443E+08
I-129	9 8288E-07	166,112 80	332,225 60	0 00E+00	1 63E-01	3 27E-01	5 0000	1 472E+08
Kr-85	5 3844E-02	166,112 80	332,225 60	0 00E+00	8 94E+03	1 79E+04	7 0000	1 696E+07
Np-237	1 0546E-05	166,112 80	332,225 60	0 00E+00	1 75E+00	3 50E+00	11 0000	1 949E+06
Pa-231	1 1370E-09	166,112 80	332,225 60	0 00E+00	1 89E-04	3 78E-04		
Pb-210	3 3624E-11	166,112 80	332,225 60	0 00E+00	5 59E-06	1 12E-05		
Pm-147	5 1211E-03	166,112 80	332,225 60	0 00E+00	8 51E+02	1.70E+03		
Pu-238	8 0669E-02	166,112 80	332,225 60	0 00E+00	1 34E+04	2 68E+04		
Pu-239	1 1626E-02	166,112 80	332,225 60	0 00E+00	1.93E+03	3 86E+03		
Pu-240	1 5097E-02	166,112 80	332,225 60	0 00E+00	2 51E+03	5 02E+03		
Pu-241	1 4567E+00	166,112 80	332,225 60	0 00E+00	2 42E+05	4 84E+05		
Pu-242	6 4260E-05	166,112 80	332,225 60	0 00E+00	1.07E+01	2.13E+01		
Ra-226	1 1392E-10	166,112 80	332,225 60	0 00E+00	1 89E-05	3 78E-05		
Ra-228	5 1841E-12	166,112 80	332,225 60	0 00E+00	8 61E-07	1 72E-06		
Ru-106	5 9012E-07	166,112 80	332,225 60	0 00E+00	9 80E-02	1 96E-01		
Se-79	1 2379E-05	166,112 80	332,225 60	0 00E+00	2 06E+00	4 11E+00		
Sn-126	2 5210E-05	166,112 80	332,225 60	0 00E+00	4 19E+00	8.38E+00		
Sr-90	1 1630E+00	166,112 80	332,225 60	0 00E+00	1 93E+05	3 86E+05		
Tc-99	3 9357E-04	166,112 80	332,225 60	0 00E+00	6 54E+01	1 31E+02		
Th-229	8 5691E-11	166,112 80	332,225 60	0 00E+00	1.42E-05	2 85E-05		
Th-230	1 4493E-08	166,112 80	332,225 60	0 00E+00	2.41E-03	4 81E-03		
Th-232	5 2923E-12	166,112 80	332,225 60	0 00E+00	8 79E-07	1.76E-06		
Tl-208	1 9202E-07	166,112 80	332,225 60	0 00E+00	3.19E-02	6 38E-02		
U-232	5 2083E-07	166,112 80	332,225 60	0 00E+00	8.65E-02	1.73E-01		
U-233	2 4386E-08	166,112 80	332,225 60	0 00E+00	4.05E-03	8 10E-03		
U-234	4 7012E-05	166,112 80	332,225 60	0 00E+00	7 81E+00	1 56E+01		
U-235	-1 4492E-06	166,112 80	0 00	3 36E-01	9.53E-02	3 36E-01		
U-236	7 5759E-06	166,112 80	332,225 60	0 00E+00	1 26E+00	2 52E+00		
U-238	-2 6129E-07	166,112 80	0 00	1.79E+00	1 75E+00	1 79E+00		
Y-90	1 1631E+00	166,112 80	332,225 60	0 00E+00	1 93E+05	3 86E+05		
Other Radionuclides								
							2 81E+05	5 61E+05

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 55E+03	9 11E+03
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	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2 833496228	0 to 5	

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

	From SFD	Estimated	Basis for burnup used in estimate:
	Nominal	161,133 55	
Bounding	173 158 20	332,225 60	Bounding burnup assumed to be twice nominal burnup

**Checks**

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	Nominal	0 85	
Bounding	1 73	1 92	

<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 VEPCO (T-11 ASSEMBLY)  
 SNF ID #: 993  
 Fuel Units & Descr: 1 - 15 X 15 ROD ARRAY  
 Heavy Metal Mass BOL=457.414kg EOL=440kg  
 ROD Storage Site INEEL

Fuel decay start date: 1983  
 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  
 HIC  
 1.00

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	16,560.18	33,120.35	0.00E+00	1.10E-05	2.20E-05	0.0150	2.252E+15
Am-241	1.3144E-01	16,560.18	33,120.35	0.00E+00	2.18E+03	4.35E+03	0.0250	4.562E+14
Am-242m	3.0039E-04	16,560.18	33,120.35	0.00E+00	4.97E+00	9.95E+00	0.0375	4.415E+14
Am-243	6.2629E-04	16,560.18	33,120.35	0.00E+00	1.04E+01	2.07E+01	0.0575	4.816E+14
C-14	4.7965E-05	16,560.18	33,120.35	0.00E+00	7.94E-01	1.59E+00	0.0850	2.552E+14
Cl-36	8.0297E-07	16,560.18	33,120.35	0.00E+00	1.33E-02	2.66E-02	0.1250	1.864E+14
Cm-243	3.1993E-04	16,560.18	33,120.35	0.00E+00	5.30E+00	1.06E+01	0.2250	2.191E+14
Cm-244	7.1851E-02	16,560.18	33,120.35	0.00E+00	1.19E+03	2.38E+03	0.3750	9.400E+13
Co-60	9.5220E-03	16,560.18	33,120.35	0.00E+00	1.58E+02	3.15E+02	0.5750	2.160E+15
Cs-134	1.1662E-03	16,560.18	33,120.35	0.00E+00	1.93E+01	3.86E+01	0.8500	4.264E+13
Cs-135	1.4433E-05	16,560.18	33,120.35	0.00E+00	2.39E-01	4.78E-01	1.2500	5.759E+13
Cs-137	1.7603E+00	16,560.18	33,120.35	0.00E+00	2.92E+04	5.83E+04	1.7500	1.262E+12
Eu-154	4.5203E-02	16,560.18	33,120.35	0.00E+00	7.49E+02	1.50E+03	2.2500	2.331E+08
Eu-155	7.1479E-03	16,560.18	33,120.35	0.00E+00	1.18E+02	2.37E+02	2.7500	2.620E+08
Fe-55	6.1919E-04	16,560.18	33,120.35	0.00E+00	1.03E+01	2.05E+01	3.5000	3.432E+07
H-3	3.6386E-02	16,560.18	33,120.35	0.00E+00	6.03E+02	1.21E+03	5.0000	1.467E+07
I-129	9.8288E-07	16,560.18	33,120.35	0.00E+00	1.63E-02	3.26E-02	7.0000	1.691E+06
Kr-85	5.3844E-02	16,560.18	33,120.35	0.00E+00	8.92E+02	1.78E+03	11.0000	1.943E+05
Np-237	1.0546E-05	16,560.18	33,120.35	0.00E+00	1.75E-01	3.49E-01		
Pa-231	1.1370E-09	16,560.18	33,120.35	0.00E+00	1.88E-05	3.77E-05		
Pb-210	3.3624E-11	16,560.18	33,120.35	0.00E+00	5.57E-07	1.11E-06		
Pm-147	5.1211E-03	16,560.18	33,120.35	0.00E+00	8.48E-01	1.70E+02		
Pu-238	8.0669E-02	16,560.18	33,120.35	0.00E+00	1.34E+03	2.67E+03		
Pu-239	1.1626E-02	16,560.18	33,120.35	0.00E+00	1.93E+02	3.85E+02		
Pu-240	1.5097E-02	16,560.18	33,120.35	0.00E+00	2.50E+02	5.00E+02		
Pu-241	1.4567E+00	16,560.18	33,120.35	0.00E+00	2.41E+04	4.82E+04		
Pu-242	6.4260E-05	16,560.18	33,120.35	0.00E+00	1.06E+00	2.13E+00		
Ra-226	1.1392E-10	16,560.18	33,120.35	0.00E+00	1.89E-06	3.77E-06		
Ra-228	5.1841E-12	16,560.18	33,120.35	0.00E+00	8.58E-08	1.72E-07		
Ru-106	5.9012E-07	16,560.18	33,120.35	0.00E+00	9.77E-03	1.95E-02		
Se-79	1.2379E-05	16,560.18	33,120.35	0.00E+00	2.05E-01	4.10E-01		
Sn-126	2.5210E-05	16,560.18	33,120.35	0.00E+00	4.17E-01	8.35E-01		
Sr-90	1.1630E+00	16,560.18	33,120.35	0.00E+00	1.93E+04	3.85E+04		
Tc-99	3.9357E-04	16,560.18	33,120.35	0.00E+00	6.52E+00	1.30E+01		
Th-229	8.5691E-11	16,560.18	33,120.35	0.00E+00	1.42E-06	2.84E-06		
Th-230	1.4493E-08	16,560.18	33,120.35	0.00E+00	2.40E-04	4.80E-04		
Th-232	5.2923E-12	16,560.18	33,120.35	0.00E+00	8.76E-08	1.75E-07		
Ti-208	1.9202E-07	16,560.18	33,120.35	0.00E+00	3.18E-03	6.36E-03		
U-232	5.2083E-07	16,560.18	33,120.35	0.00E+00	8.63E-03	1.73E-02		
U-233	2.4386E-08	16,560.18	33,120.35	0.00E+00	4.04E-04	8.08E-04		
U-234	4.7012E-05	16,560.18	33,120.35	0.00E+00	7.79E-01	1.56E+00		
U-235	-1.4492E-06	16,560.18	0.00	2.95E-02	5.52E-03	2.95E-02		
U-236	7.5759E-06	16,560.18	33,120.35	0.00E+00	1.25E-01	2.51E-01		
U-238	-2.6129E-07	16,560.18	0.00	1.49E-01	1.45E-01	1.49E-01		
Y-90	1.1631E+00	16,560.18	33,120.35	0.00E+00	1.93E+04	3.85E+04		
Other Radionuclides					2.80E+04	5.60E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.54E+02	9.08E+02
Total	Total

**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 %	2.986167273	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	13,429.68	16,560.18	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding	14,431.88	33,120.35	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.03	1.23	1.00
Bounding	2.07	2.29	

<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: VEPCO (T-11 RODS)  
 SNF ID #: 1049  
 Fuel Units & Descr: 9 - ROD  
 Heavy Metal Mass: BOL=20 18kg, EOL=19 678kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1983  
 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"  
 0.07

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)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6376E-10	592.48	636.69	0.00E+00	3.93E-07	4.23E-07	Avg. MeV	
Am-241	1.3144E-01	592.48	636.69	0.00E+00	7.79E+01	8.37E+01	0.0150	4.330E+13
Am-242m	3.0039E-04	592.48	636.69	0.00E+00	1.78E-01	1.91E-01	0.0250	8.769E+12
Am-243	6.2629E-04	592.48	636.69	0.00E+00	3.71E-01	3.99E-01	0.0375	8.487E+12
C-14	4.7965E-05	592.48	636.69	0.00E+00	2.84E-02	3.05E-02	0.0575	9.258E+12
Cl-36	8.0297E-07	592.48	636.69	0.00E+00	4.76E-04	5.11E-04	0.0850	4.906E+12
Cm-243	3.1993E-04	592.48	636.69	0.00E+00	1.90E-01	2.04E-01	0.1250	3.584E+12
Cm-244	7.1851E-02	592.48	636.69	0.00E+00	4.26E+01	4.57E+01	0.2250	4.212E+12
Co-60	9.5220E-03	592.48	636.69	0.00E+00	5.64E+00	6.06E+00	0.3750	1.807E+12
Cs-134	1.1662E-03	592.48	636.69	0.00E+00	6.91E-01	7.42E-01	0.5750	4.152E+13
Cs-135	1.4433E-05	592.48	636.69	0.00E+00	8.55E-03	9.19E-03	0.8500	8.196E+11
Cs-137	1.7603E+00	592.48	636.69	0.00E+00	1.04E+03	1.12E+03	1.2500	1.107E+12
Eu-154	4.5203E-02	592.48	636.69	0.00E+00	2.68E+01	2.88E+01	1.7500	2.426E+10
Eu-155	7.1479E-03	592.48	636.69	0.00E+00	4.23E+00	4.55E+00	2.2500	4.480E+06
Fe-55	6.1919E-04	592.48	636.69	0.00E+00	3.67E-01	3.94E-01	2.7500	5.036E+06
H-3	3.6386E-02	592.48	636.69	0.00E+00	2.16E+01	2.32E+01	3.5000	6.598E+05
I-129	9.8288E-07	592.48	636.69	0.00E+00	5.82E-04	6.26E-04	5.0000	2.820E+05
Kr-85	5.3844E-02	592.48	636.69	0.00E+00	3.19E+01	3.43E+01	7.0000	3.251E+04
Np-237	1.0546E-05	592.48	636.69	0.00E+00	6.25E-03	6.71E-03	11.0000	3.734E+03
Pa-231	1.1370E-09	592.48	636.69	0.00E+00	6.74E-07	7.24E-07		
Pb-210	3.3624E-11	592.48	636.69	0.00E+00	1.99E-08	2.14E-08		
Pm-147	5.1211E-03	592.48	636.69	0.00E+00	3.03E+00	3.26E+00		
Pu-238	8.0669E-02	592.48	636.69	0.00E+00	4.78E+01	5.14E+01		
Pu-239	1.1626E-02	592.48	636.69	0.00E+00	6.89E+00	7.40E+00		
Pu-240	1.5097E-02	592.48	636.69	0.00E+00	8.94E+00	9.61E+00		
Pu-241	1.4567E+00	592.48	636.69	0.00E+00	8.63E+02	9.27E+02		
Pu-242	6.4260E-05	592.48	636.69	0.00E+00	3.81E-02	4.09E-02		
Ra-226	1.1392E-10	592.48	636.69	0.00E+00	6.75E-08	7.25E-08		
Ra-228	5.1841E-12	592.48	636.69	0.00E+00	3.07E-09	3.30E-09		
Ru-106	5.9012E-07	592.48	636.69	0.00E+00	3.50E-04	3.76E-04		
Se-79	1.2379E-05	592.48	636.69	0.00E+00	7.39E-03	7.88E-03		
Sn-126	2.5210E-05	592.48	636.69	0.00E+00	1.49E-02	1.61E-02		
Sr-90	1.1630E+00	592.48	636.69	0.00E+00	6.89E+02	7.40E+02		
Tc-99	3.9357E-04	592.48	636.69	0.00E+00	2.33E-01	2.51E-01		
Th-229	8.5691E-11	592.48	636.69	0.00E+00	5.08E-08	5.46E-08		
Th-230	1.4493E-08	592.48	636.69	0.00E+00	8.59E-06	9.23E-06		
Th-232	5.2923E-12	592.48	636.69	0.00E+00	3.14E-09	3.37E-09		
Ti-208	1.9202E-07	592.48	636.69	0.00E+00	1.14E-04	1.22E-04		
U-232	5.2083E-07	592.48	636.69	0.00E+00	3.09E-04	3.32E-04		
U-233	2.4386E-08	592.48	636.69	0.00E+00	1.44E-05	1.55E-05		
U-234	4.7012E-05	592.48	636.69	0.00E+00	2.79E-02	2.99E-02		
U-235	-1.4492E-06	592.48	0.00	1.30E+03	4.44E-04	1.30E+03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	7.5759E-06	592.48	636.69	0.00E+00	4.49E-03	4.82E-03	1.62E+01	1.75E+01
U-238	-2.6129E-07	592.48	0.00	6.58E+03	6.43E-03	6.58E+03	Total	Total
Y-90	1.1631E+00	592.48	636.69	0.00E+00	6.89E+02	7.41E+02		
Other Radionuclides					1.00E+03	1.08E+03		

**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 %	2.986165227	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	592.48	477.57	
Bounding	636.69	955.14	

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	0.84	0.81	
Bounding	0.90	1.50	

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	VEPCO T-11	Fuel decay start date	1983
SNF ID #	994	Estimates as of	2010
Fuel Units & Descr	3 - ROD	Template	PWR (Light Water, Zirc 0 to 5%, U)
Heavy Metal Mass	BOL=6 727kg, EOL=6.559kg	Template Burnup(MWd)	61 92
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0 00176911
		Template Decay Time	25 years

Estimated  
Canister usage  
18"x10"  
0 02

Radionuclide	II. Estimates		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	
	m	x <sub>a</sub>						Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6376E-10	197 49	212.23	212.23	0 00E+00	1.31E-07	1.41E-07	Avg MeV	
Am-241	1 3144E-01	197 49	212.23	212.23	0 00E+00	2 60E+01	2 79E+01	0 0150	1 443E+13
Am-242m	3 0039E-04	197 49	212.23	212.23	0 00E+00	5 93E-02	6 38E-02	0 0250	2 923E+12
Am-243	6 2629E-04	197 49	212.23	212.23	0 00E+00	1 24E-01	1 33E-01	0 0375	2 829E+12
C-14	4 7965E-05	197 49	212.23	212.23	0 00E+00	9 47E-03	1 02E-02	0 0575	3 086E+12
Cl-36	8 0297E-07	197 49	212.23	212.23	0 00E+00	1 59E-04	1 70E-04	0 0850	1 635E+12
Cm-243	3 1993E-04	197 49	212.23	212.23	0 00E+00	6 32E-02	6 79E-02	0 1250	1 195E+12
Cm-244	7 1851E-02	197 49	212.23	212.23	0 00E+00	1 42E+01	1 52E+01	0 2250	1 404E+12
Co-60	9 5220E-03	197 49	212.23	212.23	0 00E+00	1 88E+00	2 02E+00	0 3750	6 024E+11
Cs-134	1 1662E-03	197 49	212.23	212.23	0 00E+00	2 30E-01	2 47E-01	0 5750	1 384E+11
Cs-135	1 4433E-05	197 49	212.23	212.23	0 00E+00	2 85E-03	3 06E-03	0 8500	2 732E+11
Cs-137	1 7603E+00	197 49	212.23	212.23	0 00E+00	3 48E+02	3 74E+02	1 2500	3 690E+11
Eu-154	4 5203E-02	197 49	212.23	212.23	0 00E+00	8 93E+00	9 59E+00	1 7500	8 085E+09
Eu-155	7 1479E-03	197 49	212.23	212.23	0 00E+00	1 41E+00	1 52E+00	2 2500	1 493E+06
Fe-55	6 1919E-04	197 49	212.23	212.23	0 00E+00	1 22E-01	1 31E-01	2 7500	1 679E+06
H-3	3 6386E-02	197 49	212.23	212.23	0 00E+00	7 19E+00	7 72E+00	3 5000	2 199E+05
I-129	9 8288E-07	197 49	212.23	212.23	0 00E+00	1 94E-04	2 09E-04	5 0000	9 401E+04
Kr-85	5 3844E-02	197 49	212.23	212.23	0 00E+00	1 06E+01	1 14E+01	7 0000	1 084E+04
Np-237	1 0546E-05	197 49	212.23	212.23	0 00E+00	2 08E-03	2 24E-03	11 0000	1 245E+03
Pa-231	1 1370E-09	197 49	212.23	212.23	0 00E+00	2 25E-07	2 41E-07		
Pb-210	3 3624E-11	197 49	212.23	212.23	0 00E+00	6 64E-09	7 14E-09		
Pm-147	5 1211E-03	197 49	212.23	212.23	0 00E+00	1 01E+00	1 09E+00		
Pu-238	8 0669E-02	197 49	212.23	212.23	0 00E+00	1 59E+01	1 71E+01		
Pu-239	1 1626E-02	197 49	212.23	212.23	0 00E+00	2 30E+00	2 47E+00		
Pu-240	1 5097E-02	197 49	212.23	212.23	0 00E+00	2 98E+00	3 20E+00		
Pu-241	1 4567E+00	197 49	212.23	212.23	0 00E+00	2 88E+02	3 09E+02		
Pu-242	6 4260E-05	197 49	212.23	212.23	0 00E+00	1 27E-02	1 36E-02		
Ra-226	1 1392E-10	197 49	212.23	212.23	0 00E+00	2 25E-08	2 42E-08		
Ra-228	5 1841E-12	197 49	212.23	212.23	0 00E+00	1 02E-09	1 10E-09		
Ru-106	5 9012E-07	197 49	212.23	212.23	0 00E+00	1 17E-04	1 25E-04		
Se-79	1 2379E-05	197 49	212.23	212.23	0 00E+00	2 44E-03	2 63E-03		
Sn-126	2 5210E-05	197 49	212.23	212.23	0 00E+00	4 98E-03	5 35E-03		
Sr-90	1 1630E+00	197 49	212.23	212.23	0 00E+00	2 30E+02	2 47E+02		
Tc-99	3 9357E-04	197 49	212.23	212.23	0 00E+00	7 77E-02	8 35E-02		
Th-229	8 5691E-11	197 49	212.23	212.23	0 00E+00	1 69E-08	1 82E-08		
Th-230	1 4493E-08	197 49	212.23	212.23	0 00E+00	2 86E-06	3 08E-06		
Th-232	5 2923E-12	197 49	212.23	212.23	0 00E+00	1 05E-09	1 12E-09		
Tl-208	1 9202E-07	197 49	212.23	212.23	0 00E+00	3 79E-05	4 08E-05		
U-232	5 2083E-07	197 49	212.23	212.23	0 00E+00	1 03E-04	1 11E-04		
U-233	2 4386E-08	197 49	212.23	212.23	0 00E+00	4 82E-06	5 18E-06	Thermal Power	
U-234	4 7012E-05	197 49	212.23	212.23	0 00E+00	9 28E-03	9 98E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-1 4492E-06	197 49	0 00	0 00	4 34E-04	1 48E-04	4 34E-04	5.41E+00	5.82E+00
U-236	7 5759E-06	197 49	212.23	212.23	0 00E+00	1 50E-03	1 61E-03	Total	Total
U-238	-2 6129E-07	197 49	0 00	0 00	2 19E-03	2 14E-03	2 19E-03		
Y-90	1 1631E+00	197 49	212.23	212.23	0 00E+00	2 30E+02	2 47E+02		
Other Radionuclides						3 34E+02	3 59E+02		

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

<b>Template Selection Summary</b>			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	2.986165227	0 to 5	

<b>Burnup Summary (MWd)<sup>2</sup></b>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	197.49	159.19	
Bounding	212.23	318.38	

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

<b>Checks</b>			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.84	0.81	
Bounding	0.90	1.50	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: ANLJ  
 SNF ID #: 5  
 Fuel Units & Descr: 19 - ELEMENT  
 Heavy Metal Mass: BOL=2.793kg, EOL=2.789kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 1966  
 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: 35 years

Estimated  
 Canister usage:  
 18"x10"  
 0.79

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	2.0068E-09	3.60	7.20	0.00E+00	7.22E-09	1.44E-08		
Am-241	2.5251E-03	3.60	7.20	0.00E+00	9.09E-03	1.82E-02	0.0150	5.302E+11
Am-242m	3.9624E-07	3.60	7.20	0.00E+00	1.43E-06	2.85E-06	0.0250	1.101E+11
Am-243	1.4880E-06	3.60	7.20	0.00E+00	5.35E-06	1.07E-05	0.0375	9.568E+10
C-14	5.7053E-09	3.60	7.20	0.00E+00	2.05E-08	4.11E-08	0.0575	1.030E+11
Cl-36	1.3124E-32	3.60	7.20	0.00E+00	4.72E-32	9.45E-32	0.0850	6.207E+10
Cm-243	1.1419E-07	3.60	7.20	0.00E+00	4.11E-07	8.22E-07	0.1250	4.102E+10
Cm-244	1.6522E-05	3.60	7.20	0.00E+00	5.95E-05	1.19E-04	0.2250	5.368E+10
Co-60	7.4047E-07	3.60	7.20	0.00E+00	2.66E-06	5.33E-06	0.3750	2.331E+10
Cs-134	2.0455E-05	3.60	7.20	0.00E+00	7.36E-05	1.47E-04	0.5750	3.852E+11
Cs-135	3.4477E-06	3.60	7.20	0.00E+00	1.24E-05	2.48E-05	0.8500	4.705E+09
Cs-137	1.4365E+00	3.60	7.20	0.00E+00	5.17E+00	1.03E+01	1.2500	2.275E+09
Eu-154	7.3230E-03	3.60	7.20	0.00E+00	2.64E-02	5.27E-02	1.7500	1.281E+08
Eu-155	5.9259E-04	3.60	7.20	0.00E+00	2.13E-03	4.27E-03	2.2500	1.071E+04
Fe-55	2.2791E-06	3.60	7.20	0.00E+00	8.20E-06	1.64E-05	2.7500	1.022E+04
H-3	1.9698E-03	3.60	7.20	0.00E+00	7.09E-03	1.42E-02	3.5000	6.449E+00
I-129	7.5300E-07	3.60	7.20	0.00E+00	2.71E-06	5.42E-06	5.0000	2.641E+00
Kr-85	4.1176E-02	3.60	7.20	0.00E+00	1.48E-01	2.96E-01	7.0000	2.898E-01
Np-237	9.5752E-06	3.60	7.20	0.00E+00	3.45E-05	6.89E-05	11.0000	3.236E-02
Pa-231	3.9379E-09	3.60	7.20	0.00E+00	1.42E-08	2.83E-08		
Pb-210	3.3115E-10	3.60	7.20	0.00E+00	1.19E-09	2.38E-09		
Pm-147	9.2402E-04	3.60	7.20	0.00E+00	3.33E-03	6.65E-03		
Pu-238	1.6217E-02	3.60	7.20	0.00E+00	5.84E-02	1.17E-01		
Pu-239	4.2810E-04	3.60	7.20	0.00E+00	1.54E-03	3.08E-03		
Pu-240	2.4333E-04	3.60	7.20	0.00E+00	8.76E-04	1.75E-03		
Pu-241	1.6242E-02	3.60	7.20	0.00E+00	5.84E-02	1.17E-01		
Pu-242	3.6329E-07	3.60	7.20	0.00E+00	1.31E-06	2.61E-06		
Ra-226	9.0114E-10	3.60	7.20	0.00E+00	3.24E-09	6.49E-09		
Ra-228	3.1019E-14	3.60	7.20	0.00E+00	1.12E-13	2.23E-13		
Ru-106	2.1225E-10	3.60	7.20	0.00E+00	7.64E-10	1.53E-09		
Se-79	1.2930E-05	3.60	7.20	0.00E+00	4.65E-05	9.31E-05		
Sn-126	1.1571E-05	3.60	7.20	0.00E+00	4.16E-05	8.33E-05		
Sr-90	1.3472E+00	3.60	7.20	0.00E+00	4.85E+00	9.70E+00		
Tc-99	4.2239E-04	3.60	7.20	0.00E+00	1.52E-03	3.04E-03		
Th-229	1.2407E-11	3.60	7.20	0.00E+00	4.47E-11	8.93E-11		
Th-230	8.3497E-08	3.60	7.20	0.00E+00	3.00E-07	6.01E-07		
Th-232	3.8371E-14	3.60	7.20	0.00E+00	1.38E-13	2.76E-13		
Ti-208	4.0414E-08	3.60	7.20	0.00E+00	1.45E-07	2.91E-07		
U-232	1.0948E-07	3.60	7.20	0.00E+00	3.94E-07	7.88E-07		
U-233	3.6275E-09	3.60	7.20	0.00E+00	1.31E-08	2.61E-08		
U-234	1.8562E-04	3.60	7.20	0.00E+00	6.68E-04	1.34E-03		
U-235	-2.7235E-06	3.60	0.00	5.63E-03	5.62E-03	5.63E-03		
U-236	1.5493E-05	3.60	7.20	0.00E+00	5.58E-05	1.12E-04		
U-238	-4.2851E-09	3.60	0.00	6.39E-05	6.38E-05	6.39E-05		
Y-90	1.3475E+00	3.60	7.20	0.00E+00	4.85E+00	9.70E+00		
Other Radionuclides					4.92E+00	9.85E+00		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.04E-02	1.21E-01
Total	Total

**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 %:	93.197	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3.60	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		7.20	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.00		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 ASTRA-(AUSTRIA)(LEU U308) ¹Fuel decay start date 1985  
 SNF ID # 1058 Estimates as of 2010  
 Fuel Units & Descr 3 - 19 FLAT PLATES Template ATR (Light Water, Alum , 60 to 100%, U)  
 Heavy Metal Mass BOL=5.379kg EOL=4 818kg ²Template Burnup(MWd): 367.2  
 ROD Storage Site SRS Template BOL Heavy Metal Mass (MT) 0 00116689  
Template Decay Time 25 years

Estimated  
Canister usage  
18"x10"  
0 08

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	530 99	1,061 99	0 00E+00	6.09E-07	1 22E-06	Avg MeV	
Am-241	2.3056E-03	530 99	1,061 99	0 00E+00	1.22E+00	2 45E+00	0 0150	9 937E+13
Am-242m	4 1476E-07	530 99	1,061 99	0 00E+00	2.20E-04	4 40E-04	0 0250	2 064E+13
Am-243	1 4894E-06	530 99	1,061 99	0 00E+00	7 91E-04	1 58E-03	0 0375	1 798E+13
C-14	5 7108E-09	530 99	1,061 99	0 00E+00	3 03E-06	6 06E-06	0 0575	1 931E+13
Cl-36	1.3124E-32	530 99	1,061 99	0 00E+00	6 97E-00	1.39E-29	0 0850	1 165E+13
Cm-243	1 4562E-07	530 99	1,061 99	0 00E+00	7 73E-05	1 55E-04	0 1250	7 803E+12
Cm-244	2 4221E-05	530 99	1,061 99	0 00E+00	1 29E-02	2 57E-02	0 2250	1 006E+13
Co-60	2 7560E-06	530 99	1,061 99	0 00E+00	1 46E-03	2 93E-03	0 3750	4 372E+12
Cs-134	5 8851E-04	530 99	1,061 99	0 00E+00	3 12E-01	6 25E-01	0 5750	7 168E+13
Cs-135	3 4477E-06	530 99	1,061 99	0 00E+00	1 83E-03	3 66E-03	0 8500	1 033E+12
Cs-137	1 8099E+00	530 99	1,061 99	0 00E+00	9 61E-02	1 92E+03	1 2500	5 744E+11
Eu-154	1 6386E-02	530 99	1,061 99	0 00E+00	8 70E+00	1 74E+01	1 7500	2 838E+10
Eu-155	2 3957E-03	530 99	1,061 99	0 00E+00	1 27E+00	2 54E+00	2 2500	2 023E+06
Fe-55	3 2707E-05	530 99	1,061 99	0 00E+00	1 74E-02	3 47E-02	2 7500	1 656E+06
H-3	3 4504E-03	530 99	1,061 99	0 00E+00	1 83E+00	3 66E+00	3 5000	1 257E+03
I-129	7 5300E-07	530 99	1,061 99	0 00E+00	4 00E-04	8 00E-04	5 0000	4 236E+02
Kr-85	7 8540E-02	530 99	1,061 99	0 00E+00	4 17E+01	8 34E+01	7 0000	4 663E+01
Np-237	9 5615E-06	530 99	1,061 99	0 00E+00	5 08E-03	1 02E-02	11 0000	5 217E+00
Pa-231	2 7968E-09	530 99	1,061 99	0 00E+00	1 49E-06	2 97E-06		
Pb-210	1 2612E-10	530 99	1,061 99	0 00E+00	6 70E-08	1 34E-07		
Pm-147	1 2952E-02	530 99	1,061 99	0 00E+00	6 88E+00	1 38E+01		
Pu-238	1 7549E-02	530 99	1,061 99	0 00E+00	9 32E+00	1 86E+01		
Pu-239	4 2810E-04	530 99	1,061 99	0 00E+00	2 27E-01	4 55E-01		
Pu-240	2 4357E-04	530 99	1,061 99	0 00E+00	1 29E-01	2 59E-01		
Pu-241	2 6277E-02	530 99	1,061 99	0 00E+00	1 40E+01	2 79E+01		
Pu-242	3 6329E-07	530 99	1,061 99	0 00E+00	1 93E-04	3 86E-04		
Ra-226	4 4444E-10	530 99	1,061 99	0 00E+00	2 36E-07	4 72E-07		
Ra-228	1 9714E-14	530 99	1,061 99	0 00E+00	1 05E-11	2 09E-11		
Ru-106	2 0477E-07	530 99	1,061 99	0 00E+00	1 09E-04	2 17E-04		
Se-79	1 2933E-05	530 99	1,061 99	0 00E+00	6 87E-03	1 37E-02		
Sn-126	1 1574E-05	530 99	1,061 99	0 00E+00	6 15E-03	1 23E-02		
Sr-90	1 7092E+00	530 99	1,061 99	0 00E+00	9 08E+02	1 82E+03		
Tc-99	4 2239E-04	530 99	1,061 99	0 00E+00	2 24E-01	4 49E-01		
Th-229	7 7260E-12	530 99	1,061 99	0 00E+00	4 10E-09	8 20E-09		
Th-230	5 8497E-08	530 99	1,061 99	0 00E+00	3 11E-05	6 21E-05		
Th-232	2 6906E-14	530 99	1,061 99	0 00E+00	1 43E-11	2 86E-11		
Ti-208	4 4336E-08	530 99	1,061 99	0 00E+00	2 35E-05	4 71E-05		
U-232	1 2037E-07	530 99	1,061 99	0 00E+00	6 39E-05	1 28E-04		
U-233	3 0011E-09	530 99	1,061 99	0 00E+00	1 59E-06	3 19E-06		
U-234	1 8497E-04	530 99	1,061 99	0 00E+00	9 82E-02	1 96E-01		
U-235	-2 7235E-06	530 99	0 00	2 27E-03	8 21E-04	2 27E-03		
U-236	1 5493E-05	530 99	1,061 99	0 00E+00	8 23E-03	1 65E-02		
U-238	-4 2851E-09	530 99	0 00	1 46E-03	1 45E-03	1 46E-03		
Y-90	1 7094E+00	530 99	1,061 99	0 00E+00	9 08E+02	1 82E+03		
Other Radionuclides					9 15E+02	1 83E+03		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 12E+01	2 25E+01
Total	Total

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

Template Selection Summary			Basis for Parameter Differences*
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 50065847	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		530 99	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		1,061 99	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0 31		1 01
Bounding	0 63		

\*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: ASTRA-(AUSTRIA)(LEU U3S2)  
 SNF ID #: 712  
 Fuel Units & Descr: 39 - 19 FLAT PLATES  
 Heavy Metal Mass: BOL=72.236kg, EOL=66 183kg  
 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 08

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	5,732.12	11,464.24	0.00E+00	6.57E-06	1.31E-05	Avg. MeV	
Am-241	2.3056E-03	5,732.12	11,464.24	0.00E+00	1.32E+01	2.64E+01	0.0150	1.073E+15
Am-242m	4.1476E-07	5,732.12	11,464.24	0.00E+00	2.38E-03	4.75E-03	0.0250	2.229E+14
Am-243	1.4894E-06	5,732.12	11,464.24	0.00E+00	8.54E-03	1.71E-02	0.0375	1.941E+14
C-14	5.7108E-09	5,732.12	11,464.24	0.00E+00	3.27E-05	6.55E-05	0.0575	2.084E+14
Cl-36	1.3124E-32	5,732.12	11,464.24	0.00E+00	7.52E-29	1.50E-28	0.0850	1.258E+14
Cm-243	1.4562E-07	5,732.12	11,464.24	0.00E+00	8.35E-04	1.67E-03	0.1250	8.423E+13
Cm-244	2.4221E-05	5,732.12	11,464.24	0.00E+00	1.39E-01	2.78E-01	0.2250	1.086E+14
Co-60	2.7560E-06	5,732.12	11,464.24	0.00E+00	1.58E-02	3.16E-02	0.3750	4.720E+13
Cs-134	5.8851E-04	5,732.12	11,464.24	0.00E+00	3.37E+00	6.75E+00	0.5750	7.738E+14
Cs-135	3.4477E-06	5,732.12	11,464.24	0.00E+00	1.98E-02	3.95E-02	0.8500	1.115E+13
Cs-137	1.8099E+00	5,732.12	11,464.24	0.00E+00	1.04E+04	2.07E+04	1.2500	6.201E+12
Eu-154	1.6386E-02	5,732.12	11,464.24	0.00E+00	9.39E+01	1.88E+02	1.7500	3.063E+11
Eu-155	2.3957E-03	5,732.12	11,464.24	0.00E+00	1.37E+01	2.75E+01	2.2500	2.183E+07
Fe-55	3.2707E-05	5,732.12	11,464.24	0.00E+00	1.87E-01	3.75E-01	2.7500	1.788E+07
H-3	3.4504E-03	5,732.12	11,464.24	0.00E+00	1.98E+01	3.96E+01	3.5000	1.359E+04
I-129	7.5300E-07	5,732.12	11,464.24	0.00E+00	4.32E-03	8.63E-03	5.0000	4.581E+03
Kr-85	7.8540E-02	5,732.12	11,464.24	0.00E+00	4.50E+02	9.00E+02	7.0000	5.043E+02
Np-237	9.5615E-06	5,732.12	11,464.24	0.00E+00	5.48E-02	1.10E-01	11.0000	5.643E+01
Pa-231	2.7968E-09	5,732.12	11,464.24	0.00E+00	1.60E-05	3.21E-05		
Pb-210	1.2612E-10	5,732.12	11,464.24	0.00E+00	7.23E-07	1.45E-06		
Pm-147	1.2952E-02	5,732.12	11,464.24	0.00E+00	7.42E+01	1.48E+02		
Pu-238	1.7549E-02	5,732.12	11,464.24	0.00E+00	1.01E+02	2.01E+02		
Pu-239	4.2810E-04	5,732.12	11,464.24	0.00E+00	2.45E+00	4.91E+00		
Pu-240	2.4357E-04	5,732.12	11,464.24	0.00E+00	1.40E+00	2.79E+00		
Pu-241	2.6277E-02	5,732.12	11,464.24	0.00E+00	1.51E+02	3.01E+02		
Pu-242	3.6329E-07	5,732.12	11,464.24	0.00E+00	2.08E-03	4.16E-03		
Ra-226	4.4444E-10	5,732.12	11,464.24	0.00E+00	2.55E-06	5.10E-06		
Ra-228	1.9714E-14	5,732.12	11,464.24	0.00E+00	1.13E-10	2.26E-10		
Ru-108	2.0477E-07	5,732.12	11,464.24	0.00E+00	1.17E-03	2.35E-03		
Se-79	1.2933E-05	5,732.12	11,464.24	0.00E+00	7.41E-02	1.48E-01		
Sn-126	1.1574E-05	5,732.12	11,464.24	0.00E+00	6.63E-02	1.33E-01		
Sr-90	1.7092E+00	5,732.12	11,464.24	0.00E+00	9.80E+03	1.96E+04		
Tc-99	4.2239E-04	5,732.12	11,464.24	0.00E+00	2.42E+00	4.84E+00		
Th-229	7.7260E-12	5,732.12	11,464.24	0.00E+00	4.43E-08	8.86E-08		
Th-230	5.8497E-08	5,732.12	11,464.24	0.00E+00	3.35E-04	6.71E-04		
Th-232	2.6906E-14	5,732.12	11,464.24	0.00E+00	1.54E-10	3.08E-10		
Tl-208	4.4336E-08	5,732.12	11,464.24	0.00E+00	2.54E-04	5.08E-04		
U-232	1.2037E-07	5,732.12	11,464.24	0.00E+00	6.90E-04	1.38E-03		
U-233	3.0011E-09	5,732.12	11,464.24	0.00E+00	1.72E-05	3.44E-05		
U-234	1.8497E-04	5,732.12	11,464.24	0.00E+00	1.06E+00	2.12E+00		
U-235	-2.7235E-06	5,732.12	0.00	3.10E-02	1.54E-02	3.10E-02		
U-236	1.5493E-05	5,732.12	11,464.24	0.00E+00	8.88E-02	1.78E-01		
U-238	-4.2851E-09	5,732.12	0.00	1.95E-02	1.94E-02	1.95E-02		
Y-90	1.7094E+00	5,732.12	11,464.24	0.00E+00	9.80E+03	1.96E+04		
Other Radionuclides					9.88E+03	1.98E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.21E+02	2.42E+02
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.83800556	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		5,732.12	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		11,464.24	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.25		1.01
Bounding	0.50		

<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	ASTRA-AUSTRIA (UALX-HEU)	<sup>1</sup> Fuel decay start date	1985		Estimated
SNF ID #	646	Estimates as of	2010		Canister usage
Fuel Units & Descr	33 - MTR TYPE	Template	ATR (Light Water, Alum, 60 to 100%, U)		18"x10"
Heavy Metal Mass	BOL=9 026kg, EOL=4 359kg	<sup>2</sup> Template Burnup(MWd)	367.2		0.92
ROD Storage Site	SRS	Template BOL Heavy Metal Mass (MT)	0.00116689		
		Template Decay Time	25 years		

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	Total Photons/sec (bounding)	Avg MeV					
Ac-227	1.1465E-09	4,418.98	8,547.32	0.00E+00	5.07E-06	9.80E-06								
Am-241	2.3056E-03	4,418.98	8,547.32	0.00E+00	1.02E+01	1.97E+01								
Am-242m	4.1476E-07	4,418.98	8,547.32	0.00E+00	1.83E-03	3.55E-03								
Am-243	1.4894E-06	4,418.98	8,547.32	0.00E+00	6.58E-03	1.27E-02								
C-14	5.7108E-09	4,418.98	8,547.32	0.00E+00	2.52E-05	4.88E-05								
Cl-36	1.3124E-32	4,418.98	8,547.32	0.00E+00	5.80E-29	1.12E-28								
Cm-243	1.4562E-07	4,418.98	8,547.32	0.00E+00	6.43E-04	1.24E-03								
Cm-244	2.4221E-05	4,418.98	8,547.32	0.00E+00	1.07E-01	2.07E-01								
Co-60	2.7560E-06	4,418.98	8,547.32	0.00E+00	1.22E-02	2.36E-02								
Cs-134	5.8851E-04	4,418.98	8,547.32	0.00E+00	2.60E+00	5.03E+00								
Cs-135	3.4477E-06	4,418.98	8,547.32	0.00E+00	1.52E-02	2.95E-02								
Cs-137	1.8099E+00	4,418.98	8,547.32	0.00E+00	8.00E+03	1.55E+04								
Eu-154	1.6386E-02	4,418.98	8,547.32	0.00E+00	7.24E+01	1.40E+02								
Eu-155	2.3957E-03	4,418.98	8,547.32	0.00E+00	1.06E+01	2.05E+01								
Fe-55	3.2707E-05	4,418.98	8,547.32	0.00E+00	1.45E-01	2.80E-01								
H-3	3.4504E-03	4,418.98	8,547.32	0.00E+00	1.52E+01	2.95E+01								
I-129	7.5300E-07	4,418.98	8,547.32	0.00E+00	3.33E-03	6.44E-03								
Kr-85	7.8540E-02	4,418.98	8,547.32	0.00E+00	3.47E+02	6.71E+02								
Np-237	9.5615E-06	4,418.98	8,547.32	0.00E+00	4.23E-02	8.17E-02								
Pa-231	2.7968E-09	4,418.98	8,547.32	0.00E+00	1.24E-05	2.39E-05								
Pb-210	1.2612E-10	4,418.98	8,547.32	0.00E+00	5.57E-07	1.08E-06								
Pm-147	1.2952E-02	4,418.98	8,547.32	0.00E+00	5.72E+01	1.11E+02								
Pu-238	1.7549E-02	4,418.98	8,547.32	0.00E+00	7.75E+01	1.50E+02								
Pu-239	4.2810E-04	4,418.98	8,547.32	0.00E+00	1.89E+00	3.66E+00								
Pu-240	2.4357E-04	4,418.98	8,547.32	0.00E+00	1.08E+00	2.08E+00								
Pu-241	2.6277E-02	4,418.98	8,547.32	0.00E+00	1.16E+02	2.25E+02								
Pu-242	3.6329E-07	4,418.98	8,547.32	0.00E+00	1.61E-03	3.11E-03								
Ra-226	4.4444E-10	4,418.98	8,547.32	0.00E+00	1.96E-06	3.80E-06								
Ra-228	1.9714E-14	4,418.98	8,547.32	0.00E+00	8.71E-11	1.69E-10								
Ru-106	2.0477E-07	4,418.98	8,547.32	0.00E+00	9.05E-04	1.75E-03								
Se-79	1.2933E-05	4,418.98	8,547.32	0.00E+00	5.72E-02	1.11E-01								
Sn-126	1.1574E-05	4,418.98	8,547.32	0.00E+00	5.11E-02	9.89E-02								
Sr-90	1.7092E+00	4,418.98	8,547.32	0.00E+00	7.55E+03	1.46E+04								
Tc-99	4.2239E-04	4,418.98	8,547.32	0.00E+00	1.87E+00	3.61E+00								
Th-229	7.7260E-12	4,418.98	8,547.32	0.00E+00	3.41E-08	6.60E-08								
Th-230	5.8497E-08	4,418.98	8,547.32	0.00E+00	2.58E-04	5.00E-04								
Th-232	2.6906E-14	4,418.98	8,547.32	0.00E+00	1.19E-10	2.30E-10								
Ti-208	4.4336E-08	4,418.98	8,547.32	0.00E+00	1.96E-04	3.79E-04								
U-232	1.2037E-07	4,418.98	8,547.32	0.00E+00	5.32E-04	1.03E-03								
U-233	3.0011E-09	4,418.98	8,547.32	0.00E+00	1.33E-05	2.57E-05								
U-234	1.8497E-04	4,418.98	8,547.32	0.00E+00	8.17E-01	1.58E+00								
U-235	-2.7235E-06	4,418.98	0.00	1.82E-02	6.12E-03	1.82E-02								
U-236	1.5493E-05	4,418.98	8,547.32	0.00E+00	6.85E-02	1.32E-01								
U-238	-4.2851E-09	4,418.98	0.00	2.10E-04	1.91E-04	2.10E-04								
Y-90	1.7094E+00	4,418.98	8,547.32	0.00E+00	7.55E+03	1.46E+04								
Other Radionuclides					7.61E+03	1.47E+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:	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.07350223	60 to 100	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal		4,418.98	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup calculated assuming all BOL heavy metal burned.
Bounding		8,547.32	
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.56		1.06
Bounding	3.01		

\* 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: ASTRA-AUSTRIA (UALX-MEU)  
 SNF ID #: 566  
 Fuel Units & Descr: 5 - MTR TYPE  
 Heavy Metal Mass: BOL=3 62kg; EOL=2.766kg  
 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 14

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	1.1465E-09	807 81	1,615 62	0 00E+00	9.26E-07	1 85E-06	Avg MeV	
Am-241	2.3056E-03	807 81	1,615 62	0 00E+00	1 86E+00	3 72E+00	0 0150	1 512E+14
Am-242m	4.1476E-07	807 81	1,615 62	0 00E+00	3 35E-04	6 70E-04	0.0250	3 141E+13
Am-243	1 4894E-06	807 81	1,615 62	0 00E+00	1 20E-03	2 41E-03	0 0375	2 735E+13
C-14	5 7108E-09	807 81	1,615 62	0 00E+00	4 61E-06	9 23E-06	0 0575	2 937E+13
Cl-36	1 3124E-32	807 81	1,615 62	0 00E+00	1 06E-29	2 12E-29	0 0850	1 772E+13
Cm-243	1 4562E-07	807 81	1,615 62	0 00E+00	1 18E-04	2 35E-04	0 1250	1 187E+13
Cm-244	2 4221E-05	807 81	1,615 62	0 00E+00	1 96E-02	3 91E-02	0 2250	1 530E+13
Co-60	2 7560E-06	807 81	1,615 62	0 00E+00	2.23E-03	4 45E-03	0 3750	6 652E+12
Cs-134	5 8851E-04	807 81	1,615 62	0 00E+00	4 75E-01	9.51E-01	0 5750	1 091E+14
Cs-135	3 4477E-06	807 81	1,615 62	0 00E+00	2.79E-03	5.57E-03	0 8500	1 571E+12
Cs-137	1 8099E+00	807 81	1,615 62	0 00E+00	1 46E+03	2 92E+03	1.2500	8 739E+11
Eu-154	1 6386E-02	807 81	1,615 62	0 00E+00	1 32E+01	2 65E+01	1 7500	4 317E+10
Eu-155	2 3957E-03	807 81	1,615 62	0 00E+00	1 94E+00	3 87E+00	2.2500	3 077E+06
Fe-55	3 2707E-05	807 81	1,615 62	0 00E+00	2 64E-02	5 28E-02	2 7500	2 520E+06
H-3	3 4504E-03	807 81	1,615 62	0 00E+00	2 79E+00	5 57E+00	3.5000	1 905E+03
I-129	7 5300E-07	807 81	1,615 62	0 00E+00	6 08E-04	1 22E-03	5 0000	6 409E+02
Kr-85	7.8540E-02	807 81	1,615 62	0 00E+00	6 34E+01	1 27E+02	7 0000	7 053E+01
Np-237	9 5615E-06	807 81	1,615 62	0 00E+00	7 72E-03	1 54E-02	11.0000	7 890E+00
Pa-231	2 7968E-09	807 81	1,615 62	0 00E+00	2 26E-06	4 52E-06		
Pb-210	1 2612E-10	807 81	1,615 62	0 00E+00	1 02E-07	2 04E-07		
Pm-147	1 2952E-02	807 81	1,615 62	0 00E+00	1 05E+01	2 09E+01		
Pu-238	1 7549E-02	807 81	1,615 62	0 00E+00	1.42E+01	2.84E+01		
Pu-239	4 2810E-04	807 81	1,615 62	0 00E+00	3 46E-01	6 92E-01		
Pu-240	2 4357E-04	807 81	1,615 62	0 00E+00	1 97E-01	3 94E-01		
Pu-241	2 6277E-02	807 81	1,615 62	0 00E+00	2.12E+01	4.25E+01		
Pu-242	3 6329E-07	807 81	1,615 62	0 00E+00	2.93E-04	5 87E-04		
Ra-226	4 4444E-10	807 81	1,615 62	0 00E+00	3.59E-07	7 18E-07		
Ra-228	1 9714E-14	807 81	1,615 62	0 00E+00	1 59E-11	3 19E-11		
Ru-106	2 0477E-07	807 81	1,615 62	0 00E+00	1 65E-04	3 31E-04		
Se-79	1 2933E-05	807 81	1,615 62	0 00E+00	1 04E-02	2 09E-02		
Sn-126	1 1574E-05	807 81	1,615 62	0 00E+00	9 35E-03	1 87E-02		
Sr-90	1 7092E+00	807 81	1,615 62	0 00E+00	1 38E+03	2 76E+03		
Tc-99	4 2239E-04	807 81	1,615 62	0 00E+00	3 41E-01	6 82E-01		
Th-229	7 7260E-12	807 81	1,615 62	0 00E+00	6 24E-09	1 25E-08		
Th-230	5 8497E-08	807 81	1,615 62	0 00E+00	4 73E-05	9 45E-05		
Th-232	2 6906E-14	807 81	1,615 62	0 00E+00	2.17E-11	4.35E-11		
Th-208	4 4336E-08	807 81	1,615 62	0 00E+00	3 58E-05	7.16E-05		
U-232	1 2037E-07	807 81	1,615 62	0 00E+00	9.72E-05	1.94E-04		
U-233	3 0011E-09	807 81	1,615 62	0 00E+00	2.42E-06	4.85E-06		
U-234	1 8497E-04	807 81	1,615 62	0 00E+00	1.49E-01	2.99E-01		
U-235	-2.7235E-06	807 81	0 00	3 48E-03	1.28E-03	3 48E-03		
U-236	1 5493E-05	807 81	1,615 62	0 00E+00	1.25E-02	2.50E-02		
U-238	-4 2851E-09	807 81	0 00	6 76E-04	6 72E-04	6 76E-04		
Y-90	1 7094E+00	807 81	1,615 62	0 00E+00	1 38E+03	2 76E+03		
Other Radionuclides					1 39E+03	2 78E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 71E+01	3 42E+01
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 %:	44 43904151	60 to 100

**Basis for Parameter Differences:**  
 This Template was used for the following reasons  
 The fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal		807 81
Bounding		1 615 62

**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	0.71	
Bounding	1.42	

Estimated EOL HM/Given EOL HM: 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: ATSR	<sup>1</sup> Fuel decay start date: 1988	Estimated Canister usage 18"x10" 0.56
SNF ID #: 17	Estimates as of: 2010	
Fuel Units & Descr: 20 - 19 FLAT PLATES	Template: ATR (Light Water, Alum, 60 to 100%, U)	
Heavy Metal Mass: BOL= ; EOL=3.21kg	<sup>2</sup> Template Burnup(MWd): 367.2	
ROD Storage Site: SRS	Template BOL Heavy Metal Mass (MT): 0.00116689	
	Template Decay Time: 20 years	

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	6.6313E-10	3,039.93	3,039.93	0.00E+00	2.02E-06	2.02E-06	Avg MeV	
Am-241	2.0060E-03	3,039.93	3,039.93	0.00E+00	6.10E+00	6.10E+00	0.0150	3.209E+14
Am-242m	4.2429E-07	3,039.93	3,039.93	0.00E+00	1.29E-03	1.29E-03	0.0250	6.673E+13
Am-243	1.4899E-06	3,039.93	3,039.93	0.00E+00	4.53E-03	4.53E-03	0.0375	5.820E+13
C-14	5.7135E-09	3,039.93	3,039.93	0.00E+00	1.74E-05	1.74E-05	0.0575	6.234E+13
Cl-36	1.3124E-32	3,039.93	3,039.93	0.00E+00	3.99E-29	3.99E-29	0.0850	3.767E+13
Cm-243	1.6443E-07	3,039.93	3,039.93	0.00E+00	5.00E-04	5.00E-04	0.1250	2.549E+13
Cm-244	2.9330E-05	3,039.93	3,039.93	0.00E+00	8.92E-02	8.92E-02	0.2250	3.250E+13
Co-60	5.3186E-06	3,039.93	3,039.93	0.00E+00	1.62E-02	1.62E-02	0.3750	1.415E+13
Cs-134	3.1563E-03	3,039.93	3,039.93	0.00E+00	9.59E+00	9.59E+00	0.5750	2.308E+14
Cs-135	3.4477E-06	3,039.93	3,039.93	0.00E+00	1.05E-02	1.05E-02	0.8500	3.902E+12
Cs-137	2.0313E+00	3,039.93	3,039.93	0.00E+00	6.18E+03	6.18E+03	1.2500	2.228E+12
Eu-154	2.4513E-02	3,039.93	3,039.93	0.00E+00	7.45E+01	7.45E+01	1.7500	1.023E+11
Eu-155	4.8175E-03	3,039.93	3,039.93	0.00E+00	1.46E+01	1.46E+01	2.2500	8.970E+06
Fe-55	1.2397E-04	3,039.93	3,039.93	0.00E+00	3.77E-01	3.77E-01	2.7500	5.071E+06
H-3	4.5697E-03	3,039.93	3,039.93	0.00E+00	1.39E+01	1.39E+01	3.5000	2.330E+04
I-129	7.5300E-07	3,039.93	3,039.93	0.00E+00	2.29E-03	2.29E-03	5.0000	1.317E+03
Kr-85	1.0850E-01	3,039.93	3,039.93	0.00E+00	3.30E+02	3.30E+02	7.0000	1.454E+02
Np-237	9.5561E-06	3,039.93	3,039.93	0.00E+00	2.90E-02	2.90E-02	11.0000	1.630E+01
Pa-231	2.0359E-09	3,039.93	3,039.93	0.00E+00	6.19E-06	6.19E-06		
Pb-210	4.9728E-11	3,039.93	3,039.93	0.00E+00	1.51E-07	1.51E-07		
Pm-147	4.8502E-02	3,039.93	3,039.93	0.00E+00	1.47E+02	1.47E+02		
Pu-238	1.8254E-02	3,039.93	3,039.93	0.00E+00	5.55E+01	5.55E+01		
Pu-239	4.2810E-04	3,039.93	3,039.93	0.00E+00	1.30E+00	1.30E+00		
Pu-240	2.4368E-04	3,039.93	3,039.93	0.00E+00	7.41E-01	7.41E-01		
Pu-241	3.3415E-02	3,039.93	3,039.93	0.00E+00	1.02E+02	1.02E+02		
Pu-242	3.6329E-07	3,039.93	3,039.93	0.00E+00	1.10E-03	1.10E-03		
Ra-226	2.2854E-10	3,039.93	3,039.93	0.00E+00	6.95E-07	6.95E-07		
Ra-228	1.2426E-14	3,039.93	3,039.93	0.00E+00	3.78E-11	3.78E-11		
Ru-106	6.3589E-06	3,039.93	3,039.93	0.00E+00	1.93E-02	1.93E-02		
Se-79	1.2933E-05	3,039.93	3,039.93	0.00E+00	3.93E-02	3.93E-02		
Sn-126	1.1574E-05	3,039.93	3,039.93	0.00E+00	3.52E-02	3.52E-02		
Sr-90	1.9248E+00	3,039.93	3,039.93	0.00E+00	5.85E+03	5.85E+03		
Tc-99	4.2239E-04	3,039.93	3,039.93	0.00E+00	1.28E+00	1.28E+00		
Th-229	5.0953E-12	3,039.93	3,039.93	0.00E+00	1.55E-08	1.55E-08		
Th-230	4.1885E-08	3,039.93	3,039.93	0.00E+00	1.27E-04	1.27E-04		
Th-232	1.9270E-14	3,039.93	3,039.93	0.00E+00	5.86E-11	5.86E-11		
Ti-208	4.6024E-08	3,039.93	3,039.93	0.00E+00	1.40E-04	1.40E-04		
U-232	1.2582E-07	3,039.93	3,039.93	0.00E+00	3.82E-04	3.82E-04		
U-233	2.5825E-09	3,039.93	3,039.93	0.00E+00	7.85E-06	7.85E-06		
U-234	1.8450E-04	3,039.93	3,039.93	0.00E+00	5.61E-01	5.61E-01		
U-235	-2.7235E-06	3,039.93	0.00	1.28E-02	4.50E-03	1.28E-02		
U-236	1.5493E-05	3,039.93	3,039.93	0.00E+00	4.71E-02	4.71E-02		
U-238	-4.2851E-09	3,039.93	0.00	1.29E-04	1.16E-04	1.29E-04		
Y-90	1.9254E+00	3,039.93	3,039.93	0.00E+00	5.85E+03	5.85E+03		
Other Radionuclides					5.88E+03	5.88E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.25E+01	7.25E+01
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 %:		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		3,039.93
Bounding		3,039.93

**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.

Checks		
	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	1.50	
Bounding	1.50	

Estimated EOL HM/ Given EOL HM: 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: BABCOCK & WILCOX SCRAP  
 SNF ID #: 18  
 Fuel Units & Descr: 1 - CANISTER OF SCRAP  
 Heavy Metal Mass: BOL= , EOL=0.07kg  
 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): 0.00186965  
 Template Decay Time: 35 years

Estimated  
 Canister usage:  
 HIC  
 1.00

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)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3072E-06	66.52	66.52	0.00E+00	1.53E-04	1.53E-04	Avg MeV	
Am-241	8.4448E+00	66.52	66.52	0.00E+00	5.62E+02	5.62E+02	0.0150	8.152E+13
Am-242m	1.6848E-02	66.52	66.52	0.00E+00	1.12E+00	1.12E+00	0.0250	1.622E+13
Am-243	1.6320E-02	66.52	66.52	0.00E+00	1.09E+00	1.09E+00	0.0375	1.417E+13
C-14	1.2090E-01	66.52	66.52	0.00E+00	8.04E+00	8.04E+00	0.0575	2.230E+13
Cl-36	2.2849E-03	66.52	66.52	0.00E+00	1.52E-01	1.52E-01	0.0850	8.703E+12
Cm-243	8.6624E-04	66.52	66.52	0.00E+00	5.76E-02	5.76E-02	0.1250	6.821E+12
Cm-244	1.6848E-01	66.52	66.52	0.00E+00	1.12E+01	1.12E+01	0.2250	7.539E+12
Co-60	2.8086E+01	66.52	66.52	0.00E+00	1.87E+03	1.87E+03	0.3750	3.225E+12
Cs-134	3.4148E-04	66.52	66.52	0.00E+00	2.27E-02	2.27E-02	0.5750	5.244E+13
Cs-135	4.3976E-04	66.52	66.52	0.00E+00	2.93E-02	2.93E-02	0.8500	2.004E+12
Cs-137	2.1049E+01	66.52	66.52	0.00E+00	1.40E+03	1.40E+03	1.2500	1.401E+14
Eu-154	1.2500E+00	66.52	66.52	0.00E+00	8.32E+01	8.32E+01	1.7500	6.196E+10
Eu-155	6.8986E-02	66.52	66.52	0.00E+00	4.59E+00	4.59E+00	2.2500	7.346E+08
Fe-55	2.9308E-01	66.52	66.52	0.00E+00	1.95E+01	1.95E+01	2.7500	2.070E+08
H-3	2.4311E-01	66.52	66.52	0.00E+00	1.62E+01	1.62E+01	3.5000	1.657E+05
I-129	1.0618E-05	66.52	66.52	0.00E+00	7.06E-04	7.06E-04	5.0000	7.036E+04
Kr-85	5.9882E-01	66.52	66.52	0.00E+00	3.98E+01	3.98E+01	7.0000	8.057E+03
Np-237	1.5668E-04	66.52	66.52	0.00E+00	1.04E-02	1.04E-02	11.0000	9.219E+02
Pa-231	2.8656E-06	66.52	66.52	0.00E+00	1.91E-04	1.91E-04		
Pb-210	2.3918E-08	66.52	66.52	0.00E+00	1.59E-06	1.59E-06		
Pm-147	1.6900E-02	66.52	66.52	0.00E+00	1.12E+00	1.12E+00		
Pu-238	-8.6120E-01	66.52	0.00	1.80E+01	0.00E+00	1.80E+01		
Pu-239	-4.8440E-02	66.52	0.00	2.18E+00	0.00E+00	2.18E+00		
Pu-240	-3.0095E-01	66.52	0.00	2.78E+00	0.00E+00	2.78E+00		
Pu-241	-1.0411E+02	66.52	0.00	7.16E+02	0.00E+00	7.16E+02		
Pu-242	-1.1381E-04	66.52	0.00	1.20E-02	4.46E-03	1.20E-02		
Ra-226	6.4400E-08	66.52	66.52	0.00E+00	4.28E-06	4.28E-06		
Ra-228	5.9952E-07	66.52	66.52	0.00E+00	3.99E-05	3.99E-05		
Ru-106	8.5526E-07	66.52	66.52	0.00E+00	5.69E-05	5.69E-05		
Se-79	1.9181E-04	66.52	66.52	0.00E+00	1.28E-02	1.28E-02		
Sn-126	1.6671E-04	66.52	66.52	0.00E+00	1.11E-02	1.11E-02		
Sr-90	1.9799E+01	66.52	66.52	0.00E+00	1.32E+03	1.32E+03		
Tc-99	6.7678E-03	66.52	66.52	0.00E+00	4.50E-01	4.50E-01		
Th-229	1.7488E-06	66.52	66.52	0.00E+00	1.16E-04	1.16E-04		
Th-230	5.8704E-06	66.52	66.52	0.00E+00	3.91E-04	3.91E-04		
Th-232	6.0208E-07	66.52	66.52	0.00E+00	4.01E-05	4.01E-05		
Tl-208	8.7573E-05	66.52	66.52	0.00E+00	5.83E-03	5.83E-03		
U-232	2.3706E-04	66.52	66.52	0.00E+00	1.58E-02	1.58E-02		
U-233	3.6128E-04	66.52	66.52	0.00E+00	2.40E-02	2.40E-02		
U-234	1.2788E-02	66.52	66.52	0.00E+00	8.51E-01	8.51E-01		
U-235	5.7486E-04	66.52	66.52	6.02E-05	3.83E-02	3.83E-02		
U-236	2.3485E-04	66.52	66.52	0.00E+00	1.56E-02	1.56E-02		
U-238	1.1581E-04	66.52	66.52	7.49E-06	7.71E-03	7.71E-03		
Y-90	1.9804E+01	66.52	66.52	0.00E+00	1.32E+03	1.32E+03		
Other Radionuclides					4.10E+03	4.10E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.56E+01	6.63E+01
Total	Total

