

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name FRR MTR-S (U308-LEU) INDONESIA
SNF ID # 502
Fuel Units & Descr: 142 - ASSEMBLY
Heavy Metal Mass: BOL=177.5kg EOL=159.75kg
ROD Storage Site: SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage:
18"x10"
5.92

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	6.6313E-10	16,809.59	33,619.19	0.00E+00	1.11E-05	2.23E-05	Avg MeV	
Am-241	2.0060E-03	16,809.59	33,619.19	0.00E+00	3.37E+01	6.74E+01	0.0150	3.549E+15
Am-242m	4.2429E-07	16,809.59	33,619.19	0.00E+00	7.13E-03	1.43E-02	0.0250	7.380E+14
Am-243	1.4899E-06	16,809.59	33,619.19	0.00E+00	2.50E-02	5.01E-02	0.0375	6.437E+14
C-14	5.7135E-09	16,809.59	33,619.19	0.00E+00	9.60E-05	1.92E-04	0.0575	6.894E+14
Cl-36	1.3124E-32	16,809.59	33,619.19	0.00E+00	2.21E-28	4.41E-28	0.0850	4.166E+14
Cm-243	1.6443E-07	16,809.59	33,619.19	0.00E+00	2.76E-03	5.53E-03	0.1250	2.819E+14
Cm-244	2.9330E-05	16,809.59	33,619.19	0.00E+00	4.93E-01	9.86E-01	0.2250	3.595E+14
Co-60	5.3186E-06	16,809.59	33,619.19	0.00E+00	8.94E-02	1.79E-01	0.3750	1.565E+14
Cs-134	3.1563E-03	16,809.59	33,619.19	0.00E+00	5.31E+01	1.06E+02	0.5750	2.552E+15
Cs-135	3.4477E-06	16,809.59	33,619.19	0.00E+00	5.80E-02	1.16E-01	0.8500	4.315E+13
Cs-137	2.0313E+00	16,809.59	33,619.19	0.00E+00	3.41E+04	6.83E+04	1.2500	2.464E+13
Eu-154	2.4513E-02	16,809.59	33,619.19	0.00E+00	4.12E+02	8.24E+02	1.7500	1.131E+12
Eu-155	4.8175E-03	16,809.59	33,619.19	0.00E+00	8.10E+01	1.62E+02	2.2500	9.921E+07
Fe-55	1.2397E-04	16,809.59	33,619.19	0.00E+00	2.08E+00	4.17E+00	2.7500	5.609E+07
H-3	4.5697E-03	16,809.59	33,619.19	0.00E+00	7.68E+01	1.54E+02	3.5000	2.579E+05
I-129	7.3300E-07	16,809.59	33,619.19	0.00E+00	1.27E-02	2.53E-02	5.0000	1.467E+04
Kr-85	1.0850E-01	16,809.59	33,619.19	0.00E+00	1.82E+03	3.65E+03	7.0000	1.620E+03
Np-237	9.5561E-06	16,809.59	33,619.19	0.00E+00	1.61E-01	3.21E-01	11.0000	1.816E+02
Pa-231	2.0359E-09	16,809.59	33,619.19	0.00E+00	3.42E-05	6.84E-05		
Pb-210	4.9728E-11	16,809.59	33,619.19	0.00E+00	8.36E-07	1.67E-06		
Pm-147	4.8502E-02	16,809.59	33,619.19	0.00E+00	8.15E+02	1.63E+03		
Pu-238	1.8254E-02	16,809.59	33,619.19	0.00E+00	3.07E+02	6.14E+02		
Pu-239	4.2810E-04	16,809.59	33,619.19	0.00E+00	7.20E+00	1.44E+01		
Pu-240	2.4368E-04	16,809.59	33,619.19	0.00E+00	4.10E+00	8.19E+00		
Pu-241	3.3415E-02	16,809.59	33,619.19	0.00E+00	5.62E+02	1.12E+03		
Pu-242	3.6329E-07	16,809.59	33,619.19	0.00E+00	6.11E-03	1.22E-02		
Ra-226	2.2854E-10	16,809.59	33,619.19	0.00E+00	3.84E-06	7.68E-06		
Ra-228	1.2426E-14	16,809.59	33,619.19	0.00E+00	2.09E-10	4.18E-10		
Ru-106	6.3589E-06	16,809.59	33,619.19	0.00E+00	1.07E-01	2.14E-01		
Se-79	1.2933E-05	16,809.59	33,619.19	0.00E+00	2.17E-01	4.35E-01		
Sn-126	1.1574E-05	16,809.59	33,619.19	0.00E+00	1.95E-01	3.89E-01		
Sr-90	1.9248E+00	16,809.59	33,619.19	0.00E+00	3.24E+04	6.47E+04		
Tc-99	4.2239E-04	16,809.59	33,619.19	0.00E+00	7.10E+00	1.42E+01		
Th-229	5.0953E-12	16,809.59	33,619.19	0.00E+00	8.57E-08	1.71E-07		
Th-230	4.1885E-08	16,809.59	33,619.19	0.00E+00	7.04E-04	1.41E-03		
Th-232	1.9270E-14	16,809.59	33,619.19	0.00E+00	3.24E-10	6.48E-10		
Ti-208	4.6024E-08	16,809.59	33,619.19	0.00E+00	7.74E-04	1.55E-03		
U-232	1.2582E-07	16,809.59	33,619.19	0.00E+00	2.11E-03	4.23E-03	Thermal Power	
U-233	2.5825E-09	16,809.59	33,619.19	0.00E+00	4.34E-05	8.68E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8450E-04	16,809.59	33,619.19	0.00E+00	3.10E+00	6.20E+00	4.01E+02	8.01E+02
U-235	-2.7235E-06	16,809.59	0.00	7.67E-02	3.09E-02	7.67E-02	Total	Total
U-236	1.5493E-05	16,809.59	33,619.19	0.00E+00	2.60E-01	5.21E-01		
U-238	-4.2851E-09	16,809.59	0.00	4.77E-02	4.77E-02	4.77E-02		
Y-90	1.9254E+00	16,809.59	33,619.19	0.00E+00	3.24E+04	6.47E+04		
Other Radionuclides					3.25E+04	6.50E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: The 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: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	20	60 to 100	

Burnup Summary (MWd) ¹			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	16,809.59	
	Bounding	33,619.19	

Checks			Estimated EOL HM/Given EOL HM 1.01
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	Nominal	0.30	
	Bounding	0.60	

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

²Total burnup for all fuel associated with this worksheet must be 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-S (U308-LEU) PERU
 SNF ID #: 504
 Fuel Units & Descr: 23 - ASSEMBLY
 Heavy Metal Mass: BOL=32.2kg; EOL=28.98kg
 ROD Storage Site: SRS

Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum., 60 to 100%, U)
 Template Burnup (MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage:
 18"x10"
 0.96

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ¹	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	3,049.40	6,098.80	0.00E+00	2.02E-06	4.04E-06	Avg MeV	
Am-241	2.0060E-03	3,049.40	6,098.80	0.00E+00	6.12E+00	1.22E+01	0.0150	6.438E+14
Am-242m	4.2429E-07	3,049.40	6,098.80	0.00E+00	1.29E-03	2.59E-03	0.0250	1.339E+14
Am-243	1.4899E-06	3,049.40	6,098.80	0.00E+00	4.54E-03	9.09E-03	0.0375	1.168E+14
C-14	5.7135E-09	3,049.40	6,098.80	0.00E+00	1.74E-05	3.48E-05	0.0575	1.251E+14
Cf-252	1.3124E-32	3,049.40	6,098.80	0.00E+00	4.00E-29	8.00E-29	0.0850	7.557E+13
Cm-243	1.6443E-07	3,049.40	6,098.80	0.00E+00	5.01E-04	1.00E-03	0.1250	5.114E+13
Cm-244	2.9330E-05	3,049.40	6,098.80	0.00E+00	8.94E-02	1.79E-01	0.2250	6.521E+13
Co-60	5.3186E-06	3,049.40	6,098.80	0.00E+00	1.62E-02	3.24E-02	0.3750	2.839E+13
Cs-134	3.1563E-03	3,049.40	6,098.80	0.00E+00	9.62E+00	1.92E+01	0.5750	4.630E+14
Cs-135	3.4477E-06	3,049.40	6,098.80	0.00E+00	1.05E-02	2.10E-02	0.8500	7.828E+12
Cs-137	2.0313E+00	3,049.40	6,098.80	0.00E+00	6.19E+03	1.24E+04	1.2500	4.470E+12
Eu-154	2.4513E-02	3,049.40	6,098.80	0.00E+00	7.47E+01	1.49E+02	1.7500	2.052E+11
Eu-155	4.8175E-03	3,049.40	6,098.80	0.00E+00	1.47E+01	2.94E+01	2.2500	1.800E+07
Fe-55	1.2397E-04	3,049.40	6,098.80	0.00E+00	3.78E-01	7.56E-01	2.7500	1.017E+07
H-3	4.5697E-03	3,049.40	6,098.80	0.00E+00	1.39E+01	2.79E+01	3.5000	4.679E+04
I-129	7.5300E-07	3,049.40	6,098.80	0.00E+00	2.30E-03	4.59E-03	5.0000	2.663E+03
Kr-85	1.0850E-01	3,049.40	6,098.80	0.00E+00	3.31E+02	6.62E+02	7.0000	2.940E+02
Np-237	9.5561E-06	3,049.40	6,098.80	0.00E+00	2.91E-02	5.83E-02	11.0000	3.296E+01
Pa-231	2.0359E-09	3,049.40	6,098.80	0.00E+00	6.21E-06	1.24E-05		
Pb-210	4.9728E-11	3,049.40	6,098.80	0.00E+00	1.52E-07	3.03E-07		
Pm-147	4.8502E-02	3,049.40	6,098.80	0.00E+00	1.48E+02	2.96E+02		
Pu-238	1.8254E-02	3,049.40	6,098.80	0.00E+00	5.57E+01	1.11E+02		
Pu-239	4.2810E-04	3,049.40	6,098.80	0.00E+00	1.31E+00	2.61E+00		
Pu-240	2.4368E-04	3,049.40	6,098.80	0.00E+00	7.43E-01	1.49E+00		
Pu-241	3.3415E-02	3,049.40	6,098.80	0.00E+00	1.02E+02	2.04E+02		
Pu-242	3.6329E-07	3,049.40	6,098.80	0.00E+00	1.11E-03	2.22E-03		
Ra-226	2.2854E-10	3,049.40	6,098.80	0.00E+00	6.97E-07	1.39E-06		
Ra-228	1.2426E-14	3,049.40	6,098.80	0.00E+00	3.79E-11	7.58E-11		
Ru-106	6.3589E-06	3,049.40	6,098.80	0.00E+00	1.94E-02	3.88E-02		
Se-79	1.2933E-05	3,049.40	6,098.80	0.00E+00	3.94E-02	7.89E-02		
Sr-126	1.1574E-05	3,049.40	6,098.80	0.00E+00	3.53E-02	7.06E-02		
Sr-90	1.9248E+00	3,049.40	6,098.80	0.00E+00	5.87E+03	1.17E+04		
Tc-99	4.2239E-04	3,049.40	6,098.80	0.00E+00	1.29E+00	2.58E+00		
Th-229	5.0953E-12	3,049.40	6,098.80	0.00E+00	1.55E-08	3.11E-08		
Th-230	4.1885E-08	3,049.40	6,098.80	0.00E+00	1.28E-04	2.55E-04		
Th-232	1.9270E-14	3,049.40	6,098.80	0.00E+00	5.88E-11	1.18E-10		
Th-208	4.6024E-08	3,049.40	6,098.80	0.00E+00	1.40E-04	2.81E-04		
U-232	1.2582E-07	3,049.40	6,098.80	0.00E+00	3.84E-04	7.67E-04		
U-233	2.5825E-09	3,049.40	6,098.80	0.00E+00	7.88E-06	1.58E-05		
U-234	1.8450E-04	3,049.40	6,098.80	0.00E+00	5.63E-01	1.13E+00		
U-235	-2.7235E-06	3,049.40	0.00	1.14E-02	3.13E-03	1.14E-02		
U-236	1.5493E-05	3,049.40	6,098.80	0.00E+00	4.72E-02	9.45E-02		
U-238	-4.2851E-09	3,049.40	0.00	9.04E-03	9.03E-03	9.04E-03		
Y-90	1.9254E+00	3,049.40	6,098.80	0.00E+00	5.87E+03	1.17E+04		
Other Radionuclides					5.90E+03	1.18E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons. This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	16.42857201	60 to 100	

Burnup Summary (MWd) ¹			Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal Bounding	From SFD	Estimated	
		3.049.40 6.098.80	

Checks			Estimated EOL HM/Given EOL HM 1.01
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.30 0.60		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (U3Si2 LEU) CANADA
 SNF ID #: 513
 Fuel Units & Descr: 35 - ASSEMBLY
 Heavy Metal Mass: BOL=50 75kg EOL=45 675kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0 00116689
 Template Decay Time: 20 years

Estimated
 Canister usage
 18"x10"
 1.46

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	4,806.12	9,612.25	0 00E+00	3 19E-06	6 37E-06	0 0150	1 015E+15
Am-241	2 0060E-03	4,806.12	9,612.25	0 00E+00	9 64E+00	1 93E+01	0 0250	2 110E+14
Am-242m	4 2429E-07	4,806.12	9,612.25	0 00E+00	2 04E-03	4 08E-03	0 0375	1 840E+14
Am-243	1 4899E-06	4,806.12	9,612.25	0 00E+00	7 16E-03	1 43E-02	0 0575	1 971E+14
C-14	5 7135E-09	4,806.12	9,612.25	0 00E+00	2 75E-05	5 49E-05	0 0850	1 191E+14
Cl-36	1 3124E-32	4,806.12	9,612.25	0 00E+00	6 31E-29	1 26E-28	0 1250	8 060E+13
Cm-243	1 6443E-07	4,806.12	9,612.25	0 00E+00	7 90E-04	1 58E-03	0 2250	1 028E+14
Cm-244	2 9330E-05	4,806.12	9,612.25	0 00E+00	1 41E-01	2 82E-01	0 3750	4 474E+13
Co-60	5 3186E-06	4,806.12	9,612.25	0 00E+00	2 56E-02	5 11E-02	0 5750	7 298E+14
Cs-134	3 1563E-03	4,806.12	9,612.25	0 00E+00	1 52E+01	3 03E+01	0 8500	1 234E+13
Cs-135	3 4477E-06	4,806.12	9,612.25	0 00E+00	1 66E-02	3 31E-02	1 2500	7 045E+12
Cs-137	2 0313E+00	4,806.12	9,612.25	0 00E+00	9 76E+03	1 95E+04	1 7500	3 234E+11
Eu-154	2 4513E-02	4,806.12	9,612.25	0 00E+00	1 18E+02	2 36E+02	2 2500	2 836E+07
Eu-155	4 8175E-03	4,806.12	9,612.25	0 00E+00	2 32E+01	4 63E+01	2 7500	1 604E+07
Fe-55	1 2397E-04	4,806.12	9,612.25	0 00E+00	5 96E-01	1 19E+00	3 5000	7 374E+04
H-3	4 5697E-03	4,806.12	9,612.25	0 00E+00	2 20E+01	4 39E+01	5 0000	4 195E+03
I-129	7 5300E-07	4,806.12	9,612.25	0 00E+00	3 62E-03	7 24E-03	7 0000	4 633E+02
Kr-85	1 0850E-01	4,806.12	9,612.25	0 00E+00	5 21E+02	1 04E+03	11 0000	5 193E+01
Np-237	9 5561E-06	4,806.12	9,612.25	0 00E+00	4 59E-02	9 19E-02		
Pa-231	2 0359E-09	4,806.12	9,612.25	0 00E+00	9 79E-06	1 96E-05		
Pb-210	4 9728E-11	4,806.12	9,612.25	0 00E+00	2 39E-07	4 78E-07		
Pm-147	4 8502E-02	4,806.12	9,612.25	0 00E+00	2 33E+02	4 66E+02		
Pu-238	1 8254E-02	4,806.12	9,612.25	0 00E+00	8 77E+01	1 75E+02		
Pu-239	4 2810E-04	4,806.12	9,612.25	0 00E+00	2 06E+00	4 12E+00		
Pu-240	2 4368E-04	4,806.12	9,612.25	0 00E+00	1 17E+00	2 34E+00		
Pu-241	3 3415E-02	4,806.12	9,612.25	0 00E+00	1 61E+02	3 21E+02		
Pu-242	3 6329E-07	4,806.12	9,612.25	0 00E+00	1 75E-03	3 49E-03		
Ra-226	2 2854E-10	4,806.12	9,612.25	0 00E+00	1 10E-06	2 20E-06		
Ra-228	1 2426E-14	4,806.12	9,612.25	0 00E+00	5 97E-11	1 19E-10		
Ru-106	6 3589E-06	4,806.12	9,612.25	0 00E+00	3 06E-02	6 11E-02		
Se-79	1 2933E-05	4,806.12	9,612.25	0 00E+00	6 22E-02	1 24E-01		
Sn-126	1 1574E-05	4,806.12	9,612.25	0 00E+00	5 56E-02	1 11E-01		
Sr-90	1 9248E+00	4,806.12	9,612.25	0 00E+00	9 25E+03	1 85E+04		
Tc-99	4 2239E-04	4,806.12	9,612.25	0 00E+00	2 03E+00	4 06E+00		
Th-229	5 0953E-12	4,806.12	9,612.25	0 00E+00	2 45E-08	4 90E-08		
Th-230	4 1885E-08	4,806.12	9,612.25	0 00E+00	2 01E-04	4 03E-04		
Th-232	1 9270E-14	4,806.12	9,612.25	0 00E+00	9 26E-11	1 85E-10		
Ti-208	4 6024E-08	4,806.12	9,612.25	0 00E+00	2 21E-04	4 42E-04		
U-232	1 2582E-07	4,806.12	9,612.25	0 00E+00	6 05E-04	1 21E-03		
U-233	2 5825E-09	4,806.12	9,612.25	0 00E+00	1 24E-05	2 48E-05		
U-234	1 8450E-04	4,806.12	9,612.25	0 00E+00	8 87E-01	1 77E+00		
U-235	2 7235E-06	4,806.12	0 00	2 19E-02	8 84E-03	2 19E-02		
U-236	1 5493E-05	4,806.12	9,612.25	0 00E+00	7 45E-02	1 49E-01		
U-238	4 2851E-09	4,806.12	0 00	1 36E-02	1 36E-02	1 36E-02		
Y-90	1 9254E+00	4,806.12	9,612.25	0 00E+00	9 25E+03	1 85E+04		
Other Radionuclides					9 30E+03	1 86E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences ¹
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)²

	From SFD	Estimated	Basis for burnup used in estimate ³
Nominal		4 806.12	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		9 612.25	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.30		1.01
Bounding	0.60		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (U3Si2 LEU) GERMANY
SNF ID #: 519
Fuel Units & Descr: 97 - ASSEMBLY
Heavy Metal Mass: BOL=155.2kg; EOL=131.804kg
ROD Storage Site: SRS

Fuel decay start date: 2010
Estimates as of: 2030
Template: TRIGA-AI (LW/U-Zr, Alum., 10 to 20%, U)
Template Burnup(MWd): 6.65
Template BOL Heavy Metal Mass (MT): 0.00018
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
4.04

II. Estimates	m	X _n	X _b	b	Y _n	Y _b	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.4556E-09	22,332.30	44,664.59	0.00E+00	5.48E-05	1.10E-04	Avg MeV	
Am-241	3.8752E-03	22,332.30	44,664.59	0.00E+00	8.65E+01	1.73E+02	0.0150	4.584E+15
Am-242m	1.8617E-06	22,332.30	44,664.59	0.00E+00	4.16E-02	8.32E-02	0.0250	9.465E+14
Am-243	2.3293E-07	22,332.30	44,664.59	0.00E+00	5.20E-03	1.04E-02	0.0375	9.907E+14
C-14	4.3233E-05	22,332.30	44,664.59	0.00E+00	9.65E-01	1.93E+00	0.0675	9.157E+14
Cl-36	4.3023E-08	22,332.30	44,664.59	0.00E+00	9.61E-04	1.92E-03	0.0850	5.575E+14
Cm-243	1.9053E-07	22,332.30	44,664.59	0.00E+00	4.25E-03	8.51E-03	0.1250	6.258E+14
Cm-244	1.7744E-06	22,332.30	44,664.59	0.00E+00	3.96E-02	7.93E-02	0.2250	5.052E+14
Co-60	4.3188E-03	22,332.30	44,664.59	0.00E+00	9.64E+01	1.93E+02	0.3750	2.076E+14
Cs-134	6.7188E-04	22,332.30	44,664.59	0.00E+00	1.50E+01	3.00E+01	0.5750	3.307E+15
Cs-135	3.1549E-05	22,332.30	44,664.59	0.00E+00	7.05E-01	1.41E+00	0.8500	3.519E+14
Cs-137	1.9489E+00	22,332.30	44,664.59	0.00E+00	4.35E+04	8.70E+04	1.2500	3.791E+14
Eu-154	4.0301E-01	22,332.30	44,664.59	0.00E+00	9.00E+03	1.80E+04	1.7500	1.136E+13
Eu-155	5.4000E-02	22,332.30	44,664.59	0.00E+00	1.21E+03	2.41E+03	2.2500	1.800E+08
Fe-55	1.5955E-04	22,332.30	44,664.59	0.00E+00	3.56E+00	7.13E+00	2.7500	2.996E+07
H-3	4.6571E-03	22,332.30	44,664.59	0.00E+00	1.04E+02	2.08E+02	3.5000	2.051E+05
I-129	7.3805E-07	22,332.30	44,664.59	0.00E+00	1.65E-02	3.30E-02	5.0000	2.520E+04
Kr-85	9.5684E-02	22,332.30	44,664.59	0.00E+00	2.14E+03	4.27E+03	7.0000	2.845E+03
Np-237	1.4618E-06	22,332.30	44,664.59	0.00E+00	3.26E-02	6.53E-02	11.0000	3.235E+02
Pa-231	6.4782E-09	22,332.30	44,664.59	0.00E+00	1.45E-04	2.89E-04		
Pb-210	6.3158E-14	22,332.30	44,664.59	0.00E+00	1.41E-09	2.82E-09		
Pm-147	3.9564E-02	22,332.30	44,664.59	0.00E+00	8.84E+02	1.77E+03		
Pu-238	1.2008E-03	22,332.30	44,664.59	0.00E+00	2.68E+01	5.36E+01		
Pu-239	5.6917E-03	22,332.30	44,664.59	0.00E+00	1.27E+02	2.54E+02		
Pu-240	2.2617E-03	22,332.30	44,664.59	0.00E+00	5.05E+01	1.01E+02		
Pu-241	6.1113E-02	22,332.30	44,664.59	0.00E+00	1.36E+03	2.73E+03		
Pu-242	3.0602E-07	22,332.30	44,664.59	0.00E+00	6.83E-03	1.37E-02		
Ra-226	2.6707E-13	22,332.30	44,664.59	0.00E+00	5.96E-09	1.19E-08		
Ra-228	2.2556E-10	22,332.30	44,664.59	0.00E+00	5.04E-06	1.01E-05		
Ru-106	3.1293E-06	22,332.30	44,664.59	0.00E+00	6.99E-02	1.40E-01		
Se-79	1.2935E-05	22,332.30	44,664.59	0.00E+00	2.89E-01	5.78E-01		
Sn-126	1.2238E-05	22,332.30	44,664.59	0.00E+00	2.73E-01	5.47E-01		
Sr-90	1.8195E+00	22,332.30	44,664.59	0.00E+00	4.06E+04	8.13E+04		
Tc-99	4.4120E-04	22,332.30	44,664.59	0.00E+00	9.85E+00	1.97E+01		
Th-229	3.3308E-10	22,332.30	44,664.59	0.00E+00	7.44E-06	1.49E-05		
Th-230	4.6526E-11	22,332.30	44,664.59	0.00E+00	1.04E-06	2.08E-06		
Th-232	2.3744E-10	22,332.30	44,664.59	0.00E+00	5.30E-06	1.06E-05		
Tl-208	1.8195E-08	22,332.30	44,664.59	0.00E+00	4.06E-04	8.13E-04		
U-232	4.9098E-08	22,332.30	44,664.59	0.00E+00	1.10E-03	2.19E-03		
U-233	1.3140E-07	22,332.30	44,664.59	0.00E+00	2.93E-03	5.87E-03		
U-234	2.2571E-07	22,332.30	44,664.59	0.00E+00	5.04E-03	1.01E-02		
U-235	-2.6159E-06	22,332.30	0.00	6.71E-02	8.66E-03	6.71E-02		
U-236	1.2719E-05	22,332.30	44,664.59	0.00E+00	2.84E-01	5.68E-01		
U-238	-3.8857E-08	22,332.30	0.00	4.17E-02	4.09E-02	4.17E-02		
Y-90	1.8211E+00	22,332.30	44,664.59	0.00E+00	4.07E+04	8.13E+04		
Other Radionuclides					4.68E+04	9.35E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	19.9999963	10 to 20.1	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:		22,332.30	
Bounding:		44,664.59	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:	3.89		
Bounding:	7.79		1.00

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

²Total burnup for all fuel associated with this worksheet must be 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-S (US2 LEU) GERMANY
SNF ID #: 1067
Fuel Units & Descr 7 - ASSEMBLY
Heavy Metal Mass BOL=14 7kg, EOL=12.936kg
ROD Storage Site SRS

Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
Template Burnup (MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage:
18"x10"
0.29

II. Estimates	m	x ₀	x ₀	b	y ₀	y ₀	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	1,670.54	3,341.08	0.00E+00	1.11E-06	2.22E-06	Avg MeV	
Am-241	2.0060E-03	1,670.54	3,341.08	0.00E+00	3.35E+00	6.70E+00	0.0150	3.527E+14
Am-242m	4.2429E-07	1,670.54	3,341.08	0.00E+00	7.09E-04	1.42E-03	0.0250	7.334E+13
Am-243	1.4899E-06	1,670.54	3,341.08	0.00E+00	2.49E-03	4.98E-03	0.0375	6.397E+13
C-14	5.7135E-09	1,670.54	3,341.08	0.00E+00	9.54E-06	1.91E-05	0.0575	6.851E+13
Cl-36	1.3124E-32	1,670.54	3,341.08	0.00E+00	2.19E-29	4.38E-29	0.0850	4.140E+13
Cm-243	1.6443E-07	1,670.54	3,341.08	0.00E+00	2.75E-04	5.49E-04	0.1250	2.802E+13
Cm-244	2.9330E-05	1,670.54	3,341.08	0.00E+00	4.90E-02	9.80E-02	0.2250	3.572E+13
Co-60	5.3186E-06	1,670.54	3,341.08	0.00E+00	8.88E-03	1.78E-02	0.3750	1.555E+13
Cs-134	3.1563E-03	1,670.54	3,341.08	0.00E+00	5.27E+00	1.05E+01	0.5750	2.537E+14
Cs-135	3.4477E-06	1,670.54	3,341.08	0.00E+00	5.76E-03	1.15E-02	0.8500	4.289E+12
Cs-137	2.0313E+00	1,670.54	3,341.08	0.00E+00	3.39E+03	6.79E+03	1.2500	2.449E+12
Eu-154	2.4513E-02	1,670.54	3,341.08	0.00E+00	4.09E+01	8.19E+01	1.7500	1.124E+11
Eu-155	4.8175E-03	1,670.54	3,341.08	0.00E+00	8.05E+00	1.61E+01	2.2500	9.859E+06
Fe-55	1.2397E-04	1,670.54	3,341.08	0.00E+00	2.07E-01	4.14E-01	2.7500	5.574E+06
H-3	4.5697E-03	1,670.54	3,341.08	0.00E+00	7.63E+00	1.53E+01	3.5000	2.563E+04
I-129	7.5300E-07	1,670.54	3,341.08	0.00E+00	1.26E-03	2.52E-03	5.0000	1.456E+03
Kr-85	1.0850E-01	1,670.54	3,341.08	0.00E+00	1.81E+02	3.62E+02	7.0000	1.608E+02
Np-237	9.5561E-06	1,670.54	3,341.08	0.00E+00	1.60E-02	3.19E-02	11.0000	1.803E+01
Pa-231	2.0359E-09	1,670.54	3,341.08	0.00E+00	3.40E-06	6.80E-06		
Pb-210	4.9728E-11	1,670.54	3,341.08	0.00E+00	8.31E-08	1.66E-07		
Pm-147	4.8502E-02	1,670.54	3,341.08	0.00E+00	8.10E+01	1.62E+02		
Pu-238	1.8254E-02	1,670.54	3,341.08	0.00E+00	3.05E+01	6.10E+01		
Pu-239	4.2810E-04	1,670.54	3,341.08	0.00E+00	7.15E-01	1.43E+00		
Pu-240	2.4368E-04	1,670.54	3,341.08	0.00E+00	4.07E-01	8.14E-01		
Pu-241	3.3415E-02	1,670.54	3,341.08	0.00E+00	5.58E+01	1.12E+02		
Pu-242	3.6329E-07	1,670.54	3,341.08	0.00E+00	6.07E-04	1.21E-03		
Ra-226	2.2854E-10	1,670.54	3,341.08	0.00E+00	3.82E-07	7.64E-07		
Ra-228	1.2426E-14	1,670.54	3,341.08	0.00E+00	2.08E-11	4.15E-11		
Ru-106	6.3589E-06	1,670.54	3,341.08	0.00E+00	1.06E-02	2.12E-02		
Se-79	1.2933E-05	1,670.54	3,341.08	0.00E+00	2.16E-02	4.32E-02		
Sn-126	1.1574E-05	1,670.54	3,341.08	0.00E+00	1.93E-02	3.87E-02		
Sr-90	1.9248E+00	1,670.54	3,341.08	0.00E+00	3.22E+03	6.43E+03		
Tc-99	4.2239E-04	1,670.54	3,341.08	0.00E+00	7.06E-01	1.41E+00		
Th-229	5.0953E-12	1,670.54	3,341.08	0.00E+00	8.51E-09	1.70E-08		
Th-230	4.1885E-08	1,670.54	3,341.08	0.00E+00	7.00E-05	1.40E-04		
Th-232	1.9270E-14	1,670.54	3,341.08	0.00E+00	3.22E-11	6.44E-11		
Ti-208	4.6024E-08	1,670.54	3,341.08	0.00E+00	7.69E-05	1.54E-04		
U-232	1.2582E-07	1,670.54	3,341.08	0.00E+00	2.10E-04	4.20E-04		
U-233	2.5825E-09	1,670.54	3,341.08	0.00E+00	4.31E-06	8.63E-06		
U-234	1.8450E-04	1,670.54	3,341.08	0.00E+00	3.08E-01	6.16E-01		
U-235	-2.7235E-06	1,670.54	0.00	6.35E-03	1.80E-03	6.35E-03		
U-236	1.5493E-05	1,670.54	3,341.08	0.00E+00	2.59E-02	5.18E-02		
U-238	-4.2851E-09	1,670.54	0.00	3.95E-03	3.95E-03	3.95E-03		
Y-90	1.9254E+00	1,670.54	3,341.08	0.00E+00	3.22E+03	6.43E+03		
Other Radionuclides					3.23E+03	6.46E+03		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
Fuel Cladding:	ALUM	ALUM	This fuel matches on all parameters except enrichment.
BOL HM Constituents:	U	U	
BOL Enrichment %:	20.00000028	60 to 100	

Burnup Summary (MWd)³

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		1,670.54	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		3,341.08	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.36		1.01
Bounding	0.72		

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

² Total burnup for all fuel associated with this worksheet must be 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-S (U3Si2 LEU) GREECE
 SNF ID #: 532
 Fuel Units & Descr: 67 - ASSEMBLY
 Heavy Metal Mass: BOL=74.37kg, EOL=67 683kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage:
 16"x10"
 2.79

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	6,332.34	12,664.68	0.00E+00	4.20E-06	8.40E-06	Avg. MeV	
Am-241	2.0060E-03	6,332.34	12,664.68	0.00E+00	1.27E+01	2.54E+01	0.0150	1.337E+15
Am-242m	4.2429E-07	6,332.34	12,664.68	0.00E+00	2.69E-03	5.37E-03	0.0250	2.780E+14
Am-243	1.4899E-06	6,332.34	12,664.68	0.00E+00	9.43E-03	1.89E-02	0.0375	2.425E+14
Ci-14	5.7135E-09	6,332.34	12,664.68	0.00E+00	3.62E-05	7.24E-05	0.0575	2.597E+14
Ci-36	1.3124E-32	6,332.34	12,664.68	0.00E+00	8.31E-29	1.66E-28	0.0850	1.569E+14
Cm-243	1.6443E-07	6,332.34	12,664.68	0.00E+00	1.04E-03	2.08E-03	0.1250	1.062E+14
Cm-244	2.9330E-05	6,332.34	12,664.68	0.00E+00	1.86E-01	3.71E-01	0.2250	1.354E+14
Co-60	5.3186E-06	6,332.34	12,664.68	0.00E+00	3.37E-02	6.74E-02	0.3750	5.895E+13
Cs-134	3.1563E-03	6,332.34	12,664.68	0.00E+00	2.00E+01	4.00E+01	0.5750	9.615E+14
Cs-135	3.4477E-06	6,332.34	12,664.68	0.00E+00	2.18E-02	4.37E-02	0.8500	1.626E+13
Cs-137	2.0313E+00	6,332.34	12,664.68	0.00E+00	1.29E+04	2.57E+04	1.2500	9.282E+12
Eu-154	2.4513E-02	6,332.34	12,664.68	0.00E+00	1.55E+02	3.10E+02	1.7500	4.260E+11
Eu-155	4.8175E-03	6,332.34	12,664.68	0.00E+00	3.05E+01	6.10E+01	2.2500	3.737E+07
Fe-55	1.2397E-04	6,332.34	12,664.68	0.00E+00	7.85E-01	1.57E+00	2.7500	2.113E+07
H-3	4.5697E-03	6,332.34	12,664.68	0.00E+00	2.89E+01	5.79E+01	3.5000	9.716E+04
I-129	7.5300E-07	6,332.34	12,664.68	0.00E+00	4.77E-03	9.54E-03	5.0000	5.532E+03
Kr-85	1.0850E-01	6,332.34	12,664.68	0.00E+00	6.87E+02	1.37E+03	7.0000	6.109E+02
Np-237	9.5561E-06	6,332.34	12,664.68	0.00E+00	6.05E-02	1.21E-01	11.0000	6.848E+01
Pa-231	2.0359E-09	6,332.34	12,664.68	0.00E+00	1.29E-05	2.58E-05		
Pb-210	4.9728E-11	6,332.34	12,664.68	0.00E+00	3.15E-07	6.30E-07		
Pm-147	4.8502E-02	6,332.34	12,664.68	0.00E+00	3.07E+02	6.14E+02		
Pu-238	1.8254E-02	6,332.34	12,664.68	0.00E+00	1.16E+02	2.31E+02		
Pu-239	4.2810E-04	6,332.34	12,664.68	0.00E+00	2.71E+00	5.42E+00		
Pu-240	2.4368E-04	6,332.34	12,664.68	0.00E+00	1.54E+00	3.09E+00		
Pu-241	3.3415E-02	6,332.34	12,664.68	0.00E+00	2.12E+02	4.23E+02		
Pu-242	3.6329E-07	6,332.34	12,664.68	0.00E+00	2.30E-03	4.60E-03		
Ra-226	2.2854E-10	6,332.34	12,664.68	0.00E+00	1.45E-06	2.89E-06		
Ra-228	1.2426E-14	6,332.34	12,664.68	0.00E+00	7.87E-11	1.57E-10		
Ru-106	6.3589E-06	6,332.34	12,664.68	0.00E+00	4.03E-02	8.05E-02		
Se-79	1.2933E-05	6,332.34	12,664.68	0.00E+00	8.19E-02	1.64E-01		
Sm-126	1.1574E-05	6,332.34	12,664.68	0.00E+00	7.33E-02	1.47E-01		
Sr-90	1.9248E+00	6,332.34	12,664.68	0.00E+00	1.22E+04	2.44E+04		
Tc-99	4.2239E-04	6,332.34	12,664.68	0.00E+00	2.67E+00	5.35E+00		
Th-229	5.0953E-12	6,332.34	12,664.68	0.00E+00	3.23E-08	6.45E-08		
Th-230	4.1885E-08	6,332.34	12,664.68	0.00E+00	2.65E-04	5.30E-04		
Th-232	1.9270E-14	6,332.34	12,664.68	0.00E+00	1.22E-10	2.44E-10		
Th-208	4.6024E-08	6,332.34	12,664.68	0.00E+00	2.91E-04	5.83E-04		
U-232	1.2582E-07	6,332.34	12,664.68	0.00E+00	7.97E-04	1.59E-03		
U-233	2.5825E-09	6,332.34	12,664.68	0.00E+00	1.64E-05	3.27E-05		
U-234	1.8450E-04	6,332.34	12,664.68	0.00E+00	1.17E+00	2.34E+00		
U-235	-2.7235E-06	6,332.34	0.00	3.21E-02	1.49E-02	3.21E-02		
U-236	1.5493E-05	6,332.34	12,664.68	0.00E+00	9.81E-02	1.96E-01		
U-238	-4.2851E-09	6,332.34	0.00	2.00E-02	2.00E-02	2.00E-02		
Y-90	1.9254E+00	6,332.34	12,664.68	0.00E+00	1.22E+04	2.44E+04		
Other Radionuclides					1.22E+04	2.45E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20	60 to 100	

Burnup Summary (MWd) ²			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		6,332.34	
Bounding		12,664.68	

Checks			Estimated EOL HM/Given EOL HM 1.01
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.27		
Bounding	0.54		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (U3Si2 LEU) JAPAN
SNF ID # 506
Fuel Units & Descr 70 - ASSEMBLY
Heavy Metal Mass BOL=73.5kg EOL=70.413kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
2.92

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	2,923.45	5,846.90	0.00E+00	1.94E-06	3.88E-06	Avg MeV	
Am-241	2.0060E-03	2,923.45	5,846.90	0.00E+00	5.86E+00	1.17E+01	0.0150	6.172E+14
Am-242m	4.2429E-07	2,923.45	5,846.90	0.00E+00	1.24E-03	2.48E-03	0.0250	1.283E+14
Am-243	1.4899E-06	2,923.45	5,846.90	0.00E+00	4.36E-03	8.71E-03	0.0375	1.119E+14
C-14	5.7135E-09	2,923.45	5,846.90	0.00E+00	1.67E-05	3.34E-05	0.0575	1.199E+14
Cl-36	1.3124E-32	2,923.45	5,846.90	0.00E+00	3.84E-29	7.67E-29	0.0850	7.245E+13
Cm-243	1.6443E-07	2,923.45	5,846.90	0.00E+00	4.81E-04	9.61E-04	0.1250	4.903E+13
Cm-244	2.9330E-05	2,923.45	5,846.90	0.00E+00	8.57E-02	1.71E-01	0.2250	6.252E+13
Co-60	5.3186E-06	2,923.45	5,846.90	0.00E+00	1.55E-02	3.11E-02	0.3750	2.721E+13
Cs-134	3.1563E-03	2,923.45	5,846.90	0.00E+00	9.23E+00	1.85E+01	0.5750	4.439E+14
Cs-135	3.4477E-06	2,923.45	5,846.90	0.00E+00	1.01E-02	2.02E-02	0.8500	7.505E+12
Cs-137	2.0313E+00	2,923.45	5,846.90	0.00E+00	5.94E+03	1.19E+04	1.2500	4.285E+12
Eu-154	2.4513E-02	2,923.45	5,846.90	0.00E+00	7.17E+01	1.43E+02	1.7500	1.967E+11
Eu-155	4.8175E-03	2,923.45	5,846.90	0.00E+00	1.41E+01	2.82E+01	2.2500	1.725E+07
Fe-55	1.2397E-04	2,923.45	5,846.90	0.00E+00	3.62E-01	7.25E-01	2.7500	9.754E+06
H-3	4.5697E-03	2,923.45	5,846.90	0.00E+00	1.34E+01	2.67E+01	3.5000	4.491E+04
I-129	7.5300E-07	2,923.45	5,846.90	0.00E+00	2.20E-03	4.40E-03	5.0000	2.578E+03
Kr-85	1.0850E-01	2,923.45	5,846.90	0.00E+00	3.17E+02	6.34E+02	7.0000	2.848E+02
Np-237	9.5561E-06	2,923.45	5,846.90	0.00E+00	2.79E-02	5.59E-02	11.0000	3.194E+01
Pa-231	2.0359E-09	2,923.45	5,846.90	0.00E+00	5.95E-06	1.19E-05		
Pb-210	4.9728E-11	2,923.45	5,846.90	0.00E+00	1.45E-07	2.91E-07		
Pm-147	4.8502E-02	2,923.45	5,846.90	0.00E+00	1.42E+02	2.84E+02		
Pu-238	1.8254E-02	2,923.45	5,846.90	0.00E+00	5.34E+01	1.07E+02		
Pu-239	4.2810E-04	2,923.45	5,846.90	0.00E+00	1.25E+00	2.50E+00		
Pu-240	2.4368E-04	2,923.45	5,846.90	0.00E+00	7.12E-01	1.42E+00		
Pu-241	3.3415E-02	2,923.45	5,846.90	0.00E+00	9.77E+01	1.95E+02		
Pu-242	3.6329E-07	2,923.45	5,846.90	0.00E+00	1.06E-03	2.12E-03		
Ra-226	2.2854E-10	2,923.45	5,846.90	0.00E+00	6.68E-07	1.34E-06		
Ra-228	1.2426E-14	2,923.45	5,846.90	0.00E+00	3.63E-11	7.27E-11		
Ru-106	6.3589E-06	2,923.45	5,846.90	0.00E+00	1.86E-02	3.72E-02		
Se-79	1.2933E-05	2,923.45	5,846.90	0.00E+00	3.78E-02	7.56E-02		
Sn-126	1.1574E-05	2,923.45	5,846.90	0.00E+00	3.38E-02	6.77E-02		
Sr-90	1.9248E+00	2,923.45	5,846.90	0.00E+00	5.63E+03	1.13E+04		
Tc-99	4.2239E-04	2,923.45	5,846.90	0.00E+00	1.23E+00	2.47E+00		
Th-229	5.0953E-12	2,923.45	5,846.90	0.00E+00	1.49E-08	2.98E-08		
Th-230	4.1885E-08	2,923.45	5,846.90	0.00E+00	1.22E-04	2.45E-04		
Th-232	1.9270E-14	2,923.45	5,846.90	0.00E+00	5.63E-11	1.13E-10		
Ti-208	4.6024E-08	2,923.45	5,846.90	0.00E+00	1.35E-04	2.69E-04		
U-232	1.2582E-07	2,923.45	5,846.90	0.00E+00	3.68E-04	7.36E-04		
U-233	2.5825E-09	2,923.45	5,846.90	0.00E+00	7.55E-06	1.51E-05		
U-234	1.8450E-04	2,923.45	5,846.90	0.00E+00	5.39E-01	1.08E+00		
U-235	2.7235E-06	2,923.45	0.00	3.18E-02	2.38E-02	3.18E-02		
U-236	1.5493E-05	2,923.45	5,846.90	0.00E+00	4.53E-02	9.06E-02		
U-238	4.2851E-09	2,923.45	0.00	1.98E-02	1.98E-02	1.98E-02		
Y-90	1.9254E+00	2,923.45	5,846.90	0.00E+00	5.63E+03	1.13E+04		
Other Radionuclides					5.65E+03	1.13E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.97E+01	1.39E+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 on all parameters except enrichment.
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20.0000028	60 to 100	

Burnup Summary (MWd) ³			Basis for burnup used in estimate ⁴
	From SFD	Estimated	
Nominal		2,923.45	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		5,846.90	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.13		1.00
Bounding	0.25		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (U3Si2 LEU) JAPAN
 SNF ID #: 508
 Fuel Units & Descr: 149 - ASSEMBLY
 Heavy Metal Mass: BOL=205.62kg; EOL=193.283kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage:
 18"x10"
 621

II. Estimates	m	X _n	X _b	b	Y _n	Y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	11,683.57	23,367.15	0.00E+00	7.75E-06	1.55E-05	Avg MeV	
Am-241	2.0060E-03	11,683.57	23,367.15	0.00E+00	2.34E+01	4.69E+01	0.0150	2.467E+15
Am-242m	4.2429E-07	11,683.57	23,367.15	0.00E+00	4.96E-03	9.91E-03	0.0250	5.129E+14
Am-243	1.4899E-06	11,683.57	23,367.15	0.00E+00	1.74E-02	3.48E-02	0.0375	4.474E+14
C-14	5.7135E-09	11,683.57	23,367.15	0.00E+00	6.68E-05	1.34E-04	0.0575	4.792E+14
Cl-36	1.3124E-32	11,683.57	23,367.15	0.00E+00	1.53E-28	3.07E-28	0.0850	2.896E+14
Cm-243	1.6443E-07	11,683.57	23,367.15	0.00E+00	1.92E-03	3.84E-03	0.1250	1.959E+14
Cm-244	2.9330E-05	11,683.57	23,367.15	0.00E+00	3.43E-01	6.85E-01	0.2250	2.498E+14
Co-60	5.3186E-06	11,683.57	23,367.15	0.00E+00	6.21E-02	1.24E-01	0.3750	1.088E+14
Cs-134	3.1563E-03	11,683.57	23,367.15	0.00E+00	3.69E+01	7.38E+01	0.5750	1.774E+15
Cs-135	3.4477E-06	11,683.57	23,367.15	0.00E+00	4.03E-02	8.06E-02	0.8500	2.999E+13
Cs-137	2.0313E+00	11,683.57	23,367.15	0.00E+00	2.37E+04	4.75E+04	1.2500	1.713E+13
Eu-154	2.4513E-02	11,683.57	23,367.15	0.00E+00	2.86E+02	5.73E+02	1.7500	7.861E+11
Eu-155	4.8175E-03	11,683.57	23,367.15	0.00E+00	5.63E+01	1.13E+02	2.2500	6.895E+07
Fe-55	1.2397E-04	11,683.57	23,367.15	0.00E+00	1.45E+00	2.90E+00	2.7500	3.898E+07
H-3	4.5697E-03	11,683.57	23,367.15	0.00E+00	5.34E+01	1.07E+02	3.5000	1.794E+05
I-129	7.5300E-07	11,683.57	23,367.15	0.00E+00	8.80E-03	1.76E-02	5.0000	1.025E+04
Kr-85	1.0850E-01	11,683.57	23,367.15	0.00E+00	1.27E+03	2.54E+03	7.0000	1.132E+03
Np-237	9.5561E-06	11,683.57	23,367.15	0.00E+00	1.12E-01	2.23E-01	11.0000	1.269E+02
Pa-231	2.0359E-09	11,683.57	23,367.15	0.00E+00	2.38E-05	4.76E-05		
Pb-210	4.9728E-11	11,683.57	23,367.15	0.00E+00	5.81E-07	1.16E-06		
Pm-147	4.8502E-02	11,683.57	23,367.15	0.00E+00	5.67E+02	1.13E+03		
Pu-238	1.8254E-02	11,683.57	23,367.15	0.00E+00	2.13E+02	4.27E+02		
Pu-239	4.2810E-04	11,683.57	23,367.15	0.00E+00	5.00E+00	1.00E+01		
Pu-240	2.4368E-04	11,683.57	23,367.15	0.00E+00	2.85E+00	5.69E+00		
Pu-241	3.3415E-02	11,683.57	23,367.15	0.00E+00	3.90E+02	7.81E+02		
Pu-242	3.6329E-07	11,683.57	23,367.15	0.00E+00	4.24E-03	8.49E-03		
Ra-226	2.2854E-10	11,683.57	23,367.15	0.00E+00	2.67E-06	5.34E-06		
Ra-228	1.2426E-14	11,683.57	23,367.15	0.00E+00	1.45E-10	2.90E-10		
Ru-106	6.3589E-06	11,683.57	23,367.15	0.00E+00	7.43E-02	1.49E-01		
Se-79	1.2933E-05	11,683.57	23,367.15	0.00E+00	1.51E-01	3.02E-01		
Sn-126	1.1574E-05	11,683.57	23,367.15	0.00E+00	1.35E-01	2.70E-01		
Sr-90	1.9248E+00	11,683.57	23,367.15	0.00E+00	2.25E+04	4.50E+04		
Tc-99	4.2239E-04	11,683.57	23,367.15	0.00E+00	4.93E+00	9.87E+00		
Th-229	5.0953E-12	11,683.57	23,367.15	0.00E+00	5.95E-08	1.19E-07		
Th-230	4.1885E-08	11,683.57	23,367.15	0.00E+00	4.89E-04	9.79E-04		
Th-232	1.9270E-14	11,683.57	23,367.15	0.00E+00	2.25E-10	4.50E-10		
Ti-208	4.6024E-08	11,683.57	23,367.15	0.00E+00	5.38E-04	1.08E-03		
U-232	1.2582E-07	11,683.57	23,367.15	0.00E+00	1.47E-03	2.94E-03		
U-233	2.5825E-09	11,683.57	23,367.15	0.00E+00	3.02E-05	6.03E-05		
U-234	1.8450E-04	11,683.57	23,367.15	0.00E+00	2.16E+00	4.31E+00		
U-235	-2.7235E-06	11,683.57	0.00	8.89E-02	5.70E-02	8.89E-02		
U-236	1.5493E-05	11,683.57	23,367.15	0.00E+00	1.81E-01	3.62E-01		
U-238	-4.2851E-09	11,683.57	0.00	5.53E-02	5.52E-02	5.53E-02		
Y-90	1.9254E+00	11,683.57	23,367.15	0.00E+00	2.25E+04	4.50E+04		
Other Radionuclides					2.26E+04	4.52E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences ¹
	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 %	19.99999957	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		11,683.57	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		23,367.15	

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

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

²Total burnup for all fuel associated with this worksheet must be 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-S (U3Si2 LEU) NETHERLANDS
 SNF ID #: 510
 Fuel Units & Descr: 43 - ASSEMBLY
 Heavy Metal Mass: BOL=64.5kg EOL=56.76kg
 ROD Storage Site: SRS

Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
 *Template Burnup (MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage
 18"x10"
 179

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	6.6313E-10	7,329.93	14,659.86	0.00E+00	4.86E-06	9.72E-06	0.0150	1.547E+15
Am-241	2.0060E-03	7,329.93	14,659.86	0.00E+00	1.47E+01	2.94E+01	0.0250	3.218E+14
Am-242m	4.2429E-07	7,329.93	14,659.86	0.00E+00	3.11E-03	6.22E-03	0.0375	2.807E+14
Am-243	1.4899E-06	7,329.93	14,659.86	0.00E+00	1.09E-02	2.18E-02	0.0575	3.006E+14
C-14	5.7135E-09	7,329.93	14,659.86	0.00E+00	4.19E-05	8.38E-05	0.0850	1.817E+14
Cl-36	1.3124E-32	7,329.93	14,659.86	0.00E+00	9.62E-29	1.92E-28	0.1250	1.229E+14
Cm-243	1.6443E-07	7,329.93	14,659.86	0.00E+00	1.21E-03	2.41E-03	0.2250	1.567E+14
Cm-244	2.9330E-05	7,329.93	14,659.86	0.00E+00	2.15E-01	4.30E-01	0.3750	6.823E+13
Co-60	5.3186E-06	7,329.93	14,659.86	0.00E+00	3.90E-02	7.80E-02	0.5750	1.113E+15
Cs-134	3.1563E-03	7,329.93	14,659.86	0.00E+00	2.31E+01	4.63E+01	0.8500	1.882E+13
Cs-135	3.4477E-06	7,329.93	14,659.86	0.00E+00	2.53E-02	5.05E-02	1.2500	1.074E+13
Cs-137	2.0313E+00	7,329.93	14,659.86	0.00E+00	1.49E+04	2.98E+04	1.7500	4.932E+11
Eu-154	2.4513E-02	7,329.93	14,659.86	0.00E+00	1.80E+02	3.59E+02	2.2500	4.326E+07
Eu-155	4.8175E-03	7,329.93	14,659.86	0.00E+00	3.53E+01	7.06E+01	2.7500	2.446E+07
Fe-55	1.2397E-04	7,329.93	14,659.86	0.00E+00	9.09E-01	1.82E+00	3.5000	1.124E+05
H-3	4.5697E-03	7,329.93	14,659.86	0.00E+00	3.35E+01	6.70E+01	5.0000	6.390E+03
I-129	7.5300E-07	7,329.93	14,659.86	0.00E+00	5.52E-03	1.10E-02	7.0000	7.066E+02
Kr-85	1.0850E-01	7,329.93	14,659.86	0.00E+00	7.95E+02	1.59E+03	11.0000	7.910E+01
Np-237	9.5561E-06	7,329.93	14,659.86	0.00E+00	7.00E-02	1.40E-01		
Pa-231	2.0359E-09	7,329.93	14,659.86	0.00E+00	1.49E-05	2.98E-05		
Pb-210	4.9728E-11	7,329.93	14,659.86	0.00E+00	3.65E-07	7.29E-07		
Pm-147	4.8502E-02	7,329.93	14,659.86	0.00E+00	3.56E+02	7.11E+02		
Pu-238	1.8254E-02	7,329.93	14,659.86	0.00E+00	1.34E+02	2.68E+02		
Pu-239	4.2810E-04	7,329.93	14,659.86	0.00E+00	3.14E+00	6.28E+00		
Pu-240	2.4368E-04	7,329.93	14,659.86	0.00E+00	1.79E+00	3.57E+00		
Pu-241	3.3415E-02	7,329.93	14,659.86	0.00E+00	2.45E+02	4.90E+02		
Pu-242	3.6329E-07	7,329.93	14,659.86	0.00E+00	2.66E-03	5.33E-03		
Ra-226	2.2854E-10	7,329.93	14,659.86	0.00E+00	1.68E-06	3.35E-06		
Ra-228	1.2426E-14	7,329.93	14,659.86	0.00E+00	9.11E-11	1.82E-10		
Ru-106	6.3589E-06	7,329.93	14,659.86	0.00E+00	4.66E-02	9.32E-02		
Se-79	1.2933E-05	7,329.93	14,659.86	0.00E+00	9.48E-02	1.90E-01		
Sn-126	1.1574E-05	7,329.93	14,659.86	0.00E+00	8.48E-02	1.70E-01		
Sr-90	1.9248E+00	7,329.93	14,659.86	0.00E+00	1.41E+04	2.82E+04		
Tc-99	4.2239E-04	7,329.93	14,659.86	0.00E+00	3.10E+00	6.19E+00		
Th-229	5.0953E-12	7,329.93	14,659.86	0.00E+00	3.73E-08	7.47E-08		
Th-230	4.1885E-08	7,329.93	14,659.86	0.00E+00	3.07E-04	6.14E-04		
Th-232	1.9270E-14	7,329.93	14,659.86	0.00E+00	1.41E-10	2.82E-10		
Ti-208	4.6024E-08	7,329.93	14,659.86	0.00E+00	3.37E-04	6.75E-04		
U-232	1.2582E-07	7,329.93	14,659.86	0.00E+00	9.22E-04	1.84E-03		
U-233	2.5825E-09	7,329.93	14,659.86	0.00E+00	1.89E-05	3.79E-05		
U-234	1.8450E-04	7,329.93	14,659.86	0.00E+00	1.35E+00	2.70E+00		
U-235	-2.7235E-06	7,329.93	0.00	2.79E-02	7.91E-03	2.79E-02		
U-236	1.5493E-05	7,329.93	14,659.86	0.00E+00	1.14E-01	2.27E-01		
U-238	-4.2851E-09	7,329.93	0.00	1.73E-02	1.73E-02	1.73E-02		
Y-90	1.9254E+00	7,329.93	14,659.86	0.00E+00	1.41E+04	2.82E+04		
Other Radionuclides					1.42E+04	2.84E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	20.0000079	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Nominal		7,329.93	
Bounding		14,659.86	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1.01
Nominal	0.36		
Bounding	0.72		

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

² Total burnup for all fuel associated with this worksheet must be 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-S (U3Si2 LEU) TURKEY
SNF ID #: 528
Fuel Units & Descr: 32 - ASSEMBLY
Heavy Metal Mass: BOL=67.2kg, EOL=59 136kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
1.33

II, Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	7,636.76	15,273.53	0.00E+00	5.06E-06	1.01E-05	Avg. MeV	
Am-241	2.0060E-03	7,636.76	15,273.53	0.00E+00	1.53E+01	3.06E+01	0.0150	1.612E+15
Am-242m	4.2429E-07	7,636.76	15,273.53	0.00E+00	3.24E-03	6.48E-03	0.0250	3.353E+14
Am-243	1.4899E-06	7,636.76	15,273.53	0.00E+00	1.14E-02	2.28E-02	0.0375	2.924E+14
C-14	5.7135E-09	7,636.76	15,273.53	0.00E+00	4.36E-05	8.73E-05	0.0575	3.132E+14
Cl-36	1.3124E-32	7,636.76	15,273.53	0.00E+00	1.00E-28	2.00E-28	0.0850	1.893E+14
Cm-243	1.6443E-07	7,636.76	15,273.53	0.00E+00	1.26E-03	2.51E-03	0.1250	1.281E+14
Cm-244	2.9330E-05	7,636.76	15,273.53	0.00E+00	2.24E-01	4.48E-01	0.2250	1.633E+14
Co-60	5.3186E-06	7,636.76	15,273.53	0.00E+00	4.06E-02	8.12E-02	0.3750	7.109E+13
Cs-134	3.1563E-03	7,636.76	15,273.53	0.00E+00	2.41E+01	4.82E+01	0.5750	1.160E+15
Cs-135	3.4477E-06	7,636.76	15,273.53	0.00E+00	2.63E-02	5.27E-02	0.8500	1.960E+13
Cs-137	2.0313E+00	7,636.76	15,273.53	0.00E+00	1.55E+04	3.10E+04	1.2500	1.119E+13
Eu-154	2.4513E-02	7,636.76	15,273.53	0.00E+00	1.87E+02	3.74E+02	1.7500	5.138E+11
Eu-155	4.8175E-03	7,636.76	15,273.53	0.00E+00	3.68E+01	7.36E+01	2.2500	4.507E+07
Fe-55	1.2397E-04	7,636.76	15,273.53	0.00E+00	9.47E-01	1.89E+00	2.7500	2.548E+07
H-3	4.5697E-03	7,636.76	15,273.53	0.00E+00	3.49E+01	6.98E+01	3.5000	1.171E+05
I-129	7.5300E-07	7,636.76	15,273.53	0.00E+00	5.75E-03	1.15E-02	5.0000	6.658E+03
Kr-85	1.0850E-01	7,636.76	15,273.53	0.00E+00	8.29E+02	1.66E+03	7.0000	7.351E+02
Np-237	9.5561E-06	7,636.76	15,273.53	0.00E+00	7.30E-02	1.46E-01	11.0000	8.241E+01
Pa-231	2.0359E-09	7,636.76	15,273.53	0.00E+00	1.55E-05	3.11E-05		
Pb-210	4.9728E-11	7,636.76	15,273.53	0.00E+00	3.80E-07	7.60E-07		
Pm-147	4.8502E-02	7,636.76	15,273.53	0.00E+00	3.70E+02	7.41E+02		
Pu-238	1.8254E-02	7,636.76	15,273.53	0.00E+00	1.39E+02	2.79E+02		
Pu-239	4.2810E-04	7,636.76	15,273.53	0.00E+00	3.27E+00	6.54E+00		
Pu-240	2.4368E-04	7,636.76	15,273.53	0.00E+00	1.86E+00	3.72E+00		
Pu-241	3.3415E-02	7,636.76	15,273.53	0.00E+00	2.55E+02	5.10E+02		
Pu-242	3.6329E-07	7,636.76	15,273.53	0.00E+00	2.77E-03	5.55E-03		
Ra-226	2.2854E-10	7,636.76	15,273.53	0.00E+00	1.75E-06	3.49E-06		
Ra-228	1.2426E-14	7,636.76	15,273.53	0.00E+00	9.49E-11	1.90E-10		
Ru-106	6.3589E-06	7,636.76	15,273.53	0.00E+00	4.86E-02	9.71E-02		
Se-79	1.2933E-05	7,636.76	15,273.53	0.00E+00	9.88E-02	1.98E-01		
Sn-126	1.1574E-05	7,636.76	15,273.53	0.00E+00	8.84E-02	1.77E-01		
Sr-90	1.9248E+00	7,636.76	15,273.53	0.00E+00	1.47E+04	2.94E+04		
Tc-99	4.2239E-04	7,636.76	15,273.53	0.00E+00	3.23E+00	6.45E+00		
Th-229	5.0953E-12	7,636.76	15,273.53	0.00E+00	3.89E-08	7.78E-08		
Th-230	4.1885E-08	7,636.76	15,273.53	0.00E+00	3.20E-04	6.40E-04		
Th-232	1.9270E-14	7,636.76	15,273.53	0.00E+00	1.47E-10	2.94E-10		
Ti-208	4.6024E-08	7,636.76	15,273.53	0.00E+00	3.51E-04	7.03E-04		
U-232	1.2582E-07	7,636.76	15,273.53	0.00E+00	9.61E-04	1.92E-03	Thermal Power	
U-233	2.5825E-09	7,636.76	15,273.53	0.00E+00	1.97E-05	3.94E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8450E-04	7,636.76	15,273.53	0.00E+00	1.41E+00	2.82E+00	1.82E+02	3.64E+02
U-235	-2.7235E-06	7,636.76	0.00	2.90E-02	8.24E-03	2.90E-02	Total	Total
U-236	1.5493E-05	7,636.76	15,273.53	0.00E+00	1.18E-01	2.37E-01		
U-238	-4.2851E-09	7,636.76	0.00	1.81E-02	1.80E-02	1.81E-02		
Y-90	1.9254E+00	7,636.76	15,273.53	0.00E+00	1.47E+04	2.94E+04		
Other Radionuclides					1.48E+04	2.95E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
Fuel Cladding	ALUM	ALUM	This fuel matches on all parameters except enrichment.
BOL HM Constituents	U	U	
BOL Enrichment %	20.00000028	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		7,636.76	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		15,273.53	Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.36		1.01
Bounding	0.72		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) CANADA
SNF ID #: 720
Fuel Units & Descr: 21 - MTR TYPE
Heavy Metal Mass: BOL=4 427kg EOL=2.862kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water Alum, 60 to 100% U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
0.88

II. Estimates		m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	1,481.61	2,963.22	0 00E+00	9.82E-07	1 96E-06	0.0150	3 128E+14	
Am-241	2 0060E-03	1,481.61	2,963.22	0 00E+00	2 97E+00	5 94E+00	0.0250	6 504E+13	
Am-242m	4.2429E-07	1,481.61	2,963.22	0 00E+00	6.29E-04	1.26E-03	0.0375	5 673E+13	
Am-243	1.4899E-06	1,481.61	2,963.22	0 00E+00	2.21E-03	4.41E-03	0.0575	6 076E+13	
C-14	5 7135E-09	1,481.61	2,963.22	0 00E+00	8 47E-06	1.69E-05	0.0850	3.672E+13	
Cl-36	1.3124E-32	1,481.61	2,963.22	0 00E+00	1 94E-29	3 89E-29	0.1250	2.485E+13	
Cm-243	1 6443E-07	1,481.61	2,963.22	0 00E+00	2 44E-04	4 87E-04	0.2250	3 168E+13	
Cm-244	2 9330E-05	1,481.61	2,963.22	0 00E+00	4.35E-02	8 69E-02	0.3750	1.379E+13	
Co-60	5.3186E-06	1,481.61	2,963.22	0 00E+00	7 88E-03	1 58E-02	0.5750	2.250E+14	
Cs-134	3 1563E-03	1,481.61	2,963.22	0 00E+00	4 68E+00	9 35E+00	0.8500	3.803E+12	
Cs-135	3 4477E-06	1,481.61	2,963.22	0 00E+00	5 11E-03	1 02E-02	1.2500	2.172E+12	
Cs-137	2 0313E+00	1,481.61	2,963.22	0 00E+00	3 01E+03	6 02E+03	1.7500	9 968E+10	
Eu-154	2 4513E-02	1,481.61	2,963.22	0 00E+00	3 63E+01	7 26E+01	2.2500	8 744E+06	
Eu-155	4 8175E-03	1,481.61	2,963.22	0 00E+00	7 14E+00	1 43E+01	2.7500	4.943E+06	
Fe-55	1.2397E-04	1,481.61	2,963.22	0 00E+00	1 84E-01	3 67E-01	3 5000	2.271E+04	
H-3	4 5697E-03	1,481.61	2,963.22	0 00E+00	6 77E+00	1 35E+01	5 0000	1.284E+03	
I-129	7 5300E-07	1,481.61	2,963.22	0 00E+00	1 12E-03	2 23E-03	7 0000	1 417E+02	
Kr-85	1 0850E-01	1,481.61	2,963.22	0 00E+00	1 61E+02	3 22E+02	11.0000	1.589E+01	
Np-237	9.5561E-06	1,481.61	2,963.22	0 00E+00	1 42E-02	2 83E-02			
Pa-231	2 0359E-09	1,481.61	2,963.22	0 00E+00	3 02E-06	6 03E-06			
Pb-210	4 9728E-11	1,481.61	2,963.22	0 00E+00	7 37E-08	1 47E-07			
Pm-147	4 8502E-02	1,481.61	2,963.22	0 00E+00	7 19E+01	1 44E+02			
Pu-238	1 8254E-02	1,481.61	2,963.22	0 00E+00	2 70E+01	5 41E+01			
Pu-239	4 2810E-04	1,481.61	2,963.22	0 00E+00	6 34E-01	1 27E+00			
Pu-240	2 4368E-04	1,481.61	2,963.22	0 00E+00	3 61E-01	7 22E-01			
Pu-241	3 3415E-02	1,481.61	2,963.22	0 00E+00	4 95E+01	9 90E+01			
Pu-242	3 6329E-07	1,481.61	2,963.22	0 00E+00	5 38E-04	1 08E-03			
Ra-226	2 2854E-10	1,481.61	2,963.22	0 00E+00	3 39E-07	6 77E-07			
Ra-228	1 2426E-14	1,481.61	2,963.22	0 00E+00	1 84E-11	3 68E-11			
Ru-106	6 3589E-06	1,481.61	2,963.22	0 00E+00	9 42E-03	1 88E-02			
Se-79	1 2933E-05	1,481.61	2,963.22	0 00E+00	1 92E-02	3 83E-02			
Sn-126	1 1574E-05	1,481.61	2,963.22	0 00E+00	1 71E-02	3 43E-02			
Sr-90	1 9248E+00	1,481.61	2,963.22	0 00E+00	2 85E+03	5 70E+03			
Tc-99	4 2239E-04	1,481.61	2,963.22	0 00E+00	6 26E-01	1 25E+00			
Th-229	5 0953E-12	1,481.61	2,963.22	0 00E+00	7 55E-09	1 51E-08			
Th-230	4 1885E-08	1,481.61	2,963.22	0 00E+00	6 21E-05	1 24E-04			
Th-232	1 9270E-14	1,481.61	2,963.22	0 00E+00	2 86E-11	5 71E-11			
Ti-208	4 6024E-08	1,481.61	2,963.22	0 00E+00	6 82E-05	1 36E-04			
U-232	1 2582E-07	1,481.61	2,963.22	0 00E+00	1 86E-04	3 73E-04			
U-233	2 5825E-09	1,481.61	2,963.22	0 00E+00	3 83E-06	7 65E-06			
U-234	1 8450E-04	1,481.61	2,963.22	0 00E+00	2 73E-01	5 47E-01			
U-235	-2 7235E-06	1,481.61	2,963.22	0 00E+00	4 86E-03	8 90E-03			
U-236	1 5493E-05	1,481.61	2,963.22	0 00E+00	2 30E-02	4 59E-02			
U-238	-4 2851E-09	1,481.61	2,963.22	0 00E+00	9 78E-05	1 04E-04			
Y-90	1 9254E+00	1,481.61	2,963.22	0 00E+00	2 85E+03	5 71E+03			
					2 87E+03	5 73E+03			

Other Radionuclides

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 %	92.99999478	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate ²
	From SFD	Estimated	
Nominal		1,481.61	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		2,963.22	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	1.06		1.03
Bounding	2.13		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) GERMANY
 SNF ID #: 582
 Fuel Units & Descr: 1 - MTR TYPE
 Heavy Metal Mass: BOL=0 176kg; EOL=0 126kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0 00116689
 Template Decay Time: 20 years

Estimated
 Canister usage:
 18"x10"
 0 04

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	48 11	96 22	0 00E+00	3 19E-08	6 38E-08	Avg MeV	
Am-241	2 0060E-03	48 11	96 22	0 00E+00	9 65E-02	1 93E-01	0 0150	1 016E+13
Am-242m	4 2429E-07	48 11	96 22	0 00E+00	2 04E-05	4 08E-05	0 0250	2 112E+12
Am-243	1 4899E-06	48 11	96 22	0 00E+00	7 17E-05	1 43E-04	0 0375	1 842E+12
C-14	5 7135E-09	48 11	96 22	0 00E+00	2 75E-07	5 50E-07	0 0575	1 973E+12
Cl-36	1 3124E-32	48 11	96 22	0 00E+00	6 31E-31	1 26E-30	0 0850	1 192E+12
Cm-243	1 6443E-07	48 11	96 22	0 00E+00	7 91E-06	1 58E-05	0 1250	8 068E+11
Cm-244	2 9330E-05	48 11	96 22	0 00E+00	1 41E-03	2 82E-03	0 2250	1 029E+12
Co-60	5 3186E-06	48 11	96 22	0 00E+00	2 56E-04	5 12E-04	0 3750	4 478E+11
Cs-134	3 1563E-03	48 11	96 22	0 00E+00	1 52E-01	3 04E-01	0 5750	7 305E+12
Cs-135	3 4477E-06	48 11	96 22	0 00E+00	1 66E-04	3 32E-04	0 8500	1 235E+11
Cs-137	2 0313E+00	48 11	96 22	0 00E+00	9 77E+01	1 95E+02	1 2500	7 052E+10
Cs-154	2 4513E-02	48 11	96 22	0 00E+00	1 18E+00	2 36E+00	1 7500	3 237E+09
Eu-155	4 8175E-03	48 11	96 22	0 00E+00	2 32E-01	4 64E-01	2 2500	2 839E+05
Fe-55	1 2397E-04	48 11	96 22	0 00E+00	5 96E-03	1 19E-02	2 7500	1 605E+05
H-3	4 5697E-03	48 11	96 22	0 00E+00	2 20E-01	4 40E-01	3 5000	7 374E+02
I-129	7 5300E-07	48 11	96 22	0 00E+00	3 62E-05	7 25E-05	5 0000	4 169E+01
Kr-85	1 0850E-01	48 11	96 22	0 00E+00	5 22E+00	1 04E+01	7 0000	4 602E+00
Np-237	9 5561E-06	48 11	96 22	0 00E+00	4 60E-04	9 19E-04	11 0000	5 158E-01
Pa-231	2 0359E-09	48 11	96 22	0 00E+00	9 79E-08	1 96E-07		
Pb-210	4 9728E-11	48 11	96 22	0 00E+00	2 39E-09	4 78E-09		
Pm-147	4 8502E-02	48 11	96 22	0 00E+00	2 33E+00	4 67E+00		
Pu-238	1 8254E-02	48 11	96 22	0 00E+00	8 78E-01	1 76E+00		
Pu-239	4 2810E-04	48 11	96 22	0 00E+00	2 06E-02	4 12E-02		
Pu-240	2 4368E-04	48 11	96 22	0 00E+00	1 17E-02	2 34E-02		
Pu-241	3 3415E-02	48 11	96 22	0 00E+00	1 61E+00	3 22E+00		
Pu-242	3 6329E-07	48 11	96 22	0 00E+00	1 75E-05	3 50E-05		
Ra-226	2 2854E-10	48 11	96 22	0 00E+00	1 10E-08	2 20E-08		
Ra-228	1 2426E-14	48 11	96 22	0 00E+00	5 98E-13	1 20E-12		
Ru-106	6 3589E-06	48 11	96 22	0 00E+00	3 06E-04	6 12E-04		
Se-79	1 2933E-05	48 11	96 22	0 00E+00	6 22E-04	1 24E-03		
Sn-126	1 1574E-05	48 11	96 22	0 00E+00	5 57E-04	1 11E-03		
Sr-90	1 9248E+00	48 11	96 22	0 00E+00	9 26E+01	1 85E+02		
Tc-99	4 2239E-04	48 11	96 22	0 00E+00	2 03E-02	4 06E-02		
Th-229	5 0953E-12	48 11	96 22	0 00E+00	2 45E-10	4 90E-10		
Th-230	4 1885E-08	48 11	96 22	0 00E+00	2 02E-06	4 03E-06		
Th-232	1 9270E-14	48 11	96 22	0 00E+00	9 27E-13	1 85E-12		
Ti-208	4 6024E-08	48 11	96 22	0 00E+00	2 21E-06	4 43E-06		
U-232	1 2582E-07	48 11	96 22	0 00E+00	6 05E-06	1 21E-05		
U-233	2 5825E-09	48 11	96 22	0 00E+00	1 24E-07	2 48E-07		
U-234	1 8450E-04	48 11	96 22	0 00E+00	8 88E-03	1 78E-02		
U-235	-2 7235E-06	48 11	0 00	3 54E-04	2 23E-04	3 54E-04		
U-236	1 5493E-05	48 11	96 22	0 00E+00	7 45E-04	1 49E-03		
U-238	-4 2851E-09	48 11	0 00	4 15E-06	3 94E-06	4 15E-06		
Y-90	1 9254E+00	48 11	96 22	0 00E+00	9 26E+01	1 85E+02		
Other Radionuclides					9 30E+01	1 86E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92.99999263	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		48 11	
Bounding		96 22	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 87		
Bounding	1 73		1 02

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

²Total burnup for all fuel associated with this worksheet must be 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-S (JALX-HEU) GERMANY
SNF ID # 584
Fuel Units & Descr 44 - MTR TYPE
Heavy Metal Mass BOL=8 136kg EOL=5 944kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT)* 0 00116689
Template Decay Time 20 years

Estimated
Canister usage:
18"x10"
1 83

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	6 6313E-10	2,075 11	4,150 22	0 00E+00	1.38E-06	2 75E-06	0 0150	4.381E+14
Am-241	2 0060E-03	2,075 11	4,150 22	0 00E+00	4.16E+00	8.33E+00	0 0250	9 110E+13
Am-242m	4.2429E-07	2,075 11	4,150 22	0 00E+00	8 80E-04	1 76E-03	0 0375	7 946E+13
Am-243	1 4899E-06	2,075 11	4,150 22	0 00E+00	3 09E-03	6 18E-03	0 0575	8 510E+13
C-14	5 7135E-09	2,075 11	4,150 22	0 00E+00	1 19E-05	2 37E-05	0 0850	5 143E+13
Cl-36	1.3124E-32	2,075 11	4,150.22	0 00E+00	2 72E-29	5 45E-29	0 1250	3 480E+13
Cm-243	1 6443E-07	2,075 11	4,150 22	0 00E+00	3 41E-04	6 82E-04	0 2250	4 438E+13
Cm-244	2 9330E-05	2,075 11	4,150 22	0 00E+00	6 09E-02	1 22E-01	0 3750	1.932E+13
Co-60	5 3186E-06	2,075 11	4,150.22	0 00E+00	1 10E-02	2 21E-02	0 5750	3 151E+14
Cs-134	3 1563E-03	2,075 11	4,150.22	0 00E+00	6 55E+00	1 31E+01	0 8500	5.327E+12
Cs-135	3 4477E-06	2,075 11	4,150.22	0 00E+00	7 15E-03	1.43E-02	1.2500	3.042E+12
Cs-137	2 0313E+00	2,075 11	4,150.22	0 00E+00	4 22E+03	8 43E+03	1 7500	1.396E+11
Eu-154	2 4513E-02	2,075 11	4,150.22	0 00E+00	5 09E+01	1 02E+02	2 2500	1.225E+07
Eu-155	4 8175E-03	2,075 11	4,150.22	0 00E+00	1 00E+01	2 00E+01	2 7500	6 924E+06
Fe-55	1.2397E-04	2,075 11	4,150.22	0 00E+00	2.57E-01	5 14E-01	3.5000	3 181E+04
H-3	4 5697E-03	2,075 11	4,150 22	0 00E+00	9 48E+00	1.90E+01	5 0000	1 798E+03
I-129	7.5300E-07	2,075 11	4,150 22	0 00E+00	1.56E-03	3 13E-03	7.0000	1 985E+02
Kr-85	1 0850E-01	2,075 11	4,150 22	0 00E+00	2.25E+02	4.50E+02	11 0000	2 225E+01
Np-237	9 5561E-06	2,075 11	4,150 22	0 00E+00	1 98E-02	3 97E-02		
Pa-231	2 0359E-09	2,075 11	4,150 22	0 00E+00	4 22E-06	8 45E-06		
Pb-210	4 9728E-11	2,075 11	4,150 22	0 00E+00	1 03E-07	2 06E-07		
Pm-147	4 8502E-02	2,075 11	4,150 22	0 00E+00	1 01E+02	2 01E+02		
Pu-238	1 8254E-02	2,075 11	4,150.22	0 00E+00	3 79E+01	7 58E+01		
Pu-239	4 2810E-04	2,075 11	4,150.22	0 00E+00	8 88E-01	1 78E+00		
Pu-240	2 4368E-04	2,075 11	4,150.22	0 00E+00	5 06E-01	1 01E+00		
Pu-241	3 3415E-02	2,075 11	4,150.22	0 00E+00	6 93E+01	1 39E+02		
Pu-242	3 6329E-07	2,075 11	4,150.22	0 00E+00	7.54E-04	1.51E-03		
Ra-226	2.2854E-10	2,075 11	4,150.22	0 00E+00	4 74E-07	9 48E-07		
Ra-228	1.2426E-14	2,075 11	4,150.22	0 00E+00	2.58E-11	5 16E-11		
Ru-106	6.3589E-06	2,075 11	4,150.22	0 00E+00	1.32E-02	2 64E-02		
Se-79	1.2933E-05	2,075 11	4,150.22	0 00E+00	2.68E-02	5 37E-02		
Sn-126	1.1574E-05	2,075.11	4,150.22	0 00E+00	2.40E-02	4 80E-02		
Sr-90	1 9248E+00	2,075.11	4,150.22	0 00E+00	3 99E+03	7 99E+03		
Tc-99	4.2239E-04	2,075.11	4,150.22	0 00E+00	8 76E-01	1 75E+00		
Th-229	5 0953E-12	2,075 11	4,150.22	0 00E+00	1 06E-08	2 11E-08		
Th-230	4 1885E-08	2,075 11	4,150.22	0 00E+00	8 69E-05	1 74E-04		
Th-232	1 9270E-14	2,075 11	4,150 22	0 00E+00	4 00E-11	8 00E-11		
Ti-208	4 6024E-08	2,075 11	4,150 22	0 00E+00	9 55E-05	1.91E-04		
U-232	1.2582E-07	2,075 11	4,150 22	0 00E+00	2 61E-04	5.22E-04	Thermal Power	
U-233	2 5825E-09	2,075 11	4,150 22	0 00E+00	5 36E-06	1 07E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8450E-04	2,075 11	4,150 22	0 00E+00	3 83E-01	7 66E-01	4 95E+01	9.89E+01
U-235	-2.7235E-06	2,075 11	0 00	1.64E-02	1 07E-02	1 64E-02	Total	Total
U-236	1.5493E-05	2,075 11	4,150 22	0 00E+00	3.21E-02	6 43E-02		
U-238	-4.2851E-09	2,075 11	0 00	1 91E-04	1.83E-04	1 91E-04		
Y-90	1.9254E+00	2,075 11	4,150.22	0 00E+00	4 00E+03	7 99E+03		
Other Radionuclides					4 01E+03	8 03E+03		

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 00001838	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		2,075 11
Bounding		4 150.22

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 81	
Bounding	1 62	

Estimated EOL HM/Given EOL HM

1 02

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) GERMANY
SNF ID #: 585
Fuel Units & Descr: 50 - MTR TYPE
Heavy Metal Mass: BOL=9 675kg; EOL=4 635kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: TRIGA-AI (LW/U-Zr, Alum, 10 to 20%, U)
²Template Burnup(MWd): 6 65
Template BOL Heavy Metal Mass (MT): 0 00018
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
2 08

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 4556E-09	4,810 77	9,234 97	0 00E+00	1 18E-05	2 27E-05	Avg. MeV	
Am-241	3 8752E-03	4,810 77	9,234 97	0 00E+00	1 86E+01	3 58E+01	0 0150	9 477E+14
Am-242m	1 8617E-06	4,810 77	9,234 97	0 00E+00	8 96E-03	1 72E-02	0 0250	1 957E+14
Am-243	2 3293E-07	4,810 77	9,234 97	0 00E+00	1 12E-03	2 15E-03	0 0375	2 048E+14
C-14	4 3233E-05	4,810 77	9,234 97	0 00E+00	2 08E-01	3 99E-01	0 0575	1 893E+14
Cl-36	4 3023E-08	4,810 77	9,234 97	0 00E+00	2 07E-04	3 97E-04	0 0850	1 153E+14
Cm-243	1 9053E-07	4,810 77	9,234 97	0 00E+00	9 17E-04	1 76E-03	0 1250	1 294E+14
Cm-244	1 7744E-06	4,810 77	9,234 97	0 00E+00	8 54E-03	1 64E-02	0 2250	1 045E+14
Co-60	4 3188E-03	4,810 77	9,234 97	0 00E+00	2 08E+01	3 99E+01	0 3750	4 292E+13
Cs-134	6 7188E-04	4,810 77	9,234 97	0 00E+00	3 23E+00	6 20E+00	0 5750	6 838E+14
Cs-135	3 1549E-05	4,810 77	9,234 97	0 00E+00	1 52E-01	2 91E-01	0 8500	7 276E+13
Cs-137	1 9489E+00	4,810 77	9,234 97	0 00E+00	9 38E+03	1 80E+04	1 2500	7 837E+13
Eu-154	4 0301E-01	4,810 77	9,234 97	0 00E+00	1 94E+03	3 72E+03	1 7500	2 348E+12
Eu-155	5 4000E-02	4,810 77	9,234 97	0 00E+00	2 60E+02	4 99E+02	2 2500	3 722E+07
Fe-55	1 5955E-04	4,810 77	9,234 97	0 00E+00	7 68E-01	1 47E+00	2 7500	6 194E+06
H-3	4 6571E-03	4,810 77	9,234 97	0 00E+00	2 24E+01	4 30E+01	3 5000	4 237E+04
I-129	7 3805E-07	4,810 77	9,234 97	0 00E+00	3 55E-03	6 82E-03	5 0000	5 191E+03
Kr-85	9 5684E-02	4,810 77	9,234 97	0 00E+00	4 60E+02	8 84E+02	7 0000	5 859E+02
Np-237	1 4618E-06	4,810 77	9,234 97	0 00E+00	7 03E-03	1 35E-02	11 0000	6 663E+01
Pa-231	6 4782E-09	4,810 77	9,234 97	0 00E+00	3 12E-05	5 98E-05		
Pb-210	6 3158E-14	4,810 77	9,234 97	0 00E+00	3 04E-10	5 83E-10		
Pm-147	3 9564E-02	4,810 77	9,234 97	0 00E+00	1 90E+02	3 65E+02		
Pu-238	1 2008E-03	4,810 77	9,234 97	0 00E+00	5 78E+00	1 11E+01		
Pu-239	5 6917E-03	4,810 77	9,234 97	0 00E+00	2 74E+01	5 26E+01		
Pu-240	2 2617E-03	4,810 77	9,234 97	0 00E+00	1 09E+01	2 09E+01		
Pu-241	6 1113E-02	4,810 77	9,234 97	0 00E+00	2 94E+02	5 64E+02		
Pu-242	3 0602E-07	4,810 77	9,234 97	0 00E+00	1 47E-03	2 83E-03		
Ra-226	2 6707E-13	4,810 77	9,234 97	0 00E+00	1 28E-09	2 47E-09		
Ra-228	2 2556E-10	4,810 77	9,234 97	0 00E+00	1 09E-06	2 08E-06		
Ru-106	3 1293E-06	4,810 77	9,234 97	0 00E+00	1 51E-02	2 89E-02		
Se-79	1 2935E-05	4,810 77	9,234 97	0 00E+00	6 22E-02	1 19E-01		
Sn-126	1 2238E-05	4,810 77	9,234 97	0 00E+00	5 89E-02	1 13E-01		
Sr-90	1 8195E+00	4,810 77	9,234 97	0 00E+00	8 75E+03	1 68E+04		
Tc-99	4 4120E-04	4,810 77	9,234 97	0 00E+00	2 12E+00	4 07E+00		
Th-229	3 3308E-10	4,810 77	9,234 97	0 00E+00	1 60E-06	3 08E-06		
Th-230	4 6526E-11	4,810 77	9,234 97	0 00E+00	2 24E-07	4 30E-07		
Th-232	2 3744E-10	4,810 77	9,234 97	0 00E+00	1 14E-06	2 19E-06		
Ti-208	1 8195E-08	4,810 77	9,234 97	0 00E+00	8 75E-05	1 68E-04		
U-232	4 9098E-08	4,810 77	9,234 97	0 00E+00	2 36E-04	4 53E-04		
U-233	1 3140E-07	4,810 77	9,234 97	0 00E+00	6 32E-04	1 21E-03		
U-234	2 2571E-07	4,810 77	9,234 97	0 00E+00	1 09E-03	2 08E-03		
U-235	-2 6159E-06	4,810 77	0 00	1 94E-02	6 86E-03	1 94E-02		
U-236	1 2719E-05	4,810 77	9,234 97	0 00E+00	6 12E-02	1 17E-01		
U-238	-3 8857E-08	4,810 77	0 00	2 28E-04	4 07E-05	2 28E-04		
Y-90	1 8211E+00	4,810 77	9,234 97	0 00E+00	8 76E+03	1 68E+04		
Other Radionuclides					1 01E+04	1 93E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
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 %	92 9999938	10 to 20 1	

Burnup Summary (MWd) ²			Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup calculated assuming all BOL heavy metal burned.
	From SFD	Estimated	
Nominal		4 810 77	
Bounding		9 234 97	

Checks			Estimated EOL HM/Given EOL HM 1 02
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	13 46		
Bounding	25 84		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) GERMANY
 SNF ID #: 588
 Fuel Units & Descr: 2 - MTR TYPE
 Heavy Metal Mass: BOL=0.404kg, EOL=0.273kg
 ROD Storage Site: SRS

Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100% U)
 Template Burnup (MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage:
 18"x10"
 0.08

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	6.6313E-10	124.06	248.12	0.00E+00	8.23E-08	1.65E-07	0.0150	2.619E+13
Am-241	2.0060E-03	124.06	248.12	0.00E+00	2.49E-01	4.98E-01	0.0250	5.446E+12
Am-242m	4.2429E-07	124.06	248.12	0.00E+00	5.26E-05	1.05E-04	0.0375	4.750E+12
Am-243	1.4899E-06	124.06	248.12	0.00E+00	1.85E-04	3.70E-04	0.0575	5.088E+12
C-14	5.7135E-09	124.06	248.12	0.00E+00	7.09E-07	1.42E-06	0.0850	3.075E+12
Cl-36	1.3124E-32	124.06	248.12	0.00E+00	1.63E-30	3.26E-30	0.1250	2.081E+12
Cm-243	1.6443E-07	124.06	248.12	0.00E+00	2.04E-05	4.08E-05	0.2250	2.653E+12
Cm-244	2.9330E-05	124.06	248.12	0.00E+00	3.64E-03	7.28E-03	0.3750	1.155E+12
Co-60	5.3186E-06	124.06	248.12	0.00E+00	6.60E-04	1.32E-03	0.5750	1.884E+13
Cs-134	3.1563E-03	124.06	248.12	0.00E+00	3.92E-01	7.83E-01	0.8500	3.185E+11
Cs-135	3.4477E-06	124.06	248.12	0.00E+00	4.28E-04	8.55E-04	1.2500	1.819E+11
Cs-137	2.0313E+00	124.06	248.12	0.00E+00	2.52E+02	5.04E+02	1.7500	8.347E+09
Eu-154	2.4513E-02	124.06	248.12	0.00E+00	3.04E+00	6.08E+00	2.2500	7.322E+05
Eu-155	4.8175E-03	124.06	248.12	0.00E+00	5.98E-01	1.20E+00	2.7500	4.139E+05
Fe-55	1.2397E-04	124.06	248.12	0.00E+00	1.54E-02	3.08E-02	3.5000	1.902E+03
H-3	4.5697E-03	124.06	248.12	0.00E+00	5.67E-01	1.13E+00	5.0000	1.075E+02
I-129	7.5300E-07	124.06	248.12	0.00E+00	9.34E-05	1.87E-04	7.0000	1.187E+01
Kr-85	1.0850E-01	124.06	248.12	0.00E+00	1.35E+01	2.69E+01	11.0000	1.330E+00
Np-237	9.5561E-06	124.06	248.12	0.00E+00	1.19E-03	2.37E-03		
Pa-231	2.0359E-09	124.06	248.12	0.00E+00	2.53E-07	5.05E-07		
Pb-210	4.9728E-11	124.06	248.12	0.00E+00	6.17E-09	1.23E-08		
Pm-147	4.8502E-02	124.06	248.12	0.00E+00	6.02E+00	1.20E+01		
Pu-238	1.8254E-02	124.06	248.12	0.00E+00	2.26E+00	4.53E+00		
Pu-239	4.2810E-04	124.06	248.12	0.00E+00	5.31E-02	1.06E-01		
Pu-240	2.4368E-04	124.06	248.12	0.00E+00	3.02E-02	6.05E-02		
Pu-241	3.3415E-02	124.06	248.12	0.00E+00	4.15E+00	8.29E+00		
Pu-242	3.6329E-07	124.06	248.12	0.00E+00	4.51E-05	9.01E-05		
Ra-226	2.2854E-10	124.06	248.12	0.00E+00	2.84E-08	5.67E-08		
Ra-228	1.2426E-14	124.06	248.12	0.00E+00	1.54E-12	3.08E-12		
Ru-106	6.3589E-06	124.06	248.12	0.00E+00	7.89E-04	1.58E-03		
Se-79	1.2933E-05	124.06	248.12	0.00E+00	1.60E-03	3.21E-03		
Sn-126	1.1574E-05	124.06	248.12	0.00E+00	1.44E-03	2.87E-03		
Sr-90	1.9248E+00	124.06	248.12	0.00E+00	2.39E+02	4.78E+02		
Tc-99	4.2239E-04	124.06	248.12	0.00E+00	5.24E-02	1.05E-01		
Th-229	5.0953E-12	124.06	248.12	0.00E+00	6.32E-10	1.26E-09		
Th-230	4.1885E-08	124.06	248.12	0.00E+00	5.20E-06	1.04E-05		
Th-232	1.9270E-14	124.06	248.12	0.00E+00	2.39E-12	4.78E-12		
Ti-208	4.6024E-08	124.06	248.12	0.00E+00	5.71E-06	1.14E-05		
U-232	1.2582E-07	124.06	248.12	0.00E+00	1.56E-05	3.12E-05		
U-233	2.5825E-09	124.06	248.12	0.00E+00	3.20E-07	6.41E-07		
U-234	1.8450E-04	124.06	248.12	0.00E+00	2.29E-02	4.58E-02		
U-235	-2.7235E-06	124.06	0.00	7.87E-04	4.49E-04	7.87E-04		
U-236	1.5493E-05	124.06	248.12	0.00E+00	1.92E-03	3.84E-03		
U-238	-4.2851E-09	124.06	0.00	1.36E-05	1.31E-05	1.36E-05		
Y-90	1.9254E+00	124.06	248.12	0.00E+00	2.39E+02	4.78E+02		
Other Radionuclides					2.40E+02	4.80E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	90.00000989	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		124.06	
Bounding		248.12	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.97		1.03
Bounding	1.95		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) JAPAN
SNF ID #: 602
Fuel Units & Descr: 40 - MTR TYPE
Heavy Metal Mass: BOL=774kg; EOL=6 012kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 3672
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
1 67

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	1,636.45	3,272.90	0 00E+00	1 09E-06	2 17E-06	Avg MeV	
Am-241	2 0060E-03	1,636.45	3,272.90	0 00E+00	3 28E+00	6 57E+00	0 0150	3 455E+14
Am-242m	4 2429E-07	1,636.45	3,272.90	0 00E+00	6 94E-04	1 39E-03	0 0250	7 184E+13
Am-243	1 4899E-06	1,636.45	3,272.90	0 00E+00	2 44E-03	4 88E-03	0 0375	6 266E+13
C-14	5 7135E-09	1,636.45	3,272.90	0 00E+00	9 35E-06	1 87E-05	0 0575	6 711E+13
Cl-36	1 3124E-32	1,636.45	3,272.90	0 00E+00	2 15E-29	4 30E-29	0 0850	4 056E+13
Cm-243	1 6443E-07	1,636.45	3,272.90	0 00E+00	2 69E-04	5 38E-04	0 1250	2 744E+13
Cm-244	2 9330E-05	1,636.45	3,272.90	0 00E+00	4 80E-02	9 60E-02	0 2250	3 499E+13
Co-60	5 3186E-06	1,636.45	3,272.90	0 00E+00	8 70E-03	1 74E-02	0 3750	1 523E+13
Cs-134	3 1563E-03	1,636.45	3,272.90	0 00E+00	5 17E+00	1 03E+01	0 5750	2 485E+14
Cs-135	3 4477E-06	1,636.45	3,272.90	0 00E+00	5 64E-03	1 13E-02	0 8500	4 201E+12
Cs-137	2 0313E+00	1,636.45	3,272.90	0 00E+00	3 32E+03	6 65E+03	1 2500	2 399E+12
Eu-154	2 4513E-02	1,636.45	3,272.90	0 00E+00	4 01E+01	8 02E+01	1 7500	1 101E+11
Eu-155	4 8175E-03	1,636.45	3,272.90	0 00E+00	7 88E+00	1 58E+01	2 2500	9 658E+06
Fe-55	1 2397E-04	1,636.45	3,272.90	0 00E+00	2 03E-01	4 06E-01	2 7500	5 460E+06
H-3	4 5697E-03	1,636.45	3,272.90	0 00E+00	7 48E+00	1 50E+01	3 5000	2 508E+04
I-129	7 5300E-07	1,636.45	3,272.90	0 00E+00	1 23E-03	2 46E-03	5 0000	1 418E+03
Kr-85	1 0850E-01	1,636.45	3,272.90	0 00E+00	1 78E+02	3 55E+02	7 0000	1 566E+02
Np-237	9 5561E-06	1,636.45	3,272.90	0 00E+00	1 56E-02	3 13E-02	11 0000	1 755E+01
Pa-231	2 0359E-09	1,636.45	3,272.90	0 00E+00	3 33E-06	6 66E-06		
Pb-210	4 9728E-11	1,636.45	3,272.90	0 00E+00	8 14E-08	1 63E-07		
Pm-147	4 8502E-02	1,636.45	3,272.90	0 00E+00	7 94E+01	1 59E+02		
Pu-238	1 8254E-02	1,636.45	3,272.90	0 00E+00	2 99E+01	5 97E+01		
Pu-239	4 2810E-04	1,636.45	3,272.90	0 00E+00	7 01E-01	1 40E+00		
Pu-240	2 4368E-04	1,636.45	3,272.90	0 00E+00	3 99E-01	7 98E-01		
Pu-241	3 3415E-02	1,636.45	3,272.90	0 00E+00	5 47E+01	1 09E+02		
Pu-242	3 6329E-07	1,636.45	3,272.90	0 00E+00	5 95E-04	1 19E-03		
Ra-226	2 2854E-10	1,636.45	3,272.90	0 00E+00	3 74E-07	7 48E-07		
Ra-228	1 2426E-14	1,636.45	3,272.90	0 00E+00	2 03E-11	4 07E-11		
Ru-106	6 3589E-06	1,636.45	3,272.90	0 00E+00	1 04E-02	2 08E-02		
Se-79	1 2933E-05	1,636.45	3,272.90	0 00E+00	2 12E-02	4 23E-02		
Sn-126	1 1574E-05	1,636.45	3,272.90	0 00E+00	1 89E-02	3 79E-02		
Sr-90	1 9248E+00	1,636.45	3,272.90	0 00E+00	3 15E+03	6 30E+03		
Tc-99	4 2239E-04	1,636.45	3,272.90	0 00E+00	6 91E-01	1 38E+00		
Th-229	5 0953E-12	1,636.45	3,272.90	0 00E+00	8 34E-09	1 67E-08		
Th-230	4 1885E-08	1,636.45	3,272.90	0 00E+00	6 85E-05	1 37E-04		
Th-232	1 9270E-14	1,636.45	3,272.90	0 00E+00	3 15E-11	6 31E-11		
Th-208	4 6024E-08	1,636.45	3,272.90	0 00E+00	7 53E-05	1 51E-04		
U-232	1 2582E-07	1,636.45	3,272.90	0 00E+00	2 06E-04	4 12E-04		
U-233	2 5825E-09	1,636.45	3,272.90	0 00E+00	4 23E-06	8 45E-06		
U-234	1 8450E-04	1,636.45	3,272.90	0 00E+00	3 02E-01	6 04E-01		
U-235	-2 7235E-06	1,636.45	0 00	1 56E-02	1 11E-02	1 56E-02		
U-236	1 5493E-05	1,636.45	3,272.90	0 00E+00	2 54E-02	5 07E-02		
U-238	-4 2851E-09	1,636.45	0 00	1 82E-04	1 75E-04	1 82E-04		
Y-90	1 9254E+00	1,636.45	3,272.90	0 00E+00	3 15E+03	6 30E+03		
Other Radionuclides					3 16E+03	6 33E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92 99999931	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		1 636 45	
Bounding		3 272 90	

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 67		
Bounding	1 34		

1 02

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) NETHERLANDS
 SNF ID #: 607
 Fuel Units & Descr: 19 - MTR TYPE
 Heavy Metal Mass: BOL=2.042kg, EOL=1.093kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup (MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage
 18"x10"
 0.79

II. Estimates	m		x _a		x _b		b		y _a		y _b		Gamma Sources	
	Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)	Avg MeV				
	Ac-227	6.6313E-10	899.67	1,799.34	0.00E+00	5.97E-07	1.19E-06	0.0150	1.899E+14	0.0150				
	Am-241	2.0060E-03	899.67	1,799.34	0.00E+00	1.80E+00	3.61E+00	0.0250	3.950E+13	0.0250				
	Am-242m	4.2429E-07	899.67	1,799.34	0.00E+00	3.82E-04	7.63E-04	0.0375	3.445E+13	0.0375				
	Am-243	1.4899E-06	899.67	1,799.34	0.00E+00	1.34E-03	2.68E-03	0.0575	3.690E+13	0.0575				
	C-14	5.7135E-09	899.67	1,799.34	0.00E+00	5.14E-06	1.03E-05	0.0850	2.230E+13	0.0850				
	Cl-36	1.3124E-32	899.67	1,799.34	0.00E+00	1.18E-29	2.36E-29	0.1250	1.509E+13	0.1250				
	Cm-243	1.6443E-07	899.67	1,799.34	0.00E+00	1.48E-04	2.96E-04	0.2250	1.924E+13	0.2250				
	Cm-244	2.9330E-05	899.67	1,799.34	0.00E+00	2.64E-02	5.28E-02	0.3750	8.375E+12	0.3750				
	Co-60	5.3186E-06	899.67	1,799.34	0.00E+00	4.79E-03	9.57E-03	0.5750	1.366E+14	0.5750				
	Cs-134	3.1563E-03	899.67	1,799.34	0.00E+00	2.84E+00	5.68E+00	0.8500	2.310E+12	0.8500				
	Cs-135	3.4477E-06	899.67	1,799.34	0.00E+00	3.10E-03	6.20E-03	1.2500	1.319E+12	1.2500				
	Cs-137	2.0313E+00	899.67	1,799.34	0.00E+00	1.83E+03	3.66E+03	1.7500	6.053E+10	1.7500				
	Eu-154	2.4513E-02	899.67	1,799.34	0.00E+00	2.21E+01	4.41E+01	2.2500	5.310E+06	2.2500				
	Eu-155	4.8175E-03	899.67	1,799.34	0.00E+00	4.33E+00	8.67E+00	2.7500	3.002E+06	2.7500				
	Fe-55	1.2397E-04	899.67	1,799.34	0.00E+00	1.12E-01	2.23E-01	3.5000	1.379E+04	3.5000				
	H-3	4.5697E-03	899.67	1,799.34	0.00E+00	4.11E+00	8.22E+00	5.0000	7.796E+02	5.0000				
	I-129	7.5300E-07	899.67	1,799.34	0.00E+00	6.77E-04	1.35E-03	7.0000	8.606E+01	7.0000				
	Kr-85	1.0850E-01	899.67	1,799.34	0.00E+00	9.76E+01	1.95E+02	11.0000	9.645E+00	11.0000				
	Np-237	9.5561E-06	899.67	1,799.34	0.00E+00	8.60E-03	1.72E-02							
	Pa-231	2.0359E-09	899.67	1,799.34	0.00E+00	1.83E-06	3.66E-06							
	Pb-210	4.9728E-11	899.67	1,799.34	0.00E+00	4.47E-08	8.95E-08							
	Pm-147	4.8502E-02	899.67	1,799.34	0.00E+00	4.36E+01	8.73E+01							
	Pu-238	1.8254E-02	899.67	1,799.34	0.00E+00	1.64E+01	3.28E+01							
	Pu-239	4.2810E-04	899.67	1,799.34	0.00E+00	3.85E-01	7.70E-01							
	Pu-240	2.4368E-04	899.67	1,799.34	0.00E+00	2.19E-01	4.38E-01							
	Pu-241	3.3415E-02	899.67	1,799.34	0.00E+00	3.01E+01	6.01E+01							
	Pu-242	3.6329E-07	899.67	1,799.34	0.00E+00	3.27E-04	6.54E-04							
	Ra-226	2.2854E-10	899.67	1,799.34	0.00E+00	2.06E-07	4.11E-07							
	Ra-228	1.2426E-14	899.67	1,799.34	0.00E+00	1.12E-11	2.24E-11							
	Ru-106	6.3589E-06	899.67	1,799.34	0.00E+00	5.72E-03	1.14E-02							
	Se-79	1.2933E-05	899.67	1,799.34	0.00E+00	1.16E-02	2.33E-02							
	Sn-126	1.1574E-05	899.67	1,799.34	0.00E+00	1.04E-02	2.08E-02							
	Sr-90	1.9248E+00	899.67	1,799.34	0.00E+00	1.73E+03	3.46E+03							
	Tc-99	4.2239E-04	899.67	1,799.34	0.00E+00	3.80E-01	7.60E-01							
	Th-229	5.0953E-12	899.67	1,799.34	0.00E+00	4.58E-09	9.17E-09							
	Th-230	4.1885E-08	899.67	1,799.34	0.00E+00	3.77E-05	7.54E-05							
	Th-232	1.9270E-14	899.67	1,799.34	0.00E+00	1.73E-11	3.47E-11							
	Ti-208	4.6024E-08	899.67	1,799.34	0.00E+00	4.14E-05	8.28E-05							
	U-232	1.2582E-07	899.67	1,799.34	0.00E+00	1.13E-04	2.26E-04							
	U-233	2.5825E-09	899.67	1,799.34	0.00E+00	2.32E-06	4.65E-06							
	U-234	1.8450E-04	899.67	1,799.34	0.00E+00	1.66E-01	3.32E-01							
	U-235	-2.7235E-06	899.67	0.00	4.10E-03	1.65E-03	4.10E-03							
	U-236	1.5493E-05	899.67	1,799.34	0.00E+00	1.39E-02	2.79E-02							
	U-238	-4.2851E-09	899.67	0.00	4.81E-05	4.42E-05	4.81E-05							
	Y-90	1.9254E+00	899.67	1,799.34	0.00E+00	1.73E+03	3.46E+03							
	Other Radionuclides					1.74E+03	3.48E+03							

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences ¹
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
BOL HM Constituents	92.99998697	60 to 100	
BOL Enrichment %			

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
		899.67	
Bounding		1,799.34	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
	1.40		
Bounding	2.80		1.05

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) NETHERLANDS
 SNF ID #: 608
 Fuel Units & Descr: 61 - MTR TYPE
 Heavy Metal Mass BOL=12 462kg, EOL=6 667kg
 ROD Storage Site, SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage
 18"x10"
 2 54

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	5,487 98	10,975 95	0 00E+00	3 64E-06	7 28E-06	Avg. MeV	
Am-241	2 0060E-03	5,487 98	10,975 95	0 00E+00	1 10E+01	2 20E+01	0 0150	1 159E+15
Am-242m	4 2429E-07	5,487 98	10,975 95	0 00E+00	2 33E-03	4 66E-03	0 0250	2 409E+14
Am-243	1 4899E-06	5,487 98	10,975 95	0 00E+00	8 18E-03	1 64E-02	0 0375	2 101E+14
C-14	5 7135E-09	5,487 98	10,975 95	0 00E+00	3 14E-05	6 27E-05	0 0575	2 251E+14
Cl-36	1 3124E-32	5,487 98	10,975 95	0 00E+00	7 20E-29	1 44E-28	0 0850	1 360E+14
Cm-243	1 6443E-07	5,487 98	10,975 95	0 00E+00	9 02E-04	1 80E-03	0 1250	9 204E+13
Cm-244	2 9330E-05	5,487 98	10,975 95	0 00E+00	1 61E-01	3 22E-01	0 2250	1 174E+14
Co-60	5 3186E-06	5,487 98	10,975 95	0 00E+00	2 92E-02	5 84E-02	0 3750	5 109E+13
Cs-134	3 1563E-03	5,487 98	10,975 95	0 00E+00	1 73E+01	3 46E+01	0 5750	8 333E+14
Cs-135	3 4477E-06	5,487 98	10,975 95	0 00E+00	1 89E-02	3 78E-02	0 8500	1 409E+13
Cs-137	2 0313E+00	5,487 98	10,975 95	0 00E+00	1 11E+04	2 23E+04	1 2500	8 044E+12
Eu-154	2 4513E-02	5,487 98	10,975 95	0 00E+00	1 35E+02	2 69E+02	1 7500	3 692E+11
Eu-155	4 8175E-03	5,487 98	10,975 95	0 00E+00	2 64E+01	5 29E+01	2 2500	3 239E+07
Fe-55	1 2397E-04	5,487 98	10,975 95	0 00E+00	6 80E-01	1 36E+00	2 7500	1 831E+07
H-3	4 5697E-03	5,487 98	10,975 95	0 00E+00	2 51E+01	5 02E+01	3 5000	8 411E+04
I-129	7 5300E-07	5,487 98	10,975 95	0 00E+00	4 13E-03	8 26E-03	5 0000	4 755E+03
Kr-85	1 0850E-01	5,487 98	10,975 95	0 00E+00	5 95E+02	1 19E+03	7 0000	5 250E+02
Np-237	9 5561E-06	5,487 98	10,975 95	0 00E+00	5 24E-02	1 05E-01	11 0000	5 884E+01
Pa-231	2 0359E-09	5,487 98	10,975 95	0 00E+00	1 12E-05	2 23E-05		
Pb-210	4 9728E-11	5,487 98	10,975 95	0 00E+00	2 73E-07	5 46E-07		
Pm-147	4 8502E-02	5,487 98	10,975 95	0 00E+00	2 66E+02	5 32E+02		
Pu-238	1 8254E-02	5,487 98	10,975 95	0 00E+00	1 00E+02	2 00E+02		
Pu-239	4 2810E-04	5,487 98	10,975 95	0 00E+00	2 35E+00	4 70E+00		
Pu-240	2 4368E-04	5,487 98	10,975 95	0 00E+00	1 34E+00	2 67E+00		
Pu-241	3 3415E-02	5,487 98	10,975 95	0 00E+00	1 83E+02	3 67E+02		
Pu-242	3 6329E-07	5,487 98	10,975 95	0 00E+00	1 99E-03	3 99E-03		
Ra-226	2 2854E-10	5,487 98	10,975 95	0 00E+00	1 25E-06	2 51E-06		
Ra-228	1 2426E-14	5,487 98	10,975 95	0 00E+00	6 82E-11	1 36E-10		
Ru-106	6 3589E-06	5,487 98	10,975 95	0 00E+00	3 49E-02	6 98E-02		
Se-79	1 2933E-05	5,487 98	10,975 95	0 00E+00	7 10E-02	1 42E-01		
Sn-126	1 1574E-05	5,487 98	10,975 95	0 00E+00	6 35E-02	1 27E-01		
Sr-90	1 9248E+00	5,487 98	10,975 95	0 00E+00	1 06E+04	2 11E+04		
Tc-99	4 2239E-04	5,487 98	10,975 95	0 00E+00	2 32E+00	4 64E+00		
Th-229	5 0953E-12	5,487 98	10,975 95	0 00E+00	2 80E-08	5 59E-08		
Th-230	4 1885E-08	5,487 98	10,975 95	0 00E+00	2 30E-04	4 60E-04		
Th-232	1 9270E-14	5,487 98	10,975 95	0 00E+00	1 06E-10	2 12E-10		
Ti-208	4 6024E-08	5,487 98	10,975 95	0 00E+00	2 53E-04	5 05E-04		
U-232	1 2582E-07	5,487 98	10,975 95	0 00E+00	6 90E-04	1 38E-03		
U-233	2 5825E-09	5,487 98	10,975 95	0 00E+00	1 42E-05	2 83E-05	Thermal Power	
U-234	1 8450E-04	5,487 98	10,975 95	0 00E+00	1 01E+00	2 03E+00	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	-2 7235E-06	5,487 98	0 00	2 50E-02	1 01E-02	2 50E-02	1 31E+02	2 62E+02
U-236	1 5493E-05	5,487 98	10,975 95	0 00E+00	8 50E-02	1 70E-01	Total	Total
U-238	-4 2851E-09	5,487 98	0 00	2 93E-04	2 70E-04	2 93E-04		
Y-90	1 9254E+00	5,487 98	10,975 95	0 00E+00	1 06E+04	2 11E+04		
Other Radionuclides							1 06E+04	2 12E+04

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92.99998578	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		5,487 98	
Bounding		10 975 95	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 40		
Bounding	2 80		1 05

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) PORTUGAL
SNF ID # 632
Fuel Units & Descr 22 - MTR TYPE
Heavy Metal Mass BOL=6.246kg EOL=3.923kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time: 20 years

Estimated
Canister usage
18"x10"
0.92

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	2,200.12	4,400.23	0.00E+00	1.46E-06	2.92E-06	Avg MeV	
Am-241	2.0060E-03	2,200.12	4,400.23	0.00E+00	4.41E+00	8.83E+00	0.0150	4.645E+14
Am-242m	4.2429E-07	2,200.12	4,400.23	0.00E+00	9.33E-04	1.87E-03	0.0250	9.659E+13
Am-243	1.4899E-06	2,200.12	4,400.23	0.00E+00	3.28E-03	6.56E-03	0.0375	8.425E+13
C-14	5.7135E-09	2,200.12	4,400.23	0.00E+00	1.26E-05	2.51E-05	0.0575	9.023E+13
Cl-36	1.3124E-32	2,200.12	4,400.23	0.00E+00	2.89E-29	5.77E-29	0.0850	5.453E+13
Cm-243	1.6443E-07	2,200.12	4,400.23	0.00E+00	3.62E-04	7.24E-04	0.1250	3.690E+13
Cm-244	2.9330E-05	2,200.12	4,400.23	0.00E+00	6.45E-02	1.29E-01	0.2250	4.705E+13
Co-60	5.3186E-06	2,200.12	4,400.23	0.00E+00	1.17E-02	2.34E-02	0.3750	2.048E+13
Cs-134	3.1563E-03	2,200.12	4,400.23	0.00E+00	6.94E+00	1.39E+01	0.5750	3.341E+14
Cs-135	3.4477E-06	2,200.12	4,400.23	0.00E+00	7.59E-03	1.52E-02	0.8500	5.648E+12
Cs-137	2.0313E+00	2,200.12	4,400.23	0.00E+00	4.47E+03	8.94E+03	1.2500	3.225E+12
Eu-154	2.4513E-02	2,200.12	4,400.23	0.00E+00	5.39E+01	1.08E+02	1.7500	1.480E+11
Eu-155	4.8175E-03	2,200.12	4,400.23	0.00E+00	1.06E+01	2.12E+01	2.2500	1.298E+07
Fe-55	1.2397E-04	2,200.12	4,400.23	0.00E+00	2.73E-01	5.45E-01	2.7500	7.341E+06
H-3	4.5697E-03	2,200.12	4,400.23	0.00E+00	1.01E+01	2.01E+01	3.5000	3.372E+04
I-129	7.5300E-07	2,200.12	4,400.23	0.00E+00	1.66E-03	3.31E-03	5.0000	1.906E+03
Kr-85	1.0850E-01	2,200.12	4,400.23	0.00E+00	2.39E+02	4.77E+02	7.0000	2.105E+02
Np-237	9.5561E-06	2,200.12	4,400.23	0.00E+00	2.10E-02	4.20E-02	11.0000	2.359E+01
Pa-231	2.0359E-09	2,200.12	4,400.23	0.00E+00	4.48E-06	8.96E-06		
Pb-210	4.9728E-11	2,200.12	4,400.23	0.00E+00	1.09E-07	2.19E-07		
Pm-147	4.8502E-02	2,200.12	4,400.23	0.00E+00	1.07E+02	2.13E+02		
Pu-238	1.8254E-02	2,200.12	4,400.23	0.00E+00	4.02E+01	8.03E+01		
Pu-239	4.2810E-04	2,200.12	4,400.23	0.00E+00	9.42E-01	1.88E+00		
Pu-240	2.4368E-04	2,200.12	4,400.23	0.00E+00	5.36E-01	1.07E+00		
Pu-241	3.3415E-02	2,200.12	4,400.23	0.00E+00	7.35E+01	1.47E+02		
Pu-242	3.6329E-07	2,200.12	4,400.23	0.00E+00	7.99E-04	1.60E-03		
Ra-226	2.2854E-10	2,200.12	4,400.23	0.00E+00	5.03E-07	1.01E-06		
Ra-228	1.2426E-14	2,200.12	4,400.23	0.00E+00	2.73E-11	5.47E-11		
Ru-106	6.3589E-06	2,200.12	4,400.23	0.00E+00	1.40E-02	2.80E-02		
Se-79	1.2933E-05	2,200.12	4,400.23	0.00E+00	2.85E-02	5.69E-02		
Sn-126	1.1574E-05	2,200.12	4,400.23	0.00E+00	2.55E-02	5.09E-02		
Sr-90	1.9248E+00	2,200.12	4,400.23	0.00E+00	4.23E+03	8.47E+03		
Tc-99	4.2239E-04	2,200.12	4,400.23	0.00E+00	9.29E-01	1.86E+00		
Th-229	5.0953E-12	2,200.12	4,400.23	0.00E+00	1.12E-08	2.24E-08		
Th-230	4.1885E-08	2,200.12	4,400.23	0.00E+00	9.22E-05	1.84E-04		
Th-232	1.9270E-14	2,200.12	4,400.23	0.00E+00	4.24E-11	8.48E-11		
Tl-208	4.6024E-08	2,200.12	4,400.23	0.00E+00	1.01E-04	2.03E-04		
U-232	1.2582E-07	2,200.12	4,400.23	0.00E+00	2.77E-04	5.54E-04		
U-233	2.5825E-09	2,200.12	4,400.23	0.00E+00	5.68E-06	1.14E-05		
U-234	1.8450E-04	2,200.12	4,400.23	0.00E+00	4.06E-01	8.12E-01		
U-235	-2.7235E-06	2,200.12	0.00	1.26E-02	6.56E-03	1.26E-02		
U-236	1.5493E-05	2,200.12	4,400.23	0.00E+00	3.41E-02	6.82E-02		
U-238	-4.2851E-09	2,200.12	0.00	1.47E-04	1.38E-04	1.47E-04		
Y-90	1.9254E+00	2,200.12	4,400.23	0.00E+00	4.24E+03	8.47E+03		
Other Radionuclides					4.26E+03	8.51E+03		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92.99999055	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		2,200.12	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		4,400.23	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.12		1.03
Bounding	2.24		

*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-S (UALX-HEU) SWITZERLAND
SNF ID #: 658
Fuel Units & Descr: 55 - MTR TYPE
Heavy Metal Mass: BOL=16 676kg; EOL=5 973kg
ROD Storage Site: SRS

Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
2 29

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	10,135 95	15,792 50	0 00E+00	6 72E-06	1 05E-05	Avg MeV	
Am-241	2 0060E-03	10,135 95	15,792 50	0 00E+00	2 03E+01	3 17E+01	0 0150	1 667E+15
Am-242m	4 2429E-07	10,135 95	15,792 50	0 00E+00	4 30E-03	6 70E-03	0 0250	3 467E+14
Am-243	1 4899E-06	10,135 95	15,792 50	0 00E+00	1 51E-02	2 35E-02	0 0375	3 024E+14
C-14	5 7135E-09	10,135 95	15,792 50	0 00E+00	5 79E-05	9 02E-05	0 0575	3 238E+14
Cl-36	1 3124E-32	10,135 95	15,792 50	0 00E+00	1 33E-28	2 07E-28	0 0850	1 957E+14
Cm-243	1 6443E-07	10,135 95	15,792 50	0 00E+00	1 67E-03	2 60E-03	0 1250	1 324E+14
Cm-244	2 9330E-05	10,135 95	15,792 50	0 00E+00	2 97E-01	4 63E-01	0 2250	1 689E+14
Co-60	5 3186E-06	10,135 95	15,792 50	0 00E+00	5 39E-02	8 40E-02	0 3750	7 351E+13
Cs-134	3 1563E-03	10,135 95	15,792 50	0 00E+00	3 20E+01	4 98E+01	0 5750	1 199E+15
Cs-135	3 4477E-06	10,135 95	15,792 50	0 00E+00	3 49E-02	5 44E-02	0 8500	2 027E+13
Cs-137	2 0313E+00	10,135 95	15,792 50	0 00E+00	2 06E+04	3 21E+04	1 2500	1 157E+13
Eu-154	2 4513E-02	10,135 95	15,792 50	0 00E+00	2 48E+02	3 87E+02	1 7500	5 313E+11
Eu-155	4 8175E-03	10,135 95	15,792 50	0 00E+00	4 88E+01	7 61E+01	2 2500	4 660E+07
Fe-55	1 2397E-04	10,135 95	15,792 50	0 00E+00	1 26E+00	1 96E+00	2 7500	2 635E+07
H-3	4 5697E-03	10,135 95	15,792 50	0 00E+00	4 63E+01	7 22E+01	3 5000	1 210E+05
I-129	7 5300E-07	10,135 95	15,792 50	0 00E+00	7 63E-03	1 19E-02	5 0000	6 842E+03
Kr-85	1 0850E-01	10,135 95	15,792 50	0 00E+00	1 10E+03	1 71E+03	7 0000	7 553E+02
Np-237	9 5561E-06	10,135 95	15,792 50	0 00E+00	9 69E-02	1 51E-01	11 0000	8 465E+01
Pa-231	2 0359E-09	10,135 95	15,792 50	0 00E+00	2 06E-05	3 22E-05		
Pb-210	4 9728E-11	10,135 95	15,792 50	0 00E+00	5 04E-07	7 85E-07		
Pm-147	4 8502E-02	10,135 95	15,792 50	0 00E+00	4 92E+02	7 66E+02		
Pu-238	1 8254E-02	10,135 95	15,792 50	0 00E+00	1 85E+02	2 88E+02		
Pu-239	4 2810E-04	10,135 95	15,792 50	0 00E+00	4 34E+00	6 76E+00		
Pu-240	2 4368E-04	10,135 95	15,792 50	0 00E+00	2 47E+00	3 85E+00		
Pu-241	3 3415E-02	10,135 95	15,792 50	0 00E+00	3 39E+02	5 28E+02		
Pu-242	3 6329E-07	10,135 95	15,792 50	0 00E+00	3 68E-03	5 74E-03		
Ra-226	2 2854E-10	10,135 95	15,792 50	0 00E+00	2 32E-06	3 61E-06		
Ra-228	1 2426E-14	10,135 95	15,792 50	0 00E+00	1 26E-10	1 96E-10		
Ru-106	6 3589E-06	10,135 95	15,792 50	0 00E+00	6 45E-02	1 00E-01		
Se-79	1 2933E-05	10,135 95	15,792 50	0 00E+00	1 31E-01	2 04E-01		
Sn-126	1 1574E-05	10,135 95	15,792 50	0 00E+00	1 17E-01	1 83E-01		
Sr-90	1 9248E+00	10,135 95	15,792 50	0 00E+00	1 95E+04	3 04E+04		
Tc-99	4 2239E-04	10,135 95	15,792 50	0 00E+00	4 28E+00	6 67E+00		
Th-229	5 0953E-12	10,135 95	15,792 50	0 00E+00	5 16E-08	8 05E-08		
Th-230	4 1885E-08	10,135 95	15,792 50	0 00E+00	4 25E-04	6 61E-04		
Th-232	1 9270E-14	10,135 95	15,792 50	0 00E+00	1 95E-10	3 04E-10		
Ti-208	4 6024E-08	10,135 95	15,792 50	0 00E+00	4 66E-04	7 27E-04		
U-232	1 2582E-07	10,135 95	15,792 50	0 00E+00	1 28E-03	1 99E-03	Thermal Power	
U-233	2 5825E-09	10,135 95	15,792 50	0 00E+00	2 62E-05	4 08E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8450E-04	10,135 95	15,792 50	0 00E+00	1 87E+00	2 91E+00	2 42E+02	3 76E+02
U-235	-2 7235E-06	10,135 95	0 00	3 35E-02	5 91E-03	3 35E-02	Total	Total
U-236	1 5493E-05	10,135 95	15,792 50	0 00E+00	1 57E-01	2 45E-01		
U-238	-4 2851E-09	10,135 95	0 00	3 92E-04	3 49E-04	3 92E-04		
Y-90	1 9254E+00	10,135 95	15,792 50	0 00E+00	1 95E+04	3 04E+04		
Other Radionuclides					1 96E+04	3 05E+04		

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 00000816	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)¹

	From SFD	Estimated
Nominal		10 135 95
Bounding		15 792 50

Basis for burnup used in estimate:

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
Nominal	1 93	
Bounding	3 01	

Estimated EOL HM/Given EOL HM

1 10

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

² Total burnup for all fuel associated with this worksheet must be 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-S (UALX-HEU) TURKEY
SNF ID # 644
Fuel Units & Descr: 18 - MTR TYPE
Heavy Metal Mass: BOL=5.42kg EOL=2.9kg
ROD Storage Site SRS

*Fuel decay start date 2010
Estimates as of 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
*Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
0.75

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	2,386.49	4,772.98	0.00E+00	1.58E-06	3.17E-06	Avg MeV	
Am-241	2.0060E-03	2,386.49	4,772.98	0.00E+00	4.79E+00	9.57E+00	0.0150	5.038E+14
Am-242m	4.2429E-07	2,386.49	4,772.98	0.00E+00	1.01E-03	2.03E-03	0.0250	1.048E+14
Am-243	1.4899E-06	2,386.49	4,772.98	0.00E+00	3.56E-03	7.11E-03	0.0375	9.138E+13
C-14	5.7135E-09	2,386.49	4,772.98	0.00E+00	1.36E-05	2.73E-05	0.0575	9.787E+13
Cl-36	1.3124E-32	2,386.49	4,772.98	0.00E+00	3.13E-29	6.26E-29	0.0850	5.915E+13
Co-243	1.6443E-07	2,386.49	4,772.98	0.00E+00	3.92E-04	7.85E-04	0.1250	4.002E+13
Co-244	2.9330E-05	2,386.49	4,772.98	0.00E+00	7.00E-02	1.40E-01	0.2250	5.103E+13
Co-60	5.3186E-06	2,386.49	4,772.98	0.00E+00	1.27E-02	2.54E-02	0.3750	2.222E+13
Cs-134	3.1563E-03	2,386.49	4,772.98	0.00E+00	7.53E+00	1.51E+01	0.5750	3.624E+14
Cs-135	3.4477E-06	2,386.49	4,772.98	0.00E+00	8.23E-03	1.65E-02	0.8500	6.126E+12
Cs-137	2.0313E+00	2,386.49	4,772.98	0.00E+00	4.85E+03	9.70E+03	1.2500	3.498E+12
Eu-154	2.4513E-02	2,386.49	4,772.98	0.00E+00	5.85E+01	1.17E+02	1.7500	1.606E+11
Eu-155	4.8175E-03	2,386.49	4,772.98	0.00E+00	1.15E+01	2.30E+01	2.2500	1.408E+07
Fe-55	1.2397E-04	2,386.49	4,772.98	0.00E+00	2.96E-01	5.92E-01	2.7500	7.963E+06
H-3	4.5697E-03	2,386.49	4,772.98	0.00E+00	1.09E+01	2.18E+01	3.5000	3.658E+04
I-129	7.5300E-07	2,386.49	4,772.98	0.00E+00	1.80E-03	3.59E-03	5.0000	2.068E+03
Kr-85	1.0850E-01	2,386.49	4,772.98	0.00E+00	2.59E+02	5.18E+02	7.0000	2.283E+02
Np-237	9.5561E-06	2,386.49	4,772.98	0.00E+00	2.28E-02	4.56E-02	11.0000	2.559E+01
Pa-231	2.0359E-09	2,386.49	4,772.98	0.00E+00	4.86E-06	9.72E-06		
Pb-210	4.9728E-11	2,386.49	4,772.98	0.00E+00	1.19E-07	2.37E-07		
Pm-147	4.8502E-02	2,386.49	4,772.98	0.00E+00	1.16E+02	2.31E+02		
Pu-238	1.8254E-02	2,386.49	4,772.98	0.00E+00	4.36E+01	8.71E+01		
Pu-239	4.2810E-04	2,386.49	4,772.98	0.00E+00	1.02E+00	2.04E+00		
Pu-240	2.4368E-04	2,386.49	4,772.98	0.00E+00	5.82E-01	1.16E+00		
Pu-241	3.3415E-02	2,386.49	4,772.98	0.00E+00	7.97E+01	1.59E+02		
Pu-242	3.6329E-07	2,386.49	4,772.98	0.00E+00	8.67E-04	1.73E-03		
Ra-226	2.2854E-10	2,386.49	4,772.98	0.00E+00	5.45E-07	1.09E-06		
Ra-228	1.2426E-14	2,386.49	4,772.98	0.00E+00	2.97E-11	5.93E-11		
Ru-106	6.3589E-06	2,386.49	4,772.98	0.00E+00	1.52E-02	3.04E-02		
Se-79	1.2933E-05	2,386.49	4,772.98	0.00E+00	3.09E-02	6.17E-02		
Sn-126	1.1574E-05	2,386.49	4,772.98	0.00E+00	2.76E-02	5.52E-02		
Sr-90	1.9248E+00	2,386.49	4,772.98	0.00E+00	4.59E+03	9.19E+03		
Tc-99	4.2239E-04	2,386.49	4,772.98	0.00E+00	1.01E+00	2.02E+00		
Th-229	5.0953E-12	2,386.49	4,772.98	0.00E+00	1.22E-08	2.43E-08		
Th-230	4.1885E-08	2,386.49	4,772.98	0.00E+00	1.00E-04	2.00E-04		
Th-232	1.9270E-14	2,386.49	4,772.98	0.00E+00	4.60E-11	9.20E-11		
Ti-208	4.6024E-08	2,386.49	4,772.98	0.00E+00	1.10E-04	2.20E-04		
U-232	1.2582E-07	2,386.49	4,772.98	0.00E+00	3.00E-04	6.01E-04		
U-233	2.5825E-09	2,386.49	4,772.98	0.00E+00	6.16E-06	1.23E-05		
U-234	1.8450E-04	2,386.49	4,772.98	0.00E+00	4.40E-01	8.81E-01		
U-235	-2.7235E-06	2,386.49	0.00	1.09E-02	4.39E-03	1.09E-02		
U-236	1.5493E-05	2,386.49	4,772.98	0.00E+00	3.70E-02	7.39E-02		
U-238	-4.2851E-09	2,386.49	0.00	1.28E-04	1.17E-04	1.28E-04		
Y-90	1.8254E+00	2,386.49	4,772.98	0.00E+00	4.59E+03	9.19E+03		
Other Radionuclides					4.62E+03	9.23E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.69E+01	1.14E+02
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	
BOL HM Constituents	U	U	
BOL Enrichment %	92.99998782	60 to 100	

Burnup Summary (MWd)²

Nominal	From SFD	Estimated	Basis for burnup used in estimate
		2,386.49	
Bounding		4,772.98	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks

Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
	1.40		
Bounding	2.80		1.05

*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-S (UALX-LEU) JAPAN
 SNF ID #: 553
 Fuel Units & Descr: 476 - ASSEMBLY
 Heavy Metal Mass: BOL=714kg, EOL=632.461kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: HFBR (Heavy Water, Alum, 10 to 20%, U)
²Template Burnup(MWd)
 Template BOL Heavy Metal Mass (MT): 0.00034251
 Template Decay Time: 20 years