**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 %		0 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		66.52	Nominal burnup set equal to bounding burnup.
Bounding		66.52	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: BER-II (HM) (END BOXES) GERMANY  
 SNF ID #: 892  
 Fuel Units & Descr: 6 - MTR TYPE  
 Heavy Metal Mass BOL=0kg EOL=0kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date: 1996  
 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: 10 years

Estimated  
 Canister usage  
 HIC  
 100

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.8404E-10	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	Avg MeV	
Am-241	1.4935E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0150	0.000E+00
Am-242m	4.4390E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0250	0.000E+00
Am-243	1.4913E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0375	0.000E+00
C-14	5.7217E-09	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0575	0.000E+00
Cl-36	1.3124E-32	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.0850	0.000E+00
Cm-243	2.0967E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.1250	0.000E+00
Cm-244	4.3001E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.2250	0.000E+00
Co-60	1.9798E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.3750	0.000E+00
Cs-134	9.0795E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.5750	0.000E+00
Cs-135	3.4477E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	0.8500	0.000E+00
Cs-137	2.5588E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.2500	0.000E+00
Eu-154	5.4847E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	1.7500	0.000E+00
Eu-155	1.9469E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.2500	0.000E+00
Fe-55	1.7797E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	2.7500	0.000E+00
H-3	8.0065E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	3.5000	0.000E+00
I-129	7.5300E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	5.0000	0.000E+00
Kr-85	2.0705E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	7.0000	0.000E+00
Np-237	9.5507E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00	11.0000	0.000E+00
Pa-231	1.2740E-09	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pb-210	1.1838E-11	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pm-147	6.7974E-01	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-238	1.9755E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-239	4.2838E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-240	2.4390E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-241	5.4058E-02	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Pu-242	3.6329E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ra-226	8.3742E-11	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ra-228	5.7734E-15	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ru-106	6.1356E-03	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Se-79	1.2936E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Sn-126	1.1574E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Sr-90	2.4417E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Tc-99	4.2239E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Th-229	2.8568E-12	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Th-230	2.5310E-08	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Th-232	1.1631E-14	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Ti-208	4.6705E-08	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-232	1.3151E-07	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-233	2.1650E-09	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-234	1.8399E-04	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-235	-2.7235E-06	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-236	1.5493E-05	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
U-238	-4.2851E-09	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Y-90	2.4423E+00	0.00	0.00	0.00E+00	0.00E+00	0.00E+00		
Other Radionuclides								

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
0.00E+00	0.00E+00
Total	Total

**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	ALUM	ALUM	
BOL Enrichment %	U	U	
	100	60 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
Nominal	From SFD	Estimated	
Bounding			
			Nominal burnup assumed to be 2% of BOL heavy metal mass
			Bounding burnup assumed to be twice nominal burnup

  

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

\*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: BER-II (HMJ) (UALX HEU) GERMANY  
 SNF ID #: 758  
 Fuel Units & Descr: 112 - 17 FLAT PLATES  
 Heavy Metal Mass: BOL=20 653kg, EOL=12 074kg  
 ROD Storage Site, SRS

<sup>1</sup>Fuel decay start date: 1996  
 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: 10 years

Estimated  
 Canister usage  
 18"x10"  
 4 67

Radionuclide	II. Estimates		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	
	m	x <sub>a</sub>						Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 8404E-10	8,124 67	16,249 34	0 00E+00	2 31E-06	4 62E-06			
Am-241	1 4935E-03	8,124 67	16,249 34	0 00E+00	1 21E+01	2 43E+01	0 0150	2 210E+15	
Am-242m	4 4390E-07	8,124 67	16,249 34	0 00E+00	3 61E-03	7 21E-03	0 0250	4 651E+14	
Am-243	1 4913E-06	8,124 67	16,249 34	0 00E+00	1 21E-02	2 42E-02	0 0375	4 055E+14	
C-14	5 7217E-09	8,124 67	16,249 34	0 00E+00	4 65E-05	9 30E-05	0 0575	4 284E+14	
Cl-36	1 3124E-32	8,124 67	16,249 34	0 00E+00	1 07E-28	2 13E-28	0 0850	2 606E+14	
Cm-243	2 0967E-07	8,124 67	16,249 34	0 00E+00	1 70E-03	3 41E-03	0 1250	1 823E+14	
Cm-244	4 3001E-05	8,124 67	16,249 34	0 00E+00	3 49E-01	6 99E-01	0 2250	2 238E+14	
Co-60	1 9798E-05	8,124 67	16,249 34	0 00E+00	1 61E-01	3 22E-01	0 3750	1 003E+14	
Cs-134	9 0795E-02	8,124 67	16,249 34	0 00E+00	7 38E+02	1 48E+03	0 5750	1 628E+15	
Cs-135	3 4477E-06	8,124 67	16,249 34	0 00E+00	2 80E-02	5 60E-02	0 8500	7 944E+13	
Cs-137	2 5888E+00	8,124 67	16,249 34	0 00E+00	2 08E+04	4 16E+04	1 2500	2 585E+13	
Eu-154	5 4847E-02	8,124 67	16,249 34	0 00E+00	4 46E+02	8 91E+02	1 7500	9 440E+11	
Eu-155	1 9469E-02	8,124 67	16,249 34	0 00E+00	1 58E+02	3 16E+02	2 2500	6 241E+10	
Fe-55	1 7797E-03	8,124 67	16,249 34	0 00E+00	1 45E+01	2 89E+01	2 7500	8 708E+08	
H-3	8 0065E-03	8,124 67	16,249 34	0 00E+00	6 51E+01	1 30E+02	3 5000	1 037E+08	
I-129	7 5300E-07	8,124 67	16,249 34	0 00E+00	6 12E-03	1 22E-02	5 0000	8 613E+03	
Kr-85	2 0705E-01	8,124 67	16,249 34	0 00E+00	1 68E+03	3 36E+03	7 0000	9 570E+02	
Np-237	9 5507E-06	8,124 67	16,249 34	0 00E+00	7 76E-02	1 55E-01	11 0000	1 077E+02	
Pa-231	1 2740E-09	8,124 67	16,249 34	0 00E+00	1 04E-05	2 07E-05			
Pb-210	1 1838E-11	8,124 67	16,249 34	0 00E+00	9 62E-08	1 92E-07			
Pm-147	6 7974E-01	8,124 67	16,249 34	0 00E+00	5 52E+03	1 10E+04			
Pu-238	1 9755E-02	8,124 67	16,249 34	0 00E+00	1 61E+02	3 21E+02			
Pu-239	4 2838E-04	8,124 67	16,249 34	0 00E+00	3 48E+00	6 96E+00			
Pu-240	2 4390E-04	8,124 67	16,249 34	0 00E+00	1 98E+00	3 96E+00			
Pu-241	5 4058E-02	8,124 67	16,249 34	0 00E+00	4 39E+02	8 78E+02			
Pu-242	3 6329E-07	8,124 67	16,249 34	0 00E+00	2 95E-03	5 90E-03			
Ra-226	8 3742E-11	8,124 67	16,249 34	0 00E+00	6 80E-07	1 36E-06			
Ra-228	5 7734E-15	8,124 67	16,249 34	0 00E+00	4 69E-11	9 38E-11			
Ru-106	6 1356E-03	8,124 67	16,249 34	0 00E+00	4 98E+01	9 97E+01			
Se-79	1 2936E-05	8,124 67	16,249 34	0 00E+00	1 05E-01	2 10E-01			
Sn-126	1 1574E-05	8,124 67	16,249 34	0 00E+00	9 40E-02	1 88E-01			
Sr-90	2 4417E+00	8,124 67	16,249 34	0 00E+00	1 98E+04	3 97E+04			
Tc-99	4 2239E-04	8,124 67	16,249 34	0 00E+00	3 43E+00	6 86E+00			
Th-229	2 8568E-12	8,124 67	16,249 34	0 00E+00	2 32E-08	4 64E-08			
Th-230	2 5310E-08	8,124 67	16,249 34	0 00E+00	2 06E-04	4 11E-04			
Th-232	1 1631E-14	8,124 67	16,249 34	0 00E+00	9 45E-11	1 89E-10			
Th-208	4 6705E-08	8,124 67	16,249 34	0 00E+00	3 79E-04	7 59E-04			
U-232	1 3151E-07	8,124 67	16,249 34	0 00E+00	1 07E-03	2 14E-03			
U-233	2 1650E-09	8,124 67	16,249 34	0 00E+00	1 76E-05	3 52E-05			
U-234	1 8399E-04	8,124 67	16,249 34	0 00E+00	1 49E+00	2 99E+00			
U-235	-2 7235E-06	8,124 67	0 00	4 15E-02	1 94E-02	4 15E-02			
U-236	1 5493E-05	8,124 67	16,249 34	0 00E+00	1 26E-01	2 52E-01			
U-238	-4 2851E-09	8,124 67	0 00	4 84E-04	4 49E-04	4 84E-04			
Y-90	2 4423E+00	8,124 67	16,249 34	0 00E+00	1 98E+04	3 97E+04			
Other Radionuclides					2 02E+04	4 04E+04			
							Thermal Power		
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)	
							2.57E+02	5.14E+02	
							Total	Total	

**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 03245367	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		8 124 67	
Bounding		16,249 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	1.25		
Bounding	2.50		

1 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 BNL MEDICAL RX (BMRR)	<sup>1</sup> Fuel decay start date 1989	
SNF ID # 21	Estimates as of 2010	
Fuel Units & Descr. 40 - CYLINDRICAL SECTIONS	Template ATR (Light Water, Alum., 60 to 100%, U)	
Heavy Metal Mass BOL=6 188kg EOL=5 124kg	<sup>2</sup> Template Burnup(MWd) 367.2	
ROD Storage Site SRS	Template BOL Heavy Metal Mass (MT) 0 00116689	
	Template Decay Time 20 years	

Estimated Canister usage 18"x10" <b>1 11</b>
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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		
							Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	6 6313E-10	1,007.63	2,015.26	0 00E+00	6 68E-07	1.34E-06	Avg MeV		
Am-241	2 0060E-03	1,007.63	2,015.26	0 00E+00	2 02E+00	4 04E+00	0 0150	2 127E+14	
Am-242m	4 2429E-07	1,007.63	2,015.26	0 00E+00	4 28E-04	8 55E-04	0 0250	4 424E+13	
Am-243	1 4899E-06	1,007.63	2,015.26	0 00E+00	1 50E-03	3 00E-03	0 0375	3 858E+13	
C-14	5 7135E-09	1,007.63	2,015.26	0 00E+00	5 76E-06	1 15E-05	0 0575	4 132E+13	
Cl-36	1 3124E-32	1,007.63	2,015.26	0 00E+00	1 32E-29	2 64E-29	0 0850	2 497E+13	
Cm-243	1 6443E-07	1,007.63	2,015.26	0 00E+00	1 66E-04	3 31E-04	0 1250	1 690E+13	
Cm-244	2 9330E-05	1,007.63	2,015.26	0 00E+00	2 96E-02	5 91E-02	0 2250	2 155E+13	
Co-60	5 3186E-06	1,007.63	2,015.26	0 00E+00	5 36E-03	1 07E-02	0 3750	9 380E+12	
Cs-134	3 1563E-03	1,007.63	2,015.26	0 00E+00	3 18E+00	6 36E+00	0 5750	1 530E+14	
Cs-135	3 4477E-06	1,007.63	2,015.26	0 00E+00	3 47E-03	6 95E-03	0 8500	2 587E+12	
Cs-137	2 0313E+00	1,007.63	2,015.26	0 00E+00	2 05E+03	4 09E+03	1 2500	1 477E+12	
Eu-154	2 4513E-02	1,007.63	2,015.26	0 00E+00	2 47E+01	4 94E+01	1 7500	6 779E+10	
Eu-155	4 8175E-03	1,007.63	2,015.26	0 00E+00	4 85E+00	9 71E+00	2 2500	5 947E+06	
Fe-55	1 2397E-04	1,007.63	2,015.26	0 00E+00	1 25E-01	2 50E-01	2 7500	3 362E+06	
H-3	4 5697E-03	1,007.63	2,015.26	0 00E+00	4 60E+00	9 21E+00	3 5000	1 544E+04	
I-129	7 5300E-07	1,007.63	2,015.26	0 00E+00	7 59E-04	1 52E-03	5 0000	8 734E+02	
Kr-85	1 0850E-01	1,007.63	2,015.26	0 00E+00	1 09E+02	2 19E+02	7 0000	9 642E+01	
Np-237	9 5561E-06	1,007.63	2,015.26	0 00E+00	9 63E-03	1 93E-02	11.0000	1 081E+01	
Pu-231	2 0359E-09	1,007.63	2,015.26	0 00E+00	2 05E-06	4 10E-06			
Pu-239	4 2810E-04	1,007.63	2,015.26	0 00E+00	4 31E-01	8 63E-01			
Pu-240	2 4368E-04	1,007.63	2,015.26	0 00E+00	2 46E-01	4 91E-01			
Pu-241	3 3415E-02	1,007.63	2,015.26	0 00E+00	3 37E+01	6 73E+01			
Pu-242	3 6329E-07	1,007.63	2,015.26	0 00E+00	3 66E-04	7 32E-04			
Ra-226	2 2854E-10	1,007.63	2,015.26	0 00E+00	2 30E-07	4 61E-07			
Ra-228	1 2426E-14	1,007.63	2,015.26	0 00E+00	1 25E-11	2 50E-11			
Ru-106	6 3589E-06	1,007.63	2,015.26	0 00E+00	6 41E-03	1 28E-02			
Se-79	1 2933E-05	1,007.63	2,015.26	0 00E+00	1 30E-02	2 61E-02			
Sn-126	1 1574E-05	1,007.63	2,015.26	0 00E+00	1 17E-02	2 33E-02			
Sr-90	1 9248E+00	1,007.63	2,015.26	0 00E+00	1 94E+03	3 88E+03			
Tc-99	4 2239E-04	1,007.63	2,015.26	0 00E+00	4 26E-01	8 51E-01			
Th-229	5 0953E-12	1,007.63	2,015.26	0 00E+00	5 13E-09	1 03E-08			
Th-230	4 1885E-08	1,007.63	2,015.26	0 00E+00	4 22E-05	8 44E-05			
Th-232	1 9270E-14	1,007.63	2,015.26	0 00E+00	1 94E-11	3 88E-11			
Tl-208	4 6024E-08	1,007.63	2,015.26	0 00E+00	4 64E-05	9 28E-05			
U-232	1 2582E-07	1,007.63	2,015.26	0 00E+00	1 27E-04	2 54E-04			
U-233	2 5825E-09	1,007.63	2,015.26	0 00E+00	2 60E-06	5 20E-06			
U-234	1 8450E-04	1,007.63	2,015.26	0 00E+00	1 86E-01	3 72E-01			
U-235	-2 7235E-06	1,007.63	0 00	1 24E-02	9 65E-03	1 24E-02			
U-236	1 5493E-05	1,007.63	2,015.26	0 00E+00	1 56E-02	3 12E-02			
U-238	-4 2851E-09	1,007.63	0 00	1 53E-04	1 49E-04	1 53E-04			
Y-90	1 9254E+00	1,007.63	2,015.26	0 00E+00	1 94E+03	3 88E+03			
Other Radionuclides							1.95E+03	3 90E+03	

**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 %	92.65152255	60 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal		1,007.63	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		2,015.26	

  

Checks		
	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.52	
Bounding	1.03	
		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 BSR  
 SNF ID #: 31  
 Fuel Units & Descr: 41 - 19 PLATE MTR ASSY  
 Heavy Metal Mass: BOL=7 856kg EOL=6 941kg  
 ROD Storage Site: SRS

Fuel decay start date: 1991  
 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: 15 years

Estimated  
 Canister usage  
 18"x10"  
 1 71

**II. Estimates**

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
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	865 86	1,731 72	0 00E+00	3 97E-07	7 94E-07		
Am-241	1 7832E-03	865 86	1,731 72	0 00E+00	1 54E+00	3 09E+00	0 0150	2 066E+14
Am-242m	4 3410E-07	865 86	1,731 72	0 00E+00	3 76E-04	7 52E-04	0 0250	4 308E+13
Am-243	1 4907E-06	865 86	1,731 72	0 00E+00	1 29E-03	2 58E-03	0 0375	3 762E+13
C-14	5 7162E-09	865 86	1,731 72	0 00E+00	4 95E-06	9 90E-06	0 0575	4 011E+13
Cl-36	1 3124E-32	865 86	1,731 72	0 00E+00	1 14E-29	2 27E-29	0 0850	2 430E+13
Cm-243	1 8568E-07	865 86	1,731 72	0 00E+00	1 61E-04	3 22E-04	0 1250	1 666E+13
Cm-244	3 5512E-05	865 86	1,731 72	0 00E+00	3 07E-02	6 15E-02	0 2250	2 093E+13
Co-60	1 0261E-05	865 86	1,731 72	0 00E+00	8 88E-03	1 78E-02	0 3750	9 171E+12
Cs-134	1 6931E-02	865 86	1,731 72	0 00E+00	1 47E+01	2 93E+01	0 5750	1 489E+14
Cs-135	3 4477E-06	865 86	1,731 72	0 00E+00	2 99E-03	5 97E-03	0 8500	3 536E+12
Cs-137	2 2800E+00	865 86	1,731 72	0 00E+00	1 97E+03	3 95E+03	1 2500	1 786E+12
Eu-154	3 6656E-02	865 86	1,731 72	0 00E+00	3 17E+01	6 35E+01	1 7500	7 484E+10
Eu-155	9 6841E-03	865 86	1,731 72	0 00E+00	8 39E+00	1 68E+01	2 2500	9 363E+07
Fe-55	4 6977E-04	865 86	1,731 72	0 00E+00	4 07E-01	8 14E-01	2 7500	5 627E+06
H-3	6 0485E-03	865 86	1,731 72	0 00E+00	5 24E+00	1 05E+01	3 5000	3 576E+05
I-129	7 5300E-07	865 86	1,731 72	0 00E+00	6 52E-04	1 30E-03	5 0000	8 276E+02
Kr-85	1 4989E-01	865 86	1,731 72	0 00E+00	1 30E+02	2 60E+02	7 0000	9 165E+01
Np-237	9 5534E-06	865 86	1,731 72	0 00E+00	8 27E-03	1 65E-02	11 0000	1 029E+01
Pu-231	1 6550E-09	865 86	1,731 72	0 00E+00	1 43E-06	2 87E-06		
Pu-210	2 6631E-11	865 86	1,731 72	0 00E+00	2 31E-08	4 61E-08		
Pm-147	1 8156E-01	865 86	1,731 72	0 00E+00	1 57E+02	3 14E+02		
Pu-238	1 8990E-02	865 86	1,731 72	0 00E+00	1 64E+01	3 29E+01		
Pu-239	4 2838E-04	865 86	1,731 72	0 00E+00	3 71E-01	7 42E-01		
Pu-240	2 4379E-04	865 86	1,731 72	0 00E+00	2 11E-01	4 22E-01		
Pu-241	4 2511E-02	865 86	1,731 72	0 00E+00	3 68E+01	7 36E+01		
Pu-242	3 6329E-07	865 86	1,731 72	0 00E+00	3 15E-04	6 29E-04		
Ra-226	1 4725E-10	865 86	1,731 72	0 00E+00	1 27E-07	2 55E-07		
Ra-228	8 9760E-15	865 86	1,731 72	0 00E+00	7 77E-12	1 55E-11		
Ru-106	1 9752E-04	865 86	1,731 72	0 00E+00	1 71E-01	3 42E-01		
Se-79	1 2933E-05	865 86	1,731 72	0 00E+00	1 12E-02	2 24E-02		
Sn-126	1 1574E-05	865 86	1,731 72	0 00E+00	1 00E-02	2 00E-02		
Sr-90	2 1680E+00	865 86	1,731 72	0 00E+00	1 88E+03	3 75E+03		
Tc-99	4 2239E-04	865 86	1,731 72	0 00E+00	3 66E-01	7 31E-01		
Th-229	3 9270E-12	865 86	1,731 72	0 00E+00	3 40E-09	6 80E-09		
Th-230	3 3578E-08	865 86	1,731 72	0 00E+00	2 91E-05	5 81E-05		
Th-232	1 5452E-14	865 86	1,731 72	0 00E+00	1 34E-11	2 68E-11		
Tl-208	4 6705E-08	865 86	1,731 72	0 00E+00	4 04E-05	8 09E-05		
U-232	1 3045E-07	865 86	1,731 72	0 00E+00	1 13E-04	2 26E-04		
U-233	2 3739E-09	865 86	1,731 72	0 00E+00	2 06E-06	4 11E-06		
U-234	1 8423E-04	865 86	1,731 72	0 00E+00	1 60E-01	3 19E-01		
U-235	-2 7235E-06	865 86	0 00	1 58E-02	1 35E-02	1 58E-02		
U-236	1 5493E-05	865 86	1,731 72	0 00E+00	1 34E-02	2 68E-02		
U-238	-4 2851E-09	865 86	0 00	1 79E-04	1 75E-04	1 79E-04		
Y-90	2 1686E+00	865 86	1,731 72	0 00E+00	1 88E+03	3 76E+03		
Other Radionuclides					1 88E+03	3 77E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2 34E+01	4 69E+01
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 23369049	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal		865 86
Bounding		1,731 72

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 35	
Bounding	0 70	

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: CANDU  
 SNF ID #: 979  
 Fuel Units & Descr: 4 - ROD  
 Heavy Metal Mass BOL: ; EOL=49 32kg  
 ROD Storage Site INEEL

Fuel decay start date 1964  
 Estimates as of 2010  
 Template HFBR (Heavy Water, Zirc., 0 to 5%, U)  
 Template Burnup (MWd) 5  
 Template BOL Heavy Metal Mass (MT) 0.00034251  
 Template Decay Time 35 years

Estimated  
 Canister usage  
 18"x15"  
 0 14

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.6920E-09	47,275.85	47,275.85	0.00E+00	2.22E-04	2.22E-04	Avg MeV	
Am-241	2.2880E-02	47,275.85	47,275.85	0.00E+00	1.08E+03	1.08E+03	0.0150	3.298E+15
Am-242m	3.5400E-06	47,275.85	47,275.85	0.00E+00	1.67E-01	1.67E-01	0.0250	6.832E+14
Am-243	2.0580E-06	47,275.85	47,275.85	0.00E+00	9.73E-02	9.73E-02	0.0375	6.010E+14
C-14	1.1264E-03	47,275.85	47,275.85	0.00E+00	5.33E+01	5.33E+01	0.0575	6.508E+14
Cl-36	8.3760E-11	47,275.85	47,275.85	0.00E+00	3.96E-06	3.96E-06	0.0850	3.837E+14
Cm-243	5.0340E-07	47,275.85	47,275.85	0.00E+00	2.38E-02	2.38E-02	0.1250	2.532E+14
Cm-244	1.0450E-05	47,275.85	47,275.85	0.00E+00	4.94E-01	4.94E-01	0.2250	3.306E+14
Co-60	6.4420E-02	47,275.85	47,275.85	0.00E+00	3.05E+03	3.05E+03	0.3750	1.438E+14
Cs-134	7.9240E-06	47,275.85	47,275.85	0.00E+00	3.75E-01	3.75E-01	0.5750	2.516E+15
Cs-135	7.9140E-06	47,275.85	47,275.85	0.00E+00	3.74E-01	3.74E-01	0.8500	2.904E+13
Cs-137	1.4316E+00	47,275.85	47,275.85	0.00E+00	6.77E+04	6.77E+04	1.2500	2.393E+14
Eu-154	6.7900E-03	47,275.85	47,275.85	0.00E+00	3.21E+02	3.21E+02	1.7500	7.871E+11
Eu-155	6.2800E-04	47,275.85	47,275.85	0.00E+00	2.97E+01	2.97E+01	2.2500	1.261E+09
Fe-55	5.7480E-05	47,275.85	47,275.85	0.00E+00	2.72E+00	2.72E+00	2.7500	8.066E+07
H-3	2.3800E-02	47,275.85	47,275.85	0.00E+00	1.13E+03	1.13E+03	3.5000	2.433E+05
I-129	7.5020E-07	47,275.85	47,275.85	0.00E+00	3.55E-02	3.55E-02	5.0000	1.021E+05
Kr-85	3.8220E-02	47,275.85	47,275.85	0.00E+00	1.81E+03	1.81E+03	7.0000	1.149E+04
Np-237	5.5780E-06	47,275.85	47,275.85	0.00E+00	2.64E-01	2.64E-01	11.0000	1.303E+03
Pa-231	7.8820E-09	47,275.85	47,275.85	0.00E+00	3.73E-04	3.73E-04		
Pb-210	4.3840E-09	47,275.85	47,275.85	0.00E+00	2.07E-04	2.07E-04		
Pm-147	9.9500E-04	47,275.85	47,275.85	0.00E+00	4.70E+01	4.70E+01		
Pu-238	6.4240E-03	47,275.85	47,275.85	0.00E+00	3.04E+02	3.04E+02		
Pu-239	1.8744E-02	47,275.85	47,275.85	0.00E+00	8.86E+02	8.86E+02		
Pu-240	8.3540E-03	47,275.85	47,275.85	0.00E+00	3.95E+02	3.95E+02		
Pu-241	1.4606E-01	47,275.85	47,275.85	0.00E+00	6.91E+03	6.91E+03		
Pu-242	2.0400E-06	47,275.85	47,275.85	0.00E+00	9.64E-02	9.64E-02		
Ra-226	1.1804E-08	47,275.85	47,275.85	0.00E+00	5.58E-04	5.58E-04		
Ra-228	1.1864E-09	47,275.85	47,275.85	0.00E+00	5.61E-05	5.61E-05		
Ru-106	3.2580E-10	47,275.85	47,275.85	0.00E+00	1.54E-05	1.54E-05		
Se-79	1.2524E-05	47,275.85	47,275.85	0.00E+00	5.92E-01	5.92E-01		
Sn-126	1.2052E-05	47,275.85	47,275.85	0.00E+00	5.70E-01	5.70E-01		
Sr-90	1.2638E+00	47,275.85	47,275.85	0.00E+00	5.97E+04	5.97E+04		
Tc-99	4.4140E-04	47,275.85	47,275.85	0.00E+00	2.09E+01	2.09E+01		
Th-229	4.3480E-09	47,275.85	47,275.85	0.00E+00	2.06E-04	2.06E-04		
Th-230	1.0760E-06	47,275.85	47,275.85	0.00E+00	5.09E-02	5.09E-02		
Th-232	1.1926E-09	47,275.85	47,275.85	0.00E+00	5.64E-05	5.64E-05		
Th-208	4.6200E-08	47,275.85	47,275.85	0.00E+00	2.18E-03	2.18E-03		
U-232	1.2406E-07	47,275.85	47,275.85	0.00E+00	5.87E-03	5.87E-03		
U-233	9.1620E-07	47,275.85	47,275.85	0.00E+00	4.33E-02	4.33E-02		
U-234	2.3440E-03	47,275.85	47,275.85	0.00E+00	1.11E+02	1.11E+02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-2.3296E-06	47,275.85	0.00	1.07E-02	0.00E+00	1.07E-02	8.69E+02	8.89E+02
U-236	2.6620E-05	47,275.85	47,275.85	0.00E+00	1.26E+00	1.26E+00	Total	Total
U-238	-1.3291E-07	47,275.85	0.00	3.12E-02	2.49E-02	3.12E-02		
Y-90	1.2642E+00	47,275.85	47,275.85	0.00E+00	5.98E+04	5.98E+04		
Other Radionuclides					6.45E+04	6.45E+04		

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

Template Selection Summary			Basis for Parameter Differences*
	From SFD	Used	
Reactor Moderator	HEAVY WATER	HEAVY 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>1</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal		47,275.85	Nominal burnup set equal to bounding burnup
Bounding		47,275.85	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	32.83		2.59
Bounding	32.83		

\*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: CVTR FUEL  
 SNF ID #: 37  
 Fuel Units & Descr: 34 - ROD  
 Heavy Metal Mass: BOL=68 656kg, EOL=67 47kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1967  
 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: 35 years

Estimated  
 Canister usage  
 18"x15"  
 0.45

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) <sup>3</sup>	Bounding Fuel Burnup (MWd) <sup>3</sup>	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg. MeV	
Ac-227	4 6920E-09	1,137 42	2,274 84	0 00E+00	5 34E-06	1 07E-05		
Am-241	2 2880E-02	1,137 42	2,274 84	0 00E+00	2 60E+01	5 20E+01	0 0150	1 587E+14
Am-242m	3 5400E-06	1,137 42	2,274 84	0 00E+00	4 03E-03	8 05E-03	0 0250	3 287E+13
Am-243	2 0580E-06	1,137 42	2,274 84	0 00E+00	2 34E-03	4 68E-03	0 0375	2 892E+13
C-14	1 1264E-03	1,137 42	2,274 84	0 00E+00	1 28E+00	2 56E+00	0 0575	3 131E+13
Cl-36	8 3760E-11	1,137 42	2,274 84	0 00E+00	9 53E-08	1 91E-07	0 0850	1 847E+13
Cm-243	5 0340E-07	1,137 42	2,274 84	0 00E+00	5 73E-04	1 15E-03	0 1250	1 218E+13
Cm-244	1 0450E-05	1,137 42	2,274 84	0 00E+00	1 19E-02	2 38E-02	0 2250	1 591E+13
Co-60	6 4420E-02	1,137 42	2,274 84	0 00E+00	7 33E+01	1 47E+02	0 3750	6 919E+12
Cs-134	7 9240E-06	1,137 42	2,274 84	0 00E+00	9 01E-03	1 80E-02	0 5750	1 211E+14
Cs-135	7 9140E-06	1,137 42	2,274 84	0 00E+00	9 00E-03	1 80E-02	0 8500	1 398E+12
Cs-137	1 4316E+00	1,137 42	2,274 84	0 00E+00	1 63E+03	3 26E+03	1 2500	1 152E+13
Eu-154	6 7900E-03	1,137 42	2,274 84	0 00E+00	7 72E+00	1 54E+01	1 7500	3 878E+10
Eu-155	6 2800E-04	1,137 42	2,274 84	0 00E+00	7 14E-01	1 43E+00	2 2500	6 067E+07
Fe-55	5 7480E-05	1,137 42	2,274 84	0 00E+00	6 54E-02	1 31E-01	2 7500	3 882E+06
H-3	2 3800E-02	1,137 42	2,274 84	0 00E+00	2 71E+01	5 41E+01	3 5000	1 182E+04
I-129	7 5020E-07	1,137 42	2,274 84	0 00E+00	8 53E-04	1 71E-03	5 0000	4 962E+03
Kr-85	3 8220E-02	1,137 42	2,274 84	0 00E+00	4 35E+01	8 69E+01	7 0000	5 583E+02
Np-237	5 5780E-06	1,137 42	2,274 84	0 00E+00	6 34E-03	1 27E-02	11 0000	6 336E+01
Pa-231	7 8820E-09	1,137 42	2,274 84	0 00E+00	8 97E-06	1 79E-05		
Pb-210	4 3840E-09	1,137 42	2,274 84	0 00E+00	4 99E-06	9 97E-06		
Pm-147	9 9500E-04	1,137 42	2,274 84	0 00E+00	1 13E+00	2 26E+00		
Pu-238	6 4240E-03	1,137 42	2,274 84	0 00E+00	7 31E+00	1 46E+01		
Pu-239	1 8744E-02	1,137 42	2,274 84	0 00E+00	2 13E+01	4 26E+01		
Pu-240	8 3540E-03	1,137 42	2,274 84	0 00E+00	9 50E+00	1 90E+01		
Pu-241	1 4606E-01	1,137 42	2,274 84	0 00E+00	1 66E+02	3 32E+02		
Pu-242	2 0400E-06	1,137 42	2,274 84	0 00E+00	2 32E-03	4 64E-03		
Ra-226	1 1804E-08	1,137 42	2,274 84	0 00E+00	1 34E-05	2 69E-05		
Ra-228	1 1864E-09	1,137 42	2,274 84	0 00E+00	1 35E-06	2 70E-06		
Ru-106	3 2580E-10	1,137 42	2,274 84	0 00E+00	3 71E-07	7 41E-07		
Se-79	1 2524E-05	1,137 42	2,274 84	0 00E+00	1 42E-02	2 85E-02		
Sn-126	1 2052E-05	1,137 42	2,274 84	0 00E+00	1 37E-02	2 74E-02		
Sr-90	1 2638E+00	1,137 42	2,274 84	0 00E+00	1 44E+03	2 87E+03		
Tc-99	4 4140E-04	1,137 42	2,274 84	0 00E+00	5 02E-01	1 00E+00		
Th-229	4 3480E-09	1,137 42	2,274 84	0 00E+00	4 95E-06	9 89E-06		
Th-230	1 0760E-06	1,137 42	2,274 84	0 00E+00	1 22E-03	2 45E-03		
Th-232	1 1926E-09	1,137 42	2,274 84	0 00E+00	1 36E-06	2 71E-06		
Tl-208	4 6200E-08	1,137 42	2,274 84	0 00E+00	5 25E-05	1 05E-04		
U-232	1 2406E-07	1,137 42	2,274 84	0 00E+00	1 41E-04	2 82E-04		
U-233	9 1620E-07	1,137 42	2,274 84	0 00E+00	1 04E-03	2 08E-03		
U-234	2 3440E-03	1,137 42	2,274 84	0 00E+00	2 67E+00	5 33E+00		
U-235	-2 3296E-06	1,137 42	0 00	2 67E-03	2 09E-05	2 67E-03		
U-236	2 6620E-05	1,137 42	2,274 84	0 00E+00	3 03E-02	6 06E-02		
U-238	-1 3291E-07	1,137 42	0 00	2 27E-02	2 25E-02	2 27E-02		
Y-90	1 2642E+00	1,137 42	2,274 84	0 00E+00	1 44E+03	2 88E+03		
Other Radionuclides					1 55E+03	3 10E+03		
							<b>Thermal Power</b>	
							<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>
							2 09E+01	4 18E+01
							<b>Total</b>	<b>Total</b>

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator:	HEAVY WATER	HEAVY WATER	This Template was used for the following reasons This fuel matches on all parameters except possibly cladding.
Fuel Cladding:	ZIRC OR SST	ZIRC	
BOL HM Constituents:	U	U	
BOL Enrichment %:	18	0 to 5	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,137 42	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		2,274 84	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.13		1.01
Bounding	2.27		

<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: DR-3 (U308 LEU)(DENMARK)	Fuel decay start date: 1997	Estimated Canister usage <b>18"x10"</b> 0.08
SNF ID #: 1059	Estimates as of: 2010	
Fuel Units & Descr: 3 - 4 CONCENTRIC TUBES	Template: HFBR (Heavy Water, Alum, 10 to 20%, U)	
Heavy Metal Mass: BOL=2.752kg EOL=2.517kg	*Template Burnup(MWd): 15	
ROD Storage Site: SRS	Template BOL Heavy Metal Mass (MT): 0.00034251	
	Template Decay Time: 10 years	

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	3.5433E-10	224.12	448.24	0.00E+00	7.94E-08	1.59E-07	Avg MeV	
Am-241	1.6993E-02	224.12	448.24	0.00E+00	3.81E+00	7.62E+00	0.0150	5.845E+13
Am-242m	9.3333E-06	224.12	448.24	0.00E+00	2.09E-03	4.18E-03	0.0250	1.229E+13
Am-243	6.4067E-06	224.12	448.24	0.00E+00	1.44E-03	2.87E-03	0.0375	1.077E+13
C-14	2.9653E-08	224.12	448.24	0.00E+00	6.65E-06	1.33E-05	0.0575	1.140E+13
Ci-36	5.9513E-35	224.12	448.24	0.00E+00	1.33E-32	2.67E-32	0.0850	6.869E+12
Cm-243	2.8167E-06	224.12	448.24	0.00E+00	6.31E-04	1.26E-03	0.1250	4.764E+12
Cm-244	1.6140E-04	224.12	448.24	0.00E+00	3.62E-02	7.23E-02	0.2250	5.898E+12
Co-60	6.0893E-05	224.12	448.24	0.00E+00	1.36E-02	2.73E-02	0.3750	2.644E+12
Cs-134	6.1567E-02	224.12	448.24	0.00E+00	1.38E+01	2.76E+01	0.5750	4.406E+13
Cs-135	4.8607E-06	224.12	448.24	0.00E+00	1.09E-03	2.18E-03	0.8500	1.681E+12
Cs-137	2.5487E+00	224.12	448.24	0.00E+00	5.71E+02	1.14E+03	1.2500	6.099E+11
Eu-154	4.6760E-02	224.12	448.24	0.00E+00	1.05E+01	2.10E+01	1.7500	2.355E+10
Eu-155	1.6533E-02	224.12	448.24	0.00E+00	3.71E+00	7.41E+00	2.2500	1.424E+09
Fe-55	2.0373E-02	224.12	448.24	0.00E+00	4.57E+00	9.13E+00	2.7500	3.051E+07
H-3	8.1800E-03	224.12	448.24	0.00E+00	1.83E+00	3.67E+00	3.5000	3.830E+06
I-129	7.1600E-07	224.12	448.24	0.00E+00	1.60E-04	3.21E-04	5.0000	1.075E+03
Kr-85	1.9547E-01	224.12	448.24	0.00E+00	4.38E+01	8.76E+01	7.0000	1.222E+02
Np-237	3.6573E-06	224.12	448.24	0.00E+00	8.20E-04	1.64E-03	11.0000	1.394E+01
Pa-231	1.6420E-09	224.12	448.24	0.00E+00	3.68E-07	7.36E-07		
Pb-210	7.4600E-15	224.12	448.24	0.00E+00	1.67E-12	3.34E-12		
Pm-147	6.5033E-01	224.12	448.24	0.00E+00	1.46E+02	2.92E+02		
Pu-238	5.9807E-03	224.12	448.24	0.00E+00	1.34E+00	2.68E+00		
Pu-239	1.0320E-02	224.12	448.24	0.00E+00	2.31E+00	4.63E+00		
Pu-240	5.4233E-03	224.12	448.24	0.00E+00	1.22E+00	2.43E+00		
Pu-241	6.0807E-01	224.12	448.24	0.00E+00	1.36E+02	2.73E+02		
Pu-242	3.0713E-06	224.12	448.24	0.00E+00	6.88E-04	1.38E-03		
Ra-226	6.1580E-14	224.12	448.24	0.00E+00	1.38E-11	2.76E-11		
Ra-228	4.9953E-15	224.12	448.24	0.00E+00	1.12E-12	2.24E-12		
Ru-106	8.2133E-03	224.12	448.24	0.00E+00	1.84E+00	3.68E+00		
Se-79	1.2540E-05	224.12	448.24	0.00E+00	2.81E-03	5.62E-03		
Sn-126	1.1393E-05	224.12	448.24	0.00E+00	2.55E-03	5.11E-03		
Sr-90	2.3340E+00	224.12	448.24	0.00E+00	5.23E+02	1.05E+03		
Tc-99	4.3540E-04	224.12	448.24	0.00E+00	9.76E-02	1.95E-01		
Th-229	2.4973E-13	224.12	448.24	0.00E+00	5.60E-11	1.12E-10		
Th-230	2.4613E-11	224.12	448.24	0.00E+00	5.52E-09	1.10E-08		
Th-232	9.9467E-15	224.12	448.24	0.00E+00	2.23E-12	4.46E-12		
Th-208	7.7667E-09	224.12	448.24	0.00E+00	1.74E-06	3.48E-06		
U-232	2.1927E-08	224.12	448.24	0.00E+00	4.91E-06	9.83E-06		
U-233	2.7887E-10	224.12	448.24	0.00E+00	6.25E-08	1.25E-07		
U-234	3.0807E-07	224.12	448.24	0.00E+00	6.90E-05	1.38E-04		
U-235	-2.5341E-06	224.12	0.00	1.16E-03	5.97E-04	1.16E-03	Nominal Heat	Bounding Heat Output
U-236	1.3000E-05	224.12	448.24	0.00E+00	2.91E-03	5.83E-03	6.96E+00	1.39E+01
U-238	-1.4207E-08	224.12	0.00	7.44E-04	7.41E-04	7.44E-04	Total	Total
Y-90	2.3347E+00	224.12	448.24	0.00E+00	5.23E+02	1.05E+03		
Other Radionuclides					5.53E+02	1.11E+03		

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

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD: HEAVY WATER	Used: HEAVY WATER	
Fuel Cladding:	ALLUM	ALLUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	19.58291238	10 to 20	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		224.12	
Bounding		448.24	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	1.86	
Bounding	3.72	
		Estimated EOL HM/ Given EOL HM
		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: DR-3 (U3Si2 LEU)(DENMARK)  
 SNF ID #: 759  
 Fuel Units & Descr: 375 - 4 CONCENTRIC TUBES  
 Heavy Metal Mass: BOL=341 662kg; EOL=309 112kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 1997  
 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: 10 years

Estimated  
 Canister usage  
 18"x10"  
 10 42

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 5433E-10	30,937 63	61,875 26	0 00E+00	1 10E-05	2 19E-05	Avg. MeV	
Am-241	1 6993E-02	30,937 63	61,875 26	0 00E+00	5 26E+02	1 05E+03	0 0150	8 068E+15
Am-242m	9 3333E-06	30,937 63	61,875 26	0 00E+00	2 89E-01	5 78E-01	0 0250	1 697E+15
Am-243	6 4067E-06	30,937 63	61,875 26	0 00E+00	1 98E-01	3 96E-01	0 0375	1 487E+15
C-14	2 9653E-08	30,937 63	61,875 26	0 00E+00	9 17E-04	1 83E-03	0 0575	1 574E+15
Cl-36	5 9513E-35	30,937 63	61,875 26	0 00E+00	1 84E-00	3 68E-00	0 0850	9 482E+14
Cm-243	2 8167E-06	30,937 63	61,875 26	0 00E+00	8 71E-02	1 74E-01	0 1250	6 576E+14
Cm-244	1 6140E-04	30,937 63	61,875 26	0 00E+00	4 99E+00	9 99E+00	0 2250	8 142E+14
Co-60	6 0893E-05	30,937 63	61,875 26	0 00E+00	1 88E+00	3 77E+00	0 3750	3 650E+14
Cs-134	6 1567E-02	30,937 63	61,875 26	0 00E+00	1 90E+03	3 81E+03	0 5750	6 082E+15
Cs-135	4 8607E-06	30,937 63	61,875 26	0 00E+00	1 50E-01	3 01E-01	0 8500	2 321E+14
Cs-137	2 5487E+00	30,937 63	61,875 26	0 00E+00	7 88E+04	1 58E+05	1 2500	8 419E+13
Eu-154	4 6760E-02	30,937 63	61,875 26	0 00E+00	1 45E+03	2 89E+03	1 7500	3 252E+12
Eu-155	1 6533E-02	30,937 63	61,875 26	0 00E+00	5 12E+02	1 02E+03	2 2500	1 966E+11
Fe-55	2 0373E-02	30,937 63	61,875 26	0 00E+00	6 30E+02	1 26E+03	2 7500	4 211E+09
H-3	8 1800E-03	30,937 63	61,875 26	0 00E+00	2 53E+02	5 06E+02	3 5000	5 287E+08
I-129	7 1600E-07	30,937 63	61,875 26	0 00E+00	2 22E-02	4 43E-02	5 0000	1 484E+05
Kr-85	1 9547E-01	30,937 63	61,875 26	0 00E+00	6 05E+03	1 21E+04	7 0000	1 687E+04
Np-237	3 6573E-06	30,937 63	61,875 26	0 00E+00	1 13E-01	2 26E-01	11 0000	1 924E+03
Pa-231	1 6420E-09	30,937 63	61,875 26	0 00E+00	5 08E-05	1 02E-04		
Pb-210	7 4600E-15	30,937 63	61,875 26	0 00E+00	2 31E-10	4 62E-10		
Pm-147	6 5033E-01	30,937 63	61,875 26	0 00E+00	2 01E+04	4 02E+04		
Pu-238	5 9807E-03	30,937 63	61,875 26	0 00E+00	1 85E+02	3 70E+02		
Pu-239	1 0320E-02	30,937 63	61,875 26	0 00E+00	3 19E+02	6 39E+02		
Pu-240	5 4233E-03	30,937 63	61,875 26	0 00E+00	1 68E+02	3 36E+02		
Pu-241	6 0807E-01	30,937 63	61,875 26	0 00E+00	1 88E+04	3 76E+04		
Pu-242	3 0713E-06	30,937 63	61,875 26	0 00E+00	9 50E-02	1 90E-01		
Ra-226	6 1580E-14	30,937 63	61,875 26	0 00E+00	1 91E-09	3 81E-09		
Ra-228	4 9953E-15	30,937 63	61,875 26	0 00E+00	1 55E-10	3 09E-10		
Ru-106	8 2133E-03	30,937 63	61,875 26	0 00E+00	2 54E+02	5 08E+02		
Se-79	1 2540E-05	30,937 63	61,875 26	0 00E+00	3 88E-01	7 76E-01		
Sn-126	1 1393E-05	30,937 63	61,875 26	0 00E+00	3 52E-01	7 05E-01		
Sr-90	2 3340E+00	30,937 63	61,875 26	0 00E+00	7 22E+04	1 44E+05		
Tc-99	4 3540E-04	30,937 63	61,875 26	0 00E+00	1 35E+01	2 69E+01		
Th-229	2 4973E-13	30,937 63	61,875 26	0 00E+00	7 73E-09	1 55E-08		
Th-230	2 4613E-11	30,937 63	61,875 26	0 00E+00	7 61E-07	1 52E-06		
Th-232	9 9467E-15	30,937 63	61,875 26	0 00E+00	3 08E-10	6 15E-10		
Ti-208	7 7667E-09	30,937 63	61,875 26	0 00E+00	2 40E-04	4 81E-04		
U-232	2 1927E-08	30,937 63	61,875 26	0 00E+00	6 78E-04	1 36E-03		
U-233	2 7887E-10	30,937 63	61,875 26	0 00E+00	8 63E-06	1 73E-05		
U-234	3 0807E-07	30,937 63	61,875 26	0 00E+00	9 53E-03	1 91E-02		
U-235	-2 5341E-06	30,937 63	0 00	1 46E-01	6 75E-02	1 46E-01		
U-236	1 3000E-05	30,937 63	61,875 26	0 00E+00	4 02E-01	8 04E-01		
U-238	-1 4207E-08	30,937 63	0 00	9 21E-02	9 17E-02	9 21E-02		
Y-90	2 3347E+00	30,937 63	61,875 26	0 00E+00	7 22E+04	1 44E+05		
Other Radionuclides					7 63E+04	1 53E+05		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9 60E+02	1 92E+03
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 7578539	10 to 20	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		30 937.63	
Bounding		61 875.26	

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	2.07			1.02
Bounding	4.14			

<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 DR-3 (UALX HEU)(DENMARK)	Fuel decay start date 1997
SNF ID # 714	Estimates as of 2010
Fuel Units & Descr 88 - 4 CONCENTRIC TUBES	Template HFBR (Heavy Water, Alum, 40 to 100%, U)
Heavy Metal Mass BOL=14.529kg EOL=8.8kg	*Template Burnup(MWd) 164.6
ROD Storage Site SRS	Template BOL Heavy Metal Mass (MT) 0.000377
	Template Decay Time 10 years

Estimated  
Canister usage  
18"x10"  
2.44

Radionuclide	m C/MWd From Template	x <sub>n</sub> Nominal Fuel Burnup (MWd) <sup>2</sup>	x <sub>b</sub> Bounding Fuel Burnup (MWd) <sup>2</sup>	b Initial Activity (Ci)	y <sub>n</sub> Nominal Fuel Inventories(Ci)	y <sub>b</sub> Bounding Fuel Inventories(Ci)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.3262E-10	5,276.81	10,553.63	0.00E+00	7.00E-07	1.40E-06	Avg MeV	
Am-241	5.9611E-03	5,276.81	10,553.63	0.00E+00	3.15E+01	6.29E+01	0.0150	1.442E+15
Am-242m	1.4332E-06	5,276.81	10,553.63	0.00E+00	7.56E-03	1.51E-02	0.0250	3.006E+14
Am-243	3.7132E-05	5,276.81	10,553.63	0.00E+00	1.96E-01	3.92E-01	0.0375	2.720E+14
C-14	2.6501E-08	5,276.81	10,553.63	0.00E+00	1.40E-04	2.80E-04	0.0575	2.799E+14
Cf-36	4.4441E-31	5,276.81	10,553.63	0.00E+00	2.35E-27	4.69E-27	0.0850	1.734E+14
Cm-243	7.2722E-06	5,276.81	10,553.63	0.00E+00	3.84E-02	7.67E-02	0.1250	1.302E+14
Cm-244	6.8226E-03	5,276.81	10,553.63	0.00E+00	3.60E+01	7.20E+01	0.2250	1.464E+14
Co-60	1.8117E-04	5,276.81	10,553.63	0.00E+00	9.56E-01	1.91E+00	0.3750	6.467E+13
Cs-134	3.0595E-01	5,276.81	10,553.63	0.00E+00	1.61E+03	3.23E+03	0.5750	1.168E+15
Cs-135	4.2564E-06	5,276.81	10,553.63	0.00E+00	2.25E-02	4.49E-02	0.8500	1.370E+14
Cs-137	2.5650E+00	5,276.81	10,553.63	0.00E+00	1.35E+04	2.71E+04	1.2500	3.443E+13
Eu-154	1.1628E-01	5,276.81	10,553.63	0.00E+00	6.14E+02	1.23E+03	1.7500	9.917E+11
Eu-155	5.7776E-02	5,276.81	10,553.63	0.00E+00	3.05E+02	6.10E+02	2.2500	4.341E+10
Fe-55	1.9465E-02	5,276.81	10,553.63	0.00E+00	1.03E+02	2.05E+02	2.7500	6.487E+08
H-3	8.1045E-03	5,276.81	10,553.63	0.00E+00	4.28E+01	8.55E+01	3.5000	7.873E+07
I-129	6.6403E-07	5,276.81	10,553.63	0.00E+00	3.50E-03	7.01E-03	5.0000	4.568E+05
Kr-85	2.0620E-01	5,276.81	10,553.63	0.00E+00	1.09E+03	2.18E+03	7.0000	5.250E+04
Np-237	3.1513E-05	5,276.81	10,553.63	0.00E+00	1.66E-01	3.33E-01	11.0000	6.020E+03
Pa-231	6.0304E-10	5,276.81	10,553.63	0.00E+00	3.18E-06	6.36E-06		
Pb-210	2.7017E-12	5,276.81	10,553.63	0.00E+00	1.43E-08	2.85E-08		
Pm-147	3.4210E-01	5,276.81	10,553.63	0.00E+00	1.81E+03	3.61E+03		
Pu-238	1.6622E-01	5,276.81	10,553.63	0.00E+00	8.77E+02	1.75E+03		
Pu-239	6.9563E-04	5,276.81	10,553.63	0.00E+00	3.67E+00	7.34E+00		
Pu-240	3.7169E-04	5,276.81	10,553.63	0.00E+00	1.96E+00	3.92E+00		
Pu-241	2.1731E-01	5,276.81	10,553.63	0.00E+00	1.15E+03	2.29E+03		
Pu-242	3.0911E-06	5,276.81	10,553.63	0.00E+00	1.63E-02	3.26E-02		
Ra-226	1.9435E-11	5,276.81	10,553.63	0.00E+00	1.03E-07	2.05E-07		
Ra-228	6.1725E-15	5,276.81	10,553.63	0.00E+00	3.26E-11	6.51E-11		
Ru-106	7.0778E-03	5,276.81	10,553.63	0.00E+00	3.73E+01	7.47E+01		
Se-79	1.2339E-05	5,276.81	10,553.63	0.00E+00	6.51E-02	1.30E-01		
Sn-126	1.0194E-05	5,276.81	10,553.63	0.00E+00	5.38E-02	1.08E-01		
Sr-90	2.4186E+00	5,276.81	10,553.63	0.00E+00	1.28E+04	2.55E+04		
Tc-99	3.8056E-04	5,276.81	10,553.63	0.00E+00	2.01E+00	4.02E+00		
Th-229	2.0097E-12	5,276.81	10,553.63	0.00E+00	1.06E-08	2.12E-08		
Th-230	6.0577E-09	5,276.81	10,553.63	0.00E+00	3.20E-05	6.39E-05		
Th-232	1.2473E-14	5,276.81	10,553.63	0.00E+00	6.58E-11	1.32E-10		
Tl-208	4.8791E-08	5,276.81	10,553.63	0.00E+00	2.57E-04	5.15E-04		
U-232	1.3821E-07	5,276.81	10,553.63	0.00E+00	7.29E-04	1.46E-03	Thermal Power	
U-233	2.3906E-09	5,276.81	10,553.63	0.00E+00	1.26E-05	2.52E-05	Nominal Heat Output (Watts)	
U-234	4.7697E-05	5,276.81	10,553.63	0.00E+00	2.52E-01	5.03E-01	Bounding Heat Output (Watts)	
U-235	-2.8661E-06	5,276.81	0.00	2.79E-02	1.28E-02	2.79E-02	Total	
U-236	1.6701E-05	5,276.81	10,553.63	0.00E+00	8.81E-02	1.76E-01	Total	
U-238	-9.4194E-09	5,276.81	0.00	5.43E-04	4.94E-04	5.43E-04		
Y-90	2.4192E+00	5,276.81	10,553.63	0.00E+00	1.28E+04	2.55E+04		
Other Radionuclides					1.32E+04	2.64E+04		

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	88.87461392	40 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		5,276.81	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		10,553.63	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.83		1.01
Bounding	1.66		

<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 THO2/UO2 (LEU)  
 SNF ID #: 44  
 Fuel Units & Descr: 1000 - ROD  
 Heavy Metal Mass: BOL= , EOL=2382 5kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1966  
 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: 35 years

Estimated  
 Canister usage  
 18"x15"  
 5 00

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)	Gamma Sources		
							Photon Energy Group	Total Photons/sec (bounding)	
Ac-227	9 7360E-05	2,318,560 61	2,318,560 61	0 00E+00	2 26E+02	2,26E+02	Avg MeV		
Am-241	2 4345E-04	2,318,560 61	2,318,560 61	0 00E+00	5 64E+02	5 64E+02	0 0150	1 911E+17	
Am-242m	1 4821E-06	2,318,560 61	2,318,560 61	0 00E+00	3 44E+00	3 44E+00	0 0250	3 939E+16	
Am-243	3 1152E-07	2,318,560 61	2,318,560 61	0 00E+00	7 22E-01	7 22E-01	0 0375	3 366E+16	
C-14	9 2432E-05	2,318,560 61	2,318,560 61	0 00E+00	2 14E+02	2 14E+02	0 0575	3 680E+16	
Cf-36	1 8103E-06	2,318,560 61	2,318,560 61	0 00E+00	4 20E+00	4 20E+00	0 0850	2 350E+16	
Cm-243	3 0597E-07	2,318,560 61	2,318,560 61	0 00E+00	7 09E-01	7 09E-01	0 1250	1 473E+16	
Cm-244	1 4149E-05	2,318,560 61	2,318,560 61	0 00E+00	3 28E+01	3 28E+01	0 2250	2 108E+16	
Co-60	8 7369E-04	2,318,560 61	2,318,560 61	0 00E+00	2 03E+03	2 03E+03	0 3750	8 463E+15	
Cs-134	2 5601E-05	2,318,560 61	2,318,560 61	0 00E+00	5 94E+01	5 94E+01	0 5750	1 292E+17	
Cs-135	2 8639E-05	2,318,560 61	2,318,560 61	0 00E+00	6 64E+01	6 64E+01	0 8500	2 309E+15	
Cs-137	1 4772E+00	2,318,560 61	2,318,560 61	0 00E+00	3 43E+06	3 43E+06	1 2500	1 020E+15	
Eu-154	8 6025E-03	2,318,560 61	2,318,560 61	0 00E+00	1 99E+04	1 99E+04	1 7500	1 591E+14	
Eu-155	6 6062E-04	2,318,560 61	2,318,560 61	0 00E+00	1 53E+03	1 53E+03	2 2500	4 622E+09	
Fe-55	2 3011E-06	2,318,560 61	2,318,560 61	0 00E+00	5 34E+00	5 34E+00	2 7500	1 137E+15	
H-3	2 1277E-03	2,318,560 61	2,318,560 61	0 00E+00	4 93E+03	4 93E+03	3 5000	4 061E+06	
I-129	1 5853E-06	2,318,560 61	2,318,560 61	0 00E+00	3 68E+00	3 68E+00	5 0000	1 276E+06	
Kr-85	6 2625E-02	2,318,560 61	2,318,560 61	0 00E+00	1 45E+05	1 45E+05	7 0000	9 385E+04	
Np-237	1 2620E-07	2,318,560 61	2,318,560 61	0 00E+00	2 93E-01	2 93E-01	11 0000	7 240E+03	
Pa-231	1 2017E-04	2,318,560 61	2,318,560 61	0 00E+00	2 79E+02	2 79E+02			
Pb-210	1 4247E-08	2,318,560 61	2,318,560 61	0 00E+00	3 30E-02	3 30E-02			
Pm-147	2 6224E-04	2,318,560 61	2,318,560 61	0 00E+00	6 08E+02	6 08E+02			
Pu-238	4 2477E-04	2,318,560 61	2,318,560 61	0 00E+00	9 85E+02	9 85E+02			
Pu-239	2 7519E-05	2,318,560 61	2,318,560 61	0 00E+00	6 38E+01	6 38E+01			
Pu-240	1 6184E-05	2,318,560 61	2,318,560 61	0 00E+00	3 75E+01	3 75E+01			
Pu-241	1 4695E-03	2,318,560 61	2,318,560 61	0 00E+00	3 41E+03	3 41E+03			
Pu-242	4 0831E-08	2,318,560 61	2,318,560 61	0 00E+00	9 47E-02	9 47E-02			
Ra-226	2 1423E-08	2,318,560 61	2,318,560 61	0 00E+00	4 97E-02	4 97E-02			
Ra-228	4 6236E-06	2,318,560 61	2,318,560 61	0 00E+00	1 07E+01	1 07E+01			
Ru-106	4 0208E-11	2,318,560 61	2,318,560 61	0 00E+00	9 32E-05	9 32E-05			
Se-79	3 5417E-05	2,318,560 61	2,318,560 61	0 00E+00	8 21E+01	8 21E+01			
Sn-126	3 9848E-05	2,318,560 61	2,318,560 61	0 00E+00	9 24E+01	9 24E+01			
Sr-90	1 4928E+00	2,318,560 61	2,318,560 61	0 00E+00	3 46E+06	3 46E+06			
Tc-99	3 2525E-04	2,318,560 61	2,318,560 61	0 00E+00	7 54E+02	7 54E+02			
Th-229	6 4582E-05	2,318,560 61	2,318,560 61	0 00E+00	1 50E+02	1 50E+02			
Th-230	1 1432E-06	2,318,560 61	2,318,560 61	0 00E+00	2 65E+00	2 65E+00			
Th-232	-9 0328E-08	2,318,560 61	0 00	5 03E-01	2 94E-01	5 03E-01			
Tl-208	1 3964E-02	2,318,560 61	2,318,560 61	0 00E+00	3 24E+04	3 24E+04			
U-232	3 7822E-02	2,318,560 61	2,318,560 61	0 00E+00	8 77E+04	8 77E+04			
U-233	-3 3244E-03	2,318,560 61	0 00	1 69E+03	0 00E+00	1 69E+03	<b>Thermal Power</b>		
U-234	8 1769E-04	2,318,560 61	2,318,560 61	0 00E+00	1 90E+03	1 90E+03	<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>	
U-235	5 7813E-08	2,318,560 61	2,318,560 61	3 46E-04	1 34E-01	1 34E-01	6.18E+04	6 19E+04	
U-236	1 3273E-07	2,318,560 61	2,318,560 61	0 00E+00	3 08E-01	3 08E-01			
U-238	-3 1121E-10	2,318,560 61	0 00	2 21E-04	0 00E+00	2 21E-04	Total	Total	
Y-90	1 4928E+00	2,318,560 61	2,318,560 61	0 00E+00	3 46E+06	3 46E+06			
Other Radionuclides									

**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 and enrichment (unknown)
Reactor Moderator:	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding:	SST	ZIRC	
BOL HM Constituents:	Th and U	Th and 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		2,318 560 61	
Bounding		2,318 560 61	