Estimated
 Canister usage
 18"x10"
 19.83

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5333E-10	77,499.76	154,999.52	0.00E+00	6.61E-05	1.32E-04	Avg MeV	
Am-241	2.2753E-02	77,499.76	154,999.52	0.00E+00	1.76E+03	3.53E+03	0.0150	1.571E+16
Am-242m	8.9133E-06	77,499.76	154,999.52	0.00E+00	8.91E-01	1.38E+00	0.0250	3.263E+15
Am-243	6.4007E-06	77,499.76	154,999.52	0.00E+00	4.96E-01	9.92E-01	0.0375	2.866E+15
C-14	2.9620E-08	77,499.76	154,999.52	0.00E+00	2.30E-03	4.59E-03	0.0575	3.087E+15
Cl-36	5.9513E-35	77,499.76	154,999.52	0.00E+00	4.61E-30	9.22E-30	0.0850	1.838E+15
Cm-243	2.2087E-06	77,499.76	154,999.52	0.00E+00	1.71E-01	3.42E-01	0.1250	1.237E+15
Cm-244	1.1007E-04	77,499.76	154,999.52	0.00E+00	8.53E+00	1.71E+01	0.2250	1.584E+15
Co-60	1.6340E-05	77,499.76	154,999.52	0.00E+00	1.27E+00	2.53E+00	0.3750	6.894E+14
Cs-134	2.1353E-03	77,499.76	154,999.52	0.00E+00	1.65E+02	3.31E+02	0.5750	1.169E+16
Cs-135	4.8607E-06	77,499.76	154,999.52	0.00E+00	3.77E-01	7.53E-01	0.8500	1.787E+14
Cs-137	2.0227E+00	77,499.76	154,999.52	0.00E+00	1.57E+05	3.14E+05	1.2500	1.007E+14
Eu-154	2.0887E-02	77,499.76	154,999.52	0.00E+00	1.62E+03	3.24E+03	1.7500	4.753E+12
Eu-155	4.067E-03	77,499.76	154,999.52	0.00E+00	3.17E+02	6.33E+02	2.2500	4.457E+08
Fe-55	1.4167E-03	77,499.76	154,999.52	0.00E+00	1.10E+02	2.20E+02	2.7500	5.274E+07
H-3	4.6653E-03	77,499.76	154,999.52	0.00E+00	3.62E+02	7.23E+02	3.5000	2.137E+06
I-129	7.1600E-07	77,499.76	154,999.52	0.00E+00	5.55E-02	1.11E-01	5.0000	3.246E+06
Kr-85	1.0240E-01	77,499.76	154,999.52	0.00E+00	7.94E+03	1.59E+04	7.0000	3.672E+04
Np-237	3.7227E-06	77,499.76	154,999.52	0.00E+00	2.89E-01	5.77E-01	11.0000	4.179E+03
Pa-231	2.6727E-09	77,499.76	154,999.52	0.00E+00	2.07E-04	4.14E-04		
Pb-210	4.3313E-14	77,499.76	154,999.52	0.00E+00	3.36E-09	6.71E-09		
Pm-147	4.6307E-02	77,499.76	154,999.52	0.00E+00	3.59E+03	7.18E+03		
Pu-238	5.5273E-03	77,499.76	154,999.52	0.00E+00	4.28E+02	8.57E+02		
Pu-239	1.0313E-02	77,499.76	154,999.52	0.00E+00	7.99E+02	1.60E+03		
Pu-240	5.4180E-03	77,499.76	154,999.52	0.00E+00	4.20E+02	8.40E+02		
Pu-241	3.7573E-01	77,499.76	154,999.52	0.00E+00	2.91E+04	5.82E+04		
Pu-242	3.0713E-06	77,499.76	154,999.52	0.00E+00	2.38E-01	4.76E-01		
Ra-226	2.3807E-13	77,499.76	154,999.52	0.00E+00	1.85E-08	3.69E-08		
Ra-228	1.0607E-14	77,499.76	154,999.52	0.00E+00	8.22E-10	1.64E-09		
Ru-106	8.4800E-06	77,499.76	154,999.52	0.00E+00	6.57E-01	1.31E+00		
Se-79	1.2533E-05	77,499.76	154,999.52	0.00E+00	9.71E-01	1.94E+00		
Sn-126	1.1393E-05	77,499.76	154,999.52	0.00E+00	8.83E-01	1.77E+00		
Sr-90	1.8400E+00	77,499.76	154,999.52	0.00E+00	1.43E+05	2.85E+05		
Tc-99	4.3533E-04	77,499.76	154,999.52	0.00E+00	3.37E+01	6.75E+01		
Th-229	5.8947E-13	77,499.76	154,999.52	0.00E+00	4.57E-08	9.14E-08		
Th-230	5.9500E-11	77,499.76	154,999.52	0.00E+00	4.61E-06	9.22E-06		
Th-232	1.6360E-14	77,499.76	154,999.52	0.00E+00	1.27E-09	2.54E-09		
Ti-208	7.6000E-09	77,499.76	154,999.52	0.00E+00	5.89E-04	1.18E-03		
U-232	2.0747E-08	77,499.76	154,999.52	0.00E+00	1.61E-03	3.22E-03		
U-233	4.4013E-10	77,499.76	154,999.52	0.00E+00	3.41E-05	6.82E-05		
U-234	4.6500E-07	77,499.76	154,999.52	0.00E+00	3.60E-02	7.21E-02		
U-235	-2.5335E-06	77,499.76	0.00	3.09E-01	1.12E-01	3.09E-01		
U-236	1.3000E-05	77,499.76	154,999.52	0.00E+00	1.01E+00	2.01E+00		
U-238	-1.4207E-08	77,499.76	0.00	1.92E-01	1.91E-01	1.92E-01		
Y-90	1.8400E+00	77,499.76	154,999.52	0.00E+00	1.43E+05	2.85E+05		
Other Radionuclides					1.49E+05	2.98E+05		

III. Template Selection Summary, Burnup Summary, and Checks

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

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal: Bounding:	From SFD	Estimated	
		77,499.76 154,999.52	

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

Checks			Estimated EOL HM/Given EOL HM
Nominal: Bounding:	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	2.48 4.96		

1.03

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

²Total burnup for all fuel associated with this worksheet must be 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-S (UALX-LEU) PORTUGAL
SNF ID # 542
Fuel Units & Descr. 6 - ASSEMBLY
Heavy Metal Mass. BOL=5.4kg EOL=5.152kg
ROD Storage Site: SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
0.25

II. Estimates		m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	Avg. MeV
Ac-227	6.6313E-10	235.24	470.48	0.00E+00	1.56E-07	3.12E-07	0.0150	4.966E+13	0.0150
Am-241	2.0060E-03	235.24	470.48	0.00E+00	4.72E-01	9.44E-01	0.0250	1.033E+13	0.0250
Am-242m	4.2429E-07	235.24	470.48	0.00E+00	9.98E-05	2.00E-04	0.0375	9.008E+12	0.0375
Am-243	1.4899E-06	235.24	470.48	0.00E+00	3.50E-04	7.01E-04	0.0575	9.648E+12	0.0575
C-14	5.7135E-09	235.24	470.48	0.00E+00	1.34E-06	2.69E-06	0.0850	5.830E+12	0.0850
Cl-36	1.3124E-32	235.24	470.48	0.00E+00	3.09E-30	6.17E-30	0.1250	3.945E+12	0.1250
Cm-243	1.6443E-07	235.24	470.48	0.00E+00	3.87E-05	7.74E-05	0.2250	5.030E+12	0.2250
Cm-244	2.9330E-05	235.24	470.48	0.00E+00	6.90E-03	1.38E-02	0.3750	2.190E+12	0.3750
Co-60	5.3186E-06	235.24	470.48	0.00E+00	1.25E-03	2.50E-03	0.5750	3.572E+13	0.5750
Cs-134	3.1563E-03	235.24	470.48	0.00E+00	7.42E-01	1.48E+00	0.8500	6.039E+11	0.8500
Cs-135	3.4477E-06	235.24	470.48	0.00E+00	8.11E-04	1.62E-03	1.2500	3.448E+11	1.2500
Cs-137	2.0313E+00	235.24	470.48	0.00E+00	4.78E+02	9.56E+02	1.7500	1.583E+10	1.7500
Eu-154	2.4513E-02	235.24	470.48	0.00E+00	5.77E+00	1.15E+01	2.2500	1.388E+06	2.2500
Eu-155	4.8175E-03	235.24	470.48	0.00E+00	1.13E+00	2.27E+00	2.7500	7.849E+05	2.7500
Fe-55	1.2397E-04	235.24	470.48	0.00E+00	2.92E-02	5.83E-02	3.5000	3.613E+03	3.5000
H-3	4.5697E-03	235.24	470.48	0.00E+00	1.07E+00	2.15E+00	5.0000	2.071E+02	5.0000
I-129	7.5300E-07	235.24	470.48	0.00E+00	1.77E-04	3.54E-04	7.0000	2.288E+01	7.0000
Kr-85	1.0850E-01	235.24	470.48	0.00E+00	2.55E+01	5.10E+01	11.0000	2.566E+00	11.0000
Np-237	9.5561E-06	235.24	470.48	0.00E+00	2.25E-03	4.50E-03			
Pa-231	2.0359E-09	235.24	470.48	0.00E+00	4.79E-07	9.58E-07			
Pb-210	4.9728E-11	235.24	470.48	0.00E+00	1.17E-08	2.34E-08			
Pm-147	4.8502E-02	235.24	470.48	0.00E+00	1.14E+01	2.28E+01			
Pu-238	1.8254E-02	235.24	470.48	0.00E+00	4.29E+00	8.59E+00			
Pu-239	4.2810E-04	235.24	470.48	0.00E+00	1.01E-01	2.01E-01			
Pu-240	2.4368E-04	235.24	470.48	0.00E+00	5.73E-02	1.15E-01			
Pu-241	3.3415E-02	235.24	470.48	0.00E+00	7.86E+00	1.57E+01			
Pu-242	3.6329E-07	235.24	470.48	0.00E+00	8.55E-05	1.71E-04			
Ra-226	2.2854E-10	235.24	470.48	0.00E+00	5.38E-08	1.08E-07			
Ra-228	1.2426E-14	235.24	470.48	0.00E+00	2.92E-12	5.85E-12			
Ru-106	6.3589E-06	235.24	470.48	0.00E+00	1.50E-03	2.99E-03			
Se-79	1.2933E-05	235.24	470.48	0.00E+00	3.04E-03	6.08E-03			
Sn-126	1.1574E-05	235.24	470.48	0.00E+00	2.72E-03	5.45E-03			
Sr-90	1.9248E+00	235.24	470.48	0.00E+00	4.53E+02	9.06E+02			
Tc-99	4.2239E-04	235.24	470.48	0.00E+00	9.94E-02	1.99E-01			
Th-229	5.0953E-12	235.24	470.48	0.00E+00	1.20E-09	2.40E-09			
Th-230	4.1885E-08	235.24	470.48	0.00E+00	9.85E-06	1.97E-05			
Th-232	1.9270E-14	235.24	470.48	0.00E+00	4.53E-12	9.07E-12			
Th-208	4.6024E-08	235.24	470.48	0.00E+00	1.08E-05	2.17E-05			
U-232	1.2582E-07	235.24	470.48	0.00E+00	2.96E-05	5.92E-05			
U-233	2.5825E-09	235.24	470.48	0.00E+00	6.08E-07	1.22E-06			
U-234	1.8450E-04	235.24	470.48	0.00E+00	4.34E-02	8.68E-02			
U-235	-2.7235E-06	235.24	0.00	2.33E-03	1.69E-03	2.33E-03			
U-236	1.5493E-05	235.24	470.48	0.00E+00	3.64E-03	7.29E-03			
U-238	-4.2851E-09	235.24	0.00	1.45E-03	1.45E-03	1.45E-03			
Y-90	1.9254E+00	235.24	470.48	0.00E+00	4.53E+02	9.06E+02			
Other Radionuclides					4.55E+02	9.10E+02			

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	ALUM	ALUM	This fuel matches on all parameters except enrichment.
BOL HM Constituents	U	U	
BOL Enrichment %	20.0000132	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		235.24	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		470.48	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.14		1.00
Bounding	0.28		

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

²Total burnup for all fuel associated with this worksheet must be 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-S (JALX-MEU) GERMANY
SNF ID #: 1068
Fuel Units & Descr: 28 - MTR TYPE
Heavy Metal Mass: BOL=12.88kg EOL=9.17kg
ROD Storage Site: SRS

Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
1.17

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	3,513.44	7,026.88	0.00E+00	2.33E-06	4.66E-06	Avg. MeV	
Am-241	2.0060E-03	3,513.44	7,026.88	0.00E+00	7.05E+00	1.41E+01	0.0150	7.418E+14
Am-242m	4.2429E-07	3,513.44	7,026.88	0.00E+00	1.49E-03	2.98E-03	0.0250	1.542E+14
Am-243	1.4899E-06	3,513.44	7,026.88	0.00E+00	5.23E-03	1.05E-02	0.0375	1.345E+14
C-14	5.7135E-09	3,513.44	7,026.88	0.00E+00	2.01E-05	4.01E-05	0.0575	1.441E+14
Cf-254	1.3124E-32	3,513.44	7,026.88	0.00E+00	4.61E-29	9.22E-29	0.0850	8.707E+13
Cm-243	1.6443E-07	3,513.44	7,026.88	0.00E+00	5.78E-04	1.16E-03	0.1250	5.892E+13
Cm-244	2.9330E-05	3,513.44	7,026.88	0.00E+00	1.03E-01	2.06E-01	0.2250	7.513E+13
Co-60	5.3186E-06	3,513.44	7,026.88	0.00E+00	1.87E-02	3.74E-02	0.3750	3.271E+13
Cs-134	3.1563E-03	3,513.44	7,026.88	0.00E+00	1.11E+01	2.22E+01	0.5750	5.335E+14
Cs-135	3.4477E-06	3,513.44	7,026.88	0.00E+00	1.21E-02	2.42E-02	0.8500	9.019E+12
Cs-137	2.0313E+00	3,513.44	7,026.88	0.00E+00	7.14E+03	1.43E+04	1.2500	5.150E+12
Eu-154	2.4513E-02	3,513.44	7,026.88	0.00E+00	8.61E+01	1.72E+02	1.7500	2.364E+11
Eu-155	4.8175E-03	3,513.44	7,026.88	0.00E+00	1.69E+01	3.39E+01	2.2500	2.074E+07
Fe-55	1.2397E-04	3,513.44	7,026.88	0.00E+00	4.36E-01	8.71E-01	2.7500	1.172E+07
H-3	4.5697E-03	3,513.44	7,026.88	0.00E+00	1.61E+01	3.21E+01	3.5000	5.386E+04
I-129	7.5300E-07	3,513.44	7,026.88	0.00E+00	2.65E-03	5.29E-03	5.0000	3.049E+03
Kr-85	1.0850E-01	3,513.44	7,026.88	0.00E+00	3.81E+02	7.62E+02	7.0000	3.367E+02
Np-237	9.5561E-06	3,513.44	7,026.88	0.00E+00	3.36E-02	6.71E-02	11.0000	3.773E+01
Pa-231	2.0359E-09	3,513.44	7,026.88	0.00E+00	7.15E-06	1.43E-05		
Pb-210	4.9728E-11	3,513.44	7,026.88	0.00E+00	1.75E-07	3.49E-07		
Pm-147	4.8502E-02	3,513.44	7,026.88	0.00E+00	1.70E+02	3.41E+02		
Pu-238	1.8254E-02	3,513.44	7,026.88	0.00E+00	6.41E+01	1.28E+02		
Pu-239	4.2810E-04	3,513.44	7,026.88	0.00E+00	1.50E+00	3.01E+00		
Pu-240	2.4368E-04	3,513.44	7,026.88	0.00E+00	8.56E-01	1.71E+00		
Pu-241	3.3415E-02	3,513.44	7,026.88	0.00E+00	1.17E+02	2.35E+02		
Pu-242	3.6329E-07	3,513.44	7,026.88	0.00E+00	1.28E-03	2.55E-03		
Ra-226	2.2854E-10	3,513.44	7,026.88	0.00E+00	8.03E-07	1.61E-06		
Ra-228	1.2426E-14	3,513.44	7,026.88	0.00E+00	4.37E-11	8.73E-11		
Ru-106	6.3589E-06	3,513.44	7,026.88	0.00E+00	2.23E-02	4.47E-02		
Se-79	1.2933E-05	3,513.44	7,026.88	0.00E+00	4.54E-02	9.09E-02		
Sn-126	1.1574E-05	3,513.44	7,026.88	0.00E+00	4.07E-02	8.13E-02		
Sr-90	1.9248E+00	3,513.44	7,026.88	0.00E+00	6.76E+03	1.35E+04		
Tc-99	4.2239E-04	3,513.44	7,026.88	0.00E+00	1.48E+00	2.97E+00		
Th-229	5.0953E-12	3,513.44	7,026.88	0.00E+00	1.79E-08	3.58E-08		
Th-230	4.1885E-08	3,513.44	7,026.88	0.00E+00	1.47E-04	2.94E-04		
Th-232	1.9270E-14	3,513.44	7,026.88	0.00E+00	6.77E-11	1.35E-10		
Ti-208	4.6024E-08	3,513.44	7,026.88	0.00E+00	1.62E-04	3.23E-04		
U-232	1.2582E-07	3,513.44	7,026.88	0.00E+00	4.42E-04	8.84E-04		
U-233	2.5825E-09	3,513.44	7,026.88	0.00E+00	9.07E-06	1.81E-05		
U-234	1.8450E-04	3,513.44	7,026.88	0.00E+00	6.48E-01	1.30E+00		
U-235	-2.7235E-06	3,513.44	0.00	1.25E-02	2.98E-03	1.25E-02		
U-236	1.5493E-05	3,513.44	7,026.88	0.00E+00	5.44E-02	1.09E-01		
U-238	-4.2851E-09	3,513.44	0.00	2.38E-03	2.36E-03	2.38E-03		
Y-90	1.9254E+00	3,513.44	7,026.88	0.00E+00	6.76E+03	1.35E+04		
Other Radionuclides					6.80E+03	1.36E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator	From SFD	Used	
Fuel Cladding	LIGHT WATER	LIGHT WATER	
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	45.07	60 to 100	

Burnup Summary (MWd) ²			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		3,513.44	
Bounding		7,026.88	

Checks			Estimated EOL HM/Given EOL HM 1.02
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.87		
Bounding	1.73		

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

² Total burnup for all fuel associated with this worksheet must be 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 PIN CLUSTER U3Si2-LEU CANADA
SNF ID #: 660
Fuel Units & Descr: 1527 - MULTI-PIN CLUSTER
Heavy Metal Mass BOL=3796 275kg EOL=3226 398kg
ROD Storage Site SRS

Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum, 10 to 20%, U)
Template Burnup(MWd) 15
Template BOL Heavy Metal Mass (MT) 0.00034251
Template Decay Time 20 years

Estimated
Canister usage
18"x15"
127.25

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5333E-10	541,647.53	1,083,295.06	0.00E+00	4.62E-04	9.24E-04	Avg MeV	
Am-241	2.2753E-02	541,647.53	1,083,295.06	0.00E+00	1.23E+04	2.46E+04	0.0150	1.098E+17
Am-242m	6.9133E-06	541,647.53	1,083,295.06	0.00E+00	4.83E+00	9.66E+00	0.0250	2.280E+16
Am-243	8.4007E-06	541,647.53	1,083,295.06	0.00E+00	3.47E+00	6.93E+00	0.0375	2.003E+16
C-14	2.9620E-08	541,647.53	1,083,295.06	0.00E+00	1.60E-02	3.21E-02	0.0575	2.158E+16
Cl-36	5.9513E-35	541,647.53	1,083,295.06	0.00E+00	3.22E-29	6.45E-29	0.0850	1.284E+16
Cm-243	2.2087E-06	541,647.53	1,083,295.06	0.00E+00	1.20E+00	2.39E+00	0.1250	8.648E+15
Cm-244	1.1007E-04	541,647.53	1,083,295.06	0.00E+00	5.96E+01	1.19E+02	0.2250	1.107E+16
Co-60	1.6340E-05	541,647.53	1,083,295.06	0.00E+00	8.85E+00	1.77E+01	0.3750	4.818E+15
Cs-134	2.1353E-03	541,647.53	1,083,295.06	0.00E+00	1.16E+03	2.31E+03	0.5750	8.172E+16
Cs-135	4.8607E-06	541,647.53	1,083,295.06	0.00E+00	2.63E+00	5.27E+00	0.8500	1.249E+15
Cs-137	2.0227E+00	541,647.53	1,083,295.06	0.00E+00	1.10E+06	2.19E+06	1.2500	7.038E+14
Eu-154	2.0887E-02	541,647.53	1,083,295.06	0.00E+00	1.13E+04	2.26E+04	1.7500	3.322E+13
Eu-155	4.0867E-03	541,647.53	1,083,295.06	0.00E+00	2.21E+03	4.43E+03	2.2500	3.115E+09
Fe-55	1.4167E-03	541,647.53	1,083,295.06	0.00E+00	7.67E+02	1.53E+03	2.7500	3.686E+08
H-3	4.6653E-03	541,647.53	1,083,295.06	0.00E+00	2.53E+03	5.05E+03	3.5000	1.493E+07
I-129	7.1600E-07	541,647.53	1,083,295.06	0.00E+00	3.88E-01	7.76E-01	5.0000	2.268E+06
Kr-85	1.0240E-01	541,647.53	1,083,295.06	0.00E+00	5.55E+04	1.11E+05	7.0000	2.566E+05
Np-237	3.7227E-06	541,647.53	1,083,295.06	0.00E+00	2.02E+00	4.03E+00	11.0000	2.920E+04
Pa-231	2.6727E-09	541,647.53	1,083,295.06	0.00E+00	1.45E-03	2.90E-03		
Pb-210	4.3313E-14	541,647.53	1,083,295.06	0.00E+00	2.35E-08	4.69E-08		
Pm-147	4.6307E-02	541,647.53	1,083,295.06	0.00E+00	2.51E+04	5.02E+04		
Pu-238	5.5273E-03	541,647.53	1,083,295.06	0.00E+00	2.99E+03	5.99E+03		
Pu-239	1.0313E-02	541,647.53	1,083,295.06	0.00E+00	5.59E+03	1.12E+04		
Pu-240	5.4180E-03	541,647.53	1,083,295.06	0.00E+00	2.93E+03	5.87E+03		
Pu-241	3.7573E-01	541,647.53	1,083,295.06	0.00E+00	2.04E+05	4.07E+05		
Pu-242	3.0713E-06	541,647.53	1,083,295.06	0.00E+00	1.66E+00	3.33E+00		
Ra-226	2.3807E-13	541,647.53	1,083,295.06	0.00E+00	1.29E-07	2.58E-07		
Ra-228	1.0607E-14	541,647.53	1,083,295.06	0.00E+00	5.75E-09	1.15E-08		
Ru-106	8.4800E-06	541,647.53	1,083,295.06	0.00E+00	4.59E+00	9.19E+00		
Se-79	1.2533E-05	541,647.53	1,083,295.06	0.00E+00	6.79E+00	1.36E+01		
Sn-126	1.1393E-05	541,647.53	1,083,295.06	0.00E+00	6.17E+00	1.23E+01		
Sr-90	1.8400E+00	541,647.53	1,083,295.06	0.00E+00	9.97E+05	1.99E+06		
Tc-99	4.3533E-04	541,647.53	1,083,295.06	0.00E+00	2.36E+02	4.72E+02		
Th-229	5.8947E-13	541,647.53	1,083,295.06	0.00E+00	3.19E-07	6.39E-07		
Th-230	5.9500E-11	541,647.53	1,083,295.06	0.00E+00	3.22E-05	6.45E-05		
Th-232	1.6360E-14	541,647.53	1,083,295.06	0.00E+00	8.86E-09	1.77E-08		
Ti-208	7.6000E-09	541,647.53	1,083,295.06	0.00E+00	4.12E-03	8.23E-03		
U-232	2.0747E-08	541,647.53	1,083,295.06	0.00E+00	1.12E-02	2.25E-02	Thermal Power	
U-233	4.4013E-10	541,647.53	1,083,295.06	0.00E+00	2.38E-04	4.77E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4.6500E-07	541,647.53	1,083,295.06	0.00E+00	2.52E-01	5.04E-01	1.30E+04	2.59E+04
U-235	-2.5335E-06	541,647.53	0.00	1.62E+00	2.48E-01	1.62E+00	Total	Total
U-236	1.3000E-05	541,647.53	1,083,295.06	0.00E+00	7.04E+00	1.41E+01		
U-238	-1.4207E-08	541,647.53	0.00	1.02E+00	1.02E+00	1.02E+00		
Y-90	1.8400E+00	541,647.53	1,083,295.06	0.00E+00	9.97E+05	1.99E+06		
Other Radionuclides					1.04E+06	2.08E+06		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %:	19.75000043	10 to 20	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		541,647.53	
Bounding		1,083,295.06	

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	3.26		
Bounding	6.52		

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

²Total burnup for all fuel associated with this worksheet must be 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 PIN CLUSTER U3S2-LEU SO KOREA
 SNF ID #: 293
 Fuel Units & Descr: 48 - MULTI-PIN CLUSTER
 Heavy Metal Mass: BOL=59 52kg EOL=52 138kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water Alum., 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage
 18"x15"
 4.00

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	6,991.28	13,982.55	0.00E+00	4.64E-06	9.27E-06	Avg MeV	
Am-241	2.0060E-03	6,991.28	13,982.55	0.00E+00	1.40E+01	2.80E+01	0.0150	1.476E+15
Am-242m	4.2429E-07	6,991.28	13,982.55	0.00E+00	2.97E-03	5.93E-03	0.0250	3.069E+14
Am-243	1.4899E-06	6,991.28	13,982.55	0.00E+00	1.04E-02	2.08E-02	0.0375	2.677E+14
C-14	5.7135E-09	6,991.28	13,982.55	0.00E+00	3.99E-05	7.99E-05	0.0575	2.867E+14
Cl-36	1.3124E-32	6,991.28	13,982.55	0.00E+00	9.18E-29	1.84E-28	0.0850	1.733E+14
Cm-243	1.6443E-07	6,991.28	13,982.55	0.00E+00	1.15E-03	2.30E-03	0.1250	1.172E+14
Cm-244	2.9330E-05	6,991.28	13,982.55	0.00E+00	2.05E-01	4.10E-01	0.2250	1.495E+14
Co-60	5.3186E-06	6,991.28	13,982.55	0.00E+00	3.72E-02	7.44E-02	0.3750	6.508E+13
Cs-134	3.1563E-03	6,991.28	13,982.55	0.00E+00	2.21E+01	4.41E+01	0.5750	1.062E+15
Cs-135	3.4477E-06	6,991.28	13,982.55	0.00E+00	2.41E-02	4.82E-02	0.8500	1.795E+13
Cs-137	2.0313E+00	6,991.28	13,982.55	0.00E+00	1.42E+04	2.84E+04	1.2500	1.025E+13
Eu-154	2.4513E-02	6,991.28	13,982.55	0.00E+00	1.71E+02	3.43E+02	1.7500	4.704E+11
Eu-155	4.8175E-03	6,991.28	13,982.55	0.00E+00	3.37E+01	6.74E+01	2.2500	4.126E+07
Fe-55	1.2397E-04	6,991.28	13,982.55	0.00E+00	8.67E-01	1.73E+00	2.7500	2.333E+07
H-3	4.5697E-03	6,991.28	13,982.55	0.00E+00	3.19E+01	6.39E+01	3.5000	1.072E+05
I-129	7.5300E-07	6,991.28	13,982.55	0.00E+00	5.26E-03	1.05E-02	5.0000	6.094E+03
Kr-85	1.0850E-01	6,991.28	13,982.55	0.00E+00	7.59E+02	1.52E+03	7.0000	6.729E+02
Np-237	9.5561E-06	6,991.28	13,982.55	0.00E+00	6.68E-02	1.34E-01	11.0000	7.543E+01
Pa-231	2.0359E-09	6,991.28	13,982.55	0.00E+00	1.42E-05	2.85E-05		
Pb-210	4.9728E-11	6,991.28	13,982.55	0.00E+00	3.48E-07	6.95E-07		
Pm-147	4.8502E-02	6,991.28	13,982.55	0.00E+00	3.39E+02	6.78E+02		
Pu-238	1.8254E-02	6,991.28	13,982.55	0.00E+00	1.28E+02	2.55E+02		
Pu-239	4.2810E-04	6,991.28	13,982.55	0.00E+00	2.99E+00	5.99E+00		
Pu-240	2.4368E-04	6,991.28	13,982.55	0.00E+00	1.70E+00	3.41E+00		
Pu-241	3.3415E-02	6,991.28	13,982.55	0.00E+00	2.34E+02	4.67E+02		
Pu-242	3.6329E-07	6,991.28	13,982.55	0.00E+00	2.54E-03	5.08E-03		
Ra-226	2.2854E-10	6,991.28	13,982.55	0.00E+00	1.60E-06	3.20E-06		
Ra-228	1.2426E-14	6,991.28	13,982.55	0.00E+00	8.69E-11	1.74E-10		
Ru-106	6.3589E-06	6,991.28	13,982.55	0.00E+00	4.45E-02	8.89E-02		
Se-79	1.2933E-05	6,991.28	13,982.55	0.00E+00	9.04E-02	1.81E-01		
Sn-126	1.1574E-05	6,991.28	13,982.55	0.00E+00	8.09E-02	1.62E-01		
Sr-90	1.9248E+00	6,991.28	13,982.55	0.00E+00	1.35E+04	2.69E+04		
Tc-99	4.2239E-04	6,991.28	13,982.55	0.00E+00	2.95E+00	5.91E+00		
Th-229	5.0953E-12	6,991.28	13,982.55	0.00E+00	3.56E-08	7.12E-08		
Th-230	4.1885E-08	6,991.28	13,982.55	0.00E+00	2.93E-04	5.86E-04		
Th-232	1.9270E-14	6,991.28	13,982.55	0.00E+00	1.35E-10	2.69E-10		
Ti-208	4.6024E-08	6,991.28	13,982.55	0.00E+00	3.22E-04	6.44E-04		
U-232	1.2582E-07	6,991.28	13,982.55	0.00E+00	8.80E-04	1.76E-03		
U-233	2.5825E-09	6,991.28	13,982.55	0.00E+00	1.81E-05	3.61E-05		
U-234	1.8450E-04	6,991.28	13,982.55	0.00E+00	1.29E+00	2.58E+00		
U-235	-2.7235E-06	6,991.28	0.00	2.57E-02	6.68E-03	2.57E-02		
U-236	1.5493E-05	6,991.28	13,982.55	0.00E+00	1.08E-01	2.17E-01		
U-238	-4.2851E-09	6,991.28	0.00	1.60E-02	1.60E-02	1.60E-02		
Y-90	1.9254E+00	6,991.28	13,982.55	0.00E+00	1.35E+04	2.70E+04		
Other Radionuclides							Thermal Power	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							1.67E+02	3.33E+02
							Total	Total

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.
	From SFD	Used	
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	19.99999952	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		6.991.28	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		13.982.55	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.37		1.01
Bounding	0.75		

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

²Total burnup for all fuel associated with this worksheet must be 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 PIN CLUSTER U3Si2-LEU SO KOREA
 SNF ID #: 659
 Fuel Units & Descr: 158 - MULTI-PIN CLUSTER
 Heavy Metal Mass: BOL=343 65kg EOL=298 288kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2010
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup (MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 20 years

Estimated
 Canister usage
 18"x15"
 13 17

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)		
Ac-227	6.6313E-10	42,958.50	85,917.00	0.00E+00	2.85E-05	5.70E-05	Avg MeV	
Am-241	2.0060E-03	42,958.50	85,917.00	0.00E+00	8.62E+01	1.72E+02	0.0150	9.069E+15
Am-242m	4.2429E-07	42,958.50	85,917.00	0.00E+00	1.82E-02	3.65E-02	0.0250	1.886E+15
Am-243	1.4899E-06	42,958.50	85,917.00	0.00E+00	6.40E-02	1.28E-01	0.0375	1.645E+15
C-14	5.7135E-09	42,958.50	85,917.00	0.00E+00	2.45E-04	4.91E-04	0.0575	1.762E+15
Cl-36	1.3124E-32	42,958.50	85,917.00	0.00E+00	5.64E-28	1.13E-27	0.0850	1.065E+15
Co-243	1.6443E-07	42,958.50	85,917.00	0.00E+00	7.06E-03	1.41E-02	0.1250	7.204E+14
Co-244	2.9330E-05	42,958.50	85,917.00	0.00E+00	1.26E+00	2.52E+00	0.2250	9.186E+14
Co-60	5.3186E-06	42,958.50	85,917.00	0.00E+00	2.28E-01	4.57E-01	0.3750	3.999E+14
Cs-134	3.1563E-03	42,958.50	85,917.00	0.00E+00	1.36E+02	2.71E+02	0.5750	6.523E+15
Cs-135	3.4477E-06	42,958.50	85,917.00	0.00E+00	1.48E-01	2.96E-01	0.8500	1.103E+14
Cs-137	2.0313E+00	42,958.50	85,917.00	0.00E+00	8.73E+04	1.75E+05	1.2500	6.297E+13
Eu-154	2.4513E-02	42,958.50	85,917.00	0.00E+00	1.05E+03	2.11E+03	1.7500	2.890E+12
Eu-155	4.8175E-03	42,958.50	85,917.00	0.00E+00	2.07E+02	4.14E+02	2.2500	2.535E+08
Fe-55	1.2397E-04	42,958.50	85,917.00	0.00E+00	5.33E+00	1.07E+01	2.7500	1.433E+08
H-3	4.5697E-03	42,958.50	85,917.00	0.00E+00	1.96E+02	3.93E+02	3.5000	6.589E+05
I-129	7.5300E-07	42,958.50	85,917.00	0.00E+00	3.23E-02	6.47E-02	5.0000	3.743E+04
Kr-85	1.0850E-01	42,958.50	85,917.00	0.00E+00	4.66E+03	9.32E+03	7.0000	4.133E+03
Np-237	9.5561E-06	42,958.50	85,917.00	0.00E+00	4.11E-01	8.21E-01	11.0000	4.633E+02
Pa-231	2.0359E-09	42,958.50	85,917.00	0.00E+00	8.75E-05	1.75E-04		
Pb-210	4.9728E-11	42,958.50	85,917.00	0.00E+00	2.14E-06	4.27E-06		
Pm-147	4.8502E-02	42,958.50	85,917.00	0.00E+00	2.08E+03	4.17E+03		
Pu-238	1.8254E-02	42,958.50	85,917.00	0.00E+00	7.84E+02	1.57E+03		
Pu-239	4.2810E-04	42,958.50	85,917.00	0.00E+00	1.84E+01	3.68E+01		
Pu-240	2.4368E-04	42,958.50	85,917.00	0.00E+00	1.05E+01	2.09E+01		
Pu-241	3.3415E-02	42,958.50	85,917.00	0.00E+00	1.44E+03	2.87E+03		
Pu-242	3.6329E-07	42,958.50	85,917.00	0.00E+00	1.56E-02	3.12E-02		
Ra-226	2.2854E-10	42,958.50	85,917.00	0.00E+00	9.82E-06	1.96E-05		
Ra-228	1.2426E-14	42,958.50	85,917.00	0.00E+00	5.34E-10	1.07E-09		
Ru-106	6.3589E-06	42,958.50	85,917.00	0.00E+00	2.73E-01	5.46E-01		
Se-79	1.2933E-05	42,958.50	85,917.00	0.00E+00	5.56E-01	1.11E+00		
Sn-126	1.1574E-05	42,958.50	85,917.00	0.00E+00	4.97E-01	9.94E-01		
Sr-90	1.9248E+00	42,958.50	85,917.00	0.00E+00	8.27E+04	1.65E+05		
Tc-99	4.2239E-04	42,958.50	85,917.00	0.00E+00	1.81E+01	3.63E+01		
Th-229	5.0953E-12	42,958.50	85,917.00	0.00E+00	2.19E-07	4.38E-07		
Th-230	4.1885E-08	42,958.50	85,917.00	0.00E+00	1.80E-03	3.60E-03		
Th-232	1.9270E-14	42,958.50	85,917.00	0.00E+00	8.28E-10	1.66E-09		
Ti-208	4.6024E-08	42,958.50	85,917.00	0.00E+00	1.98E-03	3.96E-03		
U-232	1.2582E-07	42,958.50	85,917.00	0.00E+00	5.40E-03	1.08E-02		
U-233	2.5825E-09	42,958.50	85,917.00	0.00E+00	1.11E-04	2.22E-04		
U-234	1.8450E-04	42,958.50	85,917.00	0.00E+00	7.93E+00	1.59E+01		
U-235	-2.7235E-06	42,958.50	0.00	1.49E-01	3.15E-02	1.49E-01		
U-236	1.5493E-05	42,958.50	85,917.00	0.00E+00	6.66E-01	1.33E+00		
U-238	-4.2851E-09	42,958.50	0.00	9.24E-02	9.22E-02	9.24E-02		
Y-90	1.9254E+00	42,958.50	85,917.00	0.00E+00	8.27E+04	1.65E+05		
Other Radionuclides					8.31E+04	1.66E+05		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.02E+03	2.05E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
Fuel Cladding	ALUM	ALUM	This fuel matches on all parameters except enrichment.
BOL HM Constituents	U	U	
BOL Enrichment %	20.0000055	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		42,958.50	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		85,917.00	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.40		1.01
Bounding	0.79		

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

²Total burnup for all fuel associated with this worksheet must be 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 PIN CLUSTER UALX HEU CANADA
SNF ID #: 661
Fuel Units & Descr: 225 - MULTI-PIN CLUSTER
Heavy Metal Mass: BOL=118.597kg; EOL=34.627kg
ROD Storage Site: SRS

Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 20 years

Estimated
Canister usage
18"x15"
18.75

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	79,521.22	112,314.13	0.00E+00	5.27E-05	7.45E-05	Avg. MeV	
Am-241	2.0060E-03	79,521.22	112,314.13	0.00E+00	1.60E+02	2.25E+02	0.0150	1.186E+16
Am-242m	4.2429E-07	79,521.22	112,314.13	0.00E+00	3.37E-02	4.77E-02	0.0250	2.465E+15
Am-243	1.4899E-06	79,521.22	112,314.13	0.00E+00	1.18E-01	1.67E-01	0.0375	2.150E+15
C-14	5.7135E-09	79,521.22	112,314.13	0.00E+00	4.54E-04	6.42E-04	0.0575	2.303E+15
Cl-36	1.3124E-32	79,521.22	112,314.13	0.00E+00	1.04E-27	1.47E-27	0.0850	1.392E+15
Cm-243	1.6443E-07	79,521.22	112,314.13	0.00E+00	1.31E-02	1.85E-02	0.1250	9.418E+14
Cm-244	2.9330E-05	79,521.22	112,314.13	0.00E+00	2.33E+00	3.29E+00	0.2250	1.201E+15
Co-60	5.3186E-06	79,521.22	112,314.13	0.00E+00	4.23E-01	5.97E-01	0.3750	5.228E+14
Cs-134	3.1563E-03	79,521.22	112,314.13	0.00E+00	2.51E+02	3.54E+02	0.5750	8.527E+15
Cs-135	3.4477E-06	79,521.22	112,314.13	0.00E+00	2.74E-01	3.87E-01	0.8500	1.442E+14
Cs-137	2.0313E+00	79,521.22	112,314.13	0.00E+00	1.62E+05	2.28E+05	1.2500	8.232E+13
Eu-154	2.4513E-02	79,521.22	112,314.13	0.00E+00	1.95E+03	2.75E+03	1.7500	3.778E+12
Eu-155	4.8175E-03	79,521.22	112,314.13	0.00E+00	3.83E+02	5.41E+02	2.2500	3.314E+08
Fe-55	1.2397E-04	79,521.22	112,314.13	0.00E+00	9.86E+00	1.39E+01	2.7500	1.874E+08
H-3	4.5697E-03	79,521.22	112,314.13	0.00E+00	3.63E+02	5.13E+02	3.5000	8.607E+05
I-129	7.5300E-07	79,521.22	112,314.13	0.00E+00	5.99E-02	8.46E-02	5.0000	4.866E+04
Kr-85	1.0850E-01	79,521.22	112,314.13	0.00E+00	8.63E+03	1.22E+04	7.0000	5.372E+03
Np-237	9.5561E-06	79,521.22	112,314.13	0.00E+00	7.60E-01	1.07E+00	11.0000	6.020E+02
Pa-231	2.0359E-09	79,521.22	112,314.13	0.00E+00	1.62E-04	2.29E-04		
Pb-210	4.9728E-11	79,521.22	112,314.13	0.00E+00	3.95E-06	5.59E-06		
Pm-147	4.8502E-02	79,521.22	112,314.13	0.00E+00	3.86E+03	5.45E+03		
Pu-238	1.8254E-02	79,521.22	112,314.13	0.00E+00	1.45E+03	2.05E+03		
Pu-239	4.2810E-04	79,521.22	112,314.13	0.00E+00	3.40E+01	4.81E+01		
Pu-240	2.4368E-04	79,521.22	112,314.13	0.00E+00	1.94E+01	2.74E+01		
Pu-241	3.3415E-02	79,521.22	112,314.13	0.00E+00	2.66E+03	3.75E+03		
Pu-242	3.6329E-07	79,521.22	112,314.13	0.00E+00	2.89E-02	4.08E-02		
Ra-226	2.2854E-10	79,521.22	112,314.13	0.00E+00	1.82E-05	2.57E-05		
Ra-228	1.2426E-14	79,521.22	112,314.13	0.00E+00	9.88E-10	1.40E-09		
Ru-106	6.3589E-06	79,521.22	112,314.13	0.00E+00	5.06E-01	7.14E-01		
Se-79	1.2933E-05	79,521.22	112,314.13	0.00E+00	1.03E+00	1.45E+00		
Sn-126	1.1574E-05	79,521.22	112,314.13	0.00E+00	9.20E-01	1.30E+00		
Sr-90	1.9248E+00	79,521.22	112,314.13	0.00E+00	1.53E+05	2.16E+05		
Tc-99	4.2239E-04	79,521.22	112,314.13	0.00E+00	3.36E+01	4.74E+01		
Th-229	5.0953E-12	79,521.22	112,314.13	0.00E+00	4.05E-07	5.72E-07		
Th-230	4.1885E-08	79,521.22	112,314.13	0.00E+00	3.33E-03	4.70E-03		
Th-232	1.9270E-14	79,521.22	112,314.13	0.00E+00	1.53E-09	2.16E-09		
Ti-208	4.6024E-08	79,521.22	112,314.13	0.00E+00	3.66E-03	5.17E-03		
U-232	1.2582E-07	79,521.22	112,314.13	0.00E+00	1.00E-02	1.41E-02		
U-233	2.5825E-09	79,521.22	112,314.13	0.00E+00	2.05E-04	2.90E-04		
U-234	1.8450E-04	79,521.22	112,314.13	0.00E+00	1.47E+01	2.07E+01		
U-235	-2.7235E-06	79,521.22	0.00	2.39E-01	2.22E-02	2.39E-01		
U-236	1.5493E-05	79,521.22	112,314.13	0.00E+00	1.23E+00	1.74E+00		
U-238	-4.2851E-09	79,521.22	0.00	2.73E-03	2.39E-03	2.73E-03		
Y-90	1.9254E+00	79,521.22	112,314.13	0.00E+00	1.53E+05	2.16E+05		
Other Radionuclides					1.54E+05	2.17E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	93.14999856	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
		79,521.22	
Bounding		112,314.13	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
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
	2.13		
Bounding	3.01		1.14

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

²Total burnup for all fuel associated with this worksheet must be 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 PIN CLUSTER UALX HEU CANADA
SNF ID # 662
Fuel Units & Descr: 741 - MULTI-PIN CLUSTER
Heavy Metal Mass BOL=395.694kg EOL=97.59kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum, 40 to 100% U)
²Template Burnup(MWd) 164.6
Template BOL Heavy Metal Mass (MT) 0.000377
Template Decay Time 20 years

Estimated
Canister usage
18"x15"
61.75

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ¹	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.1355E-10	274.584.76	364.474.92	0.00E+00	8.61E-05	1.14E-04	Avg MeV	
Am-241	8.0194E-03	274.584.76	364.474.92	0.00E+00	2.20E+03	2.92E+03	0.0150	3.853E+16
Am-242m	1.3694E-06	274.584.76	364.474.92	0.00E+00	3.76E-01	4.99E-01	0.0250	7.942E+15
Am-243	3.7096E-05	274.584.76	364.474.92	0.00E+00	1.02E+01	1.35E+01	0.0375	7.057E+15
C-14	2.6464E-08	274.584.76	364.474.92	0.00E+00	7.27E-03	9.65E-03	0.0575	7.471E+15
Cl-36	4.4441E-31	274.584.76	364.474.92	0.00E+00	1.22E-25	1.62E-25	0.0850	4.522E+15
Cm-243	5.7029E-06	274.584.76	364.474.92	0.00E+00	1.57E+00	2.08E+00	0.1250	3.203E+15
Cm-244	4.6555E-03	274.584.76	364.474.92	0.00E+00	1.28E+03	1.70E+03	0.2250	3.893E+15
Co-60	4.8663E-05	274.584.76	364.474.92	0.00E+00	1.34E+01	1.77E+01	0.3750	1.685E+15
Cs-134	1.0638E-02	274.584.76	364.474.92	0.00E+00	2.92E+03	3.88E+03	0.5750	2.789E+16
Cs-135	4.2564E-06	274.584.76	364.474.92	0.00E+00	1.17E+00	1.55E+00	0.8500	7.303E+14
Cs-137	2.0358E+00	274.584.76	364.474.92	0.00E+00	5.59E+05	7.42E+05	1.2500	4.682E+14
Eu-154	5.1956E-02	274.584.76	364.474.92	0.00E+00	1.43E+04	1.89E+04	1.7500	1.804E+13
Eu-155	1.4295E-02	274.584.76	364.474.92	0.00E+00	3.93E+03	5.21E+03	2.2500	1.154E+09
Fe-55	1.3560E-03	274.584.76	364.474.92	0.00E+00	3.72E+02	4.94E+02	2.7500	6.750E+08
H-3	4.6258E-03	274.584.76	364.474.92	0.00E+00	1.27E+03	1.69E+03	3.5000	2.852E+07
I-129	6.6403E-07	274.584.76	364.474.92	0.00E+00	1.82E-01	2.42E-01	5.0000	1.097E+07
Kr-85	1.0808E-01	274.584.76	364.474.92	0.00E+00	2.97E+04	3.94E+04	7.0000	1.259E+06
Np-237	3.1537E-05	274.584.76	364.474.92	0.00E+00	8.66E+00	1.15E+01	11.0000	1.442E+05
Pa-231	9.7023E-10	274.584.76	364.474.92	0.00E+00	2.66E-04	3.54E-04		
Pb-210	1.1731E-11	274.584.76	364.474.92	0.00E+00	3.22E-06	4.28E-06		
Pm-147	2.4405E-02	274.584.76	364.474.92	0.00E+00	6.70E+03	8.89E+03		
Pu-238	1.5358E-01	274.584.76	364.474.92	0.00E+00	4.22E+04	5.60E+04		
Pu-239	6.9502E-04	274.584.76	364.474.92	0.00E+00	1.91E+02	2.53E+02		
Pu-240	3.7631E-04	274.584.76	364.474.92	0.00E+00	1.03E+02	1.37E+02		
Pu-241	1.3433E-01	274.584.76	364.474.92	0.00E+00	3.69E+04	4.90E+04		
Pu-242	3.0911E-06	274.584.76	364.474.92	0.00E+00	8.49E-01	1.13E+00		
Ra-226	5.5079E-11	274.584.76	364.474.92	0.00E+00	1.51E-05	2.01E-05		
Ra-228	1.3335E-14	274.584.76	364.474.92	0.00E+00	3.66E-09	4.86E-09		
Ru-106	7.3390E-06	274.584.76	364.474.92	0.00E+00	2.02E+00	2.67E+00		
Se-79	1.2339E-05	274.584.76	364.474.92	0.00E+00	3.39E+00	4.50E+00		
Sn-126	1.0194E-05	274.584.76	364.474.92	0.00E+00	2.80E+00	3.72E+00		
Sr-90	1.9064E+00	274.584.76	364.474.92	0.00E+00	5.23E+05	6.95E+05		
Tc-99	3.8056E-04	274.584.76	364.474.92	0.00E+00	1.04E+02	1.39E+02		
Th-229	4.9198E-12	274.584.76	364.474.92	0.00E+00	1.35E-06	1.79E-06		
Th-230	1.0547E-08	274.584.76	364.474.92	0.00E+00	2.90E-03	3.84E-03		
Th-232	2.0705E-14	274.584.76	364.474.92	0.00E+00	5.69E-09	7.55E-09		
Ti-208	4.8827E-08	274.584.76	364.474.92	0.00E+00	1.34E-02	1.78E-02		
U-232	1.3414E-07	274.584.76	364.474.92	0.00E+00	3.68E-02	4.89E-02		
U-233	3.7679E-09	274.584.76	364.474.92	0.00E+00	1.03E-03	1.37E-03		
U-234	5.2047E-05	274.584.76	364.474.92	0.00E+00	1.43E+01	1.90E+01		
U-235	-2.8661E-06	274.584.76	0.00	7.95E-01	8.24E-03	7.95E-01		
U-236	1.6701E-05	274.584.76	364.474.92	0.00E+00	4.59E+00	6.09E+00		
U-238	-9.4194E-09	274.584.76	0.00	9.31E-03	6.72E-03	9.31E-03		
Y-90	1.9070E+00	274.584.76	364.474.92	0.00E+00	5.24E+05	6.95E+05		
Other Radionuclides					5.35E+05	7.10E+05		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92.9999565	40 to 100	

Burnup Summary (MWd)³

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		274.584.76	
Bounding		364.474.92	

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	1.59		1.06
Bounding	2.11		

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

²Total burnup for all fuel associated with this worksheet must be 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 PIN CLUSTER UALX HEU CANADA
SNF ID #: 663
Fuel Units & Descr: 131 - MULTI-PIN CLUSTER
Heavy Metal Mass: BOL=76 648kg; EOL=32.383kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 40 to 100%, U)
²Template Burnup(MWd): 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time: 20 years

Estimated
Canister usage:
18"x15"
10.92

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.1355E-10	40,772.53	70,600.79	0.00E+00	1.28E-05	2.21E-05	Avg. MeV	
Am-241	8.0194E-03	40,772.53	70,600.79	0.00E+00	3.27E+02	5.66E+02	0.0150	7.464E+15
Am-242m	1.3694E-06	40,772.53	70,600.79	0.00E+00	5.58E-02	9.67E-02	0.0250	1.538E+15
Am-243	3.7096E-05	40,772.53	70,600.79	0.00E+00	1.51E+00	2.62E+00	0.0375	1.367E+15
C-14	2.6464E-08	40,772.53	70,600.79	0.00E+00	1.08E-03	1.87E-03	0.0575	1.447E+15
Cl-36	4.4441E-31	40,772.53	70,600.79	0.00E+00	1.81E-26	3.14E-26	0.0850	8.760E+14
Cm-243	5.7029E-06	40,772.53	70,600.79	0.00E+00	2.33E-01	4.03E-01	0.1250	6.204E+14
Cm-244	4.6555E-03	40,772.53	70,600.79	0.00E+00	1.90E+02	3.29E+02	0.2250	7.540E+14
Co-60	4.8663E-05	40,772.53	70,600.79	0.00E+00	1.98E+00	3.44E+00	0.3750	3.263E+14
Cs-134	1.0638E-02	40,772.53	70,600.79	0.00E+00	4.34E+02	7.51E+02	0.5750	5.402E+15
Cs-135	4.2564E-06	40,772.53	70,600.79	0.00E+00	1.74E-01	3.01E-01	0.8500	1.415E+14
Cs-137	2.0358E+00	40,772.53	70,600.79	0.00E+00	8.30E+04	1.44E+05	1.2500	9.069E+13
Eu-154	5.1956E-02	40,772.53	70,600.79	0.00E+00	2.12E+03	3.67E+03	1.7500	3.495E+12
Eu-155	1.4295E-02	40,772.53	70,600.79	0.00E+00	5.83E+02	1.01E+03	2.2500	2.235E+08
Fe-55	1.3560E-03	40,772.53	70,600.79	0.00E+00	5.53E+01	9.57E+01	2.7500	1.308E+08
H-3	4.6258E-03	40,772.53	70,600.79	0.00E+00	1.89E+02	3.27E+02	3.5000	5.525E+06
I-129	6.6403E-07	40,772.53	70,600.79	0.00E+00	2.71E-02	4.69E-02	5.0000	2.124E+06
Kr-85	1.0808E-01	40,772.53	70,600.79	0.00E+00	4.41E+03	7.63E+03	7.0000	2.438E+05
Np-237	3.1537E-05	40,772.53	70,600.79	0.00E+00	1.29E+00	2.23E+00	11.0000	2.794E+04
Pa-231	9.7023E-10	40,772.53	70,600.79	0.00E+00	3.96E-05	6.85E-05		
Pb-210	1.1731E-11	40,772.53	70,600.79	0.00E+00	4.78E-07	8.28E-07		
Pm-147	2.4405E-02	40,772.53	70,600.79	0.00E+00	9.95E+02	1.72E+03		
Pu-238	1.5358E-01	40,772.53	70,600.79	0.00E+00	6.26E+03	1.08E+04		
Pu-239	6.9502E-04	40,772.53	70,600.79	0.00E+00	2.83E+01	4.91E+01		
Pu-240	3.7631E-04	40,772.53	70,600.79	0.00E+00	1.53E+01	2.66E+01		
Pu-241	1.3433E-01	40,772.53	70,600.79	0.00E+00	5.48E+03	9.48E+03		
Pu-242	3.0911E-06	40,772.53	70,600.79	0.00E+00	1.26E-01	2.18E-01		
Ra-226	5.5079E-11	40,772.53	70,600.79	0.00E+00	2.25E-06	3.89E-06		
Ra-228	1.3335E-14	40,772.53	70,600.79	0.00E+00	5.44E-10	9.41E-10		
Ru-106	7.3390E-06	40,772.53	70,600.79	0.00E+00	2.99E-01	5.18E-01		
Se-79	1.2339E-05	40,772.53	70,600.79	0.00E+00	5.03E-01	8.71E-01		
Sn-126	1.0194E-05	40,772.53	70,600.79	0.00E+00	4.16E-01	7.20E-01		
Sr-90	1.9064E+00	40,772.53	70,600.79	0.00E+00	7.77E+04	1.35E+05		
Tc-99	3.8056E-04	40,772.53	70,600.79	0.00E+00	1.55E+01	2.69E+01		
Th-229	4.9198E-12	40,772.53	70,600.79	0.00E+00	2.01E-07	3.47E-07		
Th-230	1.0547E-08	40,772.53	70,600.79	0.00E+00	4.30E-04	7.45E-04		
Th-232	2.0705E-14	40,772.53	70,600.79	0.00E+00	8.44E-10	1.46E-09		
Ti-208	4.8827E-08	40,772.53	70,600.79	0.00E+00	1.99E-03	3.45E-03		
U-232	1.3414E-07	40,772.53	70,600.79	0.00E+00	5.47E-03	9.47E-03		
U-233	3.7679E-09	40,772.53	70,600.79	0.00E+00	1.54E-04	2.66E-04		
U-234	5.2047E-05	40,772.53	70,600.79	0.00E+00	2.12E+00	3.67E+00		
U-235	-2.8661E-06	40,772.53	0.00	1.54E-01	3.74E-02	1.54E-01		
U-236	1.6701E-05	40,772.53	70,600.79	0.00E+00	6.81E-01	1.18E+00		
U-238	-9.4194E-09	40,772.53	0.00	1.76E-03	1.38E-03	1.76E-03		
Y-90	1.9070E+00	40,772.53	70,600.79	0.00E+00	7.78E+04	1.35E+05		
Other Radionuclides					7.94E+04	1.37E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	HEAVY WATER	HEAVY WATER	
	ALUM	ALUM	
	U	U	
	93.15000501	40 to 100	

Burnup Summary (MWd) ³			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		40,772.53	
		70,600.79	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
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	1.22		
	2.11		1.03

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

²Total burnup for all fuel associated with this worksheet must be 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 SLOWPOKE (HEU) CANADA
SNF ID #: 665
Fuel Units & Descr: 2 - 297 ROD ARRAY
Heavy Metal Mass BOL=1 772kg EOL=1 742kg
ROD Storage Site SRS

Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100% U)
*Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time: 20 years

Estimated
Canister usage
18"x10"
0 08

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	28.24	56 48	0 00E+00	1.87E-08	3 75E-08	Avg MeV	
Am-241	2 0060E-03	28.24	56 48	0 00E+00	5 66E-02	1.13E-01	0 0150	5 962E+12
Am-242m	4 2429E-07	28.24	56 48	0 00E+00	1.20E-05	2 40E-05	0 0250	1 240E+12
Am-243	1 4899E-06	28.24	56 48	0 00E+00	4 21E-05	8 42E-05	0 0375	1 081E+12
C-14	5 7135E-09	28.24	56 48	0 00E+00	1 61E-07	3 23E-07	0 0575	1 158E+12
Cl-36	1.3124E-32	28.24	56 48	0 00E+00	3 71E-31	7 41E-31	0 0850	6 999E+11
Cm-243	1 6443E-07	28.24	56 48	0 00E+00	4 64E-06	9.29E-06	0 1250	4 736E+11
Cm-244	2 9330E-05	28.24	56 48	0 00E+00	8.28E-04	1 66E-03	0.2250	6 040E+11
Co-60	5 3186E-06	28.24	56 48	0 00E+00	1.50E-04	3 00E-04	0 3750	2.629E+11
Cs-134	3 1563E-03	28.24	56 48	0 00E+00	8 91E-02	1 78E-01	0 5750	4.288E+12
Cs-135	3 4477E-06	28.24	56 48	0 00E+00	9 74E-05	1 95E-04	0 8500	7.250E+10
Cs-137	2 0313E+00	28.24	56 48	0 00E+00	5 74E+01	1 15E+02	1.2500	4 140E+10
Eu-154	2 4513E-02	28.24	56 48	0 00E+00	6 92E-01	1 38E+00	1 7500	1 900E+09
Eu-155	4 8175E-03	28.24	56 48	0 00E+00	1.36E-01	2 72E-01	2.2500	1 667E+05
Fe-55	1.2397E-04	28.24	56 48	0 00E+00	3 50E-03	7.00E-03	2 7500	9 422E+04
H-3	4 5697E-03	28.24	56 48	0 00E+00	1.29E-01	2.58E-01	3 5000	4.332E+02
I-129	7 5300E-07	28.24	56 48	0 00E+00	2 13E-05	4.25E-05	5 0000	2 461E+01
Kr-85	1 0850E-01	28.24	56 48	0 00E+00	3 06E+00	6 13E+00	7 0000	2 717E+00
Np-237	9 5561E-06	28.24	56 48	0 00E+00	2 70E-04	5 40E-04	11.0000	3 045E-01
Pa-231	2 0359E-09	28.24	56 48	0 00E+00	5 75E-08	1 15E-07		
Pb-210	4 9728E-11	28.24	56 48	0 00E+00	1 40E-09	2 81E-09		
Pm-147	4 8502E-02	28.24	56 48	0 00E+00	1 37E+00	2 74E+00		
Pu-238	1 8254E-02	28.24	56 48	0 00E+00	5 16E-01	1.03E+00		
Pu-239	4.2810E-04	28.24	56 48	0 00E+00	1.21E-02	2 42E-02		
Pu-240	2 4368E-04	28.24	56 48	0 00E+00	6 88E-03	1 38E-02		
Pu-241	3 3415E-02	28.24	56 48	0 00E+00	9 44E-01	1 89E+00		
Pu-242	3 6329E-07	28.24	56 48	0 00E+00	1 03E-05	2 05E-05		
Ra-226	2.2854E-10	28.24	56 48	0 00E+00	6 45E-09	1.29E-08		
Ra-228	1.2426E-14	28.24	56 48	0 00E+00	3 51E-13	7.02E-13		
Ru-106	6 3589E-06	28.24	56 48	0 00E+00	1.80E-04	3 59E-04		
Se-79	1 2933E-05	28.24	56 48	0 00E+00	3.65E-04	7 30E-04		
Sn-126	1 1574E-05	28.24	56 48	0 00E+00	3.27E-04	6 54E-04		
Sr-90	1 9248E+00	28.24	56 48	0 00E+00	5 44E+01	1 09E+02		
Tc-99	4.2239E-04	28.24	56 48	0 00E+00	1 19E-02	2 39E-02		
Th-229	5 0953E-12	28.24	56 48	0 00E+00	1 44E-10	2.88E-10		
Th-230	4 1885E-08	28.24	56 48	0 00E+00	1 18E-06	2.37E-06		
Th-232	1.9270E-14	28.24	56 48	0 00E+00	5 44E-13	1 09E-12		
Th-208	4 6024E-08	28.24	56 48	0 00E+00	1.30E-06	2 60E-06		
U-232	1.2582E-07	28.24	56 48	0 00E+00	3.55E-06	7 11E-06		
U-233	2 5825E-09	28.24	56 48	0 00E+00	7.29E-08	1 46E-07		
U-234	1 8450E-04	28.24	56 48	0 00E+00	5 21E-03	1.04E-02		
U-235	-2 7235E-06	28.24	0 00	3.57E-03	3 49E-03	3 57E-03		
U-236	1.5493E-05	28.24	56 48	0 00E+00	4 38E-04	8 75E-04		
U-238	-4 2851E-09	28.24	0 00	4 10E-05	4 09E-05	4 10E-05		
Y-90	1 9254E+00	28.24	56 48	0 00E+00	5 44E+01	1 09E+02		
Other Radionuclides					5 46E+01	1 09E+02		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93 11512415	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		28.24
Bounding		56 48

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 05	
Bounding	0 10	

Estimated EOL HM/Given EOL HM

1 00

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

²Total burnup for all fuel associated with this worksheet must be 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 SLOWPOKE (HEU) CANADA
SNF ID #: 666
Fuel Units & Descr: 2 - 297 ROD ARRAY
Heavy Metal Mass: BOL=1 772kg; EOL=1 742kg
ROD Storage Site: SRS

Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
Template Burnup (MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
0 08

II. Estimates

	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	28.24	56 48	0 00E+00	1 87E-08	3 75E-08	Avg MeV	
Am-241	2 0060E-03	28.24	56 48	0 00E+00	5 66E-02	1 13E-01	0 0150	5 962E+12
Am-242m	4 2429E-07	28.24	56 48	0 00E+00	1 20E-05	2 40E-05	0 0250	1 240E+12
Am-243	1 4899E-06	28.24	56 48	0 00E+00	4 21E-05	8 42E-05	0 0375	1 081E+12
C-14	5 7135E-09	28.24	56 48	0 00E+00	1 61E-07	3 23E-07	0 0575	1 158E+12
Cl-36	1 3124E-32	28.24	56 48	0 00E+00	3 71E-31	7 41E-31	0 0850	6 999E+11
Cm-243	1 6443E-07	28.24	56 48	0 00E+00	4 64E-06	9 29E-06	0 1250	4 736E+11
Cm-244	2 9330E-05	28.24	56 48	0 00E+00	8 28E-04	1 66E-03	0 2250	6 040E+11
Co-60	5 3186E-06	28.24	56 48	0 00E+00	1 50E-04	3 00E-04	0 3750	2 629E+11
Cs-134	3 1563E-03	28.24	56 48	0 00E+00	8 91E-02	1 78E-01	0 5750	4 288E+12
Cs-135	3 4477E-06	28.24	56 48	0 00E+00	9 74E-05	1 95E-04	0 8500	7 250E+10
Cs-137	2 0313E+00	28.24	56 48	0 00E+00	5 74E+01	1 15E+02	1 2500	4 140E+10
Eu-154	2 4513E-02	28.24	56 48	0 00E+00	6 92E-01	1 38E+00	1 7500	1 900E+09
Eu-155	4 8175E-03	28.24	56 48	0 00E+00	1 36E-01	2 72E-01	2 2500	1 667E+05
Fe-55	1 2397E-04	28.24	56 48	0 00E+00	3 50E-03	7 00E-03	2 7500	9 422E+04
H-3	4 5697E-03	28.24	56 48	0 00E+00	1 29E-01	2 58E-01	3 5000	4 332E+02
I-129	7 5300E-07	28.24	56 48	0 00E+00	2 13E-05	4 25E-05	5 0000	2 461E+01
Kr-85	1 0850E-01	28.24	56 48	0 00E+00	3 06E+00	6 13E+00	7 0000	2 717E+00
Np-237	9 5561E-06	28.24	56 48	0 00E+00	2 70E-04	5 40E-04	11.0000	3.045E 01
Pa-231	2 0359E-09	28.24	56 48	0 00E+00	5 75E-08	1 15E-07		
Pb-210	4 9728E-11	28.24	56 48	0 00E+00	1 40E-09	2 81E-09		
Pm-147	4 8502E-02	28.24	56 48	0 00E+00	1 37E+00	2 74E+00		
Pu-238	1 8254E-02	28.24	56 48	0 00E+00	5 16E-01	1 03E+00		
Pu-239	4 2810E-04	28.24	56 48	0 00E+00	1 21E-02	2 42E-02		
Pu-240	2 4368E-04	28.24	56 48	0 00E+00	6 88E-03	1 38E-02		
Pu-241	3 3415E-02	28.24	56 48	0 00E+00	9 44E-01	1 89E+00		
Pu-242	3 6329E-07	28.24	56 48	0 00E+00	1 03E-05	2 05E-05		
Ra-226	2 2854E-10	28.24	56 48	0 00E+00	6 45E-09	1 29E-08		
Ra-228	1 2426E-14	28.24	56 48	0 00E+00	3 51E-13	7 02E-13		
Ru-106	6 3589E-06	28.24	56 48	0 00E+00	1 80E-04	3 59E-04		
Se-79	1 2933E-05	28.24	56 48	0 00E+00	3 65E-04	7 30E-04		
Sn-126	1 1574E-05	28.24	56 48	0 00E+00	3 27E-04	6 54E-04		
Sr-90	1 9248E+00	28.24	56 48	0 00E+00	5 44E+01	1 09E+02		
Tc-99	4 2239E-04	28.24	56 48	0 00E+00	1 19E-02	2 39E-02		
Th-229	5 0953E-12	28.24	56 48	0 00E+00	1 44E-10	2 88E-10		
Th-230	4 1885E-08	28.24	56 48	0 00E+00	1 18E-06	2 37E-06		
Th-232	1 9270E-14	28.24	56 48	0 00E+00	5 44E-13	1 09E-12		
Ti-208	4 6024E-08	28.24	56 48	0 00E+00	1 30E-06	2 60E-06		
U-232	1 2582E-07	28.24	56 48	0 00E+00	3 55E-06	7 11E-06		
U-233	2 5825E-09	28.24	56 48	0 00E+00	7 29E-08	1 46E-07		
U-234	1 8450E-04	28.24	56 48	0 00E+00	5 21E-03	1 04E-02		
U-235	-2 7235E-06	28.24	0 00	3 57E-03	3 49E-03	3 57E-03		
U-236	1 5493E-05	28.24	56 48	0 00E+00	4 38E-04	8 75E-04		
U-238	-4 2851E-09	28.24	0 00	4 10E-05	4 09E-05	4 10E-05		
Y-90	1 9254E+00	28.24	56 48	0 00E+00	5 44E+01	1 09E+02		
Other Radionuclides					5 46E+01	1 09E+02		

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 11512415	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)¹

	From SFD	Estimated
Nominal		28.24
Bounding		56 48

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 05	
Bounding	0 10	

Estimated EOL HM/Given EOL HM

1 00

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

²Total burnup for all fuel associated with this worksheet must be 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 SLOWPOKE (HEU) CANADA
SNF ID #: 668
Fuel Units & Descr: 2 - 297 ROD ARRAY
Heavy Metal Mass: BOL=1 772kg EOL=1 742kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup (MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
0.08

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
							Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	6 6313E-10	28.24	56.48	0 00E+00	1.87E-08	3.75E-08	0.0150	5.962E+12
Am-241	2.0060E-03	28.24	56.48	0 00E+00	5.66E-02	1.13E-01	0.0250	1.240E+12
Am-242m	4 2429E-07	28.24	56.48	0 00E+00	1.20E-05	2.40E-05	0.0375	1.081E+12
Am-243	1 4899E-06	28.24	56.48	0 00E+00	4.21E-05	8.42E-05	0.0575	1.158E+12
C-14	5 7135E-09	28.24	56.48	0 00E+00	1.61E-07	3.23E-07	0.0850	6.999E+11
Cl-36	1 3124E-32	28.24	56.48	0 00E+00	4.64E-06	9.29E-06	0.1250	4.736E+11
Cm-243	1 6443E-07	28.24	56.48	0 00E+00	8.28E-04	1.66E-03	0.2250	6.040E+11
Cm-244	2 9330E-05	28.24	56.48	0 00E+00	1.50E-04	3.00E-04	0.3750	2.629E+11
Co-60	5.3186E-06	28.24	56.48	0 00E+00	8.91E-02	1.78E-01	0.5750	4.288E+12
Cs-134	3 1563E-03	28.24	56.48	0 00E+00	9.74E-05	1.95E-04	0.8500	7.250E+10
Cs-135	3 4477E-06	28.24	56.48	0 00E+00	5.74E+01	1.15E+02	1.2500	4.140E+10
Cs-137	2 0313E+00	28.24	56.48	0 00E+00	6.92E-01	1.38E+00	1.7500	1.900E+09
Eu-154	2 4513E-02	28.24	56.48	0 00E+00	1.36E-01	2.72E-01	2.2500	1.667E+05
Eu-155	4 8175E-03	28.24	56.48	0 00E+00	3.50E-03	7.00E-03	2.7500	9.422E+04
Fe-55	1.2397E-04	28.24	56.48	0 00E+00	1.29E-01	2.58E-01	3.5000	4.332E+02
H-3	4 5697E-03	28.24	56.48	0 00E+00	2.13E-05	4.25E-05	5.0000	2.461E+01
I-129	7.5300E-07	28.24	56.48	0 00E+00	3.06E+00	6.13E+00	7.0000	2.717E+00
Kr-85	1.0850E-01	28.24	56.48	0 00E+00	2.70E-04	5.40E-04	11.0000	3.045E-01
Np-237	9 5561E-06	28.24	56.48	0 00E+00	5.75E-08	1.15E-07		
Pa-231	2 0359E-09	28.24	56.48	0 00E+00	1.40E-09	2.81E-09		
Pb-210	4 9728E-11	28.24	56.48	0 00E+00	1.37E+00	2.74E+00		
Pm-147	4 8502E-02	28.24	56.48	0 00E+00	5.16E-01	1.03E+00		
Pu-238	1 8254E-02	28.24	56.48	0 00E+00	1.21E-02	2.42E-02		
Pu-239	4.2810E-04	28.24	56.48	0 00E+00	6.88E-03	1.38E-02		
Pu-240	2.4368E-04	28.24	56.48	0 00E+00	9.44E-01	1.89E+00		
Pu-241	3.3415E-02	28.24	56.48	0 00E+00	1.03E-05	2.05E-05		
Pu-242	3 6329E-07	28.24	56.48	0 00E+00	6.45E-09	1.29E-08		
Ra-226	2.2854E-10	28.24	56.48	0 00E+00	3.51E-13	7.02E-13		
Ra-228	1 2426E-14	28.24	56.48	0 00E+00	1.80E-04	3.59E-04		
Ru-106	6 3589E-06	28.24	56.48	0 00E+00	3.65E-04	7.30E-04		
Se-79	1 2933E-05	28.24	56.48	0 00E+00	3.27E-04	6.54E-04		
Sn-126	1 1574E-05	28.24	56.48	0 00E+00	5.44E+01	1.09E+02		
Sr-90	1.9248E+00	28.24	56.48	0 00E+00	1.19E-02	2.39E-02		
Tc-99	4.2239E-04	28.24	56.48	0 00E+00	1.44E-10	2.88E-10		
Th-229	5 0953E-12	28.24	56.48	0 00E+00	1.18E-06	2.37E-06		
Th-230	4 1885E-08	28.24	56.48	0 00E+00	5.44E-13	1.09E-12		
Th-232	1 9270E-14	28.24	56.48	0 00E+00	1.30E-06	2.60E-06		
Ti-208	4 6024E-08	28.24	56.48	0 00E+00	3.55E-06	7.11E-06		
U-232	1 2582E-07	28.24	56.48	0 00E+00	7.29E-08	1.46E-07		
U-233	2.5825E-09	28.24	56.48	0 00E+00	5.21E-03	1.04E-02		
U-234	1 8450E-04	28.24	56.48	0 00E+00	3.49E-03	3.57E-03		
U-235	-2 7235E-06	28.24	0.00	3.57E-03	4.38E-04	8.75E-04	6.73E-01	1.35E+00
U-236	1.5493E-05	28.24	56.48	0 00E+00	4.09E-05	4.10E-05	Total	Total
U-238	-4.2851E-09	28.24	0.00	4.10E-05	5.44E+01	1.09E+02		
Y-90	1 9254E+00	28.24	56.48	0 00E+00	5.46E+01	1.09E+02		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93 11512415	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		28.24	
Bounding		56.48	

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.05		
Bounding	0.10		

Estimated EOL HM/Given EOL HM
1.00

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

²Total burnup for all fuel associated with this worksheet must be 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 SLOWPOKE (HEU) CANADA
SNF ID #: 669
Fuel Units & Descr: 2 - 297 ROD ARRAY
Heavy Metal Mass: BOL=1 772kg, EOL=1 742kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd), 367.2
Template BOL Heavy Metal Mass (MT), 0 00116689
Template Decay Time, 20 years

Estimated
Canister usage,
18"x10"
0 08

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	28.22	56 44	0 00E+00	1 87E-08	3 74E-08	Avg MeV	
Am-241	2 0060E-03	28.22	56 44	0 00E+00	5 66E-02	1 13E-01	0 0150	5 958E+12
Am-242m	4 2429E-07	28 22	56 44	0 00E+00	1 20E-05	2 39E-05	0 0250	1 239E+12
Am-243	1 4899E-06	28 22	56 44	0 00E+00	4 20E-05	8 41E-05	0 0375	1 081E+12
C-14	5 7135E-09	28 22	56 44	0 00E+00	1 61E-07	3 22E-07	0 0575	1 157E+12
Cl-36	1 3124E-32	28 22	56 44	0 00E+00	3 70E-31	7 41E-31	0 0850	6 994E+11
Cm-243	1 6443E-07	28 22	56 44	0 00E+00	4 64E-06	9 28E-06	0 1250	4 733E+11
Cm-244	2 9330E-05	28 22	56 44	0 00E+00	8 28E-04	1 66E-03	0 2250	6 036E+11
Co-60	5 3186E-06	28 22	56 44	0 00E+00	1 50E-04	3 00E-04	0 3750	2 627E+11
Cs-134	3 1563E-03	28.22	56 44	0 00E+00	8 91E-02	1 78E-01	0 5750	4 285E+12
Cs-135	3 4477E-06	28.22	56 44	0 00E+00	9 73E-05	1 95E-04	0 8500	7 245E+10
Cs-137	2 0313E+00	28.22	56 44	0 00E+00	5 73E+01	1 15E+02	1 2500	4 137E+10
Eu-154	2 4513E-02	28.22	56 44	0 00E+00	6 92E-01	1 38E+00	1 7500	1 899E+09
Eu-155	4 8175E-03	28.22	56 44	0 00E+00	1 36E-01	2 72E-01	2 2500	1 666E+05
Fe-55	1 2397E-04	28.22	56 44	0 00E+00	3 50E-03	7 00E-03	2 7500	9 416E+04
H-3	4 5697E-03	28.22	56 44	0 00E+00	1 29E-01	2 58E-01	3 5000	4 329E+02
I-129	7 5300E-07	28.22	56 44	0 00E+00	2 13E-05	4 25E-05	5 0000	2 459E+01
Kr-85	1 0850E-01	28.22	56 44	0 00E+00	3 06E+00	6 12E+00	7 0000	2 715E+00
Np-237	9 5561E-06	28 22	56 44	0 00E+00	2 70E-04	5 39E-04	11 0000	3 043E-01
Pa-231	2 0359E-09	28 22	56 44	0 00E+00	5 75E-08	1 15E-07		
Pb-210	4 9728E-11	28 22	56 44	0 00E+00	1 40E-09	2 81E-09		
Pm-147	4 8502E-02	28 22	56 44	0 00E+00	1 37E+00	2 74E+00		
Pu-238	1 8254E-02	28 22	56 44	0 00E+00	5 15E-01	1 03E+00		
Pu-239	4 2810E-04	28 22	56 44	0 00E+00	1 21E-02	2 42E-02		
Pu-240	2 4368E-04	28 22	56 44	0 00E+00	6 88E-03	1 38E-02		
Pu-241	3 3415E-02	28 22	56 44	0 00E+00	9 43E-01	1 89E+00		
Pu-242	3 6329E-07	28 22	56 44	0 00E+00	1 03E-05	2 05E-05		
Ra-226	2 2854E-10	28.22	56 44	0 00E+00	6 45E-09	1 29E-08		
Ra-228	1 2426E-14	28.22	56 44	0 00E+00	3 51E-13	7 01E-13		
Ru-106	6 3589E-06	28.22	56 44	0 00E+00	1 79E-04	3 59E-04		
Se-79	1 2933E-05	28.22	56 44	0 00E+00	3 65E-04	7 30E-04		
Sn-126	1 1574E-05	28.22	56 44	0 00E+00	3 27E-04	6 53E-04		
Sr-90	1 9248E+00	28.22	56 44	0 00E+00	5 43E+01	1 09E+02		
Tc-99	4 2239E-04	28 22	56 44	0 00E+00	1 19E-02	2 38E-02		
Th-229	5 0953E-12	28 22	56 44	0 00E+00	1 44E-10	2 88E-10		
Th-230	4 1885E-08	28 22	56 44	0 00E+00	1 18E-06	2 36E-06		
Th-232	1 9270E-14	28 22	56 44	0 00E+00	5 44E-13	1 09E-12		
Ti-208	4 6024E-08	28.22	56 44	0 00E+00	1 30E-06	2 60E-06		
U-232	1 2582E-07	28.22	56 44	0 00E+00	3 55E-06	7 10E-06		
U-233	2 5825E-09	28.22	56 44	0 00E+00	7 29E-08	1 46E-07		
U-234	1 8450E-04	28.22	56 44	0 00E+00	5 21E-03	1 04E-02		
U-235	-2 7235E-06	28.22	0 00	3 57E-03	3 49E-03	3 57E-03		
U-236	1 5493E-05	28.22	56 44	0 00E+00	4 37E-04	8 74E-04		
U-238	-4 2851E-09	28.22	0 00	4 10E-05	4 09E-05	4 10E-05		
Y-90	1 9254E+00	28.22	56 44	0 00E+00	5 43E+01	1 09E+02		
Other Radionuclides					5 46E+01	1 09E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.73E-01	1.35E+00
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 %	93.11512415	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		28.22
Bounding		56 44

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 05	
Bounding	0 10	

Estimated EOL HM/Given EOL HM

1 00

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

²Total burnup for all fuel associated with this worksheet must be 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 SLOWPOKE (HEU) MONTREAL
SNF ID #: 667
Fuel Units & Descr: 2 - 297 ROD ARRAY
Heavy Metal Mass BOL=1 772kg EOL=1 742kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 20 years

Estimated
Canister usage*
18"x10"
0 08

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	6 6313E-10	28.24	56 48	0 00E+00	1 87E-08	3 75E-08	0 0150	5 962E+12
Am-241	2 0060E-03	28.24	56 48	0 00E+00	5 66E-02	1 13E-01	0 0250	1 240E+12
Am-242m	4 2429E-07	28.24	56 48	0 00E+00	1 20E-05	2 40E-05	0 0375	1 081E+12
Am-243	1 4899E-06	28.24	56 48	0 00E+00	4 21E-05	8 42E-05	0 0575	1 158E+12
C-14	5 7135E-09	28.24	56 48	0 00E+00	1 61E-07	3 23E-07	0 0850	6 999E+11
Cl-36	1 3124E-32	28.24	56 48	0 00E+00	3 71E-31	7 41E-31	0 1250	4 736E+11
Cm-243	1 6443E-07	28.24	56 48	0 00E+00	4 64E-06	9 29E-06	0 2250	6 040E+11
Cm-244	2 9330E-05	28.24	56 48	0 00E+00	8 28E-04	1 66E-03	0 3750	2 629E+11
Co-60	5 3186E-06	28.24	56 48	0 00E+00	1 50E-04	3 00E-04	0 5750	4 288E+12
Cs-134	3 1563E-03	28.24	56 48	0 00E+00	8 91E-02	1 78E-01	0 8500	7 250E+10
Cs-135	3 4477E-06	28.24	56 48	0 00E+00	9 74E-05	1 95E-04	1 2500	4 140E+10
Cs-137	2 0313E+00	28.24	56 48	0 00E+00	5 74E+01	1 15E+02	1 7500	1 900E+09
Eu-154	2 4513E-02	28.24	56 48	0 00E+00	6 92E-01	1 38E+00	2 2500	1 667E+05
Eu-155	4 8175E-03	28.24	56 48	0 00E+00	1 36E-01	2 72E-01	2 7500	9 422E+04
Fe-55	1 2397E-04	28.24	56 48	0 00E+00	3 50E-03	7 00E-03	3 5000	4 332E+02
H-3	4 5697E-03	28.24	56 48	0 00E+00	1 29E-01	2 58E-01	5 0000	2 461E+01
I-129	7 5300E-07	28.24	56 48	0 00E+00	2 13E-05	4 25E-05	7 0000	2 717E+00
Kr-85	1 0850E-01	28.24	56 48	0 00E+00	3 06E+00	6 13E+00	11 0000	3 045E-01
Np-237	9 5561E-06	28.24	56 48	0 00E+00	2 70E-04	5 40E-04		
Pa-231	2 0359E-09	28.24	56 48	0 00E+00	5 75E-08	1 15E-07		
Pb-210	4 9728E-11	28.24	56 48	0 00E+00	1 40E-09	2 81E-09		
Pm-147	4 8502E-02	28.24	56 48	0 00E+00	1 37E+00	2 74E+00		
Pu-238	1 8254E-02	28.24	56 48	0 00E+00	5 16E-01	1 03E+00		
Pu-239	4 2810E-04	28.24	56 48	0 00E+00	1 21E-02	2 42E-02		
Pu-240	2 4368E-04	28.24	56 48	0 00E+00	6 88E-03	1 38E-02		
Pu-241	3 3415E-02	28.24	56 48	0 00E+00	9 44E-01	1 89E+00		
Pu-242	3 6329E-07	28.24	56 48	0 00E+00	1 03E-05	2 05E-05		
Ra-226	2 2854E-10	28.24	56 48	0 00E+00	6 45E-09	1 29E-08		
Ra-228	1 2426E-14	28.24	56 48	0 00E+00	3 51E-13	7 02E-13		
Ru-106	6 3589E-06	28.24	56 48	0 00E+00	1 80E-04	3 59E-04		
Se-79	1 2933E-05	28.24	56 48	0 00E+00	3 65E-04	7 30E-04		
Sn-126	1 1574E-05	28.24	56 48	0 00E+00	3 27E-04	6 54E-04		
Sr-90	1 9248E+00	28.24	56 48	0 00E+00	5 44E+01	1 09E+02		
Tc-99	4 2239E-04	28.24	56 48	0 00E+00	1 19E-02	2 39E-02		
Th-229	5 0953E-12	28.24	56 48	0 00E+00	1 44E-10	2 88E-10		
Th-230	4 1885E-08	28.24	56 48	0 00E+00	1 18E-06	2 37E-06		
Th-232	1 9270E-14	28.24	56 48	0 00E+00	5 44E-13	1 09E-12		
Th-208	4 6024E-08	28.24	56 48	0 00E+00	1 30E-06	2 60E-06		
U-232	1 2582E-07	28.24	56 48	0 00E+00	3 55E-06	7 11E-06		
U-233	2 5825E-09	28.24	56 48	0 00E+00	7 29E-08	1 46E-07		
U-234	1 8450E-04	28.24	56 48	0 00E+00	5 21E-03	1 04E-02		
U-235	-2 7235E-06	28.24	0 00	3 57E-03	3 49E-03	3 57E-03		
U-236	1 5493E-05	28.24	56 48	0 00E+00	4 38E-04	8 75E-04		
U-238	-4 2851E-09	28.24	0 00	4 10E-05	4 09E-05	4 10E-05		
Y-90	1 9254E+00	28.24	56 48	0 00E+00	5 44E+01	1 09E+02		
Other Radionuclides								

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	Basis for Parameter Differences*
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
BOL Enrichment %	93 11512415	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		28 24	
Bounding		56 48	

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0 05		
Bounding	0 10		

1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: FRR TARGET ARGENTINA
SNF ID #: 297
Fuel Units & Descr: 48 - PARTICULATE
Heavy Metal Mass BOL=3 97kg; EOL=3 97kg
ROD Storage Site SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: Pathfinder (Light Water, SST, 60 to 100%, U)
²Template Burnup(MWd): 6 01
Template BOL Heavy Metal Mass (MT): 0 00012882
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
1 33

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 0233E-09	75 00	149 99	0 00E+00	6 02E-07	1 20E-06	Avg MeV	
Am-241	8 8502E-05	75 00	149 99	0 00E+00	6 64E-03	1 33E-02	0 0150	1 615E+13
Am-242m	9 1098E-09	75 00	149 99	0 00E+00	6 83E-07	1 37E-06	0 0250	3 357E+12
Am-243	9 8652E-10	75 00	149 99	0 00E+00	7 40E-08	1 48E-07	0 0375	2 893E+12
C-14	2 3062E-04	75 00	149 99	0 00E+00	1 73E-02	3 46E-02	0 0575	3 120E+12
Cl-36	1 2261E-06	75 00	149 99	0 00E+00	9 20E-05	1 84E-04	0 0850	1 889E+12
Cm-243	3 5824E-10	75 00	149 99	0 00E+00	2 69E-08	5 37E-08	0 1250	1 227E+12
Cm-244	4 1131E-09	75 00	149 99	0 00E+00	3 08E-07	6 17E-07	0 2250	1 615E+12
Co-60	5 0882E-01	75 00	149 99	0 00E+00	3 82E+01	7 63E+01	0 3750	7 064E+11
Cs-134	4 6705E-04	75 00	149 99	0 00E+00	3 50E-02	7 01E-02	0 5750	1 147E+13
Cs-135	3 0316E-05	75 00	149 99	0 00E+00	2 27E-03	4 55E-03	0 8500	1 234E+11
Cs-137	2 0516E+00	75 00	149 99	0 00E+00	1 54E+02	3 08E+02	1 2500	5 694E+12
Eu-154	2 2413E-03	75 00	149 99	0 00E+00	1 68E-01	3 36E-01	1 7500	3 139E+09
Eu-155	5 6772E-03	75 00	149 99	0 00E+00	4 26E-01	8 52E-01	2 2500	3 036E+07
Fe-55	6 6988E-02	75 00	149 99	0 00E+00	5 02E+00	1 00E+01	2 7500	2 310E+05
H-3	5 8303E-03	75 00	149 99	0 00E+00	4 37E-01	8 75E-01	3 5000	8 733E+02
I-129	7 3195E-07	75 00	149 99	0 00E+00	5 49E-05	1 10E-04	5 0000	5 350E+00
Kr-85	1 0880E-01	75 00	149 99	0 00E+00	8 16E+00	1 63E+01	7 0000	5 981E-01
Np-237	1 1481E-06	75 00	149 99	0 00E+00	8 61E-05	1 72E-04	11 0000	6 761E-02
Pa-231	2 3844E-08	75 00	149 99	0 00E+00	1 79E-06	3 58E-06		
Pb-210	9 6339E-14	75 00	149 99	0 00E+00	7 23E-12	1 45E-11		
Pm-147	6 1148E-02	75 00	149 99	0 00E+00	4 59E+00	9 17E+00		
Pu-238	3 3228E-04	75 00	149 99	0 00E+00	2 49E-02	4 98E-02		
Pu-239	6 6805E-04	75 00	149 99	0 00E+00	5 01E-02	1 00E-01		
Pu-240	8 6972E-05	75 00	149 99	0 00E+00	6 52E-03	1 30E-02		
Pu-241	1 4714E-03	75 00	149 99	0 00E+00	1 10E-01	2 21E-01		
Pu-242	1 9717E-09	75 00	149 99	0 00E+00	1 48E-07	2 96E-07		
Ra-226	4 4093E-13	75 00	149 99	0 00E+00	3 31E-11	6 61E-11		
Ra-228	7 8419E-12	75 00	149 99	0 00E+00	5 88E-10	1 18E-09		
Ru-106	5 5175E-06	75 00	149 99	0 00E+00	4 14E-04	8 28E-04		
Se-79	1 3226E-05	75 00	149 99	0 00E+00	9 92E-04	1 98E-03		
Sn-126	1 1493E-05	75 00	149 99	0 00E+00	8 62E-04	1 72E-03		
Sr-90	1 9501E+00	75 00	149 99	0 00E+00	1 46E+02	2 93E+02		
Tc-99	4 6656E-04	75 00	149 99	0 00E+00	3 50E-02	7 00E-02		
Th-229	7 2080E-12	75 00	149 99	0 00E+00	5 41E-10	1 08E-09		
Th-230	8 1248E-11	75 00	149 99	0 00E+00	6 09E-09	1 22E-08		
Th-232	8 3161E-12	75 00	149 99	0 00E+00	6 24E-10	1 25E-09		
Ti-208	2 5008E-08	75 00	149 99	0 00E+00	1 88E-06	3 75E-06		
U-232	6 7754E-08	75 00	149 99	0 00E+00	5 08E-06	1 02E-05		
U-233	3 0582E-09	75 00	149 99	0 00E+00	2 29E-07	4 59E-07		
U-234	3 6722E-07	75 00	149 99	0 00E+00	2 75E-05	5 51E-05		
U-235	-2 7761E-06	75 00	0 00	4 15E-03	3 94E-03	4 15E-03		
U-236	1 6190E-05	75 00	149 99	0 00E+00	1 21E-03	2 43E-03		
U-238	-2 8547E-09	75 00	0 00	6 89E-04	6 89E-04	6 89E-04		
Y-90	1 9501E+00	75 00	149 99	0 00E+00	1 46E+02	2 93E+02		
Other Radionuclides					1 69E+02	3 38E+02		

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 Pathfinder Template except enrichment and cladding (but substituting Stainless Steel is a good conservative assumption)
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	NONE	SST	
	U	U	
	48.34531901	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate: Nominal burnup assumed to be 2% of BOL heavy metal mass. Bounding burnup assumed to be twice nominal burnup.
Nominal: Bounding	From SFD	Estimated	
		75 00 149 99	

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

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

²Total burnup for all fuel associated with this worksheet must be 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 TARGET CANADA
SNF ID #: 671
Fuel Units & Descr: 5952 - PARTICULATE
Heavy Metal Mass: BOL=492.23kg EOL=492.23kg
ROD Storage Site: SRS

Fuel decay start date: 2010
Estimates as of: 2030
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: 20 years

Estimated
Canister usage:
18"x10"
165.33

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	8.0233E-09	9,299.68	18,599.37	0.00E+00	7.46E-05	1.49E-04	0.0150	2.003E+15
Am-241	8.8502E-05	9,299.68	18,599.37	0.00E+00	8.23E-01	1.65E+00	0.0250	4.162E+14
Am-242m	9.1098E-09	9,299.68	18,599.37	0.00E+00	8.47E-05	1.69E-04	0.0375	3.587E+14
Am-243	9.8652E-10	9,299.68	18,599.37	0.00E+00	9.17E-06	1.83E-05	0.0575	3.868E+14
C-14	2.3062E-04	9,299.68	18,599.37	0.00E+00	2.14E+00	4.29E+00	0.0850	2.342E+14
Cl-36	1.2261E-06	9,299.68	18,599.37	0.00E+00	1.14E-02	2.28E-02	0.1250	1.521E+14
Cm-243	3.5824E-10	9,299.68	18,599.37	0.00E+00	3.33E-06	6.66E-06	0.2250	2.002E+14
Cm-244	4.1131E-09	9,299.68	18,599.37	0.00E+00	3.83E-05	7.65E-05	0.3750	8.760E+13
Co-60	5.0882E-01	9,299.68	18,599.37	0.00E+00	4.73E+03	9.46E+03	0.5750	1.422E+15
Cs-134	4.6705E-04	9,299.68	18,599.37	0.00E+00	4.34E+00	8.69E+00	0.8500	1.530E+13
Cs-135	3.0316E-05	9,299.68	18,599.37	0.00E+00	2.82E-01	5.64E-01	1.2500	7.060E+14
Cs-137	2.0516E+00	9,299.68	18,599.37	0.00E+00	1.91E+04	3.82E+04	1.7500	3.892E+11
Eu-154	2.2413E-03	9,299.68	18,599.37	0.00E+00	2.08E+01	4.17E+01	2.2500	3.765E+09
Eu-155	5.6772E-03	9,299.68	18,599.37	0.00E+00	5.28E+01	1.06E+02	2.7500	2.864E+07
Fe-55	6.6988E-02	9,299.68	18,599.37	0.00E+00	6.23E+02	1.25E+03	3.5000	1.083E+05
H-3	5.8303E-03	9,299.68	18,599.37	0.00E+00	5.42E+01	1.08E+02	5.0000	6.634E+02
I-129	7.3195E-07	9,299.68	18,599.37	0.00E+00	6.81E-03	1.36E-02	7.0000	7.416E+01
Kr-85	1.0880E-01	9,299.68	18,599.37	0.00E+00	1.01E+03	2.02E+03	11.0000	8.384E+00
Np-237	1.1481E-06	9,299.68	18,599.37	0.00E+00	1.07E-02	2.14E-02		
Pa-231	2.3844E-08	9,299.68	18,599.37	0.00E+00	2.22E-04	4.43E-04		
Pb-210	9.6339E-14	9,299.68	18,599.37	0.00E+00	8.96E-10	1.79E-09		
Pm-147	6.1148E-02	9,299.68	18,599.37	0.00E+00	5.69E+02	1.14E+03		
Pu-238	3.3228E-04	9,299.68	18,599.37	0.00E+00	3.09E+00	6.18E+00		
Pu-239	6.6805E-04	9,299.68	18,599.37	0.00E+00	6.21E+00	1.24E+01		
Pu-240	8.6972E-05	9,299.68	18,599.37	0.00E+00	8.09E-01	1.62E+00		
Pu-241	1.4714E-03	9,299.68	18,599.37	0.00E+00	1.37E+01	2.74E+01		
Pu-242	1.9717E-09	9,299.68	18,599.37	0.00E+00	1.83E-05	3.67E-05		
Ra-226	4.4093E-13	9,299.68	18,599.37	0.00E+00	4.10E-09	8.20E-09		
Ra-228	7.8419E-12	9,299.68	18,599.37	0.00E+00	7.29E-08	1.46E-07		
Ru-106	5.5175E-06	9,299.68	18,599.37	0.00E+00	5.13E-02	1.03E-01		
Se-79	1.3226E-05	9,299.68	18,599.37	0.00E+00	1.23E-01	2.46E-01		
Sn-126	1.1493E-05	9,299.68	18,599.37	0.00E+00	1.07E-01	2.14E-01		
Sr-90	1.9501E+00	9,299.68	18,599.37	0.00E+00	1.81E+04	3.63E+04		
Tc-99	4.6656E-04	9,299.68	18,599.37	0.00E+00	4.34E+00	8.68E+00		
Th-229	7.2080E-12	9,299.68	18,599.37	0.00E+00	6.70E-08	1.34E-07		
Th-230	8.1248E-11	9,299.68	18,599.37	0.00E+00	7.56E-07	1.51E-06		
Th-232	8.3161E-12	9,299.68	18,599.37	0.00E+00	7.73E-08	1.55E-07		
Ti-208	2.5008E-08	9,299.68	18,599.37	0.00E+00	2.33E-04	4.65E-04		
U-232	6.7754E-08	9,299.68	18,599.37	0.00E+00	6.30E-04	1.26E-03		
U-233	3.0582E-09	9,299.68	18,599.37	0.00E+00	2.84E-05	5.69E-05		
U-234	3.6722E-07	9,299.68	18,599.37	0.00E+00	3.42E-03	6.83E-03		
U-235	-2.7761E-06	9,299.68	0.00	5.14E-01	4.88E-01	5.14E-01		
U-236	1.6190E-05	9,299.68	18,599.37	0.00E+00	1.51E-01	3.01E-01		
U-238	-2.8547E-09	9,299.68	0.00	8.55E-02	8.54E-02	8.55E-02		
Y-90	1.9501E+00	9,299.68	18,599.37	0.00E+00	1.81E+04	3.63E+04		
Other Radionuclides					2.10E+04	4.19E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons.
Fuel Cladding	NONE	SST	This fuel matches Pathfinder Template except enrichment and cladding (but substituting Stainless Steel is a good conservative assumption)
BOL HM Constituents	U	U	
BOL Enrichment %	48.34531901	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		9,299.68	Nominal burnup assumed to be 2% of BOL heavy metal mass
Bounding		18,599.37	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.40		0.98
Bounding	0.81		

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

² Total burnup for all fuel associated with this worksheet must be 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 TARGET INDONESIA
SNF ID #: 672
Fuel Units & Descr: 48 - PARTICULATE
Heavy Metal Mass: BOL=3 97kg, EOL=3 97kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030

Template: Pathfinder (Light Water, SST, 60 to 100%, U)

²Template Burnup(MWd): 6 01

Template BOL Heavy Metal Mass (MT): 0 00012882

Template Decay Time: 20 years

Estimated
Canister usage
18"x10"
1 33

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8 0233E-09	75 00	149 99	0 00E+00	6 02E-07	1 20E-06	Avg MeV	
Am-241	8 8502E-05	75 00	149 99	0 00E+00	6 64E-03	1 33E-02	0 0150	1 615E+13
Am-242m	9 1098E-09	75 00	149 99	0 00E+00	6 83E-07	1 37E-06	0 0250	3 357E+12
Am-243	9 8652E-10	75 00	149 99	0 00E+00	7 40E-08	1 48E-07	0 0375	2 893E+12
C-14	2 3062E-04	75 00	149 99	0 00E+00	1 73E-02	3 46E-02	0 0575	3 120E+12
Cl-36	1 2261E-06	75 00	149 99	0 00E+00	9 20E-05	1 84E-04	0 0850	1 889E+12
Cm-243	3 5824E-10	75 00	149 99	0 00E+00	2 69E-08	5 37E-08	0 1250	1 227E+12
Cm-244	4 1131E-09	75 00	149 99	0 00E+00	3 08E-07	6 17E-07	0 2250	1 615E+12
Co-60	5 0882E-01	75 00	149 99	0 00E+00	3 82E+01	7 63E+01	0 3750	7 064E+11
Cs-134	4 6705E-04	75 00	149 99	0 00E+00	3 50E-02	7 01E-02	0 5750	1 147E+13
Cs-135	3 0316E-05	75 00	149 99	0 00E+00	2 27E-03	4 55E-03	0 8500	1 234E+11
Cs-137	2 0516E+00	75 00	149 99	0 00E+00	1 54E+02	3 08E+02	1 2500	5 694E+12
Eu-154	2 2413E-03	75 00	149 99	0 00E+00	1 68E-01	3 36E-01	1 7500	3 139E+09
Eu-155	5 6772E-03	75 00	149 99	0 00E+00	4 26E-01	8 52E-01	2 2500	3 036E+07
Fe-55	6 6988E-02	75 00	149 99	0 00E+00	5 02E+00	1 00E+01	2 7500	2 310E+05
H-3	5 8303E-03	75 00	149 99	0 00E+00	4 37E-01	8 75E-01	3 5000	8 733E+02
I-129	7 3195E-07	75 00	149 99	0 00E+00	5 49E-05	1 10E-04	5 0000	5 350E+00
Kr-85	1 0880E-01	75 00	149 99	0 00E+00	8 16E+00	1 63E+01	7 0000	5 981E-01
Np-237	1 1481E-06	75 00	149 99	0 00E+00	8 61E-05	1 72E-04	11 0000	6 761E-02
Pa-231	2 3844E-08	75 00	149 99	0 00E+00	1 79E-06	3 58E-06		
Pb-210	9 6339E-14	75 00	149 99	0 00E+00	7 23E-12	1 45E-11		
Pm-147	6 1148E-02	75 00	149 99	0 00E+00	4 59E+00	9 17E+00		
Pu-238	3 3228E-04	75 00	149 99	0 00E+00	2 49E-02	4 98E-02		
Pu-239	6 6805E-04	75 00	149 99	0 00E+00	5 01E-02	1 00E-01		
Pu-240	8 6972E-05	75 00	149 99	0 00E+00	6 52E-03	1 30E-02		
Pu-241	1 4714E-03	75 00	149 99	0 00E+00	1 10E-01	2 21E-01		
Pu-242	1 9717E-09	75 00	149 99	0 00E+00	1 48E-07	2 96E-07		
Ra-226	4 4093E-13	75 00	149 99	0 00E+00	3 31E-11	6 61E-11		
Ra-228	7 8419E-12	75 00	149 99	0 00E+00	5 88E-10	1 18E-09		
Ru-106	5 5175E-06	75 00	149 99	0 00E+00	4 14E-04	8 28E-04		
Se-79	1 3226E-05	75 00	149 99	0 00E+00	9 92E-04	1 98E-03		
Sn-126	1 1493E-05	75 00	149 99	0 00E+00	8 62E-04	1 72E-03		
Sr-90	1 9501E+00	75 00	149 99	0 00E+00	1 46E+02	2 93E+02		
Tc-99	4 6656E-04	75 00	149 99	0 00E+00	3 50E-02	7 00E-02		
Th-229	7 2080E-12	75 00	149 99	0 00E+00	5 41E-10	1 08E-09		
Th-230	8 1248E-11	75 00	149 99	0 00E+00	6 09E-09	1 22E-08		
Th-232	8 3161E-12	75 00	149 99	0 00E+00	6 24E-10	1 25E-09		
Ti-208	2 5008E-08	75 00	149 99	0 00E+00	1 88E-06	3 75E-06		
U-232	6 7754E-08	75 00	149 99	0 00E+00	5 08E-06	1 02E-05		
U-233	3 0582E-09	75 00	149 99	0 00E+00	2 29E-07	4 59E-07		
U-234	3 6722E-07	75 00	149 99	0 00E+00	2 75E-05	5 51E-05		
U-235	-2 7761E-06	75 00	0 00	4 15E-03	3 94E-03	4 15E-03		
U-236	1 6190E-05	75 00	149 99	0 00E+00	1 21E-03	2 43E-03		
U-238	-2 8547E-09	75 00	0 00	6 89E-04	6 89E-04	6 89E-04		
Y-90	1 9501E+00	75 00	149 99	0 00E+00	1 46E+02	2 93E+02		
Other Radionuclides					1 69E+02	3 38E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches Pathfinder Template except enrichment and cladding (but substituting Stainless Steel is a good conservative assumption)
BOL HM Constituents	NONE	SST	
BOL Enrichment %	48.34531901	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		75 00	Nominal burnup assumed to be 2% of BOL heavy metal mass. Bounding burnup assumed to be twice nominal burnup
Bounding		149 99	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.40		0.98
Bounding	0.81		

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (U3Si2 LEU) DENMARK
SNF ID # 298
Fuel Units & Descr: 184 - ASSEMBLY
Heavy Metal Mass BOL=165.6kg EOL=142.618kg
ROD Storage Site SRS

Fuel decay start date: 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum, 10 to 20% U)
Template Burnup (MWd) 15
Template BOL Heavy Metal Mass (MT): 0.00034251
Template Decay Time: 20 years

Estimated
Canister usage
18"x10"
5 11

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5333E-10	21,843.20	43,686.40	0.00E+00	1.86E-05	3.73E-05	Avg MeV	
Am-241	2.2753E-02	21,843.20	43,686.40	0.00E+00	4.97E+02	9.94E+02	0.0150	4.427E+15
Am-242m	8.9133E-06	21,843.20	43,686.40	0.00E+00	1.95E-01	3.89E-01	0.0250	9.196E+14
Am-243	6.4007E-06	21,843.20	43,686.40	0.00E+00	1.40E-01	2.80E-01	0.0375	8.077E+14
C-14	2.9620E-08	21,843.20	43,686.40	0.00E+00	6.47E-04	1.29E-03	0.0575	8.702E+14
Cl-36	5.9513E-35	21,843.20	43,686.40	0.00E+00	1.30E-30	2.60E-30	0.0850	5.180E+14
Cm-243	2.2087E-06	21,843.20	43,686.40	0.00E+00	4.82E-02	9.65E-02	0.1250	3.488E+14
Cm-244	1.1007E-04	21,843.20	43,686.40	0.00E+00	2.40E+00	4.81E+00	0.2250	4.464E+14
Co-60	1.6340E-05	21,843.20	43,686.40	0.00E+00	3.57E-01	7.14E-01	0.3750	1.943E+14
Cs-134	2.1353E-03	21,843.20	43,686.40	0.00E+00	4.66E+01	9.33E+01	0.5750	3.296E+15
Cs-135	4.8607E-06	21,843.20	43,686.40	0.00E+00	1.06E-01	2.12E-01	0.8500	5.037E+13
Cs-137	2.0227E+00	21,843.20	43,686.40	0.00E+00	4.42E+04	8.84E+04	1.2500	2.838E+13
Eu-154	2.0887E-02	21,843.20	43,686.40	0.00E+00	4.56E+02	9.12E+02	1.7500	1.340E+12
Eu-155	4.0867E-03	21,843.20	43,686.40	0.00E+00	8.93E+01	1.79E+02	2.2500	1.256E+08
Fe-55	1.4167E-03	21,843.20	43,686.40	0.00E+00	3.09E+01	6.19E+01	2.7500	1.487E+07
H-3	4.6653E-03	21,843.20	43,686.40	0.00E+00	1.02E+02	2.04E+02	3.5000	6.022E+05
I-129	7.1600E-07	21,843.20	43,686.40	0.00E+00	1.56E-02	3.13E-02	5.0000	9.146E+04
Kr-85	1.0240E-01	21,843.20	43,686.40	0.00E+00	2.24E+03	4.47E+03	7.0000	1.035E+04
Np-237	3.7227E-06	21,843.20	43,686.40	0.00E+00	8.13E-02	1.63E-01	11.0000	1.178E+03
Pa-231	2.6727E-09	21,843.20	43,686.40	0.00E+00	5.84E-05	1.17E-04		
Pb-210	4.3313E-14	21,843.20	43,686.40	0.00E+00	9.46E-10	1.89E-09		
Pm-147	4.6307E-02	21,843.20	43,686.40	0.00E+00	1.01E+03	2.02E+03		
Pu-238	5.5273E-03	21,843.20	43,686.40	0.00E+00	1.21E+02	2.41E+02		
Pu-239	1.0313E-02	21,843.20	43,686.40	0.00E+00	2.25E+02	4.51E+02		
Pu-240	5.4180E-03	21,843.20	43,686.40	0.00E+00	1.18E+02	2.37E+02		
Pu-241	3.7573E-01	21,843.20	43,686.40	0.00E+00	8.21E+03	1.64E+04		
Pu-242	3.0713E-06	21,843.20	43,686.40	0.00E+00	6.71E-02	1.34E-01		
Ra-226	2.3807E-13	21,843.20	43,686.40	0.00E+00	5.20E-09	1.04E-08		
Ra-228	1.0607E-14	21,843.20	43,686.40	0.00E+00	2.32E-10	4.63E-10		
Ru-106	8.4800E-06	21,843.20	43,686.40	0.00E+00	1.85E-01	3.70E-01		
Se-79	1.2533E-05	21,843.20	43,686.40	0.00E+00	2.74E-01	5.48E-01		
Sn-126	1.1393E-05	21,843.20	43,686.40	0.00E+00	2.49E-01	4.98E-01		
Sr-90	1.8400E+00	21,843.20	43,686.40	0.00E+00	4.02E+04	8.04E+04		
Tc-99	4.3533E-04	21,843.20	43,686.40	0.00E+00	9.51E+00	1.90E+01		
Th-229	5.8947E-13	21,843.20	43,686.40	0.00E+00	1.29E-08	2.58E-08		
Th-230	5.9500E-11	21,843.20	43,686.40	0.00E+00	1.30E-06	2.60E-06		
Th-232	1.6360E-14	21,843.20	43,686.40	0.00E+00	3.57E-10	7.15E-10		
Ti-208	7.6000E-09	21,843.20	43,686.40	0.00E+00	1.66E-04	3.32E-04		
U-232	2.0747E-08	21,843.20	43,686.40	0.00E+00	4.53E-04	9.06E-04	Thermal Power	
U-233	4.4013E-10	21,843.20	43,686.40	0.00E+00	9.61E-06	1.92E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4.6500E-07	21,843.20	43,686.40	0.00E+00	1.02E-02	2.03E-02	5.22E+02	1.04E+03
U-235	-2.5335E-06	21,843.20	0.00	7.16E-02	1.62E-02	7.16E-02	Total	Total
U-236	1.3000E-05	21,843.20	43,686.40	0.00E+00	2.84E-01	5.68E-01		
U-238	-1.4207E-08	21,843.20	0.00	4.45E-02	4.42E-02	4.45E-02		
Y-90	1.8400E+00	21,843.20	43,686.40	0.00E+00	4.02E+04	8.04E+04		
Other Radionuclides					4.20E+04	8.39E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		21,843.20	
Bounding		43,686.40	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	3.01		
Bounding	6.02		1.04

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (U3Si2 LEU) GERMANY
SNF ID #: 673
Fuel Units & Descr: 135 - ASSEMBLY
Heavy Metal Mass: BOL=121.5kg EOL=109.35kg
ROD Storage Site: SRS

Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 10 to 20%, U)
Template Burnup (MWd): 15
Template BOL Heavy Metal Mass (MT): 0.00034251
Template Decay Time: 20 years

Estimated
Canister usage
18"x10"
375

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5333E-10	11,548.15	23,096.29	0.00E+00	9.85E-06	1.97E-05	Avg MeV	
Am-241	2.2753E-02	11,548.15	23,096.29	0.00E+00	2.63E+02	5.26E+02	0.0150	2.340E+15
Am-242m	8.9133E-06	11,548.15	23,096.29	0.00E+00	1.03E-01	2.06E-01	0.0250	4.862E+14
Am-243	6.4007E-06	11,548.15	23,096.29	0.00E+00	7.39E-02	1.48E-01	0.0375	4.270E+14
C-14	2.9620E-08	11,548.15	23,096.29	0.00E+00	3.42E-04	6.84E-04	0.0575	4.601E+14
Cl-36	5.9513E-35	11,548.15	23,096.29	0.00E+00	6.87E-31	1.37E-30	0.0850	2.738E+14
Cm-243	2.2087E-06	11,548.15	23,096.29	0.00E+00	2.55E-02	5.10E-02	0.1250	1.844E+14
Cm-244	1.1007E-04	11,548.15	23,096.29	0.00E+00	1.27E+00	2.54E+00	0.2250	2.360E+14
Co-60	1.6340E-05	11,548.15	23,096.29	0.00E+00	1.89E-01	3.77E-01	0.3750	1.027E+14
Cs-134	2.1353E-03	11,548.15	23,096.29	0.00E+00	2.47E+01	4.93E+01	0.5750	1.742E+15
Cs-135	4.8607E-06	11,548.15	23,096.29	0.00E+00	5.61E-02	1.12E-01	0.8500	2.663E+13
Cs-137	2.0227E+00	11,548.15	23,096.29	0.00E+00	2.34E+04	4.67E+04	1.2500	1.501E+13
Eu-154	2.0887E-02	11,548.15	23,096.29	0.00E+00	2.41E+02	4.82E+02	1.7500	7.082E+11
Eu-155	4.0867E-03	11,548.15	23,096.29	0.00E+00	4.72E+01	9.44E+01	2.2500	6.642E+07
Fe-55	1.4167E-03	11,548.15	23,096.29	0.00E+00	1.64E+01	3.27E+01	2.7500	7.859E+06
H-3	4.6653E-03	11,548.15	23,096.29	0.00E+00	5.39E+01	1.08E+02	3.5000	3.184E+05
I-129	7.1600E-07	11,548.15	23,096.29	0.00E+00	8.27E-03	1.65E-02	5.0000	4.837E+04
Kr-85	1.0240E-01	11,548.15	23,096.29	0.00E+00	1.18E+03	2.37E+03	7.0000	5.473E+03
Np-237	3.7227E-06	11,548.15	23,096.29	0.00E+00	4.30E-02	8.60E-02	11.0000	6.228E+02
Pa-231	2.6727E-09	11,548.15	23,096.29	0.00E+00	3.09E-05	6.17E-05		
Pb-210	4.3313E-14	11,548.15	23,096.29	0.00E+00	5.00E-10	1.00E-09		
Pm-147	4.6307E-02	11,548.15	23,096.29	0.00E+00	5.35E+02	1.07E+03		
Pu-238	5.5273E-03	11,548.15	23,096.29	0.00E+00	6.38E+01	1.28E+02		
Pu-239	1.0313E-02	11,548.15	23,096.29	0.00E+00	1.19E+02	2.38E+02		
Pu-240	5.4180E-03	11,548.15	23,096.29	0.00E+00	6.26E+01	1.25E+02		
Pu-241	3.7573E-01	11,548.15	23,096.29	0.00E+00	4.34E+03	8.68E+03		
Pu-242	3.0713E-06	11,548.15	23,096.29	0.00E+00	3.55E-02	7.09E-02		
Ra-226	2.3807E-13	11,548.15	23,096.29	0.00E+00	2.75E-09	5.50E-09		
Ra-228	1.0607E-14	11,548.15	23,096.29	0.00E+00	1.22E-10	2.45E-10		
Ru-106	8.4800E-06	11,548.15	23,096.29	0.00E+00	9.79E-02	1.96E-01		
Se-79	1.2533E-05	11,548.15	23,096.29	0.00E+00	1.45E-01	2.89E-01		
Sn-126	1.1393E-05	11,548.15	23,096.29	0.00E+00	1.32E-01	2.63E-01		
Sr-90	1.8400E+00	11,548.15	23,096.29	0.00E+00	2.12E+04	4.25E+04		
Tc-99	4.3533E-04	11,548.15	23,096.29	0.00E+00	5.03E+00	1.01E+01		
Th-229	5.8947E-13	11,548.15	23,096.29	0.00E+00	6.81E-09	1.36E-08		
Th-230	5.9500E-11	11,548.15	23,096.29	0.00E+00	6.87E-07	1.37E-06		
Th-232	1.6360E-14	11,548.15	23,096.29	0.00E+00	1.89E-10	3.78E-10		
Tl-208	7.6000E-09	11,548.15	23,096.29	0.00E+00	8.78E-05	1.76E-04		
U-232	2.0747E-08	11,548.15	23,096.29	0.00E+00	2.40E-04	4.79E-04		
U-233	4.4013E-10	11,548.15	23,096.29	0.00E+00	5.08E-06	1.02E-05		
U-234	4.6500E-07	11,548.15	23,096.29	0.00E+00	5.37E-03	1.07E-02		
U-235	-2.5335E-06	11,548.15	0.00	5.25E-02	2.33E-02	5.25E-02		
U-236	1.3000E-05	11,548.15	23,096.29	0.00E+00	1.50E-01	3.00E-01		
U-238	-1.4207E-08	11,548.15	0.00	3.27E-02	3.25E-02	3.27E-02		
Y-90	1.8400E+00	11,548.15	23,096.29	0.00E+00	2.12E+04	4.25E+04		
Other Radionuclides					2.22E+04	4.44E+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 %	20	10 to 20	

Burnup Summary (MWd) ¹			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		11,548.15	
Bounding		23,096.29	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	2.17		
Bounding	4.34		1.02

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (U3Si2 LEU) GERMANY
SNF ID # 674
Fuel Units & Descr 18 - ASSEMBLY
Heavy Metal Mass: BOL=18kg EOL=16 kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of 2030
Template HFBR (Heavy Water Alum, 10 to 20%, U)
²Template Burnup(MWd) 15
Template BOL Heavy Metal Mass (MT): 0.00034251
Template Decay Time: 20 years

Estimated
Canister usage
18"x10"
0.50

II. Estimates	m	x _m	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5333E-10	1,710.84	3,421.67	0.00E+00	1.46E-06	2.92E-06	Avg MeV	
Am-241	2.2753E-02	1,710.84	3,421.67	0.00E+00	3.89E+01	7.79E+01	0.0150	3.467E+14
Am-242m	8.9133E-06	1,710.84	3,421.67	0.00E+00	1.52E-02	3.05E-02	0.0250	7.202E+13
Am-243	6.4007E-06	1,710.84	3,421.67	0.00E+00	1.10E-02	2.19E-02	0.0375	6.327E+13
C-14	2.9620E-08	1,710.84	3,421.67	0.00E+00	5.07E-05	1.01E-04	0.0575	6.816E+13
Cl-36	5.9513E-35	1,710.84	3,421.67	0.00E+00	1.02E-31	2.04E-31	0.0850	4.057E+13
Cm-243	2.2087E-06	1,710.84	3,421.67	0.00E+00	3.78E-03	7.56E-03	0.1250	2.732E+13
Cm-244	1.1007E-04	1,710.84	3,421.67	0.00E+00	1.88E-01	3.77E-01	0.2250	3.497E+13
Co-60	1.6340E-05	1,710.84	3,421.67	0.00E+00	2.80E-02	5.59E-02	0.3750	1.522E+13
Cs-134	2.1353E-03	1,710.84	3,421.67	0.00E+00	3.65E+00	7.31E+00	0.5750	2.581E+14
Cs-135	4.8607E-06	1,710.84	3,421.67	0.00E+00	8.32E-03	1.66E-02	0.8500	3.945E+12
Cs-137	2.0227E+00	1,710.84	3,421.67	0.00E+00	3.46E+03	6.92E+03	1.2500	2.223E+12
Eu-154	2.0887E-02	1,710.84	3,421.67	0.00E+00	3.57E+01	7.15E+01	1.7500	1.049E+11
Eu-155	4.0867E-03	1,710.84	3,421.67	0.00E+00	6.99E+00	1.40E+01	2.2500	9.840E+06
Fe-55	1.4167E-03	1,710.84	3,421.67	0.00E+00	2.42E+00	4.85E+00	2.7500	1.164E+06
H-3	4.6653E-03	1,710.84	3,421.67	0.00E+00	7.98E+00	1.60E+01	3.5000	4.717E+04
I-129	7.1600E-07	1,710.84	3,421.67	0.00E+00	1.22E-03	2.45E-03	5.0000	7.166E+03
Kr-85	1.0240E-01	1,710.84	3,421.67	0.00E+00	1.75E+02	3.50E+02	7.0000	8.108E+02
Np-237	3.7227E-06	1,710.84	3,421.67	0.00E+00	6.37E-03	1.27E-02	11.0000	9.227E+01
Pa-231	2.6727E-09	1,710.84	3,421.67	0.00E+00	4.57E-06	9.14E-06		
Pb-210	4.3313E-14	1,710.84	3,421.67	0.00E+00	7.41E-11	1.48E-10		
Pm-147	4.6307E-02	1,710.84	3,421.67	0.00E+00	7.92E+01	1.58E+02		
Pu-238	5.5273E-03	1,710.84	3,421.67	0.00E+00	9.46E+00	1.89E+01		
Pu-239	1.0313E-02	1,710.84	3,421.67	0.00E+00	1.76E+01	3.53E+01		
Pu-240	5.4180E-03	1,710.84	3,421.67	0.00E+00	9.27E+00	1.85E+01		
Pu-241	3.7573E-01	1,710.84	3,421.67	0.00E+00	6.43E+02	1.29E+03		
Pu-242	3.0713E-06	1,710.84	3,421.67	0.00E+00	5.25E-03	1.05E-02		
Ra-226	2.3807E-13	1,710.84	3,421.67	0.00E+00	4.07E-10	8.15E-10		
Ra-228	1.0607E-14	1,710.84	3,421.67	0.00E+00	1.81E-11	3.63E-11		
Ru-106	8.4800E-06	1,710.84	3,421.67	0.00E+00	1.45E-02	2.90E-02		
Se-79	1.2533E-05	1,710.84	3,421.67	0.00E+00	2.14E-02	4.29E-02		
Sn-126	1.1393E-05	1,710.84	3,421.67	0.00E+00	1.95E-02	3.90E-02		
Sr-90	1.8400E+00	1,710.84	3,421.67	0.00E+00	3.15E+03	6.30E+03		
Tc-99	4.3533E-04	1,710.84	3,421.67	0.00E+00	7.45E-01	1.49E+00		
Th-229	5.8947E-13	1,710.84	3,421.67	0.00E+00	1.01E-09	2.02E-09		
Th-230	5.9500E-11	1,710.84	3,421.67	0.00E+00	1.02E-07	2.04E-07		
Th-232	1.6360E-14	1,710.84	3,421.67	0.00E+00	2.80E-11	5.60E-11		
Ti-208	7.6000E-09	1,710.84	3,421.67	0.00E+00	1.30E-05	2.60E-05		
U-232	2.0747E-08	1,710.84	3,421.67	0.00E+00	3.55E-05	7.10E-05		
U-233	4.4013E-10	1,710.84	3,421.67	0.00E+00	7.53E-07	1.51E-06		
U-234	4.6500E-07	1,710.84	3,421.67	0.00E+00	7.96E-04	1.59E-03		
U-235	-2.5335E-06	1,710.84	0.00	7.78E-03	3.45E-03	7.78E-03		
U-236	1.3000E-05	1,710.84	3,421.67	0.00E+00	2.22E-02	4.45E-02		
U-238	-1.4207E-08	1,710.84	0.00	4.84E-03	4.82E-03	4.84E-03		
Y-90	1.8400E+00	1,710.84	3,421.67	0.00E+00	3.15E+03	6.30E+03		
Other Radionuclides					3.29E+03	6.57E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.09E+01	8.18E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		1,710.84	
Bounding		3,421.67	

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	2.17		
Bounding	4.34		

1.02

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (U3S2 LEU) GERMANY
SNF ID #: 675
Fuel Units & Descr: 135 - ASSEMBLY
Heavy Metal Mass: BOL=151 875kg; EOL=136 688kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 10 to 20%, U)
²Template Burnup(MWd): 15
Template BOL Heavy Metal Mass (MT): 0 00034251
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
3.75

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5333E-10	14,435 18	28,870 37	0 00E+00	1.23E-05	2 46E-05	Avg. MeV	
Am-241	2.2753E-02	14,435 18	28,870 37	0 00E+00	3 28E+02	6.57E+02	0 0150	2 925E+15
Am-242m	8 9133E-06	14,435 18	28,870 37	0 00E+00	1.29E-01	2.57E-01	0 0250	6 077E+14
Am-243	6 4007E-06	14,435 18	28,870 37	0 00E+00	9.24E-02	1 85E-01	0 0375	5 338E+14
C-14	2 9620E-08	14,435 18	28,870 37	0 00E+00	4.28E-04	8 55E-04	0 0575	5 751E+14
Cl-36	5 9513E-35	14,435 18	28,870 37	0 00E+00	8.59E-31	1.72E-30	0 0850	3 423E+14
Cm-243	2.2087E-06	14,435 18	28,870 37	0 00E+00	3.19E-02	6.38E-02	0 1250	2 305E+14
Cm-244	1.1007E-04	14,435 18	28,870 37	0 00E+00	1.59E+00	3.18E+00	0.2250	2 950E+14
Co-60	1 6340E-05	14,435 18	28,870 37	0 00E+00	2.36E-01	4 72E-01	0 3750	1 284E+14
Cs-134	2.1353E-03	14,435 18	28,870 37	0 00E+00	3 08E+01	6 16E+01	0.5750	2 178E+15
Cs-135	4 8607E-06	14,435 18	28,870 37	0 00E+00	7 02E-02	1 40E-01	0 8500	3 329E+13
Cs-137	2 0227E+00	14,435 18	28,870 37	0 00E+00	2 92E+04	5 84E+04	1.2500	1 876E+13
Eu-154	2 0887E-02	14,435 18	28,870 37	0 00E+00	3 02E+02	6 03E+02	1 7500	8 853E+11
Eu-155	4 0867E-03	14,435 18	28,870 37	0 00E+00	5 90E+01	1 18E+02	2.2500	8 303E+07
Fe-55	1 4167E-03	14,435 18	28,870 37	0 00E+00	2 04E+01	4 09E+01	2.7500	9 824E+06
H-3	4 6653E-03	14,435 18	28,870 37	0 00E+00	6 73E+01	1 35E+02	3 5000	3 980E+05
I-129	7 1600E-07	14,435 18	28,870 37	0 00E+00	1 03E-02	2 07E-02	5 0000	6 047E+04
Kr-85	1 0240E-01	14,435 18	28,870 37	0 00E+00	1 48E+03	2 96E+03	7 0000	6 841E+03
Np-237	3.7227E-06	14,435 18	28,870 37	0 00E+00	5 37E-02	1.07E-01	11 0000	7 785E+02
Pa-231	2 6727E-09	14,435 18	28,870 37	0 00E+00	3 86E-05	7.72E-05		
Pb-210	4 3313E-14	14,435 18	28,870 37	0 00E+00	6 25E-10	1.25E-09		
Pm-147	4 6307E-02	14,435 18	28,870 37	0 00E+00	6 68E+02	1 34E+03		
Pu-238	5 5273E-03	14,435 18	28,870 37	0 00E+00	7 98E+01	1 60E+02		
Pu-239	1 0313E-02	14,435 18	28,870 37	0 00E+00	1 49E+02	2 98E+02		
Pu-240	5 4180E-03	14,435 18	28,870 37	0 00E+00	7 82E+01	1 56E+02		
Pu-241	3 7573E-01	14,435 18	28,870 37	0 00E+00	5 42E+03	1 08E+04		
Pu-242	3 0713E-06	14,435 18	28,870 37	0 00E+00	4 43E-02	8 87E-02		
Ra-226	2 3807E-13	14,435 18	28,870 37	0 00E+00	3 44E-09	6 87E-09		
Ra-228	1 0607E-14	14,435 18	28,870 37	0 00E+00	1 53E-10	3 06E-10		
Ru-106	8 4800E-06	14,435 18	28,870 37	0 00E+00	1 22E-01	2 45E-01		
Se-79	1 2533E-05	14,435 18	28,870 37	0 00E+00	1 81E-01	3 62E-01		
Sn-126	1 1393E-05	14,435 18	28,870 37	0 00E+00	1 64E-01	3.29E-01		
Sr-90	1 8400E+00	14,435 18	28,870 37	0 00E+00	2 66E+04	5 31E+04		
Tc-99	4 3533E-04	14,435 18	28,870 37	0 00E+00	6 28E+00	1 26E+01		
Th-229	5 8947E-13	14,435 18	28,870 37	0 00E+00	8 51E-09	1 70E-08		
Th-230	5 9500E-11	14,435 18	28,870 37	0 00E+00	8 59E-07	1 72E-06		
Th-232	1 6360E-14	14,435 18	28,870 37	0 00E+00	2 36E-10	4 72E-10		
Ti-208	7 6000E-09	14,435 18	28,870 37	0 00E+00	1.10E-04	2.19E-04		
U-232	2 0747E-08	14,435 18	28,870 37	0 00E+00	2 99E-04	5 99E-04		
U-233	4 4013E-10	14,435 18	28,870 37	0 00E+00	6 35E-06	1.27E-05		
U-234	4 6500E-07	14,435 18	28,870 37	0 00E+00	6 71E-03	1 34E-02		
U-235	-2.5335E-06	14,435 18	0 00	6.56E-02	2 91E-02	6 56E-02		
U-236	1 3000E-05	14,435 18	28,870 37	0 00E+00	1 88E-01	3 75E-01		
U-238	-1 4207E-08	14,435 18	0 00	4 08E-02	4 06E-02	4 08E-02		
Y-90	1 8400E+00	14,435 18	28,870 37	0 00E+00	2 66E+04	5 31E+04		
Other Radionuclides					2.77E+04	5 55E+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 %	20	10 to 20	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		14,435 18	
Bounding		28,870 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	2.17		
Bounding	4 34		1 02

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (UALX LEU) AUSTRALIA
SNF ID #: 299
Fuel Units & Descr: 289 - ASSEMBLY
Heavy Metal Mass BOL=289kg EOL=260 1kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum, 10 to 20%, U)
²Template Burnup(MWd) 15
Template BOL Heavy Metal Mass (MT) 0.00034251
Template Decay Time 20 years

Estimated
Canister usage:
18"x10"
8 03

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	8.5333E-10	27,468.45	54,936.90	0.00E+00	2.34E-05	4.69E-05	Avg MeV	
Am-241	2.2753E-02	27,468.45	54,936.90	0.00E+00	6.25E+02	1.25E+03	0.0150	5.566E+15
Am-242m	8.9133E-06	27,468.45	54,936.90	0.00E+00	2.45E-01	4.90E-01	0.0250	1.156E+15
Am-243	6.4007E-06	27,468.45	54,936.90	0.00E+00	1.76E-01	3.52E-01	0.0375	1.016E+15
C-14	2.9620E-08	27,468.45	54,936.90	0.00E+00	8.14E-04	1.63E-03	0.0575	1.094E+15
Cl-36	5.9513E-35	27,468.45	54,936.90	0.00E+00	1.63E-30	3.27E-30	0.0850	6.514E+14
Co-243	2.2087E-06	27,468.45	54,936.90	0.00E+00	6.07E-02	1.21E-01	0.1250	4.386E+14
Co-244	1.1007E-04	27,468.45	54,936.90	0.00E+00	3.02E+00	6.05E+00	0.2250	5.614E+14
Co-60	1.6340E-05	27,468.45	54,936.90	0.00E+00	4.49E-01	8.98E-01	0.3750	2.444E+14
Cs-134	2.1353E-03	27,468.45	54,936.90	0.00E+00	5.87E+01	1.17E+02	0.5750	4.144E+15
Cs-135	4.8607E-06	27,468.45	54,936.90	0.00E+00	1.34E-01	2.67E-01	0.8500	6.335E+13
Cs-137	2.0227E+00	27,468.45	54,936.90	0.00E+00	5.56E+04	1.11E+05	1.2500	3.569E+13
Eu-154	2.0887E-02	27,468.45	54,936.90	0.00E+00	5.74E+02	1.15E+03	1.7500	1.685E+12
Eu-155	4.0867E-03	27,468.45	54,936.90	0.00E+00	1.12E+02	2.25E+02	2.2500	1.580E+08
Fe-55	1.4167E-03	27,468.45	54,936.90	0.00E+00	3.89E+01	7.78E+01	2.7500	1.869E+07
H-3	4.6653E-03	27,468.45	54,936.90	0.00E+00	1.28E+02	2.56E+02	3.5000	7.574E+05
I-129	7.1600E-07	27,468.45	54,936.90	0.00E+00	1.97E-02	3.93E-02	5.0000	1.151E+05
Kr-85	1.0240E-01	27,468.45	54,936.90	0.00E+00	2.81E+03	5.63E+03	7.0000	1.302E+04
Np-237	3.7227E-06	27,468.45	54,936.90	0.00E+00	1.02E-01	2.05E-01	11.0000	1.481E+03
Pa-231	2.6727E-09	27,468.45	54,936.90	0.00E+00	7.34E-05	1.47E-04		
Pb-210	4.3313E-14	27,468.45	54,936.90	0.00E+00	1.19E-09	2.38E-09		
Pm-147	4.6307E-02	27,468.45	54,936.90	0.00E+00	1.27E+03	2.54E+03		
Pu-238	5.5273E-03	27,468.45	54,936.90	0.00E+00	1.52E+02	3.04E+02		
Pu-239	1.0313E-02	27,468.45	54,936.90	0.00E+00	2.83E+02	5.67E+02		
Pu-240	5.4180E-03	27,468.45	54,936.90	0.00E+00	1.49E+02	2.98E+02		
Pu-241	3.7573E-01	27,468.45	54,936.90	0.00E+00	1.03E+04	2.06E+04		
Pu-242	3.0713E-06	27,468.45	54,936.90	0.00E+00	8.44E-02	1.69E-01		
Ra-226	2.3807E-13	27,468.45	54,936.90	0.00E+00	6.54E-09	1.31E-08		
Ra-228	1.0607E-14	27,468.45	54,936.90	0.00E+00	2.91E-10	5.83E-10		
Ru-106	8.4800E-06	27,468.45	54,936.90	0.00E+00	2.33E-01	4.66E-01		
Se-79	1.2533E-05	27,468.45	54,936.90	0.00E+00	3.44E-01	6.89E-01		
Sn-126	1.1393E-05	27,468.45	54,936.90	0.00E+00	3.13E-01	6.26E-01		
Sr-90	1.8400E+00	27,468.45	54,936.90	0.00E+00	5.05E+04	1.01E+05		
Tc-99	4.3533E-04	27,468.45	54,936.90	0.00E+00	1.20E+01	2.39E+01		
Th-229	5.8947E-13	27,468.45	54,936.90	0.00E+00	1.62E-08	3.24E-08		
Th-230	5.9500E-11	27,468.45	54,936.90	0.00E+00	1.63E-06	3.27E-06		
Th-232	1.6360E-14	27,468.45	54,936.90	0.00E+00	4.49E-10	8.99E-10		
Ti-208	7.6000E-09	27,468.45	54,936.90	0.00E+00	2.09E-04	4.18E-04		
U-232	2.0747E-08	27,468.45	54,936.90	0.00E+00	5.70E-04	1.14E-03		
U-233	4.4013E-10	27,468.45	54,936.90	0.00E+00	1.21E-05	2.42E-05		
U-234	4.6500E-07	27,468.45	54,936.90	0.00E+00	1.28E-02	2.55E-02		
U-235	-2.5335E-06	27,468.45	0.00	1.25E-01	5.53E-02	1.25E-01		
U-236	1.3000E-05	27,468.45	54,936.90	0.00E+00	3.57E-01	7.14E-01		
U-238	-1.4207E-08	27,468.45	0.00	7.77E-02	7.73E-02	7.77E-02		
Y-90	1.8400E+00	27,468.45	54,936.90	0.00E+00	5.05E+04	1.01E+05		
Other Radionuclides					5.28E+04	1.06E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters.
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	20.0000003	10 to 20	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal		27,468.45	
Bounding		54,936.90	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1.02
Nominal	2.17		
Bounding	4.34		