Checks			Estimated EOL HM/Given EOL HM 1 28
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	21 79		
Bounding	21 79		

<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 UO2 (LEU)	Fuel decay start date:	1966
SNF ID #	49	Estimates as of	2010
Fuel Units & Descr	72 - ROD	Template	Pathfinder (Light Water, SST, 60 to 100%, U)
Heavy Metal Mass	BOL= , EOL=162.382kg	Template Burnup(MWd)	6 01
ROD Storage Site	INEEL	Template BOL Heavy Metal Mass (MT)	0 00012882
		Template Decay Time	35 years

Estimated Canister usage 18"x15" 0 36
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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	2 3344E-08	153,393 39	153,393 39	0 00E+00	3 58E-03	3 58E-03	Avg MeV	
Am-241	1 1135E-04	153,393 39	153,393 39	0 00E+00	1.71E+01	1 71E+01	0 0150	1 145E+16
Am-242m	8 5075E-09	153,393 39	153,393 39	0 00E+00	1.30E-03	1 30E-03	0 0250	2.379E+15
Am-243	9 8519E-10	153,393 39	153,393 39	0 00E+00	1 51E-04	1 51E-04	0 0375	2 058E+15
C-14	2.3012E-04	153,393 39	153,393 39	0 00E+00	3.53E+01	3.53E+01	0 0575	2.218E+15
Cl-36	1.2261E-06	153,393 39	153,393 39	0 00E+00	1 88E-01	1 88E-01	0 0850	1.340E+15
Cr-243	2 4875E-10	153,393 39	153,393 39	0 00E+00	3 82E-05	3 82E-05	0 1250	8 702E+14
Cm-244	2.3178E-09	153,393 39	153,393 39	0 00E+00	3 56E-04	3 56E-04	0.2250	1 154E+15
Co-60	7.0849E-02	153,393 39	153,393 39	0 00E+00	1 09E+04	1 09E+04	0.3750	5 032E+14
Cs-134	3 0266E-06	153,393 39	153,393 39	0 00E+00	4 64E-01	4 64E-01	0 5750	8.289E+15
Cs-135	3 0316E-05	153,393 39	153,393 39	0 00E+00	4 65E+00	4 65E+00	0 8500	8 390E+13
Cs-137	1.4511E+00	153,393 39	153,393 39	0 00E+00	2 23E+05	2 23E+05	1.2500	8 339E+14
Eu-154	6 6955E-04	153,393 39	153,393 39	0 00E+00	1 03E+02	1 03E+02	1 7500	2 164E+12
Eu-155	6 9850E-04	153,393 39	153,393 39	0 00E+00	1 07E+02	1 07E+02	2.2500	4 493E+09
Fe-55	1.2318E-03	153,393 39	153,393 39	0 00E+00	1 89E+02	1 89E+02	2 7500	1.299E+08
H-3	2 5141E-03	153,393 39	153,393 39	0 00E+00	3 86E+02	3 86E+02	3 5000	9 159E+03
I-129	7.3195E-07	153,393 39	153,393 39	0 00E+00	1.12E-01	1 12E-01	5 0000	3 767E+03
Kr-85	4 1281E-02	153,393 39	153,393 39	0 00E+00	6 33E+03	6 33E+03	7 0000	4 159E+02
Np-237	1 1489E-06	153,393 39	153,393 39	0 00E+00	1.76E-01	1 76E-01	11 0000	4 667E+01
Pa-231	4 5241E-08	153,393 39	153,393 39	0 00E+00	6 94E-03	6 94E-03		
Pb-210	6 4476E-13	153,393 39	153,393 39	0 00E+00	9 89E-08	9 89E-08		
Pm-147	1 1651E-03	153,393 39	153,393 39	0 00E+00	1 79E+02	1 79E+02		
Pu-238	2 9517E-04	153,393 39	153,393 39	0 00E+00	4 53E+01	4 53E+01		
Pu-239	6 6772E-04	153,393 39	153,393 39	0 00E+00	1 02E+02	1 02E+02		
Pu-240	8 6839E-05	153,393 39	153,393 39	0 00E+00	1.33E+01	1.33E+01		
Pu-241	7 1514E-04	153,393 39	153,393 39	0 00E+00	1.10E+02	1.10E+02		
Pu-242	1 9717E-09	153,393 39	153,393 39	0 00E+00	3 02E-04	3 02E-04		
Ra-226	1 7654E-12	153,393 39	153,393 39	0 00E+00	2.71E-07	2 71E-07		
Ra-228	8 2928E-12	153,393 39	153,393 39	0 00E+00	1.27E-06	1.27E-06		
Ru-106	1 8419E-10	153,393 39	153,393 39	0 00E+00	2 83E-05	2 83E-05		
Se-79	1.3223E-05	153,393 39	153,393 39	0 00E+00	2.03E+00	2.03E+00		
Sn-126	1 1493E-05	153,393 39	153,393 39	0 00E+00	1.76E+00	1 76E+00		
Sr-90	1.3649E+00	153,393 39	153,393 39	0 00E+00	2 09E+05	2 09E+05		
Tc-99	4 6656E-04	153,393 39	153,393 39	0 00E+00	7.16E+01	7 16E+01		
Th-229	1 4547E-11	153,393 39	153,393 39	0 00E+00	2 23E-06	2 23E-06		
Th-230	1 6617E-10	153,393 39	153,393 39	0 00E+00	2 55E-05	2 55E-05		
Th-232	8.3361E-12	153,393 39	153,393 39	0 00E+00	1 28E-06	1 28E-06		
Tl-208	2.1664E-08	153,393 39	153,393 39	0 00E+00	3 32E-03	3 32E-03		
U-232	5.8669E-08	153,393 39	153,393 39	0 00E+00	9 00E-03	9 00E-03		
U-233	3.1847E-09	153,393 39	153,393 39	0 00E+00	4 89E-04	4 89E-04		
U-234	3 8769E-07	153,393 39	153,393 39	0 00E+00	5 95E-02	5 95E-02		
U-235	-2 7761E-06	153,393 39	0 00	6 56E-01	2.30E-01	6 56E-01		
U-236	1 6190E-05	153,393 39	153,393 39	0 00E+00	2 48E+00	2 48E+00		
U-238	-2 8547E-09	153,393 39	0 00	7 09E-03	6 65E-03	7 09E-03		
Y-90	1.3652E+00	153,393 39	153,393 39	0 00E+00	2 09E+05	2 09E+05		
Other Radionuclides					2 53E+05	2.53E+05		

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

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

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate <sup>3</sup>
	From SFD	Estimated	
Nominal		153,393.39	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Bounding		153 393.39	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
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: EBWR (6% UO<sub>2</sub>) LEU  
 SNF ID #: 65  
 Fuel Units & Descr. 61 - 6 FLAT PLATES  
 Heavy Metal Mass BOL=1636 02kg; EOL=1603 519kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date: 1966  
 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"  
 5 08

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	8 7758E-10	30,906 72	61,813 45	0 00E+00	2.71E-05	5 42E-05		
Am-241	1 4352E-01	30,906 72	61,813 45	0 00E+00	4 44E+03	8 87E+03	0 0150	3 326E+15
Am-242m	2 8698E-04	30,906 72	61,813 45	0 00E+00	8 87E+00	1 77E+01	0 0250	6 707E+14
Am-243	6 2565E-04	30,906 72	61,813 45	0 00E+00	1 93E+01	3 87E+01	0 0375	6 397E+14
C-14	4 7901E-05	30,906 72	61,813 45	0 00E+00	1 48E+00	2 96E+00	0 0575	7 391E+14
Cl-36	8 2027E-07	30,906 72	61,813 45	0 00E+00	2 48E-02	4 96E-02	0 0850	3 722E+14
Cm-243	2 5081E-04	30,906 72	61,813 45	0 00E+00	7 75E+00	1 55E+01	0 1250	2 582E+14
Cm-244	4 9015E-02	30,906 72	61,813 45	0 00E+00	1.51E+03	3 03E+03	0.2250	3 191E+14
Co-60	2 5581E-03	30,906 72	61,813 45	0 00E+00	7 91E+01	1 58E+02	0.3750	1 372E+14
Cs-134	4 0536E-05	30,906 72	61,813 45	0 00E+00	1.25E+00	2 51E+00	0.5750	3 192E+15
Cs-135	1 4433E-05	30,906 72	61,813 45	0 00E+00	4 46E-01	8 92E-01	0.8500	4 415E+13
Cs-137	1 3979E+00	30,906 72	61,813 45	0 00E+00	4.32E+04	8 64E+04	1.2500	4 337E+13
Eu-154	2 0203E-02	30,906 72	61,813 45	0 00E+00	6.24E+02	1 25E+03	1 7500	1 299E+12
Eu-155	1 7684E-03	30,906 72	61,813 45	0 00E+00	5.47E+01	1 09E+02	2 2500	2 091E+08
Fe-55	4 3136E-05	30,906 72	61,813 45	0 00E+00	1.33E+00	2 67E+00	2 7500	4 285E+08
H-3	2 0769E-02	30,906 72	61,813 45	0 00E+00	6 42E+02	1 28E+03	3 5000	4 412E+07
I-129	9 8288E-07	30,906 72	61,813 45	0 00E+00	3 04E-02	6 08E-02	5 0000	1 866E+07
Kr-85	2 8214E-02	30,906 72	61,813 45	0 00E+00	8.72E+02	1 74E+03	7 0000	2 174E+06
Np-237	1 1218E-05	30,906 72	61,813 45	0 00E+00	3 47E-01	6 93E-01	11 0000	2 497E+05
Pa-231	1 3036E-09	30,906 72	61,813 45	0 00E+00	4 03E-05	8 06E-05		
Pb-210	8 5078E-11	30,906 72	61,813 45	0 00E+00	2 63E-06	5 26E-06		
Pm-147	3 6531E-04	30,906 72	61,813 45	0 00E+00	1.13E+01	2 26E+01		
Pu-238	7 4564E-02	30,906 72	61,813 45	0 00E+00	2.30E+03	4 61E+03		
Pu-239	1 1623E-02	30,906 72	61,813 45	0 00E+00	3.59E+02	7 18E+02		
Pu-240	1 5132E-02	30,906 72	61,813 45	0 00E+00	4 68E+02	9 35E+02		
Pu-241	9 0036E-01	30,906 72	61,813 45	0.00E+00	2.78E+04	5 57E+04		
Pu-242	6 4260E-05	30,906 72	61,813 45	0 00E+00	1.99E+00	3 97E+00		
Ra-226	2 2804E-10	30,906 72	61,813 45	0 00E+00	7 05E-06	1 41E-05		
Ra-228	5 2713E-12	30,906 72	61,813 45	0 00E+00	1 63E-07	3 26E-07		
Ru-106	6 1160E-10	30,906 72	61,813 45	0 00E+00	1 89E-05	3 78E-05		
Se-79	1 2377E-05	30,906 72	61,813 45	0 00E+00	3 83E-01	7 65E-01		
Sn-126	2 5210E-05	30,906 72	61,813 45	0 00E+00	7.79E-01	1 56E+00		
Sr-90	9 1667E-01	30,906 72	61,813 45	0 00E+00	2.83E+04	5 67E+04		
Tc-99	3 9357E-04	30,906 72	61,813 45	0 00E+00	1.22E+01	2 43E+01		
Th-229	1 2057E-10	30,906 72	61,813 45	0.00E+00	3 73E-06	7 45E-06		
Th-230	2 1043E-08	30,906 72	61,813 45	0 00E+00	6 50E-04	1 30E-03		
Th-232	5 2972E-12	30,906 72	61,813 45	0.00E+00	1 64E-07	3 27E-07		
Tl-208	1 7474E-07	30,906 72	61,813 45	0 00E+00	5 40E-03	1 08E-02		
U-232	4 7368E-07	30,906 72	61,813 45	0.00E+00	1 46E-02	2 93E-02		
U-233	2 5097E-08	30,906 72	61,813 45	0.00E+00	7 76E-04	1 55E-03		
U-234	5 0000E-05	30,906 72	61,813 45	0 00E+00	1.55E+00	3 09E+00		
U-235	-1.4489E-06	30,906 72	0 00	2.11E-01	1 66E-01	2 11E-01		
U-236	7 5824E-06	30,906 72	61,813 45	0.00E+00	2.34E-01	4 69E-01		
U-238	-2 6129E-07	30,906 72	0 00	5.17E-01	5 09E-01	5 17E-01		
Y-90	9 1699E-01	30,906 72	61,813 45	0 00E+00	2.83E+04	5 67E+04		
Other Radionuclides					4.15E+04	8.30E+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	This Template was used for the following reasons: This fuel matches PWR Template on all but one parameter (enrichment) making PWR a reasonable match
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %	5.973154429	0 to 5	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		30 906 72	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding	2 617 63	61,813 45	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.54		1 00
Bounding	1 08	23 61	

<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 EBWR (FUEL FOLLOWER) HEU  
 SNF ID # 740  
 Fuel Units & Descr 4 - CANISTER OF SCRAP  
 Heavy Metal Mass BOL=176kg EOL=1728kg  
 ROD Storage Site INEEL

Fuel decay start date 1966  
 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  
 HIC  
 1.00

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	2.3344E-08	29.85	59.70	0.00E+00	6.97E-07	1.39E-06	0.0150	4.456E+12
Am-241	1.1135E-04	29.85	59.70	0.00E+00	3.32E-03	6.65E-03	0.0250	9.260E+11
Am-242m	8.5075E-09	29.85	59.70	0.00E+00	2.54E-07	5.08E-07	0.0375	8.009E+11
Am-243	9.8519E-10	29.85	59.70	0.00E+00	2.94E-08	5.88E-08	0.0575	8.633E+11
C-14	2.3012E-04	29.85	59.70	0.00E+00	6.87E-03	1.37E-02	0.0850	5.216E+11
Cl-36	1.2261E-06	29.85	59.70	0.00E+00	3.66E-05	7.32E-05	0.1250	3.387E+11
Cm-243	2.4875E-10	29.85	59.70	0.00E+00	7.43E-09	1.49E-08	0.2250	4.491E+11
Cm-244	2.3178E-09	29.85	59.70	0.00E+00	6.92E-08	1.38E-07	0.3750	1.959E+11
Co-60	7.0849E-02	29.85	59.70	0.00E+00	2.11E+00	4.23E+00	0.5750	3.226E+12
Cs-134	3.0266E-06	29.85	59.70	0.00E+00	9.03E-05	1.81E-04	0.8500	3.266E+10
Cs-135	3.0316E-05	29.85	59.70	0.00E+00	9.05E-04	1.81E-03	1.2500	3.246E+11
Cs-137	1.4511E+00	29.85	59.70	0.00E+00	4.33E+01	8.66E+01	1.7500	8.423E+08
Eu-154	6.6955E-04	29.85	59.70	0.00E+00	2.00E-02	4.00E-02	2.2500	1.749E+06
Eu-155	6.9850E-04	29.85	59.70	0.00E+00	2.09E-02	4.17E-02	2.7500	5.055E+04
Fe-55	1.2318E-03	29.85	59.70	0.00E+00	3.68E-02	7.35E-02	3.5000	3.862E+00
H-3	2.5141E-03	29.85	59.70	0.00E+00	7.50E-02	1.50E-01	5.0000	1.591E+00
I-129	7.3195E-07	29.85	59.70	0.00E+00	2.18E-05	4.37E-05	7.0000	1.759E-01
Kr-85	4.1281E-02	29.85	59.70	0.00E+00	1.23E+00	2.46E+00	11.0000	1.976E-02
Np-237	1.1489E-06	29.85	59.70	0.00E+00	3.43E-05	6.86E-05		
Pa-231	4.5241E-08	29.85	59.70	0.00E+00	1.35E-06	2.70E-06		
Pb-210	6.4476E-13	29.85	59.70	0.00E+00	1.92E-11	3.85E-11		
Pm-147	1.1651E-03	29.85	59.70	0.00E+00	3.48E-02	6.96E-02		
Pu-238	2.9517E-04	29.85	59.70	0.00E+00	8.81E-03	1.76E-02		
Pu-239	6.6772E-04	29.85	59.70	0.00E+00	1.99E-02	3.99E-02		
Pu-240	8.6839E-05	29.85	59.70	0.00E+00	2.59E-03	5.18E-03		
Pu-241	7.1514E-04	29.85	59.70	0.00E+00	2.13E-02	4.27E-02		
Pu-242	1.9717E-09	29.85	59.70	0.00E+00	5.89E-08	1.18E-07		
Ra-226	1.7654E-12	29.85	59.70	0.00E+00	5.27E-11	1.05E-10		
Ra-228	8.2928E-12	29.85	59.70	0.00E+00	2.48E-10	4.95E-10		
Ru-106	1.8419E-10	29.85	59.70	0.00E+00	5.50E-09	1.10E-08		
Se-79	1.3223E-05	29.85	59.70	0.00E+00	3.95E-04	7.89E-04		
Sn-126	1.1493E-05	29.85	59.70	0.00E+00	3.43E-04	6.86E-04		
Sr-90	1.3649E+00	29.85	59.70	0.00E+00	4.07E+01	8.15E+01		
Tc-99	4.6656E-04	29.85	59.70	0.00E+00	1.39E-02	2.79E-02		
Th-229	1.4547E-11	29.85	59.70	0.00E+00	4.34E-10	8.69E-10		
Th-230	1.6617E-10	29.85	59.70	0.00E+00	4.96E-09	9.92E-09		
Th-232	8.3361E-12	29.85	59.70	0.00E+00	2.49E-10	4.98E-10		
Th-208	2.1664E-08	29.85	59.70	0.00E+00	6.47E-07	1.29E-06		
U-232	5.8669E-08	29.85	59.70	0.00E+00	1.75E-06	3.50E-06		
U-233	3.1847E-09	29.85	59.70	0.00E+00	9.51E-08	1.90E-07		
U-234	3.8769E-07	29.85	59.70	0.00E+00	1.16E-05	2.31E-05		
U-235	-2.7761E-06	29.85	0.00	3.56E-03	3.48E-03	3.56E-03		
U-236	1.6190E-05	29.85	59.70	0.00E+00	4.83E-04	9.67E-04		
U-238	-2.8547E-09	29.85	0.00	3.76E-05	3.76E-05	3.76E-05		
Y-90	1.3652E+00	29.85	59.70	0.00E+00	4.08E+01	8.15E+01		
Other Radionuclides					4.93E+01	9.86E+01		

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons This fuel matches Pathfinder Template on all but one parameter (cladding) but substituting Stainless Steel is a good conservative assumption
Fuel Cladding	ZIRC	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93.636	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		29.85	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		59.70	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.36		1.00
Bounding	0.73		

<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: EBWR (MOX)  
 SNF ID #: 63  
 Fuel Units & Descr: 25 - 6 FLAT PLATES  
 Heavy Metal Mass, BOL=986kg, EOL=932.562kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1966  
 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" x 10"  
 2.08

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	2.3072E-06	50,784.46	101,568.92	0.00E+00	1.17E-01	2.34E-01	0.0150	1.253E+17
Am-241	8.4448E+00	50,784.46	101,568.92	0.00E+00	4.29E+05	8.58E+05	0.0250	2.477E+16
Am-242m	1.6848E-02	50,784.46	101,568.92	0.00E+00	8.56E+02	1.71E+03	0.0375	2.164E+16
Am-243	1.6320E-02	50,784.46	101,568.92	0.00E+00	8.29E+02	1.66E+03	0.0575	3.404E+16
C-14	1.2090E-01	50,784.46	101,568.92	0.00E+00	6.14E+03	1.23E+04	0.0850	1.329E+16
Cl-36	2.2849E-03	50,784.46	101,568.92	0.00E+00	1.16E+02	2.32E+02	0.1250	1.041E+16
Cm-243	8.6624E-04	50,784.46	101,568.92	0.00E+00	4.40E+01	8.80E+01	0.2250	1.151E+16
Cm-244	1.6848E-01	50,784.46	101,568.92	0.00E+00	8.56E+03	1.71E+04	0.3750	4.924E+15
Co-60	2.8086E+01	50,784.46	101,568.92	0.00E+00	1.43E+06	2.85E+06	0.5750	8.006E+16
Cs-134	3.4148E-04	50,784.46	101,568.92	0.00E+00	1.73E+01	3.47E+01	0.8500	3.060E+15
Cs-135	4.3976E-04	50,784.46	101,568.92	0.00E+00	2.23E+01	4.47E+01	1.2500	2.139E+17
Cs-137	2.1049E+01	50,784.46	101,568.92	0.00E+00	1.07E+06	2.14E+06	1.7500	9.460E+13
Eu-154	1.2500E+00	50,784.46	101,568.92	0.00E+00	6.35E+04	1.27E+05	2.2500	1.122E+12
Eu-155	6.8986E-02	50,784.46	101,568.92	0.00E+00	3.50E+03	7.01E+03	2.7500	3.161E+11
Fe-55	2.9308E-01	50,784.46	101,568.92	0.00E+00	1.49E+04	2.98E+04	3.5000	2.675E+08
H-3	2.4311E-01	50,784.46	101,568.92	0.00E+00	1.23E+04	2.47E+04	5.0000	1.136E+08
I-129	1.0618E-05	50,784.46	101,568.92	0.00E+00	5.39E-01	1.08E+00	7.0000	1.300E+07
Kr-85	5.9882E-01	50,784.46	101,568.92	0.00E+00	3.04E+04	6.08E+04	11.0000	1.487E+06
Np-237	1.5668E-04	50,784.46	101,568.92	0.00E+00	7.96E+00	1.59E+01		
Pa-231	2.8656E-06	50,784.46	101,568.92	0.00E+00	1.46E-01	2.91E-01		
Pb-210	2.3918E-08	50,784.46	101,568.92	0.00E+00	1.21E-03	2.43E-03		
Pm-147	1.6900E-02	50,784.46	101,568.92	0.00E+00	8.58E+02	1.72E+03		
Pu-238	-8.6120E-01	50,784.46	0.00	1.27E+05	8.30E+04	1.27E+05		
Pu-239	-4.8440E-02	50,784.46	0.00	1.53E+04	1.29E+04	1.53E+04		
Pu-240	-3.0095E-01	50,784.46	0.00	1.96E+04	4.29E+03	1.96E+04		
Pu-241	-1.0411E+02	50,784.46	0.00	5.04E+06	0.00E+00	5.04E+06		
Pu-242	-1.1381E-04	50,784.46	0.00	8.47E+01	7.90E+01	8.47E+01		
Ra-226	6.4400E-08	50,784.46	101,568.92	0.00E+00	3.27E-03	6.54E-03		
Ra-228	5.9952E-07	50,784.46	101,568.92	0.00E+00	3.04E-02	6.09E-02		
Ru-106	8.5526E-07	50,784.46	101,568.92	0.00E+00	4.34E-02	8.69E-02		
Se-79	1.9181E-04	50,784.46	101,568.92	0.00E+00	9.74E+00	1.95E+01		
Sn-126	1.6671E-04	50,784.46	101,568.92	0.00E+00	8.47E+00	1.69E+01		
Sr-90	1.9799E+01	50,784.46	101,568.92	0.00E+00	1.01E+06	2.01E+06		
Tc-99	6.7678E-03	50,784.46	101,568.92	0.00E+00	3.44E+02	6.87E+02		
Th-229	1.7488E-06	50,784.46	101,568.92	0.00E+00	8.88E-02	1.78E-01		
Th-230	5.8704E-06	50,784.46	101,568.92	0.00E+00	2.98E-01	5.96E-01		
Th-232	6.0208E-07	50,784.46	101,568.92	0.00E+00	3.06E-02	6.12E-02		
Th-208	8.7573E-05	50,784.46	101,568.92	0.00E+00	4.45E+00	8.89E+00		
U-232	2.3706E-04	50,784.46	101,568.92	0.00E+00	1.20E+01	2.41E+01		
U-233	3.6128E-04	50,784.46	101,568.92	0.00E+00	1.83E+01	3.67E+01		
U-234	1.2788E-02	50,784.46	101,568.92	0.00E+00	6.49E+02	1.30E+03		
U-235	5.7486E-04	50,784.46	101,568.92	4.24E-01	2.96E+01	5.88E+01		
U-236	2.3485E-04	50,784.46	101,568.92	0.00E+00	1.19E+01	2.39E+01		
U-238	1.1581E-04	50,784.46	101,568.92	5.28E-02	5.93E+00	1.18E+01		
Y-90	1.9804E+01	50,784.46	101,568.92	0.00E+00	1.01E+06	2.01E+06		
Other Radionuclides					3.13E+06	6.26E+06		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.33E+04	1.06E+05
Total	Total

**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	ZIRC	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		50,784.46	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		101,568.92	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.54		34.51
Bounding	3.08		

<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 EBWR (NORMAL UO2)  
 SNF ID # 60  
 Fuel Units & Descr 51 - 6 FLAT PLATES  
 Heavy Metal Mass BOL=1358.64kg, EOL=1357.824kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1966  
 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"  
 425

Radionuclide	II. Estimates		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	
	m	x <sub>a</sub>						Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	775.98	1,551.95	0.00E+00	6.81E-07	1.36E-06	Avg MeV		
Am-241	1.4352E-01	775.98	1,551.95	0.00E+00	1.11E+02	2.23E+02	0.0150	8.351E+13	
Am-242m	2.8698E-04	775.98	1,551.95	0.00E+00	2.23E-01	4.45E-01	0.0250	1.684E+13	
Am-243	6.2565E-04	775.98	1,551.95	0.00E+00	4.85E-01	9.71E-01	0.0375	1.606E+13	
C-14	4.7901E-05	775.98	1,551.95	0.00E+00	3.72E-02	7.43E-02	0.0575	1.856E+13	
Cl-36	8.0297E-07	775.98	1,551.95	0.00E+00	6.23E-04	1.25E-03	0.0850	9.344E+12	
Cm-243	2.5081E-04	775.98	1,551.95	0.00E+00	1.95E-01	3.89E-01	0.1250	6.484E+12	
Cm-244	4.9015E-02	775.98	1,551.95	0.00E+00	3.80E+01	7.61E+01	0.2250	8.012E+12	
Co-60	2.5581E-03	775.98	1,551.95	0.00E+00	1.99E+00	3.97E+00	0.3750	3.445E+12	
Cs-134	4.0536E-05	775.98	1,551.95	0.00E+00	3.15E-02	6.29E-02	0.5750	8.013E+13	
Cs-135	1.4433E-05	775.98	1,551.95	0.00E+00	1.12E-02	2.24E-02	0.8500	1.109E+12	
Cs-137	1.3979E+00	775.98	1,551.95	0.00E+00	1.08E+03	2.17E+03	1.2500	1.089E+12	
Eu-154	2.0203E-02	775.98	1,551.95	0.00E+00	1.57E+01	3.14E+01	1.7500	3.261E+10	
Eu-155	1.7684E-03	775.98	1,551.95	0.00E+00	1.37E+00	2.74E+00	2.2500	5.255E+06	
Fe-55	4.3136E-05	775.98	1,551.95	0.00E+00	3.35E-02	6.69E-02	2.7500	1.076E+07	
H-3	2.0769E-02	775.98	1,551.95	0.00E+00	1.61E+01	3.22E+01	3.5000	1.110E+06	
I-129	9.8288E-07	775.98	1,551.95	0.00E+00	7.63E-04	1.53E-03	5.0000	4.746E+05	
Kr-85	2.8214E-02	775.98	1,551.95	0.00E+00	2.19E+01	4.38E+01	7.0000	5.470E+04	
Np-237	1.1218E-05	775.98	1,551.95	0.00E+00	8.70E-03	1.74E-02	11.0000	6.283E+03	
Pa-231	1.3036E-09	775.98	1,551.95	0.00E+00	1.01E-06	2.02E-06			
Pb-210	8.5078E-11	775.98	1,551.95	0.00E+00	6.60E-08	1.32E-07			
Pm-147	3.6531E-04	775.98	1,551.95	0.00E+00	2.83E-01	5.67E-01			
Pu-238	7.4564E-02	775.98	1,551.95	0.00E+00	5.79E+01	1.16E+02			
Pu-239	1.1623E-02	775.98	1,551.95	0.00E+00	9.02E+00	1.80E+01			
Pu-240	1.5132E-02	775.98	1,551.95	0.00E+00	1.17E+01	2.35E+01			
Pu-241	9.0036E-01	775.98	1,551.95	0.00E+00	6.99E+02	1.40E+03			
Pu-242	6.4260E-05	775.98	1,551.95	0.00E+00	4.99E-02	9.97E-02			
Ra-226	2.2804E-10	775.98	1,551.95	0.00E+00	1.77E-07	3.54E-07			
Ra-228	5.2713E-12	775.98	1,551.95	0.00E+00	4.09E-09	8.18E-09			
Ru-106	6.1160E-10	775.98	1,551.95	0.00E+00	4.75E-07	9.49E-07			
Se-79	1.2377E-05	775.98	1,551.95	0.00E+00	9.60E-03	1.92E-02			
Sn-126	2.5210E-05	775.98	1,551.95	0.00E+00	1.96E-02	3.91E-02			
Sr-90	9.1667E-01	775.98	1,551.95	0.00E+00	7.11E+02	1.42E+03			
Tc-99	3.9357E-04	775.98	1,551.95	0.00E+00	3.05E-01	6.11E-01			
Th-229	1.2057E-10	775.98	1,551.95	0.00E+00	9.36E-08	1.87E-07			
Th-230	2.1043E-08	775.98	1,551.95	0.00E+00	1.63E-05	3.27E-05			
Th-232	5.2972E-12	775.98	1,551.95	0.00E+00	4.11E-09	8.22E-09			
Tl-208	1.7474E-07	775.98	1,551.95	0.00E+00	1.36E-04	2.71E-04			
U-232	4.7368E-07	775.98	1,551.95	0.00E+00	3.68E-04	7.35E-04			
U-233	2.5097E-08	775.98	1,551.95	0.00E+00	1.95E-05	3.89E-05			
U-234	5.0000E-05	775.98	1,551.95	0.00E+00	3.88E-02	7.76E-02			
U-235	-1.4489E-06	775.98	0.00	2.09E-02	1.98E-02	2.09E-02			
U-236	7.5824E-06	775.98	1,551.95	0.00E+00	5.88E-03	1.18E-02			
U-238	-2.6129E-07	775.98	0.00	4.53E-01	4.53E-01	4.53E-01			
Y-90	9.1699E-01	775.98	1,551.95	0.00E+00	7.12E+02	1.42E+03			
Other Radionuclides					1.04E+03	2.08E+03			

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.79E+01	3.57E+01
Total	Total

**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 %:	0.711000016	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		775.98	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		1,551.95	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.02		1.00
Bounding	0.03		

<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: EBWR (SPIKES)  
 SNF ID #: 891  
 Fuel Units & Descr: 31 - 7 X 7 ROD ARRAY  
 Heavy Metal Mass: BOL=29 205kg, EOL=26 989kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1966  
 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"  
 258

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	2,093 81	4,187 62	0 00E+00	4 89E-05	9 78E-05	Avg MeV	
Am-241	1.1135E-04	2,093 81	4,187 62	0 00E+00	2.33E-01	4 66E-01	0 0150	3 126E+14
Am-242m	8.5075E-09	2,093.81	4,187 62	0 00E+00	1 78E-05	3 56E-05	0 0250	6 495E+13
Am-243	9 8519E-10	2,093 81	4,187 62	0 00E+00	2.06E-06	4 13E-06	0 0375	5 618E+13
C-14	2 3012E-04	2,093 81	4,187 62	0 00E+00	4 82E-01	9 64E-01	0 0575	6 056E+13
Cl-36	1.2261E-06	2,093 81	4,187 62	0 00E+00	2.57E-03	5 13E-03	0 0850	3 659E+13
Cm-243	2 4875E-10	2,093 81	4,187 62	0 00E+00	5.21E-07	1 04E-06	0 1250	2.376E+13
Cm-244	2 3178E-09	2,093 81	4,187 62	0 00E+00	4 85E-06	9 71E-06	0 2250	3 149E+13
Co-60	7 0849E-02	2,093 81	4,187 62	0 00E+00	1 48E+02	2 97E+02	0 3750	1 374E+13
Cs-134	3 0266E-06	2,093 81	4,187 62	0 00E+00	6 34E-03	1.27E-02	0 5750	2.263E+14
Cs-135	3 0316E-05	2,093 81	4,187 62	0 00E+00	6 35E-02	1.27E-01	0 8500	2.291E+12
Cs-137	1 4511E+00	2,093 81	4,187 62	0 00E+00	3 04E+03	6 08E+03	1 2500	2 277E+13
Eu-154	6 6955E-04	2,093 81	4,187 62	0 00E+00	1 40E+00	2.80E+00	1 7500	5 908E+10
Eu-155	6 9850E-04	2,093 81	4,187 62	0 00E+00	1 46E+00	2.93E+00	2.2500	1.227E+08
Fe-55	1 2318E-03	2,093 81	4,187 62	0 00E+00	2 58E+00	5 16E+00	2 7500	3 546E+06
H-3	2 5141E-03	2,093 81	4,187 62	0 00E+00	5.26E+00	1 05E+01	3 5000	2 539E+02
I-129	7 3195E-07	2,093 81	4,187.62	0 00E+00	1 53E-03	3 07E-03	5 0000	1 045E+02
Kr-85	4 1281E-02	2,093 81	4,187 62	0 00E+00	8 64E+01	1 73E+02	7.0000	1 154E+01
Np-237	1 1489E-06	2,093 81	4,187 62	0 00E+00	2 41E-03	4 81E-03	11 0000	1.295E+00
Pa-231	4 5241E-08	2,093 81	4,187 62	0 00E+00	9 47E-05	1 89E-04		
Pb-210	6 4476E-13	2,093 81	4,187 62	0 00E+00	1 35E-09	2.70E-09		
Pm-147	1.1651E-03	2,093 81	4,187 62	0 00E+00	2 44E+00	4 88E+00		
Pu-238	2 9517E-04	2,093 81	4,187 62	0 00E+00	6.18E-01	1 24E+00		
Pu-239	6.6772E-04	2,093 81	4,187 62	0 00E+00	1 40E+00	2 80E+00		
Pu-240	8 6839E-05	2,093 81	4,187 62	0 00E+00	1 82E-01	3 64E-01		
Pu-241	7 1514E-04	2,093 81	4,187 62	0 00E+00	1 50E+00	2 99E+00		
Pu-242	1 9717E-09	2,093 81	4,187 62	0 00E+00	4 13E-06	8 26E-06		
Ra-226	1 7654E-12	2,093 81	4,187 62	0 00E+00	3 70E-09	7 39E-09		
Ra-228	8 2928E-12	2,093 81	4,187 62	0 00E+00	1 74E-08	3 47E-08		
Ru-106	1 8419E-10	2,093 81	4,187 62	0 00E+00	3 86E-07	7 71E-07		
Se-79	1 3223E-05	2,093 81	4,187 62	0 00E+00	2 77E-02	5 54E-02		
Sn-126	1 1493E-05	2,093 81	4,187 62	0 00E+00	2 41E-02	4 81E-02		
Sr-90	1 3649E+00	2,093 81	4,187.62	0 00E+00	2 86E+03	5 72E+03		
Tc-99	4 6656E-04	2,093 81	4,187.62	0 00E+00	9 77E-01	1 95E+00		
Th-229	1 4547E-11	2,093 81	4,187.62	0 00E+00	3 05E-08	6 09E-08		
Th-230	1 6617E-10	2,093.81	4,187 62	0 00E+00	3 48E-07	6 96E-07		
Th-232	8.3361E-12	2,093 81	4,187 62	0 00E+00	1 75E-08	3 49E-08		
Th-208	2.1664E-08	2,093 81	4,187 62	0 00E+00	4 54E-05	9 07E-05		
U-232	5 8669E-08	2,093 81	4,187 62	0 00E+00	1.23E-04	2 46E-04		
U-233	3.1847E-09	2,093 81	4,187 62	0 00E+00	6 67E-06	1 33E-05		
U-234	3 8769E-07	2,093 81	4,187 62	0 00E+00	8.12E-04	1 62E-03		
U-235	-2.7761E-06	2,093 81	0 00	5 88E-02	5.30E-02	5 88E-02		
U-236	1 6190E-05	2,093 81	4,187 62	0 00E+00	3 39E-02	6 78E-02		
U-238	-2.8547E-09	2,093 81	0 00	6 68E-04	6 62E-04	6 68E-04		
Y-90	1 3652E+00	2,093 81	4,187 62	0 00E+00	2 86E+03	5 72E+03		
Other Radionuclides					3 46E+03	6 91E+03		

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches Pathfinder Template on all but one parameter (cladding, but substituting Stainless Steel is a good conservative assumption).
Fuel Cladding:	ZIRC	SST	
BOL HM Constituents:	U		
BOL Enrichment %:	93 18999022	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	1,233.24	2,093.81	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding	1 767 05	4 187 62	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.54	1.70	1 00
Bounding	3.07	2.37	

<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 EBWR (U METAL) ENRICHED HEAVY  
 SNF ID # 64  
 Fuel Units & Descr 53 - 6 FLAT PLATES  
 Heavy Metal Mass, BOL=2989.2kg EOL=2982.962kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1966  
 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 42

II. Estimates	m						Gamma Sources	
	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	5,932.14	11,864.28	0.00E+00	5.21E-06	1.04E-05	Avg MeV	
Am-241	1.4352E-01	5,932.14	11,864.28	0.00E+00	8.51E+02	1.70E+03	0.0150	6.384E+14
Am-242m	2.8698E-04	5,932.14	11,864.28	0.00E+00	1.70E+00	3.40E+00	0.0250	1.287E+14
Am-243	6.2565E-04	5,932.14	11,864.28	0.00E+00	3.71E+00	7.42E+00	0.0375	1.228E+14
C-14	4.7901E-05	5,932.14	11,864.28	0.00E+00	2.84E-01	5.68E-01	0.0575	1.419E+14
Cl-36	8.0297E-07	5,932.14	11,864.28	0.00E+00	4.76E-03	9.53E-03	0.0850	7.143E+13
Cm-243	2.5081E-04	5,932.14	11,864.28	0.00E+00	1.49E+00	2.98E+00	0.1250	4.957E+13
Cm-244	4.9015E-02	5,932.14	11,864.28	0.00E+00	2.91E+02	5.82E+02	0.2250	6.125E+13
Co-60	2.5581E-03	5,932.14	11,864.28	0.00E+00	1.52E+01	3.04E+01	0.3750	2.634E+13
Cs-134	4.0536E-05	5,932.14	11,864.28	0.00E+00	2.40E-01	4.81E-01	0.5750	6.126E+14
Cs-135	1.4433E-05	5,932.14	11,864.28	0.00E+00	8.56E-02	1.71E-01	0.8500	8.475E+12
Cs-137	1.3979E+00	5,932.14	11,864.28	0.00E+00	8.29E+03	1.66E+04	1.2500	8.324E+12
Eu-154	2.0203E-02	5,932.14	11,864.28	0.00E+00	1.20E+02	2.40E+02	1.7500	2.493E+11
Eu-155	1.7684E-03	5,932.14	11,864.28	0.00E+00	1.05E+01	2.10E+01	2.2500	4.015E+07
Fe-55	4.3136E-05	5,932.14	11,864.28	0.00E+00	2.56E-01	5.12E-01	2.7500	8.225E+07
H-3	2.0769E-02	5,932.14	11,864.28	0.00E+00	1.23E+02	2.46E+02	3.5000	8.473E+06
I-129	9.8288E-07	5,932.14	11,864.28	0.00E+00	5.83E-03	1.17E-02	5.0000	3.623E+06
Kr-85	2.8214E-02	5,932.14	11,864.28	0.00E+00	1.67E+02	3.35E+02	7.0000	4.175E+05
Np-237	1.1218E-05	5,932.14	11,864.28	0.00E+00	6.65E-02	1.33E-01	11.0000	4.796E+04
Pa-231	1.3036E-09	5,932.14	11,864.28	0.00E+00	7.73E-06	1.55E-05		
Pb-210	8.5078E-11	5,932.14	11,864.28	0.00E+00	5.05E-07	1.01E-06		
Pm-147	3.6531E-04	5,932.14	11,864.28	0.00E+00	2.17E+00	4.33E+00		
Pu-238	7.4564E-02	5,932.14	11,864.28	0.00E+00	4.42E+02	8.85E+02		
Pu-239	1.1623E-02	5,932.14	11,864.28	0.00E+00	6.89E+01	1.38E+02		
Pu-240	1.5132E-02	5,932.14	11,864.28	0.00E+00	8.98E+01	1.80E+02		
Pu-241	9.0036E-01	5,932.14	11,864.28	0.00E+00	5.34E+03	1.07E+04		
Pu-242	6.4260E-05	5,932.14	11,864.28	0.00E+00	3.81E-01	7.62E-01		
Ra-226	2.2804E-10	5,932.14	11,864.28	0.00E+00	1.35E-06	2.71E-06		
Ra-228	5.2713E-12	5,932.14	11,864.28	0.00E+00	3.13E-08	6.25E-08		
Ru-106	6.1160E-10	5,932.14	11,864.28	0.00E+00	3.63E-06	7.26E-06		
Se-79	1.2377E-05	5,932.14	11,864.28	0.00E+00	7.34E-02	1.47E-01		
Sn-126	2.5210E-05	5,932.14	11,864.28	0.00E+00	1.50E-01	2.99E-01		
Sr-90	9.1667E-01	5,932.14	11,864.28	0.00E+00	5.44E+03	1.09E+04		
Tc-99	3.9357E-04	5,932.14	11,864.28	0.00E+00	2.33E+00	4.67E+00		
Th-229	1.2057E-10	5,932.14	11,864.28	0.00E+00	7.15E-07	1.43E-06		
Th-230	2.1043E-08	5,932.14	11,864.28	0.00E+00	1.25E-04	2.50E-04		
Th-232	5.2972E-12	5,932.14	11,864.28	0.00E+00	3.14E-08	6.28E-08		
Tl-208	1.7474E-07	5,932.14	11,864.28	0.00E+00	1.04E-03	2.07E-03		
U-232	4.7368E-07	5,932.14	11,864.28	0.00E+00	2.81E-03	5.62E-03		
U-233	2.5097E-08	5,932.14	11,864.28	0.00E+00	1.49E-04	2.98E-04		
U-234	5.0000E-05	5,932.14	11,864.28	0.00E+00	2.97E-01	5.93E-01		
U-235	-1.4489E-06	5,932.14	0.00	9.28E-02	8.42E-02	9.28E-02		
U-236	7.5824E-06	5,932.14	11,864.28	0.00E+00	4.50E-02	9.00E-02		
U-238	-2.6129E-07	5,932.14	0.00	9.90E-01	9.89E-01	9.90E-01		
Y-90	9.1699E-01	5,932.14	11,864.28	0.00E+00	5.44E+03	1.09E+04		
Other Radionuclides					7.96E+03	1.59E+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 %	1.436170175	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		5,932.14	
Bounding	4,782.72	11,864.28	

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	0.06		
Bounding	0.11	2.48	

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: EBWR (U METAL) ENRICHED THIN  
 SNF ID #: 887  
 Fuel Units & Descr: 54 - 6 FLAT PLATES  
 Heavy Metal Mass: BOL= , EOL=2194 101kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1966  
 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 50

Radionuclide	m		x <sub>a</sub>		x <sub>b</sub>		b		y <sub>a</sub>		y <sub>b</sub>		Gamma Sources	
	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	3,516 48	3,516 48	0 00E+00	3 09E-06	3 09E-06	Avg MeV							
Am-241	1 4352E-01	3,516 48	3,516 48	0 00E+00	5 05E+02	5 05E+02	0 0150	1 892E+14						
Am-242m	2 8698E-04	3,516 48	3,516 48	0 00E+00	1 01E+00	1 01E+00	0 0250	3 815E+13						
Am-243	6 2565E-04	3,516 48	3,516 48	0 00E+00	2 20E+00	2 20E+00	0 0375	3 639E+13						
C-14	4 7901E-05	3,516 48	3,516 48	0 00E+00	1 68E-01	1 68E-01	0 0575	4 205E+13						
Cl-36	8 0297E-07	3,516 48	3,516 48	0 00E+00	2 82E-03	2 82E-03	0 0850	2 117E+13						
Cm-243	2 5081E-04	3,516 48	3,516 48	0 00E+00	8 82E-01	8 82E-01	0 1250	1 469E+13						
Cm-244	4 9015E-02	3,516 48	3,516 48	0 00E+00	1 72E+02	1 72E+02	0 2250	1 816E+13						
Co-60	2 5581E-03	3,516 48	3,516 48	0 00E+00	9 00E+00	9 00E+00	0 3750	7 807E+12						
Cs-134	4 0536E-05	3,516 48	3,516 48	0 00E+00	1 43E-01	1 43E-01	0 5750	1 816E+14						
Cs-135	1 4433E-05	3,516 48	3,516 48	0 00E+00	5 08E-02	5 08E-02	0 8500	2 512E+12						
Cs-137	1 3979E+00	3,516 48	3,516 48	0 00E+00	4 92E+03	4 92E+03	1 2500	2 467E+12						
Eu-154	2 0203E-02	3,516 48	3,516 48	0 00E+00	7 10E+01	7 10E+01	1 7500	7 389E+10						
Eu-155	1 7684E-03	3,516 48	3,516 48	0 00E+00	6 22E+00	6 22E+00	2 2500	1 190E+07						
Fe-55	4 3136E-05	3,516 48	3,516 48	0 00E+00	1 52E-01	1 52E-01	2 7500	2 438E+07						
H-3	2 0769E-02	3,516 48	3,516 48	0 00E+00	7 30E+01	7 30E+01	3 5000	2 514E+06						
I-129	9 8288E-07	3,516 48	3,516 48	0 00E+00	3 46E-03	3 46E-03	5 0000	1 075E+06						
Kr-85	2 8214E-02	3,516 48	3,516 48	0 00E+00	9 92E+01	9 92E+01	7 0000	1 239E+05						
Np-237	1 1218E-05	3,516 48	3,516 48	0 00E+00	3 94E-02	3 94E-02	11.0000	1 423E+04						
Pa-231	1 3036E-09	3,516 48	3,516 48	0 00E+00	4 58E-06	4 58E-06								
Pb-210	8.5078E-11	3,516 48	3,516 48	0 00E+00	2 99E-07	2 99E-07								
Pm-147	3 6531E-04	3,516 48	3,516 48	0 00E+00	1 28E+00	1 28E+00								
Pu-238	7 4564E-02	3,516 48	3,516 48	0 00E+00	2 62E+02	2 62E+02								
Pu-239	1 1623E-02	3,516 48	3,516 48	0 00E+00	4 09E+01	4 09E+01								
Pu-240	1 5132E-02	3,516 48	3,516 48	0 00E+00	5 32E+01	5 32E+01								
Pu-241	9 0036E-01	3,516 48	3,516 48	0 00E+00	3 17E+03	3 17E+03								
Pu-242	6 4260E-05	3,516 48	3,516 48	0 00E+00	2 26E-01	2 26E-01								
Ra-226	2 2804E-10	3,516 48	3,516 48	0 00E+00	8 02E-07	8 02E-07								
Ra-228	5 2713E-12	3,516 48	3,516 48	0 00E+00	1 85E-08	1 85E-08								
Ru-106	6 1160E-10	3,516 48	3,516 48	0 00E+00	2 15E-06	2 15E-06								
Sg-79	1 2377E-05	3,516 48	3,516 48	0 00E+00	4 35E-02	4 35E-02								
Sn-126	2 5210E-05	3,516 48	3,516 48	0 00E+00	8 87E-02	8 87E-02								
Sr-90	9 1667E-01	3,516 48	3,516 48	0 00E+00	3 22E+03	3 22E+03								
Tc-99	3 9357E-04	3,516 48	3,516 48	0 00E+00	1 38E+00	1 38E+00								
Th-229	1 2057E-10	3,516 48	3,516 48	0 00E+00	4 24E-07	4 24E-07								
Th-230	2 1043E-08	3,516 48	3,516 48	0 00E+00	7 40E-05	7 40E-05								
Th-232	5 2972E-12	3,516 48	3,516 48	0 00E+00	1 86E-08	1 86E-08								
Th-208	1 7474E-07	3,516 48	3,516 48	0 00E+00	6 14E-04	6 14E-04								
U-232	4 7368E-07	3,516 48	3,516 48	0 00E+00	1 67E-03	1 67E-03								
U-233	2 5097E-08	3,516 48	3,516 48	0 00E+00	8 83E-05	8 83E-05								
U-234	5 0000E-05	3,516 48	3,516 48	0 00E+00	1 76E-01	1 76E-01								
U-235	-1 4489E-06	3,516 48	0 00	1 52E-01	1 47E-01	1 52E-01								
U-236	7 5824E-06	3,516 48	3,516 48	0 00E+00	2 67E-02	2 67E-02								
U-238	-2 6129E-07	3,516 48	0 00	7 15E-01	7 14E-01	7 15E-01								
Y-90	9 1699E-01	3,516 48	3,516 48	0 00E+00	3 22E+03	3 22E+03								
Other Radionuclides					4 72E+03	4 72E+03								

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8 09E+01	8 09E+01
Total	Total

**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 %	U	U	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		3 516 48	Nominal burnup set equal to bounding burnup
		3 516 48	Bounding burnup assumed to be twice nominal burnup

Checks			
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Bounding	0 05	0 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: EBWR (U METAL) ET-11  
 SNF ID #: 888  
 Fuel Units & Descr: 1 - 6 FLAT PLATES  
 Heavy Metal Mass BOL=40.2kg EOL=38.365kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1966  
 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  
 Container usage:  
 18"x10"  
 0.08

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	1,745.00	3,490.00	0.00E+00	1.53E-06	3.06E-06	Avg MeV	
Am-241	1.4352E-01	1,745.00	3,490.00	0.00E+00	2.50E+02	5.01E+02	0.0150	1.878E+14
Am-242m	2.8698E-04	1,745.00	3,490.00	0.00E+00	5.01E-01	1.00E+00	0.0250	3.787E+13
Am-243	6.2565E-04	1,745.00	3,490.00	0.00E+00	1.09E+00	2.18E+00	0.0375	3.612E+13
C-14	4.7901E-05	1,745.00	3,490.00	0.00E+00	8.36E-02	1.67E-01	0.0575	4.173E+13
Cf-252	8.0297E-07	1,745.00	3,490.00	0.00E+00	1.40E-03	2.80E-03	0.0850	2.101E+13
Cm-243	2.5081E-04	1,745.00	3,490.00	0.00E+00	4.38E-01	8.75E-01	0.1250	1.458E+13
Cm-244	4.9015E-02	1,745.00	3,490.00	0.00E+00	8.55E+01	1.71E+02	0.2250	1.802E+13
Co-60	2.5581E-03	1,745.00	3,490.00	0.00E+00	4.46E+00	8.93E+00	0.3750	7.748E+12
Cs-134	4.0536E-05	1,745.00	3,490.00	0.00E+00	7.07E-02	1.41E-01	0.5750	1.802E+14
Cs-135	1.4433E-05	1,745.00	3,490.00	0.00E+00	2.52E-02	5.04E-02	0.8500	2.493E+12
Cs-137	1.3979E+00	1,745.00	3,490.00	0.00E+00	2.44E+03	4.88E+03	1.2500	2.449E+12
Eu-154	2.0203E-02	1,745.00	3,490.00	0.00E+00	3.53E+01	7.05E+01	1.7500	7.333E+10
Eu-155	1.7684E-03	1,745.00	3,490.00	0.00E+00	3.09E+00	6.17E+00	2.2500	1.181E+07
Fe-55	4.3136E-05	1,745.00	3,490.00	0.00E+00	7.53E-02	1.51E-01	2.7500	2.419E+07
H-3	2.0769E-02	1,745.00	3,490.00	0.00E+00	3.62E+01	7.25E+01	3.5000	2.491E+06
I-129	9.8288E-07	1,745.00	3,490.00	0.00E+00	1.72E-03	3.43E-03	5.0000	1.065E+06
Kr-85	2.8214E-02	1,745.00	3,490.00	0.00E+00	4.92E+01	9.85E+01	7.0000	1.227E+05
Np-237	1.1218E-05	1,745.00	3,490.00	0.00E+00	1.96E-02	3.91E-02	11.0000	1.410E+04
Pa-231	1.3036E-09	1,745.00	3,490.00	0.00E+00	2.27E-06	4.55E-06		
Pb-210	8.5078E-11	1,745.00	3,490.00	0.00E+00	1.48E-07	2.97E-07		
Pm-147	3.6531E-04	1,745.00	3,490.00	0.00E+00	6.37E-01	1.27E+00		
Pu-238	7.4564E-02	1,745.00	3,490.00	0.00E+00	1.30E+02	2.60E+02		
Pu-239	1.1623E-02	1,745.00	3,490.00	0.00E+00	2.03E+01	4.06E+01		
Pu-240	1.5132E-02	1,745.00	3,490.00	0.00E+00	2.64E+01	5.28E+01		
Pu-241	9.0036E-01	1,745.00	3,490.00	0.00E+00	1.57E+03	3.14E+03		
Pu-242	6.4260E-05	1,745.00	3,490.00	0.00E+00	1.12E-01	2.24E-01		
Ra-226	2.2804E-10	1,745.00	3,490.00	0.00E+00	3.98E-07	7.96E-07		
Ra-228	5.2713E-12	1,745.00	3,490.00	0.00E+00	9.20E-09	1.84E-08		
Ru-106	6.1160E-10	1,745.00	3,490.00	0.00E+00	1.07E-06	2.13E-06		
Se-79	1.2377E-05	1,745.00	3,490.00	0.00E+00	2.16E-02	4.32E-02		
Sn-126	2.5210E-05	1,745.00	3,490.00	0.00E+00	4.40E-02	8.80E-02		
Sr-90	9.1667E-01	1,745.00	3,490.00	0.00E+00	1.60E+03	3.20E+03		
Tc-99	3.9357E-04	1,745.00	3,490.00	0.00E+00	6.87E-01	1.37E+00		
Th-229	1.2057E-10	1,745.00	3,490.00	0.00E+00	2.10E-07	4.21E-07		
Th-230	2.1043E-08	1,745.00	3,490.00	0.00E+00	3.67E-05	7.34E-05		
Th-232	5.2972E-12	1,745.00	3,490.00	0.00E+00	9.24E-09	1.85E-08		
Ti-208	1.7474E-07	1,745.00	3,490.00	0.00E+00	3.05E-04	6.10E-04		
U-232	4.7368E-07	1,745.00	3,490.00	0.00E+00	8.27E-04	1.65E-03		
U-233	2.5097E-08	1,745.00	3,490.00	0.00E+00	4.38E-05	8.76E-05		
U-234	5.0000E-05	1,745.00	3,490.00	0.00E+00	8.72E-02	1.74E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-1.4489E-06	1,745.00	0.00	1.26E-03	0.00E+00	1.26E-03	4.01E+01	8.03E+01
U-236	7.5824E-06	1,745.00	3,490.00	0.00E+00	1.32E-02	2.65E-02	Total	Total
U-238	-2.6129E-07	1,745.00	0.00	1.33E-02	1.29E-02	1.33E-02		
Y-90	9.1699E-01	1,745.00	3,490.00	0.00E+00	1.60E+03	3.20E+03		
Other Radionuclides					2.34E+03	4.68E+03		

**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 %:	1.447761165	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,745.00	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding	64.32	3,490.00	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.24		1.02
Bounding	2.48	54.26	

<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: EBWR (U METAL) NORMAL HEAVY  
 SNF ID #: 889  
 Fuel Units & Descr: 11 - 6 FLAT PLATES  
 Heavy Metal Mass: BOL=620 4kg EOL=566 145kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1966  
 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 92

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 7758E-10	51,594 22	103,188 45	0 00E+00	4.53E-05	9 06E-05	Avg MeV		
Am-241	1 4352E-01	51,594 22	103,188 45	0 00E+00	7 41E+03	1 48E+04	0 0150	5.552E+15	
Am-242m	2 8698E-04	51,594 22	103,188 45	0 00E+00	1 48E+01	2 96E+01	0 0250	1 120E+15	
Am-243	6 2565E-04	51,594 22	103,188 45	0 00E+00	3 23E+01	6 46E+01	0 0375	1 068E+15	
C-14	4 7901E-05	51,594 22	103,188 45	0 00E+00	2 47E+00	4 94E+00	0 0575	1 234E+15	
Cl-36	8 0297E-07	51,594 22	103,188 45	0 00E+00	4 14E-02	8 29E-02	0 0850	6 213E+14	
Cm-243	2 5081E-04	51,594 22	103,188 45	0 00E+00	1 29E+01	2 59E+01	0 1250	4 311E+14	
Cm-244	4 9015E-02	51,594 22	103,188 45	0 00E+00	2 53E+03	5 06E+03	0 2250	5 327E+14	
Co-60	2 5581E-03	51,594 22	103,188 45	0 00E+00	1 32E+02	2 64E+02	0 3750	2 291E+14	
Cs-134	4 0536E-05	51,594 22	103,188 45	0 00E+00	2 09E+00	4 18E+00	0 5750	5 328E+15	
Cs-135	1 4433E-05	51,594 22	103,188 45	0 00E+00	7 45E-01	1 49E+00	0 8500	7 371E+13	
Cs-137	1 3979E+00	51,594 22	103,188 45	0 00E+00	7 21E+04	1 44E+05	1 2500	7 240E+13	
Eu-154	2 0203E-02	51,594 22	103,188 45	0 00E+00	1 04E+03	2 08E+03	1 7500	2 168E+12	
Eu-155	1 7684E-03	51,594 22	103,188 45	0 00E+00	9 12E+01	1 82E+02	2 2500	3 491E+08	
Fe-55	4 3136E-05	51,594 22	103,188 45	0 00E+00	2 23E+00	4 45E+00	2 7500	7 153E+08	
H-3	2 0769E-02	51,594 22	103,188 45	0 00E+00	1 07E+03	2 14E+03	3 5000	7 365E+07	
I-129	9 8288E-07	51,594 22	103,188 45	0 00E+00	5 07E-02	1 01E-01	5 0000	3 149E+07	
Kr-85	2 8214E-02	51,594 22	103,188 45	0 00E+00	1 46E+03	2 91E+03	7 0000	3 629E+06	
Np-237	1 1218E-05	51,594 22	103,188 45	0 00E+00	5 79E-01	1 16E+00	11 0000	4 168E+05	
Pa-231	1 3036E-09	51,594 22	103,188 45	0 00E+00	6 73E-05	1 35E-04			
Pb-210	8 5078E-11	51,594 22	103,188 45	0 00E+00	4 39E-06	8 78E-06			
Pm-147	3 6531E-04	51,594 22	103,188 45	0 00E+00	1 88E+01	3 77E+01			
Pu-238	7 4564E-02	51,594 22	103,188 45	0 00E+00	3 85E+03	7 69E+03			
Pu-239	1 1623E-02	51,594 22	103,188 45	0 00E+00	6 00E+02	1 20E+03			
Pu-240	1 5132E-02	51,594 22	103,188 45	0 00E+00	7 81E+02	1 56E+03			
Pu-241	9 0036E-01	51,594 22	103,188 45	0 00E+00	4 65E+04	9 29E+04			
Pu-242	6 4260E-05	51,594 22	103,188 45	0 00E+00	3 32E+00	6 63E+00			
Ra-226	2 2804E-10	51,594 22	103,188 45	0 00E+00	1 18E-05	2 35E-05			
Ra-228	5 2713E-12	51,594 22	103,188 45	0 00E+00	2 72E-07	5 44E-07			
Ru-106	6 1160E-10	51,594 22	103,188 45	0 00E+00	3 16E-05	6 31E-05			
Se-79	1 2377E-05	51,594 22	103,188 45	0 00E+00	6 39E-01	1 28E+00			
Sn-126	2 5210E-05	51,594 22	103,188 45	0 00E+00	1 30E+00	2 60E+00			
Sr-90	9 1667E-01	51,594 22	103,188 45	0 00E+00	4 73E+04	9 46E+04			
Tc-99	3 9357E-04	51,594 22	103,188 45	0 00E+00	2 03E+01	4 06E+01			
Th-229	1 2057E-10	51,594 22	103,188 45	0 00E+00	6 22E-06	1 24E-05			
Th-230	2 1043E-08	51,594 22	103,188 45	0 00E+00	1 09E-03	2 17E-03			
Th-232	5 2972E-12	51,594 22	103,188 45	0 00E+00	2 73E-07	5 47E-07			
Tl-208	1 7474E-07	51,594 22	103,188 45	0 00E+00	9 02E-03	1 80E-02			
U-232	4 7368E-07	51,594 22	103,188 45	0 00E+00	2 44E-02	4 89E-02			
U-233	2 5097E-08	51,594 22	103,188 45	0 00E+00	1 29E-03	2 59E-03			
U-234	5 0000E-05	51,594 22	103,188 45	0 00E+00	2 58E+00	5 16E+00			
U-235	-1 4489E-06	51,594 22	0 00	9 56E-03	0 00E+00	9 56E-03			
U-236	7 5824E-06	51,594 22	103,188 45	0 00E+00	3 91E-01	7 82E-01			
U-238	-2 6129E-07	51,594 22	0 00	2 07E-01	1 94E-01	2 07E-01			
Y-90	9 1699E-01	51,594 22	103,188 45	0 00E+00	4 73E+04	9 46E+04			
Other Radionuclides							6 93E+04	1 39E+05	

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.19E+03	2.37E+03
Total	Total

**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 712765938	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		51,594 22	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding	992 64	103 188 45	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	2 38		1 05
Bounding	4 75	103 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: EBWR (U METAL) NORMAL THIN  
 SNF ID #: 890  
 Fuel Units & Descr: 7 - 6 FLAT PLATES  
 Heavy Metal Mass: BOL=2814kg, EOL=279076kg  
 ROD Storage Site: INEEL

<sup>1</sup>Fuel decay start date: 1966  
 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  
 18"x10"  
 0 58