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (UALX-HEU) AUSTRALIA
SNF ID #: 300
Fuel Units & Descr: 266 - ASSEMBLY
Heavy Metal Mass: BOL=38.251kg; EOL=22.025kg
ROD Storage Site: SRS

¹Fuel decay start date 2010

Estimates as of: 2030

Template: HFBR (Heavy Water, Alum., 40 to 100%, U)

²Template Burnup(MWd), 164.6

Template BOL Heavy Metal Mass (MT): 0.000377

Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
7.39

II. Estimates

	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.1355E-10	14,945.82	29,891.64	0.00E+00	4.69E-06	9.37E-06	Avg MeV	
Am-241	8.0194E-03	14,945.82	29,891.64	0.00E+00	1.20E+02	2.40E+02	0.0150	3.160E+15
Am-242m	1.3694E-06	14,945.82	29,891.64	0.00E+00	2.05E-02	4.09E-02	0.0250	6.514E+14
Am-243	3.7096E-05	14,945.82	29,891.64	0.00E+00	5.54E-01	1.11E+00	0.0375	5.787E+14
C-14	2.6464E-08	14,945.82	29,891.64	0.00E+00	3.96E-04	7.91E-04	0.0575	6.128E+14
Cl-36	4.4441E-31	14,945.82	29,891.64	0.00E+00	6.64E-27	1.33E-26	0.0850	3.709E+14
Cm-243	5.7029E-06	14,945.82	29,891.64	0.00E+00	8.52E-02	1.70E-01	0.1250	2.627E+14
Cm-244	4.6555E-03	14,945.82	29,891.64	0.00E+00	6.96E+01	1.39E+02	0.2250	3.192E+14
Co-60	4.8663E-05	14,945.82	29,891.64	0.00E+00	7.27E-01	1.45E+00	0.3750	1.382E+14
Cs-134	1.0638E-02	14,945.82	29,891.64	0.00E+00	1.59E+02	3.18E+02	0.5750	2.287E+15
Cs-135	4.2564E-06	14,945.82	29,891.64	0.00E+00	6.36E-02	1.27E-01	0.8500	5.989E+13
Cs-137	2.0358E+00	14,945.82	29,891.64	0.00E+00	3.04E+04	6.09E+04	1.2500	3.840E+13
Eu-154	5.1956E-02	14,945.82	29,891.64	0.00E+00	7.77E+02	1.55E+03	1.7500	1.480E+12
Eu-155	1.4295E-02	14,945.82	29,891.64	0.00E+00	2.14E+02	4.27E+02	2.2500	9.461E+07
Fe-55	1.3560E-03	14,945.82	29,891.64	0.00E+00	2.03E+01	4.05E+01	2.7500	5.536E+07
H-3	4.6258E-03	14,945.82	29,891.64	0.00E+00	6.91E+01	1.38E+02	3.5000	2.339E+06
I-129	6.6403E-07	14,945.82	29,891.64	0.00E+00	9.92E-03	1.98E-02	5.0000	8.993E+05
Kr-85	1.0808E-01	14,945.82	29,891.64	0.00E+00	1.62E+03	3.23E+03	7.0000	1.032E+05
Np-237	3.1537E-05	14,945.82	29,891.64	0.00E+00	4.71E-01	9.43E-01	11.0000	1.183E+04
Pa-231	9.7023E-10	14,945.82	29,891.64	0.00E+00	1.45E-05	2.90E-05		
Pb-210	1.1731E-11	14,945.82	29,891.64	0.00E+00	1.75E-07	3.51E-07		
Pm-147	2.4405E-02	14,945.82	29,891.64	0.00E+00	3.65E+02	7.29E+02		
Pu-238	1.5358E-01	14,945.82	29,891.64	0.00E+00	2.30E+03	4.59E+03		
Pu-239	6.9502E-04	14,945.82	29,891.64	0.00E+00	1.04E+01	2.08E+01		
Pu-240	3.7631E-04	14,945.82	29,891.64	0.00E+00	5.62E+00	1.12E+01		
Pu-241	1.3433E-01	14,945.82	29,891.64	0.00E+00	2.01E+03	4.02E+03		
Pu-242	3.0911E-06	14,945.82	29,891.64	0.00E+00	4.62E-02	9.24E-02		
Ra-226	5.5079E-11	14,945.82	29,891.64	0.00E+00	8.23E-07	1.65E-06		
Ra-228	1.3335E-14	14,945.82	29,891.64	0.00E+00	1.99E-10	3.99E-10		
Ru-106	7.3390E-06	14,945.82	29,891.64	0.00E+00	1.10E-01	2.19E-01		
Se-79	1.2339E-05	14,945.82	29,891.64	0.00E+00	1.84E-01	3.69E-01		
Sn-126	1.0194E-05	14,945.82	29,891.64	0.00E+00	1.52E-01	3.05E-01		
Sr-90	1.9064E+00	14,945.82	29,891.64	0.00E+00	2.85E+04	5.70E+04		
Tc-99	3.8056E-04	14,945.82	29,891.64	0.00E+00	5.69E+00	1.14E+01		
Th-229	4.9198E-12	14,945.82	29,891.64	0.00E+00	7.35E-08	1.47E-07		
Th-230	1.0547E-08	14,945.82	29,891.64	0.00E+00	1.58E-04	3.15E-04		
Th-232	2.0705E-14	14,945.82	29,891.64	0.00E+00	3.09E-10	6.19E-10		
Ti-208	4.8827E-08	14,945.82	29,891.64	0.00E+00	7.30E-04	1.46E-03		
U-232	1.3414E-07	14,945.82	29,891.64	0.00E+00	2.00E-03	4.01E-03		
U-233	3.7679E-09	14,945.82	29,891.64	0.00E+00	5.63E-05	1.13E-04		
U-234	5.2047E-05	14,945.82	29,891.64	0.00E+00	7.78E-01	1.56E+00		
U-235	-2.8661E-06	14,945.82	0.00	6.61E-02	2.33E-02	6.61E-02		
U-236	1.6701E-05	14,945.82	29,891.64	0.00E+00	2.50E-01	4.99E-01		
U-238	-9.4194E-09	14,945.82	0.00	2.57E-03	2.43E-03	2.57E-03		
Y-90	1.9070E+00	14,945.82	29,891.64	0.00E+00	2.85E+04	5.70E+04		
Other Radionuclides					2.91E+04	5.82E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	80.0000311	40 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		14,945.82	
Bounding		29,891.64	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.89		
Bounding	1.79		1.01

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (UALX-HEU) AUSTRALIA
SNF ID #: 684
Fuel Units & Descr: 169 - ASSEMBLY
Heavy Metal Mass BOL=47.878kg EOL=32.651kg
ROD Storage Site SRS

Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum, 40 to 100% U)
Template Burnup (MWd) 164.6
Template BOL Heavy Metal Mass (MT) 0.000377
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
4.69

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.1355E-10	14,025.54	28,051.09	0.00E+00	4.40E-06	8.80E-06	0.0150	2.966E+15
Am-241	8.0194E-03	14,025.54	28,051.09	0.00E+00	1.12E+02	2.25E+02	0.0250	6.113E+14
Am-242m	1.3694E-06	14,025.54	28,051.09	0.00E+00	1.92E-02	3.84E-02	0.0375	5.431E+14
Am-243	3.7096E-05	14,025.54	28,051.09	0.00E+00	5.20E-01	1.04E+00	0.0575	5.750E+14
C-14	2.6464E-08	14,025.54	28,051.09	0.00E+00	3.71E-04	7.42E-04	0.0850	3.481E+14
Cl-36	4.4441E-31	14,025.54	28,051.09	0.00E+00	6.23E-27	1.25E-26	0.1250	2.465E+14
Cm-243	5.7029E-06	14,025.54	28,051.09	0.00E+00	8.00E-02	1.60E-01	0.2250	2.996E+14
Cm-244	4.6555E-03	14,025.54	28,051.09	0.00E+00	6.53E+01	1.31E+02	0.3750	1.297E+14
Co-60	4.8663E-05	14,025.54	28,051.09	0.00E+00	6.83E-01	1.37E+00	0.5750	2.146E+15
Cs-134	1.0638E-02	14,025.54	28,051.09	0.00E+00	1.49E+02	2.98E+02	0.8500	5.620E+13
Cs-135	4.2564E-06	14,025.54	28,051.09	0.00E+00	5.97E-02	1.19E-01	1.2500	3.603E+13
Cs-137	2.0358E+00	14,025.54	28,051.09	0.00E+00	2.86E+04	5.71E+04	1.7500	1.388E+12
Eu-154	5.1956E-02	14,025.54	28,051.09	0.00E+00	7.29E+02	1.46E+03	2.2500	8.879E+07
Eu-155	1.4295E-02	14,025.54	28,051.09	0.00E+00	2.00E+02	4.01E+02	2.7500	5.195E+07
Fe-55	1.3560E-03	14,025.54	28,051.09	0.00E+00	1.90E+01	3.80E+01	3.5000	2.195E+06
H-3	4.6258E-03	14,025.54	28,051.09	0.00E+00	6.49E+01	1.30E+02	5.0000	8.440E+05
I-129	6.6403E-07	14,025.54	28,051.09	0.00E+00	9.31E-03	1.86E-02	7.0000	9.688E+04
Kr-85	1.0808E-01	14,025.54	28,051.09	0.00E+00	1.52E+03	3.03E+03	11.0000	1.110E+04
Np-237	3.1537E-05	14,025.54	28,051.09	0.00E+00	4.42E-01	8.85E-01		
Pa-231	9.7023E-10	14,025.54	28,051.09	0.00E+00	1.36E-05	2.72E-05		
Pb-210	1.1731E-11	14,025.54	28,051.09	0.00E+00	1.65E-07	3.29E-07		
Pm-147	2.4405E-02	14,025.54	28,051.09	0.00E+00	3.42E+02	6.85E+02		
Pu-238	1.5358E-01	14,025.54	28,051.09	0.00E+00	2.15E+03	4.31E+03		
Pu-239	6.9502E-04	14,025.54	28,051.09	0.00E+00	9.75E+00	1.95E+01		
Pu-240	3.7631E-04	14,025.54	28,051.09	0.00E+00	5.28E+00	1.06E+01		
Pu-241	1.3433E-01	14,025.54	28,051.09	0.00E+00	1.88E+03	3.77E+03		
Pu-242	3.0911E-06	14,025.54	28,051.09	0.00E+00	4.34E-02	8.67E-02		
Ra-226	5.5079E-11	14,025.54	28,051.09	0.00E+00	7.73E-07	1.55E-06		
Ra-228	1.3335E-14	14,025.54	28,051.09	0.00E+00	1.87E-10	3.74E-10		
Ru-106	7.3390E-06	14,025.54	28,051.09	0.00E+00	1.03E-01	2.06E-01		
Se-79	1.2339E-05	14,025.54	28,051.09	0.00E+00	1.73E-01	3.46E-01		
Sn-126	1.0194E-05	14,025.54	28,051.09	0.00E+00	1.43E-01	2.86E-01		
Sr-90	1.9064E+00	14,025.54	28,051.09	0.00E+00	2.67E+04	5.35E+04		
Tc-99	3.8056E-04	14,025.54	28,051.09	0.00E+00	5.34E+00	1.07E+01		
Th-229	4.9198E-12	14,025.54	28,051.09	0.00E+00	6.90E-08	1.38E-07		
Th-230	1.0547E-08	14,025.54	28,051.09	0.00E+00	1.48E-04	2.96E-04		
Th-232	2.0705E-14	14,025.54	28,051.09	0.00E+00	2.90E-10	5.81E-10		
Th-208	4.8827E-08	14,025.54	28,051.09	0.00E+00	6.85E-04	1.37E-03		
U-232	1.3414E-07	14,025.54	28,051.09	0.00E+00	1.88E-03	3.76E-03		
U-233	3.7679E-09	14,025.54	28,051.09	0.00E+00	5.28E-05	1.06E-04		
U-234	5.2047E-05	14,025.54	28,051.09	0.00E+00	7.30E-01	1.46E+00		
U-235	-2.8661E-06	14,025.54	0.00	6.21E-02	2.19E-02	6.21E-02		
U-236	1.6701E-05	14,025.54	28,051.09	0.00E+00	2.34E-01	4.68E-01		
U-238	-9.4194E-09	14,025.54	0.00	6.44E-03	6.30E-03	6.44E-03		
Y-90	1.9070E+00	14,025.54	28,051.09	0.00E+00	2.67E+04	5.35E+04		
Other Radionuclides					2.73E+04	5.46E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	HEAVY WATER	HEAVY WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	60.0000706	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		14,025.54
Bounding		28,051.09

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	0.67	
Bounding	1.34	

Estimated EOL HM/Given EOL HM
1.01

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (UALX-HEU) DENMARK
SNF ID #: 676
Fuel Units & Descr: 5 - ASSEMBLY
Heavy Metal Mass: BOL=0.64kg; EOL=0.336kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum, 40 to 100%, U)
²Template Burnup(MWd): 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
0.14

II. Estimates

Radionuclide	m	X _n	X _b	b	Y _n	Y _b	Gamma Sources	
	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.1355E-10	279.55	559.11	0.00E+00	8.77E-08	1.75E-07	Avg MeV	
Am-241	8.0194E-03	279.55	559.11	0.00E+00	2.24E+00	4.48E+00	0.0150	5.911E+13
Am-242m	1.3694E-06	279.55	559.11	0.00E+00	3.83E-04	7.66E-04	0.0250	1.218E+13
Am-243	3.7096E-05	279.55	559.11	0.00E+00	1.04E-02	2.07E-02	0.0375	1.082E+13
C-14	2.6464E-08	279.55	559.11	0.00E+00	7.40E-08	1.48E-05	0.0575	1.146E+13
Cl-36	4.4441E-31	279.55	559.11	0.00E+00	1.24E-28	2.48E-28	0.0850	6.937E+12
Cm-243	5.7029E-06	279.55	559.11	0.00E+00	1.59E-03	3.19E-03	0.1250	4.913E+12
Cm-244	4.6555E-03	279.55	559.11	0.00E+00	1.30E+00	2.60E+00	0.2250	5.971E+12
Co-60	4.8663E-05	279.55	559.11	0.00E+00	1.36E-02	2.72E-02	0.3750	2.584E+12
Cs-134	1.0638E-02	279.55	559.11	0.00E+00	2.97E+00	5.95E+00	0.5750	4.278E+13
Cs-135	4.2564E-06	279.55	559.11	0.00E+00	1.19E-03	2.38E-03	0.8500	1.120E+12
Cs-137	2.0358E+00	279.55	559.11	0.00E+00	5.69E+02	1.14E+03	1.2500	7.182E+11
Eu-154	5.1956E-02	279.55	559.11	0.00E+00	1.45E+01	2.90E+01	1.7500	2.767E+10
Eu-155	1.4295E-02	279.55	559.11	0.00E+00	4.00E+00	7.99E+00	2.2500	1.770E+06
Fe-55	1.3560E-03	279.55	559.11	0.00E+00	3.79E-01	7.58E-01	2.7500	1.036E+06
H-3	4.6258E-03	279.55	559.11	0.00E+00	1.29E+00	2.59E+00	3.5000	4.376E+04
I-129	6.6403E-07	279.55	559.11	0.00E+00	1.86E-04	3.71E-04	5.0000	1.682E+04
Kr-85	1.0808E-01	279.55	559.11	0.00E+00	3.02E+01	6.04E+01	7.0000	1.931E+03
Np-237	3.1537E-05	279.55	559.11	0.00E+00	8.82E-03	1.76E-02	11.0000	2.213E+02
Pa-231	9.7023E-10	279.55	559.11	0.00E+00	2.71E-07	5.42E-07		
Pb-210	1.1731E-11	279.55	559.11	0.00E+00	3.28E-09	6.56E-09		
Pm-147	2.4405E-02	279.55	559.11	0.00E+00	6.82E+00	1.36E+01		
Pu-238	1.5358E-01	279.55	559.11	0.00E+00	4.29E+01	8.59E+01		
Pu-239	6.9502E-04	279.55	559.11	0.00E+00	1.94E-01	3.89E-01		
Pu-240	3.7631E-04	279.55	559.11	0.00E+00	1.05E-01	2.10E-01		
Pu-241	1.3433E-01	279.55	559.11	0.00E+00	3.76E+01	7.51E+01		
Pu-242	3.0911E-06	279.55	559.11	0.00E+00	8.64E-04	1.73E-03		
Ra-226	5.5079E-11	279.55	559.11	0.00E+00	1.54E-08	3.08E-08		
Ra-228	1.3335E-14	279.55	559.11	0.00E+00	3.73E-12	7.46E-12		
Ru-106	7.3390E-06	279.55	559.11	0.00E+00	2.05E-03	4.10E-03		
Se-79	1.2339E-05	279.55	559.11	0.00E+00	3.45E-03	6.90E-03		
Sn-126	1.0194E-05	279.55	559.11	0.00E+00	2.85E-03	5.70E-03		
Sr-90	1.9064E+00	279.55	559.11	0.00E+00	5.33E+02	1.07E+03		
Tc-99	3.8056E-04	279.55	559.11	0.00E+00	1.06E-01	2.13E-01		
Th-229	4.9198E-12	279.55	559.11	0.00E+00	1.38E-09	2.75E-09		
Th-230	1.0547E-08	279.55	559.11	0.00E+00	2.95E-06	5.90E-06		
Th-232	2.0705E-14	279.55	559.11	0.00E+00	5.79E-12	1.16E-11		
Ti-208	4.8827E-08	279.55	559.11	0.00E+00	1.36E-05	2.73E-05		
U-232	1.3414E-07	279.55	559.11	0.00E+00	3.75E-05	7.50E-05		
U-233	3.7679E-09	279.55	559.11	0.00E+00	1.05E-06	2.11E-06		
U-234	5.2047E-05	279.55	559.11	0.00E+00	1.46E-02	2.91E-02		
U-235	-2.8661E-06	279.55	0.00	1.29E-03	4.85E-04	1.29E-03		
U-236	1.6701E-05	279.55	559.11	0.00E+00	4.67E-03	9.34E-03		
U-238	-9.4194E-09	279.55	0.00	1.51E-05	1.24E-05	1.51E-05		
Y-90	1.9070E+00	279.55	559.11	0.00E+00	5.33E+02	1.07E+03		
Other Radionuclides					5.44E+02	1.09E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.09E+00	1.62E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	HEAVY WATER	HEAVY WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	92.9999218	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		279.55
Bounding		559.11

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	1.00	
Bounding	2.00	

Estimated EOL HM/Given EOL HM

1.02

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (UALX-HEU) DENMARK
SNF ID # 678
Fuel Units & Descr 5 - ASSEMBLY
Heavy Metal Mass BOL=0.79kg EOL=0.423kg
ROD Storage Site SRS

Fuel decay start date: 2010
Estimates as of 2030
Template HFBR (Heavy Water Alum, 40 to 100% U)
Template Burnup (MWd) 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
0.14

II. Estimates							Gamma Sources	
Radionuclide	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	3.1355E-10	338.51	677.01	0.00E+00	1.06E-07	2.12E-07	0.0150	7.158E+13
Am-241	8.0194E-03	338.51	677.01	0.00E+00	2.71E+00	5.43E+00	0.0250	1.475E+13
Am-242m	1.3694E-06	338.51	677.01	0.00E+00	4.64E-04	9.27E-04	0.0375	1.311E+13
Am-243	3.7096E-05	338.51	677.01	0.00E+00	1.26E-02	2.51E-02	0.0575	1.388E+13
C-14	2.6464E-08	338.51	677.01	0.00E+00	8.96E-06	1.79E-05	0.0850	8.400E+12
Cl-36	4.4411E-31	338.51	677.01	0.00E+00	1.50E-28	3.01E-28	0.1250	5.950E+12
Cm-243	5.7029E-06	338.51	677.01	0.00E+00	1.93E-03	3.86E-03	0.2250	7.230E+12
Cm-244	4.6555E-03	338.51	677.01	0.00E+00	1.58E+00	3.15E+00	0.3750	3.129E+12
Co-60	4.8663E-05	338.51	677.01	0.00E+00	1.65E-02	3.29E-02	0.5750	5.180E+13
Cs-134	1.0638E-02	338.51	677.01	0.00E+00	3.60E+00	7.20E+00	0.8500	1.356E+12
Cs-135	4.2564E-06	338.51	677.01	0.00E+00	1.44E-03	2.88E-03	1.2500	8.696E+11
Cs-137	2.0358E+00	338.51	677.01	0.00E+00	6.89E+02	1.38E+03	1.7500	3.351E+10
Eu-154	5.1956E-02	338.51	677.01	0.00E+00	1.76E+01	3.52E+01	2.2500	2.143E+06
Eu-155	1.4295E-02	338.51	677.01	0.00E+00	4.84E+00	9.68E+00	2.7500	1.254E+06
Fe-55	1.3560E-03	338.51	677.01	0.00E+00	4.59E-01	9.18E-01	3.5000	5.298E+04
H-3	4.6258E-03	338.51	677.01	0.00E+00	1.57E+00	3.13E+00	5.0000	2.037E+04
I-129	6.6403E-07	338.51	677.01	0.00E+00	2.25E-04	4.50E-04	7.0000	2.338E+03
Kr-85	1.0808E-01	338.51	677.01	0.00E+00	3.66E+01	7.32E+01	11.0000	2.679E+02
Np-237	3.1537E-05	338.51	677.01	0.00E+00	1.07E-02	2.14E-02		
Pa-231	9.7023E-10	338.51	677.01	0.00E+00	3.28E-07	6.57E-07		
Pb-210	1.1731E-11	338.51	677.01	0.00E+00	3.97E-09	7.94E-09		
Pm-147	2.4405E-02	338.51	677.01	0.00E+00	8.26E+00	1.65E+01		
Pu-238	1.5358E-01	338.51	677.01	0.00E+00	5.20E+01	1.04E+02		
Pu-239	6.9502E-04	338.51	677.01	0.00E+00	2.35E-01	4.71E-01		
Pu-240	3.7631E-04	338.51	677.01	0.00E+00	1.27E-01	2.55E-01		
Pu-241	1.3433E-01	338.51	677.01	0.00E+00	4.55E+01	9.09E+01		
Pu-242	3.0911E-06	338.51	677.01	0.00E+00	1.05E-03	2.09E-03		
Ra-226	5.5079E-11	338.51	677.01	0.00E+00	1.86E-08	3.73E-08		
Ra-228	1.3335E-14	338.51	677.01	0.00E+00	4.51E-12	9.03E-12		
Ru-106	7.3390E-06	338.51	677.01	0.00E+00	2.48E-03	4.97E-03		
Se-79	1.2339E-05	338.51	677.01	0.00E+00	4.18E-03	8.35E-03		
Sn-126	1.0194E-05	338.51	677.01	0.00E+00	3.45E-03	6.90E-03		
Sr-90	1.9064E+00	338.51	677.01	0.00E+00	6.45E+02	1.29E+03		
Tc-99	3.8056E-04	338.51	677.01	0.00E+00	1.29E-01	2.58E-01		
Th-229	4.9198E-12	338.51	677.01	0.00E+00	1.67E-09	3.33E-09		
Th-230	1.0547E-08	338.51	677.01	0.00E+00	3.57E-06	7.14E-06		
Th-232	2.0705E-14	338.51	677.01	0.00E+00	7.01E-12	1.40E-11		
Ti-208	4.8827E-08	338.51	677.01	0.00E+00	1.65E-05	3.31E-05		
U-232	1.3414E-07	338.51	677.01	0.00E+00	4.54E-05	9.08E-05		
U-233	3.7679E-09	338.51	677.01	0.00E+00	1.28E-06	2.55E-06		
U-234	5.2047E-05	338.51	677.01	0.00E+00	1.76E-02	3.52E-02		
U-235	-2.8661E-06	338.51	0.00	1.59E-03	6.18E-04	1.59E-03		
U-236	1.6701E-05	338.51	677.01	0.00E+00	5.65E-03	1.13E-02		
U-238	-9.4194E-09	338.51	0.00	1.86E-05	1.54E-05	1.86E-05		
Y-90	1.9070E+00	338.51	677.01	0.00E+00	6.46E+02	1.29E+03		
Other Radionuclides					6.59E+02	1.32E+03		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	HEAVY WATER	HEAVY WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93.00000949	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		338.51
Bounding		677.01

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	0.98	
Bounding	1.96	

Estimated EOL HM/Given EOL HM

1.02

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (JALX-HEU) GERMANY
SNF ID #: 583
Fuel Units & Descr: 105 - ASSEMBLY
Heavy Metal Mass: BOL=19 688kg; EOL=13 388kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 40 to 100%, U)
²Template Burnup(MWd): 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time*: 20 years

Estimated
Canister usage:
18"x10"
2.92

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.1355E-10	5,802.95	11,605.90	0.00E+00	1.82E-06	3.64E-06	Avg MeV	
Am-241	8.0194E-03	5,802.95	11,605.90	0.00E+00	4.65E+01	9.31E+01	0.0150	1.227E+15
Am-242m	1.3694E-06	5,802.95	11,605.90	0.00E+00	7.95E-03	1.59E-02	0.0250	2.529E+14
Am-243	3.7096E-05	5,802.95	11,605.90	0.00E+00	2.15E-01	4.31E-01	0.0375	2.247E+14
C-14	2.6464E-08	5,802.95	11,605.90	0.00E+00	1.54E-04	3.07E-04	0.0575	2.379E+14
Cl-36	4.4441E-31	5,802.95	11,605.90	0.00E+00	2.58E-27	5.16E-27	0.0850	1.440E+14
Cm-243	5.7029E-06	5,802.95	11,605.90	0.00E+00	3.31E-02	6.62E-02	0.1250	1.020E+14
Cm-244	4.6555E-03	5,802.95	11,605.90	0.00E+00	2.70E+01	5.40E+01	0.2250	1.240E+14
Co-60	4.8663E-05	5,802.95	11,605.90	0.00E+00	2.82E-01	5.65E-01	0.3750	5.364E+13
Cs-134	1.0638E-02	5,802.95	11,605.90	0.00E+00	6.17E+01	1.23E+02	0.5750	8.879E+14
Cs-135	4.2564E-06	5,802.95	11,605.90	0.00E+00	2.47E-02	4.94E-02	0.8500	2.325E+13
Cs-137	2.0358E+00	5,802.95	11,605.90	0.00E+00	1.18E+04	2.36E+04	1.2500	1.491E+13
Eu-154	5.1956E-02	5,802.95	11,605.90	0.00E+00	3.01E+02	6.03E+02	1.7500	5.745E+11
Eu-155	1.4295E-02	5,802.95	11,605.90	0.00E+00	8.30E+01	1.66E+02	2.2500	3.674E+07
Fe-55	1.3560E-03	5,802.95	11,605.90	0.00E+00	7.87E+00	1.57E+01	2.7500	2.149E+07
H-3	4.6258E-03	5,802.95	11,605.90	0.00E+00	2.68E+01	5.37E+01	3.5000	9.083E+05
I-129	6.6403E-07	5,802.95	11,605.90	0.00E+00	3.85E-03	7.71E-03	5.0000	3.492E+05
Kr-85	1.0808E-01	5,802.95	11,605.90	0.00E+00	6.27E+02	1.25E+03	7.0000	4.008E+04
Np-237	3.1537E-05	5,802.95	11,605.90	0.00E+00	1.83E-01	3.66E-01	11.0000	4.593E+03
Pa-231	9.7023E-10	5,802.95	11,605.90	0.00E+00	5.63E-06	1.13E-05		
Pb-210	1.1731E-11	5,802.95	11,605.90	0.00E+00	6.81E-08	1.36E-07		
Pm-147	2.4405E-02	5,802.95	11,605.90	0.00E+00	1.42E+02	2.83E+02		
Pu-238	1.5358E-01	5,802.95	11,605.90	0.00E+00	8.91E+02	1.78E+03		
Pu-239	6.9502E-04	5,802.95	11,605.90	0.00E+00	4.03E+00	8.07E+00		
Pu-240	3.7631E-04	5,802.95	11,605.90	0.00E+00	2.18E+00	4.37E+00		
Pu-241	1.3433E-01	5,802.95	11,605.90	0.00E+00	7.79E+02	1.56E+03		
Pu-242	3.0911E-06	5,802.95	11,605.90	0.00E+00	1.79E-02	3.59E-02		
Ra-226	5.5079E-11	5,802.95	11,605.90	0.00E+00	3.20E-07	6.39E-07		
Ra-228	1.3335E-14	5,802.95	11,605.90	0.00E+00	7.74E-11	1.55E-10		
Ru-106	7.3390E-06	5,802.95	11,605.90	0.00E+00	4.26E-02	8.52E-02		
Se-79	1.2339E-05	5,802.95	11,605.90	0.00E+00	7.16E-02	1.43E-01		
Sn-126	1.0194E-05	5,802.95	11,605.90	0.00E+00	5.92E-02	1.18E-01		
Sr-90	1.9064E+00	5,802.95	11,605.90	0.00E+00	1.11E+04	2.21E+04		
Tc-99	3.8056E-04	5,802.95	11,605.90	0.00E+00	2.21E+00	4.42E+00		
Th-229	4.9198E-12	5,802.95	11,605.90	0.00E+00	2.85E-08	5.71E-08		
Th-230	1.0547E-08	5,802.95	11,605.90	0.00E+00	6.12E-05	1.22E-04		
Th-232	2.0705E-14	5,802.95	11,605.90	0.00E+00	1.20E-10	2.40E-10		
Ti-208	4.8827E-08	5,802.95	11,605.90	0.00E+00	2.83E-04	5.67E-04		
U-232	1.3414E-07	5,802.95	11,605.90	0.00E+00	7.78E-04	1.56E-03		
U-233	3.7679E-09	5,802.95	11,605.90	0.00E+00	2.19E-05	4.37E-05		
U-234	5.2047E-05	5,802.95	11,605.90	0.00E+00	3.02E-01	6.04E-01		
U-235	-2.8661E-06	5,802.95	0.00	3.40E-02	1.74E-02	3.40E-02		
U-236	1.6701E-05	5,802.95	11,605.90	0.00E+00	9.69E-02	1.94E-01		
U-238	-9.4194E-09	5,802.95	0.00	1.32E-03	1.27E-03	1.32E-03		
Y-90	1.9070E+00	5,802.95	11,605.90	0.00E+00	1.11E+04	2.21E+04		
Other Radionuclides					1.13E+04	2.26E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	HEAVY WATER	HEAVY WATER	
	ALUM	ALUM	
	U	U	
	80	40 to 100	

Burnup Summary (MWd) ¹			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		5,802.95 11 605.90	

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

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.68 1.35		

1.01

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

²Total burnup for all fuel associated with this worksheet must be 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 TUBES (JALX-HEU) GERMANY
SNF ID #: 685
Fuel Units & Descr: 130 - ASSEMBLY
Heavy Metal Mass BOL=27 625kg, EOL=18 785kg
ROD Storage Site SRS

¹Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water Alum, 40 to 100%, U)
²Template Burnup (MWD) 164.6
Template BOL Heavy Metal Mass (MT) 0.000377
Template Decay Time 20 years

Estimated
Canister usage:
18"x10"
3.61

II. Estimates		m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)	Avg MeV
Ac-227	3.1355E-10	8,142.55	16,285.10	0.00E+00	2.55E-06	5.11E-06	0.0150	1.722E+15	0.0150
Am-241	8.0194E-03	8,142.55	16,285.10	0.00E+00	6.53E+01	1.31E+02	0.0250	3.549E+14	0.0250
Am-242m	1.3694E-06	8,142.55	16,285.10	0.00E+00	1.12E-02	2.23E-02	0.0375	3.153E+14	0.0375
Am-243	3.7096E-05	8,142.55	16,285.10	0.00E+00	3.02E-01	6.04E-01	0.0575	3.338E+14	0.0575
C-14	2.6464E-08	8,142.55	16,285.10	0.00E+00	2.15E-04	4.31E-04	0.0850	2.021E+14	0.0850
Cl-36	4.4441E-31	8,142.55	16,285.10	0.00E+00	3.62E-27	7.24E-27	0.1250	1.431E+14	0.1250
Cm-243	5.7029E-06	8,142.55	16,285.10	0.00E+00	4.64E-02	9.29E-02	0.2250	1.739E+14	0.2250
Cm-244	4.6555E-03	8,142.55	16,285.10	0.00E+00	3.79E+01	7.58E+01	0.3750	7.527E+13	0.3750
Co-60	4.8663E-05	8,142.55	16,285.10	0.00E+00	3.96E-01	7.92E-01	0.5750	1.246E+15	0.5750
Cs-134	1.0638E-02	8,142.55	16,285.10	0.00E+00	8.66E+01	1.73E+02	0.8500	3.263E+13	0.8500
Cs-135	4.2564E-06	8,142.55	16,285.10	0.00E+00	3.47E-02	6.93E-02	1.2500	2.092E+13	1.2500
Cs-137	2.0358E+00	8,142.55	16,285.10	0.00E+00	1.66E+04	3.32E+04	1.7500	8.061E+11	1.7500
Eu-154	5.1956E-02	8,142.55	16,285.10	0.00E+00	4.23E+02	8.46E+02	2.2500	5.155E+07	2.2500
Eu-155	1.4295E-02	8,142.55	16,285.10	0.00E+00	1.16E+02	2.33E+02	2.7500	3.016E+07	2.7500
Fe-55	1.3560E-03	8,142.55	16,285.10	0.00E+00	1.10E+01	2.21E+01	3.5000	1.274E+06	3.5000
H-3	4.6258E-03	8,142.55	16,285.10	0.00E+00	3.77E+01	7.53E+01	5.0000	4.900E+05	5.0000
I-129	6.6403E-07	8,142.55	16,285.10	0.00E+00	5.41E-03	1.08E-02	7.0000	5.624E+04	7.0000
Kr-85	1.0808E-01	8,142.55	16,285.10	0.00E+00	8.80E+02	1.76E+03	11.0000	6.445E+03	11.0000
Np-237	3.1537E-05	8,142.55	16,285.10	0.00E+00	2.57E-01	5.14E-01			
Pa-231	9.7023E-10	8,142.55	16,285.10	0.00E+00	7.90E-06	1.58E-05			
Pb-210	1.1731E-11	8,142.55	16,285.10	0.00E+00	9.55E-08	1.91E-07			
Pm-147	2.4405E-02	8,142.55	16,285.10	0.00E+00	1.99E+02	3.97E+02			
Pu-238	1.5358E-01	8,142.55	16,285.10	0.00E+00	1.25E+03	2.50E+03			
Pu-239	6.9502E-04	8,142.55	16,285.10	0.00E+00	5.66E+00	1.13E+01			
Pu-240	3.7631E-04	8,142.55	16,285.10	0.00E+00	3.06E+00	6.13E+00			
Pu-241	1.3433E-01	8,142.55	16,285.10	0.00E+00	1.09E+03	2.19E+03			
Pu-242	3.0911E-06	8,142.55	16,285.10	0.00E+00	2.52E-02	5.03E-02			
Ra-226	5.5079E-11	8,142.55	16,285.10	0.00E+00	4.48E-07	8.97E-07			
Ra-228	1.3335E-14	8,142.55	16,285.10	0.00E+00	1.09E-10	2.17E-10			
Ru-106	7.3390E-06	8,142.55	16,285.10	0.00E+00	5.98E-02	1.20E-01			
Se-79	1.2339E-05	8,142.55	16,285.10	0.00E+00	1.00E-01	2.01E-01			
Sn-126	1.0194E-05	8,142.55	16,285.10	0.00E+00	8.30E-02	1.66E-01			
Sr-90	1.9064E+00	8,142.55	16,285.10	0.00E+00	1.55E+04	3.10E+04			
Tc-99	3.8056E-04	8,142.55	16,285.10	0.00E+00	3.10E+00	6.20E+00			
Th-229	4.9198E-12	8,142.55	16,285.10	0.00E+00	4.01E-08	8.01E-08			
Th-230	1.0547E-08	8,142.55	16,285.10	0.00E+00	8.59E-05	1.72E-04			
Th-232	2.0705E-14	8,142.55	16,285.10	0.00E+00	1.69E-10	3.37E-10			
Ti-208	4.8827E-08	8,142.55	16,285.10	0.00E+00	3.98E-04	7.95E-04			
U-232	1.3414E-07	8,142.55	16,285.10	0.00E+00	1.09E-03	2.18E-03			
U-233	3.7679E-09	8,142.55	16,285.10	0.00E+00	3.07E-05	6.14E-05			
U-234	5.2047E-05	8,142.55	16,285.10	0.00E+00	4.24E-01	8.48E-01			
U-235	-2.8661E-06	8,142.55	0.00	4.78E-02	2.44E-02	4.78E-02			
U-236	1.6701E-05	8,142.55	16,285.10	0.00E+00	1.36E-01	2.72E-01			
U-238	-9.4194E-09	8,142.55	0.00	1.86E-03	1.78E-03	1.86E-03			
Y-90	1.9070E+00	8,142.55	16,285.10	0.00E+00	1.55E+04	3.11E+04			
Other Radionuclides					1.59E+04	3.17E+04			

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	HEAVY WATER	HEAVY WATER
Fuel Cladding:	ALUM	ALUM
BOL HM Constituents:	U	U
BOL Enrichment %:	80	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		8.142.55
Bounding		16.285.10

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	0.68	
Bounding	1.35	

Estimated EOL HM/Given EOL HM

1.01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: GCRE (1B SERIES)
SNF ID #: 745
Fuel Units & Descr: 69 - 19 ROD ASSEMBLY
Heavy Metal Mass: BOL=60.541kg, EOL=59.864kg
ROD Storage Site: INEEL

¹Fuel decay start date: 1960
Estimates as of: 2030
Template: Pathfinder (Light Water, SST, 60 to 100%, U)
²Template Burnup(MWd): 6.01
Template BOL Heavy Metal Mass (MT): 0.00012882
Template Decay Time: 65 years

Estimated
Canister usage
18"x10"
2.88

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.5940E-08	638.77	1,277.54	0.00E+00	2.93E-05	5.87E-05	Avg MeV	
Am-241	1.1471E-04	638.77	1,277.54	0.00E+00	7.33E-02	1.47E-01	0.0150	4.663E+13
Am-242m	7.4210E-09	638.77	1,277.54	0.00E+00	4.74E-06	9.48E-06	0.0250	9.688E+12
Am-243	9.8236E-10	638.77	1,277.54	0.00E+00	6.28E-07	1.26E-06	0.0375	8.419E+12
C-14	2.2928E-04	638.77	1,277.54	0.00E+00	1.46E-01	2.93E-01	0.0575	9.035E+12
Ct-36	1.2260E-06	638.77	1,277.54	0.00E+00	7.83E-04	1.57E-03	0.0850	5.457E+12
Cm-243	1.2000E-10	638.77	1,277.54	0.00E+00	7.67E-08	1.53E-07	0.1250	3.539E+12
Cm-244	7.3577E-10	638.77	1,277.54	0.00E+00	4.70E-07	9.40E-07	0.2250	4.705E+12
Co-60	1.3732E-03	638.77	1,277.54	0.00E+00	8.77E-01	1.75E+00	0.3750	2.051E+12
Cs-134	1.2709E-10	638.77	1,277.54	0.00E+00	8.12E-08	1.62E-07	0.5750	3.451E+13
Cs-135	3.0316E-05	638.77	1,277.54	0.00E+00	1.94E-02	3.87E-02	0.8500	3.351E+11
Cs-137	7.2579E-01	638.77	1,277.54	0.00E+00	4.64E+02	9.27E+02	1.2500	2.426E+11
Eu-154	5.9750E-05	638.77	1,277.54	0.00E+00	3.82E-02	7.63E-02	1.7500	8.621E+09
Eu-155	1.0577E-05	638.77	1,277.54	0.00E+00	6.76E-03	1.35E-02	2.2500	1.630E+06
Fe-55	4.1631E-07	638.77	1,277.54	0.00E+00	2.66E-04	5.32E-04	2.7500	7.302E+05
H-3	4.6722E-04	638.77	1,277.54	0.00E+00	2.98E-01	5.97E-01	3.5000	8.581E+01
I-129	7.3195E-07	638.77	1,277.54	0.00E+00	4.68E-04	9.35E-04	5.0000	3.554E+01
Kr-85	5.9418E-03	638.77	1,277.54	0.00E+00	3.80E+00	7.59E+00	7.0000	3.940E+00
Np-237	1.1499E-06	638.77	1,277.54	0.00E+00	7.35E-04	1.47E-03	11.0000	4.432E-01
Pa-231	7.0899E-08	638.77	1,277.54	0.00E+00	4.53E-05	9.06E-05		
Pb-210	2.2363E-12	638.77	1,277.54	0.00E+00	1.43E-09	2.86E-09		
Pm-147	4.2296E-07	638.77	1,277.54	0.00E+00	2.70E-04	5.40E-04		
Pu-238	2.3295E-04	638.77	1,277.54	0.00E+00	1.49E-01	2.98E-01		
Pu-239	6.6722E-04	638.77	1,277.54	0.00E+00	4.26E-01	8.52E-01		
Pu-240	8.6556E-05	638.77	1,277.54	0.00E+00	5.53E-02	1.11E-01		
Pu-241	1.6889E-04	638.77	1,277.54	0.00E+00	1.08E-01	2.16E-01		
Pu-242	1.9717E-09	638.77	1,277.54	0.00E+00	1.26E-06	2.52E-06		
Ra-226	4.5740E-12	638.77	1,277.54	0.00E+00	2.92E-09	5.84E-09		
Ra-228	8.3511E-12	638.77	1,277.54	0.00E+00	5.33E-09	1.07E-08		
Ru-106	2.0516E-19	638.77	1,277.54	0.00E+00	1.31E-16	2.62E-16		
Se-79	1.3220E-05	638.77	1,277.54	0.00E+00	8.44E-03	1.69E-02		
Sn-126	1.1489E-05	638.77	1,277.54	0.00E+00	7.34E-03	1.47E-02		
Sr-90	6.6872E-01	638.77	1,277.54	0.00E+00	4.27E+02	8.54E+02		
Tc-99	4.6639E-04	638.77	1,277.54	0.00E+00	2.98E-01	5.96E-01		
Th-229	2.3727E-11	638.77	1,277.54	0.00E+00	1.52E-08	3.03E-08		
Th-230	2.7354E-10	638.77	1,277.54	0.00E+00	1.75E-07	3.49E-07		
Th-232	8.3594E-12	638.77	1,277.54	0.00E+00	5.34E-09	1.07E-08		
Th-208	1.6228E-08	638.77	1,277.54	0.00E+00	1.04E-05	2.07E-05		
U-232	4.3960E-08	638.77	1,277.54	0.00E+00	2.81E-05	5.62E-05		
U-233	3.3344E-09	638.77	1,277.54	0.00E+00	2.13E-06	4.26E-06		
U-234	4.0749E-07	638.77	1,277.54	0.00E+00	2.60E-04	5.21E-04		
U-235	-2.7761E-06	638.77	0.00	1.21E-01	1.19E-01	1.21E-01		
U-236	1.6190E-05	638.77	1,277.54	0.00E+00	1.03E-02	2.07E-02		
U-238	-2.8547E-09	638.77	0.00	1.59E-03	1.58E-03	1.59E-03		
Y-90	6.6889E-01	638.77	1,277.54	0.00E+00	4.27E+02	8.55E+02		
Other Radionuclides					5.80E+02	1.16E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except cladding (SST is conservative).
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	HASTELOY	SST	
BOL HM Constituents	U	U	
BOL Enrichment %:	92.20234775	60 to 100	

Burnup Summary (MWd) ²			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		638.77	
Bounding		1,277.54	

Checks			Estimated EOL HM/Given EOL HM 1.00
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.23		
Bounding	0.45		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name GCRE (1Z SERIES)
SNF ID # 916
Fuel Units & Descr: 3 - 4 CONCENTRIC TUBES
Heavy Metal Mass BOL=1.067kg EOL=1.018kg
ROD Storage Site INEEL

¹Fuel decay start date 1960
Estimates as of 2030

²Template Burnup(MWd) 6.01

Template BOL Heavy Metal Mass (MT) 0.00012882
Template Decay Time 65 years

Estimated
Canister usage
18"x10"
0.08

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	4.5940E-08	46.19	92.39	0.00E+00	2.12E-06	4.24E-06	0.0150	3.372E+12
Am-241	1.1471E-04	46.19	92.39	0.00E+00	5.30E-03	1.06E-02	0.0250	7.006E+11
Am-242m	7.4210E-09	46.19	92.39	0.00E+00	3.43E-07	6.86E-07	0.0375	6.089E+11
Am-243	9.8236E-10	46.19	92.39	0.00E+00	4.54E-08	9.08E-08	0.0575	6.534E+11
C-14	2.2928E-04	46.19	92.39	0.00E+00	1.06E-02	2.12E-02	0.0850	3.946E+11
Cf-252	1.2260E-06	46.19	92.39	0.00E+00	5.66E-05	1.13E-04	0.1250	2.559E+11
Cm-243	1.2000E-10	46.19	92.39	0.00E+00	5.54E-09	1.11E-08	0.2250	3.401E+11
Cm-244	7.3577E-10	46.19	92.39	0.00E+00	3.40E-08	6.80E-08	0.3750	1.483E+11
Co-60	1.3732E-03	46.19	92.39	0.00E+00	6.34E-02	1.27E-01	0.5750	2.495E+12
Cs-134	1.2709E-10	46.19	92.39	0.00E+00	5.87E-09	1.17E-08	0.8500	2.424E+10
Cs-135	3.0316E-05	46.19	92.39	0.00E+00	1.40E-03	2.80E-03	1.2500	1.754E+10
Cs-137	7.2579E-01	46.19	92.39	0.00E+00	3.35E+01	6.71E+01	1.7500	6.234E+08
Eu-154	5.9750E-05	46.19	92.39	0.00E+00	2.76E-03	5.52E-03	2.2500	1.179E+05
Eu-155	1.0577E-05	46.19	92.39	0.00E+00	4.89E-04	9.77E-04	2.7500	5.280E+04
Fe-55	4.1631E-07	46.19	92.39	0.00E+00	1.92E-05	3.85E-05	3.5000	5.494E+00
H-3	4.6722E-04	46.19	92.39	0.00E+00	2.16E-02	4.32E-02	5.0000	2.270E+00
I-129	7.3195E-07	46.19	92.39	0.00E+00	3.38E-05	6.76E-05	7.0000	2.510E-01
Kr-85	5.9418E-03	46.19	92.39	0.00E+00	2.74E-01	5.49E-01	11.0000	2.819E-02
Np-237	1.1499E-06	46.19	92.39	0.00E+00	5.31E-05	1.06E-04		
Pa-231	7.0899E-08	46.19	92.39	0.00E+00	3.28E-06	6.55E-06		
Pb-210	2.2363E-12	46.19	92.39	0.00E+00	1.03E-10	2.07E-10		
Pm-147	4.2296E-07	46.19	92.39	0.00E+00	1.95E-05	3.91E-05		
Pu-238	2.3295E-04	46.19	92.39	0.00E+00	1.08E-02	2.15E-02		
Pu-239	6.6722E-04	46.19	92.39	0.00E+00	3.08E-02	6.16E-02		
Pu-240	8.6556E-05	46.19	92.39	0.00E+00	4.00E-03	8.00E-03		
Pu-241	1.6889E-04	46.19	92.39	0.00E+00	7.80E-03	1.56E-02		
Pu-242	1.9717E-09	46.19	92.39	0.00E+00	9.11E-08	1.82E-07		
Ra-226	4.5740E-12	46.19	92.39	0.00E+00	2.11E-10	4.23E-10		
Ra-228	8.3511E-12	46.19	92.39	0.00E+00	3.86E-10	7.72E-10		
Ru-106	2.0516E-19	46.19	92.39	0.00E+00	9.48E-18	1.90E-17		
Se-79	1.3220E-05	46.19	92.39	0.00E+00	6.11E-04	1.22E-03		
Sn-126	1.1489E-05	46.19	92.39	0.00E+00	5.31E-04	1.06E-03		
Sr-90	6.6872E-01	46.19	92.39	0.00E+00	3.09E+01	6.18E+01		
Tc-99	4.6639E-04	46.19	92.39	0.00E+00	2.15E-02	4.31E-02		
Th-229	2.3727E-11	46.19	92.39	0.00E+00	1.10E-09	2.19E-09		
Th-230	2.7354E-10	46.19	92.39	0.00E+00	1.26E-08	2.53E-08		
Th-232	8.3594E-12	46.19	92.39	0.00E+00	3.86E-10	7.72E-10		
Tl-208	1.6228E-08	46.19	92.39	0.00E+00	7.50E-07	1.50E-06		
U-232	4.3960E-08	46.19	92.39	0.00E+00	2.03E-06	4.06E-06		
U-233	3.3344E-09	46.19	92.39	0.00E+00	1.54E-07	3.08E-07		
U-234	4.0749E-07	46.19	92.39	0.00E+00	1.88E-05	3.76E-05		
U-235	-2.7761E-06	46.19	0.00	2.16E-03	2.03E-03	2.16E-03		
U-236	1.6190E-05	46.19	92.39	0.00E+00	7.48E-04	1.50E-03		
U-238	-2.8547E-09	46.19	0.00	2.27E-05	2.26E-05	2.27E-05		
Y-90	6.6889E-01	46.19	92.39	0.00E+00	3.09E+01	6.18E+01		
Other Radionuclides					4.20E+01	8.39E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.76E-01	7.52E-01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %:	93.671	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		46.19	
Bounding		92.39	

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	0.93		
Bounding	1.86		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: GENTR
SNF ID #: 97
Fuel Units & Descr: 16 - STACKED DISKS
Heavy Metal Mass: BOL=3 992kg, EOL=3 984kg
ROD Storage Site: SRS

Fuel decay start date: 2035
Estimates as of: 2030
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"
0.44

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	7.58	15.15	0.00E+00	1.10E-09	2.20E-09	Avg MeV	
Am-241	1.1190E-03	7.58	15.15	0.00E+00	8.48E-03	1.70E-02	0.0150	2.923E+12
Am-242m	4.5425E-07	7.58	15.15	0.00E+00	3.44E-06	6.88E-06	0.0250	6.298E+11
Am-243	1.4921E-06	7.58	15.15	0.00E+00	1.13E-05	2.26E-05	0.0375	5.812E+11
C-14	5.7244E-09	7.58	15.15	0.00E+00	4.34E-08	8.67E-08	0.0575	5.714E+11
Cl-36	1.3124E-32	7.58	15.15	0.00E+00	9.94E-32	1.99E-31	0.0850	3.643E+11
Cm-243	2.3676E-07	7.58	15.15	0.00E+00	1.79E-06	3.59E-06	0.1250	3.155E+11
Cm-244	5.2042E-05	7.58	15.15	0.00E+00	3.94E-04	7.89E-04	0.2250	3.089E+11
Co-60	3.8208E-05	7.58	15.15	0.00E+00	2.89E-04	5.79E-04	0.3750	1.495E+11
Cs-134	4.8693E-01	7.58	15.15	0.00E+00	3.69E+00	7.38E+00	0.5750	2.053E+12
Cs-135	3.4477E-06	7.58	15.15	0.00E+00	2.61E-05	5.22E-05	0.8500	2.875E+11
Cs-137	2.8731E+00	7.58	15.15	0.00E+00	2.18E+01	4.35E+01	1.2500	5.349E+10
Eu-154	8.2053E-02	7.58	15.15	0.00E+00	6.22E-01	1.24E+00	1.7500	2.243E+09
Eu-155	3.9134E-02	7.58	15.15	0.00E+00	2.96E-01	5.93E-01	2.2500	4.705E+09
Fe-55	6.7429E-03	7.58	15.15	0.00E+00	5.11E-02	1.02E-01	2.7500	2.707E+07
H-3	1.0599E-02	7.58	15.15	0.00E+00	8.03E-02	1.61E-01	3.5000	3.002E+06
I-129	7.5300E-07	7.58	15.15	0.00E+00	5.70E-06	1.14E-05	5.0000	9.270E+00
Kr-85	2.8595E-01	7.58	15.15	0.00E+00	2.17E+00	4.33E+00	7.0000	1.034E+00
Np-237	9.5479E-06	7.58	15.15	0.00E+00	7.23E-05	1.45E-04	11.0000	1.165E-01
Pa-231	8.9297E-10	7.58	15.15	0.00E+00	6.77E-09	1.35E-08		
Pb-210	3.7609E-12	7.58	15.15	0.00E+00	2.85E-11	5.70E-11		
Pm-147	2.5452E+00	7.58	15.15	0.00E+00	1.93E+01	3.86E+01		
Pu-238	2.0550E-02	7.58	15.15	0.00E+00	1.56E-01	3.11E-01		
Pu-239	4.2838E-04	7.58	15.15	0.00E+00	3.25E-03	6.49E-03		
Pu-240	2.4401E-04	7.58	15.15	0.00E+00	1.85E-03	3.70E-03		
Pu-241	6.8764E-02	7.58	15.15	0.00E+00	5.21E-01	1.04E+00		
Pu-242	3.6320E-07	7.58	15.15	0.00E+00	2.75E-06	5.50E-06		
Ra-226	3.8045E-11	7.58	15.15	0.00E+00	2.88E-10	5.76E-10		
Ra-228	2.9902E-15	7.58	15.15	0.00E+00	2.27E-14	4.53E-14		
Ru-106	1.9055E-01	7.58	15.15	0.00E+00	1.44E+00	2.89E+00		
Se-79	1.2936E-05	7.58	15.15	0.00E+00	9.80E-05	1.96E-04		
Sn-126	1.1574E-05	7.58	15.15	0.00E+00	8.77E-05	1.75E-04		
Sr-90	2.7505E+00	7.58	15.15	0.00E+00	2.08E+01	4.17E+01		
Tc-99	4.2239E-04	7.58	15.15	0.00E+00	3.20E-03	6.40E-03		
Th-229	1.8848E-12	7.58	15.15	0.00E+00	1.43E-11	2.86E-11		
Th-230	1.7042E-08	7.58	15.15	0.00E+00	1.29E-07	2.58E-07		
Th-232	7.8132E-15	7.58	15.15	0.00E+00	5.92E-14	1.18E-13		
Th-208	4.4063E-08	7.58	15.15	0.00E+00	3.34E-07	6.68E-07		
U-232	1.3151E-07	7.58	15.15	0.00E+00	9.96E-07	1.99E-06		
U-233	1.9564E-09	7.58	15.15	0.00E+00	1.48E-08	2.96E-08		
U-234	1.8371E-04	7.58	15.15	0.00E+00	1.39E-03	2.78E-03		
U-235	-2.7235E-06	7.58	0.00	8.10E-03	8.08E-03	8.10E-03		
U-236	1.5493E-05	7.58	15.15	0.00E+00	1.17E-04	2.35E-04		
U-238	-4.2851E-09	7.58	0.00	8.13E-05	8.13E-05	8.13E-05		
Y-90	2.7505E+00	7.58	15.15	0.00E+00	2.08E+01	4.17E+01		
Other Radionuclides					3.90E+01	7.79E+01		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	93.93787575	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		7.58	
Bounding		15.15	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	0.01		
Bounding	0.01		1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name GRR (UALX HEU) GREECE
SNF ID # 440
Fuel Units & Descr: 108 - MTR TYPE
Heavy Metal Mass: BOL=18 76kg, EOL=14 72kg
ROD Storage Site: SRS

¹Fuel decay start date 1993
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time: 35 years

Estimated
Canister usage:
18"x10"
3.00

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	2.0068E-09	3.825.20	7,650.40	0.00E+00	7.68E-06	1.54E-05	Avg MeV	
Am-241	2.5251E-03	3,825.20	7,650.40	0.00E+00	9.66E+00	1.93E+01	0.0150	5.635E+14
Am-242m	3.9624E-07	3,825.20	7,650.40	0.00E+00	1.52E-03	3.03E-03	0.0250	1.170E+14
Am-243	1.4880E-06	3,825.20	7,650.40	0.00E+00	5.69E-03	1.14E-02	0.0375	1.017E+14
C-14	5.7053E-09	3,825.20	7,650.40	0.00E+00	2.18E-05	4.36E-05	0.0575	1.095E+14
Cl-36	1.3124E-32	3,825.20	7,650.40	0.00E+00	5.02E-29	1.00E-28	0.0850	6.596E+13
Cm-243	1.1419E-07	3,825.20	7,650.40	0.00E+00	4.37E-04	8.74E-04	0.1250	4.357E+13
Cm-244	1.6522E-05	3,825.20	7,650.40	0.00E+00	6.32E-02	1.26E-01	0.2250	5.694E+13
Co-60	7.4047E-07	3,825.20	7,650.40	0.00E+00	2.83E-03	5.66E-03	0.3750	2.477E+13
Cs-134	2.0455E-05	3,825.20	7,650.40	0.00E+00	7.82E-02	1.56E-01	0.5750	4.094E+14
Cs-135	3.4477E-06	3,825.20	7,650.40	0.00E+00	1.32E-02	2.64E-02	0.8500	5.001E+12
Cs-137	1.4365E+00	3,825.20	7,650.40	0.00E+00	5.50E+03	1.10E+04	1.2500	2.419E+12
Eu-154	7.3230E-03	3,825.20	7,650.40	0.00E+00	2.80E+01	5.60E+01	1.7500	1.361E+11
Eu-155	5.9259E-04	3,825.20	7,650.40	0.00E+00	2.27E+00	4.53E+00	2.2500	1.138E+07
Fe-55	2.2791E-06	3,825.20	7,650.40	0.00E+00	8.72E-03	1.74E-02	2.7500	1.086E+07
H-3	1.9698E-03	3,825.20	7,650.40	0.00E+00	7.53E+00	1.51E+01	3.5000	6.295E+03
I-129	7.5300E-07	3,825.20	7,650.40	0.00E+00	2.88E-03	5.76E-03	5.0000	2.572E+03
Kr-85	4.1176E-02	3,825.20	7,650.40	0.00E+00	1.58E+02	3.15E+02	7.0000	2.815E+02
Np-237	9.5752E-06	3,825.20	7,650.40	0.00E+00	3.66E-02	7.33E-02	11.0000	3.139E+01
Pa-231	3.9379E-09	3,825.20	7,650.40	0.00E+00	1.51E-05	3.01E-05		
Pb-210	3.3115E-10	3,825.20	7,650.40	0.00E+00	1.27E-06	2.53E-06		
Pm-147	9.2402E-04	3,825.20	7,650.40	0.00E+00	3.53E+00	7.07E+00		
Pu-238	1.6217E-02	3,825.20	7,650.40	0.00E+00	6.20E+01	1.24E+02		
Pu-239	4.2810E-04	3,825.20	7,650.40	0.00E+00	1.64E+00	3.28E+00		
Pu-240	2.4333E-04	3,825.20	7,650.40	0.00E+00	9.31E-01	1.86E+00		
Pu-241	1.6242E-02	3,825.20	7,650.40	0.00E+00	6.21E+01	1.24E+02		
Pu-242	3.6329E-07	3,825.20	7,650.40	0.00E+00	1.39E-03	2.78E-03		
Ra-226	9.0114E-10	3,825.20	7,650.40	0.00E+00	3.45E-06	6.89E-06		
Ra-228	3.1019E-14	3,825.20	7,650.40	0.00E+00	1.19E-10	2.37E-10		
Ru-106	2.1225E-10	3,825.20	7,650.40	0.00E+00	8.12E-07	1.62E-06		
Se-79	1.2930E-05	3,825.20	7,650.40	0.00E+00	4.95E-02	9.89E-02		
Sn-126	1.1571E-05	3,825.20	7,650.40	0.00E+00	4.43E-02	8.85E-02		
Sr-90	1.3472E+00	3,825.20	7,650.40	0.00E+00	5.15E+03	1.03E+04		
Tc-99	4.2239E-04	3,825.20	7,650.40	0.00E+00	1.62E+00	3.23E+00		
Th-229	1.2407E-11	3,825.20	7,650.40	0.00E+00	4.75E-08	9.49E-08		
Th-230	8.3497E-08	3,825.20	7,650.40	0.00E+00	3.19E-04	6.39E-04		
Th-232	3.8371E-14	3,825.20	7,650.40	0.00E+00	1.47E-10	2.94E-10		
Ti-208	4.0414E-08	3,825.20	7,650.40	0.00E+00	1.55E-04	3.09E-04		
U-232	1.0948E-07	3,825.20	7,650.40	0.00E+00	4.19E-04	8.38E-04		
U-233	3.6275E-09	3,825.20	7,650.40	0.00E+00	1.39E-05	2.78E-05		
U-234	1.8562E-04	3,825.20	7,650.40	0.00E+00	7.10E-01	1.42E+00		
U-235	-2.7235E-06	3,825.20	0.00	3.73E-02	2.69E-02	3.73E-02		
U-236	1.5493E-05	3,825.20	7,650.40	0.00E+00	5.93E-02	1.19E-01		
U-238	-4.2851E-09	3,825.20	0.00	5.08E-04	4.92E-04	5.08E-04		
Y-90	1.3475E+00	3,825.20	7,650.40	0.00E+00	5.15E+03	1.03E+04		
Other Radionuclides					5.23E+03	1.05E+04		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.40E+01	1.28E+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 %	91.93720219	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3,825.20	
Bounding		7,650.40	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	0.65		
Bounding	1.30		1.02

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: GRR (UALX HEU) GREECE
SNF ID #: 1069
Fuel Units & Descr: 46 - MTR TYPE
Heavy Metal Mass: BOL=7.99kg EOL=6.27kg
ROD Storage Site: SRS

¹Fuel decay start date: 1993
Estimates as of: 2030
Template: ATR (Light Water, Alum 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 35 years

Estimated
Canister usage:
18"x10"
1.28

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	1,629.25	3,258.50	0.00E+00	3.27E-06	6.54E-06	Avg MeV	
Am-241	2.5251E-03	1,629.25	3,258.50	0.00E+00	4.11E+00	8.23E+00	0.0150	2.400E+14
Am-242m	3.9624E-07	1,629.25	3,258.50	0.00E+00	6.46E-04	1.29E-03	0.0250	4.983E+13
Am-243	1.4880E-06	1,629.25	3,258.50	0.00E+00	2.42E-03	4.85E-03	0.0375	4.332E+13
C-14	5.7053E-09	1,629.25	3,258.50	0.00E+00	9.30E-06	1.86E-05	0.0575	4.662E+13
Cl-36	1.3124E-32	1,629.25	3,258.50	0.00E+00	2.14E-29	4.28E-29	0.0850	2.809E+13
Cm-243	1.1419E-07	1,629.25	3,258.50	0.00E+00	1.86E-04	3.72E-04	0.1250	1.856E+13
Cm-244	1.6522E-05	1,629.25	3,258.50	0.00E+00	2.69E-02	5.38E-02	0.2250	2.425E+13
Co-60	7.4047E-07	1,629.25	3,258.50	0.00E+00	1.21E-03	2.41E-03	0.3750	1.055E+13
Cs-134	2.0455E-05	1,629.25	3,258.50	0.00E+00	3.33E-02	6.67E-02	0.5750	1.744E+14
Cs-135	3.4477E-06	1,629.25	3,258.50	0.00E+00	5.62E-03	1.12E-02	0.8500	2.130E+12
Cs-137	1.4365E+00	1,629.25	3,258.50	0.00E+00	2.34E+03	4.68E+03	1.2500	1.030E+12
Eu-154	7.3230E-03	1,629.25	3,258.50	0.00E+00	1.19E+01	2.39E+01	1.7500	5.798E+10
Eu-155	5.9259E-04	1,629.25	3,258.50	0.00E+00	9.65E-01	1.93E+00	2.2500	4.848E+06
Fe-55	2.2791E-06	1,629.25	3,258.50	0.00E+00	3.71E-03	7.43E-03	2.7500	4.627E+06
H-3	1.9698E-03	1,629.25	3,258.50	0.00E+00	3.21E+00	6.42E+00	3.5000	2.681E+03
I-129	7.5300E-07	1,629.25	3,258.50	0.00E+00	1.23E-03	2.45E-03	5.0000	1.096E+03
Kr-85	4.1176E-02	1,629.25	3,258.50	0.00E+00	6.71E+01	1.34E+02	7.0000	1.199E+02
Np-237	9.5752E-06	1,629.25	3,258.50	0.00E+00	1.56E-02	3.12E-02	11.0000	1.337E+01
Pa-231	3.9379E-09	1,629.25	3,258.50	0.00E+00	6.42E-06	1.28E-05		
Pb-210	3.3115E-10	1,629.25	3,258.50	0.00E+00	5.40E-07	1.08E-06		
Pm-147	9.2402E-04	1,629.25	3,258.50	0.00E+00	1.51E+00	3.01E+00		
Pu-238	1.6217E-02	1,629.25	3,258.50	0.00E+00	2.64E+01	5.28E+01		
Pu-239	4.2810E-04	1,629.25	3,258.50	0.00E+00	6.97E-01	1.39E+00		
Pu-240	2.4333E-04	1,629.25	3,258.50	0.00E+00	3.96E-01	7.93E-01		
Pu-241	1.6242E-02	1,629.25	3,258.50	0.00E+00	2.65E+01	5.29E+01		
Pu-242	3.6329E-07	1,629.25	3,258.50	0.00E+00	5.92E-04	1.18E-03		
Ra-226	9.0114E-10	1,629.25	3,258.50	0.00E+00	1.47E-06	2.94E-06		
Ra-228	3.1019E-14	1,629.25	3,258.50	0.00E+00	5.05E-11	1.01E-10		
Ru-106	2.1225E-10	1,629.25	3,258.50	0.00E+00	3.46E-07	6.92E-07		
Se-79	1.2930E-05	1,629.25	3,258.50	0.00E+00	2.11E-02	4.21E-02		
Sn-126	1.1571E-05	1,629.25	3,258.50	0.00E+00	1.89E-02	3.77E-02		
Sr-90	1.3472E+00	1,629.25	3,258.50	0.00E+00	2.19E+03	4.39E+03		
Tc-99	4.2239E-04	1,629.25	3,258.50	0.00E+00	6.88E-01	1.38E+00		
Th-229	1.2407E-11	1,629.25	3,258.50	0.00E+00	2.02E-08	4.04E-08		
Th-230	8.3497E-08	1,629.25	3,258.50	0.00E+00	1.36E-04	2.72E-04		
Th-232	3.8371E-14	1,629.25	3,258.50	0.00E+00	6.25E-11	1.25E-10		
Ti-208	4.0414E-08	1,629.25	3,258.50	0.00E+00	6.58E-05	1.32E-04		
U-232	1.0948E-07	1,629.25	3,258.50	0.00E+00	1.78E-04	3.57E-04		
U-233	3.6275E-09	1,629.25	3,258.50	0.00E+00	5.91E-06	1.18E-05		
U-234	1.8562E-04	1,629.25	3,258.50	0.00E+00	3.02E-01	6.05E-01		
U-235	-2.7235E-06	1,629.25	0.00	1.59E-02	1.14E-02	1.59E-02		
U-236	1.5493E-05	1,629.25	3,258.50	0.00E+00	2.52E-02	5.05E-02		
U-238	-4.2851E-09	1,629.25	0.00	2.17E-04	2.10E-04	2.17E-04		
Y-90	1.3475E+00	1,629.25	3,258.50	0.00E+00	2.20E+03	4.39E+03		
Other Radionuclides					2.23E+03	4.46E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.73E+01	5.45E+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 %	91.93720219	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		1,629.25
Bounding		3,258.50

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	0.65	
Bounding	1.30	

Estimated EOL HM/Given EOL HM

1.02

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name GTRR
SNF ID #: 87
Fuel Units & Descr 25 - ASSEMBLY
Heavy Metal Mass BOL=5.05kg EOL=4.47kg
ROD Storage Site SRS

¹Fuel decay start date 1996
Estimates as of 2030
Template HFBR (Heavy Water, Alum 40 to 100% U)
²Template Burnup(MWd)³ 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time⁴ 25 years

Estimated
Canister usage⁵
18"x10"
0.69

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	5.4520E-10	534.24	1,068.48	0.00E+00	2.91E-07	5.83E-07	0.0150	1.002E+14
Am-241	9.2284E-03	534.24	1,068.48	0.00E+00	4.93E+00	9.86E+00	0.0250	2.062E+13
Am-242m	1.3390E-06	534.24	1,068.48	0.00E+00	7.15E-04	1.43E-03	0.0375	1.820E+13
Am-243	3.7084E-05	534.24	1,068.48	0.00E+00	1.98E-02	3.96E-02	0.0575	1.942E+13
C-14	2.6452E-08	534.24	1,068.48	0.00E+00	1.41E-05	2.83E-05	0.0850	1.169E+13
Cl-36	4.4441E-31	534.24	1,068.48	0.00E+00	2.37E-28	4.75E-28	0.1250	8.110E+12
Cm-243	5.0498E-06	534.24	1,068.48	0.00E+00	2.70E-03	5.40E-03	0.2250	1.009E+13
Cm-244	3.8451E-03	534.24	1,068.48	0.00E+00	2.05E+00	4.11E+00	0.3750	4.367E+12
Co-60	2.5225E-05	534.24	1,068.48	0.00E+00	1.35E-02	2.70E-02	0.5750	7.240E+13
Cs-134	1.9830E-03	534.24	1,068.48	0.00E+00	1.06E+00	2.12E+00	0.8500	1.426E+12
Cs-135	4.2564E-06	534.24	1,068.48	0.00E+00	2.27E-03	4.55E-03	1.2500	9.625E+11
Cs-137	1.8141E+00	534.24	1,068.48	0.00E+00	9.69E+02	1.94E+03	1.7500	3.984E+10
Eu-154	3.4733E-02	534.24	1,068.48	0.00E+00	1.86E+01	3.71E+01	2.2500	2.147E+06
Eu-155	7.1081E-03	534.24	1,068.48	0.00E+00	3.80E+00	7.59E+00	2.7500	1.846E+06
Fe-55	3.5790E-04	534.24	1,068.48	0.00E+00	1.91E-01	3.82E-01	3.5000	6.337E+04
H-3	3.945E-03	534.24	1,068.48	0.00E+00	1.87E+00	3.73E+00	5.0000	2.686E+04
I-129	6.6403E-07	534.24	1,068.48	0.00E+00	3.55E-04	7.10E-04	7.0000	3.081E+03
Kr-85	7.8250E-02	534.24	1,068.48	0.00E+00	4.18E+01	8.36E+01	11.0000	3.529E+02
Np-237	3.1567E-05	534.24	1,068.48	0.00E+00	1.69E-02	3.37E-02		
Pa-231	1.3372E-09	534.24	1,068.48	0.00E+00	7.14E-07	1.43E-06		
Pb-210	3.0644E-11	534.24	1,068.48	0.00E+00	1.64E-08	3.27E-08		
Pm-147	6.5188E-03	534.24	1,068.48	0.00E+00	3.48E+00	6.97E+00		
Pu-238	1.4769E-01	534.24	1,068.48	0.00E+00	7.89E+01	1.58E+02		
Pu-239	6.9502E-04	534.24	1,068.48	0.00E+00	3.71E-01	7.43E-01		
Pu-240	3.7928E-04	534.24	1,068.48	0.00E+00	2.03E-01	4.05E-01		
Pu-241	1.0565E-01	534.24	1,068.48	0.00E+00	5.64E+01	1.13E+02		
Pu-242	3.0911E-06	534.24	1,068.48	0.00E+00	1.65E-03	3.30E-03		
Ra-226	1.1081E-10	534.24	1,068.48	0.00E+00	5.92E-08	1.18E-07		
Ra-228	2.1185E-14	534.24	1,068.48	0.00E+00	1.13E-11	2.26E-11		
Ru-106	2.3621E-07	534.24	1,068.48	0.00E+00	1.26E-04	2.52E-04		
Se-79	1.2339E-05	534.24	1,068.48	0.00E+00	6.59E-03	1.32E-02		
Sn-126	1.0194E-05	534.24	1,068.48	0.00E+00	5.45E-03	1.09E-02		
Sr-90	1.6932E+00	534.24	1,068.48	0.00E+00	9.05E+02	1.81E+03		
Tc-99	3.8056E-04	534.24	1,068.48	0.00E+00	2.03E-01	4.07E-01		
Th-229	9.1252E-12	534.24	1,068.48	0.00E+00	4.88E-09	9.75E-09		
Th-230	1.5407E-08	534.24	1,068.48	0.00E+00	8.23E-06	1.65E-05		
Th-232	2.8937E-14	534.24	1,068.48	0.00E+00	1.55E-11	3.09E-11		
Ti-208	4.7272E-08	534.24	1,068.48	0.00E+00	2.53E-05	5.06E-05		
U-232	1.2855E-07	534.24	1,068.48	0.00E+00	6.87E-05	1.37E-04		
U-233	5.1470E-09	534.24	1,068.48	0.00E+00	2.75E-06	5.50E-06		
U-234	5.6069E-05	534.24	1,068.48	0.00E+00	3.00E-02	5.99E-02		
U-235	-2.8661E-06	534.24	0.00	1.02E-02	8.63E-03	1.02E-02		
U-236	1.6701E-05	534.24	1,068.48	0.00E+00	8.92E-03	1.78E-02		
U-238	-9.4194E-09	534.24	0.00	1.18E-04	1.13E-04	1.18E-04		
Y-90	1.6932E+00	534.24	1,068.48	0.00E+00	9.05E+02	1.81E+03		
Other Radionuclides					9.27E+02	1.85E+03		

Thermal Power		
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)	
1.39E+01	2.77E+01	
Total	Total	

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
	HEAVY WATER	HEAVY WATER	
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %:	93.06930693	40 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate ³
Nominal		534.24	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		1,068.48	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.24		1.00
Bounding	0.48		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: H B ROBINSON
SNF ID #: 99
Fuel Units & Descr: 1 - CANISTER OF SCRAP
Heavy Metal Mass: BOL=0.547kg, EOL=0.52kg
ROD Storage Site: INEEL

¹Fuel decay start date: 1966
Estimates as of: 2030
Template: (Worst Case)
²Template Burnup(MWd): 62.5
Template BOL Heavy Metal Mass (MT): 0.00186865
Template Decay Time: 50 years

Estimated
Canister usage:
18"x15"
0.04

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group Avg MeV Total Photons/sec (bounding)
Ac-227	2.5200E-06	25.85	51.70	0.00E+00	6.51E-05	1.30E-04	0.0150 4.428E+13
Am-241	8.6432E+00	25.85	51.70	0.00E+00	2.23E+02	4.47E+02	0.0250 8.654E+12
Am-242m	1.5728E-02	25.85	51.70	0.00E+00	4.07E-01	8.13E-01	0.0375 7.317E+12
Am-243	1.6288E-02	25.85	51.70	0.00E+00	4.21E-01	8.42E-01	0.0575 1.382E+13
C-14	1.2068E-01	25.85	51.70	0.00E+00	3.12E+00	6.24E+00	0.0850 4.633E+12
Ci-36	2.2849E-03	25.85	51.70	0.00E+00	5.91E-02	1.18E-01	0.1250 3.278E+12
Cm-243	6.0144E-04	25.85	51.70	0.00E+00	1.55E-02	3.11E-02	0.2250 4.009E+12
Cm-244	9.4880E-02	25.85	51.70	0.00E+00	2.45E+00	4.91E+00	0.3750 1.735E+12
Co-60	3.9052E+00	25.85	51.70	0.00E+00	1.01E+02	2.02E+02	0.5750 2.872E+12
Cs-134	2.2139E-06	25.85	51.70	0.00E+00	5.72E-05	1.14E-04	0.8500 6.290E+11
Cs-135	4.3976E-04	25.85	51.70	0.00E+00	1.14E-02	2.27E-02	1.2500 1.542E+13
Cs-137	1.4887E+01	25.85	51.70	0.00E+00	3.85E+02	7.70E+02	1.7500 1.853E+10
Eu-154	3.7342E-01	25.85	51.70	0.00E+00	9.65E+00	1.93E+01	2.2500 8.014E+07
Eu-155	8.4893E-03	25.85	51.70	0.00E+00	2.19E-01	4.39E-01	2.7500 1.379E+08
Fe-55	5.3750E-03	25.85	51.70	0.00E+00	1.39E-01	2.78E-01	3.5000 8.338E+04
H-3	1.0472E-01	25.85	51.70	0.00E+00	2.71E+00	5.41E+00	5.0000 3.523E+04
I-129	1.0618E-05	25.85	51.70	0.00E+00	2.74E-04	5.49E-04	7.0000 4.010E+03
Kr-85	2.2717E-01	25.85	51.70	0.00E+00	5.87E+00	1.17E+01	11.0000 4.573E+02
Np-237	1.6400E-04	25.85	51.70	0.00E+00	4.24E-03	8.48E-03	
Pa-231	2.8688E-06	25.85	51.70	0.00E+00	7.42E-05	1.48E-04	
Pb-210	4.7312E-08	25.85	51.70	0.00E+00	1.22E-06	2.45E-06	
Pm-147	3.2198E-04	25.85	51.70	0.00E+00	8.32E-03	1.66E-02	
Pu-238	-1.1924E+00	25.85	0.00	7.03E+01	3.95E+01	7.03E+01	
Pu-239	-4.8600E-02	25.85	0.00	8.51E+00	7.25E+00	8.51E+00	
Pu-240	-3.0127E-01	25.85	0.00	1.09E+01	3.08E+00	1.09E+01	
Pu-241	-1.2917E+02	25.85	0.00	2.80E+03	0.00E+00	2.80E+03	
Pu-242	-1.1381E-04	25.85	0.00	4.70E-02	4.41E-02	4.70E-02	
Ra-226	1.0760E-07	25.85	51.70	0.00E+00	2.78E-06	5.56E-06	
Ra-228	6.0160E-07	25.85	51.70	0.00E+00	1.56E-05	3.11E-05	
Ru-106	1.3388E-13	25.85	51.70	0.00E+00	3.46E-12	6.92E-12	
Se-79	1.9179E-04	25.85	51.70	0.00E+00	4.96E-03	9.92E-03	
Sn-126	1.6669E-04	25.85	51.70	0.00E+00	4.31E-03	8.62E-03	
Sr-90	1.3859E+01	25.85	51.70	0.00E+00	3.58E+02	7.17E+02	
Tc-99	6.7678E-03	25.85	51.70	0.00E+00	1.75E-01	3.50E-01	
Th-229	2.2592E-06	25.85	51.70	0.00E+00	5.84E-05	1.17E-04	
Th-230	7.5955E-06	25.85	51.70	0.00E+00	1.96E-04	3.93E-04	
Th-232	6.0208E-07	25.85	51.70	0.00E+00	1.56E-05	3.11E-05	
Ti-208	7.5795E-05	25.85	51.70	0.00E+00	1.96E-03	3.92E-03	
U-232	2.0521E-04	25.85	51.70	0.00E+00	5.30E-03	1.06E-02	
U-233	3.6128E-04	25.85	51.70	0.00E+00	9.34E-03	1.87E-02	
U-234	1.2788E-02	25.85	51.70	0.00E+00	3.31E-01	6.61E-01	
U-235	5.7486E-04	25.85	51.70	2.35E-04	1.51E-02	3.00E-02	
U-236	2.3485E-04	25.85	51.70	0.00E+00	6.07E-03	1.21E-02	
U-238	1.1581E-04	25.85	51.70	2.93E-05	3.02E-03	6.02E-03	
Y-90	1.3861E+01	25.85	51.70	0.00E+00	3.58E+02	7.17E+02	
Other Radionuclides					1.33E+03	2.66E+03	

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
Fuel Cladding	LIGHT WATER	(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	
	2.897	0 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		25.85	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding	16.42	51.70	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	1.41		31.56
Bounding	2.82	3.15	

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HFBR
SNF ID # 706
Fuel Units & Descr: 1050 - 18 CURVED PLATES
Heavy Metal Mass BOL=394.8kg EOL=282.24kg
ROD Storage Site SRS

¹Fuel decay start date 1982
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum, 40 to 100%, U)
²Template Burnup(MWd) 164.6
Template BOL Heavy Metal Mass (MT) 0.000377
Template Decay Time 35 years

Estimated
Canister usage
18"x10"
29 17

II. Estimates	m	X _n	X _b	b	Y _n	Y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.5869E-10	103,679.35	207,358.71	0.00E+00	9.94E-05	1.99E-04	Avg MeV	
Am-241	1.0109E-02	103,679.35	207,358.71	0.00E+00	1.05E+03	2.10E+03	0.0150	1.532E+16
Am-242m	1.2789E-06	103,679.35	207,358.71	0.00E+00	1.33E-01	2.65E-01	0.0250	3.147E+15
Am-243	3.7047E-05	103,679.35	207,358.71	0.00E+00	3.84E+00	7.68E+00	0.0375	2.758E+15
C-14	2.6416E-08	103,679.35	207,358.71	0.00E+00	2.74E-03	5.48E-03	0.0575	2.967E+15
Cl-36	4.4441E-31	103,679.35	207,358.71	0.00E+00	4.61E-26	9.22E-26	0.0850	1.776E+15
Cm-243	3.9605E-06	103,679.35	207,358.71	0.00E+00	4.11E-01	8.21E-01	0.1250	1.198E+15
Cm-244	2.6227E-03	103,679.35	207,358.71	0.00E+00	2.72E+02	5.44E+02	0.2250	1.534E+15
Co-60	6.7740E-06	103,679.35	207,358.71	0.00E+00	7.02E-01	1.40E+00	0.3750	6.660E+14
Cs-134	6.8894E-05	103,679.35	207,358.71	0.00E+00	7.14E+00	1.43E+01	0.5750	1.112E+16
Cs-135	4.2564E-06	103,679.35	207,358.71	0.00E+00	4.41E-01	8.83E-01	0.8500	1.648E+14
Cs-137	1.4399E+00	103,679.35	207,358.71	0.00E+00	1.49E+05	2.99E+05	1.2500	9.844E+13
Eu-154	1.5522E-02	103,679.35	207,358.71	0.00E+00	1.61E+03	3.22E+03	1.7500	4.657E+12
Eu-155	1.7588E-03	103,679.35	207,358.71	0.00E+00	1.82E+02	3.65E+02	2.2500	3.224E+08
Fe-55	2.4933E-05	103,679.35	207,358.71	0.00E+00	2.59E+00	5.17E+00	2.7500	3.241E+08
H-3	1.9945E-03	103,679.35	207,358.71	0.00E+00	2.07E+02	4.14E+02	3.5000	8.616E+06
I-129	6.6403E-07	103,679.35	207,358.71	0.00E+00	6.88E-02	1.38E-01	5.0000	3.616E+06
Kr-85	4.1002E-02	103,679.35	207,358.71	0.00E+00	4.25E+03	8.50E+03	7.0000	4.192E+05
Np-237	3.1610E-05	103,679.35	207,358.71	0.00E+00	3.28E+00	6.55E+00	11.0000	4.797E+04
Pa-231	1.8876E-09	103,679.35	207,358.71	0.00E+00	1.96E-04	3.91E-04		
Pb-210	8.3840E-11	103,679.35	207,358.71	0.00E+00	8.69E-06	1.74E-05		
Pm-147	4.6501E-04	103,679.35	207,358.71	0.00E+00	4.82E+01	9.64E+01		
Pu-238	1.3645E-01	103,679.35	207,358.71	0.00E+00	1.41E+04	2.83E+04		
Pu-239	6.9502E-04	103,679.35	207,358.71	0.00E+00	7.21E+01	1.44E+02		
Pu-240	3.8183E-04	103,679.35	207,358.71	0.00E+00	3.96E+01	7.92E+01		
Pu-241	6.5310E-02	103,679.35	207,358.71	0.00E+00	6.77E+03	1.35E+04		
Pu-242	3.0911E-06	103,679.35	207,358.71	0.00E+00	3.20E-01	6.41E-01		
Ra-226	2.3512E-10	103,679.35	207,358.71	0.00E+00	2.44E-05	4.88E-05		
Ra-228	3.3366E-14	103,679.35	207,358.71	0.00E+00	3.46E-09	6.92E-09		
Ru-106	2.4490E-10	103,679.35	207,358.71	0.00E+00	2.54E-05	5.08E-05		
Se-79	1.2333E-05	103,679.35	207,358.71	0.00E+00	1.28E+00	2.56E+00		
Sn-126	1.0194E-05	103,679.35	207,358.71	0.00E+00	1.06E+00	2.11E+00		
Sr-90	1.3348E+00	103,679.35	207,358.71	0.00E+00	1.38E+05	2.77E+05		
Tc-99	3.8058E-04	103,679.35	207,358.71	0.00E+00	3.95E+01	7.89E+01		
Th-229	1.7868E-11	103,679.35	207,358.71	0.00E+00	1.85E-06	3.70E-06		
Th-230	2.3348E-08	103,679.35	207,358.71	0.00E+00	2.42E-03	4.84E-03		
Th-232	4.1288E-14	103,679.35	207,358.71	0.00E+00	4.28E-09	8.56E-09		
Ti-208	4.3190E-08	103,679.35	207,358.71	0.00E+00	4.48E-03	8.96E-03		
U-232	1.1707E-07	103,679.35	207,358.71	0.00E+00	1.21E-02	2.43E-02	Thermal Power	
U-233	7.2175E-09	103,679.35	207,358.71	0.00E+00	7.48E-04	1.50E-03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	6.1543E-05	103,679.35	207,358.71	0.00E+00	6.38E+00	1.28E+01		
U-235	-2.8661E-06	103,679.35	0.00	7.94E-01	4.97E-01	7.94E-01	2.19E+03	4.37E+03
U-236	1.6701E-05	103,679.35	207,358.71	0.00E+00	1.73E+00	3.46E+00	Total	Total
U-238	-9.4194E-09	103,679.35	0.00	9.18E-03	8.20E-03	9.18E-03		
Y-90	1.3348E+00	103,679.35	207,358.71	0.00E+00	1.38E+05	2.77E+05		
Other Radionuclides					1.43E+05	2.86E+05		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.08510638	40 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		103.679.35	
Bounding		207,358.71	

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	0.60		
Bounding	1.20		

1.01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HFIR (INNER)
SNF ID #: 103
Fuel Units & Descr: 442 - 171 CURVED PLATES
Heavy Metal Mass: BOL=1234 506kg; EOL=823 667kg
ROO Storage Site: SRS

¹Fuel decay start date: 1986
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated
Canister usage
18"x10"
147 33

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	389,072 50	778,145 01	0 00E+00	7 81E-04	1 56E-03	Avg. MeV	
Am-241	2 5251E-03	389,072 50	778,145 01	0 00E+00	9 82E+02	1 96E+03	0.0150	5 731E+16
Am-242m	3 9624E-07	389,072 50	778,145 01	0 00E+00	1 54E-01	3 08E-01	0 0250	1 190E+16
Am-243	1 4880E-06	389,072 50	778,145 01	0 00E+00	5 79E-01	1 16E+00	0 0375	1 034E+16
C-14	5 7053E-09	389,072 50	778,145 01	0 00E+00	2 22E-03	4 44E-03	0 0575	1 113E+16
Ci-36	1 3124E-32	389,072 50	778,145 01	0 00E+00	5 11E-27	1 02E-26	0 0850	6 709E+15
Cm-243	1 1419E-07	389,072 50	778,145 01	0 00E+00	4 44E-02	8 89E-02	0 1250	4 431E+15
Cm-244	1 6522E-05	389,072 50	778,145 01	0 00E+00	6 43E+00	1 29E+01	0 2250	5 791E+15
Co-60	7 4047E-07	389,072 50	778,145 01	0 00E+00	2 88E-01	5 76E-01	0 3750	2 520E+15
Cs-134	2 0455E-05	389,072 50	778,145 01	0 00E+00	7 96E+00	1 59E+01	0 5750	4 164E+16
Cs-135	3 4477E-06	389,072 50	778,145 01	0 00E+00	1 34E+00	2 68E+00	0 8500	5 086E+14
Cs-137	1 4365E+00	389,072 50	778,145 01	0 00E+00	5 59E+05	1 12E+06	1 2500	2 460E+14
Eu-154	7 3230E-03	389,072 50	778,145 01	0 00E+00	2 85E+03	5 70E+03	1 7500	1 385E+13
Eu-155	5 9259E-04	389,072 50	778,145 01	0 00E+00	2 31E+02	4 61E+02	2 2500	1 158E+09
Fe-55	2 2791E-06	389,072 50	778,145 01	0 00E+00	8 87E-01	1 77E+00	2 7500	1 105E+09
H-3	1 9698E-03	389,072 50	778,145 01	0 00E+00	7 66E+02	1 53E+03	3 5000	6 402E+05
I-129	7 5300E-07	389,072 50	778,145 01	0 00E+00	2 93E-01	5 86E-01	5 0000	2 616E+05
Kr-85	4 1176E-02	389,072 50	778,145 01	0 00E+00	1 60E+04	3 20E+04	7 0000	2 862E+04
Np-237	9 5752E-06	389,072 50	778,145 01	0 00E+00	3 73E+00	7 45E+00	11 0000	3 192E+03
Pa-231	3 9379E-09	389,072 50	778,145 01	0 00E+00	1 53E-03	3 06E-03		
Pb-210	3 3115E-10	389,072 50	778,145 01	0 00E+00	1 29E-04	2 58E-04		
Pm-147	9 2402E-04	389,072 50	778,145 01	0 00E+00	3 60E+02	7 19E+02		
Pu-238	1 6217E-02	389,072 50	778,145 01	0 00E+00	6 31E+03	1 26E+04		
Pu-239	4 2810E-04	389,072 50	778,145 01	0 00E+00	1 67E+02	3 33E+02		
Pu-240	2 4333E-04	389,072 50	778,145 01	0 00E+00	9 47E+01	1 89E+02		
Pu-241	1 6242E-02	389,072 50	778,145 01	0 00E+00	6 32E+03	1 26E+04		
Pu-242	3 6329E-07	389,072 50	778,145 01	0 00E+00	1 41E-01	2 83E-01		
Ra-226	9 0114E-10	389,072 50	778,145 01	0 00E+00	3 51E-04	7 01E-04		
Ra-228	3 1019E-14	389,072 50	778,145 01	0 00E+00	1 21E-08	2 41E-08		
Ru-106	2 1225E-10	389,072 50	778,145 01	0 00E+00	8 26E-05	1 65E-04		
Sa-79	1 2930E-05	389,072 50	778,145 01	0 00E+00	5 03E+00	1 01E+01		
Sn-126	1 1571E-05	389,072 50	778,145 01	0 00E+00	4 50E+00	9 00E+00		
Sr-90	1 3472E+00	389,072 50	778,145 01	0 00E+00	5 24E+05	1 05E+06		
Tc-99	4 2239E-04	389,072 50	778,145 01	0 00E+00	1 64E+02	3 29E+02		
Th-229	1 2407E-11	389,072 50	778,145 01	0 00E+00	4 83E-06	9 65E-06		
Th-230	8 3497E-08	389,072 50	778,145 01	0 00E+00	3 25E-02	6 50E-02		
Th-232	3 8371E-14	389,072 50	778,145 01	0 00E+00	1 49E-08	2 99E-08		
Ti-208	4 0414E-08	389,072 50	778,145 01	0 00E+00	1 57E-02	3 14E-02		
U-232	1 0948E-07	389,072 50	778,145 01	0 00E+00	4 26E-02	8 52E-02		
U-233	3 6275E-09	389,072 50	778,145 01	0 00E+00	1 41E-03	2 82E-03		
U-234	1 8562E-04	389,072 50	778,145 01	0 00E+00	7 22E+01	1 44E+02		
U-235	-2 7235E-06	389,072 50	0 00	2 48E+00	1 42E+00	2 48E+00		
U-236	1 5493E-05	389,072 50	778,145 01	0 00E+00	6 03E+00	1 21E+01		
U-238	-4 2851E-09	389,072 50	0 00	2 92E-02	2 76E-02	2 92E-02		
Y-90	1 3475E+00	389,072 50	778,145 01	0 00E+00	5 24E+05	1 05E+06		
Other Radionuclides					5 32E+05	1 06E+06		

Thermal Power
Nominal Heat Output (Watts) 6.51E+03
Bounding Heat Output (Watts) 1.30E+04
Total Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92 954	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	283 936.38	389,072 50	
Bounding		778,145 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	1 00	1 37	
Bounding	2 00		1 03

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HFIR (INNER)
 SNF ID #: 1083
 Fuel Units & Descr: 54 - 171 CURVED PLATES
 Heavy Metal Mass: BOL=148.446kg EOL=115.285kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1986
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup (MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 35 years

Estimated
 Canister usage
 18"x10"
 18.00

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	34,142.58	68,285.16	0.00E+00	6.85E-05	1.37E-04	Avg MeV	
Am-241	2.5251E-03	34,142.58	68,285.16	0.00E+00	8.62E+01	1.72E+02	0.0150	5.029E+15
Am-242m	3.9624E-07	34,142.58	68,285.16	0.00E+00	1.35E-02	2.71E-02	0.0250	1.044E+15
Am-243	1.4880E-06	34,142.58	68,285.16	0.00E+00	5.08E-02	1.02E-01	0.0375	9.077E+14
C-14	5.7053E-09	34,142.58	68,285.16	0.00E+00	1.95E-04	3.90E-04	0.0575	9.771E+14
Cl-36	1.3124E-32	34,142.58	68,285.16	0.00E+00	4.48E-28	8.96E-28	0.0850	5.887E+14
Cm-243	1.1419E-07	34,142.58	68,285.16	0.00E+00	3.90E-03	7.80E-03	0.1250	3.889E+14
Cm-244	1.6522E-05	34,142.58	68,285.16	0.00E+00	5.64E-01	1.13E+00	0.2250	5.082E+14
Co-60	7.4047E-07	34,142.58	68,285.16	0.00E+00	2.53E-02	5.06E-02	0.3750	2.211E+14
Cs-134	2.0455E-05	34,142.58	68,285.16	0.00E+00	6.98E-01	1.40E+00	0.5750	3.654E+15
Cs-135	3.4477E-06	34,142.58	68,285.16	0.00E+00	1.18E-01	2.35E-01	0.8500	4.464E+13
Cs-137	1.4365E+00	34,142.58	68,285.16	0.00E+00	4.90E+04	9.81E+04	1.2500	2.159E+13
Eu-154	7.3230E-03	34,142.58	68,285.16	0.00E+00	2.50E+02	5.00E+02	1.7500	1.215E+12
Eu-155	5.9259E-04	34,142.58	68,285.16	0.00E+00	2.02E+01	4.05E+01	2.2500	1.016E+08
Fe-55	2.2791E-06	34,142.58	68,285.16	0.00E+00	7.78E-02	1.56E-01	2.7500	9.697E+07
H-3	1.9698E-03	34,142.58	68,285.16	0.00E+00	6.73E+01	1.35E+02	3.5000	5.618E+04
I-129	7.5300E-07	34,142.58	68,285.16	0.00E+00	2.57E-02	5.14E-02	5.0000	2.296E+04
Kr-85	4.1176E-02	34,142.58	68,285.16	0.00E+00	1.41E+03	2.81E+03	7.0000	2.512E+03
Np-237	9.5752E-06	34,142.58	68,285.16	0.00E+00	3.27E-01	6.54E-01	11.0000	2.801E+02
Pa-231	3.9379E-09	34,142.58	68,285.16	0.00E+00	1.34E-04	2.69E-04		
Pb-210	3.3115E-10	34,142.58	68,285.16	0.00E+00	1.13E-05	2.26E-05		
Pm-147	9.2402E-04	34,142.58	68,285.16	0.00E+00	3.15E+01	6.31E+01		
Pu-238	1.6217E-02	34,142.58	68,285.16	0.00E+00	5.54E+02	1.11E+03		
Pu-239	4.2810E-04	34,142.58	68,285.16	0.00E+00	1.46E+01	2.92E+01		
Pu-240	2.4333E-04	34,142.58	68,285.16	0.00E+00	8.31E+00	1.66E+01		
Pu-241	1.6242E-02	34,142.58	68,285.16	0.00E+00	5.55E+02	1.11E+03		
Pu-242	3.6329E-07	34,142.58	68,285.16	0.00E+00	1.24E-02	2.48E-02		
Ra-226	9.0114E-10	34,142.58	68,285.16	0.00E+00	3.08E-05	6.15E-05		
Ra-228	3.1019E-14	34,142.58	68,285.16	0.00E+00	1.06E-09	2.12E-09		
Ru-106	2.1225E-10	34,142.58	68,285.16	0.00E+00	7.25E-06	1.45E-05		
Se-79	1.2930E-05	34,142.58	68,285.16	0.00E+00	4.41E-01	8.83E-01		
Sn-126	1.1571E-05	34,142.58	68,285.16	0.00E+00	3.95E-01	7.90E-01		
Sr-90	1.3472E+00	34,142.58	68,285.16	0.00E+00	4.60E+04	9.20E+04		
Tc-99	4.2239E-04	34,142.58	68,285.16	0.00E+00	1.44E+01	2.88E+01		
Th-229	1.2407E-11	34,142.58	68,285.16	0.00E+00	4.24E-07	8.47E-07		
Th-230	8.3497E-08	34,142.58	68,285.16	0.00E+00	2.85E-03	5.70E-03		
Th-232	3.8371E-14	34,142.58	68,285.16	0.00E+00	1.31E-09	2.62E-09		
Th-208	4.0414E-08	34,142.58	68,285.16	0.00E+00	1.38E-03	2.76E-03		
U-232	1.0948E-07	34,142.58	68,285.16	0.00E+00	3.74E-03	7.48E-03	Thermal Power	
U-233	3.6275E-09	34,142.58	68,285.16	0.00E+00	1.24E-04	2.48E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8562E-04	34,142.58	68,285.16	0.00E+00	6.34E+00	1.27E+01		
U-235	-2.7235E-06	34,142.58	0.00	2.99E-01	2.06E-01	2.99E-01		
U-236	1.5493E-05	34,142.58	68,285.16	0.00E+00	5.29E-01	1.06E+00	5.71E+02	1.14E+03
U-238	-4.2851E-09	34,142.58	0.00	3.42E-03	3.28E-03	3.42E-03	Total	Total
Y-90	1.3475E+00	34,142.58	68,285.16	0.00E+00	4.60E+04	9.20E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	LIGHT WATER	LIGHT WATER	
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	93.141	60 to 100	
Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	34,142.58	31,404.49	Nominal burnup taken directly from SFD (converted to MWd)
Bounding		68,285.16	Bounding burnup assumed to be twice nominal burnup
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.73	0.92	0.99
Bounding	1.46		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HFIR (OUTER)
SNF ID #: 707
Fuel Units & Descr: 54 - 369 CURVED PLATES
Heavy Metal Mass: BOL=388 687kg, EOL=322.364kg
ROD Storage Site: SRS

¹Fuel decay start date: 1986
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd), 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated
Canister usage:
24"x10"
18 00

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	89,397 92	178,795 84	0 00E+00	1 79E-04	3 59E-04	Avg MeV	
Am-241	2 5251E-03	89,397 92	178,795 84	0 00E+00	2 26E+02	4 51E+02	0 0150	1 317E+16
Am-242m	3 9624E-07	89,397 92	178,795 84	0 00E+00	3 54E-02	7 08E-02	0 0250	2 734E+15
Am-243	1 4880E-06	89,397 92	178,795 84	0 00E+00	1 33E-01	2 66E-01	0 0375	2 377E+15
C-14	5 7053E-09	89,397 92	178,795 84	0 00E+00	5 10E-04	1 02E-03	0 0575	2 558E+15
Cl-36	1 3124E-32	89,397 92	178,795 84	0 00E+00	1 17E-27	2 35E-27	0 0850	1 541E+15
Cm-243	1 1419E-07	89,397 92	178,795 84	0 00E+00	1 02E-02	2 04E-02	0 1250	1 018E+15
Cm-244	1 6522E-05	89,397 92	178,795 84	0 00E+00	1 48E+00	2 95E+00	0 2250	1 331E+15
Co-60	7 4047E-07	89,397 92	178,795 84	0 00E+00	6 62E-02	1 32E-01	0 3750	5 789E+14
Cs-134	2 0455E-05	89,397 92	178,795 84	0 00E+00	1 83E+00	3 66E+00	0 5750	9 568E+15
Cs-135	3 4477E-06	89,397 92	178,795 84	0 00E+00	3 08E-01	6 16E-01	0 8500	1 169E+14
Cs-137	1 4365E+00	89,397 92	178,795 84	0 00E+00	1 28E+05	2 57E+05	1 2500	5 653E+13
Eu-154	7 3230E-03	89,397 92	178,795 84	0 00E+00	6 55E+02	1 31E+03	1 7500	3 181E+12
Eu-155	5 9259E-04	89,397 92	178,795 84	0 00E+00	5 30E+01	1 06E+02	2 2500	2 660E+08
Fe-55	2 2791E-06	89,397 92	178,795 84	0 00E+00	2 04E-01	4 08E-01	2 7500	2 539E+08
H-3	1 9698E-03	89,397 92	178,795 84	0 00E+00	1 76E+02	3 52E+02	3 5000	1 471E+05
I-129	7 5300E-07	89,397 92	178,795 84	0 00E+00	6 73E-02	1 35E-01	5 0000	6 011E+04
Kr-85	4 1176E-02	89,397 92	178,795 84	0 00E+00	3 68E+03	7 36E+03	7 0000	6 578E+03
Np-237	9 5752E-06	89,397 92	178,795 84	0 00E+00	8 56E-01	1 71E+00	11 0000	7 334E+02
Pa-231	3 9379E-09	89,397 92	178,795 84	0 00E+00	3 52E-04	7 04E-04		
Pb-210	3 3115E-10	89,397 92	178,795 84	0 00E+00	2 96E-05	5 92E-05		
Pm-147	9 2402E-04	89,397 92	178,795 84	0 00E+00	8 26E+01	1 65E+02		
Pu-238	1 6217E-02	89,397 92	178,795 84	0 00E+00	1 45E+03	2 90E+03		
Pu-239	4 2810E-04	89,397 92	178,795 84	0 00E+00	3 83E+01	7 65E+01		
Pu-240	2 4333E-04	89,397 92	178,795 84	0 00E+00	2 18E+01	4 35E+01		
Pu-241	1 6242E-02	89,397 92	178,795 84	0 00E+00	1 45E+03	2 90E+03		
Pu-242	3 6329E-07	89,397 92	178,795 84	0 00E+00	3 25E-02	6 50E-02		
Ra-226	9 0114E-10	89,397 92	178,795 84	0 00E+00	8 06E-05	1 61E-04		
Ra-228	3 1019E-14	89,397 92	178,795 84	0 00E+00	2 77E-09	5 55E-09		
Ru-106	2 1225E-10	89,397 92	178,795 84	0 00E+00	1 90E-05	3 80E-05		
Se-79	1 2930E-05	89,397 92	178,795 84	0 00E+00	1 16E+00	2 31E+00		
Sn-126	1 1571E-05	89,397 92	178,795 84	0 00E+00	1 03E+00	2 07E+00		
Sr-90	1 3472E+00	89,397 92	178,795 84	0 00E+00	1 20E+05	2 41E+05		
Tc-99	4 2239E-04	89,397 92	178,795 84	0 00E+00	3 78E+01	7 55E+01		
Th-229	1 2407E-11	89,397 92	178,795 84	0 00E+00	1 11E-06	2 22E-06		
Th-230	8 3497E-08	89,397 92	178,795 84	0 00E+00	7 46E-03	1 49E-02		
Th-232	3 8371E-14	89,397 92	178,795 84	0 00E+00	3 43E-09	6 86E-09		
Th-208	4 0414E-08	89,397 92	178,795 84	0 00E+00	3 61E-03	7 23E-03		
U-232	1 0948E-07	89,397 92	178,795 84	0 00E+00	9 79E-03	1 96E-02		
U-233	3 6275E-09	89,397 92	178,795 84	0 00E+00	3 24E-04	6 49E-04		
U-234	1 8562E-04	89,397 92	178,795 84	0 00E+00	1 66E+01	3 32E+01		
U-235	-2 7235E-06	89,397 92	0 00	7 82E-01	5 39E-01	7 82E-01		
U-236	1 5493E-05	89,397 92	178,795 84	0 00E+00	1 39E+00	2 77E+00		
U-238	-4 2851E-09	89,397 92	0 00	8 96E-03	8 58E-03	8 96E-03		
Y-90	1 3475E+00	89,397 92	178,795 84	0 00E+00	1 20E+05	2 41E+05		
Other Radionuclides					1 22E+05	2 45E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93 141	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	89 397 92	62 808 98	
Bounding		178,795 84	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 73	0 70	
Bounding	1 46		0 93

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HFIR (OUTER)
SNF ID # 1084
Fuel Units & Descr 442 - 369 CURVED PLATES
Heavy Metal Mass BOL=3232.39kg EOL=2303 174kg
ROD Storage Site SRS

¹Fuel decay start date 1986
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 35 years

Estimated
Canister usage*
24"x10"
147.33

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	879,986.15	1,759,972.29	0.00E+00	1.77E-03	3.53E-03	Avg MeV	
Am-241	2.5251E-03	879,986.15	1,759,972.29	0.00E+00	2.22E+03	4.44E+03	0.0150	1.296E+17
Am-242m	3.9624E-07	879,986.15	1,759,972.29	0.00E+00	3.49E-01	6.97E-01	0.0250	2.692E+16
Am-243	1.4880E-06	879,986.15	1,759,972.29	0.00E+00	1.31E+00	2.62E+00	0.0375	2.340E+16
C-14	5.7053E-09	879,986.15	1,759,972.29	0.00E+00	5.02E-03	1.00E-02	0.0575	2.518E+16
Cl-36	1.3124E-32	879,986.15	1,759,972.29	0.00E+00	1.15E-26	2.31E-26	0.0850	1.517E+16
Cm-243	1.1419E-07	879,986.15	1,759,972.29	0.00E+00	1.00E-01	2.01E-01	0.1250	1.002E+16
Cm-244	1.6522E-05	879,986.15	1,759,972.29	0.00E+00	1.45E+01	2.91E+01	0.2250	1.310E+16
Co-60	7.4047E-07	879,986.15	1,759,972.29	0.00E+00	6.52E-01	1.30E+00	0.3750	5.699E+15
Cs-134	2.0455E-05	879,986.15	1,759,972.29	0.00E+00	1.80E+01	3.60E+01	0.5750	9.418E+16
Cs-135	3.4477E-06	879,986.15	1,759,972.29	0.00E+00	3.03E+00	6.07E+00	0.8500	1.150E+15
Cs-137	1.4365E+00	879,986.15	1,759,972.29	0.00E+00	1.26E+06	2.53E+06	1.2500	5.564E+14
Eu-154	7.3230E-03	879,986.15	1,759,972.29	0.00E+00	6.44E+03	1.29E+04	1.7500	3.132E+13
Eu-155	5.9259E-04	879,986.15	1,759,972.29	0.00E+00	5.21E+02	1.04E+03	2.2500	2.618E+09
Fe-55	2.2791E-06	879,986.15	1,759,972.29	0.00E+00	2.01E+00	4.01E+00	2.7500	2.499E+09
H-3	1.9698E-03	879,986.15	1,759,972.29	0.00E+00	1.73E+03	3.47E+03	3.5000	1.448E+06
I-129	7.5300E-07	879,986.15	1,759,972.29	0.00E+00	6.63E-01	1.33E+00	5.0000	5.917E+05
Kr-85	4.1176E-02	879,986.15	1,759,972.29	0.00E+00	3.62E+04	7.25E+04	7.0000	6.475E+04
Np-237	9.5752E-06	879,986.15	1,759,972.29	0.00E+00	8.43E+00	1.69E+01	11.0000	7.219E+03
Pa-231	3.9379E-09	879,986.15	1,759,972.29	0.00E+00	3.47E-03	6.93E-03		
Pb-210	3.3115E-10	879,986.15	1,759,972.29	0.00E+00	2.91E-04	5.83E-04		
Pm-147	9.2402E-04	879,986.15	1,759,972.29	0.00E+00	8.13E+02	1.63E+03		
Pu-238	1.6217E-02	879,986.15	1,759,972.29	0.00E+00	1.43E+04	2.85E+04		
Pu-239	4.2810E-04	879,986.15	1,759,972.29	0.00E+00	3.77E+02	7.53E+02		
Pu-240	2.4333E-04	879,986.15	1,759,972.29	0.00E+00	2.14E+02	4.28E+02		
Pu-241	1.6242E-02	879,986.15	1,759,972.29	0.00E+00	1.43E+04	2.86E+04		
Pu-242	3.6329E-07	879,986.15	1,759,972.29	0.00E+00	3.20E-01	6.39E-01		
Ra-226	9.0114E-10	879,986.15	1,759,972.29	0.00E+00	7.93E-04	1.59E-03		
Ra-228	3.1019E-14	879,986.15	1,759,972.29	0.00E+00	2.73E-08	5.46E-08		
Ru-106	2.1225E-10	879,986.15	1,759,972.29	0.00E+00	1.87E-04	3.74E-04		
Se-79	1.2930E-05	879,986.15	1,759,972.29	0.00E+00	1.14E+01	2.28E+01		
Sn-126	1.1571E-05	879,986.15	1,759,972.29	0.00E+00	1.02E+01	2.04E+01		
Sr-90	1.3472E+00	879,986.15	1,759,972.29	0.00E+00	1.19E+06	2.37E+06		
Tc-99	4.2239E-04	879,986.15	1,759,972.29	0.00E+00	3.72E+02	7.43E+02		
Th-229	1.2407E-11	879,986.15	1,759,972.29	0.00E+00	1.09E-05	2.18E-05		
Th-230	8.3497E-08	879,986.15	1,759,972.29	0.00E+00	7.35E-02	1.47E-01		
Th-232	3.8371E-14	879,986.15	1,759,972.29	0.00E+00	3.38E-08	6.75E-08		
Ti-208	4.0414E-08	879,986.15	1,759,972.29	0.00E+00	3.56E-02	7.11E-02		
U-232	1.0948E-07	879,986.15	1,759,972.29	0.00E+00	9.63E-02	1.93E-01		
U-233	3.6275E-09	879,986.15	1,759,972.29	0.00E+00	3.19E-03	6.38E-03		
U-234	1.8562E-04	879,986.15	1,759,972.29	0.00E+00	1.63E+02	3.27E+02		
U-235	-2.7235E-06	879,986.15	0.00	6.49E+00	4.10E+00	6.49E+00		
U-236	1.5493E-05	879,986.15	1,759,972.29	0.00E+00	1.36E+01	2.73E+01		
U-238	-4.2851E-09	879,986.15	0.00	7.65E-02	7.28E-02	7.65E-02		
Y-90	1.3475E+00	879,986.15	1,759,972.29	0.00E+00	1.19E+06	2.37E+06		
Other Radionuclides					1.20E+06	2.41E+06		

Thermal Power
Nominal Heat Output (Watts) Bounding Heat Output (Watts)
1.47E+04 2.95E+04
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 %	92.954	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal	743.449.75	879.986.15
Bounding		1,759.972.29

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	0.87	1.18
Bounding	1.73	

Estimated EOL HM/ Given EOL HM
1.02

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HIFAR (UALX-HEU) AUSTRALIA
SNF ID #: 680
Fuel Units & Descr: 240 - 12 CURVED PLATES
Heavy Metal Mass: BOL=45.192kg; EOL=33 624kg
ROD Storage Site: SRS

Fuel decay start date: 1998
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum, 40 to 100%, U)
Template Burnup(MWd): 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time: 25 years

Estimated
Canister usage
18"x10"
6.67

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	5.4520E-10	10,655.32	21,310.64	0.00E+00	5.81E-06	1.16E-05	Avg. MeV	
Am-241	9.2284E-03	10,655.32	21,310.64	0.00E+00	9.83E+01	1.97E+02	0.0150	1.998E+15
Am-242m	1.3390E-06	10,655.32	21,310.64	0.00E+00	1.43E-02	2.85E-02	0.0250	4.112E+14
Am-243	3.7084E-05	10,655.32	21,310.64	0.00E+00	3.95E-01	7.90E-01	0.0375	3.631E+14
C-14	2.6452E-08	10,655.32	21,310.64	0.00E+00	2.82E-04	5.64E-04	0.0575	3.872E+14
Cl-36	4.4441E-31	10,655.32	21,310.64	0.00E+00	4.74E-27	9.47E-27	0.0850	2.331E+14
Cm-243	5.0498E-06	10,655.32	21,310.64	0.00E+00	5.38E-02	1.08E-01	0.1250	1.617E+14
Cm-244	3.8451E-03	10,655.32	21,310.64	0.00E+00	4.10E+01	8.19E+01	0.2250	2.012E+14
Co-60	2.5225E-05	10,655.32	21,310.64	0.00E+00	2.69E-01	5.38E-01	0.3750	8.710E+13
Cs-134	1.9830E-03	10,655.32	21,310.64	0.00E+00	2.11E+01	4.23E+01	0.5750	1.444E+15
Cs-135	4.2564E-06	10,655.32	21,310.64	0.00E+00	4.54E-02	9.07E-02	0.8500	2.844E+13
Cs-137	1.8141E+00	10,655.32	21,310.64	0.00E+00	1.93E+04	3.87E+04	1.2500	1.920E+13
Eu-154	3.4733E-02	10,655.32	21,310.64	0.00E+00	3.70E+02	7.40E+02	1.7500	7.945E+11
Eu-155	7.1081E-03	10,655.32	21,310.64	0.00E+00	7.57E+01	1.51E+02	2.2500	4.283E+07
Fe-55	3.5790E-04	10,655.32	21,310.64	0.00E+00	3.81E+00	7.63E+00	2.7500	3.682E+07
H-3	3.4945E-03	10,655.32	21,310.64	0.00E+00	3.72E+01	7.45E+01	3.5000	1.264E+06
I-129	6.6403E-07	10,655.32	21,310.64	0.00E+00	7.08E-03	1.42E-02	5.0000	5.558E+05
Kr-85	7.8250E-02	10,655.32	21,310.64	0.00E+00	8.34E+02	1.67E+03	7.0000	6.146E+04
Np-237	3.1567E-05	10,655.32	21,310.64	0.00E+00	3.36E-01	6.73E-01	11.0000	7.039E+03
Pa-231	1.3372E-09	10,655.32	21,310.64	0.00E+00	1.42E-05	2.85E-05		
Pb-210	3.0644E-11	10,655.32	21,310.64	0.00E+00	3.27E-07	6.53E-07		
Pm-147	6.5188E-03	10,655.32	21,310.64	0.00E+00	6.95E+01	1.39E+02		
Pu-238	1.4769E-01	10,655.32	21,310.64	0.00E+00	1.57E+03	3.15E+03		
Pu-239	6.9502E-04	10,655.32	21,310.64	0.00E+00	7.41E+00	1.48E+01		
Pu-240	3.7928E-04	10,655.32	21,310.64	0.00E+00	4.04E+00	8.08E+00		
Pu-241	1.0565E-01	10,655.32	21,310.64	0.00E+00	1.13E+03	2.25E+03		
Pu-242	3.0911E-06	10,655.32	21,310.64	0.00E+00	3.29E-02	6.59E-02		
Ra-226	1.1081E-10	10,655.32	21,310.64	0.00E+00	1.18E-06	2.36E-06		
Ra-228	2.1185E-14	10,655.32	21,310.64	0.00E+00	2.26E-10	4.51E-10		
Ru-106	2.3621E-07	10,655.32	21,310.64	0.00E+00	2.52E-03	5.03E-03		
Se-79	1.2339E-05	10,655.32	21,310.64	0.00E+00	1.31E-01	2.63E-01		
Sn-126	1.0194E-05	10,655.32	21,310.64	0.00E+00	1.09E-01	2.17E-01		
Sr-90	1.6932E+00	10,655.32	21,310.64	0.00E+00	1.80E+04	3.61E+04		
Tc-99	3.8066E-04	10,655.32	21,310.64	0.00E+00	4.05E+00	8.11E+00		
Th-229	9.1252E-12	10,655.32	21,310.64	0.00E+00	9.72E-08	1.94E-07		
Th-230	1.5407E-08	10,655.32	21,310.64	0.00E+00	1.64E-04	3.28E-04		
Th-232	2.8937E-14	10,655.32	21,310.64	0.00E+00	3.08E-10	6.17E-10		
Ti-208	4.7272E-08	10,655.32	21,310.64	0.00E+00	5.04E-04	1.01E-03		
U-232	1.2855E-07	10,655.32	21,310.64	0.00E+00	1.37E-03	2.74E-03		
U-233	5.1470E-09	10,655.32	21,310.64	0.00E+00	5.48E-05	1.10E-04		
U-234	5.6069E-05	10,655.32	21,310.64	0.00E+00	5.97E-01	1.19E+00		
U-235	-2.8661E-06	10,655.32	0.00	7.80E-02	4.74E-02	7.80E-02		
U-236	1.6701E-05	10,655.32	21,310.64	0.00E+00	1.78E-01	3.56E-01		
U-238	-9.4194E-09	10,655.32	0.00	3.06E-03	2.96E-03	3.06E-03		
Y-90	1.6932E+00	10,655.32	21,310.64	0.00E+00	1.80E+04	3.61E+04		
Other Radionuclides					1.85E+04	3.70E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	HEAVY WATER	HEAVY WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	79.82555621	40 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:		10.655.32	
Bounding:		21,310.64	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	0.54		
Bounding	1.08		1.01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HOR (NETHERLANDS)
SNF ID # 713
Fuel Units & Descr: 33 - ASSEMBLY
Heavy Metal Mass BOL=6.55kg, EOL=4.01kg
ROD Storage Site: SRS

¹Fuel decay start date: 1988
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup (MWd)
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 35 years

Estimated
Canister usage
18"x10"
1.38

II. Estimates	m	x _n	x _s	b	y _n	y _s	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	2,406.38	4,812.75	0.00E+00	4.83E-06	9.66E-06	Avg MeV	
Am-241	2.5251E-03	2,406.38	4,812.75	0.00E+00	6.08E+00	1.22E+01	0.0150	3.545E+14
Am-242m	3.9624E-07	2,406.38	4,812.75	0.00E+00	9.54E-04	1.91E-03	0.0250	7.360E+13
Am-243	1.4880E-06	2,406.38	4,812.75	0.00E+00	3.58E-03	7.16E-03	0.0375	6.398E+13
C-14	5.7053E-09	2,406.38	4,812.75	0.00E+00	1.37E-05	2.75E-05	0.0575	6.886E+13
Cl-36	1.3124E-32	2,406.38	4,812.75	0.00E+00	3.16E-29	6.32E-29	0.0850	4.149E+13
Cm-243	1.1419E-07	2,406.38	4,812.75	0.00E+00	2.75E-04	5.50E-04	0.1250	2.741E+13
Cm-244	1.6522E-05	2,406.38	4,812.75	0.00E+00	3.98E-02	7.95E-02	0.2250	3.582E+13
Co-60	7.4047E-07	2,406.38	4,812.75	0.00E+00	1.78E-03	3.56E-03	0.3750	1.558E+13
Cs-134	2.0455E-05	2,406.38	4,812.75	0.00E+00	4.92E-02	9.84E-02	0.5750	2.575E+14
Cs-135	3.4477E-06	2,406.38	4,812.75	0.00E+00	8.30E-03	1.66E-02	0.8500	3.146E+12
Cs-137	1.4365E+00	2,406.38	4,812.75	0.00E+00	3.46E+03	6.91E+03	1.2500	1.522E+12
Eu-154	7.3230E-03	2,406.38	4,812.75	0.00E+00	1.76E+01	3.52E+01	1.7500	8.564E+10
Eu-155	5.9259E-04	2,406.38	4,812.75	0.00E+00	1.43E+00	2.85E+00	2.2500	7.160E+06
Fe-55	2.2791E-06	2,406.38	4,812.75	0.00E+00	5.48E-03	1.10E-02	2.7500	6.834E+06
H-3	1.9698E-03	2,406.38	4,812.75	0.00E+00	4.74E+00	9.48E+00	3.5000	3.959E+03
I-129	7.5300E-07	2,406.38	4,812.75	0.00E+00	1.81E-03	3.62E-03	5.0000	1.618E+03
Kr-85	4.1176E-02	2,406.38	4,812.75	0.00E+00	9.91E+01	1.98E+02	7.0000	1.770E+02
Np-237	9.5752E-06	2,406.38	4,812.75	0.00E+00	2.30E-02	4.61E-02	11.0000	1.974E+01
Pa-231	3.9379E-09	2,406.38	4,812.75	0.00E+00	9.48E-06	1.90E-05		
Pb-210	3.3115E-10	2,406.38	4,812.75	0.00E+00	7.97E-07	1.59E-06		
Pm-147	9.2402E-04	2,406.38	4,812.75	0.00E+00	2.22E+00	4.45E+00		
Pu-238	1.6217E-02	2,406.38	4,812.75	0.00E+00	3.90E+01	7.80E+01		
Pu-239	4.2810E-04	2,406.38	4,812.75	0.00E+00	1.03E+00	2.06E+00		
Pu-240	2.4333E-04	2,406.38	4,812.75	0.00E+00	5.86E-01	1.17E+00		
Pu-241	1.6242E-02	2,406.38	4,812.75	0.00E+00	3.91E+01	7.82E+01		
Pu-242	3.6329E-07	2,406.38	4,812.75	0.00E+00	8.74E-04	1.75E-03		
Ra-226	9.0114E-10	2,406.38	4,812.75	0.00E+00	2.17E-06	4.34E-06		
Ra-228	3.1019E-14	2,406.38	4,812.75	0.00E+00	7.46E-11	1.49E-10		
Ru-106	2.1225E-10	2,406.38	4,812.75	0.00E+00	5.11E-07	1.02E-06		
Se-79	1.2930E-05	2,406.38	4,812.75	0.00E+00	3.11E-02	6.22E-02		
Sn-126	1.1571E-05	2,406.38	4,812.75	0.00E+00	2.78E-02	5.57E-02		
Sr-90	1.3472E+00	2,406.38	4,812.75	0.00E+00	3.24E+03	6.48E+03		
Tc-99	4.2239E-04	2,406.38	4,812.75	0.00E+00	1.02E+00	2.03E+00		
Th-229	1.2407E-11	2,406.38	4,812.75	0.00E+00	2.99E-08	5.97E-08		
Th-230	8.3497E-08	2,406.38	4,812.75	0.00E+00	2.01E-04	4.02E-04		
Th-232	3.8371E-14	2,406.38	4,812.75	0.00E+00	9.23E-11	1.85E-10		
Th-232	4.0414E-08	2,406.38	4,812.75	0.00E+00	9.73E-05	1.95E-04		
Th-208								
U-232	1.0948E-07	2,406.38	4,812.75	0.00E+00	2.63E-04	5.27E-04		
U-233	3.6275E-09	2,406.38	4,812.75	0.00E+00	8.73E-06	1.75E-05		
U-234	1.8562E-04	2,406.38	4,812.75	0.00E+00	4.47E-01	8.93E-01		
U-235	-2.7235E-06	2,406.38	0.00	1.32E-02	6.63E-03	1.32E-02		
U-236	1.5493E-05	2,406.38	4,812.75	0.00E+00	3.73E-02	7.46E-02		
U-238	-4.2851E-09	2,406.38	0.00	1.51E-04	1.41E-04	1.51E-04		
Y-90	1.3475E+00	2,406.38	4,812.75	0.00E+00	3.24E+03	6.49E+03		
Other Radionuclides					3.29E+03	6.59E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.03E+01	8.05E+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 %	93.13082871	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		2,406.38
Bounding		4,812.75

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	1.17	
Bounding	2.33	

Estimated EOL HM/Given EOL HM

1.04

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HTRE (ANP)
SNF ID #: 105
Fuel Units & Descr: 13 - CANISTER OF SCRAP
Heavy Metal Mass: BOL=4.55kg; EOL=4.039kg
ROD Storage Site: INEEL

¹Fuel decay start date: 1961
Estimates as of: 2030
Template: Pathfinder (Light Water, SST, 60 to 100%, U)
²Template Burnup(MWd): 6.01
Template BOL Heavy Metal Mass (MT): 0.00012882
Template Decay Time: 65 years

Estimated
Canister usage
18"x10"
0.36

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.5940E-08	482.62	965.24	0.00E+00	2.22E-05	4.43E-05	Avg MeV	
Am-241	1.1471E-04	482.62	965.24	0.00E+00	5.54E-02	1.11E-01	0.0150	3.523E+13
Am-242m	7.4210E-09	482.62	965.24	0.00E+00	3.58E-06	7.16E-06	0.0250	7.320E+12
Am-243	9.8236E-10	482.62	965.24	0.00E+00	4.74E-07	9.48E-07	0.0375	6.361E+12
C-14	2.2928E-04	482.62	965.24	0.00E+00	1.11E-01	2.21E-01	0.0575	6.826E+12
Cl-36	1.2260E-06	482.62	965.24	0.00E+00	5.92E-04	1.18E-03	0.0850	4.123E+12
Cm-243	1.2000E-10	482.62	965.24	0.00E+00	5.79E-08	1.16E-07	0.1250	2.673E+12
Cm-244	7.3577E-10	482.62	965.24	0.00E+00	3.55E-07	7.10E-07	0.2250	3.553E+12
Co-60	1.3732E-03	482.62	965.24	0.00E+00	6.63E-01	1.33E+00	0.3750	1.550E+12
Cs-134	1.2709E-10	482.62	965.24	0.00E+00	6.13E-08	1.23E-07	0.5750	2.607E+13
Cs-135	3.0316E-05	482.62	965.24	0.00E+00	1.46E-02	2.93E-02	0.8500	2.532E+11
Cs-137	7.2579E-01	482.62	965.24	0.00E+00	3.50E+02	7.01E+02	1.2500	1.833E+11
Eu-154	5.9750E-05	482.62	965.24	0.00E+00	2.88E-02	5.77E-02	1.7500	6.513E+09
Eu-155	1.0577E-05	482.62	965.24	0.00E+00	5.10E-03	1.02E-02	2.2500	1.232E+06
Fe-55	4.1631E-07	482.62	965.24	0.00E+00	2.01E-04	4.02E-04	2.7500	5.517E+05
H-3	4.6722E-04	482.62	965.24	0.00E+00	2.25E-01	4.51E-01	3.5000	5.624E+01
I-129	7.3195E-07	482.62	965.24	0.00E+00	3.53E-04	7.07E-04	5.0000	2.323E+01
Kr-85	5.9418E-03	482.62	965.24	0.00E+00	2.87E+00	5.74E+00	7.0000	2.568E+00
Np-237	1.1499E-06	482.62	965.24	0.00E+00	5.55E-04	1.11E-03	11.0000	2.884E-01
Pa-231	7.0899E-08	482.62	965.24	0.00E+00	3.42E-05	6.84E-05		
Pb-210	2.2363E-12	482.62	965.24	0.00E+00	1.08E-09	2.16E-09		
Pm-147	4.2296E-07	482.62	965.24	0.00E+00	2.04E-04	4.08E-04		
Pu-238	2.3295E-04	482.62	965.24	0.00E+00	1.12E-01	2.25E-01		
Pu-239	6.6722E-04	482.62	965.24	0.00E+00	3.22E-01	6.44E-01		
Pu-240	8.6556E-05	482.62	965.24	0.00E+00	4.18E-02	8.35E-02		
Pu-241	1.6889E-04	482.62	965.24	0.00E+00	8.15E-02	1.63E-01		
Pu-242	1.9717E-09	482.62	965.24	0.00E+00	9.52E-07	1.90E-06		
Ra-226	4.5740E-12	482.62	965.24	0.00E+00	2.21E-09	4.42E-09		
Ra-228	8.3511E-12	482.62	965.24	0.00E+00	4.03E-09	8.06E-09		
Ru-106	2.0516E-19	482.62	965.24	0.00E+00	9.90E-17	1.98E-16		
Se-79	1.3220E-05	482.62	965.24	0.00E+00	6.38E-03	1.28E-02		
Sn-126	1.1489E-05	482.62	965.24	0.00E+00	5.54E-03	1.11E-02		
Sr-90	6.6872E-01	482.62	965.24	0.00E+00	3.23E+02	6.45E+02		
Tc-99	4.6639E-04	482.62	965.24	0.00E+00	2.25E-01	4.50E-01		
Th-229	2.3727E-11	482.62	965.24	0.00E+00	1.15E-08	2.29E-08		
Th-230	2.7354E-10	482.62	965.24	0.00E+00	1.32E-07	2.64E-07		
Th-232	8.3594E-12	482.62	965.24	0.00E+00	4.03E-09	8.07E-09		
Ti-208	1.6228E-08	482.62	965.24	0.00E+00	7.83E-06	1.57E-05		
U-232	4.3960E-08	482.62	965.24	0.00E+00	2.12E-05	4.24E-05		
U-233	3.3344E-09	482.62	965.24	0.00E+00	1.61E-06	3.22E-06		
U-234	4.0749E-07	482.62	965.24	0.00E+00	1.97E-04	3.93E-04		
U-235	-2.7761E-06	482.62	0.00	9.16E-03	7.82E-03	9.16E-03		
U-236	1.6190E-05	482.62	965.24	0.00E+00	7.81E-03	1.56E-02		
U-238	-2.8547E-09	482.62	0.00	1.05E-04	1.03E-04	1.05E-04		
Y-90	6.6889E-01	482.62	965.24	0.00E+00	3.23E+02	6.46E+02		
Other Radionuclides					4.38E+02	8.77E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	NICHROME	SST
BOL HM Constituents	U	U
BOL Enrichment %	93.15	60 to 100

Basis for Parameter Differences:

This template was used for the following reasons:
This fuel matches on all parameters except cladding (SST is conservative).