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.7758E-10	2,210.01	4,420.01	0.00E+00	1.94E-06	3.88E-06	Avg MeV	
Am-241	1.4352E-01	2,210.01	4,420.01	0.00E+00	3.17E+02	6.34E+02	0.0150	2.378E+14
Am-242m	2.8698E-04	2,210.01	4,420.01	0.00E+00	6.34E-01	1.27E+00	0.0250	4.796E+13
Am-243	6.2565E-04	2,210.01	4,420.01	0.00E+00	1.38E+00	2.77E+00	0.0375	4.574E+13
C-14	4.7901E-05	2,210.01	4,420.01	0.00E+00	1.06E-01	2.12E-01	0.0575	5.285E+13
Cl-36	8.0297E-07	2,210.01	4,420.01	0.00E+00	1.77E-03	3.55E-03	0.0850	2.661E+13
Cm-243	2.5081E-04	2,210.01	4,420.01	0.00E+00	5.54E-01	1.11E+00	0.1250	1.847E+13
Cm-244	4.9015E-02	2,210.01	4,420.01	0.00E+00	1.08E+02	2.17E+02	0.2250	2.282E+13
Co-60	2.5581E-03	2,210.01	4,420.01	0.00E+00	5.65E+00	1.13E+01	0.3750	9.812E+12
Cs-134	4.0536E-05	2,210.01	4,420.01	0.00E+00	8.96E-02	1.79E-01	0.5750	2.282E+14
Cs-135	1.4433E-05	2,210.01	4,420.01	0.00E+00	3.19E-02	6.38E-02	0.8500	3.157E+12
Cs-137	1.3979E+00	2,210.01	4,420.01	0.00E+00	3.09E+03	6.18E+03	1.2500	3.101E+12
Eu-154	2.0203E-02	2,210.01	4,420.01	0.00E+00	4.46E+01	8.93E+01	1.7500	9.287E+10
Eu-155	1.7684E-03	2,210.01	4,420.01	0.00E+00	3.91E+00	7.82E+00	2.2500	1.496E+07
Fe-55	4.3136E-05	2,210.01	4,420.01	0.00E+00	9.53E-02	1.91E-01	2.7500	3.064E+07
H-3	2.0769E-02	2,210.01	4,420.01	0.00E+00	4.59E+01	9.18E+01	3.5000	3.155E+06
I-129	9.8288E-07	2,210.01	4,420.01	0.00E+00	2.17E-03	4.34E-03	5.0000	1.349E+06
Kr-85	2.8214E-02	2,210.01	4,420.01	0.00E+00	6.24E+01	1.25E+02	7.0000	1.555E+05
Np-237	1.1218E-05	2,210.01	4,420.01	0.00E+00	2.48E-02	4.96E-02	11.0000	1.786E+04
Pa-231	1.3036E-09	2,210.01	4,420.01	0.00E+00	2.88E-06	5.76E-06		
Pb-210	8.5078E-11	2,210.01	4,420.01	0.00E+00	1.88E-07	3.76E-07		
Pm-147	3.6531E-04	2,210.01	4,420.01	0.00E+00	8.07E-01	1.61E+00		
Pu-238	7.4564E-02	2,210.01	4,420.01	0.00E+00	1.65E+02	3.30E+02		
Pu-239	1.1623E-02	2,210.01	4,420.01	0.00E+00	2.57E+01	5.14E+01		
Pu-240	1.5132E-02	2,210.01	4,420.01	0.00E+00	3.34E+01	6.69E+01		
Pu-241	9.0036E-01	2,210.01	4,420.01	0.00E+00	1.99E+03	3.98E+03		
Pu-242	6.4260E-05	2,210.01	4,420.01	0.00E+00	1.42E-01	2.84E-01		
Ra-226	2.2804E-10	2,210.01	4,420.01	0.00E+00	5.04E-07	1.01E-06		
Ra-228	5.2713E-12	2,210.01	4,420.01	0.00E+00	1.16E-08	2.33E-08		
Ru-106	6.1160E-10	2,210.01	4,420.01	0.00E+00	1.35E-06	2.70E-06		
Se-79	1.2377E-05	2,210.01	4,420.01	0.00E+00	2.74E-02	5.47E-02		
Sn-126	2.5210E-05	2,210.01	4,420.01	0.00E+00	5.57E-02	1.11E-01		
Sr-90	9.1667E-01	2,210.01	4,420.01	0.00E+00	2.03E+03	4.05E+03		
Tc-99	3.9357E-04	2,210.01	4,420.01	0.00E+00	8.70E-01	1.74E+00		
Th-229	1.2057E-10	2,210.01	4,420.01	0.00E+00	2.66E-07	5.33E-07		
Th-230	2.1043E-08	2,210.01	4,420.01	0.00E+00	4.65E-05	9.30E-05		
Th-232	5.2972E-12	2,210.01	4,420.01	0.00E+00	1.17E-08	2.34E-08		
Th-208	1.7474E-07	2,210.01	4,420.01	0.00E+00	3.86E-04	7.72E-04		
U-232	4.7368E-07	2,210.01	4,420.01	0.00E+00	1.05E-03	2.09E-03		
U-233	2.5097E-08	2,210.01	4,420.01	0.00E+00	5.55E-05	1.11E-04		
U-234	5.0000E-05	2,210.01	4,420.01	0.00E+00	1.11E-01	2.21E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-1.4489E-06	2,210.01	0.00	4.36E-03	1.15E-03	4.36E-03	5.08E+01	1.02E+02
U-236	7.5824E-06	2,210.01	4,420.01	0.00E+00	1.68E-02	3.35E-02	Total	Total
U-238	-2.6129E-07	2,210.01	0.00	9.39E-02	9.33E-02	9.39E-02		
Y-90	9.1699E-01	2,210.01	4,420.01	0.00E+00	2.03E+03	4.05E+03		
Other Radionuclides					2.97E+03	5.93E+03		

**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 %:	0.716417866	0 to 5	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		2,210.01	
Bounding	450.24	4,420.01	

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

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.22		
Bounding	0.45	9.82	

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: ENEA (LEU UALX) SALUGGIA ITALY  
 SNF ID #: 760  
 Fuel Units & Descr: 32 - MTR TYPE  
 Heavy Metal Mass: BOL=22 4kg, EOL=21 568kg  
 ROD Storage Ssite: SRS

<sup>1</sup>Fuel decay start date: 1996  
 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: 10 years

Estimated  
 Canister usage:  
 18"x10"  
 0 89

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	2 8404E-10	787 92	1,575 84	0 00E+00	2 24E-07	4 48E-07		
Am-241	1 4935E-03	787 92	1,575 84	0 00E+00	1 18E+00	2 35E+00	0 0150	2 143E+14
Am-242m	4 4390E-07	787 92	1,575 84	0 00E+00	3 50E-04	7 00E-04	0 0250	4,510E+13
Am-243	1 4913E-06	787 92	1,575 84	0 00E+00	1 18E-03	2 35E-03	0 0375	3 932E+13
C-14	5 7217E-09	787 92	1,575 84	0 00E+00	4 51E-06	9 02E-06	0 0575	4 154E+13
Cl-36	1 3124E-32	787 92	1,575 84	0 00E+00	1 03E-29	2 07E-29	0 0850	2 527E+13
Cm-243	2 0967E-07	787 92	1,575 84	0 00E+00	1 65E-04	3 30E-04	0 1250	1 768E+13
Cm-244	4 3001E-05	787 92	1,575 84	0 00E+00	3 39E-02	6 78E-02	0,2250	2,170E+13
Co-60	1 9798E-05	787 92	1,575 84	0 00E+00	1 56E-02	3 12E-02	0,3750	9 728E+12
Cs-134	9 0795E-02	787 92	1,575 84	0 00E+00	7 15E+01	1 43E+02	0 5750	1 579E+14
Cs-135	3,4477E-06	787 92	1,575 84	0 00E+00	2 72E-03	5 43E-03	0 8500	7 704E+12
Cs-137	2,5588E+00	787 92	1,575 84	0 00E+00	2 02E+03	4 03E+03	1,2500	2 507E+12
Eu-154	5 4847E-02	787 92	1,575 84	0 00E+00	4 32E+01	8 64E+01	1 7500	9 154E+10
Eu-155	1 9469E-02	787 92	1,575 84	0 00E+00	1 53E+01	3 07E+01	2,2500	6 052E+09
Fe-55	1,7797E-03	787 92	1,575 84	0 00E+00	1 40E+00	2 80E+00	2 7500	8 445E+07
H-3	8 0065E-03	787 92	1,575 84	0 00E+00	6 31E+00	1 26E+01	3 5000	1 005E+07
I-129	7,5300E-07	787 92	1,575 84	0 00E+00	5 93E-04	1 19E-03	5 0000	8 491E+02
Kr-85	2 0705E-01	787 92	1,575 84	0 00E+00	1 63E+02	3 26E+02	7 0000	9 439E+01
Np-237	9,5507E-06	787 92	1,575 84	0 00E+00	7 53E-03	1 51E-02	11 0000	1 062E+01
Pa-231	1,2740E-09	787 92	1,575 84	0 00E+00	1 00E-06	2 01E-06		
Pb-210	1,1838E-11	787 92	1,575 84	0 00E+00	9 33E-09	1 87E-08		
Pm-147	6 7974E-01	787 92	1,575 84	0 00E+00	5 36E+02	1 07E+03		
Pu-238	1 9755E-02	787 92	1,575 84	0 00E+00	1 56E+01	3 11E+01		
Pu-239	4,2638E-04	787 92	1,575 84	0 00E+00	3 38E-01	6 75E-01		
Pu-240	2,4390E-04	787 92	1,575 84	0 00E+00	1 92E-01	3 84E-01		
Pu-241	5 4058E-02	787 92	1,575 84	0 00E+00	4 26E+01	8 52E+01		
Pu-242	3 6329E-07	787 92	1,575 84	0 00E+00	2 86E-04	5 72E-04		
Ra-226	8,3742E-11	787 92	1,575 84	0 00E+00	6 80E-08	1,32E-07		
Ra-228	5 7734E-15	787 92	1,575 84	0 00E+00	4 55E-12	9 10E-12		
Ru-106	6 1356E-03	787 92	1,575 84	0 00E+00	4 83E+00	9 67E+00		
Se-79	1,2936E-05	787 92	1,575 84	0 00E+00	1 02E-02	2 04E-02		
Sr-126	1,1574E-05	787 92	1,575 84	0 00E+00	9 12E-03	1 82E-02		
Sr-90	2 4417E+00	787 92	1,575 84	0 00E+00	1 92E+03	3 85E+03		
Tc-99	4,2239E-04	787 92	1,575 84	0 00E+00	3 33E-01	6 66E-01		
Th-229	2 8568E-12	787 92	1,575 84	0 00E+00	2,25E-09	4,50E-09		
Th-230	2 5310E-08	787 92	1,575 84	0 00E+00	1 99E-05	3 99E-05		
Th-232	1 1631E-14	787 92	1,575 84	0 00E+00	9 16E-12	1 83E-11		
Tl-208	4 6705E-08	787 92	1,575 84	0 00E+00	3 68E-05	7,36E-05		
U-232	1 3151E-07	787 92	1,575 84	0 00E+00	1 04E-04	2,07E-04		
U-233	2,1650E-09	787 92	1,575 84	0 00E+00	1,71E-06	3 41E-06		
U-234	1 8399E-04	787 92	1,575 84	0 00E+00	1,45E-01	2,90E-01		
U-235	-2 7235E-06	787 92	0 00	9 68E-03	7,54E-03	9 68E-03		
U-236	1 5493E-05	787 92	1,575 84	0 00E+00	1,22E-02	2,44E-02		
U-238	-4 2851E-09	787 92	0 00	6 02E-03	6 02E-03	6 02E-03		
Y-90	2 4423E+00	787 92	1,575 84	0 00E+00	1 92E+03	3 85E+03		
Other Radionuclides					1 96E+03	3 92E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2,49E+01	4 99E+01
Total	Total

**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	ALUM	ALUM	This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
BOL HM Constituents	U	U	
BOL Enrichment %	20	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			
Nominal	From SFD	Estimated	Basis for burnup used in estimate:
	787 92	787 92	
Bounding	1 575 84	1 575 84	Bounding burnup assumed to be twice nominal burnup.

Checks			
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
	0 11		
Bounding	0 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: ENEA (UALX HEU) SALUGGIA ITALY  
 SNF ID #: 574  
 Fuel Units & Descr: 116 - MTR TYPE  
 Heavy Metal Mass: BOL=18.56kg EOL=17.226kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date 1996  
 Estimates as of 2010  
 Template ATR (Light Water, Akum, 60 to 100% U)  
<sup>2</sup>Template Burnup(MWd) 367.2  
 Template BOL Heavy Metal Mass (MT) 0.00116689  
 Template Decay Time 10 years

Estimated  
 Canister usage  
 18"x10"  
 3.22

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.8404E-10	1.263 32	2.526 65	0.00E+00	3.59E-07	7.18E-07	Avg MeV	
Am-241	1.4935E-03	1.263 32	2.526 65	0.00E+00	1.89E+00	3.77E+00	0.0150	3.436E+14
Am-242m	4.4390E-07	1.263 32	2.526 65	0.00E+00	5.61E-04	1.12E-03	0.0250	7.232E+13
Am-243	1.4913E-06	1.263 32	2.526 65	0.00E+00	1.88E-03	3.77E-03	0.0375	6.305E+13
C-14	5.7217E-09	1.263 32	2.526 65	0.00E+00	7.23E-06	1.45E-05	0.0575	6.661E+13
Cl-36	1.3124E-32	1.263 32	2.526 65	0.00E+00	1.66E-29	3.32E-29	0.0850	4.052E+13
Cm-243	2.0967E-07	1.263 32	2.526 65	0.00E+00	2.65E-04	5.30E-04	0.1250	2.835E+13
Cm-244	4.3001E-05	1.263 32	2.526 65	0.00E+00	5.43E-02	1.09E-01	0.2250	3.480E+13
Co-60	1.9798E-05	1.263 32	2.526 65	0.00E+00	2.50E-02	5.00E-02	0.3750	1.560E+13
Cs-134	9.0795E-02	1.263 32	2.526 65	0.00E+00	1.15E+02	2.29E+02	0.5750	2.532E+14
Cs-135	3.4477E-06	1.263 32	2.526 65	0.00E+00	4.36E-03	8.71E-03	0.8500	1.235E+13
Cs-137	2.5588E+00	1.263 32	2.526 65	0.00E+00	3.23E+03	6.47E+03	1.2500	4.020E+12
Eu-154	5.4847E-02	1.263 32	2.526 65	0.00E+00	6.93E+01	1.39E+02	1.7500	1.468E+11
Eu-155	1.9469E-02	1.263 32	2.526 65	0.00E+00	2.46E+01	4.92E+01	2.2500	9.704E+09
Fe-55	1.7797E-03	1.263 32	2.526 65	0.00E+00	2.25E+00	4.50E+00	2.7500	1.354E+08
H-3	8.0065E-03	1.263 32	2.526 65	0.00E+00	1.01E+01	2.02E+01	3.5000	1.612E+07
I-129	7.5300E-07	1.263 32	2.526 65	0.00E+00	9.51E-04	1.90E-03	5.0000	1.341E+03
Kr-85	2.0705E-01	1.263 32	2.526 65	0.00E+00	2.62E+02	5.23E+02	7.0000	1.489E+02
Np-237	9.5507E-06	1.263 32	2.526 65	0.00E+00	1.21E-02	2.41E-02	11.0000	1.676E+01
Pa-231	1.2740E-09	1.263 32	2.526 65	0.00E+00	1.61E-06	3.22E-06		
Pb-210	1.1838E-11	1.263 32	2.526 65	0.00E+00	1.50E-08	2.99E-08		
Pm-147	6.7974E-01	1.263 32	2.526 65	0.00E+00	8.59E+02	1.72E+03		
Pu-238	1.9755E-02	1.263 32	2.526 65	0.00E+00	2.50E+01	4.99E+01		
Pu-239	4.2838E-04	1.263 32	2.526 65	0.00E+00	5.41E-01	1.08E+00		
Pu-240	2.4390E-04	1.263 32	2.526 65	0.00E+00	3.08E-01	6.16E-01		
Pu-241	5.4058E-02	1.263 32	2.526 65	0.00E+00	6.83E+01	1.37E+02		
Pu-242	3.6329E-07	1.263 32	2.526 65	0.00E+00	4.59E-04	9.18E-04		
Ra-226	8.3742E-11	1.263 32	2.526 65	0.00E+00	1.06E-07	2.12E-07		
Ra-228	5.7734E-15	1.263 32	2.526 65	0.00E+00	7.29E-12	1.46E-11		
Ru-106	6.1356E-03	1.263 32	2.526 65	0.00E+00	7.75E+00	1.55E+01		
Se-79	1.2936E-05	1.263 32	2.526 65	0.00E+00	1.63E-02	3.27E-02		
Sn-126	1.1574E-05	1.263 32	2.526 65	0.00E+00	1.46E-02	2.92E-02		
Sr-90	2.4417E+00	1.263 32	2.526 65	0.00E+00	3.08E+03	6.17E+03		
Tc-99	4.2239E-04	1.263 32	2.526 65	0.00E+00	5.34E-01	1.07E+00		
Th-229	2.8568E-12	1.263 32	2.526 65	0.00E+00	3.61E-09	7.22E-09		
Th-230	2.5310E-08	1.263 32	2.526 65	0.00E+00	3.20E-05	6.40E-05		
Th-232	1.1631E-14	1.263 32	2.526 65	0.00E+00	1.47E-11	2.94E-11		
Th-2308	4.6705E-08	1.263 32	2.526 65	0.00E+00	5.90E-05	1.18E-04		
U-232	1.3151E-07	1.263 32	2.526 65	0.00E+00	1.66E-04	3.32E-04		
U-233	2.1650E-09	1.263 32	2.526 65	0.00E+00	2.74E-06	5.47E-06		
U-234	1.8399E-04	1.263 32	2.526 65	0.00E+00	2.32E-01	4.65E-01		
U-235	-2.7235E-06	1.263 32	0.00	3.74E-02	3.39E-02	3.74E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.5493E-05	1.263 32	2.526.65	0.00E+00	1.96E-02	3.91E-02	4.00E+01	8.00E+01
U-238	-4.2851E-09	1.263 32	0.00	4.29E-04	4.23E-04	4.29E-04	Total	Total
Y-90	2.4423E+00	1.263 32	2.526.65	0.00E+00	3.09E+03	6.17E+03		
Other Radionuclides					3.14E+03	6.28E+03		

**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 %	93.125	60 to 100	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal		1,263.32	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		2,526.65	
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.22		1.00
Bounding	0.43		

\*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: EPRI	Fuel decay start date:	1966
SNF ID #: 67	Estimates as of:	2010
Fuel Units & Descr: 1 - CANISTER OF SCRAP	Template (Worst Case)	
Heavy Metal Mass: BOL= , EOL=0.02kg	Template Burnup(MWd) <sup>2</sup>	62.5
ROD Storage Site: INEEL	Template BOL Heavy Metal Mass (MT)	0.00186865
	Template Decay Time	35 years

Estimated  
Canister usage<sup>1</sup>  
18"x10"  
0.03

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.3072E-06	19.01	19.01	0.00E+00	4.39E-05	4.39E-05	Avg MeV	
Am-241	8.4448E+00	19.01	19.01	0.00E+00	1.61E+02	1.61E+02	0.0150	2.329E+13
Am-242m	1.6848E-02	19.01	19.01	0.00E+00	3.20E-01	3.20E-01	0.0250	4.635E+12
Am-243	1.6320E-02	19.01	19.01	0.00E+00	3.10E-01	3.10E-01	0.0375	4.049E+12
C-14	1.2090E-01	19.01	19.01	0.00E+00	2.30E+00	2.30E+00	0.0575	6.371E+12
Cl-36	2.2849E-03	19.01	19.01	0.00E+00	4.34E-02	4.34E-02	0.0850	2.487E+12
Cm-243	8.6624E-04	19.01	19.01	0.00E+00	1.65E-02	1.65E-02	0.1250	1.949E+12
Cm-244	1.6848E-01	19.01	19.01	0.00E+00	3.20E+00	3.20E+00	0.2250	2.154E+12
Co-60	2.8086E+01	19.01	19.01	0.00E+00	5.34E+02	5.34E+02	0.3750	9.214E+11
Cs-134	3.4148E-04	19.01	19.01	0.00E+00	6.49E-03	6.49E-03	0.5750	1.498E+13
Cs-135	4.3976E-04	19.01	19.01	0.00E+00	8.36E-03	8.36E-03	0.8500	5.726E+11
Cs-137	2.1049E+01	19.01	19.01	0.00E+00	4.00E+02	4.00E+02	1.2500	4.002E+13
Eu-154	1.2500E+00	19.01	19.01	0.00E+00	2.38E+01	2.38E+01	1.7500	1.770E+10
Eu-155	6.8986E-02	19.01	19.01	0.00E+00	1.31E+00	1.31E+00	2.2500	2.099E+08
Fe-55	2.9308E-01	19.01	19.01	0.00E+00	5.57E+00	5.57E+00	2.7500	5.915E+07
H-3	2.4311E-01	19.01	19.01	0.00E+00	4.62E+00	4.62E+00	3.5000	4.733E+04
I-129	1.0618E-05	19.01	19.01	0.00E+00	2.02E-04	2.02E-04	5.0000	2.010E+04
Kr-85	5.9882E-01	19.01	19.01	0.00E+00	1.14E+01	1.14E+01	7.0000	2.302E+03
Np-237	1.5668E-04	19.01	19.01	0.00E+00	2.98E-03	2.98E-03	11.0000	2.634E+02
Pa-231	2.8656E-06	19.01	19.01	0.00E+00	5.45E-05	5.45E-05		
Pb-210	2.3918E-08	19.01	19.01	0.00E+00	4.55E-07	4.55E-07		
Pm-147	1.6900E-02	19.01	19.01	0.00E+00	3.21E-01	3.21E-01		
Pu-238	-8.6120E-01	19.01	0.00	5.14E+00	0.00E+00	5.14E+00		
Pu-239	-4.8440E-02	19.01	0.00	6.22E-01	0.00E+00	6.22E-01		
Pu-240	-3.0095E-01	19.01	0.00	7.94E+01	0.00E+00	7.94E+01		
Pu-241	-1.0411E+02	19.01	0.00	2.04E+02	0.00E+00	2.04E+02		
Pu-242	-1.1381E-04	19.01	0.00	3.44E-03	1.27E-03	3.44E-03		
Ra-226	6.4400E-08	19.01	19.01	0.00E+00	1.22E-06	1.22E-06		
Ra-228	5.9952E-07	19.01	19.01	0.00E+00	1.14E-05	1.14E-05		
Ru-106	8.5526E-07	19.01	19.01	0.00E+00	1.63E-05	1.63E-05		
Se-79	1.9181E-04	19.01	19.01	0.00E+00	3.65E-03	3.65E-03		
Sn-126	1.6671E-04	19.01	19.01	0.00E+00	3.17E-03	3.17E-03		
Sr-90	1.9799E+01	19.01	19.01	0.00E+00	3.76E+02	3.76E+02		
Tc-99	6.7678E-03	19.01	19.01	0.00E+00	1.29E-01	1.29E-01		
Th-229	1.7488E-06	19.01	19.01	0.00E+00	3.32E-05	3.32E-05		
Th-230	5.8704E-06	19.01	19.01	0.00E+00	1.12E-04	1.12E-04		
Th-232	6.0208E-07	19.01	19.01	0.00E+00	1.14E-05	1.14E-05		
Tl-208	8.7573E-05	19.01	19.01	0.00E+00	1.66E-03	1.66E-03		
U-232	2.3706E-04	19.01	19.01	0.00E+00	4.51E-03	4.51E-03		
U-233	3.6128E-04	19.01	19.01	0.00E+00	6.87E-03	6.87E-03		
U-234	1.2788E-02	19.01	19.01	0.00E+00	2.43E-01	2.43E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	5.8772E-04	19.01	19.01	0.00E+00	1.12E-02	1.12E-02	1.87E+01	1.90E+01
U-236	2.3485E-04	19.01	19.01	0.00E+00	4.46E-03	4.46E-03	Total	Total
U-238	1.1741E-04	19.01	19.01	0.00E+00	2.23E-03	2.23E-03		
Y-90	1.9804E+01	19.01	19.01	0.00E+00	3.76E+02	3.76E+02		
Other Radionuclides					1.17E+03	1.17E+03		

**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	U, Th, & Pu	
BOL Enrichment %		0 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		19.01	Nominal burnup set equal to bounding burnup. Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.
Bounding		19.01	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	14.21		601.11
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: ERR (ASSEMBLIES)  
 SNF ID # 68  
 Fuel Units & Descr: 190 - 5 X 5 ROD ARRAY  
 Heavy Metal Mass BOL=5056 66kg EOL=5041 023kg  
 ROD Storage Site INEEL

<sup>1</sup>Fuel decay start date 1966  
 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 35 years

Estimated  
 Canister usage  
 18"x10"  
 10 56

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	9 7360E-05	27,366 64	65,736 58	0 00E+00	2 66E+00	6 40E+00	Avg MeV	
Am-241	2 4345E-04	27,366 64	65,736 58	0 00E+00	6 66E+00	1 60E+01	0 0150	5 424E+15
Am-242m	1 4821E-06	27,366 64	65,736 58	0 00E+00	4 06E-02	9 74E-02	0 0250	1 117E+15
Am-243	3 1152E-07	27,366 64	65,736 58	0 00E+00	8 53E-03	2 05E-02	0 0375	9.545E+14
C-14	9 2432E-05	27,366 64	65,736 58	0 00E+00	2 53E+00	6 08E+00	0 0575	1 043E+15
Cf-252	1 8103E-06	27,366 64	65,736 58	0 00E+00	4 95E-02	1 19E-01	0 0850	6 664E+14
Cm-243	3 0597E-07	27,366 64	65,736 58	0 00E+00	8.37E-03	2 01E-02	0 1250	4 176E+14
Cm-244	1 4149E-05	27,366 64	65,736 58	0 00E+00	3 87E-01	9 30E-01	0.2250	5 976E+14
Co-60	8 7369E-04	27,366 64	65,736 58	0 00E+00	2 39E+01	5 74E+01	0.3750	2 400E+14
Cs-134	2.5601E-05	27,366 64	65,736 58	0 00E+00	7.01E-01	1 68E+00	0.5750	3 664E+15
Cs-135	2 8639E-05	27,366 64	65,736 58	0 00E+00	7.84E-01	1 88E+00	0.8500	6 547E+13
Cs-137	1.4772E+00	27,366 64	65,736 58	0 00E+00	4 04E+04	9 71E+04	1.2500	2 892E+13
Eu-154	8 6025E-03	27,366 64	65,736 58	0 00E+00	2.35E+02	5 65E+02	1 7500	4 511E+12
Eu-155	6 6062E-04	27,366 64	65,736 58	0 00E+00	1 81E+01	4.34E+01	2.2500	1 311E+08
Fe-55	2.3011E-06	27,366 64	65,736 58	0 00E+00	6 30E-02	1.51E-01	2 7500	3.223E+13
H-3	2 1277E-03	27,366 64	65,736 58	0 00E+00	5 82E+01	1.40E+02	3 5000	1.265E+05
I-129	1.5853E-06	27,366 64	65,736 58	0 00E+00	4 34E-02	1 04E-01	5 0000	3.959E+04
Kr-85	6 2625E-02	27,366 64	65,736 58	0 00E+00	1 71E+03	4 12E+03	7 0000	2.882E+03
Np-237	1 2620E-07	27,366 64	65,736 58	0 00E+00	3 45E-03	8 30E-03	11 0000	2.193E+02
Pa-231	1 2017E-04	27,366 64	65,736 58	0 00E+00	3 29E+00	7 90E+00		
Pb-210	1 4247E-08	27,366 64	65,736 58	0 00E+00	3 90E-04	9 37E-04		
Pm-147	2 6224E-04	27,366 64	65,736 58	0 00E+00	7 18E+00	1 72E+01		
Pu-238	4 2477E-04	27,366 64	65,736 58	0 00E+00	1 16E+01	2 79E+01		
Pu-239	2 7519E-05	27,366 64	65,736 58	0 00E+00	7.53E-01	1 81E+00		
Pu-240	1 6184E-05	27,366 64	65,736 58	0 00E+00	4 43E-01	1 06E+00		
Pu-241	1 4695E-03	27,366 64	65,736 58	0 00E+00	4 02E+01	9 66E+01		
Pu-242	4 0831E-08	27,366 64	65,736 58	0 00E+00	1.12E-03	2 68E-03		
Ra-226	2 1423E-08	27,366 64	65,736 58	0 00E+00	5 86E-04	1.41E-03		
Ra-228	4 6236E-06	27,366 64	65,736 58	0 00E+00	1.27E-01	3 04E-01		
Ru-106	4 0208E-11	27,366 64	65,736 58	0 00E+00	1 10E-06	2 64E-06		
Se-79	3.5417E-05	27,366 64	65,736 58	0 00E+00	9 69E-01	2 33E+00		
Sn-126	3 9848E-05	27,366 64	65,736 58	0 00E+00	1 09E+00	2 62E+00		
Sr-90	1.4928E+00	27,366 64	65,736 58	0 00E+00	4 09E+04	9 81E+04		
Tc-99	3.2525E-04	27,366 64	65,736 58	0 00E+00	8 90E+00	2 14E+01		
Th-229	6 4582E-05	27,366 64	65,736 58	0 00E+00	1 77E+00	4.25E+00		
Th-230	1 1432E-06	27,366 64	65,736 58	0 00E+00	3 13E-02	7 52E-02		
Th-232	-9 0328E-08	27,366 64	0 00	5.34E-01	5 32E-01	5 34E-01		
Th-208	1.3964E-02	27,366 64	65,736 58	0 00E+00	3 82E+02	9 18E+02		
U-232	3 7822E-02	27,366 64	65,736 58	0.00E+00	1 04E+03	2 49E+03	<b>Thermal Power</b>	
U-233	-3 3244E-03	27,366 64	0 00	1.80E+03	1 70E+03	1 80E+03	<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>
U-234	8 1769E-04	27,366 64	65,736 58	0 00E+00	2.24E+01	5 38E+01		
U-235	5 7813E-08	27,366 64	65,736 58	3 67E-04	1.95E-03	4.17E-03		
U-236	1 3273E-07	27,366 64	65,736 58	0 00E+00	3.63E-03	8.73E-03		
U-238	-3.1121E-10	27,366 64	0 00	2.35E-04	2.26E-04	2.35E-04		
Y-90	1 4928E+00	27,366 64	65,736 58	0 00E+00	4 09E+04	9 81E+04	<b>Total</b>	<b>Total</b>
Other Radionuclides					4.57E+04	1 10E+05		

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

Template Selection Summary			Basis for Parameter Differences <sup>3</sup>
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons This fuel matches LWBR Template on all but one parameter (cladding) making LWBR a reasonable match.
Fuel Cladding	SST	ZIRC	
BOL HM Constituents	Th and U	Th and U	
BOL Enrichment %	92 94902719	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	27,366.64	15,217.35	Nominal burnup taken directly from SFD (converted to MWd)
Bounding	65 736.58	30 434.70	Bounding burnup taken directly from SFD (converted to MWd)

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.24	0.56	1.00
Bounding	0.58	0.46	

<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: ERR (RODS)  
 SNF ID #: 1057  
 Fuel Units & Descr. 4 - ROD  
 Heavy Metal Mass: BOL=4.293kg EOL=4.242kg  
 ROD Storage Site. INEEL

Fuel decay start date: 1966  
 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 35 years

Estimated  
 Canister usage:  
 18"x10"  
 0 17

Radionuclide	m		x <sub>n</sub>		b		y <sub>n</sub>		Gamma Sources	
	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	9.7360E-05	49.83	99.65	0.00E+00	4.85E-03	9.70E-03	Avg. MeV			
Am-241	2.4345E-04	49.83	99.65	0.00E+00	1.21E-02	2.43E-02	0.0150	8.219E+12		
Am-242m	1.4821E-06	49.83	99.65	0.00E+00	7.38E-05	1.48E-04	0.0250	1.693E+12		
Am-243	3.1152E-07	49.83	99.65	0.00E+00	1.55E-05	3.10E-05	0.0375	1.447E+12		
C-14	9.2432E-05	49.83	99.65	0.00E+00	4.61E-03	9.21E-03	0.0575	1.582E+12		
Cl-36	1.8103E-06	49.83	99.65	0.00E+00	9.02E-05	1.80E-04	0.0850	1.010E+12		
Cm-243	3.0597E-07	49.83	99.65	0.00E+00	1.52E-05	3.05E-05	0.1250	6.330E+11		
Cm-244	1.4149E-05	49.83	99.65	0.00E+00	7.05E-04	1.41E-03	0.2250	9.059E+11		
Co-60	8.7369E-04	49.83	99.65	0.00E+00	4.35E-02	8.71E-02	0.3750	3.638E+11		
Cs-134	2.5601E-05	49.83	99.65	0.00E+00	1.28E-03	2.55E-03	0.5750	5.554E+12		
Cs-135	2.8639E-05	49.83	99.65	0.00E+00	1.43E-03	2.85E-03	0.8500	9.925E+10		
Cs-137	1.4772E+00	49.83	99.65	0.00E+00	7.36E+01	1.47E+02	1.2500	4.384E+10		
Eu-154	8.6025E-03	49.83	99.65	0.00E+00	4.29E-01	8.57E-01	1.7500	6.838E+09		
Eu-155	6.6062E-04	49.83	99.65	0.00E+00	3.29E-02	6.58E-02	2.2500	1.987E+05		
Fe-55	2.3011E-06	49.83	99.65	0.00E+00	1.15E-04	2.29E-04	2.7500	4.886E+10		
H-3	2.1277E-03	49.83	99.65	0.00E+00	1.06E-01	2.12E-01	3.5000	1.840E+02		
I-129	1.5853E-06	49.83	99.65	0.00E+00	7.90E-05	1.58E-04	5.0000	5.768E+01		
Kr-85	6.2625E-02	49.83	99.65	0.00E+00	3.12E+00	6.24E+00	7.0000	4.217E+00		
Np-237	1.2620E-07	49.83	99.65	0.00E+00	6.29E-06	1.26E-05	11.0000	3.229E-01		
Pa-231	1.2017E-04	49.83	99.65	0.00E+00	5.99E-03	1.20E-02				
Pb-210	1.4247E-08	49.83	99.65	0.00E+00	7.10E-07	1.42E-06				
Pm-147	2.6224E-04	49.83	99.65	0.00E+00	1.31E-02	2.61E-02				
Pu-238	4.2477E-04	49.83	99.65	0.00E+00	2.12E-02	4.23E-02				
Pu-239	2.7519E-05	49.83	99.65	0.00E+00	1.37E-03	2.74E-03				
Pu-240	1.6184E-05	49.83	99.65	0.00E+00	8.06E-04	1.61E-03				
Pu-241	1.4695E-03	49.83	99.65	0.00E+00	7.32E-02	1.46E-01				
Pu-242	4.0831E-08	49.83	99.65	0.00E+00	2.03E-06	4.07E-06				
Ra-226	2.1423E-08	49.83	99.65	0.00E+00	1.07E-06	2.13E-06				
Ra-228	4.6236E-06	49.83	99.65	0.00E+00	2.30E-04	4.61E-04				
Ru-106	4.0208E-11	49.83	99.65	0.00E+00	2.00E-09	4.01E-09				
Se-79	3.5417E-05	49.83	99.65	0.00E+00	1.76E-03	3.53E-03				
Sn-126	3.9848E-05	49.83	99.65	0.00E+00	1.99E-03	3.97E-03				
Sr-90	1.4928E+00	49.83	99.65	0.00E+00	7.44E+01	1.49E+02				
Tc-99	3.2525E-04	49.83	99.65	0.00E+00	1.62E-02	3.24E-02				
Th-229	6.4582E-05	49.83	99.65	0.00E+00	3.22E-03	6.44E-03				
Th-230	1.1432E-06	49.83	99.65	0.00E+00	5.70E-05	1.14E-04				
Th-232	-9.0328E-08	49.83	0.00	4.53E-04	4.49E-04	4.53E-04				
Th-208	1.3964E-02	49.83	99.65	0.00E+00	6.96E-01	1.39E+00				
U-232	3.7822E-02	49.83	99.65	0.00E+00	1.88E+00	3.77E+00				
U-233	-3.3244E-03	49.83	0.00	1.52E+00	1.36E+00	1.52E+00				
U-234	8.1769E-04	49.83	99.65	0.00E+00	4.07E-02	8.15E-02				
U-235	5.7813E-08	49.83	99.65	3.12E-07	3.19E-06	6.07E-06				
U-236	1.3273E-07	49.83	99.65	0.00E+00	6.61E-06	1.32E-05				
U-238	-3.1121E-10	49.83	0.00	1.99E-07	1.84E-07	1.99E-07				
Y-90	1.4928E+00	49.83	99.65	0.00E+00	7.44E+01	1.49E+02				
Other Radionuclides					8.31E+01	1.66E+02				

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.37E+00	2.70E+00
Total	Total

**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 LWBR Template on all but one parameter (cladding) making LWBR a reasonable match.
BOL HM Constituents:	Th and U	Th and U	
BOL Enrichment %:	93.0868939	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	28.26	49.83	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding	45.49	99.65	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.52	1.76	1.00
Bounding	1.04	2.19	

<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 ESSOR (UALX-HEU) ITALY  
 SNF ID # 762  
 Fuel Units & Descr 12 - 18 CURVED PLATES  
 Heavy Metal Mass BOL=7.8kg EOL=5.73kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date 2006  
 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 5 years

Estimated  
 Canister usage:  
 18"x10"  
 1.00

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	1.4545E-10	1,960.33	3,920.66	0.00E+00	2.85E-07	5.70E-07	0.0150	7.564E+14
Am-241	1.1190E-03	1,960.33	3,920.66	0.00E+00	2.19E+00	4.39E+00	0.0250	1.630E+14
Am-242m	4.5425E-07	1,960.33	3,920.66	0.00E+00	8.90E-04	1.78E-03	0.0375	1.504E+14
Am-243	1.4921E-06	1,960.33	3,920.66	0.00E+00	2.93E-03	5.85E-03	0.0575	1.479E+14
C-14	5.7244E-09	1,960.33	3,920.66	0.00E+00	1.12E-05	2.24E-05	0.0850	9.426E+13
Cl-36	1.3124E-32	1,960.33	3,920.66	0.00E+00	2.57E-29	5.15E-29	0.1250	8.163E+13
Cm-243	2.3676E-07	1,960.33	3,920.66	0.00E+00	4.64E-04	9.28E-04	0.2250	7.989E+13
Cm-244	5.2042E-05	1,960.33	3,920.66	0.00E+00	1.02E-01	2.04E-01	0.3750	3.867E+13
Co-60	3.8208E-05	1,960.33	3,920.66	0.00E+00	7.49E-02	1.50E-01	0.5750	5.312E+14
Cs-134	4.8693E-01	1,960.33	3,920.66	0.00E+00	9.55E+02	1.91E+03	0.8500	7.439E+13
Cs-135	3.4477E-06	1,960.33	3,920.66	0.00E+00	6.76E-03	1.35E-02	1.2500	1.384E+13
Cs-137	2.8731E+00	1,960.33	3,920.66	0.00E+00	5.63E+03	1.13E+04	1.7500	5.804E+11
Eu-154	8.2053E-02	1,960.33	3,920.66	0.00E+00	1.61E+02	3.22E+02	2.2500	1.217E+12
Eu-155	3.9134E-02	1,960.33	3,920.66	0.00E+00	7.67E+01	1.53E+02	2.7500	7.004E+09
Fe-55	6.7429E-03	1,960.33	3,920.66	0.00E+00	1.32E+01	2.64E+01	3.5000	7.767E+08
H-3	1.0599E-02	1,960.33	3,920.66	0.00E+00	2.09E+01	4.16E+01	5.0000	2.323E+03
I-129	7.5300E-07	1,960.33	3,920.66	0.00E+00	1.48E-03	2.95E-03	7.0000	2.589E+02
Kr-85	2.8595E-01	1,960.33	3,920.66	0.00E+00	5.61E+02	1.12E+03	11.0000	2.918E+01
Np-237	9.5479E-06	1,960.33	3,920.66	0.00E+00	1.87E-02	3.74E-02		
Pa-231	8.9297E-10	1,960.33	3,920.66	0.00E+00	1.75E-06	3.50E-06		
Pb-210	3.7609E-12	1,960.33	3,920.66	0.00E+00	7.37E-09	1.47E-08		
Pm-147	2.5452E+00	1,960.33	3,920.66	0.00E+00	4.99E+03	9.98E+03		
Pu-238	2.0550E-02	1,960.33	3,920.66	0.00E+00	4.03E+01	8.06E+01		
Pu-239	4.2838E-04	1,960.33	3,920.66	0.00E+00	8.40E-01	1.68E+00		
Pu-240	2.4401E-04	1,960.33	3,920.66	0.00E+00	4.78E-01	9.57E-01		
Pu-241	6.8764E-02	1,960.33	3,920.66	0.00E+00	1.35E+02	2.70E+02		
Pu-242	3.6329E-07	1,960.33	3,920.66	0.00E+00	7.12E-04	1.42E-03		
Ra-226	3.8045E-11	1,960.33	3,920.66	0.00E+00	7.46E-08	1.49E-07		
Ra-228	2.9902E-15	1,960.33	3,920.66	0.00E+00	5.86E-12	1.17E-11		
Ru-106	1.9055E-01	1,960.33	3,920.66	0.00E+00	3.74E+02	7.47E+02		
Se-79	1.2936E-05	1,960.33	3,920.66	0.00E+00	2.54E-02	5.07E-02		
Sn-126	1.1574E-05	1,960.33	3,920.66	0.00E+00	2.27E-02	4.54E-02		
Sr-90	2.7505E+00	1,960.33	3,920.66	0.00E+00	5.39E+03	1.08E+04		
Tc-99	4.2239E-04	1,960.33	3,920.66	0.00E+00	8.28E-01	1.66E+00		
Th-229	1.8848E-12	1,960.33	3,920.66	0.00E+00	3.69E-09	7.39E-09		
Th-230	1.7042E-08	1,960.33	3,920.66	0.00E+00	3.34E-05	6.68E-05		
Th-232	7.8132E-15	1,960.33	3,920.66	0.00E+00	1.53E-11	3.06E-11		
Tl-208	4.4063E-08	1,960.33	3,920.66	0.00E+00	8.64E-05	1.73E-04		
U-232	1.3151E-07	1,960.33	3,920.66	0.00E+00	2.58E-04	5.16E-04		
U-233	1.9564E-09	1,960.33	3,920.66	0.00E+00	3.84E-06	7.67E-06		
U-234	1.8371E-04	1,960.33	3,920.66	0.00E+00	3.60E-01	7.20E-01		
U-235	-2.7235E-06	1,960.33	0.00	1.56E-02	1.03E-02	1.56E-02		
U-236	1.5493E-05	1,960.33	3,920.66	0.00E+00	3.04E-02	6.07E-02		
U-238	-4.2851E-09	1,960.33	0.00	1.96E-04	1.87E-04	1.96E-04		
Y-90	2.7505E+00	1,960.33	3,920.66	0.00E+00	5.39E+03	1.08E+04		
Other Radionuclides					1.01E+04	2.02E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9.94E+01	1.99E+02
Total	Total

**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 %:	92.52828863	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,960.33	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		3,920.66	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.80		1.02
Bounding	1.60		

<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: FMRB (GERMANY)  
 SNF ID #: 577  
 Fuel Units & Descr: 92 - MTR TYPE  
 Heavy Metal Mass: BOL=13 138kg EOL=11 666kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 1994  
 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"  
 3 83

Radionuclide	m		x <sub>n</sub>		x <sub>b</sub>		b		y <sub>a</sub>		y <sub>b</sub>		Gamma Sources	
	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	1,394 01	2,788 03	0 00E+00	6 39E-07	1 28E-06	Avg, MeV							
Am-241	1 7832E-03	1,394 01	2,788 03	0 00E+00	2 49E+00	4 97E+00	0.0150	3.326E+14						
Am-242m	4 3410E-07	1,394 01	2,788 03	0 00E+00	6 05E-04	1 21E-03	0 0250	6.936E+13						
Am-243	1 4907E-06	1,394 01	2,788 03	0 00E+00	2 08E-03	4 16E-03	0 0375	6 057E+13						
C-14	5 7162E-09	1,394 01	2,788 03	0 00E+00	7 97E-06	1 59E-05	0 0575	6.458E+13						
Cf-252	1 3124E-32	1,394 01	2,788 03	0 00E+00	1 83E-29	3 66E-29	0 0850	3 912E+13						
Cm-243	1 8568E-07	1,394 01	2,788 03	0 00E+00	2 59E-04	5 18E-04	0 1250	2.682E+13						
Cm-244	3 5512E-05	1,394 01	2,788 03	0 00E+00	4 95E-02	9 90E-02	0 2250	3 370E+13						
Co-60	1 0261E-05	1,394 01	2,788 03	0 00E+00	1 43E-02	2 86E-02	0 3750	1 476E+13						
Cs-134	1 6931E-02	1,394 01	2,788 03	0 00E+00	2 36E+01	4 72E+01	0 5750	2.396E+14						
Cs-135	3 4477E-06	1,394 01	2,788 03	0 00E+00	4 81E-03	9 61E-03	0 8500	5 693E+12						
Cs-137	2 2800E+00	1,394 01	2,788 03	0 00E+00	3.18E+03	6 36E+03	1 2500	2 876E+12						
Eu-154	3 6656E-02	1,394 01	2,788 03	0 00E+00	5 11E+01	1 02E+02	1 7500	1 205E+11						
Eu-155	9 6841E-03	1,394 01	2,788 03	0 00E+00	1 35E+01	2 70E+01	2 2500	1 507E+08						
Fe-55	4 6977E-04	1,394 01	2,788 03	0 00E+00	6 55E-01	1 31E+00	2 7500	9 059E+06						
H-3	6 0485E-03	1,394 01	2,788 03	0 00E+00	8 43E+00	1 69E+01	3 5000	5 758E+05						
I-129	7 5300E-07	1,394 01	2,788 03	0 00E+00	1.05E-03	2 10E-03	5 0000	1 333E+03						
Kr-85	1 4989E-01	1,394 01	2,788 03	0 00E+00	2 09E+02	4 18E+02	7 0000	1 476E+02						
Np-237	9 5534E-06	1,394 01	2,788 03	0 00E+00	1.33E-02	2 66E-02	11 0000	1 657E+01						
Pa-231	1 6550E-09	1,394 01	2,788 03	0 00E+00	2 31E-06	4 61E-06								
Pb-210	2 6631E-11	1,394 01	2,788 03	0 00E+00	3 71E-08	7 42E-08								
Pm-147	1 8156E-01	1,394 01	2,788 03	0 00E+00	2 53E+02	5 06E+02								
Pu-238	1 8990E-02	1,394 01	2,788 03	0 00E+00	2 65E+01	5 29E+01								
Pu-239	4 2838E-04	1,394 01	2,788 03	0 00E+00	5 97E-01	1 19E+00								
Pu-240	2 4379E-04	1,394 01	2,788 03	0 00E+00	3 40E-01	6 80E-01								
Pu-241	4 2511E-02	1,394 01	2,788 03	0 00E+00	5 93E+01	1.19E+02								
Pu-242	3 6329E-07	1,394 01	2,788 03	0 00E+00	5 06E-04	1 01E-03								
Ra-226	1 4725E-10	1,394 01	2,788 03	0 00E+00	2 05E-07	4 11E-07								
Ra-228	8 9760E-15	1,394 01	2,788 03	0 00E+00	1.25E-11	2 50E-11								
Ru-106	1 9752E-04	1,394 01	2,788 03	0 00E+00	2.75E-01	5 51E-01								
Se-79	1 2933E-05	1,394 01	2,788 03	0 00E+00	1 80E-02	3 61E-02								
Sn-126	1.1574E-05	1,394 01	2,788 03	0 00E+00	1 61E-02	3.23E-02								
Sr-90	2.1680E+00	1,394 01	2,788 03	0 00E+00	3 02E+03	6 04E+03								
Tc-99	4.2239E-04	1,394 01	2,788 03	0 00E+00	5 89E-01	1 18E+00								
Th-229	3.9270E-12	1,394 01	2,788 03	0 00E+00	5 47E-09	1 09E-08								
Th-230	3 3578E-08	1,394 01	2,788 03	0 00E+00	4 68E-05	9 36E-05								
Th-232	1 5452E-14	1,394 01	2,788 03	0 00E+00	2.15E-11	4 31E-11								
Th-208	4 6705E-08	1,394 01	2,788 03	0 00E+00	6 51E-05	1 30E-04								
U-232	1 3045E-07	1,394 01	2,788 03	0 00E+00	1 82E-04	3 64E-04								
U-233	2 3739E-09	1,394 01	2,788 03	0 00E+00	3 31E-06	6 62E-06								
U-234	1 8423E-04	1,394 01	2,788 03	0 00E+00	2 57E-01	5 14E-01								
U-235	-2.7235E-06	1,394 01	0 00	2.59E-02	2 21E-02	2 59E-02								
U-236	1 5493E-05	1,394 01	2,788 03	0 00E+00	2 16E-02	4 32E-02								
U-238	-4 2851E-09	1,394 01	0 00	3 86E-04	3 80E-04	3 86E-04								
Y-90	2.1686E+00	1,394 01	2,788 03	0 00E+00	3 02E+03	6 05E+03								
Other Radionuclides					3 03E+03	6 06E+03								

**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 %	91.25787542	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1 394 01	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		2 788 03	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 34		1 01
Bounding	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: FRG-1 (U3S2 LEU) GERMANY  
 SNF ID #: 741  
 Fuel Units & Descr: 109 - MTR TYPE  
 Heavy Metal Mass: BOL=161.56kg, EOL=150.932kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 1994  
 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"  
 454

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	
							Photon Energy Avg MeV	Total Photons/sec (bounding)
Ac-227	4.5861E-10	10,064.45	20,128.90	0.00E+00	4.62E-06	9.23E-06		
Am-241	1.7832E-03	10,064.45	20,128.90	0.00E+00	1.79E+01	3.59E+01	0.0150	2.401E+15
Am-242m	4.3410E-07	10,064.45	20,128.90	0.00E+00	4.37E-03	8.74E-03	0.0250	5.008E+14
Am-243	1.4907E-06	10,064.45	20,128.90	0.00E+00	1.50E-02	3.00E-02	0.0375	4.373E+14
C-14	5.7162E-09	10,064.45	20,128.90	0.00E+00	5.75E-05	1.15E-04	0.0575	4.663E+14
Cl-36	1.3124E-32	10,064.45	20,128.90	0.00E+00	1.32E-28	2.64E-28	0.0850	2.824E+14
Cm-243	1.8568E-07	10,064.45	20,128.90	0.00E+00	1.87E-03	3.74E-03	0.1250	1.936E+14
Cm-244	3.5512E-05	10,064.45	20,128.90	0.00E+00	3.57E-01	7.15E-01	0.2250	2.433E+14
Co-60	1.0261E-05	10,064.45	20,128.90	0.00E+00	1.03E-01	2.07E-01	0.3750	1.066E+14
Cs-134	1.6931E-02	10,064.45	20,128.90	0.00E+00	1.70E+02	3.41E+02	0.6750	1.730E+15
Cs-135	3.4477E-06	10,064.45	20,128.90	0.00E+00	3.47E-02	6.94E-02	0.8500	4.110E+13
Cs-137	2.2800E+00	10,064.45	20,128.90	0.00E+00	2.29E+04	4.59E+04	1.2500	2.076E+13
Eu-154	3.6856E-02	10,064.45	20,128.90	0.00E+00	3.69E+02	7.38E+02	1.7500	8.699E+11
Eu-155	9.6841E-03	10,064.45	20,128.90	0.00E+00	9.75E+01	1.95E+02	2.2500	1.088E+09
Fe-55	4.6977E-04	10,064.45	20,128.90	0.00E+00	4.73E+00	9.46E+00	2.7500	6.540E+07
H-3	6.0485E-03	10,064.45	20,128.90	0.00E+00	6.09E+01	1.22E+02	3.5000	4.157E+06
I-129	7.5300E-07	10,064.45	20,128.90	0.00E+00	7.58E-03	1.52E-02	5.0000	9.713E+03
Kr-85	1.4989E-01	10,064.45	20,128.90	0.00E+00	1.51E+03	3.02E+03	7.0000	1.076E+03
Np-237	9.5534E-06	10,064.45	20,128.90	0.00E+00	9.61E-02	1.92E-01	11.0000	1.209E+02
Pa-231	1.6550E-09	10,064.45	20,128.90	0.00E+00	1.67E-05	3.33E-05		
Pb-210	2.6631E-11	10,064.45	20,128.90	0.00E+00	2.68E-07	5.36E-07		
Pm-147	1.8156E-01	10,064.45	20,128.90	0.00E+00	1.83E+03	3.65E+03		
Pu-238	1.8990E-02	10,064.45	20,128.90	0.00E+00	1.91E+02	3.82E+02		
Pu-239	4.2838E-04	10,064.45	20,128.90	0.00E+00	4.31E+00	8.62E+00		
Pu-240	2.4379E-04	10,064.45	20,128.90	0.00E+00	2.45E+00	4.91E+00		
Pu-241	4.2511E-02	10,064.45	20,128.90	0.00E+00	4.28E+02	8.56E+02		
Pu-242	3.6329E-07	10,064.45	20,128.90	0.00E+00	3.66E-03	7.31E-03		
Ra-226	1.4725E-10	10,064.45	20,128.90	0.00E+00	1.48E-06	2.96E-06		
Ra-228	8.9760E-15	10,064.45	20,128.90	0.00E+00	9.03E-11	1.81E-10		
Ru-106	1.9752E-04	10,064.45	20,128.90	0.00E+00	1.99E+00	3.98E+00		
Se-79	1.2933E-05	10,064.45	20,128.90	0.00E+00	1.30E-01	2.60E-01		
Sn-126	1.1574E-05	10,064.45	20,128.90	0.00E+00	1.16E-01	2.33E-01		
Sr-90	2.1680E+00	10,064.45	20,128.90	0.00E+00	2.18E+04	4.36E+04		
Tc-99	4.2239E-04	10,064.45	20,128.90	0.00E+00	4.25E+00	8.50E+00		
Th-229	3.9270E-12	10,064.45	20,128.90	0.00E+00	3.95E-08	7.90E-08		
Th-230	3.3578E-08	10,064.45	20,128.90	0.00E+00	3.38E-04	6.76E-04		
Th-232	1.5452E-14	10,064.45	20,128.90	0.00E+00	1.56E-10	3.11E-10		
Th-208	4.6705E-08	10,064.45	20,128.90	0.00E+00	4.70E-04	9.40E-04		
U-232	1.3045E-07	10,064.45	20,128.90	0.00E+00	1.31E-03	2.63E-03		
U-233	2.3739E-09	10,064.45	20,128.90	0.00E+00	2.39E-05	4.78E-05		
U-234	1.8423E-04	10,064.45	20,128.90	0.00E+00	1.85E+00	3.71E+00		
U-235	-2.7235E-06	10,064.45	0.00	6.92E-02	4.18E-02	6.92E-02		
U-236	1.5493E-05	10,064.45	20,128.90	0.00E+00	1.56E-01	3.12E-01		
U-238	-4.2851E-09	10,064.45	0.00	4.35E-02	4.35E-02	4.35E-02		
Y-90	2.1686E+00	10,064.45	20,128.90	0.00E+00	2.18E+04	4.37E+04		
Other Radionuclides					2.19E+04	4.38E+04		
							<b>Thermal Power</b>	
							<b>Nominal Heat Output (Watts)</b>	<b>Bounding Heat Output (Watts)</b>
							2.72E+02	5.45E+02
							<b>Total</b>	<b>Total</b>

**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 ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	19.81106509	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		10,064.45	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		20,128.90	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.20		1.00
Bounding	0.40		

<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 FRG-1 (UALX HEU) GERMANY  
 SNF ID #: 742  
 Fuel Units & Descr: 141 - MTR TYPE  
 Heavy Metal Mass BOL=23.42kg EOL=16.539kg  
 ROD Storage Site: SRS

Fuel decay start date: 1995  
 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: 15 years

Estimated  
 Canister usage  
 18"x10"  
 5 BR

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	4.5861E-10	6,516.25	13,032.50	0.00E+00	2.99E-06	5.98E-06	0.0150	1.555E+15
Am-241	1.7832E-03	6,516.25	13,032.50	0.00E+00	1.16E+01	2.32E+01	0.0250	3.242E+14
Am-242m	4.3410E-07	6,516.25	13,032.50	0.00E+00	2.83E-03	5.66E-03	0.0375	2.831E+14
Am-243	1.4907E-06	6,516.25	13,032.50	0.00E+00	9.71E-03	1.94E-02	0.0575	3.019E+14
C-14	5.7162E-09	6,516.25	13,032.50	0.00E+00	3.72E-05	7.45E-05	0.0850	1.829E+14
Cl-36	1.3124E-32	6,516.25	13,032.50	0.00E+00	8.55E-29	1.71E-28	0.1250	1.254E+14
Cm-243	1.8568E-07	6,516.25	13,032.50	0.00E+00	1.21E-03	2.42E-03	0.2250	1.575E+14
Cm-244	3.5512E-05	6,516.25	13,032.50	0.00E+00	2.31E-01	4.63E-01	0.3750	6.902E+13
Co-60	1.0261E-05	6,516.25	13,032.50	0.00E+00	6.69E-02	1.34E-01	0.5750	1.120E+15
Cs-134	1.6931E-02	6,516.25	13,032.50	0.00E+00	1.10E+02	2.21E+02	0.8500	2.661E+13
Cs-135	3.4477E-06	6,516.25	13,032.50	0.00E+00	2.25E-02	4.49E-02	1.2500	1.344E+13
Cs-137	2.2800E+00	6,516.25	13,032.50	0.00E+00	1.49E+04	2.97E+04	1.7500	5.632E+11
Eu-154	3.6656E-02	6,516.25	13,032.50	0.00E+00	2.39E+02	4.78E+02	2.2500	7.046E+08
Eu-155	9.6841E-03	6,516.25	13,032.50	0.00E+00	6.31E+01	1.26E+02	2.7500	4.235E+07
Fe-55	4.6977E-04	6,516.25	13,032.50	0.00E+00	3.06E+00	6.12E+00	3.5000	2.691E+06
H-3	6.0485E-03	6,516.25	13,032.50	0.00E+00	3.94E+01	7.88E+01	5.0000	6.225E+03
I-129	7.5300E-07	6,516.25	13,032.50	0.00E+00	4.91E-03	9.81E-03	7.0000	6.894E+02
Kr-85	1.4989E-01	6,516.25	13,032.50	0.00E+00	9.77E+02	1.95E+03	11.0000	7.741E+01
Np-237	9.5534E-06	6,516.25	13,032.50	0.00E+00	6.23E-02	1.25E-01		
Pa-231	1.6550E-09	6,516.25	13,032.50	0.00E+00	1.08E-05	2.16E-05		
Pb-210	2.6631E-11	6,516.25	13,032.50	0.00E+00	1.74E-07	3.47E-07		
Pm-147	1.8156E-01	6,516.25	13,032.50	0.00E+00	1.18E+03	2.37E+03		
Pu-238	1.8990E-02	6,516.25	13,032.50	0.00E+00	1.24E+02	2.47E+02		
Pu-239	4.2838E-04	6,516.25	13,032.50	0.00E+00	2.79E+00	5.58E+00		
Pu-240	2.4379E-04	6,516.25	13,032.50	0.00E+00	1.59E+00	3.18E+00		
Pu-241	4.2511E-02	6,516.25	13,032.50	0.00E+00	2.77E+02	5.54E+02		
Pu-242	3.6329E-07	6,516.25	13,032.50	0.00E+00	2.37E-03	4.73E-03		
Ra-226	1.4725E-10	6,516.25	13,032.50	0.00E+00	9.60E-07	1.92E-06		
Ra-228	8.9760E-15	6,516.25	13,032.50	0.00E+00	5.85E-11	1.17E-10		
Ru-106	1.9752E-04	6,516.25	13,032.50	0.00E+00	1.29E+00	2.57E+00		
Se-79	1.2933E-05	6,516.25	13,032.50	0.00E+00	8.43E-02	1.69E-01		
Sn-126	1.1574E-05	6,516.25	13,032.50	0.00E+00	7.54E-02	1.51E-01		
Sr-90	2.1680E+00	6,516.25	13,032.50	0.00E+00	1.41E+04	2.83E+04		
Tc-99	4.2239E-04	6,516.25	13,032.50	0.00E+00	2.75E+00	5.50E+00		
Th-229	3.9270E-12	6,516.25	13,032.50	0.00E+00	2.56E-08	5.12E-08		
Th-230	3.3578E-08	6,516.25	13,032.50	0.00E+00	2.19E-04	4.38E-04		
Th-232	1.5452E-14	6,516.25	13,032.50	0.00E+00	1.01E-10	2.01E-10		
Ti-208	4.6705E-08	6,516.25	13,032.50	0.00E+00	3.04E-04	6.09E-04		
U-232	1.3045E-07	6,516.25	13,032.50	0.00E+00	8.50E-04	1.70E-03		
U-233	2.3739E-09	6,516.25	13,032.50	0.00E+00	1.55E-05	3.09E-05		
U-234	1.8423E-04	6,516.25	13,032.50	0.00E+00	1.20E+00	2.40E+00		
U-235	-2.7235E-06	6,516.25	0.00	4.70E-02	2.92E-02	4.70E-02		
U-236	1.5493E-05	6,516.25	13,032.50	0.00E+00	1.01E-01	2.02E-01		
U-238	-4.2851E-09	6,516.25	0.00	5.63E-04	5.35E-04	5.63E-04		
Y-90	2.1686E+00	6,516.25	13,032.50	0.00E+00	1.41E+04	2.83E+04		
Other Radionuclides					1.42E+04	2.83E+04		

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

<b>Template Selection Summary</b>			<b>Basis for Parameter Differences*</b>
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92.84381755	60 to 100	
<b>Burnup Summary (MWd)<sup>2</sup></b>			<b>Basis for burnup used in estimate:</b>
	From SFD	Estimated	
Nominal		6,516.25	
Bounding		13,032.50	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
<b>Checks</b>			<b>Estimated EOL HM/Given EOL HM</b>
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.88		
Bounding	1.77		1.02

\*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: FRJ (UALX-HEU) GERMANY  
 SNF ID #: 933  
 Fuel Units & Descr: 195 - CONCENTRIC TUBES  
 Heavy Metal Mass: BOL=39 312kg; EOL=26.871kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 1995  
 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: 15 years

Estimated  
 Canister usage  
 18"x10"  
 5.42

**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
	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	2.1567E-10	11,459.44	22,918.88	0.00E+00	2.47E-06	4.94E-06	Avg. MeV	
Am-241	7.1264E-03	11,459.44	22,918.88	0.00E+00	8.17E+01	1.63E+02	0.0150	2.740E+15
Am-242m	1.4010E-06	11,459.44	22,918.88	0.00E+00	1.61E-02	3.21E-02	0.0250	5.663E+14
Am-243	3.7114E-05	11,459.44	22,918.88	0.00E+00	4.25E-01	8.51E-01	0.0375	5.074E+14
C-14	2.6476E-08	11,459.44	22,918.88	0.00E+00	3.03E-04	6.07E-04	0.0575	5.316E+14
Cl-36	4.4441E-31	11,459.44	22,918.88	0.00E+00	5.09E-27	1.02E-26	0.0850	3.245E+14
Cm-243	6.4399E-06	11,459.44	22,918.88	0.00E+00	7.38E-02	1.48E-01	0.1250	2.357E+14
Cm-244	5.6367E-03	11,459.44	22,918.88	0.00E+00	6.46E+01	1.29E+02	0.2250	2.776E+14
Co-60	9.3864E-05	11,459.44	22,918.88	0.00E+00	1.08E+00	2.15E+00	0.3750	1.206E+14
Cs-134	5.7047E-02	11,459.44	22,918.88	0.00E+00	6.54E+02	1.31E+03	0.5750	2.020E+15
Cs-135	4.2564E-06	11,459.44	22,918.88	0.00E+00	4.88E-02	9.76E-02	0.8500	9.318E+13
Cs-137	2.2855E+00	11,459.44	22,918.88	0.00E+00	2.62E+04	5.24E+04	1.2500	4.403E+13
Eu-154	7.7704E-02	11,459.44	22,918.88	0.00E+00	8.90E+02	1.78E+03	1.7500	1.536E+12
Eu-155	2.8736E-02	11,459.44	22,918.88	0.00E+00	3.29E+02	6.59E+02	2.2500	1.340E+09
Fe-55	5.1379E-03	11,459.44	22,918.88	0.00E+00	5.89E+01	1.18E+02	2.7500	8.390E+07
H-3	6.1239E-03	11,459.44	22,918.88	0.00E+00	7.02E+01	1.40E+02	3.5000	7.370E+06
I-129	6.6403E-07	11,459.44	22,918.88	0.00E+00	7.61E-03	1.52E-02	5.0000	8.266E+05
Kr-85	1.4927E-01	11,459.44	22,918.88	0.00E+00	1.71E+03	3.42E+03	7.0000	9.495E+04
Np-237	3.1525E-05	11,459.44	22,918.88	0.00E+00	3.61E-01	7.23E-01	11.0000	1.088E+04
Pa-231	7.8676E-10	11,459.44	22,918.88	0.00E+00	9.02E-06	1.80E-05		
Pb-210	6.1847E-12	11,459.44	22,918.88	0.00E+00	7.09E-08	1.42E-07		
Pm-147	9.1373E-02	11,459.44	22,918.88	0.00E+00	1.05E+03	2.09E+03		
Pu-238	1.5978E-01	11,459.44	22,918.88	0.00E+00	1.83E+03	3.66E+03		
Pu-239	6.9502E-04	11,459.44	22,918.88	0.00E+00	7.96E+00	1.59E+01		
Pu-240	3.7424E-04	11,459.44	22,918.88	0.00E+00	4.29E+00	8.58E+00		
Pu-241	1.7090E-01	11,459.44	22,918.88	0.00E+00	1.96E+03	3.92E+03		
Pu-242	3.0911E-06	11,459.44	22,918.88	0.00E+00	3.54E-02	7.08E-02		
Ra-226	3.4848E-11	11,459.44	22,918.88	0.00E+00	3.99E-07	7.99E-07		
Ra-228	9.6173E-15	11,459.44	22,918.88	0.00E+00	1.10E-10	2.20E-10		
Ru-106	2.2789E-04	11,459.44	22,918.88	0.00E+00	2.61E+00	5.22E+00		
Se-79	1.2339E-05	11,459.44	22,918.88	0.00E+00	1.41E-01	2.83E-01		
Sr-126	1.0194E-05	11,459.44	22,918.88	0.00E+00	1.17E-01	2.34E-01		
Sr-90	2.1476E+00	11,459.44	22,918.88	0.00E+00	2.46E+04	4.92E+04		
Tc-99	3.8056E-04	11,459.44	22,918.88	0.00E+00	4.36E+00	8.72E+00		
Th-229	3.3026E-12	11,459.44	22,918.88	0.00E+00	3.78E-08	7.57E-08		
Th-230	8.2503E-09	11,459.44	22,918.88	0.00E+00	9.45E-05	1.89E-04		
Th-232	1.6586E-14	11,459.44	22,918.88	0.00E+00	1.90E-10	3.80E-10		
Th-208	4.8827E-08	11,459.44	22,918.88	0.00E+00	5.60E-04	1.12E-03		
U-232	1.3821E-07	11,459.44	22,918.88	0.00E+00	1.58E-03	3.17E-03		
U-233	3.0790E-09	11,459.44	22,918.88	0.00E+00	3.53E-05	7.06E-05		
U-234	4.9915E-05	11,459.44	22,918.88	0.00E+00	5.72E-01	1.14E+00		
U-235	-2.8661E-06	11,459.44	0.00	6.79E-02	3.50E-02	6.79E-02		
U-236	1.6701E-05	11,459.44	22,918.88	0.00E+00	1.91E-01	3.83E-01		
U-238	-9.4194E-09	11,459.44	0.00	2.66E-03	2.55E-03	2.66E-03		
Y-90	2.1482E+00	11,459.44	22,918.88	0.00E+00	2.46E+04	4.92E+04		
Other Radionuclides					2.51E+04	5.02E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.76E+02	7.51E+02
Total	Total

**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	
	79.89992512	40 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		11,459.44	
		22,918.88	

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	
Bounding	0.67		
	1.34		

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**

<b>Fuel Name</b>	FRJ (UALX-MEU) GERMANY	<b>Fuel decay start date</b>	1993
<b>SNF ID #</b>	1000	<b>Estimates as of</b>	2010
<b>Fuel Units &amp; Descr</b>	10 - CONCENTRIC TUBES	<b>Template</b>	HFBR (Heavy Water, Alum, 40 to 100% U)
<b>Heavy Metal Mass</b>	BOL=3.781kg; EOL=3.338kg	<b>Template Burnup(MWd)</b>	164.6
<b>ROD Storage Site</b>	SRS	<b>Template BOL Heavy Metal Mass (MT)</b>	0.000377
		<b>Template Decay Time</b>	15 years

Estimated  
Canister usage:  
18"x10"  
0.28

Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) <sup>2</sup>	Bounding Fuel Burnup (MWd) <sup>2</sup>	Initial Activity (Ci)	Nominal Fuel Inventones(Ci)	Bounding Fuel Inventones(Ci)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.1567E-10	408.05	816.10	0.00E+00	8.80E-08	1.76E-07	Avg MeV	
Am-241	7.1264E-03	408.05	816.10	0.00E+00	2.91E+00	5.82E+00	0.0150	9.756E+13
Am-242m	1.4010E-06	408.05	816.10	0.00E+00	5.72E-04	1.14E-03	0.0250	2.017E+13
Am-243	3.7114E-05	408.05	816.10	0.00E+00	1.51E-02	3.03E-02	0.0375	1.807E+13
C-14	2.6476E-08	408.05	816.10	0.00E+00	1.08E-05	2.16E-05	0.0575	1.893E+13
Cf-252	4.4441E-31	408.05	816.10	0.00E+00	1.81E-28	3.63E-28	0.0850	1.156E+13
Cm-243	6.4399E-06	408.05	816.10	0.00E+00	2.63E-03	5.26E-03	0.1250	8.394E+12
Cm-244	5.6367E-03	408.05	816.10	0.00E+00	2.30E+00	4.60E+00	0.2250	9.884E+12
Co-60	9.3864E-05	408.05	816.10	0.00E+00	3.83E-02	7.66E-02	0.3750	4.293E+12
Cs-134	5.7047E-02	408.05	816.10	0.00E+00	2.33E+01	4.66E+01	0.5750	7.192E+13
Cs-135	4.2564E-06	408.05	816.10	0.00E+00	1.74E-03	3.47E-03	0.8500	3.318E+12
Cs-137	2.2855E+00	408.05	816.10	0.00E+00	9.33E+02	1.87E+03	1.2500	1.568E+12
Eu-154	7.7704E-02	408.05	816.10	0.00E+00	3.17E+01	6.34E+01	1.7500	5.469E+10
Eu-155	2.8736E-02	408.05	816.10	0.00E+00	1.17E+01	2.35E+01	2.2500	4.771E+07
Fe-55	5.1379E-03	408.05	816.10	0.00E+00	2.10E+00	4.19E+00	2.7500	2.987E+06
H-3	6.1239E-03	408.05	816.10	0.00E+00	2.50E+00	5.00E+00	3.5000	2.624E+05
I-129	6.6403E-07	408.05	816.10	0.00E+00	2.71E-04	5.42E-04	5.0000	2.943E+04
Kr-85	1.4927E-01	408.05	816.10	0.00E+00	6.09E+01	1.22E+02	7.0000	3.381E+03
Np-237	3.1525E-05	408.05	816.10	0.00E+00	1.29E-02	2.57E-02	11.0000	3.876E+02
Pa-231	7.8676E-10	408.05	816.10	0.00E+00	3.21E-07	6.42E-07		
Pb-210	6.1847E-12	408.05	816.10	0.00E+00	2.52E-09	5.05E-09		
Pm-147	9.1373E-02	408.05	816.10	0.00E+00	3.73E+01	7.46E+01		
Pu-238	1.5978E-01	408.05	816.10	0.00E+00	6.52E+01	1.30E+02		
Pu-239	6.9502E-04	408.05	816.10	0.00E+00	2.84E-01	5.67E-01		
Pu-240	3.7424E-04	408.05	816.10	0.00E+00	1.53E-01	3.05E-01		
Pu-241	1.7090E-01	408.05	816.10	0.00E+00	6.97E+01	1.39E+02		
Pu-242	3.0911E-06	408.05	816.10	0.00E+00	1.26E-03	2.52E-03		
Ra-226	3.4848E-11	408.05	816.10	0.00E+00	1.42E-08	2.84E-08		
Ra-228	9.6173E-15	408.05	816.10	0.00E+00	3.92E-12	7.85E-12		
Ru-106	2.2789E-04	408.05	816.10	0.00E+00	9.30E-02	1.86E-01		
Se-79	1.2339E-05	408.05	816.10	0.00E+00	5.03E-03	1.01E-02		
Sn-126	1.0194E-05	408.05	816.10	0.00E+00	4.16E-03	8.32E-03		
Sr-90	2.1476E+00	408.05	816.10	0.00E+00	8.76E+02	1.75E+03		
Tc-99	3.8056E-04	408.05	816.10	0.00E+00	1.55E-01	3.11E-01		
Th-229	3.3026E-12	408.05	816.10	0.00E+00	1.35E-09	2.70E-09		
Th-230	8.2503E-09	408.05	816.10	0.00E+00	3.37E-06	6.73E-06		
Th-232	1.6586E-14	408.05	816.10	0.00E+00	6.77E-12	1.35E-11		
Th-208	4.8827E-08	408.05	816.10	0.00E+00	1.99E-05	3.98E-05		
U-232	1.3821E-07	408.05	816.10	0.00E+00	5.64E-05	1.13E-04		
U-233	3.0790E-09	408.05	816.10	0.00E+00	1.26E-06	2.51E-06		
U-234	4.9915E-05	408.05	816.10	0.00E+00	2.04E-02	4.07E-02		
U-235	-2.8661E-06	408.05	0.00	3.67E-03	2.50E-03	3.67E-03		
U-236	1.6701E-05	408.05	816.10	0.00E+00	6.81E-03	1.36E-02		
U-238	-9.4194E-09	408.05	0.00	7.00E-04	6.97E-04	7.00E-04		
Y-90	2.1482E+00	408.05	816.10	0.00E+00	8.77E+02	1.75E+03		
Other Radionuclides					8.93E+02	1.79E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.34E+01	2.67E+01
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	44.88296013	40 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		408.05	
Bounding		816.10	

  

Checks			Estimated EOL HM/Grven EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.25		
Bounding	0.49		

<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, FRJ TUBES (J308 LEU) GERMANY  
 SNF ID #: 999  
 Fuel Units & Descr: 3 - CONCENTRIC TUBES  
 Heavy Metal Mass, BOL=3 038kg; EOL=3.008kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date 1998  
 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 10 years

Estimated  
 Canister usage  
 18"x10"  
 0 13

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3 5433E-10	28 23	56 46	0 00E+00	1 00E-08	2 00E-08	Avg. MeV	
Am-241	1 6993E-02	28 23	56 46	0 00E+00	4 80E-01	9 59E-01	0 0150	7 361E+12
Am-242m	9 3333E-06	28 23	56 46	0 00E+00	2 63E-04	5 27E-04	0 0250	1 548E+12
Am-243	6 4067E-06	28 23	56 46	0 00E+00	1 81E-04	3 62E-04	0 0375	1 357E+12
C-14	2 9653E-08	28 23	56 46	0 00E+00	8 37E-07	1 67E-06	0 0575	1 436E+12
Cl-36	5 9513E-35	28 23	56 46	0 00E+00	1 68E-33	3 36E-33	0 0850	8 652E+11
Cm-243	2 8167E-06	28 23	56 46	0 00E+00	7 95E-05	1 59E-04	0 1250	6 001E+11
Cm-244	1 6140E-04	28 23	56 46	0 00E+00	4 56E-03	9 11E-03	0 2250	7 429E+11
Co-60	6 0893E-05	28 23	56 46	0 00E+00	1 72E-03	3 44E-03	0 3750	3 331E+11
Cs-134	6 1567E-02	28 23	56 46	0 00E+00	1 74E+00	3 48E+00	0 5750	5 550E+12
Cs-135	4 8607E-06	28 23	56 46	0 00E+00	1 37E-04	2 74E-04	0 8500	2 118E+11
Cs-137	2 5487E+00	28 23	56 46	0 00E+00	7 19E+01	1 44E+02	1 2500	7 682E+10
Eu-154	4 6760E-02	28 23	56 46	0 00E+00	1 32E+00	2 64E+00	1 7500	2 967E+09
Eu-155	1 6533E-02	28 23	56 46	0 00E+00	4 67E-01	9 33E-01	2 2500	1 794E+08
Fe-55	2 0373E-02	28 23	56 46	0 00E+00	5 75E-01	1 15E+00	2 7500	3 843E+06
H-3	8 1800E-03	28 23	56 46	0 00E+00	2 31E-01	4 62E-01	3 5000	4 824E+05
I-129	7 1600E-07	28 23	56 46	0 00E+00	2 02E-05	4 04E-05	5 0000	1 371E+02
Kr-85	1 9547E-01	28 23	56 46	0 00E+00	5 52E+00	1 10E+01	7 0000	1 559E+01
Np-237	3 6573E-06	28 23	56 46	0 00E+00	1 03E-04	2 06E-04	11 0000	1 778E+00
Pa-231	1 6420E-09	28 23	56 46	0 00E+00	4 64E-08	9 27E-08		
Pb-210	7 4600E-15	28 23	56 46	0 00E+00	2 11E-13	4 21E-13		
Pm-147	6 5033E-01	28 23	56 46	0 00E+00	1 84E+01	3 67E+01		
Pu-238	5 9807E-03	28 23	56 46	0 00E+00	1 69E-01	3 38E-01		
Pu-239	1 0320E-02	28 23	56 46	0 00E+00	2 91E-01	5 83E-01		
Pu-240	5 4233E-03	28 23	56 46	0 00E+00	1 53E-01	3 06E-01		
Pu-241	6 0807E-01	28 23	56 46	0 00E+00	1 72E+01	3 43E+01		
Pu-242	3 0713E-06	28 23	56 46	0 00E+00	8 67E-05	1 73E-04		
Ra-226	6 1580E-14	28 23	56 46	0 00E+00	1 74E-12	3 48E-12		
Ra-228	4 9953E-15	28 23	56 46	0 00E+00	1 41E-13	2 82E-13		
Ru-106	8 2133E-03	28 23	56 46	0 00E+00	2 32E-01	4 64E-01		
Se-79	1 2540E-05	28 23	56 46	0 00E+00	3 54E-04	7 08E-04		
Sn-126	1 1393E-05	28 23	56 46	0 00E+00	3 22E-04	6 43E-04		
Sr-90	2 3340E+00	28 23	56 46	0 00E+00	6 59E+01	1 32E+02		
Tc-99	4 3540E-04	28 23	56 46	0 00E+00	1 23E-02	2 46E-02		
Th-229	2 4973E-13	28 23	56 46	0 00E+00	7 05E-12	1 41E-11		
Th-230	2 4613E-11	28 23	56 46	0 00E+00	6 95E-10	1 39E-09		
Th-232	9 9467E-15	28 23	56 46	0 00E+00	2 81E-13	5 62E-13		
Th-208	7 7667E-09	28 23	56 46	0 00E+00	2 19E-07	4 38E-07		
U-232	2 1927E-08	28 23	56 46	0 00E+00	6 19E-07	1 24E-06		
U-233	2 7887E-10	28 23	56 46	0 00E+00	7 87E-09	1 57E-08		
U-234	3 0807E-07	28 23	56 46	0 00E+00	8 70E-06	1 74E-05		
U-235	-2 5341E-06	28 23	0 00	1 30E-03	1 22E-03	1 30E-03		
U-236	1 3000E-05	28 23	56 46	0 00E+00	3 67E-04	7 34E-04		
U-238	-1 4207E-08	28 23	0 00	8 20E-04	8 19E-04	8 20E-04		
Y-90	2 3347E+00	28 23	56 46	0 00E+00	6 59E+01	1 32E+02		
Other Radionuclides					6 96E+01	1 39E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8 76E-01	1 75E+00
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 73	10 to 20	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	0 25	28 23	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.
Bounding		56 46	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 21	113 31	1 00
Bounding	0 42		

<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 FRM (UALX HEU 45%) GERMANY  
 SNF ID #: 805  
 Fuel Units & Descr: 50 - MTR TYPE  
 Heavy Metal Mass BOL=28 18kg, EOL=23 47kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date: 1995  
 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 08

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	4.5861E-10	4,460 46	8,920 92	0 00E+00	2 05E-06	4 09E-06	Avg MeV	
Am-241	1 7832E-03	4,460 46	8,920 92	0 00E+00	7.95E+00	1.59E+01	0 0150	1 064E+15
Am-242m	4 3410E-07	4,460 46	8,920 92	0 00E+00	1 94E-03	3 87E-03	0.0250	2.219E+14
Am-243	1 4907E-06	4,460 46	8,920 92	0 00E+00	6 65E-03	1.33E-02	0 0375	1 938E+14
C-14	5 7162E-09	4,460 46	8,920 92	0 00E+00	2 55E-05	5 10E-05	0 0575	2 066E+14
Cl-36	1.3124E-32	4,460 46	8,920 92	0 00E+00	5 85E-29	1 17E-28	0 0850	1.252E+14
Cm-243	1 8568E-07	4,460 46	8,920.92	0.00E+00	8 28E-04	1 66E-03	0 1250	8 582E+13
Cm-244	3 5512E-05	4,460 46	8,920 92	0 00E+00	1 58E-01	3 17E-01	0.2250	1 078E+14
Co-60	1 0261E-05	4,460 46	8,920 92	0 00E+00	4 58E-02	9 15E-02	0 3750	4 724E+13
Cs-134	1.6931E-02	4,460 46	8,920 92	0 00E+00	7 55E+01	1 51E+02	0 5750	7 668E+14
Cs-135	3.4477E-06	4,460 46	8,920 92	0 00E+00	1 54E-02	3 08E-02	0 8500	1 821E+13
Cs-137	2.2800E+00	4,460 46	8,920 92	0 00E+00	1 02E+04	2 03E+04	1.2500	9 201E+12
Eu-154	3 6656E-02	4,460 46	8,920 92	0 00E+00	1 64E+02	3 27E+02	1 7500	3.855E+11
Eu-155	9 6841E-03	4,460 46	8,920 92	0 00E+00	4 32E+01	8 64E+01	2 2500	4 823E+08
Fe-55	4 6977E-04	4,460 46	8,920 92	0 00E+00	2 10E+00	4 19E+00	2 7500	2.899E+07
H-3	6 0485E-03	4,460 46	8,920 92	0 00E+00	2 70E+01	5 40E+01	3 5000	1.842E+06
I-129	7 5300E-07	4,460 46	8,920 92	0 00E+00	3 36E-03	6 72E-03	5 0000	4.272E+03
Kr-85	1 4989E-01	4,460 46	8,920 92	0 00E+00	6 69E+02	1 34E+03	7 0000	4 732E+02
Np-237	9 5534E-06	4,460 46	8,920 92	0 00E+00	4.26E-02	8 52E-02	11 0000	5.314E+01
Pa-231	1 6550E-09	4,460 46	8,920 92	0 00E+00	7.38E-06	1.48E-05		
Pb-210	2 6631E-11	4,460 46	8,920 92	0 00E+00	1 19E-07	2.38E-07		
Pm-147	1 8156E-01	4,460 46	8,920 92	0 00E+00	8 10E+02	1 62E+03		
Pu-238	1 8990E-02	4,460 46	8,920 92	0 00E+00	8.47E+01	1.69E+02		
Pu-239	4 2838E-04	4,460 46	8,920 92	0 00E+00	1.91E+00	3 82E+00		
Pu-240	2 4379E-04	4,460 46	8,920 92	0 00E+00	1 09E+00	2.17E+00		
Pu-241	4.2511E-02	4,460 46	8,920 92	0 00E+00	1 90E+02	3 79E+02		
Pu-242	3 6329E-07	4,460 46	8,920 92	0 00E+00	1 62E-03	3 24E-03		
Ra-226	1 4725E-10	4,460 46	8,920 92	0 00E+00	6 57E-07	1 31E-06		
Ra-228	8 9760E-15	4,460 46	8,920 92	0 00E+00	4 00E-11	8 01E-11		
Ru-106	1.9752E-04	4,460 46	8,920 92	0 00E+00	8 81E-01	1 76E+00		
Se-79	1.2933E-05	4,460 46	8,920 92	0 00E+00	5 77E-02	1 15E-01		
Sn-126	1 1574E-05	4,460 46	8,920 92	0 00E+00	5 16E-02	1 03E-01		
Sr-90	2 1680E+00	4,460 46	8,920 92	0 00E+00	9 67E+03	1 93E+04		
Tc-99	4.2239E-04	4,460 46	8,920 92	0 00E+00	1 88E+00	3 77E+00		
Th-229	3 9270E-12	4,460 46	8,920 92	0 00E+00	1 75E-08	3 50E-08		
Th-230	3 3578E-08	4,460 46	8,920 92	0 00E+00	1 50E-04	3 00E-04		
Th-232	1 5452E-14	4,460 46	8,920 92	0 00E+00	6 89E-11	1.38E-10		
Tl-208	4 6705E-08	4,460 46	8,920 92	0 00E+00	2 08E-04	4 17E-04		
U-232	1 3045E-07	4,460 46	8,920 92	0 00E+00	5.82E-04	1 16E-03		
U-233	2 3739E-09	4,460 46	8,920 92	0 00E+00	1.06E-05	2 12E-05		
U-234	1 8423E-04	4,460 46	8,920 92	0 00E+00	8.22E-01	1.64E+00		
U-235	-2 7235E-06	4,460 46	0 00	2.74E-02	1.52E-02	2 74E-02		
U-236	1.5493E-05	4,460 46	8,920 92	0 00E+00	6 91E-02	1.38E-01		
U-238	-4.2851E-09	4,460 46	0 00	5.21E-03	5 19E-03	5 21E-03	1.21E+02	2.41E+02
Y-90	2.1686E+00	4,460 46	8,920 92	0 00E+00	9 67E+03	1 93E+04	Total	Total
Other Radionuclides					9 70E+03	1 94E+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	This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	44 97952648	60 to 100	

Burnup Summary (MWd) <sup>1</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	686.61	4 460 46	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		8,920 92	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.50	6.50	1 01
Bounding	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: FRM (UALX HEU) GERMANY  
 SNF ID #: 806  
 Fuel Units & Descr: 31 - MTR TYPE  
 Heavy Metal Mass: BOL=6.395kg, EOL=3.171kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 1995  
 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"  
 1 29

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.5861E-10	3.053.19	6.056 47	0.00E+00	1.40E-06	2.78E-06	Avg. MeV	
Am-241	1.7832E-03	3.053.19	6.056 47	0.00E+00	5.44E+00	1.08E+01	0.0150	7.225E+14
Am-242m	4.3410E-07	3.053.19	6.056 47	0.00E+00	1.33E-03	2.63E-03	0.0250	1.507E+14
Am-243	1.4907E-06	3.053.19	6.056 47	0.00E+00	4.55E-03	9.03E-03	0.0375	1.316E+14
C-14	5.7162E-09	3.053.19	6.056 47	0.00E+00	1.75E-05	3.46E-05	0.0575	1.403E+14
Cl-36	1.3124E-32	3.053.19	6.056 47	0.00E+00	4.01E-29	7.95E-29	0.0850	8.498E+13
Cm-243	1.8568E-07	3.053.19	6.056 47	0.00E+00	5.67E-04	1.12E-03	0.1250	5.826E+13
Cm-244	3.5512E-05	3.053.19	6.056 47	0.00E+00	1.08E-01	2.15E-01	0.2250	7.321E+13
Co-60	1.0261E-05	3.053.19	6.056 47	0.00E+00	3.13E-02	6.21E-02	0.3750	3.207E+13
Cs-134	1.6931E-02	3.053.19	6.056 47	0.00E+00	5.17E+01	1.03E+02	0.5750	5.206E+14
Cs-135	3.4477E-06	3.053.19	6.056 47	0.00E+00	1.05E-02	2.09E-02	0.8500	1.237E+13
Cs-137	2.2800E+00	3.053.19	6.056 47	0.00E+00	6.96E+03	1.38E+04	1.2500	6.247E+12
Eu-154	3.6656E-02	3.053.19	6.056 47	0.00E+00	1.12E+02	2.22E+02	1.7500	2.617E+11
Eu-155	9.6941E-03	3.053.19	6.056 47	0.00E+00	2.96E+01	5.87E+01	2.2500	3.274E+08
Fe-55	4.6977E-04	3.053.19	6.056 47	0.00E+00	1.43E+00	2.85E+00	2.7500	1.968E+07
H-3	6.0485E-03	3.053.19	6.056 47	0.00E+00	1.85E+01	3.66E+01	3.5000	1.251E+06
I-129	7.5300E-07	3.053.19	6.056 47	0.00E+00	2.30E-03	4.56E-03	5.0000	2.893E+03
Kr-85	1.4989E-01	3.053.19	6.056 47	0.00E+00	4.58E+02	9.08E+02	7.0000	3.204E+02
Np-237	9.5534E-06	3.053.19	6.056 47	0.00E+00	2.92E-02	5.79E-02	11.0000	3.597E+01
Pa-231	1.6550E-09	3.053.19	6.056 47	0.00E+00	5.05E-06	1.00E-05		
Pb-210	2.6631E-11	3.053.19	6.056 47	0.00E+00	8.13E-08	1.61E-07		
Pm-147	1.8156E-01	3.053.19	6.056 47	0.00E+00	5.54E+02	1.10E+03		
Pu-238	1.8990E-02	3.053.19	6.056 47	0.00E+00	5.80E+01	1.15E+02		
Pu-239	4.2838E-04	3.053.19	6.056 47	0.00E+00	1.31E+00	2.59E+00		
Pu-240	2.4379E-04	3.053.19	6.056 47	0.00E+00	7.44E-01	1.48E+00		
Pu-241	4.2511E-02	3.053.19	6.056 47	0.00E+00	1.30E+02	2.57E+02		
Pu-242	3.6329E-07	3.053.19	6.056 47	0.00E+00	1.11E-03	2.20E-03		
Ra-226	1.4725E-10	3.053.19	6.056 47	0.00E+00	4.50E-07	8.92E-07		
Ra-228	8.9760E-15	3.053.19	6.056 47	0.00E+00	2.74E-11	5.44E-11		
Ru-106	1.9752E-04	3.053.19	6.056 47	0.00E+00	6.03E-01	1.20E+00		
Se-79	1.2933E-05	3.053.19	6.056 47	0.00E+00	3.95E-02	7.83E-02		
Sn-126	1.1574E-05	3.053.19	6.056 47	0.00E+00	3.53E-02	7.01E-02		
Sr-90	2.1680E+00	3.053.19	6.056 47	0.00E+00	6.62E+03	1.31E+04		
Tc-99	4.2239E-04	3.053.19	6.056 47	0.00E+00	1.29E+00	2.58E+00		
Th-229	3.9270E-12	3.053.19	6.056 47	0.00E+00	1.20E-08	2.38E-08		
Th-230	3.3578E-08	3.053.19	6.056 47	0.00E+00	1.03E-04	2.03E-04		
Th-232	1.5452E-14	3.053.19	6.056 47	0.00E+00	4.72E-11	9.36E-11		
Th-208	4.6705E-08	3.053.19	6.056 47	0.00E+00	1.43E-04	2.83E-04		
U-232	1.3045E-07	3.053.19	6.056 47	0.00E+00	3.98E-04	7.90E-04		
U-233	2.3739E-09	3.053.19	6.056 47	0.00E+00	7.25E-06	1.44E-05		
U-234	1.8423E-04	3.053.19	6.056 47	0.00E+00	5.62E-01	1.12E+00		
U-235	-2.7235E-06	3.053.19	0.00	1.26E-02	4.28E-03	1.26E-02		
U-236	1.5493E-05	3.053.19	6.056 47	0.00E+00	4.73E-02	9.38E-02		
U-238	-4.2851E-09	3.053.19	0.00	1.91E-04	1.78E-04	1.91E-04		
Y-90	2.1686E+00	3.053.19	6.056 47	0.00E+00	6.62E+03	1.31E+04		
Other Radionuclides					6.64E+03	1.32E+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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	91.10863593	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3.053.19	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup calculated assuming all BOL heavy metal burned.
Bounding		6.056.47	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.52		1.06
Bounding	3.01		

<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 FRR ASTRA (U308-LEU) AUSTRIA  
 SNF ID # 556  
 Fuel Units & Descr. 4 - MTR TYPE  
 Heavy Metal Mass: BOL= , EOL=6 96kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date 2010  
 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 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 11

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 4545E-10	6,591.26	6,591.26	0 00E+00	9 59E-07	9 59E-07	Avg MeV	
Am-241	1 1190E-03	6,591.26	6,591.26	0 00E+00	7 38E+00	7 38E+00	0 0150	1 272E+15
Am-242m	4 5425E-07	6,591.26	6,591.26	0 00E+00	2 99E-03	2 99E-03	0 0250	2 740E+14
Am-243	1 4921E-06	6,591.26	6,591.26	0 00E+00	9 83E-03	9 83E-03	0 0375	2 528E+14
C-14	5 7244E-09	6,591.26	6,591.26	0 00E+00	3 77E-05	3 77E-05	0 0575	2 486E+14
Ci-36	1 3124E-32	6,591.26	6,591.26	0 00E+00	8 65E-29	8 65E-29	0 0850	1 585E+14
Cm-243	2 3676E-07	6,591.26	6,591.26	0 00E+00	1 56E-03	1 56E-03	0 1250	1 372E+14
Cm-244	5 2042E-05	6,591.26	6,591.26	0 00E+00	3 43E-01	3 43E-01	0 2250	1 343E+14
Co-60	3 8208E-05	6,591.26	6,591.26	0 00E+00	2 52E-01	2 52E-01	0 3750	6 501E+13
Cs-134	4 8693E-01	6,591.26	6,591.26	0 00E+00	3 21E+03	3 21E+03	0 5750	8 930E+14
Cs-135	3 4477E-06	6,591.26	6,591.26	0 00E+00	2 27E-02	2 27E-02	0 8500	1 251E+14
Cs-137	2 8731E+00	6,591.26	6,591.26	0 00E+00	1 89E+04	1 89E+04	1 2500	2 327E+13
Eu-154	8 2053E-02	6,591.26	6,591.26	0 00E+00	5 41E+02	5 41E+02	1 7500	9 757E+11
Eu-155	3 9134E-02	6,591.26	6,591.26	0 00E+00	2 58E+02	2 58E+02	2 2500	2 047E+12
Fe-55	6 7429E-03	6,591.26	6,591.26	0 00E+00	4 44E+01	4 44E+01	2 7500	1 177E+10
H-3	1 0599E-02	6,591.26	6,591.26	0 00E+00	6 99E+01	6 99E+01	3 5000	1 306E+09
I-129	7 5300E-07	6,591.26	6,591.26	0 00E+00	4 96E-03	4 96E-03	5 0000	3 905E+03
Kr-85	2 8595E-01	6,591.26	6,591.26	0 00E+00	1 88E+03	1 88E+03	7 0000	4 353E+02
Np-237	9 5479E-06	6,591.26	6,591.26	0 00E+00	6 29E-02	6 29E-02	11.0000	4 906E+01
Pa-231	8 9297E-10	6,591.26	6,591.26	0 00E+00	5 89E-06	5 89E-06		
Pb-210	3 7609E-12	6,591.26	6,591.26	0 00E+00	2 48E-08	2 48E-08		
Pm-147	2 5452E+00	6,591.26	6,591.26	0 00E+00	1 68E+04	1 68E+04		
Pu-238	2 0550E-02	6,591.26	6,591.26	0 00E+00	1 35E+02	1 35E+02		
Pu-239	4 2838E-04	6,591.26	6,591.26	0 00E+00	2 82E+00	2 82E+00		
Pu-240	2 4401E-04	6,591.26	6,591.26	0 00E+00	1 61E+00	1 61E+00		
Pu-241	6 8764E-02	6,591.26	6,591.26	0 00E+00	4 53E+02	4 53E+02		
Pu-242	3 6329E-07	6,591.26	6,591.26	0 00E+00	2 39E-03	2 39E-03		
Ra-226	3 8045E-11	6,591.26	6,591.26	0 00E+00	2 51E-07	2 51E-07		
Ra-228	2 9902E-15	6,591.26	6,591.26	0 00E+00	1 97E-11	1 97E-11		
Ru-106	1 9055E-01	6,591.26	6,591.26	0 00E+00	1 26E+03	1 26E+03		
Se-79	1 2936E-05	6,591.26	6,591.26	0 00E+00	8 53E-02	8 53E-02		
Sn-126	1 1574E-05	6,591.26	6,591.26	0 00E+00	7 63E-02	7 63E-02		
Sr-90	2 7505E+00	6,591.26	6,591.26	0 00E+00	1 81E+04	1 81E+04		
Tc-99	4 2239E-04	6,591.26	6,591.26	0 00E+00	2 78E+00	2 78E+00		
Th-229	1 8848E-12	6,591.26	6,591.26	0 00E+00	1 24E-08	1 24E-08		
Th-230	1 7042E-08	6,591.26	6,591.26	0 00E+00	1 12E-04	1 12E-04		
Th-232	7 8132E-15	6,591.26	6,591.26	0 00E+00	5 15E-11	5 15E-11		
Ti-208	4 4063E-08	6,591.26	6,591.26	0 00E+00	2 90E-04	2 90E-04		
U-232	1 3151E-07	6,591.26	6,591.26	0 00E+00	8 67E-04	8 67E-04	Thermal Power	
U-233	1 9564E-09	6,591.26	6,591.26	0 00E+00	1 29E-05	1 29E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8371E-04	6,591.26	6,591.26	0 00E+00	1 21E+00	1 21E+00	3 34E+02	3 34E+02
U-235	-2 7235E-06	6,591.26	0 00	2 77E-02	9 76E-03	2 77E-02	Total	Total
U-236	1 5493E-05	6,591.26	6,591.26	0 00E+00	1 02E-01	1 02E-01		
U-238	-4 2851E-09	6,591.26	0 00	2 80E-04	2 52E-04	2 80E-04		
Y-90	2 7505E+00	6,591.26	6,591.26	0 00E+00	1 81E+04	1 81E+04		
Other Radionuclides					3 39E+04	3 39E+04		

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

<b>Template Selection Summary</b>			<b>Basis for Parameter Differences:</b> This Template was used for the following reasons This fuel matches on all parameters except enrichment (unknown)
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %		60 to 100	
<b>Burnup Summary (MWd)<sup>2</sup></b>			<b>Basis for burnup used in estimate:</b> Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Nominal	From SFD	Estimated	
Bounding		6,591.26	
		6,591.26	
<b>Checks</b>			<b>Estimated EOL HM/Grven EOL HM</b> 1 02
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Bounding	1.50	1.50	

<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: FRR ASTRA (U3SI2 LEU) AUSTRIA  
 SNF ID #: 515  
 Fuel Units & Descr: 49 - MTR TYPE  
 Heavy Metal Mass: BOL=78 4kg; EOL=74 602kg  
 ROD Storage Site: SRS

Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 2 04

**II. Estimates**

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	Total Photons/sec (bounding)
Ac-227	1 4545E-10	3,596 31	7,192 61	0 00E+00	5 23E-07	1 05E-06	Avg MeV	
Am-241	1 1190E-03	3,596 31	7,192 61	0 00E+00	4 02E+00	8 05E+00	0 0150	1 388E+15
Am-242m	4 5425E-07	3,596 31	7,192 61	0 00E+00	1 63E-03	3 27E-03	0 0250	2 989E+14
Am-243	1 4921E-06	3,596 31	7,192 61	0 00E+00	5 37E-03	1 07E-02	0 0375	2 759E+14
C-14	5 7244E-09	3,596 31	7,192 61	0 00E+00	2 06E-05	4 12E-05	0 0575	2 713E+14
Cl-36	1 3124E-32	3,596 31	7,192 61	0 00E+00	4 72E-29	9 44E-29	0 0850	1 729E+14
Cm-243	2 3676E-07	3,596 31	7,192 61	0 00E+00	8 51E-04	1 70E-03	0 1250	1 498E+14
Cm-244	5 2042E-05	3,596 31	7,192 61	0 00E+00	1 87E-01	3 74E-01	0 2250	1 466E+14
Co-60	3 8208E-05	3,596 31	7,192 61	0 00E+00	1 37E-01	2 75E-01	0 3750	7 095E+13
Cs-134	4 8693E-01	3,596 31	7,192 61	0 00E+00	1 75E+03	3 50E+03	0 5750	9 745E+14
Cs-135	3 4477E-06	3,596 31	7,192 61	0 00E+00	1 24E-02	2 48E-02	0 8500	1 365E+14
Cs-137	2 8731E+00	3,596 31	7,192 61	0 00E+00	1 03E+04	2 07E+04	1 2500	2 539E+13
Eu-154	8 2053E-02	3,596 31	7,192 61	0 00E+00	2 95E+02	5 90E+02	1 7500	1 065E+12
Eu-155	3 9134E-02	3,596 31	7,192 61	0 00E+00	1 41E+02	2 81E+02	2 2500	2 233E+12
Fe-55	6 7429E-03	3,596 31	7,192 61	0 00E+00	2 42E+01	4 85E+01	2 7500	1 285E+10
H-3	1 0599E-02	3,596 31	7,192 61	0 00E+00	3 81E+01	7 62E+01	3 5000	1 425E+09
I-129	7 5300E-07	3,596 31	7,192 61	0 00E+00	2 71E-03	5 42E-03	5 0000	4 315E+03
Kr-85	2 8595E-01	3,596 31	7,192 61	0 00E+00	1 03E+03	2 06E+03	7 0000	4 812E+02
Np-237	9 5479E-06	3,596 31	7,192 61	0 00E+00	3 43E-02	6 87E-02	11 0000	5 426E+01
Pa-231	8 9297E-10	3,596 31	7,192 61	0 00E+00	3 21E-06	6 42E-06		
Pb-210	3 7609E-12	3,596 31	7,192 61	0 00E+00	1 35E-08	2 71E-08		
Pm-147	2 5452E+00	3,596 31	7,192 61	0 00E+00	9 15E+03	1 83E+04		
Pu-238	2 0550E-02	3,596 31	7,192 61	0 00E+00	7 39E+01	1 48E+02		
Pu-239	4 2838E-04	3,596 31	7,192 61	0 00E+00	1 54E+00	3 08E+00		
Pu-240	2 4401E-04	3,596 31	7,192 61	0 00E+00	8 78E-01	1 76E+00		
Pu-241	6 8764E-02	3,596 31	7,192 61	0 00E+00	2 47E+02	4 95E+02		
Pu-242	3 6329E-07	3,596 31	7,192 61	0 00E+00	1 31E-03	2 61E-03		
Ra-226	3 8045E-11	3,596 31	7,192 61	0 00E+00	1 37E-07	2 74E-07		
Ra-228	2 9902E-15	3,596 31	7,192 61	0 00E+00	1 08E-11	2 15E-11		
Ru-106	1 9055E-01	3,596 31	7,192 61	0 00E+00	6 85E+02	1 37E+03		
Se-79	1 2936E-05	3,596 31	7,192 61	0 00E+00	4 65E-02	9 30E-02		
Sn-126	1 1574E-05	3,596 31	7,192 61	0 00E+00	4 16E-02	8 32E-02		
Sr-90	2 7505E+00	3,596 31	7,192 61	0 00E+00	9 89E+03	1 98E+04		
Tc-99	4 2239E-04	3,596 31	7,192 61	0 00E+00	1 52E+00	3 04E+00		
Th-229	1 8848E-12	3,596 31	7,192 61	0 00E+00	6 78E-09	1 36E-08		
Th-230	1 7042E-08	3,596 31	7,192 61	0 00E+00	6 13E-05	1 23E-04		
Th-232	7 8132E-15	3,596 31	7,192 61	0 00E+00	2 81E-11	5 62E-11		
Th-208	4 4063E-08	3,596 31	7,192 61	0 00E+00	1 58E-04	3 17E-04		
U-232	1 3151E-07	3,596 31	7,192 61	0 00E+00	4 73E-04	9 46E-04		
U-233	1 9564E-09	3,596 31	7,192 61	0 00E+00	7 04E-06	1 41E-05		
U-234	1 8371E-04	3,596 31	7,192 61	0 00E+00	6 61E-01	1 32E+00		
U-235	-2 7235E-06	3,596 31	0 00	1 43E-02	4 50E-03	1 43E-02		
U-236	1 5493E-05	3,596 31	7,192 61	0 00E+00	5 57E-02	1 11E-01		
U-238	-4 2851E-09	3,596 31	0 00	2 41E-02	2 41E-02	2 41E-02		
Y-90	2 7505E+00	3,596 31	7,192 61	0 00E+00	9 89E+03	1 98E+04		
Other Radionuclides					1.85E+04	3 70E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.82E+02	3.65E+02
Total	Total

**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.
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	8 4375	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		3 596 31	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
		7,192 61	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Bounding	0 15		1 00
	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 FRR ASTRA (UALX+HEU) AUSTRIA  
 SNF ID # 654  
 Fuel Units & Descr 2 - MTR TYPE  
 Heavy Metal Mass BOL=0.14kg EOL=0.12kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date 2010  
 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 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.08

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	18.94	37.88	0.00E+00	2.75E-09	5.51E-09	Avg MeV	
Am-241	1.1190E-03	18.94	37.88	0.00E+00	2.12E-02	4.24E-02	0.0150	7.308E+12
Am-242m	4.5425E-07	18.94	37.88	0.00E+00	8.60E-06	1.72E-05	0.0250	1.574E+12
Am-243	1.4921E-06	18.94	37.88	0.00E+00	2.83E-05	5.65E-05	0.0375	1.453E+12
C-14	5.7244E-09	18.94	37.88	0.00E+00	1.08E-07	2.17E-07	0.0575	1.429E+12
Cl-36	1.3124E-32	18.94	37.88	0.00E+00	2.49E-31	4.97E-31	0.0850	9.107E+11
Cm-243	2.3676E-07	18.94	37.88	0.00E+00	4.48E-06	8.97E-06	0.1250	7.887E+11
Cm-244	5.2042E-05	18.94	37.88	0.00E+00	9.86E-04	1.97E-03	0.2250	7.719E+11
Co-60	3.8208E-05	18.94	37.88	0.00E+00	7.24E-04	1.45E-03	0.3750	3.736E+11
Cs-134	4.8693E-01	18.94	37.88	0.00E+00	9.22E+00	1.84E+01	0.5750	5.132E+12
Cs-135	3.4477E-06	18.94	37.88	0.00E+00	6.53E-05	1.31E-04	0.8500	7.187E+11
Cs-137	2.8731E+00	18.94	37.88	0.00E+00	5.44E+01	1.09E+02	1.2500	1.337E+11
Eu-154	8.2053E-02	18.94	37.88	0.00E+00	1.55E+00	3.11E+00	1.7500	5.608E+09
Eu-155	3.9134E-02	18.94	37.88	0.00E+00	7.41E-01	1.48E+00	2.2500	1.176E+10
Fe-55	6.7429E-03	18.94	37.88	0.00E+00	1.28E-01	2.55E-01	2.7500	6.767E+07
H-3	1.0599E-02	18.94	37.88	0.00E+00	2.01E-01	4.02E-01	3.5000	7.505E+06
I-129	7.5300E-07	18.94	37.88	0.00E+00	1.43E-05	2.85E-05	5.0000	2.245E+01
Kr-85	2.8595E-01	18.94	37.88	0.00E+00	5.42E+00	1.08E+01	7.0000	2.502E+00
Np-237	9.5479E-06	18.94	37.88	0.00E+00	1.81E-04	3.62E-04	11.0000	2.820E-01
Pa-231	8.9297E-10	18.94	37.88	0.00E+00	1.69E-08	3.38E-08		
Pb-210	3.7609E-12	18.94	37.88	0.00E+00	7.12E-11	1.42E-10		
Pm-147	2.5452E+00	18.94	37.88	0.00E+00	4.82E+01	9.64E+01		
Pu-238	2.0550E-02	18.94	37.88	0.00E+00	3.89E-01	7.78E-01		
Pu-239	4.2838E-04	18.94	37.88	0.00E+00	8.11E-03	1.62E-02		
Pu-240	2.4401E-04	18.94	37.88	0.00E+00	4.62E-03	9.24E-03		
Pu-241	6.8764E-02	18.94	37.88	0.00E+00	1.30E+00	2.60E+00		
Pu-242	3.6329E-07	18.94	37.88	0.00E+00	6.88E-06	1.38E-05		
Ra-226	3.8045E-11	18.94	37.88	0.00E+00	7.21E-10	1.44E-09		
Ra-228	2.9902E-15	18.94	37.88	0.00E+00	5.66E-14	1.13E-13		
Ru-106	1.9055E-01	18.94	37.88	0.00E+00	3.61E+00	7.22E+00		
Se-79	1.2936E-05	18.94	37.88	0.00E+00	2.45E-04	4.90E-04		
Sn-126	1.1574E-05	18.94	37.88	0.00E+00	2.19E-04	4.38E-04		
Sr-90	2.7505E+00	18.94	37.88	0.00E+00	5.21E+01	1.04E+02		
Tc-99	4.2239E-04	18.94	37.88	0.00E+00	8.00E-03	1.60E-02		
Th-229	1.8848E-12	18.94	37.88	0.00E+00	3.57E-11	7.14E-11		
Th-230	1.7042E-08	18.94	37.88	0.00E+00	3.23E-07	6.46E-07		
Th-232	7.8132E-15	18.94	37.88	0.00E+00	1.48E-13	2.96E-13		
Th-208	4.4063E-08	18.94	37.88	0.00E+00	8.35E-07	1.67E-06		
U-232	1.3151E-07	18.94	37.88	0.00E+00	2.49E-06	4.98E-06		
U-233	1.9564E-09	18.94	37.88	0.00E+00	3.71E-08	7.41E-08		
U-234	1.8371E-04	18.94	37.88	0.00E+00	3.48E-03	6.96E-03		
U-235	-2.7235E-06	18.94	0.00	2.82E-04	2.30E-04	2.82E-04		
U-236	1.5493E-05	18.94	37.88	0.00E+00	2.93E-04	5.87E-04		
U-238	-4.2851E-09	18.94	0.00	3.22E-06	3.14E-06	3.22E-06		
Y-90	2.7505E+00	18.94	37.88	0.00E+00	5.21E+01	1.04E+02		
Other Radionuclides					9.74E+01	1.95E+02		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9.60E-01	1.92E+00
Total	Total

**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 %	93.15	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal		18.94	
Bounding		37.88	

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	0.43		
Bounding	0.86		

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: FRR ASTRA (UALX-HEU) AUSTRIA  
 SNF ID #: 738  
 Fuel Units & Descr: 14 - MTR TYPE  
 Heavy Metal Mass: BOL=5.6kg, EOL=4.858kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0.58

**II. Estimates**

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	Total Photons/sec (bounding)
Ac-227	1.4545E-10	702.69	1,405.38	0.00E+00	1.02E-07	2.04E-07	Avg. MeV	
Am-241	1.1190E-03	702.69	1,405.38	0.00E+00	7.86E-01	1.57E+00	0.0150	2.711E+14
Am-242m	4.5425E-07	702.69	1,405.38	0.00E+00	3.19E-04	6.38E-04	0.0250	5.841E+13
Am-243	1.4921E-06	702.69	1,405.38	0.00E+00	1.05E-03	2.10E-03	0.0375	5.390E+13
C-14	5.7244E-09	702.69	1,405.38	0.00E+00	4.02E-06	8.04E-06	0.0575	5.300E+13
Cl-36	1.3124E-32	702.69	1,405.38	0.00E+00	9.22E-30	1.84E-29	0.0850	3.379E+13
Cm-243	2.3676E-07	702.69	1,405.38	0.00E+00	1.66E-04	3.33E-04	0.1250	2.926E+13
Cm-244	5.2042E-05	702.69	1,405.38	0.00E+00	3.66E-02	7.31E-02	0.2250	2.864E+13
Co-60	3.8208E-05	702.69	1,405.38	0.00E+00	2.68E-02	5.37E-02	0.3750	1.386E+13
Cs-134	4.8693E-01	702.69	1,405.38	0.00E+00	3.42E+02	6.84E+02	0.5750	1.904E+14
Cs-135	3.4477E-06	702.69	1,405.38	0.00E+00	2.42E-03	4.85E-03	0.8500	2.667E+13
Cs-137	2.8731E+00	702.69	1,405.38	0.00E+00	2.02E+03	4.04E+03	1.2500	4.961E+12
Eu-154	8.2053E-02	702.69	1,405.38	0.00E+00	5.77E+01	1.15E+02	1.7500	2.080E+11
Eu-155	3.9134E-02	702.69	1,405.38	0.00E+00	2.75E+01	5.50E+01	2.2500	4.364E+11
Fe-55	6.7429E-03	702.69	1,405.38	0.00E+00	4.74E+00	9.48E+00	2.7500	2.510E+09
H-3	1.0599E-02	702.69	1,405.38	0.00E+00	7.45E+00	1.49E+01	3.5000	2.784E+08
I-129	7.5300E-07	702.69	1,405.38	0.00E+00	5.29E-04	1.06E-03	5.0000	8.328E+02
Kr-85	2.8595E-01	702.69	1,405.38	0.00E+00	2.01E+02	4.02E+02	7.0000	9.283E+01
Np-237	9.5479E-06	702.69	1,405.38	0.00E+00	6.71E-03	1.34E-02	11.0000	1.046E+01
Pa-231	8.9297E-10	702.69	1,405.38	0.00E+00	6.27E-07	1.25E-06		
Pb-210	3.7609E-12	702.69	1,405.38	0.00E+00	2.64E-09	5.29E-09		
Pm-147	2.5452E+00	702.69	1,405.38	0.00E+00	1.79E+03	3.58E+03		
Pu-238	2.0550E-02	702.69	1,405.38	0.00E+00	1.44E+01	2.89E+01		
Pu-239	4.2838E-04	702.69	1,405.38	0.00E+00	3.01E-01	6.02E-01		
Pu-240	2.4401E-04	702.69	1,405.38	0.00E+00	1.71E-01	3.43E-01		
Pu-241	6.8764E-02	702.69	1,405.38	0.00E+00	4.83E+01	9.66E+01		
Pu-242	3.6329E-07	702.69	1,405.38	0.00E+00	2.55E-04	5.11E-04		
Ra-226	3.8045E-11	702.69	1,405.38	0.00E+00	2.67E-08	5.35E-08		
Ra-228	2.9902E-15	702.69	1,405.38	0.00E+00	2.10E-12	4.20E-12		
Ru-106	1.9055E-01	702.69	1,405.38	0.00E+00	1.34E+02	2.68E+02		
Se-79	1.2936E-05	702.69	1,405.38	0.00E+00	9.09E-03	1.82E-02		
Sn-126	1.1574E-05	702.69	1,405.38	0.00E+00	8.13E-03	1.63E-02		
Sr-90	2.7505E+00	702.69	1,405.38	0.00E+00	1.93E+03	3.87E+03		
Tc-99	4.2239E-04	702.69	1,405.38	0.00E+00	2.97E-01	5.94E-01		
Th-229	1.8848E-12	702.69	1,405.38	0.00E+00	1.32E-09	2.65E-09		
Th-230	1.7042E-08	702.69	1,405.38	0.00E+00	1.20E-05	2.40E-05		
Th-232	7.8132E-15	702.69	1,405.38	0.00E+00	5.49E-12	1.10E-11		
Tl-208	4.4063E-08	702.69	1,405.38	0.00E+00	3.10E-05	6.19E-05		
U-232	1.3151E-07	702.69	1,405.38	0.00E+00	9.24E-05	1.85E-04		
U-233	1.9564E-09	702.69	1,405.38	0.00E+00	1.37E-06	2.75E-06		
U-234	1.8371E-04	702.69	1,405.38	0.00E+00	1.29E-01	2.58E-01		
U-235	-2.7235E-06	702.69	0.00	1.13E-02	9.36E-03	1.13E-02		
U-236	1.5493E-05	702.69	1,405.38	0.00E+00	1.09E-02	2.18E-02		
U-238	-4.2851E-09	702.69	0.00	1.29E-04	1.26E-04	1.29E-04		
Y-90	2.7505E+00	702.69	1,405.38	0.00E+00	1.93E+03	3.87E+03		
Other Radionuclides					3.61E+03	7.23E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.56E+01	7.13E+01
Total	Total

**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 %	93.15	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		702.69	
Bounding		1,405.38	

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

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.40		
Bounding	0.80		

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 **FRR FMRB (GERMANY)** <sup>1</sup>Fuel decay start date **1994**  
 SNF ID # **1066** Estimates as of **2010**  
 Fuel Units & Descr **18 - MTR TYPE** Template **ATR (Light Water, Alum , 60 to 100%, U)**  
 Heavy Metal Mass **BOL=2.57kg EOL=2.282kg** <sup>2</sup>Template Burnup(MWd) **367.2**  
 ROD Storage Site **SRS** Template BOL Heavy Metal Mass (MT) **0.00116689**  
 Template Decay Time **15 years**

Estimated  
 Canister usage:  
**18"x10"**  
**0.75**

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.5861E-10	272.74	545.48	0.00E+00	1.25E-07	2.50E-07	Avg MeV	
Am-241	1.7832E-03	272.74	545.48	0.00E+00	4.86E-01	9.73E-01	0.0150	6.507E+13
Am-242m	4.3410E-07	272.74	545.48	0.00E+00	1.18E-04	2.37E-04	0.0250	1.357E+13
Am-243	1.4907E-06	272.74	545.48	0.00E+00	4.07E-04	8.13E-04	0.0375	1.185E+13
C-14	5.7162E-09	272.74	545.48	0.00E+00	1.56E-06	3.12E-06	0.0575	1.264E+13
Cl-36	1.3124E-32	272.74	545.48	0.00E+00	3.58E-30	7.16E-30	0.0850	7.654E+12
Cm-243	1.8568E-07	272.74	545.48	0.00E+00	5.06E-05	1.01E-04	0.1250	5.247E+12
Cm-244	3.5512E-05	272.74	545.48	0.00E+00	9.69E-03	1.94E-02	0.2250	6.594E+12
Co-60	1.0261E-05	272.74	545.48	0.00E+00	2.80E-03	5.60E-03	0.3750	2.889E+12
Cs-134	1.6931E-02	272.74	545.48	0.00E+00	4.62E+00	9.24E+00	0.5750	4.689E+13
Cs-135	3.4477E-06	272.74	545.48	0.00E+00	9.40E-04	1.88E-03	0.8500	1.114E+12
Cs-137	2.2800E+00	272.74	545.48	0.00E+00	6.22E+02	1.24E+03	1.2500	5.626E+11
Eu-154	3.6656E-02	272.74	545.48	0.00E+00	1.00E+01	2.00E+01	1.7500	2.357E+10
Eu-155	9.6841E-03	272.74	545.48	0.00E+00	2.64E+00	5.28E+00	2.2500	2.949E+07
Fe-55	4.6977E-04	272.74	545.48	0.00E+00	1.28E-01	2.56E-01	2.7500	1.772E+06
H-3	6.0485E-03	272.74	545.48	0.00E+00	1.65E+00	3.30E+00	3.5000	1.127E+05
I-129	7.5300E-07	272.74	545.48	0.00E+00	2.05E-04	4.11E-04	5.0000	2.607E+02
Kr-85	1.4989E-01	272.74	545.48	0.00E+00	4.09E+01	8.18E+01	7.0000	2.887E+01
Np-237	9.5534E-06	272.74	545.48	0.00E+00	2.61E-03	5.21E-03	11.0000	3.242E+00
Pa-231	1.6550E-09	272.74	545.48	0.00E+00	4.51E-07	9.03E-07		
Pb-210	2.6631E-11	272.74	545.48	0.00E+00	7.26E-09	1.45E-08		
Pm-147	1.8156E-01	272.74	545.48	0.00E+00	4.95E+01	9.90E+01		
Pu-238	1.8990E-02	272.74	545.48	0.00E+00	5.18E+00	1.04E+01		
Pu-239	4.2838E-04	272.74	545.48	0.00E+00	1.17E-01	2.34E-01		
Pu-240	2.4379E-04	272.74	545.48	0.00E+00	6.65E-02	1.33E-01		
Pu-241	4.2511E-02	272.74	545.48	0.00E+00	1.16E+01	2.32E+01		
Pu-242	3.6329E-07	272.74	545.48	0.00E+00	9.91E-05	1.98E-04		
Ra-226	1.4725E-10	272.74	545.48	0.00E+00	4.02E-08	8.03E-08		
Ra-228	8.9760E-15	272.74	545.48	0.00E+00	2.45E-12	4.90E-12		
Ru-106	1.9752E-04	272.74	545.48	0.00E+00	5.39E-02	1.08E-01		
Se-79	1.2933E-05	272.74	545.48	0.00E+00	3.53E-03	7.05E-03		
Sn-126	1.1574E-05	272.74	545.48	0.00E+00	3.16E-03	6.31E-03		
Sr-90	2.1680E+00	272.74	545.48	0.00E+00	5.91E+02	1.18E+03		
Tc-99	4.2239E-04	272.74	545.48	0.00E+00	1.15E-01	2.30E-01		
Th-229	3.9270E-12	272.74	545.48	0.00E+00	1.07E-09	2.14E-09		
Th-230	3.3578E-08	272.74	545.48	0.00E+00	9.16E-06	1.83E-05		
Th-232	1.5452E-14	272.74	545.48	0.00E+00	4.21E-12	8.43E-12		
Th-238	4.6705E-08	272.74	545.48	0.00E+00	1.27E-05	2.55E-05		
U-232	1.3045E-07	272.74	545.48	0.00E+00	3.56E-05	7.12E-05		
U-233	2.3739E-09	272.74	545.48	0.00E+00	6.47E-07	1.29E-06		
U-234	1.8423E-04	272.74	545.48	0.00E+00	5.02E-02	1.00E-01		
U-235	-2.7235E-06	272.74	0.00	5.07E-03	4.33E-03	5.07E-03		
U-236	1.5493E-05	272.74	545.48	0.00E+00	4.23E-03	8.45E-03		
U-238	-4.2851E-09	272.74	0.00	7.55E-05	7.44E-05	7.55E-05		
Y-90	2.1686E+00	272.74	545.48	0.00E+00	5.91E+02	1.18E+03		
Other Radionuclides					5.93E+02	1.19E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.38E+00	1.48E+01
Total	Total

**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 %	91.25787542	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal		272.74	
Bounding		545.48	

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		
Bounding	0.67		

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: FRR MTR (UALX HEU) AUSTRALIA  
 SNF ID #: 649  
 Fuel Units & Descr: 12 - ASSEMBLY  
 Heavy Metal Mass, BOL=3.32kg; EOL=3.317kg  
 ROD Storage Site, SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 50