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		482.62
Bounding		965.24

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	2.27	
Bounding	4.55	

Estimated EOL HM/Given EOL HM

1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information
 Fuel Name HWCTR 3EMT-2 (UMO)
 SNF ID #: 118
 Fuel Units & Descr: 7 - TUBE
 Heavy Metal Mass BOL= , EOL=8 108kg
 ROD Storage Site INEEL

¹Fuel decay start date 1964
 Estimates as of 2030
 Template HFBR (Heavy Water, Zirc, 0 to 5%, U)
²Template Burnup(MWd) 5
 Template BOL Heavy Metal Mass (MT). 0.00034251
 Template Decay Time 65 years

Estimated
 Canister usage*
 18"x10"
 0.16

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	7.7980E-09	7,772.05	7,772.05	0.00E+00	6.06E-05	6.06E-05	0.0150	2.660E+14
Am-241	2.3560E-02	7,772.05	7,772.05	0.00E+00	1.83E+02	1.83E+02	0.0250	5.494E+13
Am-242m	3.0880E-06	7,772.05	7,772.05	0.00E+00	2.40E-02	2.40E-02	0.0375	4.837E+13
Am-243	2.0520E-06	7,772.05	7,772.05	0.00E+00	1.59E-02	1.59E-02	0.0575	5.357E+13
C-14	1.1222E-03	7,772.05	7,772.05	0.00E+00	8.72E+00	8.72E+00	0.0850	3.082E+13
Cl-36	8.3760E-11	7,772.05	7,772.05	0.00E+00	6.51E-07	6.51E-07	0.1250	2.003E+13
Cm-243	2.4260E-07	7,772.05	7,772.05	0.00E+00	1.89E-03	1.89E-03	0.2250	2.653E+13
Cm-244	3.3140E-06	7,772.05	7,772.05	0.00E+00	2.58E-02	2.58E-02	0.3750	1.155E+13
Co-60	1.2454E-03	7,772.05	7,772.05	0.00E+00	9.68E+00	9.68E+00	0.5750	2.066E+14
Cs-134	3.3040E-10	7,772.05	7,772.05	0.00E+00	2.57E-06	2.57E-06	0.8500	1.974E+12
Cs-135	7.9140E-06	7,772.05	7,772.05	0.00E+00	6.15E-02	6.15E-02	1.2500	1.426E+12
Cs-137	7.1580E-01	7,772.05	7,772.05	0.00E+00	5.56E+03	5.56E+03	1.7500	5.100E+10
Eu-154	6.0500E-04	7,772.05	7,772.05	0.00E+00	4.70E+00	4.70E+00	2.2500	9.178E+06
Eu-155	9.4860E-06	7,772.05	7,772.05	0.00E+00	7.37E-02	7.37E-02	2.7500	9.536E+06
Fe-55	1.9322E-08	7,772.05	7,772.05	0.00E+00	1.50E-04	1.50E-04	3.5000	3.886E+04
H-3	4.4180E-03	7,772.05	7,772.05	0.00E+00	3.43E+01	3.43E+01	5.0000	1.631E+04
I-129	7.5020E-07	7,772.05	7,772.05	0.00E+00	5.83E-03	5.83E-03	7.0000	1.834E+03
Kr-85	5.4940E-03	7,772.05	7,772.05	0.00E+00	4.27E+01	4.27E+01	11.0000	2.080E+02
Np-237	5.8040E-06	7,772.05	7,772.05	0.00E+00	4.51E-02	4.51E-02		
Pa-231	1.1096E-08	7,772.05	7,772.05	0.00E+00	8.62E-05	8.62E-05		
Pb-210	1.4712E-08	7,772.05	7,772.05	0.00E+00	1.14E-04	1.14E-04		
Pm-147	3.5920E-07	7,772.05	7,772.05	0.00E+00	2.79E-03	2.79E-03		
Pu-238	5.0700E-03	7,772.05	7,772.05	0.00E+00	3.94E+01	3.94E+01		
Pu-239	1.8728E-02	7,772.05	7,772.05	0.00E+00	1.46E+02	1.46E+02		
Pu-240	8.3280E-03	7,772.05	7,772.05	0.00E+00	6.47E+01	6.47E+01		
Pu-241	3.4460E-02	7,772.05	7,772.05	0.00E+00	2.68E+02	2.68E+02		
Pu-242	2.0380E-06	7,772.05	7,772.05	0.00E+00	1.58E-02	1.58E-02		
Ra-226	2.9640E-08	7,772.05	7,772.05	0.00E+00	2.30E-04	2.30E-04		
Ra-228	1.1922E-09	7,772.05	7,772.05	0.00E+00	9.27E-06	9.27E-06		
Ru-106	3.5780E-19	7,772.05	7,772.05	0.00E+00	2.78E-15	2.78E-15		
Se-79	1.2520E-05	7,772.05	7,772.05	0.00E+00	9.73E-02	9.73E-02		
Sn-126	1.2050E-05	7,772.05	7,772.05	0.00E+00	9.37E-02	9.37E-02		
Sr-90	6.1880E-01	7,772.05	7,772.05	0.00E+00	4.81E+03	4.81E+03		
Tc-99	4.4120E-04	7,772.05	7,772.05	0.00E+00	3.43E+00	3.43E+00		
Th-229	6.9280E-09	7,772.05	7,772.05	0.00E+00	5.38E-05	5.38E-05		
Th-230	1.7084E-06	7,772.05	7,772.05	0.00E+00	1.33E-02	1.33E-02		
Th-232	1.1926E-09	7,772.05	7,772.05	0.00E+00	9.27E-06	9.27E-06		
Ti-208	3.4740E-08	7,772.05	7,772.05	0.00E+00	2.70E-04	2.70E-04		
U-232	9.2940E-08	7,772.05	7,772.05	0.00E+00	7.22E-04	7.22E-04		
U-233	9.1680E-07	7,772.05	7,772.05	0.00E+00	7.13E-03	7.13E-03		
U-234	2.3440E-03	7,772.05	7,772.05	0.00E+00	1.82E+01	1.82E+01		
U-235	-2.3296E-06	7,772.05	0.00	1.75E-03	0.00E+00	1.75E-03		
U-236	2.6620E-05	7,772.05	7,772.05	0.00E+00	2.07E-01	2.07E-01		
U-238	-1.3291E-07	7,772.05	0.00	5.13E-03	4.09E-03	5.13E-03		
Y-90	6.1900E-01	7,772.05	7,772.05	0.00E+00	4.81E+03	4.81E+03		
Other Radionuclides					5.32E+03	5.32E+03		

Thermal Power
 Nominal Heat Output (Watts) 7.38E+01
 Bounding Heat Output (Watts) 7.38E+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	This Template was used for the following reasons: This fuel matches on all parameters except enrichment (unknown)
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %		0 to 5	

Burnup Summary (MWd) ²			Basis for burnup used in estimate
	From SFD	Estimated	
Nominal		7,772.05	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Bounding		7,772.05	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	32.83		2.59
Bounding	32.83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HWCTR DRIVER (U-ZR) HEU
SNF ID # 117
Fuel Units & Descr: 76 - TUBE
Heavy Metal Mass BOL= , EOL=36 13kg
ROD Storage Site INEEL

¹Fuel decay start date: 1964
Estimates as of 2030
Template: HFBR (Heavy Water, Zirc., 0 to 5%, U)
²Template Burnup(MWd) 5
Template BOL Heavy Metal Mass (MT): 0 00034251
Template Decay Time: 65 years

Estimated
Canister usage:
18"x15"
3.45

II. Estimates	m	x _n	x _s	b	y _n	y _s	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7.7980E-09	34,632.91	34,632.91	0.00E+00	2.70E-04	2.70E-04	Avg. MeV	
Am-241	2.3560E-02	34,632.91	34,632.91	0.00E+00	8.16E+02	8.16E+02	0.0150	1.185E+15
Am-242m	3.0880E-06	34,632.91	34,632.91	0.00E+00	1.07E-01	1.07E-01	0.0250	2.448E+14
Am-243	2.0520E-06	34,632.91	34,632.91	0.00E+00	7.11E-02	7.11E-02	0.0375	2.155E+14
C-14	1.1222E-03	34,632.91	34,632.91	0.00E+00	3.89E+01	3.89E+01	0.0575	2.387E+14
Cl-36	8.3760E-11	34,632.91	34,632.91	0.00E+00	2.90E-06	2.90E-06	0.0850	1.373E+14
Cm-243	2.4260E-07	34,632.91	34,632.91	0.00E+00	8.40E-03	8.40E-03	0.1250	8.926E+13
Cm-244	3.3140E-06	34,632.91	34,632.91	0.00E+00	1.15E-01	1.15E-01	0.2250	1.182E+14
Co-60	1.2454E-03	34,632.91	34,632.91	0.00E+00	4.31E+01	4.31E+01	0.3750	5.148E+13
Cs-134	3.3040E-10	34,632.91	34,632.91	0.00E+00	1.14E-05	1.14E-05	0.5750	9.208E+14
Cs-135	7.9140E-06	34,632.91	34,632.91	0.00E+00	2.74E-01	2.74E-01	0.8500	8.796E+12
Cs-137	7.1580E-01	34,632.91	34,632.91	0.00E+00	2.48E+04	2.48E+04	1.2500	6.356E+12
Eu-154	6.0500E-04	34,632.91	34,632.91	0.00E+00	2.10E+01	2.10E+01	1.7500	2.273E+11
Eu-155	9.4860E-06	34,632.91	34,632.91	0.00E+00	3.29E-01	3.29E-01	2.2500	4.090E+07
Fe-55	1.9322E-08	34,632.91	34,632.91	0.00E+00	6.69E-04	6.69E-04	2.7500	4.249E+07
H-3	4.4180E-03	34,632.91	34,632.91	0.00E+00	1.53E+02	1.53E+02	3.5000	1.732E+05
I-129	7.5020E-07	34,632.91	34,632.91	0.00E+00	2.60E-02	2.60E-02	5.0000	7.267E+04
Kr-85	5.4940E-03	34,632.91	34,632.91	0.00E+00	1.90E+02	1.90E+02	7.0000	8.171E+03
Np-237	5.8040E-06	34,632.91	34,632.91	0.00E+00	2.01E-01	2.01E-01	11.0000	9.270E+02
Pa-231	1.1096E-08	34,632.91	34,632.91	0.00E+00	3.84E-04	3.84E-04		
Pb-210	1.4712E-08	34,632.91	34,632.91	0.00E+00	5.10E-04	5.10E-04		
Pm-147	3.5920E-07	34,632.91	34,632.91	0.00E+00	1.24E-02	1.24E-02		
Pu-238	5.0700E-03	34,632.91	34,632.91	0.00E+00	1.76E+02	1.76E+02		
Pu-239	1.8728E-02	34,632.91	34,632.91	0.00E+00	6.49E+02	6.49E+02		
Pu-240	8.3280E-03	34,632.91	34,632.91	0.00E+00	2.88E+02	2.88E+02		
Pu-241	3.4460E-02	34,632.91	34,632.91	0.00E+00	1.19E+03	1.19E+03		
Pu-242	2.0380E-06	34,632.91	34,632.91	0.00E+00	7.06E-02	7.06E-02		
Ra-226	2.9640E-08	34,632.91	34,632.91	0.00E+00	1.03E-03	1.03E-03		
Ra-228	1.1922E-09	34,632.91	34,632.91	0.00E+00	4.13E-05	4.13E-05		
Ru-106	3.5780E-19	34,632.91	34,632.91	0.00E+00	1.24E-14	1.24E-14		
Se-79	1.2520E-05	34,632.91	34,632.91	0.00E+00	4.34E-01	4.34E-01		
Sn-126	1.2050E-05	34,632.91	34,632.91	0.00E+00	4.17E-01	4.17E-01		
Sr-90	6.1880E-01	34,632.91	34,632.91	0.00E+00	2.14E+04	2.14E+04		
Tc-99	4.4120E-04	34,632.91	34,632.91	0.00E+00	1.53E+01	1.53E+01		
Th-229	6.9280E-09	34,632.91	34,632.91	0.00E+00	2.40E-04	2.40E-04		
Th-230	1.7084E-06	34,632.91	34,632.91	0.00E+00	5.92E-02	5.92E-02		
Th-232	1.1926E-09	34,632.91	34,632.91	0.00E+00	4.13E-05	4.13E-05		
Tl-208	3.4740E-08	34,632.91	34,632.91	0.00E+00	1.20E-03	1.20E-03		
U-232	9.2940E-08	34,632.91	34,632.91	0.00E+00	3.22E-03	3.22E-03		
U-233	9.1680E-07	34,632.91	34,632.91	0.00E+00	3.18E-02	3.18E-02		
U-234	2.3440E-03	34,632.91	34,632.91	0.00E+00	8.12E+01	8.12E+01		
U-235	-2.3296E-06	34,632.91	0.00	7.81E-03	0.00E+00	7.81E-03		
U-236	2.6620E-05	34,632.91	34,632.91	0.00E+00	9.22E-01	9.22E-01		
U-238	-1.3291E-07	34,632.91	0.00	2.28E-02	1.82E-02	2.28E-02		
Y-90	6.1900E-01	34,632.91	34,632.91	0.00E+00	2.14E+04	2.14E+04		
Other Radionuclides					2.37E+04	2.37E+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: This fuel matches on all parameters except enrichment (unknown)
Fuel Cladding	ZIRC	ZIRC	
BOL HM Constituents	U	U	
BOL Enrichment %		0 to 5	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		34 632.91	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Bounding		34 632.91	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	32.83		2.59
Bounding	32.83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HWCTR ETWO (U METAL) LEU
SNF ID # 867
Fuel Units & Descr: 6 - TUBE
Heavy Metal Mass BOL= , EOL=45 456kg
ROD Storage Site INEEL

¹Fuel decay start date: 1964
Estimates as of 2030
Template: HFBR (Heavy Water, Zirc, 0 to 5% U)
²Template Burnup(MWd) 5
Template BOL Heavy Metal Mass (MT) 0.00034251
Template Decay Time 65 years

Estimated
Canister usage
18"x15"
0.27

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7.7980E-09	43,572.00	43,572.00	0.00E+00	3.40E-04	3.40E-04	Avg MeV	
Am-241	2.3560E-02	43,572.00	43,572.00	0.00E+00	1.03E+03	1.03E+03	0.0150	1.491E+15
Am-242m	3.0880E-06	43,572.00	43,572.00	0.00E+00	1.35E-01	1.35E-01	0.0250	3.080E+14
Am-243	2.0520E-06	43,572.00	43,572.00	0.00E+00	8.94E-02	8.94E-02	0.0375	2.712E+14
C-14	1.1222E-03	43,572.00	43,572.00	0.00E+00	4.89E+01	4.89E+01	0.0575	3.003E+14
Cl-36	8.3760E-11	43,572.00	43,572.00	0.00E+00	3.65E-06	3.65E-06	0.0850	1.728E+14
Cm-243	2.4260E-07	43,572.00	43,572.00	0.00E+00	1.06E-02	1.06E-02	0.1250	1.123E+14
Cm-244	3.3140E-06	43,572.00	43,572.00	0.00E+00	1.44E-01	1.44E-01	0.2250	1.487E+14
Co-60	1.2454E-03	43,572.00	43,572.00	0.00E+00	5.43E+01	5.43E+01	0.3750	6.477E+13
Cs-134	3.3040E-10	43,572.00	43,572.00	0.00E+00	1.44E-05	1.44E-05	0.5750	1.159E+15
Cs-135	7.9140E-06	43,572.00	43,572.00	0.00E+00	3.45E-01	3.45E-01	0.8500	1.107E+13
Cs-137	7.1580E-01	43,572.00	43,572.00	0.00E+00	3.12E+04	3.12E+04	1.2500	7.997E+12
Eu-154	6.0500E-04	43,572.00	43,572.00	0.00E+00	2.64E+01	2.64E+01	1.7500	2.859E+11
Eu-155	9.4860E-06	43,572.00	43,572.00	0.00E+00	4.13E-01	4.13E-01	2.2500	5.145E+07
Fe-55	1.9322E-08	43,572.00	43,572.00	0.00E+00	8.42E-04	8.42E-04	2.7500	5.346E+07
H-3	4.4180E-03	43,572.00	43,572.00	0.00E+00	1.93E+02	1.93E+02	3.5000	2.179E+05
I-129	7.5020E-07	43,572.00	43,572.00	0.00E+00	3.27E-02	3.27E-02	5.0000	9.143E+04
Kr-85	5.4940E-03	43,572.00	43,572.00	0.00E+00	2.53E-01	2.53E-01	7.0000	1.028E+04
Np-237	5.8040E-06	43,572.00	43,572.00	0.00E+00	2.53E-01	2.53E-01	11.0000	1.166E+03
Pa-231	1.1096E-08	43,572.00	43,572.00	0.00E+00	4.83E-04	4.83E-04		
Pb-210	1.4712E-08	43,572.00	43,572.00	0.00E+00	6.41E-04	6.41E-04		
Pm-147	3.5920E-07	43,572.00	43,572.00	0.00E+00	1.57E-02	1.57E-02		
Pu-238	5.0700E-03	43,572.00	43,572.00	0.00E+00	2.21E+02	2.21E+02		
Pu-239	1.8728E-02	43,572.00	43,572.00	0.00E+00	8.16E+02	8.16E+02		
Pu-240	8.3280E-03	43,572.00	43,572.00	0.00E+00	3.63E+02	3.63E+02		
Pu-241	3.4460E-02	43,572.00	43,572.00	0.00E+00	1.50E+03	1.50E+03		
Pu-242	2.0380E-06	43,572.00	43,572.00	0.00E+00	8.88E-02	8.88E-02		
Ra-226	2.9640E-08	43,572.00	43,572.00	0.00E+00	1.29E-03	1.29E-03		
Ra-228	1.1922E-09	43,572.00	43,572.00	0.00E+00	5.19E-05	5.19E-05		
Ru-106	3.5780E-19	43,572.00	43,572.00	0.00E+00	1.56E-14	1.56E-14		
Se-79	1.2520E-05	43,572.00	43,572.00	0.00E+00	5.46E-01	5.46E-01		
Sn-126	1.2050E-05	43,572.00	43,572.00	0.00E+00	5.25E-01	5.25E-01		
Sr-90	6.1880E-01	43,572.00	43,572.00	0.00E+00	2.70E+04	2.70E+04		
Tc-99	4.4120E-04	43,572.00	43,572.00	0.00E+00	1.92E+01	1.92E+01		
Th-229	6.9280E-09	43,572.00	43,572.00	0.00E+00	3.02E-04	3.02E-04		
Th-230	1.7084E-06	43,572.00	43,572.00	0.00E+00	7.44E-02	7.44E-02		
Th-232	1.1926E-09	43,572.00	43,572.00	0.00E+00	5.20E-05	5.20E-05		
Ti-208	3.4740E-08	43,572.00	43,572.00	0.00E+00	1.51E-03	1.51E-03		
U-232	9.2940E-08	43,572.00	43,572.00	0.00E+00	4.05E-03	4.05E-03		
U-233	9.1680E-07	43,572.00	43,572.00	0.00E+00	3.99E-02	3.99E-02		
U-234	2.3440E-03	43,572.00	43,572.00	0.00E+00	1.02E+02	1.02E+02		
U-235	-2.3296E-06	43,572.00	43,572.00	0.00E+00	9.83E-03	9.83E-03		
U-236	2.6620E-05	43,572.00	43,572.00	0.00E+00	1.16E+00	1.16E+00		
U-238	-1.3291E-07	43,572.00	43,572.00	0.00E+00	2.29E-02	2.29E-02		
Y-90	6.1900E-01	43,572.00	43,572.00	0.00E+00	2.70E+04	2.70E+04		
Other Radionuclides					2.98E+04	2.98E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences.
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)²

	From SFD	Estimated	Basis for burnup used in estimate
Nominal:		43,572.00	Nominal burnup set equal to bounding burnup
Bounding:		43,572.00	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	32.83		2.59
Bounding	32.83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HWCTR IMT (U METAL-SST) DU
SNF ID #: 113
Fuel Units & Descr: 82 - TUBE
Heavy Metal Mass: BOL= , EOL=92 775kg
ROD Storage Site: INEEL

¹Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, SST, 0 to 5% U)
²Template Burnup(MWd): 5
Template BOL Heavy Metal Mass (MT): 0 00034251
Template Decay Time: 65 years

Estimated
Canister usage.
18"x10"
1 15

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9 2380E-09	88,573 24	88,573 24	0 00E+00	8 18E-04	8 18E-04	Avg. MeV	
Am-241	2 2020E-01	88,573 24	88,573 24	0 00E+00	1 95E+04	1 95E+04	0 0150	2 835E+15
Am-242m	8 9860E-05	88,573 24	88,573 24	0 00E+00	7 96E+00	7 96E+00	0 0250	5 483E+14
Am-243	5 2240E-05	88,573 24	88,573 24	0 00E+00	4 63E+00	4 63E+00	0 0375	4 892E+14
C-14	2 2080E-02	88,573 24	88,573 24	0 00E+00	1 96E+03	1 96E+03	0 0575	7 546E+14
Ci-36	4 1880E-04	88,573 24	88,573 24	0 00E+00	3 71E+01	3 71E+01	0 0850	2 925E+14
Cm-243	8 0820E-06	88,573 24	88,573 24	0 00E+00	7 16E-01	7 16E-01	0 1250	1 900E+14
Cm-244	2 3260E-04	88,573 24	88,573 24	0 00E+00	2 06E+01	2 06E+01	0 2250	2 497E+14
Co-60	9 9520E-02	88,573 24	88,573 24	0 00E+00	8 81E+03	8 81E+03	0 3750	1 084E+14
Cs-134	7 2160E-10	88,573 24	88,573 24	0 00E+00	6 39E-05	6 39E-05	0 5750	2 360E+15
Cs-135	3 7460E-06	88,573 24	88,573 24	0 00E+00	3 32E-01	3 32E-01	0 8500	2 002E+13
Cs-137	7 2140E-01	88,573 24	88,573 24	0 00E+00	6 39E+04	6 39E+04	1 2500	6 595E+14
Eu-154	8 2120E-04	88,573 24	88,573 24	0 00E+00	7 27E+01	7 27E+01	1 7500	4 938E+11
Eu-155	1 2284E-05	88,573 24	88,573 24	0 00E+00	1 09E+00	1 09E+00	2 2500	3 511E+09
Fe-55	1 8062E-05	88,573 24	88,573 24	0 00E+00	1 60E+00	1 60E+00	2 7500	3 689E+08
H-3	8 2700E-03	88,573 24	88,573 24	0 00E+00	7 33E+02	7 33E+02	3 5000	1 862E+06
I-129	9 1660E-07	88,573 24	88,573 24	0 00E+00	8 12E-02	8 12E-02	5 0000	7 734E+05
Kr-85	4 6540E-03	88,573 24	88,573 24	0 00E+00	4 12E+02	4 12E+02	7 0000	8 611E+04
Np-237	2 1800E-05	88,573 24	88,573 24	0 00E+00	1 93E+00	1 93E+00	11 0000	9 708E+03
Pa-231	1 2982E-08	88,573 24	88,573 24	0 00E+00	1 15E-03	1 15E-03		
Pb-210	1 3604E-08	88,573 24	88,573 24	0 00E+00	1 20E-03	1 20E-03		
Pm-147	2 8480E-07	88,573 24	88,573 24	0 00E+00	2 52E-02	2 52E-02		
Pu-238	2 8680E-02	88,573 24	88,573 24	0 00E+00	2 54E+03	2 54E+03		
Pu-239	6 5040E-02	88,573 24	88,573 24	0 00E+00	5 76E+03	5 76E+03		
Pu-240	2 6620E-02	88,573 24	88,573 24	0 00E+00	2 36E+03	2 36E+03		
Pu-241	3 2120E-01	88,573 24	88,573 24	0 00E+00	2 84E+04	2 84E+04		
Pu-242	1 6742E-05	88,573 24	88,573 24	0 00E+00	1 48E+00	1 48E+00		
Ra-226	2 7420E-08	88,573 24	88,573 24	0 00E+00	2 43E-03	2 43E-03		
Ra-228	2 0880E-10	88,573 24	88,573 24	0 00E+00	1 85E-05	1 85E-05		
Ru-106	8 1300E-19	88,573 24	88,573 24	0 00E+00	7 20E-14	7 20E-14		
Se-79	2 8480E-05	88,573 24	88,573 24	0 00E+00	2 52E+00	2 52E+00		
Sn-126	1 7790E-05	88,573 24	88,573 24	0 00E+00	1 58E+00	1 58E+00		
Sr-90	5 0780E-01	88,573 24	88,573 24	0 00E+00	4 50E+04	4 50E+04		
Tc-99	4 3360E-04	88,573 24	88,573 24	0 00E+00	3 84E+01	3 84E+01		
Th-229	3 1120E-09	88,573 24	88,573 24	0 00E+00	2 76E-04	2 76E-04		
Th-230	1 5812E-06	88,573 24	88,573 24	0 00E+00	1 40E-01	1 40E-01		
Th-232	2 0900E-10	88,573 24	88,573 24	0 00E+00	1 85E-05	1 85E-05		
Ti-208	1 1448E-07	88,573 24	88,573 24	0 00E+00	1 01E-02	1 01E-02		
U-232	3 1000E-07	88,573 24	88,573 24	0 00E+00	2 75E-02	2 75E-02	Thermal Power	
U-233	4 1460E-07	88,573 24	88,573 24	0 00E+00	3 67E-02	3 67E-02	Nominal Heat	Bounding
U-234	2 1720E-03	88,573 24	88,573 24	0 00E+00	1 92E+02	1 92E+02	Output (Watts)	Heat Output (Watts)
U-235	-1 7016E-06	88,573 24	0 00	2 01E-02	0 00E+00	2 01E-02	1 97E+03	1 97E+03
U-236	2 6100E-05	88,573 24	88,573 24	0 00E+00	2 31E+00	2 31E+00	Total	Total
U-238	-5 1291E-07	88,573 24	0 00	5 87E-02	1 32E-02	5 87E-02		
Y-90	5 0800E-01	88,573 24	88,573 24	0 00E+00	4 50E+04	4 50E+04		
Other Radionuclides					5 73E+05	5 73E+05		

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 enrichment (unknown)
Fuel Cladding	SST	SST	
BOL HM Constituents	U	U	
BOL Enrichment %		0 to 5	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		88,573.24	Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL
Bounding		88,573.24	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	32.70		2.26
Bounding	32.70		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HWCTR IRO (UO2) LEU
SNF ID #: 976
Fuel Units & Descr: 2 - TUBE
Heavy Metal Mass BOL= , EOL=5 407kg
ROD Storage Site INEEL

Fuel decay start date 1964
Estimates as of 2030
Template HFBR (Heavy Water, Zirc., 0 to 5% U)
Template Burnup (MWd) 5
Template BOL Heavy Metal Mass (MT) 0.00034251
Template Decay Time 65 years

Estimated
Canister usage
18"x10"
0.02

II. Estimates		m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7.7980E-09	5,183.09	5,183.09	0.00E+00	4.04E-05	4.04E-05	0.0150	0.0150	1.774E+14
Am-241	2.3560E-02	5,183.09	5,183.09	0.00E+00	1.22E+02	1.22E+02	0.0250	0.0250	3.664E+13
Am-242m	3.0880E-06	5,183.09	5,183.09	0.00E+00	1.60E-02	1.60E-02	0.0375	0.0375	3.226E+13
Am-243	2.0520E-06	5,183.09	5,183.09	0.00E+00	1.06E-02	1.06E-02	0.0575	0.0575	3.572E+13
C-14	1.1222E-03	5,183.09	5,183.09	0.00E+00	5.82E+00	5.82E+00	0.0850	0.0850	2.055E+13
Cl-36	8.3760E-11	5,183.09	5,183.09	0.00E+00	4.34E-07	4.34E-07	0.1250	0.1250	1.336E+13
Cm-243	2.4260E-07	5,183.09	5,183.09	0.00E+00	1.26E-03	1.26E-03	0.2250	0.2250	1.769E+13
Cm-244	3.3140E-06	5,183.09	5,183.09	0.00E+00	1.72E-02	1.72E-02	0.3750	0.3750	7.705E+12
Co-60	1.2454E-03	5,183.09	5,183.09	0.00E+00	6.46E+00	6.46E+00	0.5750	0.5750	1.378E+14
Cs-134	3.3040E-10	5,183.09	5,183.09	0.00E+00	1.71E-06	1.71E-06	0.8500	0.8500	1.316E+12
Cs-135	7.9140E-06	5,183.09	5,183.09	0.00E+00	4.10E-02	4.10E-02	1.2500	1.2500	9.513E+11
Cs-137	7.1580E-01	5,183.09	5,183.09	0.00E+00	3.71E+03	3.71E+03	1.7500	1.7500	3.401E+10
Eu-154	6.0500E-04	5,183.09	5,183.09	0.00E+00	3.14E+00	3.14E+00	2.2500	2.2500	6.121E+06
Eu-155	9.4860E-06	5,183.09	5,183.09	0.00E+00	4.92E-02	4.92E-02	2.7500	2.7500	6.360E+06
Fe-55	1.9322E-08	5,183.09	5,183.09	0.00E+00	1.00E-04	1.00E-04	3.5000	3.5000	2.592E+04
H-3	4.4180E-03	5,183.09	5,183.09	0.00E+00	2.29E+01	2.29E+01	5.0000	5.0000	1.088E+04
I-129	7.5020E-07	5,183.09	5,183.09	0.00E+00	3.89E-03	3.89E-03	7.0000	7.0000	1.223E+03
Kr-85	5.4940E-03	5,183.09	5,183.09	0.00E+00	2.85E+01	2.85E+01	11.0000	11.0000	1.387E+02
Np-237	5.8040E-06	5,183.09	5,183.09	0.00E+00	3.01E-02	3.01E-02			
Pa-231	1.1096E-08	5,183.09	5,183.09	0.00E+00	5.75E-05	5.75E-05			
Pb-210	1.4712E-08	5,183.09	5,183.09	0.00E+00	7.63E-05	7.63E-05			
Pm-147	3.5920E-07	5,183.09	5,183.09	0.00E+00	1.86E-03	1.86E-03			
Pu-238	5.0700E-03	5,183.09	5,183.09	0.00E+00	2.63E+01	2.63E+01			
Pu-239	1.8728E-02	5,183.09	5,183.09	0.00E+00	9.71E+01	9.71E+01			
Pu-240	8.3280E-03	5,183.09	5,183.09	0.00E+00	4.32E+01	4.32E+01			
Pu-241	3.4460E-02	5,183.09	5,183.09	0.00E+00	1.79E+02	1.79E+02			
Pu-242	2.0380E-06	5,183.09	5,183.09	0.00E+00	1.06E-02	1.06E-02			
Ra-226	2.9640E-08	5,183.09	5,183.09	0.00E+00	1.54E-04	1.54E-04			
Ra-228	1.1922E-09	5,183.09	5,183.09	0.00E+00	6.18E-06	6.18E-06			
Ru-106	3.5780E-19	5,183.09	5,183.09	0.00E+00	1.85E-15	1.85E-15			
Se-79	1.2520E-05	5,183.09	5,183.09	0.00E+00	6.49E-02	6.49E-02			
Sn-126	1.2050E-05	5,183.09	5,183.09	0.00E+00	6.25E-02	6.25E-02			
Sr-90	6.1880E-01	5,183.09	5,183.09	0.00E+00	3.21E+03	3.21E+03			
Tc-99	4.4120E-04	5,183.09	5,183.09	0.00E+00	2.29E+00	2.29E+00			
Th-229	6.9280E-09	5,183.09	5,183.09	0.00E+00	3.59E-05	3.59E-05			
Th-230	1.7084E-06	5,183.09	5,183.09	0.00E+00	8.85E-03	8.85E-03			
Th-232	1.1926E-09	5,183.09	5,183.09	0.00E+00	6.18E-06	6.18E-06			
Th-208	3.4740E-08	5,183.09	5,183.09	0.00E+00	1.80E-04	1.80E-04			
U-232	9.2940E-08	5,183.09	5,183.09	0.00E+00	4.82E-04	4.82E-04			
U-233	9.1680E-07	5,183.09	5,183.09	0.00E+00	4.75E-03	4.75E-03			
U-234	2.3440E-03	5,183.09	5,183.09	0.00E+00	1.21E+01	1.21E+01			
U-235	-2.3296E-06	5,183.09	5,183.09	0.00E+00	0.00E+00	0.00E+00			
U-236	2.6620E-05	5,183.09	5,183.09	0.00E+00	1.38E-01	1.38E-01			
U-238	-1.3291E-07	5,183.09	0.00	3.42E-03	2.73E-03	3.42E-03			
Y-90	6.1900E-01	5,183.09	5,183.09	0.00E+00	3.21E+03	3.21E+03			
Y-90	6.1900E-01	5,183.09	5,183.09	0.00E+00	3.55E+03	3.55E+03			

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Basis for Parameter Differences*

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

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		5,183.09
Bounding		5,183.09

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	32.83	
Bounding	32.83	

Estimated EOL HM/Given EOL HM

2.59

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HWCTR IS (U-ZR) LEU
SNF ID #: 977
Fuel Units & Descr: 3 - TUBE
Heavy Metal Mass: BOL= ; EOL=15 776kg
ROD Storage Site: INEEL

Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc., 0 to 5% U)
Template Burnup(MWd): 5
Template BOL Heavy Metal Mass (MT): 0.00034251
Template Decay Time: 65 years

Estimated
Canister usage:
18"x15"
0.14

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7.7980E-09	15,122.23	15,122.23	0.00E+00	1.18E-04	1.18E-04	Avg MeV	
Am-241	2.3560E-02	15,122.23	15,122.23	0.00E+00	3.56E+02	3.56E+02	0.0150	5.176E+14
Am-242m	3.0880E-06	15,122.23	15,122.23	0.00E+00	4.67E-02	4.67E-02	0.0250	1.069E+14
Am-243	2.0520E-06	15,122.23	15,122.23	0.00E+00	3.10E-02	3.10E-02	0.0375	9.411E+13
C-14	1.1222E-03	15,122.23	15,122.23	0.00E+00	1.70E+01	1.70E+01	0.0575	1.042E+14
Cl-36	8.3760E-11	15,122.23	15,122.23	0.00E+00	1.27E-06	1.27E-06	0.0850	5.996E+13
Cm-243	2.4260E-07	15,122.23	15,122.23	0.00E+00	3.67E-03	3.67E-03	0.1250	3.897E+13
Cm-244	3.3140E-06	15,122.23	15,122.23	0.00E+00	5.01E-02	5.01E-02	0.2250	5.162E+13
Co-60	1.2454E-03	15,122.23	15,122.23	0.00E+00	1.88E+01	1.88E+01	0.3750	2.248E+13
Cs-134	3.3040E-10	15,122.23	15,122.23	0.00E+00	5.00E-06	5.00E-06	0.5750	4.021E+14
Cs-135	7.9140E-06	15,122.23	15,122.23	0.00E+00	1.20E-01	1.20E-01	0.8500	3.841E+12
Cs-137	7.1580E-01	15,122.23	15,122.23	0.00E+00	1.08E+04	1.08E+04	1.2500	2.775E+12
Eu-154	6.0500E-04	15,122.23	15,122.23	0.00E+00	9.15E+00	9.15E+00	1.7500	9.923E+10
Eu-155	9.4860E-06	15,122.23	15,122.23	0.00E+00	1.43E-01	1.43E-01	2.2500	1.786E+07
Fe-55	1.9322E-08	15,122.23	15,122.23	0.00E+00	2.92E-04	2.92E-04	2.7500	1.856E+07
H-3	4.4180E-03	15,122.23	15,122.23	0.00E+00	6.68E+01	6.68E+01	3.5000	7.562E+04
I-129	7.5020E-07	15,122.23	15,122.23	0.00E+00	1.13E-02	1.13E-02	5.0000	3.173E+04
Kr-85	5.4940E-03	15,122.23	15,122.23	0.00E+00	8.31E+01	8.31E+01	7.0000	3.568E+03
Np-237	5.8040E-06	15,122.23	15,122.23	0.00E+00	8.78E-02	8.78E-02	11.0000	4.048E+02
Pa-231	1.1096E-08	15,122.23	15,122.23	0.00E+00	1.68E-04	1.68E-04		
Pb-210	1.4712E-08	15,122.23	15,122.23	0.00E+00	2.22E-04	2.22E-04		
Pm-147	3.5920E-07	15,122.23	15,122.23	0.00E+00	5.43E-03	5.43E-03		
Pu-238	5.0700E-03	15,122.23	15,122.23	0.00E+00	7.67E+01	7.67E+01		
Pu-239	1.8728E-02	15,122.23	15,122.23	0.00E+00	2.83E+02	2.83E+02		
Pu-240	8.3280E-03	15,122.23	15,122.23	0.00E+00	1.26E+02	1.26E+02		
Pu-241	3.4460E-02	15,122.23	15,122.23	0.00E+00	5.21E+02	5.21E+02		
Pu-242	2.0380E-06	15,122.23	15,122.23	0.00E+00	3.08E-02	3.08E-02		
Ra-226	2.9640E-08	15,122.23	15,122.23	0.00E+00	4.48E-04	4.48E-04		
Ra-228	1.1922E-09	15,122.23	15,122.23	0.00E+00	1.80E-05	1.80E-05		
Ru-106	3.5780E-19	15,122.23	15,122.23	0.00E+00	5.41E-15	5.41E-15		
Se-79	1.2520E-05	15,122.23	15,122.23	0.00E+00	1.89E-01	1.89E-01		
Sn-126	1.2050E-05	15,122.23	15,122.23	0.00E+00	1.82E-01	1.82E-01		
Sr-90	6.1880E-01	15,122.23	15,122.23	0.00E+00	9.36E+03	9.36E+03		
Tc-99	4.4120E-04	15,122.23	15,122.23	0.00E+00	6.67E+00	6.67E+00		
Th-229	6.9280E-09	15,122.23	15,122.23	0.00E+00	1.05E-04	1.05E-04		
Th-230	1.7084E-06	15,122.23	15,122.23	0.00E+00	2.58E-02	2.58E-02		
Th-232	1.1926E-09	15,122.23	15,122.23	0.00E+00	1.80E-05	1.80E-05		
Tl-208	3.4740E-08	15,122.23	15,122.23	0.00E+00	5.25E-04	5.25E-04		
U-232	9.2940E-08	15,122.23	15,122.23	0.00E+00	1.41E-03	1.41E-03		
U-233	9.1680E-07	15,122.23	15,122.23	0.00E+00	1.39E-02	1.39E-02		
U-234	2.3440E-03	15,122.23	15,122.23	0.00E+00	3.54E+01	3.54E+01		
U-235	-2.3296E-06	15,122.23	0.00	3.41E-03	0.00E+00	3.41E-03		
U-236	2.6620E-05	15,122.23	15,122.23	0.00E+00	4.03E-01	4.03E-01		
U-238	-1.3291E-07	15,122.23	0.00	9.97E-03	7.96E-03	9.97E-03		
Y-90	6.1900E-01	15,122.23	15,122.23	0.00E+00	9.36E+03	9.36E+03		
Other Radionuclides					1.04E+04	1.04E+04		

III. Template Selection Summary, Burnup Summary, and Checks

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

Burnup Summary (MWd) ²			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		15,122.23	
Bounding		15,122.23	

Checks			Estimated EOL HM/Given EOL HM 2.59
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	32.83		
Bounding	32.83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HWCTR OT (UO2) LEU
SNF ID # 283
Fuel Units & Descr: 8 - TUBE
Heavy Metal Mass: BOL= , EOL=139.532kg
ROD Storage Site INEEL

¹Fuel decay start date 1963
Estimates as of 2030
Template PWR (Light Water, Zirc 0 to 5%, U)
²Template Burnup (MWd) 61 92
Template BOL Heavy Metal Mass (MT) 0 00176911
Template Decay Time 65 years

Estimated
Canister usage
18"x15"
0.36

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
	Cl/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.2581E-09	209 63	209 63	0.00E+00	2.64E-07	2.64E-07	Avg MeV	
Am-241	1.4761E-01	209 63	209 63	0.00E+00	3.09E+01	3.09E+01	0.0150	5.676E+12
Am-242m	2.5032E-04	209 63	209 63	0.00E+00	5.25E-02	5.25E-02	0.0250	1.127E+12
Am-243	6.2387E-04	209 63	209 63	0.00E+00	1.31E-01	1.31E-01	0.0375	1.054E+12
C-14	4.7739E-05	209 63	209 63	0.00E+00	1.00E-02	1.00E-02	0.0575	1.446E+12
Cl-36	8.0297E-07	209 63	209 63	0.00E+00	1.68E-04	1.68E-04	0.0850	6.169E+11
Cm-243	1.2099E-04	209 63	209 63	0.00E+00	2.54E-02	2.54E-02	0.1250	4.024E+11
Cm-244	1.5560E-02	209 63	209 63	0.00E+00	3.26E+00	3.26E+00	0.2250	5.248E+11
Co-60	4.9580E-05	209 63	209 63	0.00E+00	1.04E-02	1.04E-02	0.3750	2.271E+11
Cs-134	1.7022E-09	209 63	209 63	0.00E+00	3.57E-07	3.57E-07	0.5750	5.405E+12
Cs-135	1.4433E-03	209 63	209 63	0.00E+00	3.03E-03	3.03E-03	0.8500	4.333E+10
Cs-137	6.9929E-01	209 63	209 63	0.00E+00	1.47E+02	1.47E+02	1.2500	2.026E+10
Eu-154	1.8023E-03	209 63	209 63	0.00E+00	3.78E-01	3.78E-01	1.7500	1.165E+09
Eu-155	2.6793E-05	209 63	209 63	0.00E+00	5.62E-03	5.62E-03	2.2500	2.057E+05
Fe-55	1.4580E-08	209 63	209 63	0.00E+00	3.06E-06	3.06E-06	2.7500	1.021E+06
H-3	3.8566E-03	209 63	209 63	0.00E+00	8.08E-01	8.08E-01	3.5000	5.090E+04
I-129	9.8288E-07	209 63	209 63	0.00E+00	2.06E-04	2.06E-04	5.0000	2.174E+04
Kr-85	4.0617E-03	209 63	209 63	0.00E+00	8.51E-01	8.51E-01	7.0000	2.503E+03
Np-237	1.2645E-05	209 63	209 63	0.00E+00	2.65E-03	2.65E-03	11.0000	2.872E+02
Pa-231	1.6376E-09	209 63	209 63	0.00E+00	3.43E-07	3.43E-07		
Pb-210	2.8795E-10	209 63	209 63	0.00E+00	6.04E-08	6.04E-08		
Pm-147	1.3264E-07	209 63	209 63	0.00E+00	2.78E-05	2.78E-05		
Pu-238	5.8882E-02	209 63	209 63	0.00E+00	1.23E+01	1.23E+01		
Pu-239	1.1613E-02	209 63	209 63	0.00E+00	2.43E+00	2.43E+00		
Pu-240	1.5142E-02	209 63	209 63	0.00E+00	3.17E+00	3.17E+00		
Pu-241	2.1269E-01	209 63	209 63	0.00E+00	4.46E+01	4.46E+01		
Pu-242	6.4260E-05	209 63	209 63	0.00E+00	1.35E-02	1.35E-02		
Ra-226	5.8689E-10	209 63	209 63	0.00E+00	1.23E-07	1.23E-07		
Ra-228	5.3036E-12	209 63	209 63	0.00E+00	1.11E-09	1.11E-09		
Ru-106	6.8136E-19	209 63	209 63	0.00E+00	1.43E-16	1.43E-16		
Se-79	1.2372E-05	209 63	209 63	0.00E+00	2.59E-03	2.59E-03		
Sn-126	2.5194E-05	209 63	209 63	0.00E+00	5.28E-03	5.28E-03		
Sr-90	4.4913E-01	209 63	209 63	0.00E+00	9.42E+01	9.42E+01		
Tc-99	3.9357E-04	209 63	209 63	0.00E+00	8.25E-02	8.25E-02		
Th-229	1.9331E-10	209 63	209 63	0.00E+00	4.05E-08	4.05E-08		
Th-230	3.5223E-08	209 63	209 63	0.00E+00	7.38E-06	7.38E-06		
Th-232	5.3085E-12	209 63	209 63	0.00E+00	1.11E-09	1.11E-09		
Th-208	1.3102E-07	209 63	209 63	0.00E+00	2.75E-05	2.75E-05		
U-232	3.5497E-07	209 63	209 63	0.00E+00	7.44E-05	7.44E-05		
U-233	2.6647E-08	209 63	209 63	0.00E+00	5.59E-06	5.59E-06		
U-234	5.5023E-05	209 63	209 63	0.00E+00	1.15E-02	1.15E-02		
U-235	-1.4485E-06	209 63	0.00	9.66E-03	9.36E-03	9.66E-03		
U-236	7.5969E-06	209 63	209 63	0.00E+00	1.59E-03	1.59E-03		
U-238	-2.6129E-07	209 63	0.00	4.54E-02	4.54E-02	4.54E-02		
Y-90	4.4913E-01	209 63	209 63	0.00E+00	9.42E+01	9.42E+01		
					1.42E+02	1.42E+02		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

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

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		209 63	
Bounding		209 63	

Nominal burnup set equal to bounding burnup
Bounding burnup taken from SFD and converted to MWd using BOL=139.752kg

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.04		
Bounding	0.04		

1.00

*Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel
*Total burnup for all fuel associated with this worksheet must be divided by BOL heavy metal mass to get specific burnup values (MWd/MT)

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HWCTR RMT & SMT (U METAL) LEU
 SNF ID #: 790
 Fuel Units & Descr: 10 - TUBE
 Heavy Metal Mass: BOL= , EOL=63 746kg
 ROD Storage Site: INEEL

¹Fuel decay start date: 1964
 Estimates as of: 2030
 Template: HFBR (Heavy Water, Zirc., 0 to 5% U)
²Template Burnup(MWd): 5
 Template BOL Heavy Metal Mass (MT): 0 00034251
 Template Decay Time: 65 years

Estimated
 Canister usage:
 18"x15"
 0 45

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7.7980E-09	61,103 94	61,103 94	0 00E+00	4 76E-04	4.76E-04	Avg. MeV	
Am-241	2.3560E-02	61,103 94	61,103 94	0 00E+00	1 44E+03	1 44E+03	0 0150	2 091E+15
Am-242m	3 0880E-06	61,103 94	61,103 94	0 00E+00	1 89E-01	1.89E-01	0 0250	4 319E+14
Am-243	2 0520E-06	61,103 94	61,103 94	0 00E+00	1.25E-01	1.25E-01	0 0375	3 803E+14
C-14	1 1222E-03	61,103 94	61,103 94	0 00E+00	6.86E+01	6 86E+01	0.0575	4 212E+14
Cl-36	8 3760E-11	61,103 94	61,103 94	0 00E+00	5 12E-06	5 12E-06	0.0850	2 423E+14
Cm-243	2 4260E-07	61,103 94	61,103 94	0 00E+00	1 48E-02	1 48E-02	0 1250	1 575E+14
Cm-244	3 3140E-06	61,103 94	61,103 94	0 00E+00	2.02E-01	2 02E-01	0.2250	2 086E+14
Co-60	1 2454E-03	61,103 94	61,103 94	0 00E+00	7 61E+01	7 61E+01	0 3750	9 083E+13
Cs-134	3 3040E-10	61,103 94	61,103 94	0 00E+00	2 02E-05	2 02E-05	0.5750	1 625E+15
Cs-135	7 9140E-06	61,103 94	61,103 94	0 00E+00	4 84E-01	4 84E-01	0 8500	1.552E+13
Cs-137	7 1580E-01	61,103 94	61,103 94	0 00E+00	4 37E+04	4.37E+04	1.2500	1 121E+13
Eu-154	6 0500E-04	61,103 94	61,103 94	0 00E+00	3 70E+01	3 70E+01	1 7500	4 010E+11
Eu-155	9 4860E-06	61,103 94	61,103 94	0 00E+00	5 80E-01	5 80E-01	2.2500	7.216E+07
Fe-55	1 9322E-08	61,103 94	61,103 94	0 00E+00	1 18E-03	1 18E-03	2.7500	7 498E+07
H-3	4 4180E-03	61,103 94	61,103 94	0 00E+00	2.70E+02	2.70E+02	3 5000	3 055E+05
I-129	7.5020E-07	61,103 94	61,103 94	0 00E+00	4 58E-02	4 58E-02	5 0000	1 282E+05
Kr-85	5 4940E-03	61,103 94	61,103 94	0 00E+00	3.36E+02	3 36E+02	7 0000	1 442E+04
Np-237	5 8040E-06	61,103 94	61,103 94	0 00E+00	3 55E-01	3.55E-01	11 0000	1 636E+03
Pa-231	1.1096E-08	61,103 94	61,103 94	0 00E+00	6 78E-04	6.78E-04		
Pb-210	1 4712E-08	61,103 94	61,103 94	0 00E+00	8 99E-04	8.99E-04		
Pm-147	3 5920E-07	61,103 94	61,103 94	0 00E+00	2.19E-02	2 19E-02		
Pu-238	5 0700E-03	61,103 94	61,103 94	0 00E+00	3.10E+02	3 10E+02		
Pu-239	1 8728E-02	61,103 94	61,103 94	0 00E+00	1 14E+03	1 14E+03		
Pu-240	8 3280E-03	61,103 94	61,103 94	0 00E+00	5 09E+02	5 09E+02		
Pu-241	3 4460E-02	61,103 94	61,103 94	0 00E+00	2 11E+03	2 11E+03		
Pu-242	2 0380E-06	61,103 94	61,103 94	0 00E+00	1.25E-01	1 25E-01		
Ra-226	2 9640E-08	61,103 94	61,103 94	0 00E+00	1 81E-03	1 81E-03		
Ra-228	1 1922E-09	61,103 94	61,103 94	0 00E+00	7 28E-05	7.28E-05		
Ru-106	3 5780E-19	61,103 94	61,103 94	0 00E+00	2 19E-14	2.19E-14		
Se-79	1 2520E-05	61,103 94	61,103 94	0 00E+00	7 65E-01	7 65E-01		
Sn-126	1.2050E-05	61,103 94	61,103 94	0 00E+00	7 36E-01	7 36E-01		
Sr-90	6 1880E-01	61,103 94	61,103 94	0 00E+00	3 78E+04	3.78E+04		
Tc-99	4 4120E-04	61,103 94	61,103 94	0 00E+00	2.70E+01	2.70E+01		
Th-229	6.9280E-09	61,103 94	61,103 94	0 00E+00	4.23E-04	4.23E-04		
Th-230	1 7084E-06	61,103 94	61,103 94	0 00E+00	1 04E-01	1 04E-01		
Th-232	1 1926E-09	61,103 94	61,103 94	0 00E+00	7.29E-05	7.29E-05		
Ti-208	3 4740E-08	61,103 94	61,103 94	0 00E+00	2.12E-03	2 12E-03		
U-232	9.2940E-08	61,103 94	61,103 94	0 00E+00	5 68E-03	5 68E-03		
U-233	9 1680E-07	61,103 94	61,103 94	0 00E+00	5 60E-02	5 60E-02		
U-234	2 3440E-03	61,103 94	61,103 94	0 00E+00	1 43E+02	1 43E+02		
U-235	-2 3296E-06	61,103 94	0 00	1.38E-02	0 00E+00	1 38E-02		
U-236	2 6620E-05	61,103 94	61,103 94	0 00E+00	1 63E+00	1 63E+00		
U-238	-1 3291E-07	61,103 94	0 00	4 03E-02	3 22E-02	4 03E-02		
Y-90	6 1900E-01	61,103 94	61,103 94	0 00E+00	3 78E+04	3 78E+04		
Other Radionuclides					4 19E+04	4 19E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Basis for Parameter Differences:

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

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		61,103 94
Bounding		61,103 94

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	32.83	
Bounding	32.83	

Estimated EOL HM/Given EOL HM
 2.59

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HWCTR SOT (UO2) LEU
SNF ID # 120
Fuel Units & Descr 96 - TUBE
Heavy Metal Mass BOL = : EOL=249 725kg
ROD Storage Site: INEEL

¹Fuel decay start date 1964
Estimates as of: 2030
Template HFBR (Heavy Water, Zirc, 0 to 5% U)
²Template Burnup(MWd) 5
Template BOL Heavy Metal Mass (MT) 0.00034251
Template Decay Time 65 years

Estimated
Canister usage
18"x10"
1.09

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7.7980E-09	239,374.53	239,374.53	0.00E+00	1.87E-03	1.87E-03	Avg MeV	
Am-241	2.3560E-02	239,374.53	239,374.53	0.00E+00	5.64E+03	5.64E+03	0.0150	8.193E+15
Am-242m	3.0880E-06	239,374.53	239,374.53	0.00E+00	7.39E-01	7.39E-01	0.0250	1.692E+15
Am-243	2.0520E-06	239,374.53	239,374.53	0.00E+00	4.91E-01	4.91E-01	0.0375	1.490E+15
C-14	1.1222E-03	239,374.53	239,374.53	0.00E+00	2.69E+02	2.69E+02	0.0575	1.650E+15
Cl-36	8.3760E-11	239,374.53	239,374.53	0.00E+00	2.01E-05	2.01E-05	0.0850	9.492E+14
Cm-243	2.4260E-07	239,374.53	239,374.53	0.00E+00	5.81E-02	5.81E-02	0.1250	6.169E+14
Cm-244	3.3140E-06	239,374.53	239,374.53	0.00E+00	7.93E-01	7.93E-01	0.2250	8.170E+14
Co-60	1.2454E-03	239,374.53	239,374.53	0.00E+00	2.98E+02	2.98E+02	0.3750	3.558E+14
Cs-134	3.3040E-10	239,374.53	239,374.53	0.00E+00	7.91E-05	7.91E-05	0.5750	6.365E+15
Cs-135	7.9140E-06	239,374.53	239,374.53	0.00E+00	1.89E+00	1.89E+00	0.8500	6.080E+13
Cs-137	7.1580E-01	239,374.53	239,374.53	0.00E+00	1.71E+05	1.71E+05	1.2500	4.393E+13
Eu-154	6.0500E-04	239,374.53	239,374.53	0.00E+00	1.45E+02	1.45E+02	1.7500	1.571E+12
Eu-155	9.4860E-06	239,374.53	239,374.53	0.00E+00	2.27E+00	2.27E+00	2.2500	2.827E+08
Fe-55	1.9322E-08	239,374.53	239,374.53	0.00E+00	4.63E-03	4.63E-03	2.7500	2.937E+08
H-3	4.4180E-03	239,374.53	239,374.53	0.00E+00	1.06E+03	1.06E+03	3.5000	1.197E+06
I-129	7.5020E-07	239,374.53	239,374.53	0.00E+00	1.80E-01	1.80E-01	5.0000	5.023E+05
Kr-85	5.4940E-03	239,374.53	239,374.53	0.00E+00	1.32E+03	1.32E+03	7.0000	5.648E+04
Np-237	5.8040E-06	239,374.53	239,374.53	0.00E+00	1.39E+00	1.39E+00	11.0000	6.407E+03
Pa-231	1.1096E-08	239,374.53	239,374.53	0.00E+00	2.66E-03	2.66E-03		
Pb-210	1.4712E-08	239,374.53	239,374.53	0.00E+00	3.52E-03	3.52E-03		
Pm-147	3.5920E-07	239,374.53	239,374.53	0.00E+00	8.60E-02	8.60E-02		
Pu-238	5.0700E-03	239,374.53	239,374.53	0.00E+00	1.21E+03	1.21E+03		
Pu-239	1.8728E-02	239,374.53	239,374.53	0.00E+00	4.48E+03	4.48E+03		
Pu-240	8.3280E-03	239,374.53	239,374.53	0.00E+00	1.99E+03	1.99E+03		
Pu-241	3.4460E-02	239,374.53	239,374.53	0.00E+00	8.25E+03	8.25E+03		
Pu-242	2.0380E-06	239,374.53	239,374.53	0.00E+00	4.88E-01	4.88E-01		
Ra-226	2.9640E-08	239,374.53	239,374.53	0.00E+00	7.10E-03	7.10E-03		
Ra-228	1.1922E-09	239,374.53	239,374.53	0.00E+00	2.85E-04	2.85E-04		
Ru-106	3.5780E-19	239,374.53	239,374.53	0.00E+00	8.56E-14	8.56E-14		
Se-79	1.2520E-05	239,374.53	239,374.53	0.00E+00	3.00E+00	3.00E+00		
Sn-126	1.2050E-05	239,374.53	239,374.53	0.00E+00	2.88E+00	2.88E+00		
Sr-90	6.1880E-01	239,374.53	239,374.53	0.00E+00	1.48E+05	1.48E+05		
Tc-99	4.4120E-04	239,374.53	239,374.53	0.00E+00	1.06E+02	1.06E+02		
Th-229	6.9280E-09	239,374.53	239,374.53	0.00E+00	1.66E-03	1.66E-03		
Th-230	1.7084E-06	239,374.53	239,374.53	0.00E+00	4.09E-01	4.09E-01		
Th-232	1.1926E-09	239,374.53	239,374.53	0.00E+00	2.85E-04	2.85E-04		
Ti-208	3.4740E-08	239,374.53	239,374.53	0.00E+00	8.32E-03	8.32E-03		
U-232	9.2940E-08	239,374.53	239,374.53	0.00E+00	2.22E-02	2.22E-02		
U-233	9.1680E-07	239,374.53	239,374.53	0.00E+00	2.19E-01	2.19E-01		
U-234	2.3440E-03	239,374.53	239,374.53	0.00E+00	5.61E+02	5.61E+02		
U-235	-2.3296E-06	239,374.53	0.00	5.40E-02	0.00E+00	5.40E-02		
U-236	2.6620E-05	239,374.53	239,374.53	0.00E+00	6.37E+00	6.37E+00		
U-238	-1.3291E-07	239,374.53	0.00	1.58E-01	1.26E-01	1.58E-01		
Y-90	6.1900E-01	239,374.53	239,374.53	0.00E+00	1.48E+05	1.48E+05		
Other Radionuclides					1.64E+05	1.64E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		239,374.53	Nominal burnup set equal to bounding burnup
Bounding		239,374.53	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	32.83		2.59
Bounding	32.83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HWCTR SPR (U-ZR) LEU
SNF ID #: 783
Fuel Units & Descr: 56 - TUBE
Heavy Metal Mass: BOL = 437 679kg
ROD Storage Site: INEEL

Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc. 0 to 5%, U)
Template Burnup (MWd): 5
Template BOL Heavy Metal Mass (MT): 0 00034251
Template Decay Time: 65 years

Estimated
Canister usage
18"x15"
2 55

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7 7980E-09	419,538 84	419,538 84	0 00E+00	3 27E-03	3 27E-03	Avg MeV	
Am-241	2 3560E-02	419,538 84	419,538 84	0 00E+00	9 88E+03	9 88E+03	0 0150	1 436E+16
Am-242m	3 0880E-06	419,538 84	419,538 84	0 00E+00	1 30E+00	1 30E+00	0 0250	2 965E+15
Am-243	2 0520E-06	419,538 84	419,538 84	0 00E+00	8 61E-01	8 61E-01	0 0375	2 611E+15
C-14	1 1222E-03	419,538 84	419,538 84	0 00E+00	4 71E+02	4 71E+02	0 0575	2 892E+15
Cl-36	8 3760E-11	419,538 84	419,538 84	0 00E+00	3 51E-05	3 51E-05	0 0850	1 664E+15
Cm-243	2 4260E-07	419,538 84	419,538 84	0 00E+00	1 02E-01	1 02E-01	0 1250	1 081E+15
Cm-244	3 3140E-06	419,538 84	419,538 84	0 00E+00	1 39E+00	1 39E+00	0 2250	1 432E+15
Co-60	1 2454E-03	419,538 84	419,538 84	0 00E+00	5 22E+02	5 22E+02	0 3750	6 237E+14
Cs-134	3 3040E-10	419,538 84	419,538 84	0 00E+00	1 39E-04	1 39E-04	0 5750	1 115E+16
Cs-135	7 9140E-06	419,538 84	419,538 84	0 00E+00	3 32E+00	3 32E+00	0 8500	1 066E+14
Cs-137	7 1580E-01	419,538 84	419,538 84	0 00E+00	3 00E+05	3 00E+05	1 2500	7 700E+13
Eu-154	6 0500E-04	419,538 84	419,538 84	0 00E+00	2 54E+02	2 54E+02	1 7500	2 753E+12
Eu-155	9 4860E-06	419,538 84	419,538 84	0 00E+00	3 98E+00	3 98E+00	2 2500	4 954E+08
Fe-55	1 9322E-08	419,538 84	419,538 84	0 00E+00	8 11E-03	8 11E-03	2 7500	5 148E+08
H-3	4 4180E-03	419,538 84	419,538 84	0 00E+00	1 85E+03	1 85E+03	3 5000	2 098E+06
I-129	7 5020E-07	419,538 84	419,538 84	0 00E+00	3 15E-01	3 15E-01	5 0000	8 803E+05
Kr-85	5 4940E-03	419,538 84	419,538 84	0 00E+00	2 30E+03	2 30E+03	7 0000	9 898E+04
Np-237	5 8040E-06	419,538 84	419,538 84	0 00E+00	2 44E+00	2 44E+00	11 0000	1 123E+04
Pa-231	1 1096E-08	419,538 84	419,538 84	0 00E+00	4 66E-03	4 66E-03		
Pb-210	1 4712E-08	419,538 84	419,538 84	0 00E+00	6 17E-03	6 17E-03		
Pm-147	3 5920E-07	419,538 84	419,538 84	0 00E+00	1 51E-01	1 51E-01		
Pu-238	5 0700E-03	419,538 84	419,538 84	0 00E+00	2 13E+03	2 13E+03		
Pu-239	1 8728E-02	419,538 84	419,538 84	0 00E+00	7 86E+03	7 86E+03		
Pu-240	8 3280E-03	419,538 84	419,538 84	0 00E+00	3 49E+03	3 49E+03		
Pu-241	3 4460E-02	419,538 84	419,538 84	0 00E+00	1 45E+04	1 45E+04		
Pu-242	2 0380E-06	419,538 84	419,538 84	0 00E+00	8 55E-01	8 55E-01		
Ra-226	2 9640E-08	419,538 84	419,538 84	0 00E+00	1 24E-02	1 24E-02		
Ra-228	1 1922E-09	419,538 84	419,538 84	0 00E+00	5 00E-04	5 00E-04		
Ru-106	3 5780E-19	419,538 84	419,538 84	0 00E+00	1 50E-13	1 50E-13		
Se-79	1 2520E-05	419,538 84	419,538 84	0 00E+00	5 25E+00	5 25E+00		
Sn-126	1 2050E-05	419,538 84	419,538 84	0 00E+00	5 06E+00	5 06E+00		
Sr-90	6 1880E-01	419,538 84	419,538 84	0 00E+00	2 60E+05	2 60E+05		
Tc-99	4 4120E-04	419,538 84	419,538 84	0 00E+00	1 85E+02	1 85E+02		
Th-229	6 9280E-09	419,538 84	419,538 84	0 00E+00	2 91E-03	2 91E-03		
Th-230	1 7084E-06	419,538 84	419,538 84	0 00E+00	7 17E-01	7 17E-01		
Th-232	1 1926E-09	419,538 84	419,538 84	0 00E+00	5 00E-04	5 00E-04		
Ti-208	3 4740E-08	419,538 84	419,538 84	0 00E+00	1 46E-02	1 46E-02		
U-232	9 2940E-08	419,538 84	419,538 84	0 00E+00	3 90E-02	3 90E-02		
U-233	9 1680E-07	419,538 84	419,538 84	0 00E+00	3 85E-01	3 85E-01		
U-234	2 3440E-03	419,538 84	419,538 84	0 00E+00	9 83E+02	9 83E+02		
U-235	2 3296E-06	419,538 84	0 00	9 46E-02	0 00E+00	9 46E-02		
U-236	2 6620E-05	419,538 84	419,538 84	0 00E+00	1 12E+01	1 12E+01		
U-238	1 3291E-07	419,538 84	0 00	2 77E-01	2 21E-01	2 77E-01		
Y-90	6 1900E-01	419,538 84	419,538 84	0 00E+00	2 60E+05	2 60E+05		
Other Radionuclides					2 87E+05	2 87E+05		

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	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	
		0 to 5	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		419 538 84	Nominal burnup set equal to bounding burnup. Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.
Bounding		419 538 84	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	32.83		2.59
Bounding	32.83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HWCTR SPRO (UO2) ALUM LEU
SNF ID # 115
Fuel Units & Descr: 3 - TUBE
Heavy Metal Mass: BOL= , EOL=6.499kg
ROD Storage Site: SRS

*Fuel decay start date 1964
Estimates as of 2030
Template HFBR (Heavy Water Alum, 10 to 20%, U)
*Template Burnup(MWd) 15
Template BOL Heavy Metal Mass (MT) 0.00034251
Template Decay Time 65 years