Radionuclide	II. Estimates		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	
	m	x <sub>n</sub>						Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	3.41	6.82	6.82	0.00E+00	4.96E-10	9.92E-10	Avg. MeV	
Am-241	1.1190E-03	3.41	6.82	6.82	0.00E+00	3.82E-03	7.63E-03	0.0150	1.316E+12
Am-242m	4.5425E-07	3.41	6.82	6.82	0.00E+00	1.55E-06	3.10E-06	0.0250	2.834E+11
Am-243	1.4921E-06	3.41	6.82	6.82	0.00E+00	5.09E-06	1.02E-05	0.0375	2.615E+11
C-14	5.7244E-09	3.41	6.82	6.82	0.00E+00	1.95E-08	3.90E-08	0.0575	2.572E+11
Cl-36	1.3124E-32	3.41	6.82	6.82	0.00E+00	4.47E-32	8.95E-32	0.0850	1.640E+11
Cm-243	2.3676E-07	3.41	6.82	6.82	0.00E+00	8.07E-07	1.61E-06	0.1250	1.420E+11
Cm-244	5.2042E-05	3.41	6.82	6.82	0.00E+00	1.77E-04	3.55E-04	0.2250	1.391E+11
Co-60	3.8208E-05	3.41	6.82	6.82	0.00E+00	1.30E-04	2.61E-04	0.3750	6.726E+10
Cs-134	4.8693E-01	3.41	6.82	6.82	0.00E+00	1.66E+00	3.32E+00	0.5750	9.238E+11
Cs-135	3.4477E-06	3.41	6.82	6.82	0.00E+00	1.18E-05	2.35E-05	0.8500	1.294E+11
Cs-137	2.8731E+00	3.41	6.82	6.82	0.00E+00	9.80E+00	1.96E+01	1.2500	2.407E+10
Eu-154	8.2053E-02	3.41	6.82	6.82	0.00E+00	2.80E-01	5.59E-01	1.7500	1.009E+09
Eu-155	3.9134E-02	3.41	6.82	6.82	0.00E+00	1.33E-01	2.67E-01	2.2500	2.117E+09
Fe-55	6.7429E-03	3.41	6.82	6.82	0.00E+00	2.30E-02	4.60E-02	2.7500	1.218E+07
H-3	1.0599E-02	3.41	6.82	6.82	0.00E+00	3.61E-02	7.23E-02	3.5000	1.351E+06
I-129	7.5300E-07	3.41	6.82	6.82	0.00E+00	2.57E-06	5.13E-06	5.0000	4.382E+00
Kr-85	2.8595E-01	3.41	6.82	6.82	0.00E+00	9.75E-01	1.95E+00	7.0000	4.891E-01
Np-237	9.5479E-06	3.41	6.82	6.82	0.00E+00	3.26E-05	6.51E-05	11.0000	5.518E-02
Pa-231	8.9297E-10	3.41	6.82	6.82	0.00E+00	3.04E-09	6.09E-09		
Pb-210	3.7609E-12	3.41	6.82	6.82	0.00E+00	1.28E-11	2.56E-11		
Pm-147	2.5452E+00	3.41	6.82	6.82	0.00E+00	8.68E+00	1.74E+01		
Pu-238	2.0550E-02	3.41	6.82	6.82	0.00E+00	7.01E-02	1.40E-01		
Pu-239	4.2838E-04	3.41	6.82	6.82	0.00E+00	1.46E-03	2.92E-03		
Pu-240	2.4401E-04	3.41	6.82	6.82	0.00E+00	8.32E-04	1.66E-03		
Pu-241	6.8764E-02	3.41	6.82	6.82	0.00E+00	2.34E-01	4.69E-01		
Pu-242	3.6329E-07	3.41	6.82	6.82	0.00E+00	1.24E-06	2.48E-06		
Ra-226	3.8045E-11	3.41	6.82	6.82	0.00E+00	1.30E-10	2.59E-10		
Ra-228	2.9902E-15	3.41	6.82	6.82	0.00E+00	1.02E-14	2.04E-14		
Ru-106	1.9055E-01	3.41	6.82	6.82	0.00E+00	6.50E-01	1.30E+00		
Se-79	1.2936E-05	3.41	6.82	6.82	0.00E+00	4.41E-05	8.82E-05		
Sn-126	1.1574E-05	3.41	6.82	6.82	0.00E+00	3.95E-05	7.89E-05		
Sr-90	2.7505E+00	3.41	6.82	6.82	0.00E+00	9.38E+00	1.88E+01		
Tc-99	4.2239E-04	3.41	6.82	6.82	0.00E+00	1.44E-03	2.88E-03		
Th-229	1.8848E-12	3.41	6.82	6.82	0.00E+00	6.43E-12	1.29E-11		
Th-230	1.7042E-08	3.41	6.82	6.82	0.00E+00	5.81E-08	1.16E-07		
Th-232	7.8132E-15	3.41	6.82	6.82	0.00E+00	2.66E-14	5.33E-14		
Tl-208	4.4063E-08	3.41	6.82	6.82	0.00E+00	1.50E-07	3.00E-07		
U-232	1.3151E-07	3.41	6.82	6.82	0.00E+00	4.48E-07	8.97E-07		
U-233	1.9564E-09	3.41	6.82	6.82	0.00E+00	6.67E-09	1.33E-08		
U-234	1.8371E-04	3.41	6.82	6.82	0.00E+00	6.26E-04	1.25E-03		
U-235	-2.7235E-06	3.41	0.00	0.00	6.46E-03	6.45E-03	6.46E-03		
U-236	1.5493E-05	3.41	6.82	6.82	0.00E+00	5.28E-05	1.06E-04		
U-238	-4.2851E-09	3.41	0.00	0.00	1.12E-04	1.12E-04	1.12E-04		
Y-90	2.7505E+00	3.41	6.82	6.82	0.00E+00	9.38E+00	1.88E+01		
Other Radionuclides						1.75E+01	3.51E+01		

**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	ALUM	ALUM	
BOL Enrichment %	89.99998815	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		3.41	Nominal burnup calculated from the heavy metal mass destroyed.
		6.82	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		1.00
	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 FRR MTR (JALX-HEU) JAPAN  
 SNF ID # 603  
 Fuel Units & Descr. 12 - MTR TYPE  
 Heavy Metal Mass BOL=3.553kg EOL=3 553kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date 2010  
 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 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.33

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	1.4545E-10	67.30	134.60	0.00E+00	9.79E-09	1.96E-08	0.0150	2.597E+13
Am-241	1.1190E-03	67.30	134.60	0.00E+00	7.53E-02	1.51E-01	0.0250	5.594E+12
Am-242m	4.5425E-07	67.30	134.60	0.00E+00	3.06E-05	6.11E-05	0.0375	5.162E+12
Am-243	1.4921E-06	67.30	134.60	0.00E+00	1.00E-04	2.01E-04	0.0575	5.076E+12
C-14	5.7244E-09	67.30	134.60	0.00E+00	3.85E-07	7.70E-07	0.0850	3.236E+12
Cl-36	1.3124E-32	67.30	134.60	0.00E+00	8.83E-31	1.77E-30	0.1250	2.802E+12
Cm-243	2.3676E-07	67.30	134.60	0.00E+00	1.59E-05	3.19E-05	0.2250	2.743E+12
Cm-244	5.2042E-05	67.30	134.60	0.00E+00	3.50E-03	7.00E-03	0.3750	1.328E+12
Co-60	3.8208E-05	67.30	134.60	0.00E+00	2.57E-03	5.14E-03	0.5750	1.824E+13
Cs-134	4.8693E-01	67.30	134.60	0.00E+00	3.28E+01	6.55E+01	0.8500	2.554E+12
Cs-135	3.4477E-06	67.30	134.60	0.00E+00	2.32E-04	4.64E-04	1.2500	4.751E+11
Cs-137	2.8731E+00	67.30	134.60	0.00E+00	1.93E+02	3.87E+02	1.7500	1.993E+10
Eu-154	8.2053E-02	67.30	134.60	0.00E+00	5.52E+00	1.10E+01	2.2500	4.179E+10
Eu-155	3.9134E-02	67.30	134.60	0.00E+00	2.63E+00	5.27E+00	2.7500	2.404E+08
Fe-55	6.7429E-03	67.30	134.60	0.00E+00	4.54E-01	9.08E-01	3.5000	2.667E+07
H-3	1.0599E-02	67.30	134.60	0.00E+00	7.13E-01	1.43E+00	5.0000	8.009E+01
I-129	7.5300E-07	67.30	134.60	0.00E+00	5.07E-05	1.01E-04	7.0000	8.928E+00
Kr-85	2.8595E-01	67.30	134.60	0.00E+00	1.92E+01	3.85E+01	11.0000	1.006E+00
Np-237	9.5479E-06	67.30	134.60	0.00E+00	6.43E-04	1.29E-03		
Pa-231	8.9297E-10	67.30	134.60	0.00E+00	6.01E-08	1.20E-07		
Pb-210	3.7609E-12	67.30	134.60	0.00E+00	2.53E-10	5.06E-10		
Pm-147	2.5452E+00	67.30	134.60	0.00E+00	1.71E+02	3.43E+02		
Pu-238	2.0550E-02	67.30	134.60	0.00E+00	1.38E+00	2.77E+00		
Pu-239	4.2838E-04	67.30	134.60	0.00E+00	2.88E-02	5.77E-02		
Pu-240	2.4401E-04	67.30	134.60	0.00E+00	1.64E-02	3.28E-02		
Pu-241	6.8764E-02	67.30	134.60	0.00E+00	4.63E+00	9.26E+00		
Pu-242	3.6329E-07	67.30	134.60	0.00E+00	2.44E-05	4.89E-05		
Ra-226	3.8045E-11	67.30	134.60	0.00E+00	2.56E-09	5.12E-09		
Ra-228	2.9902E-15	67.30	134.60	0.00E+00	2.01E-13	4.02E-13		
Ru-106	1.9055E-01	67.30	134.60	0.00E+00	1.28E+01	2.56E+01		
Se-79	1.2936E-05	67.30	134.60	0.00E+00	8.71E-04	1.74E-03		
Sn-126	1.1574E-05	67.30	134.60	0.00E+00	7.79E-04	1.56E-03		
Sr-90	2.7505E+00	67.30	134.60	0.00E+00	1.85E+02	3.70E+02		
Tc-99	4.2239E-04	67.30	134.60	0.00E+00	2.84E-02	5.69E-02		
Th-229	1.8848E-12	67.30	134.60	0.00E+00	1.27E-10	2.54E-10		
Th-230	1.7042E-08	67.30	134.60	0.00E+00	1.15E-06	2.29E-06		
Th-232	7.8132E-15	67.30	134.60	0.00E+00	5.26E-13	1.05E-12		
Th-208	4.4063E-08	67.30	134.60	0.00E+00	2.97E-06	5.93E-06		
U-232	1.3151E-07	67.30	134.60	0.00E+00	8.85E-06	1.77E-05		
U-233	1.9564E-09	67.30	134.60	0.00E+00	1.32E-07	2.63E-07		
U-234	1.8371E-04	67.30	134.60	0.00E+00	1.24E-02	2.47E-02		
U-235	-2.7235E-06	67.30	0.00	6.90E-03	6.71E-03	6.90E-03		
U-236	1.5493E-05	67.30	134.60	0.00E+00	1.04E-03	2.09E-03		
U-238	-4.2851E-09	67.30	0.00	1.22E-04	1.21E-04	1.22E-04		
Y-90	2.7505E+00	67.30	134.60	0.00E+00	1.85E+02	3.70E+02		
Other Radionuclides					3.46E+02	6.92E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.41E+00	6.82E+00
Total	Total

**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 %	89.81998522	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		67.30	Nominal burnup assumed to be 2% of BOL heavy metal mass. Bounding burnup assumed to be twice nominal burnup
Bounding		134.60	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.06		0.98
Bounding	0.12		

<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: FRR MTR (UALX-HEU) JAPAN  
 SNF ID #: 605  
 Fuel Units & Descr: 81 - MTR TYPE  
 Heavy Metal Mass: BOL=24.818kg, EOL=24 786kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 3 38

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	30.68	61.37	0.00E+00	4.46E-09	8.93E-09	Avg. MeV	
Am-241	1.1190E-03	30.68	61.37	0.00E+00	3.43E-02	6.87E-02	0.0150	1.184E+13
Am-242m	4.5425E-07	30.68	61.37	0.00E+00	1.39E-05	2.79E-05	0.0250	2.551E+12
Am-243	1.4921E-06	30.68	61.37	0.00E+00	4.58E-05	9.16E-05	0.0375	2.354E+12
C-14	5.7244E-09	30.68	61.37	0.00E+00	1.76E-07	3.51E-07	0.0575	2.314E+12
Cl-36	1.3124E-32	30.68	61.37	0.00E+00	4.03E-31	8.05E-31	0.0850	1.476E+12
Cm-243	2.3676E-07	30.68	61.37	0.00E+00	7.26E-06	1.45E-05	0.1250	1.278E+12
Cm-244	5.2042E-05	30.68	61.37	0.00E+00	1.60E-03	3.19E-03	0.2250	1.251E+12
Co-60	3.8208E-05	30.68	61.37	0.00E+00	1.17E-03	2.34E-03	0.3750	6.053E+11
Cs-134	4.8693E-01	30.68	61.37	0.00E+00	1.49E+01	2.99E+01	0.5750	8.315E+12
Cs-135	3.4477E-06	30.68	61.37	0.00E+00	1.06E-04	2.12E-04	0.8500	1.164E+12
Cs-137	2.8731E+00	30.68	61.37	0.00E+00	8.82E+01	1.76E+02	1.2500	2.166E+11
Eu-154	8.2053E-02	30.68	61.37	0.00E+00	2.52E+00	5.04E+00	1.7500	9.084E+09
Eu-155	3.9134E-02	30.68	61.37	0.00E+00	1.20E+00	2.40E+00	2.2500	1.905E+10
Fe-55	6.7429E-03	30.68	61.37	0.00E+00	2.07E-01	4.14E-01	2.7500	1.096E+08
H-3	1.0599E-02	30.68	61.37	0.00E+00	3.25E-01	6.50E-01	3.5000	1.216E+07
I-129	7.5300E-07	30.68	61.37	0.00E+00	2.31E-05	4.62E-05	5.0000	3.836E+01
Kr-85	2.8595E-01	30.68	61.37	0.00E+00	8.77E+00	1.75E+01	7.0000	4.279E+00
Np-237	9.5479E-06	30.68	61.37	0.00E+00	2.93E-04	5.86E-04	11.0000	4.825E-01
Pa-231	8.9297E-10	30.68	61.37	0.00E+00	2.74E-08	5.48E-08		
Pb-210	3.7609E-12	30.68	61.37	0.00E+00	1.15E-10	2.31E-10		
Pm-147	2.5452E+00	30.68	61.37	0.00E+00	7.81E+01	1.56E+02		
Pu-238	2.0550E-02	30.68	61.37	0.00E+00	6.31E-01	1.26E+00		
Pu-239	4.2838E-04	30.68	61.37	0.00E+00	1.31E-02	2.63E-02		
Pu-240	2.4401E-04	30.68	61.37	0.00E+00	7.49E-03	1.50E-02		
Pu-241	6.8764E-02	30.68	61.37	0.00E+00	2.11E+00	4.22E+00		
Pu-242	3.6329E-07	30.68	61.37	0.00E+00	1.11E-05	2.23E-05		
Ra-226	3.8045E-11	30.68	61.37	0.00E+00	1.17E-09	2.33E-09		
Ra-228	2.9902E-15	30.68	61.37	0.00E+00	9.18E-14	1.84E-13		
Ru-106	1.9055E-01	30.68	61.37	0.00E+00	5.85E+00	1.17E+01		
Sa-79	1.2936E-05	30.68	61.37	0.00E+00	3.97E-04	7.94E-04		
Sn-126	1.1574E-05	30.68	61.37	0.00E+00	3.55E-04	7.10E-04		
Sr-90	2.7505E+00	30.68	61.37	0.00E+00	8.44E+01	1.69E+02		
Tc-99	4.2239E-04	30.68	61.37	0.00E+00	1.30E-02	2.59E-02		
Th-229	1.8848E-12	30.68	61.37	0.00E+00	5.78E-11	1.16E-10		
Th-230	1.7042E-08	30.68	61.37	0.00E+00	5.23E-07	1.05E-06		
Th-232	7.8132E-15	30.68	61.37	0.00E+00	2.40E-13	4.79E-13		
Tl-208	4.4063E-08	30.68	61.37	0.00E+00	1.35E-06	2.70E-06		
U-232	1.3151E-07	30.68	61.37	0.00E+00	4.04E-06	8.07E-06		
U-233	1.9564E-09	30.68	61.37	0.00E+00	6.00E-08	1.20E-07		
U-234	1.8371E-04	30.68	61.37	0.00E+00	5.64E-03	1.13E-02		
U-235	-2.7235E-06	30.68	0.00	4.99E-02	4.98E-02	4.99E-02		
U-236	1.5493E-05	30.68	61.37	0.00E+00	4.75E-04	9.51E-04		
U-238	-4.2851E-09	30.68	0.00	5.84E-04	5.84E-04	5.84E-04		
Y-90	2.7505E+00	30.68	61.37	0.00E+00	8.44E+01	1.69E+02		
Other Radionuclides					1.58E+02	3.16E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.56E+00	3.11E+00
Total	Total

**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 %	93.0000613	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		30.68	
Bounding		61.37	

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	0.00		
Bounding	0.01		

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: FRR MTR (JALX-HEU) NETHERLANDS  
 SNF ID #: 609  
 Fuel Units & Descr: 14 - MTR TYPE  
 Heavy Metal Mass: BOL=3 192kg EOL=3 188kg  
 ROD Storage Site: SRS

Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0 58

Radionuclide	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)
	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	1.4545E-10	3.98	7.96	0.00E+00	5.79E-10	1.16E-09		
Am-241	1.1190E-03	3.98	7.96	0.00E+00	4.45E-03	8.90E-03	0.0150	1.535E+12
Am-242m	4.5425E-07	3.98	7.96	0.00E+00	1.81E-06	3.61E-06	0.0250	3.306E+11
Am-243	1.4921E-06	3.98	7.96	0.00E+00	5.93E-06	1.19E-05	0.0375	3.051E+11
C-14	5.7244E-09	3.98	7.96	0.00E+00	2.28E-08	4.55E-08	0.0575	3.000E+11
Cl-36	1.3124E-32	3.98	7.96	0.00E+00	5.22E-32	1.04E-31	0.0850	1.913E+11
Cm-243	2.3676E-07	3.98	7.96	0.00E+00	9.42E-07	1.88E-06	0.1250	1.657E+11
Cm-244	5.2042E-05	3.98	7.96	0.00E+00	2.07E-04	4.14E-04	0.2250	1.622E+11
Co-60	3.8208E-05	3.98	7.96	0.00E+00	1.52E-04	3.04E-04	0.3750	7.847E+10
Cs-134	4.8693E-01	3.98	7.96	0.00E+00	1.94E+00	3.87E+00	0.5750	1.078E+12
Cs-135	3.4477E-06	3.98	7.96	0.00E+00	1.37E-05	2.74E-05	0.8500	1.509E+11
Cs-137	2.8731E+00	3.98	7.96	0.00E+00	1.14E+01	2.29E+01	1.2500	2.808E+10
Eu-154	8.2053E-02	3.98	7.96	0.00E+00	3.26E-01	6.53E-01	1.7500	1.178E+09
Eu-155	3.9134E-02	3.98	7.96	0.00E+00	1.56E-01	3.11E-01	2.2500	2.470E+09
Fe-55	6.7429E-03	3.98	7.96	0.00E+00	2.68E-02	5.36E-02	2.7500	1.421E+07
H-3	1.0599E-02	3.98	7.96	0.00E+00	4.22E-02	8.43E-02	3.5000	1.576E+06
I-129	7.5300E-07	3.98	7.96	0.00E+00	3.00E-06	5.99E-06	5.0000	4.971E+00
Kr-85	2.8595E-01	3.98	7.96	0.00E+00	1.14E+00	2.27E+00	7.0000	5.544E-01
Np-237	9.5479E-06	3.98	7.96	0.00E+00	3.80E-05	7.60E-05	11.0000	6.252E-02
Pa-231	8.9297E-10	3.98	7.96	0.00E+00	3.55E-09	7.10E-09		
Pb-210	3.7609E-12	3.98	7.96	0.00E+00	1.50E-11	2.99E-11		
Pm-147	2.5452E+00	3.98	7.96	0.00E+00	1.01E+01	2.02E+01		
Pu-238	2.0550E-02	3.98	7.96	0.00E+00	8.17E-02	1.63E-01		
Pu-239	4.2838E-04	3.98	7.96	0.00E+00	1.70E-03	3.41E-03		
Pu-240	2.4401E-04	3.98	7.96	0.00E+00	9.71E-04	1.94E-03		
Pu-241	6.8764E-02	3.98	7.96	0.00E+00	2.74E-01	5.47E-01		
Pu-242	3.6329E-07	3.98	7.96	0.00E+00	1.44E-06	2.89E-06		
Ra-226	3.8045E-11	3.98	7.96	0.00E+00	1.51E-10	3.03E-10		
Ra-228	2.9902E-15	3.98	7.96	0.00E+00	1.19E-14	2.38E-14		
Ru-106	1.9055E-01	3.98	7.96	0.00E+00	7.58E-01	1.52E+00		
Se-79	1.2936E-05	3.98	7.96	0.00E+00	5.15E-05	1.03E-04		
Sn-126	1.1574E-05	3.98	7.96	0.00E+00	4.60E-05	9.21E-05		
Sr-90	2.7505E+00	3.98	7.96	0.00E+00	1.09E+01	2.19E+01		
Tc-99	4.2239E-04	3.98	7.96	0.00E+00	1.68E-03	3.36E-03		
Th-229	1.8848E-12	3.98	7.96	0.00E+00	7.50E-12	1.50E-11		
Th-230	1.7042E-08	3.98	7.96	0.00E+00	6.78E-08	1.36E-07		
Th-232	7.8132E-15	3.98	7.96	0.00E+00	3.11E-14	6.22E-14		
Tl-208	4.4063E-08	3.98	7.96	0.00E+00	1.75E-07	3.51E-07		
U-232	1.3151E-07	3.98	7.96	0.00E+00	5.23E-07	1.05E-06		
U-233	1.9564E-09	3.98	7.96	0.00E+00	7.78E-09	1.56E-08		
U-234	1.8371E-04	3.98	7.96	0.00E+00	7.31E-04	1.46E-03		
U-235	-2.7235E-06	3.98	0.00	6.42E-03	6.40E-03	6.42E-03		
U-236	1.5493E-05	3.98	7.96	0.00E+00	6.16E-05	1.23E-04		
U-238	-4.2851E-09	3.98	0.00	7.51E-05	7.51E-05	7.51E-05		
Y-90	2.7505E+00	3.98	7.96	0.00E+00	1.09E+01	2.19E+01		
Other Radionuclides					2.05E+01	4.09E+01		

**Thermal Power**

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.02E-01	4.04E-01
Total	Total

**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 %	92.9999964	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3.98	
Bounding		7.96	

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	0.00		
Bounding	0.01		

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: FRR MTR (UALX-HEU) TAIWAN  
 SNF ID #: 628  
 Fuel Units & Descr: 35 - MTR TYPE  
 Heavy Metal Mass: BOL=4 764kg, EOL=4 76kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 1 46

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
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	1 4545E-10	3 31	6 63	0 00E+00	4 82E-10	9 64E-10		
Am-241	1 1190E-03	3 31	6 63	0 00E+00	3 71E-03	7 42E-03	0 0150	1 279E+12
Am-242m	4 5425E-07	3 31	6 63	0 00E+00	1 51E-06	3 01E-06	0 0250	2 755E+11
Am-243	1 4921E-06	3 31	6 63	0 00E+00	4 95E-06	9 89E-06	0 0375	2 543E+11
C-14	5 7244E-09	3 31	6 63	0 00E+00	1 90E-08	3 79E-08	0 0575	2 500E+11
Cl-36	1 3124E-32	3 31	6 63	0 00E+00	4 35E-32	8 70E-32	0 0850	1 594E+11
Cm-243	2 3678E-07	3 31	6 63	0 00E+00	7 85E-07	1 57E-06	0 1250	1 381E+11
Cm-244	5 2042E-05	3 31	6 63	0 00E+00	1 72E-04	3 45E-04	0 2250	1 353E+11
Co-60	3 8208E-05	3 31	6 63	0 00E+00	1 27E-04	2 53E-04	0 3750	6 539E+10
Cs-134	4 8693E-01	3 31	6 63	0 00E+00	1 61E+00	3 23E+00	0 5750	8 982E+11
Cs-135	3 4477E-06	3 31	6 63	0 00E+00	1 14E-05	2 29E-05	0 8500	1 258E+11
Cs-137	2 8731E+00	3 31	6 63	0 00E+00	9 52E+00	1 90E+01	1 2500	2 340E+10
Eu-154	8 2053E-02	3 31	6 63	0 00E+00	2 72E-01	5 44E-01	1 7500	9 813E+08
Eu-155	3 9134E-02	3 31	6 63	0 00E+00	1 30E-01	2 59E-01	2 2500	2 058E+09
Fe-55	6 7429E-03	3 31	6 63	0 00E+00	2 24E-02	4 47E-02	2 7500	1 184E+07
H-3	1 0599E-02	3 31	6 63	0 00E+00	3 51E-02	7 03E-02	3 5000	1 313E+06
I-129	7 5300E-07	3 31	6 63	0 00E+00	2 50E-06	4 99E-06	5 0000	4 306E+00
Kr-85	2 8595E-01	3 31	6 63	0 00E+00	9 48E-01	1 90E+00	7 0000	4 805E-01
Np-237	9 5479E-06	3 31	6 63	0 00E+00	3 16E-05	6 33E-05	11 0000	5 420E-02
Pa-231	8 9297E-10	3 31	6 63	0 00E+00	2 96E-09	5 92E-09		
Pb-210	3 7609E-12	3 31	6 63	0 00E+00	1 25E-11	2 49E-11		
Pm-147	2 5452E+00	3 31	6 63	0 00E+00	8 44E+00	1 69E+01		
Pu-238	2 0550E-02	3 31	6 63	0 00E+00	6 81E-02	1 36E-01		
Pu-239	4 2838E-04	3 31	6 63	0 00E+00	1 42E-03	2 84E-03		
Pu-240	2 4401E-04	3 31	6 63	0 00E+00	8 09E-04	1 62E-03		
Pu-241	6 8764E-02	3 31	6 63	0 00E+00	2 28E-01	4 56E-01		
Pu-242	3 6329E-07	3 31	6 63	0 00E+00	1 20E-06	2 41E-06		
Ra-226	3 8045E-11	3 31	6 63	0 00E+00	1 26E-10	2 52E-10		
Ra-228	2 9902E-15	3 31	6 63	0 00E+00	9 91E-15	1 98E-14		
Ru-106	1 9055E-01	3 31	6 63	0 00E+00	6 32E-01	1 26E+00		
Sa-79	1 2936E-05	3 31	6 63	0 00E+00	4 29E-05	8 58E-05		
Sn-126	1 1574E-05	3 31	6 63	0 00E+00	3 84E-05	7 67E-05		
Sr-90	2 7505E+00	3 31	6 63	0 00E+00	9 12E+00	1 82E+01		
Tc-99	4 2239E-04	3 31	6 63	0 00E+00	1 40E-03	2 80E-03		
Th-229	1 8848E-12	3 31	6 63	0 00E+00	6 25E-12	1 25E-11		
Th-230	1 7042E-08	3 31	6 63	0 00E+00	5 65E-08	1 13E-07		
Th-232	7 8132E-15	3 31	6 63	0 00E+00	2 59E-14	5 18E-14		
Ti-208	4 4063E-08	3 31	6 63	0 00E+00	1 46E-07	2 92E-07		
U-232	1 3151E-07	3 31	6 63	0 00E+00	4 36E-07	8 72E-07		
U-233	1 9564E-09	3 31	6 63	0 00E+00	6 48E-09	1 30E-08		
U-234	1 8371E-04	3 31	6 63	0 00E+00	6 09E-04	1 22E-03		
U-235	-2 7235E-06	3 31	0 00	9 59E-03	9 58E-03	9 59E-03		
U-236	1 5493E-05	3 31	6 63	0 00E+00	5 14E-05	1 03E-04		
U-238	-4 2851E-09	3 31	0 00	1 09E-04	1 09E-04	1 09E-04		
Y-90	2 7505E+00	3 31	6 63	0 00E+00	9 12E+00	1 82E+01		
Other Radionuclides					1 70E+01	3 41E+01		

**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 1900561	60 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3 31	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		6 63	

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
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: FRR MTR (UALX-LEU) ARGENTINA  
 SNF ID #: 547  
 Fuel Units & Descr: 30 - ASSEMBLY  
 Heavy Metal Mass: BOL=18 75kg EOL=18 714kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: .5 years

Estimated  
 Canister usage  
 18"x10"  
 125

Radionuclide	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	1.4545E-10	34.09	68.19	0.00E+00	4.96E-09	9.92E-09	0.0150	1.316E+13
Am-241	1.1190E-03	34.09	68.19	0.00E+00	3.82E-02	7.63E-02	0.0250	2.834E+12
Am-242m	4.5425E-07	34.09	68.19	0.00E+00	1.55E-05	3.10E-05	0.0375	2.615E+12
Am-243	1.4921E-06	34.09	68.19	0.00E+00	5.09E-05	1.02E-04	0.0575	2.572E+12
C-14	5.7244E-09	34.09	68.19	0.00E+00	1.95E-07	3.90E-07	0.0850	1.639E+12
Cl-36	1.3124E-32	34.09	68.19	0.00E+00	4.47E-31	8.95E-31	0.1250	1.420E+12
Cm-243	2.3676E-07	34.09	68.19	0.00E+00	8.07E-06	1.61E-05	0.2250	1.390E+12
Cm-244	5.2042E-05	34.09	68.19	0.00E+00	1.77E-03	3.55E-03	0.3750	6.726E+11
Co-60	3.8208E-05	34.09	68.19	0.00E+00	1.30E-03	2.61E-03	0.5750	9.238E+12
Cs-134	4.8693E-01	34.09	68.19	0.00E+00	1.66E+01	3.32E+01	0.8500	1.294E+12
Cs-135	3.4477E-06	34.09	68.19	0.00E+00	1.18E-04	2.35E-04	1.2500	2.407E+11
Cs-137	2.8731E+00	34.09	68.19	0.00E+00	9.80E+01	1.96E+02	1.7500	1.009E+10
Eu-154	8.2053E-02	34.09	68.19	0.00E+00	2.80E+00	5.59E+00	2.2500	2.117E+10
Eu-155	3.9134E-02	34.09	68.19	0.00E+00	1.33E+00	2.67E+00	2.7500	1.218E+08
Fe-55	6.7429E-03	34.09	68.19	0.00E+00	2.30E-01	4.60E-01	3.5000	1.351E+07
H-3	1.0599E-02	34.09	68.19	0.00E+00	3.61E-01	7.23E-01	5.0000	5.204E+01
I-129	7.5300E-07	34.09	68.19	0.00E+00	2.57E-05	5.13E-05	7.0000	5.843E+00
Kr-85	2.8595E-01	34.09	68.19	0.00E+00	9.75E+00	1.95E+01	11.0000	6.617E-01
Np-237	9.5479E-06	34.09	68.19	0.00E+00	3.26E-04	6.51E-04		
Pa-231	8.9297E-10	34.09	68.19	0.00E+00	3.04E-08	6.09E-08		
Pb-210	3.7609E-12	34.09	68.19	0.00E+00	1.28E-10	2.56E-10		
Pm-147	2.5452E+00	34.09	68.19	0.00E+00	8.68E+01	1.74E+02		
Pu-238	2.0550E-02	34.09	68.19	0.00E+00	7.01E-01	1.40E+00		
Pu-239	4.2838E-04	34.09	68.19	0.00E+00	1.46E-02	2.92E-02		
Pu-240	2.4401E-04	34.09	68.19	0.00E+00	8.32E-03	1.66E-02		
Pu-241	6.8764E-02	34.09	68.19	0.00E+00	2.34E+00	4.69E+00		
Pu-242	3.6329E-07	34.09	68.19	0.00E+00	1.24E-05	2.48E-05		
Ra-226	3.8045E-11	34.09	68.19	0.00E+00	1.30E-09	2.59E-09		
Ra-228	2.9902E-15	34.09	68.19	0.00E+00	1.02E-13	2.04E-13		
Ru-106	1.9055E-01	34.09	68.19	0.00E+00	6.50E+00	1.30E+01		
Se-79	1.2936E-05	34.09	68.19	0.00E+00	4.41E-04	8.82E-04		
Sn-126	1.1574E-05	34.09	68.19	0.00E+00	3.95E-04	7.89E-04		
Sr-90	2.7505E+00	34.09	68.19	0.00E+00	9.38E+01	1.88E+02		
Tc-99	4.2239E-04	34.09	68.19	0.00E+00	1.44E-02	2.88E-02		
Th-229	1.8848E-12	34.09	68.19	0.00E+00	6.43E-11	1.29E-10		
Th-230	1.7042E-08	34.09	68.19	0.00E+00	5.81E-07	1.16E-06		
Th-232	7.8132E-15	34.09	68.19	0.00E+00	2.66E-13	5.33E-13		
Tl-208	4.4063E-08	34.09	68.19	0.00E+00	1.50E-06	3.00E-06		
U-232	1.3151E-07	34.09	68.19	0.00E+00	4.48E-06	8.97E-06		
U-233	1.9564E-09	34.09	68.19	0.00E+00	6.67E-08	1.33E-07		
U-234	1.8371E-04	34.09	68.19	0.00E+00	6.26E-03	1.25E-02		
U-235	-2.7235E-06	34.09	0.00	8.10E-03	8.01E-03	8.10E-03		
U-236	-1.5493E-05	34.09	68.19	0.00E+00	5.28E-04	1.06E-03		
U-238	-4.2851E-09	34.09	0.00	5.04E-03	5.04E-03	5.04E-03		
Y-90	2.7505E+00	34.09	68.19	0.00E+00	9.38E+01	1.88E+02		
Other Radionuclides					1.75E+02	3.51E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.73E+00	3.46E+00
Total	Total

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

Template Selection Summary		
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER
Fuel Cladding	ALLUM	ALLUM
BOL HM Constituents	U	U
BOL Enrichment %	20	60 to 100

**Basis for Parameter Differences\***  
 This Template was used for the following reasons:  
 This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.

Burnup Summary (MWd) <sup>2</sup>		
	From SFD	Estimated
Nominal		34.09
Bounding		68.19

**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	0.01	
Bounding	0.01	

Estimated EOL HM/ Given EOL HM: 1.00

\*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: FRR MTR (UALX-LEU) JAPAN	Fuel decay start date: 2010
SNF ID #: 551	Estimates as of: 2010
Fuel Units & Descr.: 27 - ASSEMBLY	Template: ATR (Light Water, Alum, 60 to 100%, U)
Heavy Metal Mass: BOL=17 482kg, EOL=17 469kg	*Template Burnup(MWd): 367.2
ROD Storage Site: SRS	Template BOL Heavy Metal Mass (MT): 0 00116689
	Template Decay Time*: 5 years

Estimated Canister usage: 18"x10" 1 13
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II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	Total
Ac-227	1 4545E-10	12 78	25 57	0 00E+00	1 86E-09	3 72E-09	-	-
Am-241	1.1190E-03	12 78	25 57	0 00E+00	1 43E-02	2 86E-02	0.0150	4 933E+12
Am-242m	4.5425E-07	12 78	25 57	0 00E+00	5 81E-06	1 16E-05	0 0250	1 063E+12
Am-243	1.4921E-06	12 78	25 57	0 00E+00	1 91E-05	3 82E-05	0 0375	9 807E+11
C-14	5.7244E-09	12 78	25 57	0 00E+00	7.32E-08	1 46E-07	0 0575	9 643E+11
Cl-36	1.3124E-32	12 78	25 57	0 00E+00	1.68E-31	3 36E-31	0 0850	6 148E+11
Cm-243	2 3676E-07	12 78	25 57	0 00E+00	3 03E-06	6 05E-06	0 1250	5.324E+11
Cm-244	5 2042E-05	12 78	25 57	0 00E+00	6 65E-04	1.33E-03	0.2250	5.212E+11
Co-60	3 8208E-05	12 78	25 57	0 00E+00	4.88E-04	9 77E-04	0 3750	2 522E+11
Cs-134	4 8693E-01	12 78	25 57	0 00E+00	6 23E+00	1 25E+01	0 5750	3 464E+12
Cs-135	3 4477E-06	12 78	25 57	0 00E+00	4 41E-05	8 82E-05	0 8500	4 852E+11
Cs-137	2 8731E+00	12 78	25 57	0 00E+00	3 67E+01	7 35E+01	1.2500	9 026E+10
Eu-154	8 2053E-02	12 78	25 57	0 00E+00	1 05E+00	2 10E+00	1 7500	3 785E+09
Eu-155	3 9134E-02	12 78	25 57	0 00E+00	5 00E-01	1 00E+00	2.2500	7 939E+09
Fe-55	6 7429E-03	12 78	25 57	0 00E+00	8 62E-02	1.72E-01	2 7500	4 568E+07
H-3	1 0599E-02	12 78	25 57	0 00E+00	1 36E-01	2.71E-01	3 5000	5 066E+06
I-129	7 5300E-07	12 78	25 57	0 00E+00	9 63E-06	1.93E-05	5 0000	2 601E+01
Kr-85	2 8595E-01	12 78	25 57	0 00E+00	3 66E+00	7 31E+00	7 0000	2 939E+00
Np-237	9 5479E-06	12 78	25 57	0 00E+00	1 22E-04	2.44E-04	11 0000	3.341E-01
Pa-231	8 9297E-10	12 78	25 57	0 00E+00	1.14E-08	2.28E-08		
Pb-210	3 7609E-12	12 78	25 57	0 00E+00	4 81E-11	9 62E-11		
Pm-147	2 5452E+00	12 78	25 57	0 00E+00	3 25E+01	6 51E+01		
Pu-238	2 0550E-02	12 78	25 57	0 00E+00	2 63E-01	5.25E-01		
Pu-239	4 2838E-04	12 78	25 57	0 00E+00	5 48E-03	1 10E-02		
Pu-240	2 4401E-04	12 78	25 57	0 00E+00	3 12E-03	6 24E-03		
Pu-241	6 8764E-02	12 78	25 57	0 00E+00	8 79E-01	1 76E+00		
Pu-242	3 6329E-07	12 78	25 57	0 00E+00	4 64E-06	9.29E-06		
Ra-226	3 8045E-11	12 78	25 57	0 00E+00	4 86E-10	9 73E-10		
Ra-228	2 9902E-15	12 78	25 57	0 00E+00	3 82E-14	7 65E-14		
Ru-106	1 9055E-01	12 78	25 57	0 00E+00	2 44E+00	4 87E+00		
Se-79	1 2936E-05	12 78	25 57	0 00E+00	1 65E-04	3 31E-04		
Sn-126	1 1574E-05	12 78	25 57	0 00E+00	1 48E-04	2 96E-04		
Sr-90	2 7505E+00	12 78	25 57	0 00E+00	3 52E+01	7.03E+01		
Tc-99	4 2239E-04	12 78	25 57	0 00E+00	5 40E-03	1 08E-02		
Th-229	1 8848E-12	12 78	25 57	0 00E+00	2 41E-11	4 82E-11		
Th-230	1 7042E-08	12 78	25 57	0 00E+00	2 18E-07	4 36E-07		
Th-232	7 8132E-15	12 78	25 57	0 00E+00	9 99E-14	2 00E-13		
Tl-208	4 4063E-08	12 78	25 57	0 00E+00	5 63E-07	1 13E-06		
U-232	1 3151E-07	12 78	25 57	0 00E+00	1 68E-06	3 36E-06		
U-233	1 9564E-09	12 78	25 57	0 00E+00	2 50E-08	5 00E-08		
U-234	1 8371E-04	12 78	25 57	0 00E+00	2 35E-03	4 70E-03		
U-235	-2.7235E-06	12 78	0 00	7 56E-03	7 52E-03	7 56E-03		
U-236	1.5493E-05	12 78	25 57	0 00E+00	1 98E-04	3 96E-04		
U-238	-4.2851E-09	12 78	0 00	4 70E-03	4 70E-03	4 70E-03		
Y-90	2.7505E+00	12 78	25 57	0 00E+00	3 52E+01	7 03E+01		
Other Radionuclides					6 58E+01	1 32E+02		

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

<b>Template Selection Summary</b>			<b>Basis for Parameter Differences:</b> This Template was used for the following reasons This fuel matches on all parameters except enrichment.
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20 0000092	60 to 100	

<b>Burnup Summary (MWd)<sup>2</sup></b>			<b>Basis for burnup used in estimate:</b> Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
	From SFD	Estimated	
Nominal		12 78	
Bounding		25 57	

<b>Checks</b>			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1 00
Nominal	0 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: FRR MTR (JALX-LEU) TAIWAN  
 SNF ID #: 555  
 Fuel Units & Descr: 23 - ASSEMBLY  
 Heavy Metal Mass: BOL=34 797kg, EOL=34 797kg  
 ROD Storage Site: SRS

Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 96

Radionuclide	m Ct/MWd From Template	x <sub>n</sub> Nominal Fuel Burnup (MWd) <sup>2</sup>	x <sub>b</sub> Bounding Fuel Burnup (MWd) <sup>2</sup>	b Initial Activity (Ci)	y <sub>n</sub> Nominal Fuel Inventories(Ci)	y <sub>b</sub> Bounding Fuel Inventories(Ci)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	659 06	1,318 13	0 00E+00	9 59E-08	1 92E-07	Avg MeV	
Am-241	1.1190E-03	659 06	1,318 13	0 00E+00	7.37E-01	1.47E+00	0 0150	2.543E+14
Am-242m	4.5425E-07	659 06	1,318 13	0 00E+00	2 99E-04	5 99E-04	0 0250	5 479E+13
Am-243	1 4921E-06	659 06	1,318 13	0 00E+00	9 83E-04	1 97E-03	0 0375	5 056E+13
C-14	5 7244E-09	659 06	1,318 13	0 00E+00	3 77E-06	7 55E-06	0 0575	4 971E+13
Cl-36	1.3124E-32	659 06	1,318 13	0 00E+00	8 65E-30	1 73E-29	0 0850	3 169E+13
Cm-243	2 3676E-07	659 06	1,318 13	0 00E+00	1.56E-04	3 12E-04	0 1250	2 744E+13
Cm-244	5.2042E-05	659 06	1,318 13	0 00E+00	3 43E-02	6 86E-02	0 2250	2.686E+13
Co-60	3 8208E-05	659 06	1,318 13	0 00E+00	2 52E-02	5 04E-02	0 3750	1.300E+13
Cs-134	4 8693E-01	659 06	1,318 13	0 00E+00	3.21E+02	6 42E+02	0 5750	1 786E+14
Cs-135	3 4477E-06	659 06	1,318 13	0 00E+00	2 27E-03	4 54E-03	0 8500	2.501E+13
Cs-137	2 8731E+00	659 06	1,318 13	0 00E+00	1 89E+03	3 79E+03	1 2500	4 653E+12
Eu-154	8 2053E-02	659 06	1,318 13	0 00E+00	5 41E+01	1 08E+02	1 7500	1.951E+11
Eu-155	3 9134E-02	659 06	1,318 13	0 00E+00	2 58E+01	5 16E+01	2 2500	4.093E+11
Fe-55	6 7429E-03	659 06	1,318 13	0 00E+00	4 44E+00	8 89E+00	2 7500	2.355E+09
H-3	1 0599E-02	659 06	1,318 13	0 00E+00	6 99E+00	1 40E+01	3 5000	2.611E+08
I-129	7 5300E-07	659 06	1,318 13	0 00E+00	4 96E-04	9 93E-04	5 0000	8 023E+02
Kr-85	2 8595E-01	659 06	1,318 13	0 00E+00	1 88E+02	3 77E+02	7 0000	8.952E+01
Np-237	9 5479E-06	659 06	1,318 13	0 00E+00	6 29E-03	1 26E-02	11 0000	1.010E+01
Pa-231	8 9297E-10	659 06	1,318 13	0 00E+00	5 89E-07	1.18E-06		
Pb-210	3 7609E-12	659 06	1,318 13	0 00E+00	2 48E-09	4.96E-09		
Pm-147	2.5452E+00	659 06	1,318 13	0 00E+00	1 68E+03	3 35E+03		
Pu-238	2.0550E-02	659 06	1,318 13	0 00E+00	1 35E+01	2 71E+01		
Pu-239	4.2838E-04	659 06	1,318 13	0 00E+00	2 82E-01	5 65E-01		
Pu-240	2.4401E-04	659 06	1,318 13	0 00E+00	1 61E-01	3.22E-01		
Pu-241	6.8764E-02	659 06	1,318 13	0 00E+00	4 53E+01	9 06E+01		
Pu-242	3 6329E-07	659 06	1,318 13	0 00E+00	2.39E-04	4 79E-04		
Ra-226	3 8045E-11	659 06	1,318 13	0 00E+00	2.51E-08	5 01E-08		
Ra-228	2 9902E-15	659 06	1,318 13	0 00E+00	1.97E-12	3 94E-12		
Ru-106	1 9055E-01	659 06	1,318 13	0 00E+00	1.26E+02	2.51E+02		
Se-79	1.2936E-05	659 06	1,318 13	0 00E+00	8.53E-03	1 71E-02		
Sn-126	1 1574E-05	659 06	1,318 13	0 00E+00	7.63E-03	1 53E-02		
Sr-90	2 7505E+00	659 06	1,318 13	0 00E+00	1.81E+03	3 63E+03		
Tc-99	4 2239E-04	659 06	1,318 13	0 00E+00	2 78E-01	5 57E-01		
Th-229	1 8848E-12	659 06	1,318 13	0 00E+00	1.24E-09	2 48E-09		
Th-230	1 7042E-08	659 06	1,318 13	0 00E+00	1 12E-05	2 25E-05		
Th-232	7 8132E-15	659 06	1,318 13	0 00E+00	5 15E-12	1 03E-11		
Ti-208	4 4063E-08	659 06	1,318 13	0 00E+00	2 90E-05	5 81E-05		
U-232	1.3151E-07	659 06	1,318 13	0 00E+00	8 67E-05	1 73E-04		
U-233	1 9564E-09	659 06	1,318 13	0 00E+00	1 29E-06	2 58E-06		
U-234	1 8371E-04	659 06	1,318 13	0 00E+00	1 21E-01	2 42E-01		
U-235	-2 7235E-06	659 06	0 00	1 49E-02	1 31E-02	1 49E-02		
U-236	1.5493E-05	659 06	1,318 13	0 00E+00	1 02E-02	2 04E-02		
U-238	-4.2851E-09	659 06	0 00	9 38E-03	9 37E-03	9 38E-03		
Y-90	2.7505E+00	659 06	1,318 13	0 00E+00	1 81E+03	3 63E+03		
Other Radionuclides					3 39E+03	6 78E+03		

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

<b>Template Selection Summary</b>			<b>Basis for Parameter Differences:</b> This Template was used for the following reasons. This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 83000026	60 to 100	
<b>Burnup Summary (MWd)<sup>2</sup></b>			<b>Basis for burnup used in estimate:</b> Nominal burnup assumed to be 2% of BOL heavy metal mass Bounding burnup assumed to be twice nominal burnup
	From SFD	Estimated	
Nominal		659 06	
Bounding		1,318 13	
<b>Checks</b>			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 0 98
Nominal	0 06		
Bounding	0 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: FRR MTR (UJALX-LEU) VENEZUELA  
 SNF ID #: 559  
 Fuel Units & Descr: 64 - ASSEMBLY  
 Heavy Metal Mass: BOL=43.2kg, EOL=39 046kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 2 67

II. Estimates	m	x <sub>a</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	1.4545E-10	3,933.54	7,867.08	0.00E+00	5.72E-07	1.14E-06		
Am-241	1.1190E-03	3,933.54	7,867.08	0.00E+00	4.40E+00	8.80E+00	0.0150	1.518E+15
Am-242m	4.5425E-07	3,933.54	7,867.08	0.00E+00	1.79E-03	3.57E-03	0.0250	3.270E+14
Am-243	1.4921E-06	3,933.54	7,867.08	0.00E+00	5.87E-03	1.17E-02	0.0375	3.017E+14
C-14	5.7244E-09	3,933.54	7,867.08	0.00E+00	2.25E-05	4.50E-05	0.0575	2.967E+14
Cl-36	1.3124E-32	3,933.54	7,867.08	0.00E+00	5.16E-29	1.03E-28	0.0850	1.891E+14
Cm-243	2.3676E-07	3,933.54	7,867.08	0.00E+00	9.31E-04	1.86E-03	0.1250	1.638E+14
Cm-244	5.2042E-05	3,933.54	7,867.08	0.00E+00	2.05E-01	4.09E-01	0.2250	1.603E+14
Co-60	3.8208E-05	3,933.54	7,867.08	0.00E+00	1.50E-01	3.01E-01	0.3750	7.760E+13
Cs-134	4.8693E-01	3,933.54	7,867.08	0.00E+00	1.92E+03	3.83E+03	0.5750	1.066E+15
Cs-135	3.4477E-06	3,933.54	7,867.08	0.00E+00	1.36E-02	2.71E-02	0.8500	1.493E+14
Cs-137	2.8731E+00	3,933.54	7,867.08	0.00E+00	1.13E+04	2.26E+04	1.2500	2.777E+13
Eu-154	8.2053E-02	3,933.54	7,867.08	0.00E+00	3.23E+02	6.46E+02	1.7500	1.165E+12
Eu-155	3.9134E-02	3,933.54	7,867.08	0.00E+00	1.54E+02	3.08E+02	2.2500	2.443E+12
Fe-55	6.7429E-03	3,933.54	7,867.08	0.00E+00	2.65E+01	5.30E+01	2.7500	1.405E+10
H-3	1.0599E-02	3,933.54	7,867.08	0.00E+00	4.17E+01	8.34E+01	3.5000	1.559E+09
I-129	7.5300E-07	3,933.54	7,867.08	0.00E+00	2.96E-03	5.92E-03	5.0000	4.686E+03
Kr-85	2.8595E-01	3,933.54	7,867.08	0.00E+00	1.12E+03	2.25E+03	7.0000	5.225E+02
Np-237	9.5479E-06	3,933.54	7,867.08	0.00E+00	3.76E-02	7.51E-02	11.0000	5.890E+01
Pa-231	8.9297E-10	3,933.54	7,867.08	0.00E+00	3.51E-06	7.03E-06		
Pb-210	3.7609E-12	3,933.54	7,867.08	0.00E+00	1.48E-08	2.96E-08		
Pm-147	2.5452E+00	3,933.54	7,867.08	0.00E+00	1.00E+04	2.00E+04		
Pu-238	2.0550E-02	3,933.54	7,867.08	0.00E+00	8.08E+01	1.62E+02		
Pu-239	4.2838E-04	3,933.54	7,867.08	0.00E+00	1.69E+00	3.37E+00		
Pu-240	2.4401E-04	3,933.54	7,867.08	0.00E+00	9.60E-01	1.92E+00		
Pu-241	6.8764E-02	3,933.54	7,867.08	0.00E+00	2.70E+02	5.41E+02		
Pu-242	3.6329E-07	3,933.54	7,867.08	0.00E+00	1.43E-03	2.86E-03		
Ra-226	3.8045E-11	3,933.54	7,867.08	0.00E+00	1.50E-07	2.99E-07		
Ra-228	2.9902E-15	3,933.54	7,867.08	0.00E+00	1.18E-11	2.35E-11		
Ru-106	1.9055E-01	3,933.54	7,867.08	0.00E+00	7.50E+02	1.50E+03		
Se-79	1.2936E-05	3,933.54	7,867.08	0.00E+00	5.09E-02	1.02E-01		
Sn-126	1.1574E-05	3,933.54	7,867.08	0.00E+00	4.55E-02	9.11E-02		
Sr-90	2.7505E+00	3,933.54	7,867.08	0.00E+00	1.08E+04	2.16E+04		
Tc-99	4.2239E-04	3,933.54	7,867.08	0.00E+00	1.66E+00	3.32E+00		
Th-229	1.8848E-12	3,933.54	7,867.08	0.00E+00	7.41E-09	1.48E-08		
Th-230	1.7042E-08	3,933.54	7,867.08	0.00E+00	6.70E-05	1.34E-04		
Th-232	7.8132E-15	3,933.54	7,867.08	0.00E+00	3.07E-11	6.15E-11		
Th-208	4.4063E-08	3,933.54	7,867.08	0.00E+00	1.73E-04	3.47E-04		
U-232	1.3151E-07	3,933.54	7,867.08	0.00E+00	5.17E-04	1.03E-03		
U-233	1.9564E-09	3,933.54	7,867.08	0.00E+00	7.70E-06	1.54E-05		
U-234	1.8371E-04	3,933.54	7,867.08	0.00E+00	7.23E-01	1.45E+00		
U-235	-2.7235E-06	3,933.54	0.00	1.87E-02	7.96E-03	1.87E-02		
U-236	1.5493E-05	3,933.54	7,867.08	0.00E+00	6.09E-02	1.22E-01		
U-238	-4.2851E-09	3,933.54	0.00	1.16E-02	1.16E-02	1.16E-02		
Y-90	2.7505E+00	3,933.54	7,867.08	0.00E+00	1.08E+04	2.16E+04		
Other Radionuclides					2.02E+04	4.05E+04		

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

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
BOL Enrichment %	20	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3,933.54	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		7,867.08	

Checks			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.29		
Bounding	0.58		

<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 FRR MTR (UALX-MEU) JAPAN  
 SNF ID # 565  
 Fuel Units & Descr: 30 - MTR TYPE  
 Heavy Metal Mass: BOL=21.543kg, EOL=21 525kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date 2010  
 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 5 years

Estimated  
 Canister usage  
 18"x10"  
 1 25

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							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	1.4545E-10	17.05	34.09	0.00E+00	2.48E-09	4.96E-09	0.0150	6.578E+12
Am-241	1.1190E-03	17.05	34.09	0.00E+00	1.91E-02	3.82E-02	0.0250	1.417E+12
Am-242m	4.5425E-07	17.05	34.09	0.00E+00	7.74E-06	1.55E-05	0.0375	1.308E+12
Am-243	1.4921E-06	17.05	34.09	0.00E+00	2.54E-05	5.09E-05	0.0575	1.286E+12
C-14	5.7244E-09	17.05	34.09	0.00E+00	9.76E-08	1.95E-07	0.0850	8.197E+11
Cl-36	1.3124E-32	17.05	34.09	0.00E+00	2.24E-31	4.47E-31	0.1250	7.099E+11
Cm-243	2.3676E-07	17.05	34.09	0.00E+00	4.04E-06	8.07E-06	0.2250	6.951E+11
Cm-244	5.2042E-05	17.05	34.09	0.00E+00	8.87E-04	1.77E-03	0.3750	3.363E+11
Co-60	3.8208E-05	17.05	34.09	0.00E+00	6.51E-04	1.30E-03	0.5750	4.619E+11
Cs-134	4.8693E-01	17.05	34.09	0.00E+00	8.30E+00	1.66E+01	0.8500	6.469E+11
Cs-135	3.4477E-06	17.05	34.09	0.00E+00	5.88E-05	1.18E-04	1.2500	1.204E+11
Cs-137	2.8731E+00	17.05	34.09	0.00E+00	4.90E+01	9.80E+01	1.7500	5.047E+09
Eu-154	8.2053E-02	17.05	34.09	0.00E+00	1.40E+00	2.80E+00	2.2500	1.059E+10
Eu-155	3.9134E-02	17.05	34.09	0.00E+00	6.67E-01	1.33E+00	2.7500	6.090E+07
Fe-55	6.7429E-03	17.05	34.09	0.00E+00	1.15E-01	2.30E-01	3.5000	6.754E+06
H-3	1.0599E-02	17.05	34.09	0.00E+00	1.81E-01	3.61E-01	5.0000	2.960E+01
I-129	7.5300E-07	17.05	34.09	0.00E+00	1.28E-05	2.57E-05	7.0000	3.333E+00
Kr-85	2.8595E-01	17.05	34.09	0.00E+00	4.87E+00	9.75E+00	11.0000	3.780E-01
Np-237	9.5479E-06	17.05	34.09	0.00E+00	1.63E-04	3.26E-04		
Pa-231	8.9297E-10	17.05	34.09	0.00E+00	1.52E-08	3.04E-08		
Pb-210	3.7609E-12	17.05	34.09	0.00E+00	6.41E-11	1.28E-10		
Pm-147	2.5452E+00	17.05	34.09	0.00E+00	4.34E+01	8.68E+01		
Pu-238	2.0550E-02	17.05	34.09	0.00E+00	3.50E-01	7.01E-01		
Pu-239	4.2838E-04	17.05	34.09	0.00E+00	7.30E-03	1.46E-02		
Pu-240	2.4401E-04	17.05	34.09	0.00E+00	4.16E-03	8.32E-03		
Pu-241	6.8764E-02	17.05	34.09	0.00E+00	1.17E+00	2.34E+00		
Pu-242	3.6329E-07	17.05	34.09	0.00E+00	6.19E-06	1.24E-05		
Ra-226	3.8045E-11	17.05	34.09	0.00E+00	6.49E-10	1.30E-09		
Ra-228	2.9902E-15	17.05	34.09	0.00E+00	5.10E-14	1.02E-13		
Ru-106	1.9055E-01	17.05	34.09	0.00E+00	3.25E+00	6.50E+00		
Se-79	1.2936E-05	17.05	34.09	0.00E+00	2.21E-04	4.41E-04		
Sn-126	1.1574E-05	17.05	34.09	0.00E+00	1.97E-04	3.95E-04		
Sr-90	2.7505E+00	17.05	34.09	0.00E+00	4.69E+01	9.38E+01		
Tc-99	4.2239E-04	17.05	34.09	0.00E+00	7.20E-03	1.44E-02		
Th-229	1.8848E-12	17.05	34.09	0.00E+00	3.21E-11	6.43E-11		
Th-230	1.7042E-08	17.05	34.09	0.00E+00	2.91E-07	5.81E-07		
Th-232	7.8132E-15	17.05	34.09	0.00E+00	1.33E-13	2.66E-13		
Th-208	4.4063E-08	17.05	34.09	0.00E+00	7.51E-07	1.50E-06		
U-232	1.3151E-07	17.05	34.09	0.00E+00	2.24E-06	4.48E-06		
U-233	1.9564E-09	17.05	34.09	0.00E+00	3.34E-08	6.67E-08		
U-234	1.8371E-04	17.05	34.09	0.00E+00	3.13E-03	6.26E-03		
U-235	-2.7235E-06	17.05	0.00	2.09E-02	2.09E-02	2.09E-02		
U-236	1.5493E-05	17.05	34.09	0.00E+00	2.64E-04	5.28E-04		
U-238	-4.2851E-09	17.05	0.00	3.98E-03	3.98E-03	3.98E-03		
Y-90	2.7505E+00	17.05	34.09	0.00E+00	4.69E+01	9.38E+01		
Other Radionuclides					8.77E+01	1.75E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8 65E-01	1 73E+00
Total	Total

**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 ATR Template on all but one parameter (enrichment) making ATR a reasonable match
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	44 97911463	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
Nominal	From SFD	Estimated	
		17.05	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		34.09	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Bounding	0.00		1.00
	0.01		

\*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: FRR MTR UALX HEU CANADA  
 SNF ID #: 294  
 Fuel Units & Descr: 14 - MULTI-PIN CLUSTER  
 Heavy Metal Mass: BOL=2.204kg, EOL=2.192kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0.58

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	10.61	21.21	0.00E+00	1.54E-09	3.09E-09	Avg MeV	
Am-241	1.1190E-03	10.61	21.21	0.00E+00	1.19E-02	2.37E-02	0.0150	4.093E+12
Am-242m	4.5425E-07	10.61	21.21	0.00E+00	4.82E-06	9.64E-06	0.0250	8.817E+11
Am-243	1.4921E-06	10.61	21.21	0.00E+00	1.58E-05	3.17E-05	0.0375	8.136E+11
C-14	5.7244E-09	10.61	21.21	0.00E+00	6.07E-08	1.21E-07	0.0575	8.000E+11
Cf-252	1.3124E-32	10.61	21.21	0.00E+00	1.39E-31	2.78E-31	0.0850	5.100E+11
Cm-243	2.3676E-07	10.61	21.21	0.00E+00	2.51E-06	5.02E-06	0.1250	4.417E+11
Cm-244	5.2042E-05	10.61	21.21	0.00E+00	5.52E-04	1.10E-03	0.2250	4.324E+11
Co-60	3.8208E-05	10.61	21.21	0.00E+00	4.05E-04	8.11E-04	0.3750	2.092E+11
Cs-134	4.8693E-01	10.61	21.21	0.00E+00	5.16E+00	1.03E+01	0.5750	2.874E+12
Cs-135	3.4477E-06	10.61	21.21	0.00E+00	3.66E-05	7.31E-05	0.8500	4.025E+11
Cs-137	2.8731E+00	10.61	21.21	0.00E+00	3.05E+01	6.09E+01	1.2500	7.488E+10
Eu-154	8.2053E-02	10.61	21.21	0.00E+00	8.70E-01	1.74E+00	1.7500	3.140E+09
Eu-155	3.9134E-02	10.61	21.21	0.00E+00	4.15E-01	8.30E-01	2.2500	6.587E+09
Fe-55	6.7429E-03	10.61	21.21	0.00E+00	7.15E-02	1.43E-01	2.7500	3.789E+07
H-3	1.0599E-02	10.61	21.21	0.00E+00	1.12E-01	2.25E-01	3.5000	4.203E+06
I-129	7.5300E-07	10.61	21.21	0.00E+00	7.99E-06	1.60E-05	5.0000	1.274E+01
Kr-85	2.8595E-01	10.61	21.21	0.00E+00	3.03E+00	6.07E+00	7.0000	1.420E+00
Np-237	9.5479E-06	10.61	21.21	0.00E+00	1.01E-04	2.03E-04	11.0000	1.601E-01
Pa-231	8.9297E-10	10.61	21.21	0.00E+00	9.47E-09	1.89E-08		
Pb-210	3.7609E-12	10.61	21.21	0.00E+00	3.99E-11	7.98E-11		
Pm-147	2.5452E+00	10.61	21.21	0.00E+00	2.70E+01	5.40E+01		
Pu-238	2.0550E-02	10.61	21.21	0.00E+00	2.18E-01	4.36E-01		
Pu-239	4.2838E-04	10.61	21.21	0.00E+00	4.54E-03	9.09E-03		
Pu-240	2.4401E-04	10.61	21.21	0.00E+00	2.59E-03	5.18E-03		
Pu-241	6.8764E-02	10.61	21.21	0.00E+00	7.29E-01	1.46E+00		
Pu-242	3.6329E-07	10.61	21.21	0.00E+00	3.85E-06	7.71E-06		
Ra-226	3.8045E-11	10.61	21.21	0.00E+00	4.04E-10	8.07E-10		
Ra-228	2.9902E-15	10.61	21.21	0.00E+00	3.17E-14	6.34E-14		
Ru-106	1.9055E-01	10.61	21.21	0.00E+00	2.02E+00	4.04E+00		
Se-79	1.2936E-05	10.61	21.21	0.00E+00	1.37E-04	2.74E-04		
Sn-126	1.1574E-05	10.61	21.21	0.00E+00	1.23E-04	2.46E-04		
Sr-90	2.7505E+00	10.61	21.21	0.00E+00	2.92E+01	5.83E+01		
Tc-99	4.2239E-04	10.61	21.21	0.00E+00	4.48E-03	8.96E-03		
Th-229	1.8848E-12	10.61	21.21	0.00E+00	2.00E-11	4.00E-11		
Th-230	1.7042E-08	10.61	21.21	0.00E+00	1.81E-07	3.62E-07		
Th-232	7.8132E-15	10.61	21.21	0.00E+00	8.29E-14	1.66E-13		
Th-208	4.4063E-08	10.61	21.21	0.00E+00	4.67E-07	9.35E-07		
U-232	1.3151E-07	10.61	21.21	0.00E+00	1.39E-06	2.79E-06		
U-233	1.9564E-09	10.61	21.21	0.00E+00	2.08E-08	4.15E-08		
U-234	1.8371E-04	10.61	21.21	0.00E+00	1.95E-03	3.90E-03		
U-235	-2.7235E-06	10.61	0.00	4.43E-03	4.40E-03	4.43E-03		
U-236	1.5493E-05	10.61	21.21	0.00E+00	1.64E-04	3.29E-04		
U-238	-4.2851E-09	10.61	0.00	5.11E-05	5.11E-05	5.11E-05		
Y-90	2.7505E+00	10.61	21.21	0.00E+00	2.92E+01	5.83E+01		
Other Radionuclides					5.46E+01	1.09E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.36E-01	1.08E+00
Total	Total

**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	ALUM	ALUM	
BOL Enrichment %	U	U	
	93.09999644	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		10.61	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
		21.21	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
Bounding	0.02		1.00
	0.03		

<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	FRR MTR-C (U308-LEU) PERU	Fuel decay start date	2010
SNF ID #	503	Estimates as of	2010
Fuel Units & Descr	6 - ASSEMBLY	Template	ATR (Light Water, Alum, 60 to 100%, U)
Heavy Metal Mass	BOL=6kg EOL=5.67kg	Template Burnup (MWD)	367.2
ROD Storage Site	SRS	Template BOL Heavy Metal Mass (MT)	0.00116689
		Template Decay Time	5 years

Estimated  
Canister usage  
18"x10"  
0.25

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)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	312.52	625.03	0.00E+00	4.55E-08	9.09E-08	Avg MeV	
Am-241	1.1190E-03	312.52	625.03	0.00E+00	3.50E-01	6.99E-01	0.0150	1.206E+14
Am-242m	4.5425E-07	312.52	625.03	0.00E+00	1.42E-04	2.84E-04	0.0250	2.598E+13
Am-243	1.4921E-06	312.52	625.03	0.00E+00	4.66E-04	9.33E-04	0.0375	2.397E+13
C-14	5.7244E-09	312.52	625.03	0.00E+00	1.79E-06	3.58E-06	0.0575	2.357E+13
Cl-36	1.3124E-32	312.52	625.03	0.00E+00	4.10E-30	8.20E-30	0.0850	1.503E+13
Cm-243	2.3676E-07	312.52	625.03	0.00E+00	7.40E-05	1.48E-04	0.1250	1.301E+13
Cm-244	5.2042E-05	312.52	625.03	0.00E+00	1.63E-02	3.25E-02	0.2250	1.274E+13
Co-60	3.8208E-05	312.52	625.03	0.00E+00	1.19E-02	2.39E-02	0.3750	6.165E+12
Cs-134	4.8693E-01	312.52	625.03	0.00E+00	1.52E+02	3.04E+02	0.5750	8.468E+13
Cs-135	3.4477E-06	312.52	625.03	0.00E+00	1.08E-03	2.15E-03	0.8500	1.186E+13
Cs-137	2.8731E+00	312.52	625.03	0.00E+00	8.98E+02	1.80E+03	1.2500	2.206E+12
Eu-154	8.2053E-02	312.52	625.03	0.00E+00	2.56E+01	5.13E+01	1.7500	9.253E+10
Eu-155	3.9134E-02	312.52	625.03	0.00E+00	1.22E+01	2.45E+01	2.2500	1.941E+11
Fe-55	6.7429E-03	312.52	625.03	0.00E+00	2.11E+00	4.21E+00	2.7500	1.117E+09
H-3	1.0599E-02	312.52	625.03	0.00E+00	3.31E+00	6.62E+00	3.5000	1.238E+08
I-129	7.5300E-07	312.52	625.03	0.00E+00	2.35E-04	4.71E-04	5.0000	3.739E+02
Kr-85	2.8595E-01	312.52	625.03	0.00E+00	8.94E+01	1.79E+02	7.0000	4.169E+01
Np-237	9.5479E-06	312.52	625.03	0.00E+00	2.98E-03	5.97E-03	11.0000	4.701E+00
Pa-231	8.9297E-10	312.52	625.03	0.00E+00	2.79E-07	5.58E-07		
Pb-210	3.7609E-12	312.52	625.03	0.00E+00	1.18E-09	2.35E-09		
Pm-147	2.5452E+00	312.52	625.03	0.00E+00	7.95E+02	1.59E+03		
Pu-238	2.0550E-02	312.52	625.03	0.00E+00	6.42E+00	1.28E+01		
Pu-239	4.2838E-04	312.52	625.03	0.00E+00	1.34E-01	2.68E-01		
Pu-240	2.4401E-04	312.52	625.03	0.00E+00	7.63E-02	1.53E-01		
Pu-241	6.8764E-02	312.52	625.03	0.00E+00	2.15E+01	4.30E+01		
Pu-242	3.6329E-07	312.52	625.03	0.00E+00	1.14E-04	2.27E-04		
Ra-226	3.8045E-11	312.52	625.03	0.00E+00	1.19E-08	2.38E-08		
Ra-228	2.9902E-15	312.52	625.03	0.00E+00	9.34E-13	1.87E-12		
Ru-106	1.9055E-01	312.52	625.03	0.00E+00	5.96E+01	1.19E+02		
Se-79	1.2936E-05	312.52	625.03	0.00E+00	4.04E-03	8.09E-03		
Sn-126	1.1574E-05	312.52	625.03	0.00E+00	3.62E-03	7.23E-03		
Sr-90	2.7505E+00	312.52	625.03	0.00E+00	8.60E+02	1.72E+03		
Tc-99	4.2239E-04	312.52	625.03	0.00E+00	1.32E-01	2.64E-01		
Th-229	1.8848E-12	312.52	625.03	0.00E+00	5.89E-10	1.18E-09		
Th-230	1.7042E-08	312.52	625.03	0.00E+00	5.33E-06	1.07E-05		
Th-232	7.8132E-15	312.52	625.03	0.00E+00	2.44E-12	4.88E-12		
Tl-208	4.4063E-08	312.52	625.03	0.00E+00	1.38E-05	2.75E-05		
U-232	1.3151E-07	312.52	625.03	0.00E+00	4.11E-05	8.22E-05		
U-233	1.9564E-09	312.52	625.03	0.00E+00	6.11E-07	1.22E-06		
U-234	1.8371E-04	312.52	625.03	0.00E+00	5.74E-02	1.15E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-2.7235E-06	312.52	0.00	2.59E-03	1.74E-03	2.59E-03	1.58E+01	3.17E+01
U-236	1.5493E-05	312.52	625.03	0.00E+00	4.84E-03	9.68E-03	Total	Total
U-238	-4.2851E-09	312.52	0.00	1.61E-03	1.61E-03	1.61E-03		
Y-90	2.7505E+00	312.52	625.03	0.00E+00	8.60E+02	1.72E+03		
Other Radionuclides					1.61E+03	3.21E+03		

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		312.52	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		625.03	

Checks			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.17		1.00
Bounding	0.33		

<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: FRR MTR-C (U3Si2 LEU) CANADA  
 SNF ID #: 512  
 Fuel Units & Descr: 8 - ASSEMBLY  
 Heavy Metal Mass: BOL=6.52kg, EOL=5.868kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.33

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	1.4545E-10	617.46	1,234.91	0.00E+00	8.98E-08	1.80E-07	Avg. MeV	
Am-241	1.1190E-03	617.46	1,234.91	0.00E+00	6.91E-01	1.38E+00	0.0150	2.382E+14
Am-242m	4.5425E-07	617.46	1,234.91	0.00E+00	2.80E-04	5.61E-04	0.0250	5.133E+13
Am-243	1.4921E-06	617.46	1,234.91	0.00E+00	9.21E-04	1.84E-03	0.0375	4.736E+13
C-14	5.7244E-09	617.46	1,234.91	0.00E+00	3.53E-06	7.07E-06	0.0575	4.657E+13
Cl-36	1.3124E-32	617.46	1,234.91	0.00E+00	8.10E-30	1.62E-29	0.0850	2.969E+13
Cm-243	2.3676E-07	617.46	1,234.91	0.00E+00	1.46E-04	2.92E-04	0.1250	2.571E+13
Cm-244	5.2042E-05	617.46	1,234.91	0.00E+00	3.21E-02	6.43E-02	0.2250	2.516E+13
Co-60	3.8208E-05	617.46	1,234.91	0.00E+00	2.36E-02	4.72E-02	0.3750	1.218E+13
Cs-134	4.8693E-01	617.46	1,234.91	0.00E+00	3.01E+02	6.01E+02	0.5750	1.673E+14
Cs-135	3.4477E-06	617.46	1,234.91	0.00E+00	2.13E-03	4.26E-03	0.8500	2.343E+13
Cs-137	2.8731E+00	617.46	1,234.91	0.00E+00	1.77E+03	3.55E+03	1.2500	4.359E+12
Eu-154	8.2053E-02	617.46	1,234.91	0.00E+00	5.07E+01	1.01E+02	1.7500	1.828E+11
Eu-155	3.9134E-02	617.46	1,234.91	0.00E+00	2.42E+01	4.83E+01	2.2500	3.834E+11
Fe-55	6.7429E-03	617.46	1,234.91	0.00E+00	4.16E+00	8.33E+00	2.7500	2.206E+09
H-3	1.0599E-02	617.46	1,234.91	0.00E+00	6.54E+00	1.31E+01	3.5000	2.447E+08
I-129	7.5300E-07	617.46	1,234.91	0.00E+00	4.65E-04	9.30E-04	5.0000	7.354E+02
Kr-85	2.8595E-01	617.46	1,234.91	0.00E+00	1.77E+02	3.53E+02	7.0000	8.199E+01
Np-237	9.5479E-06	617.46	1,234.91	0.00E+00	5.90E-03	1.18E-02	11.0000	9.243E+00
Pa-231	8.9297E-10	617.46	1,234.91	0.00E+00	5.51E-07	1.10E-06		
Pb-210	3.7609E-12	617.46	1,234.91	0.00E+00	2.32E-09	4.64E-09		
Pm-147	2.5452E+00	617.46	1,234.91	0.00E+00	1.57E+03	3.14E+03		
Pu-238	2.0550E-02	617.46	1,234.91	0.00E+00	1.27E+01	2.54E+01		
Pu-239	4.2838E-04	617.46	1,234.91	0.00E+00	2.65E-01	5.29E-01		
Pu-240	2.4401E-04	617.46	1,234.91	0.00E+00	1.51E-01	3.01E-01		
Pu-241	6.8764E-02	617.46	1,234.91	0.00E+00	4.25E+01	8.49E+01		
Pu-242	3.6329E-07	617.46	1,234.91	0.00E+00	2.24E-04	4.49E-04		
Ra-226	3.8045E-11	617.46	1,234.91	0.00E+00	2.35E-08	4.70E-08		
Ra-228	2.9902E-15	617.46	1,234.91	0.00E+00	1.85E-12	3.69E-12		
Ru-106	1.9055E-01	617.46	1,234.91	0.00E+00	1.18E+02	2.35E+02		
Se-79	1.2936E-05	617.46	1,234.91	0.00E+00	7.99E-03	1.60E-02		
Sn-126	1.1574E-05	617.46	1,234.91	0.00E+00	7.15E-03	1.43E-02		
Sr-90	2.7505E+00	617.46	1,234.91	0.00E+00	1.70E+03	3.40E+03		
Tc-99	4.2239E-04	617.46	1,234.91	0.00E+00	2.61E-01	5.22E-01		
Th-229	1.8848E-12	617.46	1,234.91	0.00E+00	1.16E-09	2.33E-09		
Th-230	1.7042E-08	617.46	1,234.91	0.00E+00	1.05E-05	2.10E-05		
Th-232	7.8132E-15	617.46	1,234.91	0.00E+00	4.82E-12	9.65E-12		
Th-208	4.4063E-08	617.46	1,234.91	0.00E+00	2.72E-05	5.44E-05		
U-232	1.3151E-07	617.46	1,234.91	0.00E+00	8.12E-05	1.62E-04		
U-233	1.9564E-09	617.46	1,234.91	0.00E+00	1.21E-06	2.42E-06		
U-234	1.8371E-04	617.46	1,234.91	0.00E+00	1.13E-01	2.27E-01		
U-235	-2.7235E-06	617.46	0.00	2.82E-03	1.14E-03	2.82E-03		
U-236	1.5493E-05	617.46	1,234.91	0.00E+00	9.57E-03	1.91E-02		
U-238	-4.2851E-09	617.46	0.00	1.75E-03	1.75E-03	1.75E-03		
Y-90	2.7505E+00	617.46	1,234.91	0.00E+00	1.70E+03	3.40E+03		
Other Radionuclides					3.18E+03	6.35E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.13E+01	6.26E+01
Total	Total

**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.
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	20.00000037	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
Nominal:	From SFD	Estimated	
Bounding:		617.46	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
		1,234.91	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
Bounding	0.30		1.01
	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: FRR MTR-C (U3Si2 LEU) GERMANY	Fuel decay start date: 2010	Estimated Canister usage 18"x10" 1 08
SNF ID #: 517	Estimates as of: 2010	
Fuel Units & Descr: 26 - ASSEMBLY	Template: TRIGA-AI (LW/U-Zrx, Alum, 10 to 20%, U)	
Heavy Metal Mass BOL=30 94kg, EOL=26 114kg	Template Burnup(MWd): 665	
ROD Storage Site SRS	Template BOL Heavy Metal Mass (MT): 0.00018	
	Template Decay Time: 5 years	

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.0632E-10	4,606 13	9,212 25	0.00E+00	3.71E-06	7.43E-06	Avg MeV	
Am-241	2.2586E-03	4,606 13	9,212 25	0.00E+00	1.04E+01	2.08E+01	0.0150	1.559E+15
Am-242m	1.9925E-06	4,606 13	9,212 25	0.00E+00	9.18E-03	1.84E-02	0.0250	3.384E+14
Am-243	2.3323E-07	4,606 13	9,212 25	0.00E+00	1.07E-03	2.15E-03	0.0375	4.215E+14
C-14	4.3308E-05	4,606 13	9,212 25	0.00E+00	1.99E-01	3.99E-01	0.0575	3.231E+14
Cl-36	4.3023E-08	4,606 13	9,212 25	0.00E+00	1.98E-04	3.96E-04	0.0850	2.262E+14
Cm-243	2.7429E-07	4,606.13	9,212.25	0.00E+00	1.26E-03	2.53E-03	0.1250	3.383E+14
Cm-244	3.1504E-06	4,606.13	9,212.25	0.00E+00	1.45E-02	2.90E-02	0.2250	1.888E+14
Co-60	3.1008E-02	4,606.13	9,212.25	0.00E+00	1.43E+02	2.86E+02	0.3750	8.404E+13
Cs-134	1.0367E-01	4,606.13	9,212.25	0.00E+00	4.78E+02	9.55E+02	0.5750	1.066E+15
Cs-135	3.1549E-05	4,606.13	9,212.25	0.00E+00	1.45E-01	2.91E-01	0.8500	2.623E+14
Cs-137	2.7564E+00	4,606 13	9,212 25	0.00E+00	1.27E+04	2.54E+04	1.2500	2.719E+14
Eu-154	1.3490E+00	4.606 13	9,212 25	0.00E+00	6.21E+03	1.24E+04	1.7500	7.781E+12
Eu-155	4.3880E-01	4,606 13	9,212 25	0.00E+00	2.02E+03	4.04E+03	2.2500	9.458E+11
Fe-55	8.6782E-03	4,606 13	9,212 25	0.00E+00	4.00E+01	7.99E+01	2.7500	7.682E+09
H-3	1.0805E-02	4,606 13	9,212 25	0.00E+00	4.98E+01	9.95E+01	3.5000	8.979E+08
I-129	7.3805E-07	4,606 13	9,212 25	0.00E+00	3.40E-03	6.80E-03	5.0000	5.274E+03
Kr-85	2.5218E-01	4,606 13	9,212 25	0.00E+00	1.16E+03	2.32E+03	7.0000	5.969E+02
Np-237	1.4463E-06	4,606 13	9,212 25	0.00E+00	6.66E-03	1.33E-02	11.0000	6.798E+01
Pa-231	3.5970E-09	4,606 13	9,212 25	0.00E+00	1.66E-05	3.31E-05		
Pb-210	8.2511E-15	4,606 13	9,212 25	0.00E+00	3.80E-11	7.60E-11		
Pm-147	2.0767E+00	4,606 13	9,212 25	0.00E+00	9.57E+03	1.91E+04		
Pu-238	1.3514E-03	4,606 13	9,212 25	0.00E+00	6.22E+00	1.24E+01		
Pu-239	5.6947E-03	4,606 13	9,212 25	0.00E+00	2.62E+01	5.25E+01		
Pu-240	2.2647E-03	4,606 13	9,212 25	0.00E+00	1.04E+01	2.09E+01		
Pu-241	1.2574E-01	4,606 13	9,212 25	0.00E+00	5.79E+02	1.16E+03		
Pu-242	3.0602E-07	4,606 13	9,212 25	0.00E+00	1.41E-03	2.82E-03		
Ra-226	5.7353E-14	4,606 13	9,212 25	0.00E+00	2.64E-10	5.28E-10		
Ra-228	1.8150E-10	4,606 13	9,212 25	0.00E+00	8.36E-07	-1.67E-06		
Ru-106	9.3744E-02	4,606 13	9,212 25	0.00E+00	4.32E+02	8.64E+02		
Se-79	1.2938E-05	4,606 13	9,212 25	0.00E+00	5.96E-02	1.19E-01		
Sn-126	1.2239E-05	4,606 13	9,212 25	0.00E+00	5.64E-02	1.13E-01		
Sr-90	2.6000E+00	4,606 13	9,212 25	0.00E+00	1.20E+04	2.40E+04		
Tc-99	4.4120E-04	4,606 13	9,212 25	0.00E+00	2.03E+00	4.06E+00		
Th-229	1.4749E-10	4,606 13	9,212 25	0.00E+00	6.79E-07	1.36E-06		
Th-230	1.9549E-11	4,606 13	9,212 25	0.00E+00	9.00E-08	1.80E-07		
Th-232	2.3744E-10	4,606 13	9,212 25	0.00E+00	1.09E-06	2.19E-06		
Ti-208	1.9459E-08	4,606.13	9,212.25	0.00E+00	8.96E-05	1.79E-04		
U-232	5.6015E-08	4,606 13	9,212 25	0.00E+00	2.58E-04	5.16E-04		
U-233	1.3132E-07	4,606.13	9,212.25	0.00E+00	6.05E-04	1.21E-03		
U-234	1.7325E-07	4,606 13	9,212 25	0.00E+00	7.98E-04	1.60E-03		
U-235	-2.6159E-06	4,606 13	0 00	1.34E-02	1.32E-03	1.34E-02		
U-236	1.2717E-05	4,606 13	9,212 25	0.00E+00	5.86E-02	1.17E-01		
U-238	-3.8857E-08	4,606 13	0 00	8.32E-03	8.14E-03	8.32E-03		
Y-90	2.6015E+00	4,606 13	9,212 25	0.00E+00	1.20E+04	2.40E+04		
Other Radionuclides					1.75E+04	3.50E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.31E+02	4.63E+02
Total	Total

**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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.999995	10 to 20.1	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		4,606 13	
Bounding		9,212 25	

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	4.03		
Bounding	8.06		

Estimated EOL HM/Given EOL HM:

\*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: FRR MTR-C (U3Si2 LEU) GREECE  
 SNF ID #: 531  
 Fuel Units & Descr: 18 - ASSEMBLY  
 Heavy Metal Mass: BOL=11 07kg EOL=10 294kg  
 ROD Storage Site: SRS

Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 075

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)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	734.70	1,469.40	0.00E+00	1.07E-07	2.14E-07	Avg MeV	
Am-241	1.1190E-03	734.70	1,469.40	0.00E+00	8.22E-01	1.64E+00	0.0150	2.835E+14
Am-242m	4.5425E-07	734.70	1,469.40	0.00E+00	3.34E-04	6.67E-04	0.0250	6.107E+13
Am-243	1.4921E-06	734.70	1,469.40	0.00E+00	1.10E-03	2.19E-03	0.0375	5.636E+13
Cf-14	5.7244E-09	734.70	1,469.40	0.00E+00	4.21E-06	8.41E-06	0.0575	5.542E+13
Cl-36	1.3124E-32	734.70	1,469.40	0.00E+00	9.64E-30	1.93E-29	0.0850	3.533E+13
Cm-243	2.3676E-07	734.70	1,469.40	0.00E+00	1.74E-04	3.48E-04	0.1250	3.059E+13
Cm-244	5.2042E-05	734.70	1,469.40	0.00E+00	3.82E-02	7.65E-02	0.2250	2.994E+13
Co-60	3.8208E-05	734.70	1,469.40	0.00E+00	2.81E-02	5.61E-02	0.3750	1.449E+13
Cs-134	4.8693E-01	734.70	1,469.40	0.00E+00	3.58E+02	7.15E+02	0.5750	1.991E+14
Cs-135	3.4477E-06	734.70	1,469.40	0.00E+00	2.53E-03	5.07E-03	0.8500	2.788E+13
Cs-137	2.8731E+00	734.70	1,469.40	0.00E+00	2.11E+03	4.22E+03	1.2500	5.187E+12
Eu-154	8.2053E-02	734.70	1,469.40	0.00E+00	6.03E-01	1.21E+02	1.7500	2.175E+11
Eu-155	3.9134E-02	734.70	1,469.40	0.00E+00	2.88E+01	5.75E+01	2.2500	4.562E+11
Fe-55	6.7429E-03	734.70	1,469.40	0.00E+00	4.95E+00	9.91E+00	2.7500	2.625E+09
H-3	1.0599E-02	734.70	1,469.40	0.00E+00	7.79E+00	1.56E+01	3.5000	2.911E+08
I-129	7.5300E-07	734.70	1,469.40	0.00E+00	5.53E-04	1.11E-03	5.0000	8.771E+02
Kr-85	2.8595E-01	734.70	1,469.40	0.00E+00	2.10E+02	4.20E+02	7.0000	9.780E+01
Np-237	9.5479E-06	734.70	1,469.40	0.00E+00	7.01E-03	1.40E-02	11.0000	1.103E+01
Pa-231	8.9297E-10	734.70	1,469.40	0.00E+00	6.56E-07	1.31E-06		
Pb-210	3.7609E-12	734.70	1,469.40	0.00E+00	2.76E-09	5.53E-09		
Pm-147	2.5452E+00	734.70	1,469.40	0.00E+00	1.87E+03	3.74E+03		
Pu-238	2.0550E-02	734.70	1,469.40	0.00E+00	1.51E+01	3.02E+01		
Pu-239	4.2838E-04	734.70	1,469.40	0.00E+00	3.15E-01	6.29E-01		
Pu-240	2.4401E-04	734.70	1,469.40	0.00E+00	1.79E-01	3.59E-01		
Pu-241	6.8764E-02	734.70	1,469.40	0.00E+00	5.05E+01	1.01E+02		
Pu-242	3.6329E-07	734.70	1,469.40	0.00E+00	2.67E-04	5.34E-04		
Ra-226	3.8045E-11	734.70	1,469.40	0.00E+00	2.80E-08	5.59E-08		
Ra-228	2.9902E-15	734.70	1,469.40	0.00E+00	2.20E-12	4.39E-12		
Ru-106	1.9055E-01	734.70	1,469.40	0.00E+00	1.40E+02	2.80E+02		
Se-79	1.2936E-05	734.70	1,469.40	0.00E+00	9.50E-03	1.90E-02		
Sn-126	1.1574E-05	734.70	1,469.40	0.00E+00	8.50E-03	1.70E-02		
Sr-90	2.7505E+00	734.70	1,469.40	0.00E+00	2.02E+03	4.04E+03		
Tc-99	4.2239E-04	734.70	1,469.40	0.00E+00	3.10E-01	6.21E-01		
Th-229	1.8848E-12	734.70	1,469.40	0.00E+00	1.38E-09	2.77E-09		
Th-230	1.7042E-08	734.70	1,469.40	0.00E+00	1.25E-05	2.50E-05		
Th-232	7.8132E-15	734.70	1,469.40	0.00E+00	5.74E-12	1.15E-11		
Th-208	4.4063E-08	734.70	1,469.40	0.00E+00	3.24E-05	6.47E-05		
U-232	1.3151E-07	734.70	1,469.40	0.00E+00	9.66E-05	1.93E-04		
U-233	1.9564E-09	734.70	1,469.40	0.00E+00	1.44E-06	2.87E-06		
U-234	1.8371E-04	734.70	1,469.40	0.00E+00	1.35E-01	2.70E-01		
U-235	-2.7235E-06	734.70	0.00	4.78E-03	2.78E-03	4.78E-03		
U-236	1.5493E-05	734.70	1,469.40	0.00E+00	1.14E-02	2.28E-02		
U-238	-4.2851E-09	734.70	0.00	2.98E-03	2.97E-03	2.98E-03		
Y-90	2.7505E+00	734.70	1,469.40	0.00E+00	2.02E+03	4.04E+03		
Other Radionuclides					3.78E+03	7.56E+03		
							<b>Thermal Power</b>	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							3.73E+01	7.45E+01
							Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20.00000024	60 to 100	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		734.70	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		1,469.40	
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.21		1.00
Bounding	0.42		

<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: FRR MTR-C (U3Si2 LEU) JAPAN  
 SNF ID #: 289  
 Fuel Units & Descr: 17 - ASSEMBLY  
 Heavy Metal Mass BOL=8 925kg, EOL=8 6kg  
 ROD Storage Site SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.71

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	307.50	614.99	0.00E+00	4.47E-08	8.95E-08	0.0150	1.186E+14
Am-241	1.1190E-03	307.50	614.99	0.00E+00	3.44E-01	6.88E-01	0.0250	2.556E+13
Am-242m	4.5425E-07	307.50	614.99	0.00E+00	1.40E-04	2.79E-04	0.0375	2.359E+13
Am-243	1.4921E-06	307.50	614.99	0.00E+00	4.59E-04	9.18E-04	0.0575	2.319E+13
C-14	5.7244E-09	307.50	614.99	0.00E+00	1.76E-06	3.52E-06	0.0850	1.479E+13
Cl-36	1.3124E-32	307.50	614.99	0.00E+00	4.04E-30	8.07E-30	0.1250	1.280E+13
Cm-243	2.3676E-07	307.50	614.99	0.00E+00	7.28E-05	1.46E-04	0.2250	1.253E+13
Cm-244	5.2042E-05	307.50	614.99	0.00E+00	1.60E-02	3.20E-02	0.3750	6.066E+12
Co-60	3.8208E-05	307.50	614.99	0.00E+00	1.17E-02	2.35E-02	0.5750	8.332E+13
Cs-134	4.8693E-01	307.50	614.99	0.00E+00	1.50E+02	2.99E+02	0.8500	1.167E+13
Cs-135	3.4477E-06	307.50	614.99	0.00E+00	1.06E-03	2.12E-03	1.2500	2.171E+12
Cs-137	2.8731E+00	307.50	614.99	0.00E+00	8.83E+02	1.77E+03	1.7500	9.104E+10
Eu-154	8.2053E-02	307.50	614.99	0.00E+00	2.52E+01	5.05E+01	2.2500	1.910E+11
Eu-155	3.9134E-02	307.50	614.99	0.00E+00	1.20E+01	2.41E+01	2.7500	1.099E+09
Fe-55	6.7429E-03	307.50	614.99	0.00E+00	2.07E+00	4.15E+00	3.5000	1.218E+08
H-3	1.0599E-02	307.50	614.99	0.00E+00	3.26E+00	6.52E+00	5.0000	3.698E+02
I-129	7.5300E-07	307.50	614.99	0.00E+00	2.32E-04	4.63E-04	7.0000	4.124E+01
Kr-85	2.8595E-01	307.50	614.99	0.00E+00	8.79E+01	1.76E+02	11.0000	4.650E+00
Np-237	9.5479E-06	307.50	614.99	0.00E+00	2.94E-03	5.87E-03		
Pa-231	8.9297E-10	307.50	614.99	0.00E+00	2.75E-07	5.49E-07		
Pb-210	3.7609E-12	307.50	614.99	0.00E+00	1.16E-09	2.31E-09		
Pm-147	2.5452E+00	307.50	614.99	0.00E+00	7.83E+02	1.57E+03		
Pu-238	2.0550E-02	307.50	614.99	0.00E+00	6.32E+00	1.26E+01		
Pu-239	4.2838E-04	307.50	614.99	0.00E+00	1.32E-01	2.63E-01		
Pu-240	2.4401E-04	307.50	614.99	0.00E+00	7.50E-02	1.50E-01		
Pu-241	6.8764E-02	307.50	614.99	0.00E+00	2.11E+01	4.23E+01		
Pu-242	3.6329E-07	307.50	614.99	0.00E+00	1.12E-04	2.23E-04		
Ra-226	3.8045E-11	307.50	614.99	0.00E+00	1.17E-08	2.34E-08		
Ra-228	2.9902E-15	307.50	614.99	0.00E+00	9.19E-13	1.84E-12		
Ru-106	1.9055E-01	307.50	614.99	0.00E+00	5.86E+01	1.17E+02		
Se-79	1.2936E-05	307.50	614.99	0.00E+00	3.98E-03	7.96E-03		
Sn-126	1.1574E-05	307.50	614.99	0.00E+00	3.56E-03	7.12E-03		
Sr-90	2.7505E+00	307.50	614.99	0.00E+00	8.46E+02	1.69E+03		
Tc-99	4.2239E-04	307.50	614.99	0.00E+00	1.30E-01	2.60E-01		
Th-229	1.8848E-12	307.50	614.99	0.00E+00	5.80E-10	1.16E-09		
Th-230	1.7042E-08	307.50	614.99	0.00E+00	5.24E-06	1.05E-05		
Th-232	7.8132E-15	307.50	614.99	0.00E+00	2.40E-12	4.81E-12		
Tl-208	4.4063E-08	307.50	614.99	0.00E+00	1.35E-05	2.71E-05		
U-232	1.3151E-07	307.50	614.99	0.00E+00	4.04E-05	8.09E-05		
U-233	1.9564E-09	307.50	614.99	0.00E+00	6.02E-07	1.20E-06		
U-234	1.8371E-04	307.50	614.99	0.00E+00	5.65E-02	1.13E-01		
U-235	-2.7235E-06	307.50	0.00	3.86E-03	3.02E-03	3.86E-03		
U-236	1.5493E-05	307.50	614.99	0.00E+00	4.76E-03	9.53E-03		
U-238	-4.2851E-09	307.50	0.00	2.40E-03	2.40E-03	2.40E-03		
Y-90	2.7505E+00	307.50	614.99	0.00E+00	8.46E+02	1.69E+03		
Other Radionuclides					1.58E+03	3.16E+03		

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

Template Selection Summary			Basis for Parameter Differences <sup>1</sup>
	From SFD	Used	
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	20.00000028	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		307.50	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		614.99	

Checks			
	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.11		1.00
Bounding	0.22		

<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: FRR MTR-C (U3Si2 LEU) NETHERLANDS  
 SNF ID #: 509  
 Fuel Units & Descr: 7 - ASSEMBLY  
 Heavy Metal Mass: BOL=5.53kg; EOL=4 866kg  
 ROD Storage Site: SRS

Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.29

**II. Estimates**

Radionuclide	C <sub>i</sub> /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	628.44	1,256.88	0.00E+00	9.14E-08	1.83E-07	Avg MeV	
Am-241	1.1190E-03	628.44	1,256.88	0.00E+00	7.03E-01	1.41E+00	0.0150	2.425E+14
Am-242m	4.5425E-07	628.44	1,256.88	0.00E+00	2.85E-04	5.71E-04	0.0250	5.224E+13
Am-243	1.4921E-06	628.44	1,256.88	0.00E+00	9.38E-04	1.88E-03	0.0375	4.821E+13
C-14	5.7244E-09	628.44	1,256.88	0.00E+00	3.60E-00	7.19E-06	0.0575	4.740E+13
Cl-36	1.3124E-32	628.44	1,256.88	0.00E+00	8.25E-30	1.65E-29	0.0850	3.022E+13
Cm-243	2.3676E-07	628.44	1,256.88	0.00E+00	1.49E-04	2.98E-04	0.1250	2.617E+13
Cm-244	5.2042E-05	628.44	1,256.88	0.00E+00	3.27E-02	6.54E-02	0.2250	2.561E+13
Co-60	3.8208E-05	628.44	1,256.88	0.00E+00	2.40E-02	4.80E-02	0.3750	1.240E+13
Cs-134	4.8693E-01	628.44	1,256.88	0.00E+00	3.06E+02	6.12E+02	0.5750	1.703E+14
Cs-135	3.4477E-06	628.44	1,256.88	0.00E+00	2.17E-03	4.33E-03	0.8500	2.385E+13
Cs-137	2.8731E+00	628.44	1,256.88	0.00E+00	1.81E+03	3.61E+03	1.2500	4.437E+12
Eu-154	8.2053E-02	628.44	1,256.88	0.00E+00	5.16E+01	1.03E+02	1.7500	1.861E+11
Eu-155	3.9134E-02	628.44	1,256.88	0.00E+00	2.46E+01	4.92E+01	2.2500	3.903E+11
Fe-55	6.7429E-03	628.44	1,256.88	0.00E+00	4.24E+00	8.48E+00	2.7500	2.245E+09
H-3	1.0599E-02	628.44	1,256.88	0.00E+00	6.66E+00	1.33E+01	3.5000	2.490E+08
I-129	7.5300E-07	628.44	1,256.88	0.00E+00	4.73E-04	9.46E-04	5.0000	7.478E+02
Kr-85	2.8595E-01	628.44	1,256.88	0.00E+00	1.80E+02	3.59E+02	7.0000	8.337E+01
Np-237	9.5479E-06	628.44	1,256.88	0.00E+00	6.00E-03	1.20E-02	11.0000	9.399E+00
Pa-231	8.9297E-10	628.44	1,256.88	0.00E+00	5.61E-07	1.12E-06		
Pb-210	3.7609E-12	628.44	1,256.88	0.00E+00	2.36E-09	4.73E-09		
Pm-147	2.5452E+00	628.44	1,256.88	0.00E+00	1.60E+03	3.20E+03		
Pu-238	2.0550E-02	628.44	1,256.88	0.00E+00	1.29E+01	2.58E+01		
Pu-239	4.2838E-04	628.44	1,256.88	0.00E+00	2.69E-01	5.38E-01		
Pu-240	2.4401E-04	628.44	1,256.88	0.00E+00	1.53E-01	3.07E-01		
Pu-241	6.8764E-02	628.44	1,256.88	0.00E+00	4.32E+01	8.64E+01		
Pu-242	3.6329E-07	628.44	1,256.88	0.00E+00	2.28E-04	4.57E-04		
Ra-226	3.8045E-11	628.44	1,256.88	0.00E+00	2.39E-08	4.78E-08		
Ra-228	2.9902E-15	628.44	1,256.88	0.00E+00	1.88E-12	3.76E-12		
Ru-106	1.9055E-01	628.44	1,256.88	0.00E+00	1.20E+02	2.39E+02		
Se-79	1.2936E-05	628.44	1,256.88	0.00E+00	8.13E-03	1.63E-02		
Sn-126	1.1574E-05	628.44	1,256.88	0.00E+00	7.27E-03	1.45E-02		
Sr-90	2.7505E+00	628.44	1,256.88	0.00E+00	1.73E+03	3.46E+03		
Tc-99	4.2239E-04	628.44	1,256.88	0.00E+00	2.65E-01	5.31E-01		
Th-229	1.8848E-12	628.44	1,256.88	0.00E+00	1.18E-09	2.37E-09		
Th-230	1.7042E-08	628.44	1,256.88	0.00E+00	1.07E-05	2.14E-05		
Th-232	7.8132E-15	628.44	1,256.88	0.00E+00	4.91E-12	9.82E-12		
Tl-208	4.4063E-08	628.44	1,256.88	0.00E+00	2.77E-05	5.54E-05		
U-232	1.3151E-07	628.44	1,256.88	0.00E+00	8.26E-05	1.65E-04		
U-233	1.9564E-09	628.44	1,256.88	0.00E+00	1.23E-06	2.46E-06		
U-234	1.8371E-04	628.44	1,256.88	0.00E+00	1.15E-01	2.31E-01		
U-235	-2.7235E-06	628.44	0.00	2.39E-03	6.78E-04	2.39E-03		
U-236	1.5493E-05	628.44	1,256.88	0.00E+00	9.74E-03	1.95E-02		
U-238	-4.2851E-09	628.44	0.00	1.49E-03	1.48E-03	1.49E-03		
Y-90	2.7505E+00	628.44	1,256.88	0.00E+00	1.73E+03	3.46E+03		
Other Radionuclides					3.23E+03	6.46E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.19E+01	6.37E+01
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20.00000038	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		628.44	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		1,256.88	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.36		1.01
Bounding	0.72		

<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	FRR MTR-C (UALX LEU) SWEDEN	Fuel decay start date	2010
SNF ID #	523	Estimates as of	2010
Fuel Units & Descr	480 - ASSEMBLY	Template	ATR (Light Water, Alum, 60 to 100% U)
Heavy Metal Mass	BOL=960kg EOL=789 888kg	Template Burnup(MWd)	367.2
ROD Storage Site	SRS	Template BOL Heavy Metal Mass (MT)	0 00116689
		Template Decay Time	5 years

Estimated Canister usage 18"x10" 20 00
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Radionuclide	m		x <sub>n</sub>		x <sub>b</sub>		b		y <sub>n</sub>		y <sub>b</sub>		Gamma Sources	
	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 4545E-10	161,099 36	322,198 73	0 00E+00	2 34E-05	4 69E-05								
Am-241	1 1190E-03	161,099 36	322,198 73	0 00E+00	1 80E+02	3 61E+02	0 0150	6 21E+16						
Am-242m	4 5425E-07	161,099 36	322,198 73	0 00E+00	7 32E-02	1 46E-01	0 0250	1 33E+16						
Am-243	1 4921E-06	161,099 36	322,198 73	0 00E+00	2 40E-01	4 81E-01	0 0375	1 23E+16						
C-14	5 7244E-09	161,099 36	322,198 73	0 00E+00	9 22E-04	1 84E-03	0 0575	1 21E+16						
Cf-252	1 3124E-32	161,099 36	322,198 73	0 00E+00	2 11E-27	4 23E-27	0 0850	7 74E+15						
Cm-243	2 3676E-07	161,099 36	322,198 73	0 00E+00	3 81E-02	7 63E-02	0 1250	6 70E+15						
Cm-244	5 2042E-05	161,099 36	322,198 73	0 00E+00	8 38E+00	1 68E+01	0 2250	6 56E+15						
Co-60	3 8208E-05	161,099 36	322,198 73	0 00E+00	6 16E+00	1 23E+01	0 3750	3 17E+15						
Cs-134	4 8693E-01	161,099 36	322,198 73	0 00E+00	7 84E+04	1 57E+05	0 5750	4 36E+16						
Cs-135	3 4477E-06	161,099 36	322,198 73	0 00E+00	5 55E-01	1 11E+00	0 8500	6 11E+15						
Cs-137	2 8731E+00	161,099 36	322,198 73	0 00E+00	4 63E+05	9 26E+05	1 2500	1 137E+15						
Eu-154	8 2053E-02	161,099 36	322,198 73	0 00E+00	1 32E+04	2 64E+04	1 7500	4 770E+13						
Eu-155	3 9134E-02	161,099 36	322,198 73	0 00E+00	6 30E+03	1 26E+04	2 2500	1 00E+14						
Fe-55	6 7429E-03	161,099 36	322,198 73	0 00E+00	1 09E+03	2 17E+03	2 7500	5 75E+11						
H-3	1 0599E-02	161,099 36	322,198 73	0 00E+00	1 71E+03	3 42E+03	3 5000	6 38E+10						
I-129	7 5300E-07	161,099 36	322,198 73	0 00E+00	1 21E-01	2 43E-01	5 0000	1 91E+05						
Kr-85	2 8595E-01	161,099 36	322,198 73	0 00E+00	4 61E+04	9 21E+04	7 0000	2 13E+04						
Np-237	9 5479E-06	161,099 36	322,198 73	0 00E+00	1 54E+00	3 08E+00	11 0000	2 40E+03						
Pa-231	8 9297E-10	161,099 36	322,198 73	0 00E+00	1 44E-04	2 88E-04								
Pb-210	3 7609E-12	161,099 36	322,198 73	0 00E+00	6 06E-07	1 21E-06								
Pm-147	2 5452E+00	161,099 36	322,198 73	0 00E+00	4 10E+05	8 20E+05								
Pu-238	2 0550E-02	161,099 36	322,198 73	0 00E+00	3 31E+03	6 62E+03								
Pu-239	4 2838E-04	161,099 36	322,198 73	0 00E+00	6 90E+01	1 38E+02								
Pu-240	2 4401E-04	161,099 36	322,198 73	0 00E+00	3 93E+01	7 86E+01								
Pu-241	6 8764E-02	161,099 36	322,198 73	0 00E+00	1 11E+04	2 22E+04								
Pu-242	3 6329E-07	161,099 36	322,198 73	0 00E+00	5 85E-02	1 17E-01								
Ra-226	3 8045E-11	161,099 36	322,198 73	0 00E+00	6 13E-06	1 23E-05								
Ra-228	2 9902E-15	161,099 36	322,198 73	0 00E+00	4 82E-10	9 63E-10								
Ru-106	1 9055E-01	161,099 36	322,198 73	0 00E+00	3 07E+04	6 14E+04								
Se-79	1 2936E-05	161,099 36	322,198 73	0 00E+00	2 08E+00	4 17E+00								
Sn-126	1 1574E-05	161,099 36	322,198 73	0 00E+00	1 86E+00	3 73E+00								
Sr-90	2 7505E+00	161,099 36	322,198 73	0 00E+00	4 43E+05	8 86E+05								
Tc-99	4 2239E-04	161,099 36	322,198 73	0 00E+00	6 80E+01	1 36E+02								
Th-229	1 8848E-12	161,099 36	322,198 73	0 00E+00	3 04E-07	6 07E-07								
Th-230	1 7042E-08	161,099 36	322,198 73	0 00E+00	2 75E-03	5 49E-03								
Th-232	7 8132E-15	161,099 36	322,198 73	0 00E+00	1 26E-09	2 52E-09								
Th-208	4 4063E-08	161,099 36	322,198 73	0 00E+00	7 10E-03	1 42E-02								
U-232	1 3151E-07	161,099 36	322,198 73	0 00E+00	2 12E-02	4 24E-02								
U-233	1 9564E-09	161,099 36	322,198 73	0 00E+00	3 15E-04	6 30E-04								
U-234	1 8371E-04	161,099 36	322,198 73	0 00E+00	2 96E+01	5 92E+01								
U-235	-2 7235E-06	161,099 36	0 00	4 15E-01	0 00E+00	4 15E-01								
U-236	-1 5493E-05	161,099 36	322,198 73	0 00E+00	2 50E+00	4 99E+00								
U-238	-4 2851E-09	161,099 36	0 00	2 58E-01	2 57E-01	2 58E-01								
Y-90	2 7505E+00	161,099 36	322,198 73	0 00E+00	4 43E+05	8 86E+05								
Other Radionuclides					8 29E+05	1 66E+06								

**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 ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator:	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %:	20	60 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
Nominal:	From SFD	Estimated 161 099 36	
Bounding:		322,198 73	

Checks			Estimated EOL HM/Given EOL HM 1.03
Nominal	Burnup Multiplier 0.53	Estimated Burnup/ Given Burnup	
Bounding	1.07		

<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: FRR MTR-C (UALX-HEU) ARGENTINA  
 SNF ID #: 635  
 Fuel Units & Descr: 14 - MTR TYPE  
 Heavy Metal Mass: BOL=2.395kg; EOL=1 749kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0 58

II. Estimates	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
	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 4545E-10	612.53	1,225.06	0 00E+00	8 91E-08	1.78E-07	0 0150	2.363E+14
Am-241	1 1190E-03	612.53	1,225.06	0 00E+00	6 85E-01	1.37E+00	0 0250	5 092E+13
Am-242m	4 5425E-07	612.53	1,225.06	0 00E+00	2 78E-04	5 56E-04	0 0375	4 699E+13
Am-243	1 4921E-06	612.53	1,225.06	0 00E+00	9 14E-04	1 83E-03	0 0575	4 620E+13
C-14	5 7244E-09	612.53	1,225.06	0 00E+00	3 51E-06	7 01E-06	0 0850	2 945E+13
Cl-36	1 3124E-32	612.53	1,225.06	0 00E+00	8 04E-30	1 61E-29	0 1250	2 551E+13
Cm-243	2 3676E-07	612.53	1,225.06	0 00E+00	1 45E-04	2 90E-04	0 2250	2 496E+13
Cm-244	5 2042E-05	612.53	1,225.06	0 00E+00	3 19E-02	6 38E-02	0 3750	1 208E+13
Co-60	3 8208E-05	612.53	1,225.06	0 00E+00	2 34E-02	4 68E-02	0 5750	1 660E+14
Cs-134	4 8693E-01	612.53	1,225.06	0 00E+00	2 98E+02	5 97E+02	0 8500	2 324E+13
Cs-135	3 4477E-06	612.53	1,225.06	0 00E+00	2 11E-03	4 22E-03	1 2500	4 325E+12
Cs-137	2 8731E+00	612.53	1,225.06	0 00E+00	1 76E+03	3 52E+03	1 7500	1 814E+11
Eu-154	8 2053E-02	612.53	1,225.06	0 00E+00	5 03E+01	1 01E+02	2 2500	3 804E+11
Eu-155	3 9134E-02	612.53	1,225.06	0 00E+00	2 40E+01	4 79E+01	2 7500	2 188E+09
Fe-55	6 7429E-03	612.53	1,225.06	0 00E+00	4 13E+00	8 26E+00	3 5000	2 427E+08
H-3	1 0599E-02	612.53	1,225.06	0 00E+00	6 49E+00	1 30E+01	5 0000	7 258E+02
I-129	7 5300E-07	612.53	1,225.06	0 00E+00	4 61E-04	9 22E-04	7 0000	8 091E+01
Kr-85	2 8595E-01	612.53	1,225.06	0 00E+00	1 75E+02	3 50E+02	11 0000	9 120E+00
Np-237	9 5479E-06	612.53	1,225.06	0 00E+00	5 85E-03	1 17E-02		
Pa-231	8 9297E-10	612.53	1,225.06	0 00E+00	5 47E-07	1 09E-06		
Pb-210	3 7609E-12	612.53	1,225.06	0 00E+00	2 30E-09	4 61E-09		
Pm-147	2 5452E+00	612.53	1,225.06	0 00E+00	1 56E+03	3 12E+03		
Pu-238	2 0550E-02	612.53	1,225.06	0 00E+00	1 26E+01	2 52E+01		
Pu-239	4 2838E-04	612.53	1,225.06	0 00E+00	2 62E-01	5 25E-01		
Pu-240	2 4401E-04	612.53	1,225.06	0 00E+00	1 49E-01	2 99E-01		
Pu-241	6 8764E-02	612.53	1,225.06	0 00E+00	4 21E+01	8 42E+01		
Pu-242	3 6329E-07	612.53	1,225.06	0 00E+00	2 23E-04	4 45E-04		
Ra-226	3 8045E-11	612.53	1,225.06	0 00E+00	2 33E-08	4 66E-08		
Ra-228	2 9902E-15	612.53	1,225.06	0 00E+00	1 83E-12	3 66E-12		
Ru-106	1 9055E-01	612.53	1,225.06	0 00E+00	1 17E+02	2 33E+02		
Se-79	1 2936E-05	612.53	1,225.06	0 00E+00	7 92E-03	1 58E-02		
Sn-126	1 1574E-05	612.53	1,225.06	0 00E+00	7 09E-03	1 42E-02		
Sr-90	2 7505E+00	612.53	1,225.06	0 00E+00	1 68E+03	3 37E+03		
Tc-99	4 2239E-04	612.53	1,225.06	0 00E+00	2 59E-01	5 17E-01		
Th-229	1 8848E-12	612.53	1,225.06	0 00E+00	1 15E-09	2 31E-09		
Th-230	1 7042E-08	612.53	1,225.06	0 00E+00	1 04E-05	2 09E-05		
Th-232	7 8132E-15	612.53	1,225.06	0 00E+00	4 79E-12	9 57E-12		
Ti-208	4 4063E-08	612.53	1,225.06	0 00E+00	2 70E-05	5 40E-05		
U-232	1 3151E-07	612.53	1,225.06	0 00E+00	8 06E-05	1 61E-04		
U-233	1 9564E-09	612.53	1,225.06	0 00E+00	1 20E-06	2 40E-06		
U-234	1 8371E-04	612.53	1,225.06	0 00E+00	1 13E-01	2 25E-01		
U-235	-2.7235E-06	612.53	0.00	4 66E-03	2 99E-03	4 66E-03		
U-236	1 5493E-05	612.53	1,225.06	0 00E+00	9 49E-03	1 90E-02		
U-238	-4.2851E-09	612.53	0.00	8 05E-05	7 79E-05	8 05E-05		
Y-90	2 7505E+00	612.53	1,225.06	0 00E+00	1 68E+03	3 37E+03		
Other Radionuclides					3 15E+03	6 30E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 11E+01	6 21E+01
Total	Total

**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 %	90 0000174	60 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:		612.53	
Bounding:		1 225 06	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal:	0 81		
Bounding:	1 63		
			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: FRR MTR-C (UALX-HEU) CANADA  
 SNF ID #: 612  
 Fuel Units & Descr: 23 - MTR TYPE  
 Heavy Metal Mass: BOL=2 721kg EOL=1 76kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0 96

**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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 4545E-10	910 46	1,820 93	0 00E+00	1 32E-07	2 65E-07	Avg MeV	
Am-241	1 1190E-03	910 46	1,820 93	0 00E+00	1 02E+00	2 04E+00	0.0150	3 513E+14
Am-242m	4 5425E-07	910 46	1,820 93	0 00E+00	4 14E-04	8 27E-04	0 0250	7 568E+13
Am-243	1 4921E-06	910 46	1,820 93	0 00E+00	1 36E-03	2 72E-03	0 0375	6 984E+13
C-14	5 7244E-09	910 46	1,820 93	0 00E+00	5 21E-06	1 04E-05	0 0575	6 867E+13
Cf-252	1 3124E-32	910 46	1,820 93	0 00E+00	1 19E-29	2 39E-29	0 0850	4 378E+13
Cm-243	2 3676E-07	910 46	1,820 93	0 00E+00	2 16E-04	4 31E-04	0 1250	3 791E+13
Cm-244	5 2042E-05	910 46	1,820 93	0 00E+00	4 74E-02	9 48E-02	0 2250	3 711E+13
Co-60	3 8208E-05	910 46	1,820 93	0 00E+00	3 48E-02	6 96E-02	0 3750	1 796E+13
Cs-134	4 8693E-01	910 46	1,820 93	0 00E+00	4 43E+02	8 87E+02	0 5750	2 467E+14
Cs-135	3 4477E-06	910 46	1,820 93	0 00E+00	3 14E-03	6 28E-03	0 8500	3 455E+13
Cs-137	2 8731E+00	910 46	1,820 93	0 00E+00	2 62E+03	5 23E+03	1 2500	6 428E+12
Eu-154	8 2053E-02	910 46	1,820 93	0 00E+00	7 47E+01	1 49E+02	1 7500	2 696E+11
Eu-155	3 9134E-02	910 46	1,820 93	0 00E+00	3 56E+01	7 13E+01	2 2500	5 654E+11
Fe-55	6 7429E-03	910 46	1,820 93	0 00E+00	6 14E+00	1 23E+01	2 7500	3 253E+09
H-3	1 0599E-02	910 46	1,820 93	0 00E+00	9 65E+00	1 93E+01	3 5000	3 608E+08
I-129	7 5300E-07	910 46	1,820 93	0 00E+00	6 86E-04	1 37E-03	5 0000	1 079E+03
Kr-85	2 8595E-01	910 46	1,820 93	0 00E+00	2 60E+02	5 21E+02	7 0000	1 202E+02
Np-237	9 5479E-06	910 46	1,820 93	0 00E+00	8 69E-03	1 74E-02	11 0000	1 355E+01
Pa-231	8 9297E-10	910 46	1,820 93	0 00E+00	8 13E-07	1 63E-06		
Pb-210	3 7609E-12	910 46	1,820 93	0 00E+00	3 42E-09	6 85E-09		
Pm-147	2 5452E+00	910 46	1,820 93	0 00E+00	2 32E+03	4 63E+03		
Pu-238	2 0550E-02	910 46	1,820 93	0 00E+00	1 87E+01	3 74E+01		
Pu-239	4 2838E-04	910 46	1,820 93	0 00E+00	3 90E-01	7 80E-01		
Pu-240	2 4401E-04	910 46	1,820 93	0 00E+00	2 22E-01	4 44E-01		
Pu-241	6 8764E-02	910 46	1,820 93	0 00E+00	6 26E+01	1 25E+02		
Pu-242	3 6329E-07	910 46	1,820 93	0 00E+00	3 31E-04	6 62E-04		
Ra-226	3 8045E-11	910 46	1,820 93	0 00E+00	3 46E-08	6 93E-08		
Ra-228	2 9902E-15	910 46	1,820 93	0 00E+00	2 72E-12	5 44E-12		
Ru-106	1 9055E-01	910 46	1,820 93	0 00E+00	1 73E+02	3 47E+02		
Se-79	1 2936E-05	910 46	1,820 93	0 00E+00	1 18E-02	2 36E-02		
Sn-126	1 1574E-05	910 46	1,820 93	0 00E+00	1 05E-02	2 11E-02		
Sr-90	2 7505E+00	910 46	1,820 93	0 00E+00	2 50E+03	5 01E+03		
Tc-99	4 2239E-04	910 46	1,820 93	0 00E+00	3 85E-01	7 69E-01		
Th-229	1 8848E-12	910 46	1,820 93	0 00E+00	1 72E-09	3 43E-09		
Th-230	1 7042E-08	910 46	1,820 93	0 00E+00	1 55E-05	3 10E-05		
Th-232	7 8132E-15	910 46	1,820 93	0 00E+00	7 11E-12	1 42E-11		
Ti-208	4 4063E-08	910 46	1,820 93	0 00E+00	4 01E-05	8 02E-05		
U-232	1 3151E-07	910 46	1,820 93	0 00E+00	1 20E-04	2 39E-04		
U-233	1 9564E-09	910 46	1,820 93	0 00E+00	1 78E-06	3 56E-06		
U-234	1 8371E-04	910 46	1,820 93	0 00E+00	1 67E-01	3 35E-01		
U-235	-2 7235E-06	910 46	0 00	5 47E-03	2 99E-03	5 47E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1 5493E-05	910 46	1,820 93	0 00E+00	1 41E-02	2 82E-02	4 62E+01	9 23E+01
U-238	-4 2651E-09	910 46	0 00	6 40E-05	6 01E-05	6 40E-05	Total	Total
Y-90	2 7505E+00	910 46	1,820 93	0 00E+00	2 50E+03	5 01E+03		
Other Radionuclides					4 68E+03	9 37E+03		

**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 %	92 99997633	60 to 100	
Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		910 46	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		1 820 93	
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1 06		1 03
Bounding	2 13		

\*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: FRR MTR-C (UALX-HEU) GERMANY  
 SNF ID #: 579  
 Fuel Units & Descr: 33 - MTR TYPE  
 Heavy Metal Mass: BOL=3 336kg; EOL=2.062kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 1 38

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	1 4545E-10	1,206.31	2,412.63	0 00E+00	1 75E-07	3 51E-07		
Am-241	1 1190E-03	1,206.31	2,412.63	0 00E+00	1 35E+00	2 70E+00	0 0150	4 655E+14
Am-242m	4 5425E-07	1,206.31	2,412.63	0 00E+00	5 48E-04	1 10E-03	0 0250	1 003E+14
Am-243	1 4921E-06	1,206.31	2,412.63	0 00E+00	1 80E-03	3 60E-03	0 0375	9 254E+13
C-14	5 7244E-09	1,206.31	2,412.63	0 00E+00	6 91E-06	1 38E-05	0 0575	9 099E+13
Cl-36	1 3124E-32	1,206.31	2,412.63	0 00E+00	1 58E-29	3 17E-29	0 0850	5 801E+13
Cm-243	2 3676E-07	1,206.31	2,412.63	0 00E+00	2 86E-04	5 71E-04	0 1250	5 023E+13
Cm-244	5 2042E-05	1,206.31	2,412.63	0 00E+00	6 28E-02	1 26E-01	0 2250	4 916E+13
Co-60	3 8208E-05	1,206.31	2,412.63	0 00E+00	4 61E-02	9 22E-02	0 3750	2 380E+13
Cs-134	4 8693E-01	1,206.31	2,412.63	0 00E+00	5 87E+02	1 17E+03	0 5750	3 269E+14
Cs-135	3 4477E-06	1,206.31	2,412.63	0 00E+00	4 16E-03	8 32E-03	0 8500	4 578E+13
Cs-137	2 8731E+00	1,206.31	2,412.63	0 00E+00	3 47E+03	6 93E+03	1 2500	8 517E+12
Eu-154	8 2053E-02	1,206.31	2,412.63	0 00E+00	9 90E+01	1 98E+02	1 7500	3 572E+11
Eu-155	3 9134E-02	1,206.31	2,412.63	0 00E+00	4 72E+01	9 44E+01	2 2500	7 491E+11
Fe-55	6 7429E-03	1,206.31	2,412.63	0 00E+00	8 13E+00	1 63E+01	2 7500	4 310E+09
H-3	1 0599E-02	1,206.31	2,412.63	0 00E+00	1 28E+01	2 56E+01	3 5000	4 780E+08
I-129	7 5300E-07	1,206.31	2,412.63	0 00E+00	9 08E-04	1 82E-03	5 0000	1 429E+03
Kr-85	2 8595E-01	1,206.31	2,412.63	0 00E+00	3 45E+02	6 90E+02	7 0000	1 593E+02
Np-237	9 5479E-06	1,206.31	2,412.63	0 00E+00	1 15E-02	2 30E-02	11 0000	1 796E+01
Pa-231	8 9297E-10	1,206.31	2,412.63	0 00E+00	1 08E-06	2 15E-06		
Pb-210	3 7609E-12	1,206.31	2,412.63	0 00E+00	4 54E-09	9 07E-09		
Pm-147	2 5452E+00	1,206.31	2,412.63	0 00E+00	3 07E+03	6 14E+03		
Pu-238	2 0550E-02	1,206.31	2,412.63	0 00E+00	2 48E+01	4 96E+01		
Pu-239	4 2838E-04	1,206.31	2,412.63	0 00E+00	5 17E-01	1 03E+00		
Pu-240	2 4401E-04	1,206.31	2,412.63	0 00E+00	2 94E-01	5 89E-01		
Pu-241	6 8764E-02	1,206.31	2,412.63	0 00E+00	8 30E+01	1 66E+02		
Pu-242	3 6329E-07	1,206.31	2,412.63	0 00E+00	4 38E-04	8 76E-04		
Ra-226	3 8045E-11	1,206.31	2,412.63	0 00E+00	4 59E-08	9 18E-08		
Ra-228	2 9902E-15	1,206.31	2,412.63	0 00E+00	3 61E-12	7 21E-12		
Ru-106	1 9055E-01	1,206.31	2,412.63	0 00E+00	2 30E+02	4 60E+02		
Se-79	1 2936E-05	1,206.31	2,412.63	0 00E+00	1 56E-02	3 12E-02		
Sr-126	1 1574E-05	1,206.31	2,412.63	0 00E+00	1 40E-02	2 79E-02		
Sr-90	2 7505E+00	1,206.31	2,412.63	0 00E+00	3 32E+03	6 64E+03		
Tc-99	4 2239E-04	1,206.31	2,412.63	0 00E+00	5 10E-01	1 02E+00		
Th-229	1 8848E-12	1,206.31	2,412.63	0 00E+00	2 27E-09	4 55E-09		
Th-230	1 7042E-08	1,206.31	2,412.63	0 00E+00	2 06E-05	4 11E-05		
Th-232	7 8132E-15	1,206.31	2,412.63	0 00E+00	9 43E-12	1 89E-11		
Tl-208	4 4063E-08	1,206.31	2,412.63	0 00E+00	5 32E-05	1 06E-04		
U-232	1 3151E-07	1,206.31	2,412.63	0 00E+00	1 59E-04	3 17E-04		
U-233	1 9564E-09	1,206.31	2,412.63	0 00E+00	2 36E-06	4 72E-06		
U-234	1 8371E-04	1,206.31	2,412.63	0 00E+00	2 22E-01	4 43E-01		
U-235	-2 7235E-06	1,206.31	0 00	6 71E-03	3 42E-03	6 71E-03		
U-236	1 5493E-05	1,206.31	2,412.63	0 00E+00	1 87E-02	3 74E-02		
U-238	-4 2851E-09	1,206.31	0 00	7 85E-05	7 33E-05	7 85E-05		
Y-90	2 7505E+00	1,206.31	2,412.63	0 00E+00	3 32E+03	6 64E+03		
Other Radionuclides					6 20E+03	1 24E+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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92 99997131	60 to 100	

Burnup Summary (MWd) <sup>3</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,206.31	
Bounding		2 412 63	

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 15		
Bounding	2 30		

1 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: FRR MTR-C (JALX-HEU) JAPAN  
 SNF ID #: 600  
 Fuel Units & Descr: 54 - MTR TYPE  
 Heavy Metal Mass: BOL=5.227kg EOL=4 158kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 2.25

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 4545E-10	1,012.55	2,025.11	0 00E+00	1 47E-07	2 95E-07		
Am-241	1 1190E-03	1,012.55	2,025.11	0 00E+00	1 13E+00	2 27E+00	0 0150	3 907E+14
Am-242m	4 5425E-07	1,012.55	2,025.11	0 00E+00	4 60E-04	9 20E-04	0 0250	8 417E+13
Am-243	1 4921E-06	1,012.55	2,025.11	0 00E+00	1 51E-03	3 02E-03	0 0375	7 767E+13
C-14	5 7244E-09	1,012.55	2,025.11	0 00E+00	5 80E-06	1 16E-05	0 0575	7 637E+13
Cl-36	1 3124E-32	1,012.55	2,025.11	0 00E+00	1 33E-29	2 66E-29	0 0850	4 869E+13
Cm-243	2 3676E-07	1,012.55	2,025.11	0 00E+00	2 40E-04	4 79E-04	0 1250	4 216E+13
Cm-244	5 2042E-05	1,012.55	2,025.11	0 00E+00	5 27E-02	1 05E-01	0 2250	4 127E+13
Co-60	3 8208E-05	1,012.55	2,025.11	0 00E+00	3 87E-02	7 74E-02	0 3750	1 998E+13
Cs-134	4 8693E-01	1,012.55	2,025.11	0 00E+00	4 93E+02	9 86E+02	0 5750	2 744E+14
Cs-135	3 4477E-06	1,012.55	2,025.11	0 00E+00	3 49E-03	6 98E-03	0 8500	3 842E+13
Cs-137	2 8731E+00	1,012.55	2,025.11	0 00E+00	2 91E+03	5 82E+03	1 2500	7 149E+12
Eu-154	8 2053E-02	1,012.55	2,025.11	0 00E+00	8 31E+01	1 66E+02	1 7500	2 998E+11
Eu-155	3 9134E-02	1,012.55	2,025.11	0 00E+00	3 96E+01	7 93E+01	2 2500	6 288E+11
Fe-55	6 7429E-03	1,012.55	2,025.11	0 00E+00	6 83E+00	1 37E+01	2 7500	3 618E+09
H-3	1 0599E-02	1,012.55	2,025.11	0 00E+00	1 07E+01	2 15E+01	3 5000	4 012E+08
I-129	7 5300E-07	1,012.55	2,025.11	0 00E+00	7 62E-04	1 52E-03	5 0000	1 200E+03
Kr-85	2 8595E-01	1,012.55	2,025.11	0 00E+00	2 90E+02	5 79E+02	7 0000	1 337E+02
Np-237	9 5479E-06	1,012.55	2,025.11	0 00E+00	9 67E-03	1 93E-02	11 0000	1 508E+01
Pa-231	8 9297E-10	1,012.55	2,025.11	0 00E+00	9 04E-07	1 81E-06		
Pb-210	3 7609E-12	1,012.55	2,025.11	0 00E+00	3 81E-09	7 62E-09		
Pm-147	2 5452E+00	1,012.55	2,025.11	0 00E+00	2 58E+03	5 15E+03		
Pu-238	2 0550E-02	1,012.55	2,025.11	0 00E+00	2 08E+01	4 16E+01		
Pu-239	4 2838E-04	1,012.55	2,025.11	0 00E+00	4 34E-01	8 68E-01		
Pu-240	2 4401E-04	1,012.55	2,025.11	0 00E+00	2 47E-01	4 94E-01		
Pu-241	6 8764E-02	1,012.55	2,025.11	0 00E+00	6 96E+01	1 39E+02		
Pu-242	3 6329E-07	1,012.55	2,025.11	0 00E+00	3 68E-04	7 36E-04		
Ra-226	3 8045E-11	1,012.55	2,025.11	0 00E+00	3 85E-08	7 70E-08		
Ra-228	2 9902E-15	1,012.55	2,025.11	0 00E+00	3 03E-12	6 06E-12		
Ru-106	1 9055E-01	1,012.55	2,025.11	0 00E+00	1 93E+02	3 86E+02		
Se-79	1 2936E-05	1,012.55	2,025.11	0 00E+00	1 31E-02	2 62E-02		
Sn-126	1 1574E-05	1,012.55	2,025.11	0 00E+00	1 17E-02	2 34E-02		
Sr-90	2 7505E+00	1,012.55	2,025.11	0 00E+00	2 79E+03	5 57E+03		
Tc-99	4 2239E-04	1,012.55	2,025.11	0 00E+00	4 28E-01	8 55E-01		
Th-229	1 8848E-12	1,012.55	2,025.11	0 00E+00	1 91E-09	3 82E-09		
Th-230	1 7042E-08	1,012.55	2,025.11	0 00E+00	1 73E-05	3 45E-05		
Th-232	7 8132E-15	1,012.55	2,025.11	0 00E+00	7 91E-12	1 58E-11		
Tl-208	4 4063E-08	1,012.55	2,025.11	0 00E+00	4 46E-05	8 92E-05		
U-232	1 3151E-07	1,012.55	2,025.11	0 00E+00	1 33E-04	2 66E-04		
U-233	1 9564E-09	1,012.55	2,025.11	0 00E+00	1 98E-06	3 96E-06		
U-234	1 8371E-04	1,012.55	2,025.11	0 00E+00	1 86E-01	3 72E-01		
U-235	-2 7235E-06	1,012.55	0 00	1 05E-02	7 75E-03	1 05E-02		
U-236	1 5493E-05	1,012.55	2,025.11	0 00E+00	1 57E-02	3 14E-02		
U-238	-4 2851E-09	1,012.55	0 00	1 23E-04	1 19E-04	1 23E-04		
Y-90	2 7505E+00	1,012.55	2,025.11	0 00E+00	2 79E+03	5 57E+03		
Other Radionuclides					5 21E+03	1 04E+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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92 99999931	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1 012.55	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		2,025.11	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 62		1 02
Bounding	1 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: FRR MTR-C (UALX-HEU) PORTUGAL  
 SNF ID #: 631  
 Fuel Units & Descr: 9 - MTR TYPE  
 Heavy Metal Mass: BOL=1 423kg; EOL=0 894kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.38

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	501.16	1,002.33	0.00E+00	7.29E-08	1.46E-07	Avg MeV	
Am-241	1.1190E-03	501.16	1,002.33	0.00E+00	5.61E-01	1.12E+00	0.0150	1.934E+14
Am-242m	4.5425E-07	501.16	1,002.33	0.00E+00	2.28E-04	4.55E-04	0.0250	4.166E+13
Am-243	1.4921E-06	501.16	1,002.33	0.00E+00	7.48E-04	1.50E-03	0.0375	3.844E+13
C-14	5.7244E-09	501.16	1,002.33	0.00E+00	2.87E-06	5.74E-06	0.0575	3.780E+13
Cl-36	1.3124E-32	501.16	1,002.33	0.00E+00	6.58E-30	1.32E-29	0.0850	2.410E+13
Cm-243	2.3678E-07	501.16	1,002.33	0.00E+00	1.19E-04	2.37E-04	0.1250	2.087E+13
Cm-244	5.2042E-05	501.16	1,002.33	0.00E+00	2.61E-02	5.22E-02	0.2250	2.042E+13
Co-60	3.8208E-05	501.16	1,002.33	0.00E+00	1.91E-02	3.83E-02	0.3750	9.887E+12
Cs-134	4.8693E-01	501.16	1,002.33	0.00E+00	2.44E+02	4.88E+02	0.5750	1.358E+14
Cs-135	3.4477E-06	501.16	1,002.33	0.00E+00	1.73E-03	3.46E-03	0.8500	1.902E+13
Cs-137	2.8731E+00	501.16	1,002.33	0.00E+00	1.44E+03	2.88E+03	1.2500	3.538E+12
Eu-154	8.2053E-02	501.16	1,002.33	0.00E+00	4.11E+01	8.22E+01	1.7500	1.484E+11
Eu-155	3.9134E-02	501.16	1,002.33	0.00E+00	1.96E+01	3.92E+01	2.2500	3.112E+11
Fe-55	6.7429E-03	501.16	1,002.33	0.00E+00	3.38E+00	6.76E+00	2.7500	1.790E+09
H-3	1.0599E-02	501.16	1,002.33	0.00E+00	5.31E+00	1.06E+01	3.5000	1.986E+08
I-129	7.5300E-07	501.16	1,002.33	0.00E+00	3.77E-04	7.55E-04	5.0000	5.937E+02
Kr-85	2.8595E-01	501.16	1,002.33	0.00E+00	1.43E+02	2.87E+02	7.0000	6.619E+01
Np-237	9.5479E-06	501.16	1,002.33	0.00E+00	4.79E-03	9.57E-03	11.0000	7.460E+00
Pa-231	8.9297E-10	501.16	1,002.33	0.00E+00	4.48E-07	8.95E-07		
Pb-210	3.7609E-12	501.16	1,002.33	0.00E+00	1.88E-09	3.77E-09		
Pm-147	2.5452E+00	501.16	1,002.33	0.00E+00	1.28E+03	2.55E+03		
Pu-238	2.0550E-02	501.16	1,002.33	0.00E+00	1.03E+01	2.06E+01		
Pu-239	4.2838E-04	501.16	1,002.33	0.00E+00	2.15E-01	4.29E-01		
Pu-240	2.4401E-04	501.16	1,002.33	0.00E+00	1.22E-01	2.45E-01		
Pu-241	6.8764E-02	501.16	1,002.33	0.00E+00	3.45E+01	6.89E+01		
Pu-242	3.6329E-07	501.16	1,002.33	0.00E+00	1.82E-04	3.64E-04		
Ra-226	3.8045E-11	501.16	1,002.33	0.00E+00	1.91E-08	3.81E-08		
Ra-228	2.9902E-15	501.16	1,002.33	0.00E+00	1.50E-12	3.00E-12		
Ru-106	1.9055E-01	501.16	1,002.33	0.00E+00	9.55E+01	1.91E+02		
Se-79	1.2936E-05	501.16	1,002.33	0.00E+00	6.48E-03	1.30E-02		
Sn-126	1.1574E-05	501.16	1,002.33	0.00E+00	5.80E-03	1.16E-02		
Sr-90	2.7505E+00	501.16	1,002.33	0.00E+00	1.38E+03	2.76E+03		
Tc-99	4.2239E-04	501.16	1,002.33	0.00E+00	2.12E-01	4.23E-01		
Th-229	1.8848E-12	501.16	1,002.33	0.00E+00	9.45E-10	1.89E-09		
Th-230	1.7042E-08	501.16	1,002.33	0.00E+00	8.54E-06	1.71E-05		
Th-232	7.8132E-15	501.16	1,002.33	0.00E+00	3.92E-12	7.83E-12		
Tl-208	4.4063E-08	501.16	1,002.33	0.00E+00	2.21E-05	4.42E-05		
U-232	1.3151E-07	501.16	1,002.33	0.00E+00	6.59E-05	1.32E-04		
U-233	1.9564E-09	501.16	1,002.33	0.00E+00	9.80E-07	1.96E-06		
U-234	1.8371E-04	501.16	1,002.33	0.00E+00	9.21E-02	1.84E-01		
U-235	-2.7235E-06	501.16	0.00	2.86E-03	1.49E-03	2.86E-03		
U-236	1.5493E-05	501.16	1,002.33	0.00E+00	7.76E-03	1.55E-02		
U-238	-4.2851E-09	501.16	0.00	3.35E-05	3.13E-05	3.35E-05		
Y-90	2.7505E+00	501.16	1,002.33	0.00E+00	1.38E+03	2.76E+03		
Other Radionuclides					2.58E+03	5.16E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.54E+01	5.08E+01
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.00000971	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:		501.16	
Bounding:		1,002.33	

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	
Bounding	1.12 2.24		

Estimated EOL HM/Given EOL HM: 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 FRR MTR-C (UALX-HEU) TURKEY	Fuel decay start date 2010	
SNF ID # 643	Estimates as of 2010	
Fuel Units & Descr: 8 - MTR TYPE	Template ATR (Light Water, Alum, 60 to 100% U)	
Heavy Metal Mass BOL=1 781kg EOL=0 953kg	*Template Burnup(MWd) 367.2	
ROD Storage Site SRS	Template BOL Heavy Metal Mass (MT) 0 00116689	
	Template Decay Time 5 years	

Estimated Canister usage 18"x10" 0.33
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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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	784 13	1,568.26	0 00E+00	1 14E-07	2 28E-07		
Am-241	1 1190E-03	784 13	1,568.26	0 00E+00	8 77E-01	1 75E+00	0 0150	3 026E+14
Am-242m	4 5425E-07	784 13	1,568.26	0 00E+00	3 56E-04	7.12E-04	0 0250	6 518E+13
Am-243	1 4921E-06	784 13	1,568.26	0 00E+00	1 17E-03	2.34E-03	0 0375	6 015E+13
C-14	5 7244E-09	784 13	1,568.26	0 00E+00	4 49E-06	8 98E-06	0 0575	5 914E+13
Cl-36	1.3124E-32	784 13	1,568.26	0 00E+00	1 03E-29	2.06E-29	0 0850	3 771E+13
Cm-243	2 3676E-07	784 13	1,568.26	0 00E+00	1 86E-04	3.71E-04	0 1250	3 265E+13
Cm-244	5 2042E-05	784 13	1,568.26	0 00E+00	4 08E-02	8 16E-02	0 2250	3 196E+13
Co-60	3 8208E-05	784 13	1,568.26	0 00E+00	3 00E-02	5 99E-02	0 3750	1 547E+13
Cs-134	4 8693E-01	784 13	1,568.26	0 00E+00	3 82E+02	7.64E+02	0 5750	2 125E+14
Cs-135	3 4477E-06	784 13	1,568.26	0 00E+00	2 70E-03	5 41E-03	0 8500	2 976E+13
Cs-137	2 8731E+00	784 13	1,568.26	0 00E+00	2 25E+03	4 51E+03	1 2500	5 536E+12
Eu-154	8 2053E-02	784.13	1,568.26	0 00E+00	6 43E+01	1 29E+02	1 7500	2 322E+11
Eu-155	3 9134E-02	784.13	1,568.26	0 00E+00	3 07E+01	6 14E+01	2 2500	4 869E+11
Fe-55	6 7429E-03	784.13	1,568.26	0 00E+00	5 29E+00	1 06E+01	2 7500	2 801E+09
H-3	1 0599E-02	784.13	1,568.26	0 00E+00	8 31E+00	1 66E+01	3.5000	3 107E+08
I-129	7.5300E-07	784 13	1,568.26	0 00E+00	5 90E-04	1 18E-03	5 0000	9 289E+02
Kr-85	2 8595E-01	784 13	1,568.26	0 00E+00	2.24E+02	4 48E+02	7 0000	1 036E+02
Np-237	9.5479E-06	784 13	1,568.26	0 00E+00	7 49E-03	1 50E-02	11 0000	1 167E+01
Pa-231	8 9297E-10	784 13	1,568.26	0 00E+00	7 00E-07	1 40E-06		
Pb-210	3 7609E-12	784 13	1,568.26	0 00E+00	2 95E-09	5.90E-09		
Pm-147	2.5452E+00	784 13	1,568.26	0 00E+00	2 00E+03	3 99E+03		
Pu-238	2 0550E-02	784 13	1,568.26	0 00E+00	1 61E+01	3.22E+01		
Pu-239	4.2838E-04	784 13	1,568.26	0 00E+00	3 36E-01	6 72E-01		
Pu-240	2 4401E-04	784 13	1,568.26	0 00E+00	1 91E-01	3 83E-01		
Pu-241	6 8764E-02	784 13	1,568.26	0 00E+00	5 39E+01	1 08E+02		
Pu-242	3 6329E-07	784 13	1,568.26	0 00E+00	2 85E-04	5 70E-04		
Ra-226	3 8045E-11	784 13	1,568.26	0 00E+00	2 98E-08	5 97E-08		
Ra-228	2 9902E-15	784 13	1,568.26	0 00E+00	2.34E-12	4 69E-12		
Ru-106	1 9055E-01	784 13	1,568.26	0 00E+00	1 49E+02	2 99E+02		
Se-79	1 2936E-05	784 13	1,568.26	0 00E+00	1.01E-02	2 03E-02		
Sn-126	1 1574E-05	784.13	1,568.26	0 00E+00	9 08E-03	1 82E-02		
Sr-90	2 7505E+00	784.13	1,568.26	0 00E+00	2.16E+03	4 31E+03		
Tc-99	4 2239E-04	784.13	1,568.26	0 00E+00	3 31E-01	6 62E-01		
Th-229	1 8848E-12	784 13	1,568.26	0 00E+00	1 48E-09	2.96E-09		
Th-230	1 7042E-08	784 13	1,568.26	0 00E+00	1.34E-05	2.67E-05		
Th-232	7 8132E-15	784 13	1,568.26	0 00E+00	6 13E-12	1.23E-11		
Th-208	4 4063E-08	784 13	1,568.26	0 00E+00	3 46E-05	6 91E-05		
U-232	1.3151E-07	784 13	1,568.26	0 00E+00	1 03E-04	2 06E-04		
U-233	1.9564E-09	784 13	1,568.26	0 00E+00	1 53E-06	3 07E-06		
U-234	1.8371E-04	784 13	1,568.26	0 00E+00	1 44E-01	2 88E-01		
U-235	-2 7235E-06	784 13	0 00	3.58E-03	1 44E-03	3 58E-03		
U-236	1.5493E-05	784 13	1,568.26	0.00E+00	1.21E-02	2 43E-02		
U-238	-4 2851E-09	784 13	0 00	4 19E-05	3 85E-05	4 19E-05		
Y-90	2 7505E+00	784 13	1,568.26	0 00E+00	2 16E+03	4 31E+03		
Other Radionuclides					4 03E+03	8 07E+03		

**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 %	93.00002122	60 to 100	

  

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		784 13	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		1 568.26	Bounding burnup assumed to be twice nominal burnup

  

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.40		1.05
Bounding	2.80		

<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: FRR MTR-C (UALX-LEU) JAPAN  
 SNF ID #: 552  
 Fuel Units & Descr: 99 - ASSEMBLY  
 Heavy Metal Mass: BOL=94 05kg; EOL=84 645kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 4 13

**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
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	1.7533E-10	8,939 12	17,878 25	0.00E+00	1.57E-06	3.13E-06		
Am-241	1.2780E-02	8,939 12	17,878 25	0.00E+00	1.14E+02	2.28E+02	0.0150	3.244E+15
Am-242m	9.5467E-06	8,939 12	17,878 25	0.00E+00	8.53E-02	1.71E-01	0.0250	6.989E+14
Am-243	6.4100E-06	8,939 12	17,878 25	0.00E+00	5.73E-02	1.15E-01	0.0375	6.369E+14
C-14	2.9673E-08	8,939 12	17,878 25	0.00E+00	2.65E-04	5.31E-04	0.0575	6.358E+14
Cl-36	5.9513E-35	8,939 12	17,878 25	0.00E+00	5.32E-31	1.06E-30	0.0850	4.004E+14
Cm-243	3.1807E-06	8,939 12	17,878 25	0.00E+00	2.84E-02	5.69E-02	0.1250	3.344E+14
Cm-244	1.9540E-04	8,939 12	17,878.25	0.00E+00	1.75E+00	3.49E+00	0.2250	3.415E+14
Co-60	1.1753E-04	8,939 12	17,878.25	0.00E+00	1.05E+00	2.10E+00	0.3750	1.656E+14
Cs-134	3.3060E-01	8,939 12	17,878.25	0.00E+00	2.96E+03	5.91E+03	0.5750	2.287E+15
Cs-135	4.8607E-06	8,939 12	17,878.25	0.00E+00	4.35E-02	8.69E-02	0.8500	2.425E+14
Cs-137	2.8607E+00	8,939 12	17,878.25	0.00E+00	2.56E+04	5.11E+04	1.2500	5.360E+13
Eu-154	6.9933E-02	8,939.12	17,878.25	0.00E+00	6.25E+02	1.25E+03	1.7500	2.551E+12
Eu-155	3.3253E-02	8,939.12	17,878.25	0.00E+00	2.97E+02	5.95E+02	2.2500	4.437E+12
Fe-55	7.7267E-02	8,939.12	17,878.25	0.00E+00	6.91E+02	1.38E+03	2.7500	4.014E+10
H-3	1.0827E-02	8,939.12	17,878.25	0.00E+00	9.68E+01	1.94E+02	3.5000	4.755E+09
I-129	7.1600E-07	8,939 12	17,878 25	0.00E+00	6.40E-03	1.28E-02	5.0000	4.655E+04
Kr-85	2.7007E-01	8,939 12	17,878 25	0.00E+00	2.41E+03	4.83E+03	7.0000	5.303E+03
Np-237	3.6327E-06	8,939 12	17,878.25	0.00E+00	3.25E-02	6.49E-02	11.0000	6.057E+02
Pa-231	1.1267E-09	8,939 12	17,878 25	0.00E+00	1.01E-05	2.01E-05		
Pb-210	1.9773E-15	8,939 12	17,878 25	0.00E+00	1.77E-11	3.54E-11		
Pm-147	2.4367E+00	8,939 12	17,878 25	0.00E+00	2.18E+04	4.36E+04		
Pu-238	6.2213E-03	8,939 12	17,878 25	0.00E+00	5.56E+01	1.11E+02		
Pu-239	1.0320E-02	8,939 12	17,878 25	0.00E+00	9.23E+01	1.85E+02		
Pu-240	5.4260E-03	8,939 12	17,878 25	0.00E+00	4.85E+01	9.70E+01		
Pu-241	7.7333E-01	8,939 12	17,878 25	0.00E+00	6.91E+03	1.38E+04		
Pu-242	3.0713E-06	8,939 12	17,878 25	0.00E+00	2.75E-02	5.49E-02		
Ra-226	2.2027E-14	8,939 12	17,878 25	0.00E+00	1.97E-10	3.94E-10		
Ra-228	2.6333E-15	8,939 12	17,878.25	0.00E+00	2.35E-11	4.71E-11		
Ru-106	2.5580E-01	8,939 12	17,878 25	0.00E+00	2.29E+03	4.57E+03		
Se-79	1.2540E-05	8,939.12	17,878.25	0.00E+00	1.12E-01	2.24E-01		
Sn-126	1.1393E-05	8,939.12	17,878.25	0.00E+00	1.02E-01	2.04E-01		
Sr-90	2.6293E+00	8,939.12	17,878.25	0.00E+00	2.35E+04	4.70E+04		
Tc-99	4.3540E-04	8,939.12	17,878.25	0.00E+00	3.89E+00	7.78E+00		
Th-229	1.3653E-13	8,939.12	17,878.25	0.00E+00	1.22E-09	2.44E-09		
Th-230	1.2607E-11	8,939 12	17,878.25	0.00E+00	1.13E-07	2.25E-07		
Th-232	6.7400E-15	8,939 12	17,878.25	0.00E+00	6.02E-11	1.20E-10		
Tl-208	7.4667E-09	8,939 12	17,878.25	0.00E+00	6.67E-05	1.33E-04		
U-232	2.1927E-08	8,939 12	17,878 25	0.00E+00	1.96E-04	3.92E-04		
U-233	1.9920E-10	8,939 12	17,878 25	0.00E+00	1.78E-06	3.56E-06		
U-234	2.2487E-07	8,939 12	17,878 25	0.00E+00	2.01E-03	4.02E-03		
U-235	-2.5341E-06	8,939 12	0.00	4.06E-02	1.80E-02	4.06E-02		
U-236	1.3000E-05	8,939 12	17,878 25	0.00E+00	1.16E-01	2.32E-01		
U-238	-1.4207E-08	8,939 12	0.00	2.53E-02	2.52E-02	2.53E-02		
Y-90	2.6300E+00	8,939 12	17,878 25	0.00E+00	2.35E+04	4.70E+04		
Other Radionuclides					4.22E+04	8.44E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.23E+02	8.46E+02
Total	Total

**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	
	20	10 to 20	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		8,939 12	
Bounding		17,878.25	

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	
Bounding	2.17	1.03	
	4.34		

<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 FRR MTR-C (UALX-LEU) PORTUGAL Fuel decay start date 2010  
 SNF ID # 540 Estimates as of 2010  
 Fuel Units & Descr 9 - ASSEMBLY Template ATR (Light Water Alum, 60 to 100% U)  
 Heavy Metal Mass BOL=4.05kg EOL=3.912kg \*Template Burnup(MWd) 367.2  
 ROD Storage Site SRS Template BOL Heavy Metal Mass (MT) 0.00116689  
Template Decay Time 5 years

Estimated  
 Canister usage\*  
 18"x10"  
 0.38

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	130 40	260 81	0.00E+00	1.90E-08	3.79E-08	Avg MeV	
Am-241	1.1190E-03	130 40	260 81	0.00E+00	1.46E-01	2.92E-01	0.0150	5.032E+13
Am-242m	4.5425E-07	130 40	260 81	0.00E+00	5.92E-05	1.18E-04	0.0250	1.084E+13
Am-243	1.4921E-06	130 40	260 81	0.00E+00	1.95E-04	3.89E-04	0.0375	1.000E+13
C-14	5.7244E-09	130 40	260 81	0.00E+00	7.46E-07	1.49E-06	0.0575	9.836E+12
Cl-36	1.3124E-32	130 40	260 81	0.00E+00	1.71E-30	3.42E-30	0.0850	6.271E+12
Cm-243	2.3676E-07	130 40	260 81	0.00E+00	3.09E-05	6.18E-05	0.1250	5.430E+12
Cm-244	5.2042E-05	130 40	260 81	0.00E+00	6.79E-03	1.36E-02	0.2250	5.315E+12
Co-60	3.8208E-05	130 40	260 81	0.00E+00	4.98E-03	9.97E-03	0.3750	2.573E+12
Cs-134	4.8693E-01	130 40	260 81	0.00E+00	6.35E+01	1.27E+02	0.5750	3.534E+13
Cs-135	3.4477E-06	130 40	260 81	0.00E+00	4.50E-04	8.99E-04	0.8500	4.949E+12
Cs-137	2.8731E+00	130 40	260 81	0.00E+00	3.75E+02	7.49E+02	1.2500	9.207E+11
Eu-154	8.2053E-02	130 40	260 81	0.00E+00	1.07E+01	2.14E+01	1.7500	3.861E+10
Eu-155	3.9134E-02	130 40	260 81	0.00E+00	5.10E+00	1.02E+01	2.2500	8.098E+10
Fe-55	6.7429E-03	130 40	260 81	0.00E+00	8.79E-01	1.76E+00	2.7500	4.659E+08
H-3	1.0599E-02	130 40	260 81	0.00E+00	1.38E+00	2.76E+00	3.5000	5.167E+07
I-129	7.5300E-07	130 40	260 81	0.00E+00	9.82E-05	1.96E-04	5.0000	1.570E+02
Kr-85	2.8595E-01	130 40	260 81	0.00E+00	3.73E+01	7.46E+01	7.0000	1.751E+01
Np-237	9.5479E-06	130 40	260 81	0.00E+00	1.25E-03	2.49E-03	11.0000	1.974E+00
Pa-231	8.9297E-10	130 40	260 81	0.00E+00	1.16E-07	2.33E-07		
Pb-210	3.7609E-12	130 40	260 81	0.00E+00	4.90E-10	9.81E-10		
Pm-147	2.5452E+00	130 40	260 81	0.00E+00	3.32E+02	6.64E+02		
Pu-238	2.0550E-02	130 40	260 81	0.00E+00	2.68E+00	5.36E+00		
Pu-239	4.2838E-04	130 40	260 81	0.00E+00	5.59E-02	1.12E-01		
Pu-240	2.4401E-04	130 40	260 81	0.00E+00	3.18E-02	6.36E-02		
Pu-241	6.8764E-02	130 40	260 81	0.00E+00	8.97E+00	1.79E+01		
Pu-242	3.6329E-07	130 40	260 81	0.00E+00	4.74E-05	9.47E-05		
Ra-226	3.8045E-11	130 40	260 81	0.00E+00	4.96E-09	9.92E-09		
Ra-228	2.9902E-15	130 40	260 81	0.00E+00	3.90E-13	7.80E-13		
Ru-106	1.9055E-01	130 40	260 81	0.00E+00	2.48E+01	4.97E+01		
Se-79	1.2936E-05	130 40	260 81	0.00E+00	1.69E-03	3.37E-03		
Sn-126	1.1574E-05	130 40	260 81	0.00E+00	1.51E-03	3.02E-03		
Sr-90	2.7505E+00	130 40	260 81	0.00E+00	3.59E+02	7.17E+02		
Tc-99	4.2239E-04	130 40	260 81	0.00E+00	5.51E-02	1.10E-01		
Th-229	1.8848E-12	130 40	260 81	0.00E+00	2.46E-10	4.92E-10		
Th-230	1.7042E-08	130 40	260 81	0.00E+00	2.22E-06	4.44E-06		
Th-232	7.8132E-15	130 40	260 81	0.00E+00	1.02E-12	2.04E-12		
Ti-208	4.4063E-08	130 40	260 81	0.00E+00	5.75E-06	1.15E-05		
U-232	1.3151E-07	130 40	260 81	0.00E+00	1.71E-05	3.43E-05		
U-233	1.9564E-09	130 40	260 81	0.00E+00	2.55E-07	5.10E-07		
U-234	1.8371E-04	130 40	260 81	0.00E+00	2.40E-02	4.79E-02		
U-235	-2.7235E-06	130 40	0 00	1.75E-03	1.40E-03	1.75E-03		
U-236	1.5493E-05	130 40	260 81	0.00E+00	2.02E-03	4.04E-03		
U-238	-4.2851E-09	130 40	0 00	1.09E-03	1.09E-03	1.09E-03		
Y-90	2.7505E+00	130 40	260 81	0.00E+00	3.59E+02	7.17E+02		
Other Radionuclides					6.71E+02	1.34E+03		

Thermal Power	
Normal Heat Output (Watts)	Bounding Heat Output (Watts)
6.61E+00	1.32E+01
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons. This fuel matches on all parameters except enrichment.
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	20.00000132	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		130 40	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		260 81	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.10		1.00
Bounding	0.20		

<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: FRR MTR-C1 (UALX-HEU) SWITZERLAND  
 SNF ID #: 656  
 Fuel Units & Descr: 7 - MTR TYPE  
 Heavy Metal Mass: BOL=1.28kg; EOL=0.518kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.29

**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>a</sub>	y <sub>b</sub>	Gamma Sources	
							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	1.4545E-10	721.25	1,211.81	0.00E+00	1.05E-07	1.76E-07	3.5000	2.401E+08
Am-241	1.1190E-03	721.25	1,211.81	0.00E+00	8.07E-01	1.36E+00	0.0150	2.338E+14
Am-242m	4.5425E-07	721.25	1,211.81	0.00E+00	3.28E-04	5.50E-04	0.0250	5.037E+13
Am-243	1.4921E-06	721.25	1,211.81	0.00E+00	1.08E-03	1.81E-03	0.0375	4.648E+13
C-14	5.7244E-09	721.25	1,211.81	0.00E+00	4.13E-06	6.94E-06	0.0575	4.570E+13
Cl-36	1.3124E-32	721.25	1,211.81	0.00E+00	9.47E-30	1.59E-29	0.0850	2.913E+13
Cm-243	2.3676E-07	721.25	1,211.81	0.00E+00	1.71E-04	2.87E-04	0.1250	2.523E+13
Cm-244	5.2042E-05	721.25	1,211.81	0.00E+00	3.75E-02	6.31E-02	0.2250	2.469E+13
Co-60	3.8208E-05	721.25	1,211.81	0.00E+00	2.76E-02	4.63E-02	0.3750	1.195E+13
Cs-134	4.8693E-01	721.25	1,211.81	0.00E+00	3.51E+02	5.90E+02	0.5750	1.642E+14
Cs-135	3.4477E-06	721.25	1,211.81	0.00E+00	2.49E-03	4.18E-03	0.8500	2.299E+13
Cs-137	2.8731E+00	721.25	1,211.81	0.00E+00	2.07E+03	3.48E+03	1.2500	4.278E+12
Eu-154	8.2053E-02	721.25	1,211.81	0.00E+00	5.92E+01	9.94E+01	1.7500	1.794E+11
Eu-155	3.9134E-02	721.25	1,211.81	0.00E+00	2.82E+01	4.74E+01	2.2500	3.763E+11
Fe-55	6.7429E-03	721.25	1,211.81	0.00E+00	4.86E+00	8.17E+00	2.7500	2.165E+09
H-3	1.0599E-02	721.25	1,211.81	0.00E+00	7.64E+00	1.28E+01	3.5000	2.401E+08
I-129	7.5300E-07	721.25	1,211.81	0.00E+00	5.43E-04	9.12E-04	5.0000	7.178E+02
Kr-85	2.8595E-01	721.25	1,211.81	0.00E+00	2.06E+02	3.47E+02	7.0000	8.001E+01
Np-237	9.5479E-06	721.25	1,211.81	0.00E+00	6.89E-03	1.16E-02	11.0000	9.019E+00
Pa-231	8.9297E-10	721.25	1,211.81	0.00E+00	6.44E-07	1.08E-06		
Pb-210	3.7609E-12	721.25	1,211.81	0.00E+00	2.71E-09	4.56E-09		
Pm-147	2.5452E+00	721.25	1,211.81	0.00E+00	1.84E+03	3.08E+03		
Pu-238	2.0550E-02	721.25	1,211.81	0.00E+00	1.48E+01	2.49E+01		
Pu-239	4.2838E-04	721.25	1,211.81	0.00E+00	3.09E-01	5.19E-01		
Pu-240	2.4401E-04	721.25	1,211.81	0.00E+00	1.76E-01	2.96E-01		
Pu-241	6.8764E-02	721.25	1,211.81	0.00E+00	4.96E+01	8.33E+01		
Pu-242	3.6329E-07	721.25	1,211.81	0.00E+00	2.62E-04	4.40E-04		
Ra-226	3.8045E-11	721.25	1,211.81	0.00E+00	2.74E-08	4.61E-08		
Ra-228	2.9902E-15	721.25	1,211.81	0.00E+00	2.16E-12	3.62E-12		
Ru-106	1.9055E-01	721.25	1,211.81	0.00E+00	1.37E+02	2.31E+02		
Se-79	1.2936E-05	721.25	1,211.81	0.00E+00	9.33E-03	1.57E-02		
Sn-126	1.1574E-05	721.25	1,211.81	0.00E+00	8.35E-03	1.40E-02		
Sr-90	2.7505E+00	721.25	1,211.81	0.00E+00	1.98E+03	3.33E+03		
Tc-99	4.2239E-04	721.25	1,211.81	0.00E+00	3.05E-01	5.12E-01		
Th-229	1.8848E-12	721.25	1,211.81	0.00E+00	1.36E-09	2.28E-09		
Th-230	1.7042E-08	721.25	1,211.81	0.00E+00	1.23E-05	2.07E-05		
Th-232	7.8132E-15	721.25	1,211.81	0.00E+00	5.64E-12	9.47E-12		
Tl-208	4.4063E-08	721.25	1,211.81	0.00E+00	3.18E-05	5.34E-05		
U-232	1.3151E-07	721.25	1,211.81	0.00E+00	9.49E-05	1.59E-04		
U-233	1.9564E-09	721.25	1,211.81	0.00E+00	1.41E-06	2.37E-06		
U-234	1.8371E-04	721.25	1,211.81	0.00E+00	1.33E-01	2.23E-01		
U-235	-2.7235E-06	721.25	0.00	2.57E-03	6.07E-04	2.57E-03		
U-236	1.5493E-05	721.25	1,211.81	0.00E+00	1.12E-02	1.88E-02		
U-238	-4.2851E-09	721.25	0.00	3.01E-05	2.70E-05	3.01E-05		
Y-90	2.7505E+00	721.25	1,211.81	0.00E+00	1.98E+03	3.33E+03		
Other Radionuclides					3.71E+03	6.23E+03		

Thermal Power		
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)	
3.56E+01	5.14E+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	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92.9999987	60 to 100	

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

	From SFD	Estimated	Basis for burnup used in estimate:
	Nominal		
Bounding		1,211.81	

Nominal burnup calculated from the heavy metal mass destroyed  
 Bounding burnup calculated assuming all BOL heavy metal burned.

**Checks**

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	Nominal	1.79	
Bounding	3.01		

1.09

<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: FRR MTR-C2 (U3Si2 LEU) TURKEY  
 SNF ID #: 527  
 Fuel Units & Descr: 9 - ASSEMBLY  
 Heavy Metal Mass: BOL=13.95kg EOL=12.276kg  
 ROD Storage Site: SRS

Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage  
 18"x10"  
 0.38

Radionuclide	m C/MWd From Template	x <sub>n</sub> Nominal Fuel Burnup (MWd) <sup>2</sup>	x <sub>b</sub> Bounding Fuel Burnup (MWd) <sup>2</sup>	b Initial Actvrvty (Ci)	y <sub>n</sub> Nominal Fuel Inventories(Ci)	y <sub>b</sub> Bounding Fuel Inventories(Ci)	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	1,585.31	3,170.62	0.00E+00	2.31E-07	4.61E-07	Avg MeV	
Am-241	1.1190E-03	1,585.31	3,170.62	0.00E+00	1.77E+00	3.55E+00	0.0150	6.117E+14
Am-242m	4.5425E-07	1,585.31	3,170.62	0.00E+00	7.20E-04	1.44E-03	0.0250	1.318E+14
Am-243	1.4921E-06	1,585.31	3,170.62	0.00E+00	2.37E-03	4.73E-03	0.0375	1.216E+14
C-14	5.7244E-09	1,585.31	3,170.62	0.00E+00	9.07E-06	1.81E-05	0.0575	1.196E+14
Cl-36	1.3124E-32	1,585.31	3,170.62	0.00E+00	2.08E-29	4.16E-29	0.0850	7.623E+13
Cm-243	2.3676E-07	1,585.31	3,170.62	0.00E+00	3.75E-04	7.51E-04	0.1250	6.601E+13
Cm-244	5.2042E-05	1,585.31	3,170.62	0.00E+00	8.25E-02	1.65E-01	0.2250	6.461E+13
Co-60	3.8208E-05	1,585.31	3,170.62	0.00E+00	6.06E-02	1.21E-01	0.3750	3.127E+13
Cs-134	4.8693E-01	1,585.31	3,170.62	0.00E+00	7.72E+02	1.54E+03	0.5750	4.296E+14
Cs-135	3.4477E-06	1,585.31	3,170.62	0.00E+00	5.47E-03	1.09E-02	0.8500	6.016E+13
Cs-137	2.8731E+00	1,585.31	3,170.62	0.00E+00	4.55E+03	9.11E+03	1.2500	1.119E+13
Eu-154	8.2053E-02	1,585.31	3,170.62	0.00E+00	1.30E+02	2.60E+02	1.7500	4.694E+11
Eu-155	3.9134E-02	1,585.31	3,170.62	0.00E+00	6.20E+01	1.24E+02	2.2500	9.845E+11
Fe-55	6.7429E-03	1,585.31	3,170.62	0.00E+00	1.07E+01	2.14E+01	2.7500	5.664E+09
H-3	1.0599E-02	1,585.31	3,170.62	0.00E+00	1.68E+01	3.36E+01	3.5000	6.282E+08
I-129	7.5300E-07	1,585.31	3,170.62	0.00E+00	1.19E-03	2.39E-03	5.0000	1.886E+03
Kr-85	2.8595E-01	1,585.31	3,170.62	0.00E+00	4.53E+02	9.07E+02	7.0000	2.103E+02
Np-237	9.5479E-06	1,585.31	3,170.62	0.00E+00	1.51E-02	3.03E-02	11.0000	2.371E+01
Pa-231	8.9297E-10	1,585.31	3,170.62	0.00E+00	1.42E-06	2.83E-06		
Pb-210	3.7609E-12	1,585.31	3,170.62	0.00E+00	5.96E-09	1.19E-08		
Pm-147	2.5452E+00	1,585.31	3,170.62	0.00E+00	4.03E+03	8.07E+03		
Pu-238	2.0550E-02	1,585.31	3,170.62	0.00E+00	3.26E+01	6.52E+01		
Pu-239	4.2838E-04	1,585.31	3,170.62	0.00E+00	6.79E-01	1.36E+00		
Pu-240	2.4401E-04	1,585.31	3,170.62	0.00E+00	3.87E-01	7.74E-01		
Pu-241	6.8764E-02	1,585.31	3,170.62	0.00E+00	1.09E+02	2.18E+02		
Pu-242	3.6329E-07	1,585.31	3,170.62	0.00E+00	5.76E-04	1.15E-03		
Ra-226	3.8045E-11	1,585.31	3,170.62	0.00E+00	6.03E-08	1.21E-07		
Ra-228	2.9902E-15	1,585.31	3,170.62	0.00E+00	4.74E-12	9.48E-12		
Ru-106	1.9055E-01	1,585.31	3,170.62	0.00E+00	3.02E+02	6.04E+02		
Se-79	1.2936E-05	1,585.31	3,170.62	0.00E+00	2.05E-02	4.10E-02		
Sn-126	1.1574E-05	1,585.31	3,170.62	0.00E+00	1.83E-02	3.67E-02		
Sr-90	2.7505E+00	1,585.31	3,170.62	0.00E+00	4.36E+03	8.72E+03		
Tc-99	4.2239E-04	1,585.31	3,170.62	0.00E+00	6.70E-01	1.34E+00		
Th-229	1.8848E-12	1,585.31	3,170.62	0.00E+00	2.99E-09	5.98E-09		
Th-230	1.7042E-08	1,585.31	3,170.62	0.00E+00	2.70E-05	5.40E-05		
Th-232	7.8132E-15	1,585.31	3,170.62	0.00E+00	1.24E-11	2.48E-11		
Ti-208	4.4063E-08	1,585.31	3,170.62	0.00E+00	6.99E-05	1.40E-04		
U-232	1.3151E-07	1,585.31	3,170.62	0.00E+00	2.08E-04	4.17E-04		
U-233	1.9564E-09	1,585.31	3,170.62	0.00E+00	3.10E-06	6.20E-06		
U-234	1.8371E-04	1,585.31	3,170.62	0.00E+00	2.91E-01	5.82E-01		
U-235	-2.7235E-06	1,585.31	0.00	6.03E-03	1.71E-03	6.03E-03		
U-236	1.5493E-05	1,585.31	3,170.62	0.00E+00	2.46E-02	4.91E-02		
U-238	-4.2851E-09	1,585.31	0.00	3.75E-03	3.74E-03	3.75E-03		
Y-90	2.7505E+00	1,585.31	3,170.62	0.00E+00	4.36E+03	8.72E+03		
Other Radionuclides					8.15E+03	1.63E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.04E+01	1.61E+02
Total	Total

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

Template Selection Summary			Basis for Parameter Differences*
	From SFD	Used	
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	ALUM	ALUM	This fuel matches on all parameters except enrichment.
BOL HM Constituents	U	U	
BOL Enrichment %	20.00000077	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate*
	From SFD	Estimated	
Nominal		1,585.31	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		3,170.62	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.36		1.01
Bounding	0.72		

\*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: FRR MTR-C2 (UALX-HEU) SWITZERLAND 1 Fuel decay start date: 2010  
 SNF ID #: 657 Estimates as of: 2010  
 Fuel Units & Descr: 11 - MTR TYPE Template ATR (Light Water, Alum., 60 to 100%, U)  
 Heavy Metal Mass: BOL=2 461kg; EOL=0 995kg 2 Template Burnup(MWd): 367.2  
 ROD Storage Site: SRS Template BOL Heavy Metal Mass (MT): 0 00116689  
Template Decay Time: 5 years

Estimated  
Canister usage:  
18"x10"  
**0 46**

**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</sub>	y <sub>b</sub>	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
	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 4545E-10	1,387 57	2,330 33	0 00E+00	2 02E-07	3 39E-07		
Am-241	1 1190E-03	1,387 57	2,330 33	0 00E+00	1 55E+00	2 61E+00	0 0150	4 496E+14
Am-242m	4 5425E-07	1,387 57	2,330 33	0 00E+00	6 30E-04	1 06E-03	0 0250	9 686E+13
Am-243	1 4921E-06	1,387 57	2,330 33	0 00E+00	2 07E-03	3 48E-03	0 0375	8 938E+13
C-14	5 7244E-09	1,387 57	2,330 33	0 00E+00	7 94E-06	1 33E-05	0 0575	8 788E+13
Cl-36	1 3124E-32	1,387 57	2,330 33	0 00E+00	1 82E-29	3 06E-29	0 0850	5 603E+13
Cm-243	2 3676E-07	1,387 57	2,330 33	0 00E+00	3 29E-04	5 52E-04	0 1250	4 852E+13
Cm-244	5 2042E-05	1,387 57	2,330 33	0 00E+00	7 22E-02	1 21E-01	0 2250	4 749E+13
Co-60	3 8208E-05	1,387 57	2,330 33	0 00E+00	5 30E-02	8 90E-02	0 3750	2 299E+13
Cs-134	4 8693E-01	1,387 57	2,330 33	0 00E+00	6 76E+02	1 13E+03	0 5750	3 157E+14
Cs-135	3 4477E-06	1,387 57	2,330 33	0 00E+00	4 78E-03	8 03E-03	0 8500	4 422E+13
Cs-137	2 8731E+00	1,387 57	2,330 33	0 00E+00	3 99E+03	6 70E+03	1 2500	8 226E+12
Eu-154	8 2053E-02	1,387 57	2,330 33	0 00E+00	1 14E+02	1 91E+02	1 7500	3 450E+11
Eu-155	3 9134E-02	1,387 57	2,330 33	0 00E+00	5 43E+01	9 12E+01	2 2500	7 236E+11
Fe-55	6 7429E-03	1,387 57	2,330 33	0 00E+00	9 36E+00	1 57E+01	2 7500	4 163E+09
H-3	1 0599E-02	1,387 57	2,330 33	0 00E+00	1 47E+01	2 47E+01	3 5000	4 617E+08
I-129	7 5300E-07	1,387 57	2,330 33	0 00E+00	1 04E-03	1 75E-03	5 0000	1 380E+03
Kr-85	2 8595E-01	1,387 57	2,330 33	0 00E+00	3 97E+02	6 66E+02	7 0000	1 539E+02
Np-237	9 5479E-06	1,387 57	2,330 33	0 00E+00	1 32E-02	2 22E-02	11 0000	1 734E+01
Pa-231	8 9297E-10	1,387 57	2,330 33	0 00E+00	1 24E-06	2 08E-06		
Pb-210	3 7609E-12	1,387 57	2,330 33	0 00E+00	5 22E-09	8 76E-09		
Pm-147	2 5452E+00	1,387 57	2,330 33	0 00E+00	3 53E+03	5 93E+03		
Pu-238	2 0550E-02	1,387 57	2,330 33	0 00E+00	2 85E+01	4 79E+01		
Pu-239	4 2838E-04	1,387 57	2,330 33	0 00E+00	5 94E-01	9 98E-01		
Pu-240	2 4401E-04	1,387 57	2,330 33	0 00E+00	3 39E-01	5 69E-01		
Pu-241	6 8764E-02	1,387 57	2,330 33	0 00E+00	9 54E+01	1 60E+02		
Pu-242	3 6329E-07	1,387 57	2,330 33	0 00E+00	5 04E-04	8 47E-04		
Ra-226	3 8045E+11	1,387 57	2,330 33	0 00E+00	5 28E-08	8 87E-08		
Ra-228	2 9902E-15	1,387 57	2,330 33	0 00E+00	4 15E-12	6 97E-12		
Ru-106	1 9055E-01	1,387 57	2,330 33	0 00E+00	2 64E+02	4 44E+02		
Se-79	1 2936E-05	1,387 57	2,330 33	0 00E+00	1 79E-02	3 01E-02		
Sn-126	1 1574E-05	1,387 57	2,330 33	0 00E+00	1 61E-02	2 70E-02		
Sr-90	2 7505E+00	1,387 57	2,330 33	0 00E+00	3 82E+03	6 41E+03		
Tc-99	4 2239E-04	1,387 57	2,330 33	0 00E+00	5 86E-01	9 84E-01		
Th-229	1 8848E-12	1,387 57	2,330 33	0 00E+00	2 62E-09	4 39E-09		
Th-230	1 7042E-08	1,387 57	2,330 33	0 00E+00	2 36E-05	3 97E-05		
Th-232	7 8132E-15	1,387 57	2,330 33	0 00E+00	1 08E-11	1 82E-11		
Tl-208	4 4063E-08	1,387 57	2,330 33	0 00E+00	6 11E-05	1 03E-04		
U-232	1 3151E-07	1,387 57	2,330 33	0 00E+00	1 82E-04	3 06E-04		
U-233	1 9564E-09	1,387 57	2,330 33	0 00E+00	2 71E-06	4 56E-06		
U-234	1 8371E-04	1,387 57	2,330 33	0 00E+00	2 55E-01	4 28E-01		
U-235	-2 7235E-06	1,387 57	0 00	4 95E-03	1 17E-03	4 95E-03		
U-236	1 5493E-05	1,387 57	2,330 33	0 00E+00	2 15E-02	3 61E-02		
U-238	-4 2851E-09	1,387 57	0 00	5 79E-05	5 19E-05	5 79E-05		
Y-90	2 7505E+00	1,387 57	2,330 33	0 00E+00	3 82E+03	6 41E+03		
Other Radionuclides					7 14E+03	1 20E+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	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93 00001006	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,387.57	
Bounding		2,330.33	

Nominal burnup calculated from the heavy metal mass destroyed.  
 Bounding burnup calculated assuming all BOL heavy metal burned.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.79		
Bounding	3.01		

1.09

<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: FRR MTR-O (UALX-HEU) TURKEY	<sup>1</sup> Fuel decay start date	2010
SNF ID # 642	Estimates as of	2010
Fuel Units & Descr 2 - MTR TYPE	Template	ATR (Light Water, Alum, 60 to 100%, U)
Heavy Metal Mass BOL=0.366kg EOL=0.196kg	<sup>2</sup> Template Burnup(MWd)	367.2
ROD Storage Site SRS	Template BOL Heavy Metal Mass (MT)	0.00116689
	Template Decay Time	5 years

Estimated Canister usage 18"x10" 0.08
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**II. Estimates**

Radionuclide	m	x <sub>n</sub>	x <sub>b</sub>	b	y <sub>n</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	Total Photons/sec (bounding)
Ac-227	1.4545E-10	160.99	321.99	0.00E+00	2.34E-08	4.68E-08	Avg MeV	
Am-241	1.1190E-03	160.99	321.99	0.00E+00	1.80E-01	3.60E-01	0.0150	6.212E+13
Am-242m	4.5425E-07	160.99	321.99	0.00E+00	7.31E-05	1.46E-04	0.0250	1.338E+13
Am-243	1.4921E-06	160.99	321.99	0.00E+00	2.40E-04	4.80E-04	0.0375	1.235E+13
C-14	5.7244E-09	160.99	321.99	0.00E+00	9.22E-07	1.84E-06	0.0575	1.214E+13
Cl-36	1.3124E-32	160.99	321.99	0.00E+00	2.11E-30	4.23E-30	0.0850	7.741E+12
Cm-243	2.3676E-07	160.99	321.99	0.00E+00	3.81E-05	7.62E-05	0.1250	6.704E+12
Cm-244	5.2042E-05	160.99	321.99	0.00E+00	8.38E-03	1.68E-02	0.2250	6.561E+12
Co-60	3.8208E-05	160.99	321.99	0.00E+00	6.15E-03	1.23E-02	0.3750	3.176E+12
Cs-134	4.8693E-01	160.99	321.99	0.00E+00	7.84E+01	1.57E+02	0.5750	4.363E+13
Cs-135	3.4477E-06	160.99	321.99	0.00E+00	5.55E-04	1.11E-03	0.8500	6.109E+12
Cs-137	2.8731E+00	160.99	321.99	0.00E+00	4.63E+02	9.25E+02	1.2500	1.137E+12
Eu-154	8.2053E-02	160.99	321.99	0.00E+00	1.32E+01	2.64E+01	1.7500	4.767E+10
Eu-155	3.9134E-02	160.99	321.99	0.00E+00	6.30E+00	1.26E+01	2.2500	9.997E+10
Fe-55	6.7429E-03	160.99	321.99	0.00E+00	1.09E+00	2.17E+00	2.7500	5.752E+08
H-3	1.0599E-02	160.99	321.99	0.00E+00	1.71E+00	3.41E+00	3.5000	6.379E+07
I-129	7.5300E-07	160.99	321.99	0.00E+00	1.21E-04	2.42E-04	5.0000	1.907E+02
Kr-85	2.8595E-01	160.99	321.99	0.00E+00	4.60E+01	9.21E+01	7.0000	2.126E+01
Np-237	9.5479E-06	160.99	321.99	0.00E+00	1.54E-03	3.07E-03	11.0000	2.396E+00
Pa-231	8.9297E-10	160.99	321.99	0.00E+00	1.44E-07	2.88E-07		
Pb-210	3.7609E-12	160.99	321.99	0.00E+00	6.05E-10	1.21E-09		
Pm-147	2.5452E+00	160.99	321.99	0.00E+00	4.10E+02	8.20E+02		
Pu-238	2.0550E-02	160.99	321.99	0.00E+00	3.31E+00	6.62E+00		
Pu-239	4.2838E-04	160.99	321.99	0.00E+00	6.90E-02	1.38E-01		
Pu-240	2.4401E-04	160.99	321.99	0.00E+00	3.93E-02	7.86E-02		
Pu-241	6.8764E-02	160.99	321.99	0.00E+00	1.11E+01	2.21E+01		
Pu-242	3.6329E-07	160.99	321.99	0.00E+00	5.85E-05	1.17E-04		
Ra-226	3.8045E-11	160.99	321.99	0.00E+00	6.12E-09	1.22E-08		
Ra-228	2.9902E-15	160.99	321.99	0.00E+00	4.81E-13	9.63E-13		
Ru-106	1.9055E-01	160.99	321.99	0.00E+00	3.07E+01	6.14E+01		
Se-79	1.2936E-05	160.99	321.99	0.00E+00	2.08E-03	4.17E-03		
Sn-126	1.1574E-05	160.99	321.99	0.00E+00	1.86E-03	3.73E-03		
Sr-90	2.7505E+00	160.99	321.99	0.00E+00	4.43E+02	8.86E+02		
Tc-99	4.2239E-04	160.99	321.99	0.00E+00	6.80E-02	1.36E-01		
Th-229	1.8848E-12	160.99	321.99	0.00E+00	3.03E-10	6.07E-10		
Th-230	1.7042E-08	160.99	321.99	0.00E+00	2.74E-06	5.49E-06		
Th-232	7.8132E-15	160.99	321.99	0.00E+00	1.26E-12	2.52E-12		
Tl-208	4.4063E-08	160.99	321.99	0.00E+00	7.09E-06	1.42E-05		
U-232	1.3151E-07	160.99	321.99	0.00E+00	2.12E-05	4.23E-05		
U-233	1.9564E-09	160.99	321.99	0.00E+00	3.15E-07	6.30E-07		
U-234	1.8371E-04	160.99	321.99	0.00E+00	2.96E-02	5.92E-02		
U-235	-2.7235E-06	160.99	0.00	7.35E-04	2.96E-04	7.35E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-236	1.5493E-05	160.99	321.99	0.00E+00	2.49E-03	4.99E-03	8.16E+00	1.63E+01
U-238	-4.2851E-09	160.99	0.00	8.60E-06	7.91E-06	8.60E-06	Total	Total
Y-90	2.7505E+00	160.99	321.99	0.00E+00	4.43E+02	8.86E+02		
Other Radionuclides					8.28E+02	1.66E+03		

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

<b>Template Selection Summary</b>			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
Fuel Cladding:	LIGHT WATER	LIGHT WATER	
BOL HM Constituents:	ALUM	ALUM	
BOL Enrichment %:	U	U	
	92.9999987	60 to 100	
<b>Burnup Summary (MWd)<sup>2</sup></b>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		160.99	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		321.99	Bounding burnup assumed to be twice nominal burnup
<b>Checks</b>			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.40		1.05
Bounding	2.80		

<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: FRR MTR-O (UALX-LEU) PORTUGAL  
 SNF ID #: 541  
 Fuel Units & Descr: 3 - ASSEMBLY  
 Heavy Metal Mass: BOL=1.35kg; EOL=1.35kg  
 ROD Storage Site: SRS

<sup>1</sup>Fuel decay start date: 2010  
 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: 5 years

Estimated  
 Canister usage:  
 18"x10"  
 0 13

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	
							Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	25.57	51.14	0.00E+00	3.72E-09	7.44E-09	Avg MeV	
Am-241	1.1190E-03	25.57	51.14	0.00E+00	2.86E-02	5.72E-02	0.0150	9.866E+12
Am-242m	4.5425E-07	25.57	51.14	0.00E+00	1.16E-05	2.32E-05	0.0250	2.125E+12
Am-243	1.4921E-06	25.57	51.14	0.00E+00	3.82E-05	7.63E-05	0.0375	1.961E+12
C-14	5.7244E-09	25.57	51.14	0.00E+00	1.46E-07	2.93E-07	0.0575	1.929E+12
Cl-36	1.3124E-32	25.57	51.14	0.00E+00	3.36E-31	6.71E-31	0.0850	1.230E+12
Cm-243	2.3676E-07	25.57	51.14	0.00E+00	6.05E-06	1.21E-05	0.1250	1.065E+12
Cm-244	5.2042E-05	25.57	51.14	0.00E+00	1.33E-03	2.66E-03	0.2250	1.042E+12
Co-60	3.8208E-05	25.57	51.14	0.00E+00	9.77E-04	1.95E-03	0.3750	5.044E+11
Cs-134	4.8693E-01	25.57	51.14	0.00E+00	1.25E+01	2.49E+01	0.5750	6.929E+12
Cs-135	3.4477E-06	25.57	51.14	0.00E+00	8.82E-05	1.76E-04	0.8500	9.703E+11
Cs-137	2.8731E+00	25.57	51.14	0.00E+00	7.35E+01	1.47E+02	1.2500	1.805E+11
Eu-154	8.2053E-02	25.57	51.14	0.00E+00	2.10E+00	4.20E+00	1.7500	7.570E+09
Eu-155	3.9134E-02	25.57	51.14	0.00E+00	1.00E+00	2.00E+00	2.2500	1.588E+10
Fe-55	6.7429E-03	25.57	51.14	0.00E+00	1.72E-01	3.45E-01	2.7500	9.135E+07
H-3	1.0599E-02	25.57	51.14	0.00E+00	2.71E-01	5.42E-01	3.5000	1.013E+07
I-129	7.5300E-07	25.57	51.14	0.00E+00	1.93E-05	3.85E-05	5.0000	3.113E+01
Kr-85	2.8595E-01	25.57	51.14	0.00E+00	7.31E+00	1.46E+01	7.0000	3.473E+00
Np-237	9.5479E-06	25.57	51.14	0.00E+00	2.44E-04	4.88E-04	11.0000	3.917E-01
Pa-231	8.9297E-10	25.57	51.14	0.00E+00	2.28E-08	4.57E-08		
Pb-210	3.7609E-12	25.57	51.14	0.00E+00	9.62E-11	1.92E-10		
Pm-147	2.5452E+00	25.57	51.14	0.00E+00	6.51E+01	1.30E+02		
Pu-238	2.0550E-02	25.57	51.14	0.00E+00	5.25E-01	1.05E+00		
Pu-239	4.2838E-04	25.57	51.14	0.00E+00	1.10E-02	2.19E-02		
Pu-240	2.4401E-04	25.57	51.14	0.00E+00	6.24E-03	1.25E-02		
Pu-241	6.8764E-02	25.57	51.14	0.00E+00	1.76E+00	3.52E+00		
Pu-242	3.6329E-07	25.57	51.14	0.00E+00	9.29E-06	1.86E-05		
Ra-226	3.8045E-11	25.57	51.14	0.00E+00	9.73E-10	1.95E-09		
Ra-228	2.9902E-15	25.57	51.14	0.00E+00	7.65E-14	1.53E-13		
Ru-106	1.9055E-01	25.57	51.14	0.00E+00	4.87E+00	9.74E+00		
Se-79	1.2936E-05	25.57	51.14	0.00E+00	3.31E-04	6.62E-04		
Sn-126	1.1574E-05	25.57	51.14	0.00E+00	2.96E-04	5.92E-04		
Sr-90	2.7505E+00	25.57	51.14	0.00E+00	7.03E+01	1.41E+02		
Tc-99	4.2239E-04	25.57	51.14	0.00E+00	1.08E-02	2.16E-02		
Th-229	1.8848E-12	25.57	51.14	0.00E+00	4.82E-11	9.64E-11		
Th-230	1.7042E-08	25.57	51.14	0.00E+00	4.36E-07	8.72E-07		
Th-232	7.8132E-15	25.57	51.14	0.00E+00	2.00E-13	4.00E-13		
Tl-208	4.4063E-08	25.57	51.14	0.00E+00	1.13E-06	2.25E-06		
U-232	1.3151E-07	25.57	51.14	0.00E+00	3.36E-06	6.73E-06		
U-233	1.9564E-09	25.57	51.14	0.00E+00	5.00E-08	1.00E-07		
U-234	1.8371E-04	25.57	51.14	0.00E+00	4.70E-03	9.39E-03		
U-235	-2.7235E-06	25.57	0.00	5.83E-04	5.14E-04	5.83E-04		
U-236	1.5493E-05	25.57	51.14	0.00E+00	3.96E-04	7.92E-04		
U-238	-4.2851E-09	25.57	0.00	3.63E-04	3.63E-04	3.63E-04		
Y-90	2.7505E+00	25.57	51.14	0.00E+00	7.03E+01	1.41E+02		
Other Radionuclides					1.32E+02	2.63E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.30E+00	2.59E+00
Total	Total

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

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20.00000132	60 to 100	

Burnup Summary (MWd) <sup>2</sup>			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		25.57	Nominal burnup assumed to be 2% of BOL heavy metal mass. Bounding burnup assumed to be twice nominal burnup.
Bounding		51.14	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.06		0.98
Bounding	0.12		

<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)