Estimated
Canister usage:
18"x10"
0.08

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	5.3460E-09	6,176.98	6,176.98	0.00E+00	3.30E-05	3.30E-05	0.0150	2.149E+14
Am-241	2.9433E-02	6,176.98	6,176.98	0.00E+00	1.82E+02	1.82E+02	0.0250	4.444E+13
Am-242m	7.2600E-06	6,176.98	6,176.98	0.00E+00	4.48E-02	4.48E-02	0.0375	3.892E+13
Am-243	6.3740E-06	6,176.98	6,176.98	0.00E+00	3.94E-02	3.94E-02	0.0575	4.378E+13
C-14	2.9460E-08	6,176.98	6,176.98	0.00E+00	1.82E-04	1.82E-04	0.0850	2.493E+13
Cl-36	5.9507E-35	6,176.98	6,176.98	0.00E+00	3.68E-31	3.68E-31	0.1250	1.620E+13
Cm-243	7.3933E-07	6,176.98	6,176.98	0.00E+00	4.57E-03	4.57E-03	0.2250	2.147E+13
Cm-244	1.9660E-05	6,176.98	6,176.98	0.00E+00	1.21E-01	1.21E-01	0.3750	9.351E+12
Co-60	4.3927E-08	6,176.98	6,176.98	0.00E+00	2.71E-04	2.71E-04	0.5750	1.642E+14
Cs-134	5.7507E-10	6,176.98	6,176.98	0.00E+00	3.55E-06	3.55E-06	0.8500	1.575E+12
Cs-135	4.8607E-06	6,176.98	6,176.98	0.00E+00	3.00E-02	3.00E-02	1.2500	5.673E+11
Cs-137	7.1533E-01	6,176.98	6,176.98	0.00E+00	4.42E+03	4.42E+03	1.7500	4.106E+10
Eu-154	5.5533E-04	6,176.98	6,176.98	0.00E+00	3.43E+00	3.43E+00	2.2500	4.340E+06
Eu-155	7.5800E-06	6,176.98	6,176.98	0.00E+00	4.68E-02	4.68E-02	2.7500	1.108E+06
Fe-55	8.7333E-09	6,176.98	6,176.98	0.00E+00	5.39E-05	5.39E-05	3.5000	2.271E+04
H-3	3.7133E-04	6,176.98	6,176.98	0.00E+00	2.30E+00	2.30E+00	5.0000	9.495E+03
I-129	7.1600E-07	6,176.98	6,176.98	0.00E+00	4.42E-03	4.42E-03	7.0000	1.064E+03
Kr-85	5.5793E-03	6,176.98	6,176.98	0.00E+00	3.45E+01	3.45E+01	11.0000	1.204E+02
Np-237	4.2207E-06	6,176.98	6,176.98	0.00E+00	2.61E-02	2.61E-02		
Pa-231	8.3333E-09	6,176.98	6,176.98	0.00E+00	5.15E-05	5.15E-05		
Pb-210	2.4613E-12	6,176.98	6,176.98	0.00E+00	1.52E-08	1.52E-08		
Pm-147	3.1780E-07	6,176.98	6,176.98	0.00E+00	1.96E-03	1.96E-03		
Pu-238	3.8753E-03	6,176.98	6,176.98	0.00E+00	2.39E+01	2.39E+01		
Pu-239	1.0300E-02	6,176.98	6,176.98	0.00E+00	6.36E+01	6.36E+01		
Pu-240	5.3920E-03	6,176.98	6,176.98	0.00E+00	3.33E+01	3.33E+01		
Pu-241	4.3067E-02	6,176.98	6,176.98	0.00E+00	2.66E+02	2.66E+02		
Pu-242	3.0713E-06	6,176.98	6,176.98	0.00E+00	1.90E-02	1.90E-02		
Ra-226	5.8127E-12	6,176.98	6,176.98	0.00E+00	3.59E-08	3.59E-08		
Ra-228	4.5447E-14	6,176.98	6,176.98	0.00E+00	2.81E-10	2.81E-10		
Ru-106	3.0860E-19	6,176.98	6,176.98	0.00E+00	1.91E-15	1.91E-15		
Se-79	1.2533E-05	6,176.98	6,176.98	0.00E+00	7.74E-02	7.74E-02		
Sn-126	1.1393E-05	6,176.98	6,176.98	0.00E+00	7.04E-02	7.04E-02		
Sr-90	6.3033E-01	6,176.98	6,176.98	0.00E+00	3.89E+03	3.89E+03		
Tc-99	4.3527E-04	6,176.98	6,176.98	0.00E+00	2.69E+00	2.69E+00		
Th-229	5.2893E-12	6,176.98	6,176.98	0.00E+00	3.27E-08	3.27E-08		
Th-230	4.6820E-10	6,176.98	6,176.98	0.00E+00	2.89E-06	2.89E-06		
Th-232	5.1647E-14	6,176.98	6,176.98	0.00E+00	3.19E-10	3.19E-10		
Th-208	4.9873E-09	6,176.98	6,176.98	0.00E+00	3.08E-05	3.08E-05		
U-232	1.3513E-08	6,176.98	6,176.98	0.00E+00	8.35E-05	8.35E-05		
U-233	1.3927E-09	6,176.98	6,176.98	0.00E+00	8.60E-06	8.60E-06		
U-234	1.1380E-06	6,176.98	6,176.98	0.00E+00	7.03E-03	7.03E-03		
U-235	-2.5335E-06	6,176.98	0.00	4.21E-03	0.00E+00	4.21E-03		
U-236	1.3007E-05	6,176.98	6,176.98	0.00E+00	8.03E-02	8.03E-02		
U-238	-1.4207E-08	6,176.98	0.00	3.67E-03	3.58E-03	3.67E-03		
Y-90	6.3053E-01	6,176.98	6,176.98	0.00E+00	3.89E+03	3.89E+03		
Other Radionuclides					4.21E+03	4.21E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.73E+01	5.73E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences.
Reactor Moderator	HEAVY WATER	HEAVY WATER	This Template was used for the following reasons
Fuel Cladding	ALUM	ALUM	This fuel matches on all parameters except enrichment (unknown)
BOL HM Constituents	U	U	
BOL Enrichment %		10 to 20	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		6.176.98	Nominal burnup set equal to bounding burnup
Bounding		6.176.98	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	10.85		2.01
Bounding	10.85		

*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: HWCTR SPRO (U02) SST LEU
SNF ID #: 978

Fuel Units & Descr: 5 - TUBE

Heavy Metal Mass BOL= , EOL=89 362kg

ROD Storage Site: INEEL

¹Fuel decay start date. 1964
Estimates as of: 2030

Template: HFBR (Heavy Water, SST, 0 to 5%, U)

²Template Burnup(MWd): 5

Template BOL Heavy Metal Mass (MT) 0 00034251

Template Decay Time 65 years

Estimated
Canister usage
18"x10"
0.06

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.2380E-09	85,315.00	85,315.00	0.00E+00	7.88E-04	7.88E-04	Avg. MeV	
Am-241	2.2020E-01	85,315.00	85,315.00	0.00E+00	1.88E+04	1.88E+04	0.0150	2.731E+15
Am-242m	8.9860E-05	85,315.00	85,315.00	0.00E+00	7.67E+00	7.67E+00	0.0250	5.281E+14
Am-243	5.2240E-05	85,315.00	85,315.00	0.00E+00	4.46E+00	4.46E+00	0.0375	4.712E+14
C-14	2.2080E-02	85,315.00	85,315.00	0.00E+00	1.88E+03	1.88E+03	0.0575	7.268E+14
Cl-36	4.1880E-04	85,315.00	85,315.00	0.00E+00	3.57E+01	3.57E+01	0.0850	2.818E+14
Cm-243	8.0820E-06	85,315.00	85,315.00	0.00E+00	6.90E-01	6.90E-01	0.1250	1.830E+14
Cm-244	2.3260E-04	85,315.00	85,315.00	0.00E+00	1.98E+01	1.98E+01	0.2250	2.405E+14
Co-60	9.9520E-02	85,315.00	85,315.00	0.00E+00	8.49E+03	8.49E+03	0.3750	1.044E+14
Cs-134	7.2160E-10	85,315.00	85,315.00	0.00E+00	6.16E-05	6.16E-05	0.5750	2.274E+15
Cs-135	3.7460E-06	85,315.00	85,315.00	0.00E+00	3.20E-01	3.20E-01	0.8500	1.928E+13
Cs-137	7.2140E-01	85,315.00	85,315.00	0.00E+00	6.15E+04	6.15E+04	1.2500	6.352E+14
Eu-154	8.2120E-04	85,315.00	85,315.00	0.00E+00	7.01E+01	7.01E+01	1.7500	4.757E+11
Eu-155	1.2284E-05	85,315.00	85,315.00	0.00E+00	1.05E+00	1.05E+00	2.2500	3.381E+09
Fe-55	1.8062E-05	85,315.00	85,315.00	0.00E+00	1.54E+00	1.54E+00	2.7500	3.553E+08
H-3	8.2700E-03	85,315.00	85,315.00	0.00E+00	7.06E+02	7.06E+02	3.5000	1.794E+06
I-129	9.1660E-07	85,315.00	85,315.00	0.00E+00	7.82E-02	7.82E-02	5.0000	7.450E+05
Kr-85	4.6540E-03	85,315.00	85,315.00	0.00E+00	3.97E+02	3.97E+02	7.0000	8.295E+04
Np-237	2.1800E-05	85,315.00	85,315.00	0.00E+00	1.86E+00	1.86E+00	11.0000	9.351E+03
Pa-231	1.2982E-08	85,315.00	85,315.00	0.00E+00	1.11E-03	1.11E-03		
Pb-210	1.3604E-08	85,315.00	85,315.00	0.00E+00	1.16E-03	1.16E-03		
Pm-147	2.8480E-07	85,315.00	85,315.00	0.00E+00	2.43E-02	2.43E-02		
Pu-238	2.8680E-02	85,315.00	85,315.00	0.00E+00	2.45E+03	2.45E+03		
Pu-239	6.5040E-02	85,315.00	85,315.00	0.00E+00	5.55E+03	5.55E+03		
Pu-240	2.6620E-02	85,315.00	85,315.00	0.00E+00	2.27E+03	2.27E+03		
Pu-241	3.2120E-01	85,315.00	85,315.00	0.00E+00	2.74E+04	2.74E+04		
Pu-242	1.6742E-05	85,315.00	85,315.00	0.00E+00	1.43E+00	1.43E+00		
Ra-226	2.7420E-08	85,315.00	85,315.00	0.00E+00	2.34E-03	2.34E-03		
Ra-228	2.0880E-10	85,315.00	85,315.00	0.00E+00	1.78E-05	1.78E-05		
Ru-106	8.1300E-19	85,315.00	85,315.00	0.00E+00	6.94E-14	6.94E-14		
Se-79	2.8480E-05	85,315.00	85,315.00	0.00E+00	2.43E+00	2.43E+00		
Sn-126	1.7790E-05	85,315.00	85,315.00	0.00E+00	1.52E+00	1.52E+00		
Sr-90	5.0780E-01	85,315.00	85,315.00	0.00E+00	4.33E+04	4.33E+04		
Tc-99	4.3360E-04	85,315.00	85,315.00	0.00E+00	3.70E+01	3.70E+01		
Th-229	3.1120E-09	85,315.00	85,315.00	0.00E+00	2.66E-04	2.66E-04		
Th-230	1.5812E-06	85,315.00	85,315.00	0.00E+00	1.35E-01	1.35E-01		
Th-232	2.0900E-10	85,315.00	85,315.00	0.00E+00	1.78E-05	1.78E-05		
Ti-208	1.1448E-07	85,315.00	85,315.00	0.00E+00	9.77E-03	9.77E-03		
U-232	3.1000E-07	85,315.00	85,315.00	0.00E+00	2.64E-02	2.64E-02		
U-233	4.1460E-07	85,315.00	85,315.00	0.00E+00	3.54E-02	3.54E-02		
U-234	2.1720E-03	85,315.00	85,315.00	0.00E+00	1.85E+02	1.85E+02		
U-235	-1.7016E-06	85,315.00	0.00	1.93E-02	0.00E+00	1.93E-02		
U-236	2.6100E-05	85,315.00	85,315.00	0.00E+00	2.23E+00	2.23E+00		
U-238	-5.1291E-07	85,315.00	0.00	5.65E-02	1.27E-02	5.65E-02		
Y-90	5.0800E-01	85,315.00	85,315.00	0.00E+00	4.33E+04	4.33E+04		
Other Radionuclides					5.52E+05	5.52E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup set equal to bounding burnup Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL.
Nominal		85,315.00	
Bounding		85,315.00	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 2.26
Nominal	32.70		
Bounding	32.70		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HWCTR SPRO (UO2) ZR LEU
SNF ID # 772
Fuel Units & Descr: 48 - TUBE
Heavy Metal Mass BOL= , EOL=180 922kg
ROD Storage Site INEEL

¹Fuel decay start date: 1964
Estimates as of 2030
Template HFBR (Heavy Water, Zirc , 0 to 5% U)
²Template Burnup(MWd) 5
Template BOL Heavy Metal Mass (MT) 0 00034251
Template Decay Time: 65 years

Estimated
Canister usage
18"x10"
0 55

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	7 7980E-09	173,423 00	173,423 00	0 00E+00	1.35E-03	1.35E-03	0 0150	5.936E+15
Am-241	2 3560E-02	173,423 00	173,423 00	0 00E+00	4 09E+03	4 09E+03	0 0250	1.226E+15
Am-242m	3 0880E-06	173,423 00	173,423 00	0 00E+00	5 36E-01	5.36E-01	0 0375	1.079E+15
Am-243	2 0520E-06	173,423 00	173,423 00	0 00E+00	3 56E-01	3 56E-01	0 0575	1.195E+15
C-14	1 1222E-03	173,423 00	173,423 00	0 00E+00	1 95E+02	1.95E+02	0 0850	6 877E+14
Cl-36	8 3760E-11	173,423 00	173,423 00	0 00E+00	4 21E-02	4 21E-02	0 1250	4 470E+14
Cm-243	2 4260E-07	173,423 00	173,423 00	0 00E+00	5 75E-01	5 75E-01	0 2250	5 919E+14
Cm-244	3 3140E-06	173,423 00	173,423 00	0 00E+00	2 16E+02	2 16E+02	0 3750	2.578E+14
Co-60	1.2454E-03	173,423 00	173,423 00	0 00E+00	5 73E-05	5 73E-05	0 5750	4 611E+15
Cs-134	3.3040E-10	173,423 00	173,423 00	0 00E+00	1 37E+00	1 37E+00	0 8500	4 405E+13
Cs-135	7.9140E-06	173,423 00	173,423 00	0 00E+00	1 24E+05	1 24E+05	1.2500	3 183E+13
Cs-137	7 1580E-01	173,423 00	173,423 00	0 00E+00	1 05E+02	1 05E+02	1 7500	1 138E+12
Eu-154	6 0500E-04	173,423 00	173,423 00	0 00E+00	1 65E+00	1 65E+00	2.2500	2.048E+08
Eu-155	9 4860E-06	173,423 00	173,423 00	0 00E+00	3.35E-03	3.35E-03	2.7500	2 128E+08
Fe-55	1 9322E-08	173,423 00	173,423 00	0 00E+00	7.66E+02	7 66E+02	3.5000	8 672E+05
H-3	4 4180E-03	173,423 00	173,423 00	0 00E+00	1.30E-01	1.30E-01	5.0000	3 639E+05
I-129	7 5020E-07	173,423 00	173,423 00	0 00E+00	9 53E+02	9.53E+02	7.0000	4 092E+04
Kr-85	5 4940E-03	173,423 00	173,423 00	0 00E+00	1 01E+00	1.01E+00	11 0000	4 642E+03
Np-237	5 8040E-06	173,423 00	173,423 00	0 00E+00	1 92E-03	1 92E-03		
Pa-231	1 1096E-08	173,423 00	173,423 00	0 00E+00	2 55E-03	2 55E-03		
Pb-210	1 4712E-08	173,423 00	173,423 00	0 00E+00	6 23E-02	6 23E-02		
Pm-147	3 5920E-07	173,423 00	173,423 00	0 00E+00	8 79E+02	8 79E+02		
Pu-238	5 0700E-03	173,423 00	173,423 00	0 00E+00	3 25E+03	3 25E+03		
Pu-239	1 8728E-02	173,423 00	173,423 00	0 00E+00	1 44E+03	1 44E+03		
Pu-240	8 3280E-03	173,423 00	173,423 00	0 00E+00	5 98E+03	5 98E+03		
Pu-241	3 4460E-02	173,423 00	173,423 00	0 00E+00	3 53E-01	3 53E-01		
Pu-242	2 0380E-06	173,423 00	173,423 00	0 00E+00	5.14E-03	5 14E-03		
Ra-226	2 9640E-08	173,423 00	173,423 00	0 00E+00	2 07E-04	2 07E-04		
Ra-228	1 1922E-09	173,423 00	173,423 00	0 00E+00	6.21E-14	6.21E-14		
Ru-106	3 5780E-19	173,423 00	173,423 00	0 00E+00	2.17E+00	2 17E+00		
Se-79	1 2520E-05	173,423 00	173,423 00	0 00E+00	2 09E+00	2 09E+00		
Sn-126	1 2050E-05	173,423 00	173,423 00	0 00E+00	1.07E+05	1 07E+05		
Sr-90	6 1880E-01	173,423 00	173,423 00	0 00E+00	7.65E+01	7 65E+01		
Tc-99	4 4120E-04	173,423 00	173,423 00	0 00E+00	1 20E-03	1.20E-03		
Th-229	6 9280E-09	173,423 00	173,423 00	0 00E+00	2 96E-01	2 96E-01		
Th-230	1 7084E-06	173,423 00	173,423 00	0 00E+00	2 07E-04	2 07E-04		
Th-232	1.1926E-09	173,423 00	173,423 00	0 00E+00	6 02E-03	6 02E-03		
Th-208	3.4740E-08	173,423 00	173,423 00	0 00E+00	1 61E-02	1.61E-02		
U-232	9.2940E-08	173,423 00	173,423 00	0 00E+00	1.59E-01	1.59E-01		
U-233	9 1680E-07	173,423 00	173,423 00	0 00E+00	4 07E+02	4 07E+02		
U-234	2 3440E-03	173,423 00	173,423 00	0 00E+00	3 91E-02	3 91E-02		
U-235	-2.3296E-06	173,423 00	0 00	3.91E-02	0 00E+00	0 00E+00		
U-236	2 6620E-05	173,423 00	173,423 00	0 00E+00	4 62E+00	4 62E+00		
U-238	-1 3291E-07	173,423 00	0 00	1 14E-01	9 13E-02	1 14E-01		
Y-90	6 1900E-01	173,423 00	173,423 00	0 00E+00	1 07E+05	1 07E+05		
Other Radionuclides					1.19E+05	1 19E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
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)²

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		173 423 00	Nominal burnup set equal to bounding burnup
Bounding		173 423 00	Bounding burnup estimated by assuming BOL heavy metal mass was twice EOL

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	32 83		2.59
Bounding	32 83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HWCTR TFEN (U-ZR) LEU
 SNF ID #: 880
 Fuel Units & Descr: 11 - TUBE
 Heavy Metal Mass, BOL= , EOL=162.082kg
 ROD Storage Site: INEEL

Fuel decay start date: 1964
 Estimates as of: 2030
 Template: HFBR (Heavy Water, Zirc, 0 to 5%, U)
 Template Burnup(MWd): 5
 Template BOL Heavy Metal Mass (MT): 0.00034251
 Template Decay Time: 65 years

Estimated
 Canister usage
 18"x15"
 0.50

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7.7980E-09	155,363.95	155,363.95	0.00E+00	1.21E-03	1.21E-03	Avg MeV	
Am-241	2.3560E-02	155,363.95	155,363.95	0.00E+00	3.66E+03	3.66E+03	0.0150	5.318E+15
Am-242m	3.0880E-06	155,363.95	155,363.95	0.00E+00	4.80E-01	4.80E-01	0.0250	1.098E+15
Am-243	2.0520E-06	155,363.95	155,363.95	0.00E+00	3.19E-01	3.19E-01	0.0375	9.669E+14
C-14	1.1222E-03	155,363.95	155,363.95	0.00E+00	1.74E+02	1.74E+02	0.0575	1.071E+15
Cl-36	8.3760E-11	155,363.95	155,363.95	0.00E+00	1.30E-05	1.30E-05	0.0850	6.160E+14
Cm-243	2.4260E-07	155,363.95	155,363.95	0.00E+00	3.77E-02	3.77E-02	0.1250	4.004E+14
Cm-244	3.3140E-06	155,363.95	155,363.95	0.00E+00	5.15E-01	5.15E-01	0.2250	5.303E+14
Co-60	1.2454E-03	155,363.95	155,363.95	0.00E+00	1.93E+02	1.93E+02	0.3750	2.310E+14
Cs-134	3.3040E-10	155,363.95	155,363.95	0.00E+00	5.13E-05	5.13E-05	0.5750	4.131E+15
Cs-135	7.9140E-06	155,363.95	155,363.95	0.00E+00	1.23E+00	1.23E+00	0.8500	3.946E+13
Cs-137	7.1580E-01	155,363.95	155,363.95	0.00E+00	1.11E+05	1.11E+05	1.2500	2.851E+13
Eu-154	6.0500E-04	155,363.95	155,363.95	0.00E+00	9.40E+01	9.40E+01	1.7500	1.019E+12
Eu-155	9.4860E-06	155,363.95	155,363.95	0.00E+00	1.47E+00	1.47E+00	2.2500	1.835E+08
Fe-55	1.9322E-08	155,363.95	155,363.95	0.00E+00	3.00E-03	3.00E-03	2.7500	1.906E+08
H-3	4.4180E-03	155,363.95	155,363.95	0.00E+00	6.86E+02	6.86E+02	3.5000	7.769E+05
I-129	7.5020E-07	155,363.95	155,363.95	0.00E+00	1.17E-01	1.17E-01	5.0000	3.260E+05
Kr-85	5.4940E-03	155,363.95	155,363.95	0.00E+00	8.54E+02	8.54E+02	7.0000	3.665E+04
Np-237	5.8040E-06	155,363.95	155,363.95	0.00E+00	9.02E-01	9.02E-01	11.0000	4.159E+03
Pa-231	1.1096E-08	155,363.95	155,363.95	0.00E+00	1.72E-03	1.72E-03		
Pb-210	1.4712E-08	155,363.95	155,363.95	0.00E+00	2.29E-03	2.29E-03		
Pm-147	3.5920E-07	155,363.95	155,363.95	0.00E+00	5.58E-02	5.58E-02		
Pu-238	5.0700E-03	155,363.95	155,363.95	0.00E+00	7.88E+02	7.88E+02		
Pu-239	1.8728E-02	155,363.95	155,363.95	0.00E+00	2.91E+03	2.91E+03		
Pu-240	8.3280E-03	155,363.95	155,363.95	0.00E+00	1.29E+03	1.29E+03		
Pu-241	3.4460E-02	155,363.95	155,363.95	0.00E+00	5.35E+03	5.35E+03		
Pu-242	2.0380E-06	155,363.95	155,363.95	0.00E+00	3.17E-01	3.17E-01		
Ra-226	2.9640E-08	155,363.95	155,363.95	0.00E+00	4.60E-03	4.60E-03		
Ra-228	1.1922E-09	155,363.95	155,363.95	0.00E+00	1.85E-04	1.85E-04		
Ru-106	3.5780E-19	155,363.95	155,363.95	0.00E+00	5.56E-14	5.56E-14		
Se-79	1.2520E-05	155,363.95	155,363.95	0.00E+00	1.95E+00	1.95E+00		
Sn-126	1.2050E-05	155,363.95	155,363.95	0.00E+00	1.87E+00	1.87E+00		
Sr-90	6.1880E-01	155,363.95	155,363.95	0.00E+00	9.61E+04	9.61E+04		
Tc-99	4.4120E-04	155,363.95	155,363.95	0.00E+00	6.85E+01	6.85E+01		
Th-229	6.9280E-09	155,363.95	155,363.95	0.00E+00	1.08E-03	1.08E-03		
Th-230	1.7084E-06	155,363.95	155,363.95	0.00E+00	2.65E-01	2.65E-01		
Th-232	1.1926E-09	155,363.95	155,363.95	0.00E+00	1.85E-04	1.85E-04		
Ti-208	3.4740E-08	155,363.95	155,363.95	0.00E+00	5.40E-03	5.40E-03		
U-232	9.2940E-08	155,363.95	155,363.95	0.00E+00	1.44E-02	1.44E-02		
U-233	9.1680E-07	155,363.95	155,363.95	0.00E+00	1.42E-01	1.42E-01		
U-234	2.3440E-03	155,363.95	155,363.95	0.00E+00	3.64E+02	3.64E+02		
U-235	-2.3296E-06	155,363.95	0.00	3.50E-02	0.00E+00	3.50E-02		
U-236	2.6620E-05	155,363.95	155,363.95	0.00E+00	4.14E+00	4.14E+00		
U-238	-1.3291E-07	155,363.95	0.00	1.02E-01	8.18E-02	1.02E-01		
Y-90	6.1900E-01	155,363.95	155,363.95	0.00E+00	9.62E+04	9.62E+04		
Other Radionuclides					1.06E+05	1.06E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Basis for Parameter Differences:

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

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		155,363.95
Bounding		155,363.95

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	32.83	
Bounding	32.83	

Estimated EOL HM/Given EOL HM

2.59

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name HWCTR TMT-1-2 & 1-3 (U/TH)
SNF ID #: 112
Fuel Units & Descr 2 - TUBE
Heavy Metal Mass BOL: ; EOL=77.91kg
ROD Storage Site: INEEL

¹Fuel decay start date 1964
Estimates as of 2030
Template (Worst Case)
²Template Burnup(MWd) 62.5
Template BOL Heavy Metal Mass (MT): 0.00186865
Template Decay Time: 65 years

Estimated
Canister usage
18"x15"
0.09

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.6528E-06	273.69	547.39	0.00E+00	7.26E-04	1.45E-03	Avg MeV	
Am-241	8.6432E+00	273.69	547.39	0.00E+00	2.37E+03	4.73E+03	0.0150	3.426E+14
Am-242m	1.4688E-02	273.69	547.39	0.00E+00	4.02E+00	8.04E+00	0.0250	6.503E+13
Am-243	1.6272E-02	273.69	547.39	0.00E+00	4.45E+00	8.91E+00	0.0375	5.347E+13
C-14	1.2046E-01	273.69	547.39	0.00E+00	3.30E+01	6.59E+01	0.0575	1.215E+14
Cl-36	2.2849E-03	273.69	547.39	0.00E+00	6.25E-01	1.25E+00	0.0850	3.424E+13
Cm-243	4.1760E-04	273.69	547.39	0.00E+00	1.14E-01	2.29E-01	0.1250	2.301E+13
Cm-244	5.3440E-02	273.69	547.39	0.00E+00	1.46E+01	2.93E+01	0.2250	2.944E+13
Co-60	5.4296E-01	273.69	547.39	0.00E+00	1.49E+02	2.97E+02	0.3750	1.281E+13
Cs-134	1.4346E-08	273.69	547.39	0.00E+00	3.93E-06	7.85E-06	0.5750	2.147E+14
Cs-135	4.3976E-04	273.69	547.39	0.00E+00	1.20E-01	2.41E-01	0.8500	3.212E+12
Cs-137	1.0528E+01	273.69	547.39	0.00E+00	2.88E+03	5.76E+03	1.2500	2.391E+13
Eu-154	1.1156E-01	273.69	547.39	0.00E+00	3.05E+01	6.11E+01	1.7500	8.930E+10
Eu-155	1.0445E-03	273.69	547.39	0.00E+00	2.86E-01	5.72E-01	2.2500	1.237E+09
Fe-55	9.8542E-05	273.69	547.39	0.00E+00	2.70E-02	5.39E-02	2.7500	1.262E+08
H-3	4.5119E-02	273.69	547.39	0.00E+00	1.23E+01	2.47E+01	3.5000	6.505E+05
I-129	1.0618E-05	273.69	547.39	0.00E+00	2.91E-03	5.81E-03	5.0000	2.731E+05
Kr-85	8.6191E-02	273.69	547.39	0.00E+00	2.36E+01	4.72E+01	7.0000	3.086E+04
Np-237	2.0592E-04	273.69	547.39	0.00E+00	5.64E-02	1.13E-01	11.0000	3.505E+03
Pa-231	2.8720E-06	273.69	547.39	0.00E+00	7.86E-04	1.57E-03		
Pb-210	8.0265E-08	273.69	547.39	0.00E+00	2.20E-05	4.39E-05		
Pm-147	6.1354E-06	273.69	547.39	0.00E+00	1.68E-03	3.36E-03		
Pu-238	2.3536E+00	273.69	547.39	0.00E+00	6.44E+02	1.29E+03		
Pu-239	4.1616E-01	273.69	547.39	0.00E+00	1.14E+02	2.28E+02		
Pu-240	2.9200E-01	273.69	547.39	0.00E+00	7.99E+01	1.60E+02		
Pu-241	1.1490E+01	273.69	547.39	0.00E+00	3.14E+03	6.29E+03		
Pu-242	2.4560E-03	273.69	547.39	0.00E+00	6.72E-01	1.34E+00		
Ra-226	1.6171E-07	273.69	547.39	0.00E+00	4.43E-05	8.85E-05		
Ra-228	6.0192E-07	273.69	547.39	0.00E+00	1.65E-04	3.29E-04		
Ru-106	1.3163E-15	273.69	547.39	0.00E+00	3.60E-13	7.21E-13		
Se-79	1.9176E-04	273.69	547.39	0.00E+00	5.25E-02	1.05E-01		
Sn-126	1.6666E-04	273.69	547.39	0.00E+00	4.56E-02	9.12E-02		
Sr-90	9.7004E+00	273.69	547.39	0.00E+00	2.65E+03	5.31E+03		
Tc-99	6.7654E-03	273.69	547.39	0.00E+00	1.85E+00	3.70E+00		
Th-229	2.7664E-06	273.69	547.39	0.00E+00	7.57E-04	1.51E-03		
Th-230	9.3206E-06	273.69	547.39	0.00E+00	2.55E-03	5.10E-03		
Th-232	4.2431E-09	273.69	0.00	1.59E-03	1.58E-03	1.59E-03		
Th-208	6.5604E-05	273.69	547.39	0.00E+00	1.80E-02	3.59E-02		
U-232	1.7765E-04	273.69	547.39	0.00E+00	4.86E-02	9.72E-02	Thermal Power	
U-233	3.6128E-04	273.69	547.39	0.00E+00	9.89E-02	1.98E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.2788E-02	273.69	547.39	0.00E+00	3.50E+00	7.00E+00	1.45E+02	2.90E+02
U-235	5.7486E-04	273.69	547.39	3.36E-02	1.91E-01	3.48E-01	Total	Total
U-236	2.3485E-04	273.69	547.39	0.00E+00	6.43E-02	1.29E-01		
U-238	1.1581E-04	273.69	547.39	4.19E-03	3.59E-02	6.76E-02		
Y-90	9.7028E+00	273.69	547.39	0.00E+00	2.66E+03	5.31E+03		
Other Radionuclides					1.19E+04	2.37E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		273.69	Nominal burnup taken from SFD and converted to MWd using BOL=78.196kg
Bounding		547.39	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.10		2.74
Bounding	0.21		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: HWCTR TWNT (U METAL) LEU
SNF ID #: 791
Fuel Units & Descr: 15 - TUBE
Heavy Metal Mass: BOL = , EOL=321 82kg
ROD Storage Site: INEEL

¹Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc, 0 to 5% U)
²Template Burnup(MWd): 5
Template BOL Heavy Metal Mass (MT): 0 00034251
Template Decay Time: 65 years

Estimated
Canister usage
18"x15"
0.68

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	7 7980E-09	308,482.10	308,482.10	0 00E+00	2 41E-03	2 41E-03	Avg. MeV	
Am-241	2 3560E-02	308,482.10	308,482.10	0 00E+00	7 27E+03	7 27E+03	0 0150	1 056E+16
Am-242m	3 0880E-06	308,482.10	308,482.10	0 00E+00	9 53E-01	9 53E-01	0 0250	2 180E+15
Am-243	2 0520E-06	308,482.10	308,482.10	0 00E+00	6 33E-01	6 33E-01	0 0375	1 920E+15
C-14	1 1222E-03	308,482.10	308,482.10	0 00E+00	3 46E+02	3 46E+02	0 0575	2 126E+15
Cl-36	8 3760E-11	308,482.10	308,482.10	0 00E+00	2 58E-05	2 58E-05	0 0850	1 223E+15
Cm-243	2 4260E-07	308,482.10	308,482.10	0 00E+00	7 48E-02	7 48E-02	0 1250	7 950E+14
Cm-244	3 3140E-06	308,482.10	308,482.10	0 00E+00	1 02E+00	1 02E+00	0 2250	1 053E+15
Co-60	1 2454E-03	308,482.10	308,482.10	0 00E+00	3 84E+02	3 84E+02	0 3750	4 586E+14
Cs-134	3 3040E-10	308,482.10	308,482.10	0 00E+00	1 02E-04	1 02E-04	0 5750	8 202E+15
Cs-135	7 9140E-06	308,482.10	308,482.10	0 00E+00	2 44E+00	2 44E+00	0 8500	7 835E+13
Cs-137	7 1580E-01	308,482.10	308,482.10	0 00E+00	2 21E+05	2 21E+05	1 2500	5 662E+13
Eu-154	6 0500E-04	308,482.10	308,482.10	0 00E+00	1 87E+02	1 87E+02	1 7500	2 024E+12
Eu-155	9 4860E-06	308,482.10	308,482.10	0 00E+00	2 93E+00	2 93E+00	2 2500	3 643E+08
Fe-55	1 9322E-08	308,482.10	308,482.10	0 00E+00	5 96E-03	5 96E-03	2 7500	3 785E+08
H-3	4 4180E-03	308,482.10	308,482.10	0 00E+00	1 36E+03	1 36E+03	3 5000	1 543E+06
I-129	7 5020E-07	308,482.10	308,482.10	0 00E+00	2 31E-01	2 31E-01	5 0000	6 473E+05
Kr-85	5 4940E-03	308,482.10	308,482.10	0 00E+00	1 69E+03	1 69E+03	7 0000	7 278E+04
Np-237	5 8040E-06	308,482.10	308,482.10	0 00E+00	1 79E+00	1 79E+00	11 0000	8 257E+03
Pa-231	1 1096E-08	308,482.10	308,482.10	0 00E+00	3 42E-03	3 42E-03		
Pb-210	1 4712E-08	308,482.10	308,482.10	0 00E+00	4 54E-03	4 54E-03		
Pm-147	3 5920E-07	308,482.10	308,482.10	0 00E+00	1 11E-01	1 11E-01		
Pu-238	5 0700E-03	308,482.10	308,482.10	0 00E+00	1 56E+03	1 56E+03		
Pu-239	1 8728E-02	308,482.10	308,482.10	0 00E+00	5 78E+03	5 78E+03		
Pu-240	8 3280E-03	308,482.10	308,482.10	0 00E+00	2 57E+03	2 57E+03		
Pu-241	3 4460E-02	308,482.10	308,482.10	0 00E+00	1 06E+04	1 06E+04		
Pu-242	2 0380E-06	308,482.10	308,482.10	0 00E+00	6 29E-01	6 29E-01		
Ra-226	2 9640E-08	308,482.10	308,482.10	0 00E+00	9 14E-03	9 14E-03		
Ra-228	1 1922E-09	308,482.10	308,482.10	0 00E+00	3 68E-04	3 68E-04		
Ru-106	3 5780E-19	308,482.10	308,482.10	0 00E+00	1 10E-13	1 10E-13		
Se-79	1 2520E-05	308,482.10	308,482.10	0 00E+00	3 86E+00	3 86E+00		
Sn-126	1 2050E-05	308,482.10	308,482.10	0 00E+00	3 72E+00	3 72E+00		
Sr-90	6 1880E-01	308,482.10	308,482.10	0 00E+00	1 91E+05	1 91E+05		
Tc-99	4 4120E-04	308,482.10	308,482.10	0 00E+00	1 36E+02	1 36E+02		
Th-229	6 9280E-09	308,482.10	308,482.10	0 00E+00	2 14E-03	2 14E-03		
Th-230	1 7084E-06	308,482.10	308,482.10	0 00E+00	5 27E-01	5 27E-01		
Th-232	1 1926E-09	308,482.10	308,482.10	0 00E+00	3 68E-04	3 68E-04		
Ti-208	3 4740E-08	308,482.10	308,482.10	0 00E+00	1 07E-02	1 07E-02		
U-232	9 2940E-08	308,482.10	308,482.10	0 00E+00	2 87E-02	2 87E-02	Thermal Power	
U-233	9 1680E-07	308,482.10	308,482.10	0 00E+00	2 83E-01	2 83E-01	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	2 3440E-03	308,482.10	308,482.10	0 00E+00	7 23E+02	7 23E+02		
U-235	-2 3296E-06	308,482.10	0 00	6 96E-02	0 00E+00	6 96E-02	2 93E+03	2 93E+03
U-236	2 6620E-05	308,482.10	308,482.10	0 00E+00	8 21E+00	8 21E+00	Total	Total
U-238	-1 3291E-07	308,482.10	0 00	2 03E-01	1 62E-01	2 03E-01		
Y-90	6 1900E-01	308,482.10	308,482.10	0 00E+00	1 91E+05	1 91E+05		
Other Radionuclides					2 11E+05	2 11E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

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

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		308,482.10
Bounding		308,482.10

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	32.83	
Bounding	32.83	

Estimated EOL HM/Given EOL HM
2.59

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name IAN-R1 (COLUMBIA)
SNF ID # 596
Fuel Units & Descr 16 - MTR TYPE
Heavy Metal Mass BOL=2 536kg EOL=2 426kg
ROD Storage Site SRS

¹Fuel decay start date 1994
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 35 years

Estimated
Canister usage
18"x10"
0 67

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	2 0068E-09	104.55	209 10	0 00E+00	2.10E-07	4 20E-07	0 0150	1 540E+13
Am-241	2 5251E-03	104.55	209 10	0 00E+00	2.64E-01	5 28E-01	0 0250	3 198E+12
Am-242m	3 9624E-07	104.55	209 10	0 00E+00	4 14E-05	8 29E-05	0 0375	2 780E+12
Am-243	1 4880E-06	104.55	209 10	0 00E+00	1 56E-04	3 11E-04	0 0575	2 992E+12
C-14	5 7053E-09	104.55	209 10	0 00E+00	5 96E-07	1.19E-06	0 0850	1.803E+12
Cl-36	1.3124E-32	104.55	209 10	0 00E+00	1.37E-30	2 74E-30	0 1250	1 191E+12
Cm-243	1 1419E-07	104.55	209 10	0 00E+00	1.19E-05	2 39E-05	0 2250	1.556E+12
Cm-244	1 6522E-05	104.55	209 10	0 00E+00	1.73E-03	3 45E-03	0 3750	6 771E+11
Co-60	7 4047E-07	104.55	209 10	0 00E+00	7.74E-05	1 55E-04	0 5750	1 119E+13
Cs-134	2 0455E-05	104.55	209 10	0 00E+00	2 14E-03	4 28E-03	0 8500	1.367E+11
Cs-135	3 4477E-06	104.55	209 10	0 00E+00	3 60E-04	7.21E-04	1.2500	6 611E+10
Cs-137	1 4365E+00	104.55	209 10	0 00E+00	1 50E+02	3 00E+02	1 7500	3 721E+09
Eu-154	7 3230E-03	104.55	209 10	0 00E+00	7 66E-01	1.53E+00	2 2500	3 111E+05
Eu-155	5 9259E-04	104.55	209 10	0 00E+00	6 20E-02	1.24E-01	2 7500	2 969E+05
Fe-55	2.2791E-06	104.55	209 10	0 00E+00	2 38E-04	4 77E-04	3.5000	1 724E+02
H-3	1.9698E-03	104.55	209 10	0 00E+00	2 06E-01	4 12E-01	5 0000	7 047E+01
I-129	7 5300E-07	104.55	209 10	0 00E+00	7.87E-05	1 57E-04	7.0000	7 712E+00
Kr-85	4 1176E-02	104.55	209 10	0 00E+00	4.31E+00	8 61E+00	11 0000	8 599E-01
Np-237	9 5752E-06	104.55	209 10	0 00E+00	1 00E-03	2 00E-03		
Pa-231	3 9379E-09	104.55	209 10	0 00E+00	4 12E-07	8.23E-07		
Pb-210	3 3115E-10	104.55	209 10	0 00E+00	3 46E-08	6.92E-08		
Pm-147	9.2402E-04	104.55	209 10	0 00E+00	9 66E-02	1 93E-01		
Pu-238	1 6217E-02	104.55	209 10	0 00E+00	1 70E+00	3 39E+00		
Pu-239	4.2810E-04	104.55	209 10	0 00E+00	4 48E-02	8 95E-02		
Pu-240	2 4333E-04	104.55	209 10	0 00E+00	2.54E-02	5 09E-02		
Pu-241	1 6242E-02	104.55	209 10	0 00E+00	1.70E+00	3 40E+00		
Pu-242	3 6329E-07	104.55	209 10	0 00E+00	3 80E-05	7 60E-05		
Ra-226	9 0114E-10	104.55	209 10	0 00E+00	9 42E-08	1.88E-07		
Ra-228	3 1019E-14	104.55	209 10	0 00E+00	3 24E-12	6 49E-12		
Ru-106	2 1225E-10	104.55	209 10	0 00E+00	2 22E-08	4 44E-08		
Se-79	1.2930E-05	104.55	209 10	0 00E+00	1.35E-03	2 70E-03		
Sn-126	1.1571E-05	104.55	209 10	0 00E+00	1.21E-03	2 42E-03		
Sr-90	1.3472E+00	104.55	209 10	0 00E+00	1 41E+02	2 82E+02		
Tc-99	4.2239E-04	104.55	209 10	0 00E+00	4 42E-02	8 83E-02		
Th-229	1 2407E-11	104.55	209 10	0 00E+00	1 30E-09	2 59E-09		
Th-230	8 3497E-08	104.55	209 10	0 00E+00	8 73E-06	1.75E-05		
Th-232	3 8371E-14	104.55	209 10	0 00E+00	4 01E-12	8 02E-12		
Ti-208	4 0414E-08	104.55	209 10	0 00E+00	4 23E-06	8 45E-06		
U-232	1.0948E-07	104.55	209 10	0 00E+00	1 14E-05	2 29E-05		
U-233	3 6275E-09	104.55	209 10	0 00E+00	3 79E-07	7 59E-07		
U-234	1 8562E-04	104.55	209 10	0 00E+00	1.94E-02	3 88E-02		
U-235	-2 7235E-06	104.55	0 00	5 11E-03	4 82E-03	5.11E-03		
U-236	1 5493E-05	104.55	209 10	0 00E+00	1.62E-03	3.24E-03		
U-238	-4.2851E-09	104.55	0 00	5 79E-05	5 75E-05	5 79E-05		
Y-90	1.3475E+00	104.55	209 10	0 00E+00	1 41E+02	2 82E+02		
Other Radionuclides					1 43E+02	2 86E+02		

Thermal Power
Nominal Heat Output (Watts) Bounding Heat Output (Watts)
1 75E+00 3.50E+00
Total Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	93.20235261	60 to 100	
Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		104.55 209 10	
			Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0 13		
	0.26		
			1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: IAN-R1 (COLUMBIA)

SNF ID #: 803

Fuel Units & Descr: 5 - MTR TYPE

Heavy Metal Mass: BOL=0.685kg; EOL=0.685kg

ROD Storage Site: SRS

¹Fuel decay start date: 1996

Estimates as of: 2030

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

²Template Burnup (MWd)³: 367.2

Template BOL Heavy Metal Mass (MT): 0.00116689

Template Decay Time: 25 years

Estimated

Canister usage

18"x10"

0.21

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	12.97	25.95	0.00E+00	1.49E-08	2.98E-08	Avg. MeV	
Am-241	2.3056E-03	12.97	25.95	0.00E+00	2.99E-02	5.98E-02	0.0150	2.428E+12
Am-242m	4.1476E-07	12.97	25.95	0.00E+00	5.38E-06	1.08E-05	0.0250	5.044E+11
Am-243	1.4894E-06	12.97	25.95	0.00E+00	1.93E-05	3.86E-05	0.0375	4.393E+11
C-14	5.7108E-09	12.97	25.95	0.00E+00	7.41E-08	1.48E-07	0.0675	4.717E+11
Cl-36	1.3124E-32	12.97	25.95	0.00E+00	1.70E-31	3.41E-31	0.0850	2.846E+11
Cm-243	1.4562E-07	12.97	25.95	0.00E+00	1.89E-06	3.78E-06	0.1250	1.907E+11
Cm-244	2.4221E-05	12.97	25.95	0.00E+00	3.14E-04	6.28E-04	0.2250	2.458E+11
Co-60	2.7560E-06	12.97	25.95	0.00E+00	3.58E-05	7.15E-05	0.3750	1.068E+11
Cs-134	5.8851E-04	12.97	25.95	0.00E+00	7.64E-03	1.53E-02	0.5750	1.751E+12
Cs-135	3.4477E-06	12.97	25.95	0.00E+00	4.47E-05	8.95E-05	0.8500	2.524E+10
Cs-137	1.8099E+00	12.97	25.95	0.00E+00	2.35E+01	4.70E+01	1.2500	1.403E+10
Eu-154	1.6386E-02	12.97	25.95	0.00E+00	2.13E-01	4.25E-01	1.7500	6.934E+08
Eu-155	2.3957E-03	12.97	25.95	0.00E+00	3.11E-02	6.22E-02	2.2500	4.942E+04
Fe-55	3.2707E-05	12.97	25.95	0.00E+00	4.24E-04	8.49E-04	2.7500	4.047E+04
H-3	3.4504E-03	12.97	25.95	0.00E+00	4.48E-02	8.95E-02	3.5000	3.066E+01
I-129	7.5300E-07	12.97	25.95	0.00E+00	9.77E-06	1.95E-05	5.0000	1.032E+01
Kr-85	7.8540E-02	12.97	25.95	0.00E+00	1.02E+00	2.04E+00	7.0000	1.136E+00
Np-237	9.5615E-06	12.97	25.95	0.00E+00	1.24E-04	2.48E-04	11.0000	1.271E-01
Pa-231	2.7968E-09	12.97	25.95	0.00E+00	3.63E-08	7.26E-08		
Pb-210	1.2612E-10	12.97	25.95	0.00E+00	1.64E-09	3.27E-09		
Pm-147	1.2952E-02	12.97	25.95	0.00E+00	1.68E-01	3.36E-01		
Pu-238	1.7549E-02	12.97	25.95	0.00E+00	2.28E-01	4.55E-01		
Pu-239	4.2810E-04	12.97	25.95	0.00E+00	5.55E-03	1.11E-02		
Pu-240	2.4357E-04	12.97	25.95	0.00E+00	3.16E-03	6.32E-03		
Pu-241	2.6277E-02	12.97	25.95	0.00E+00	3.41E-01	6.82E-01		
Pu-242	3.6329E-07	12.97	25.95	0.00E+00	4.71E-06	9.43E-06		
Ra-226	4.4444E-10	12.97	25.95	0.00E+00	5.77E-09	1.15E-08		
Ra-228	1.9714E-14	12.97	25.95	0.00E+00	2.56E-13	5.12E-13		
Ru-106	2.0477E-07	12.97	25.95	0.00E+00	2.66E-06	5.31E-06		
Se-79	1.2933E-05	12.97	25.95	0.00E+00	1.68E-04	3.36E-04		
Sn-126	1.1574E-05	12.97	25.95	0.00E+00	1.50E-04	3.00E-04		
Sr-90	1.7092E+00	12.97	25.95	0.00E+00	2.22E+01	4.43E+01		
Tc-99	4.2239E-04	12.97	25.95	0.00E+00	5.48E-03	1.10E-02		
Th-229	7.7260E-12	12.97	25.95	0.00E+00	1.00E-10	2.00E-10		
Th-230	5.8497E-08	12.97	25.95	0.00E+00	7.59E-07	1.52E-06		
Th-232	2.6906E-14	12.97	25.95	0.00E+00	3.49E-13	6.98E-13		
Th-208	4.4336E-08	12.97	25.95	0.00E+00	5.75E-07	1.15E-06		
U-232	1.2037E-07	12.97	25.95	0.00E+00	1.56E-06	3.12E-06		
U-233	3.0011E-09	12.97	25.95	0.00E+00	3.89E-08	7.79E-08		
U-234	1.8497E-04	12.97	25.95	0.00E+00	2.40E-03	4.80E-03		
U-235	-2.7235E-06	12.97	0.00	1.38E-03	1.34E-03	1.38E-03		
U-236	1.5493E-05	12.97	25.95	0.00E+00	2.01E-04	4.02E-04		
U-238	-4.2851E-09	12.97	0.00	1.62E-05	1.62E-05	1.62E-05		
Y-90	1.7094E+00	12.97	25.95	0.00E+00	2.22E+01	4.44E+01		
Other Radionuclides					2.24E+01	4.47E+01		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	LIGHT WATER
Fuel Cladding:	ALUM	ALUM
BOL HM Constituents:	U	U
BOL Enrichment %:	92.95939437	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)³

	From SFD	Estimated
Nominal		12.97
Bounding		25.95

Basis for burnup used in estimate:

Nominal burnup assumed to be 2% of BOL heavy metal mass
Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.06	
Bounding	0.12	

Estimated EOL HM/Given EOL HM

0.98

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information
 Fuel Name IEA-R1 (UALX HEU) BRAZIL
 SNF ID #: 954
 Fuel Units & Descr 43 - ASSEMBLY
 Heavy Metal Mass: BOL=8.295kg EOL=4.975kg
 ROD Storage Site: SRS

Fuel decay start date 1998
 Estimates as of 2030
 Template ATR (Light Water Alum .60 to 100%, U)
 *Template Burnup(MWd) 367.2
 Template BOL Heavy Metal Mass (MT) 0.00116689
 Template Decay Time 25 years

Estimated
 Canister usage
 18"x10"
 119

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	3,143.73	6,287.45	0.00E+00	3.60E-06	7.21E-06	0.0150	5.883E+14
Am-241	2.3056E-03	3,143.73	6,287.45	0.00E+00	7.25E+00	1.45E+01	0.0250	1.222E+14
Am-242m	4.1476E-07	3,143.73	6,287.45	0.00E+00	1.30E-03	2.61E-03	0.0375	1.064E+14
Am-243	1.4894E-06	3,143.73	6,287.45	0.00E+00	4.68E-03	9.36E-03	0.0575	1.143E+14
C-14	5.7108E-09	3,143.73	6,287.45	0.00E+00	1.80E-05	3.59E-05	0.0850	6.897E+13
Cl-36	1.3124E-32	3,143.73	6,287.45	0.00E+00	4.13E-29	8.25E-29	0.1250	4.619E+13
Cm-243	1.4562E-07	3,143.73	6,287.45	0.00E+00	4.58E-04	9.16E-04	0.2250	5.954E+13
Cm-244	2.4221E-05	3,143.73	6,287.45	0.00E+00	7.61E-02	1.52E-01	0.3750	2.589E+13
Co-60	2.7560E-06	3,143.73	6,287.45	0.00E+00	8.66E-03	1.73E-02	0.5750	4.244E+14
Cs-134	5.8851E-04	3,143.73	6,287.45	0.00E+00	1.85E+00	3.70E+00	0.8500	6.115E+12
Cs-135	3.4477E-06	3,143.73	6,287.45	0.00E+00	1.08E-02	2.17E-02	1.2500	3.401E+12
Cs-137	1.8099E+00	3,143.73	6,287.45	0.00E+00	5.69E+03	1.14E+04	1.7500	1.680E+11
Eu-154	1.6386E-02	3,143.73	6,287.45	0.00E+00	5.15E+01	1.03E+02	2.2500	1.197E+07
Eu-155	2.3957E-03	3,143.73	6,287.45	0.00E+00	7.53E+00	1.51E+01	2.7500	9.805E+06
Fe-55	3.2707E-05	3,143.73	6,287.45	0.00E+00	1.03E-01	2.06E-01	3.5000	7.399E+03
H-3	3.4504E-03	3,143.73	6,287.45	0.00E+00	1.08E+01	2.17E+01	5.0000	2.489E+03
I-129	7.5300E-07	3,143.73	6,287.45	0.00E+00	2.37E-03	4.73E-03	7.0000	2.738E+02
Kr-85	7.8540E-02	3,143.73	6,287.45	0.00E+00	2.47E+02	4.94E+02	11.0000	3.063E+01
Np-237	9.5615E-06	3,143.73	6,287.45	0.00E+00	3.01E-02	6.01E-02		
Pa-231	2.7968E-09	3,143.73	6,287.45	0.00E+00	8.79E-06	1.76E-05		
Pb-210	1.2612E-10	3,143.73	6,287.45	0.00E+00	3.96E-07	7.93E-07		
Pm-147	1.2952E-02	3,143.73	6,287.45	0.00E+00	4.07E+01	8.14E+01		
Pu-238	1.7549E-02	3,143.73	6,287.45	0.00E+00	5.52E+01	1.10E+02		
Pu-239	4.2810E-04	3,143.73	6,287.45	0.00E+00	1.35E+00	2.69E+00		
Pu-240	2.4357E-04	3,143.73	6,287.45	0.00E+00	7.66E-01	1.53E+00		
Pu-241	2.6277E-02	3,143.73	6,287.45	0.00E+00	8.26E+01	1.65E+02		
Pu-242	3.6329E-07	3,143.73	6,287.45	0.00E+00	1.14E-03	2.28E-03		
Ra-226	4.4444E-10	3,143.73	6,287.45	0.00E+00	1.40E-06	2.79E-06		
Ra-228	1.9714E-14	3,143.73	6,287.45	0.00E+00	6.20E-11	1.24E-10		
Ru-106	2.0477E-07	3,143.73	6,287.45	0.00E+00	6.44E-04	1.29E-03		
Se-79	1.2933E-05	3,143.73	6,287.45	0.00E+00	4.07E-02	8.13E-02		
Sn-126	1.1574E-05	3,143.73	6,287.45	0.00E+00	3.64E-02	7.28E-02		
Sr-90	1.7092E+00	3,143.73	6,287.45	0.00E+00	5.37E+03	1.07E+04		
Tc-99	4.2239E-04	3,143.73	6,287.45	0.00E+00	1.33E+00	2.66E+00		
Th-229	7.7260E-12	3,143.73	6,287.45	0.00E+00	2.43E-08	4.86E-08		
Th-230	5.8497E-08	3,143.73	6,287.45	0.00E+00	1.84E-04	3.68E-04		
Th-232	2.6906E-14	3,143.73	6,287.45	0.00E+00	8.46E-11	1.69E-10		
Ti-208	4.4336E-08	3,143.73	6,287.45	0.00E+00	1.39E-04	2.79E-04		
U-232	1.2037E-07	3,143.73	6,287.45	0.00E+00	3.78E-04	7.57E-04		
U-233	3.0011E-09	3,143.73	6,287.45	0.00E+00	9.43E-06	1.89E-05		
U-234	1.8497E-04	3,143.73	6,287.45	0.00E+00	5.81E-01	1.16E+00		
U-235	-2.7235E-06	3,143.73	0.00	1.67E-02	8.13E-03	1.67E-02		
U-236	1.5493E-05	3,143.73	6,287.45	0.00E+00	4.87E-02	9.74E-02		
U-238	-4.2851E-09	3,143.73	0.00	1.92E-04	1.79E-04	1.92E-04		
Y-90	1.7094E+00	3,143.73	6,287.45	0.00E+00	5.37E+03	1.07E+04		
Other Radionuclides					5.42E+03	1.08E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.10655847	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		3.143.73	
Bounding		6,287.45	

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.20		
Bounding	2.41		

Estimated EOL HM/Given EOL HM: 1.04

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: IEA R1 (UALX LEU) BRAZIL
SNF ID #: 545
Fuel Units & Descr: 84 - ASSEMBLY
Heavy Metal Mass BOL=63.554kg, EOL=61 732kg
ROD Storage Site: SRS

¹Fuel decay start date: 1998
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time: 25 years

Estimated
Canister usage:
18"x10"
3.50

II. Estimates

	m	X _m	X _b	b	Y _m	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	1,726.23	3,452.45	0.00E+00	1.98E-06	3.96E-06	Avg. MeV	
Am-241	2.3056E-03	1,726.23	3,452.45	0.00E+00	3.98E+00	7.96E+00	0.0150	3.231E+14
Am-242m	4.1476E-07	1,726.23	3,452.45	0.00E+00	7.16E-04	1.43E-03	0.0250	6.711E+13
Am-243	1.4894E-06	1,726.23	3,452.45	0.00E+00	2.57E-03	5.14E-03	0.0375	5.845E+13
C-14	5.7108E-09	1,726.23	3,452.45	0.00E+00	9.86E-06	1.97E-05	0.0575	6.276E+13
Cl-36	1.3124E-32	1,726.23	3,452.45	0.00E+00	2.27E-29	4.53E-29	0.0850	3.787E+13
Cm-243	1.4562E-07	1,726.23	3,452.45	0.00E+00	2.51E-04	5.03E-04	0.1250	2.537E+13
Cm-244	2.4221E-05	1,726.23	3,452.45	0.00E+00	4.18E-02	8.36E-02	0.2250	3.270E+13
Co-60	2.7560E-06	1,726.23	3,452.45	0.00E+00	4.76E-03	9.51E-03	0.3750	1.421E+13
Cs-134	5.8851E-04	1,726.23	3,452.45	0.00E+00	1.02E+00	2.03E+00	0.5750	2.330E+14
Cs-135	3.4477E-06	1,726.23	3,452.45	0.00E+00	5.95E-03	1.19E-02	0.8500	3.358E+12
Cs-137	1.8099E+00	1,726.23	3,452.45	0.00E+00	3.12E+03	6.25E+03	1.2500	1.867E+12
Eu-154	1.6386E-02	1,726.23	3,452.45	0.00E+00	2.83E+01	5.66E+01	1.7500	9.226E+10
Eu-155	2.3957E-03	1,726.23	3,452.45	0.00E+00	4.14E+00	8.27E+00	2.2500	6.576E+06
Fe-55	3.2707E-05	1,726.23	3,452.45	0.00E+00	5.65E-02	1.13E-01	2.7500	5.384E+06
H-3	3.4504E-03	1,726.23	3,452.45	0.00E+00	5.96E+00	1.19E+01	3.5000	4.154E+03
I-129	7.5300E-07	1,726.23	3,452.45	0.00E+00	1.30E-03	2.60E-03	5.0000	1.406E+03
Kr-85	7.8540E-02	1,726.23	3,452.45	0.00E+00	1.36E+02	2.71E+02	7.0000	1.549E+02
Np-237	9.5615E-06	1,726.23	3,452.45	0.00E+00	1.65E-02	3.30E-02	11.0000	1.734E+01
Pa-231	2.7968E-09	1,726.23	3,452.45	0.00E+00	4.83E-06	9.66E-06		
Pb-210	1.2612E-10	1,726.23	3,452.45	0.00E+00	2.18E-07	4.35E-07		
Pm-147	1.2952E-02	1,726.23	3,452.45	0.00E+00	2.24E+01	4.47E+01		
Pu-238	1.7549E-02	1,726.23	3,452.45	0.00E+00	3.03E+01	6.06E+01		
Pu-239	4.2810E-04	1,726.23	3,452.45	0.00E+00	7.39E-01	1.48E+00		
Pu-240	2.4357E-04	1,726.23	3,452.45	0.00E+00	4.20E-01	8.41E-01		
Pu-241	2.6277E-02	1,726.23	3,452.45	0.00E+00	4.54E+01	9.07E+01		
Pu-242	3.6329E-07	1,726.23	3,452.45	0.00E+00	6.27E-04	1.25E-03		
Ra-226	4.4444E-10	1,726.23	3,452.45	0.00E+00	7.67E-07	1.53E-06		
Ra-228	1.9714E-14	1,726.23	3,452.45	0.00E+00	3.40E-11	6.81E-11		
Ru-106	2.0477E-07	1,726.23	3,452.45	0.00E+00	3.53E-04	7.07E-04		
Se-79	1.2933E-05	1,726.23	3,452.45	0.00E+00	2.23E-02	4.47E-02		
Sn-126	1.1574E-05	1,726.23	3,452.45	0.00E+00	2.00E-02	4.00E-02		
Sr-90	1.7092E+00	1,726.23	3,452.45	0.00E+00	2.95E+03	5.90E+03		
Tc-99	4.2239E-04	1,726.23	3,452.45	0.00E+00	7.29E-01	1.46E+00		
Th-229	7.7260E-12	1,726.23	3,452.45	0.00E+00	1.33E-08	2.67E-08		
Th-230	5.8497E-08	1,726.23	3,452.45	0.00E+00	1.01E-04	2.02E-04		
Th-232	2.6906E-14	1,726.23	3,452.45	0.00E+00	4.64E-11	9.29E-11		
Ti-208	4.4336E-08	1,726.23	3,452.45	0.00E+00	7.65E-05	1.53E-04		
U-232	1.2037E-07	1,726.23	3,452.45	0.00E+00	2.08E-04	4.16E-04		
U-233	3.0011E-09	1,726.23	3,452.45	0.00E+00	5.18E-06	1.04E-05		
U-234	1.8497E-04	1,726.23	3,452.45	0.00E+00	3.19E-01	6.39E-01		
U-235	-2.7235E-06	1,726.23	0.00	2.70E-02	2.23E-02	2.70E-02		
U-236	1.5493E-05	1,726.23	3,452.45	0.00E+00	2.67E-02	5.35E-02		
U-238	-4.2851E-09	1,726.23	0.00	1.72E-02	1.72E-02	1.72E-02		
Y-90	1.7094E+00	1,726.23	3,452.45	0.00E+00	2.95E+03	5.90E+03		
Other Radionuclides					2.97E+03	5.95E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	19.66156126	60 to 100	

Burnup Summary (MWd) ²			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		1,726.23	
Bounding		3,452.45	

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

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name IEA-R1 (UALX LEU) BRAZIL
SNF ID # 1076
Fuel Units & Descr. 39 - ASSEMBLY
Heavy Metal Mass BOL=29.507kg EOL=28.661kg
ROD Storage Site SRS

¹Fuel decay start date 1998
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup (MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 25 years

Estimated
Canister usage
18"x10"
1 63

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	1.1465E-09	801.46	1,602.93	0.00E+00	9.19E-07	1.84E-06	0.0150	1.500E+14
Am-241	2.3056E-03	801.46	1,602.93	0.00E+00	1.85E+00	3.70E+00	0.0150	3.116E+13
Am-242m	4.1476E-07	801.46	1,602.93	0.00E+00	3.32E-04	6.65E-04	0.0250	2.714E+13
Am-243	1.4894E-06	801.46	1,602.93	0.00E+00	1.19E-03	2.39E-03	0.0375	2.914E+13
C-14	5.7108E-09	801.46	1,602.93	0.00E+00	4.58E-06	9.15E-06	0.0575	1.758E+13
Cl-36	1.3124E-32	801.46	1,602.93	0.00E+00	1.05E-29	2.10E-29	0.0850	1.178E+13
Cm-243	1.4562E-07	801.46	1,602.93	0.00E+00	1.17E-04	2.33E-04	0.1250	1.518E+13
Cm-244	2.4221E-05	801.46	1,602.93	0.00E+00	1.94E-02	3.88E-02	0.2250	6.599E+12
Co-60	2.7560E-06	801.46	1,602.93	0.00E+00	2.21E-03	4.42E-03	0.3750	1.082E+14
Cs-134	5.8851E-04	801.46	1,602.93	0.00E+00	4.72E-01	9.43E-01	0.8500	1.559E+12
Cs-135	3.4477E-06	801.46	1,602.93	0.00E+00	2.76E-03	5.53E-03	1.2500	8.670E+11
Cs-137	1.8099E+00	801.46	1,602.93	0.00E+00	1.45E+03	2.90E+03	1.7500	4.283E+10
Eu-154	1.6386E-02	801.46	1,602.93	0.00E+00	1.31E+01	2.63E+01	2.2500	3.053E+06
Eu-155	2.3957E-03	801.46	1,602.93	0.00E+00	1.92E+00	3.84E+00	2.7500	2.500E+06
Fe-55	3.2707E-05	801.46	1,602.93	0.00E+00	2.62E-02	5.24E-02	3.5000	1.929E+03
H-3	3.4504E-03	801.46	1,602.93	0.00E+00	2.77E+00	5.53E+00	5.0000	6.527E+02
I-129	7.5300E-07	801.46	1,602.93	0.00E+00	6.03E-04	1.21E-03	7.0000	7.191E+01
Kr-85	7.8540E-02	801.46	1,602.93	0.00E+00	6.29E+01	1.26E+02	11.0000	8.050E+00
Np-237	9.5615E-06	801.46	1,602.93	0.00E+00	7.66E-03	1.53E-02		
Pa-231	2.7968E-09	801.46	1,602.93	0.00E+00	2.24E-06	4.48E-06		
Pb-210	1.2612E-10	801.46	1,602.93	0.00E+00	1.01E-07	2.02E-07		
Pm-147	1.2952E-02	801.46	1,602.93	0.00E+00	1.04E+01	2.08E+01		
Pu-238	1.7549E-02	801.46	1,602.93	0.00E+00	1.41E+01	2.81E+01		
Pu-239	4.2810E-04	801.46	1,602.93	0.00E+00	3.43E-01	6.86E-01		
Pu-240	2.4357E-04	801.46	1,602.93	0.00E+00	1.95E-01	3.90E-01		
Pu-241	2.6277E-02	801.46	1,602.93	0.00E+00	2.11E+01	4.21E+01		
Pu-242	3.6329E-07	801.46	1,602.93	0.00E+00	2.91E-04	5.82E-04		
Ra-226	4.4444E-10	801.46	1,602.93	0.00E+00	3.56E-07	7.12E-07		
Ra-228	1.9714E-14	801.46	1,602.93	0.00E+00	1.58E-11	3.16E-11		
Ru-106	2.0477E-07	801.46	1,602.93	0.00E+00	1.64E-04	3.28E-04		
Se-79	1.2933E-05	801.46	1,602.93	0.00E+00	1.04E-02	2.07E-02		
Sn-126	1.1574E-05	801.46	1,602.93	0.00E+00	9.28E-03	1.86E-02		
Sr-90	1.7092E+00	801.46	1,602.93	0.00E+00	1.37E+03	2.74E+03		
Tc-99	4.2239E-04	801.46	1,602.93	0.00E+00	3.39E-01	6.77E-01		
Th-229	7.7260E-12	801.46	1,602.93	0.00E+00	6.19E-09	1.24E-08		
Th-230	5.8497E-08	801.46	1,602.93	0.00E+00	4.69E-05	9.38E-05		
Th-232	2.6906E-14	801.46	1,602.93	0.00E+00	2.16E-11	4.31E-11		
Ti-208	4.4336E-08	801.46	1,602.93	0.00E+00	3.55E-05	7.11E-05		
U-232	1.2037E-07	801.46	1,602.93	0.00E+00	9.65E-05	1.93E-04	Thermal Power	
U-233	3.0011E-09	801.46	1,602.93	0.00E+00	2.41E-06	4.81E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8497E-04	801.46	1,602.93	0.00E+00	1.48E-01	2.96E-01	1.70E+01	3.39E+01
U-235	-2.7235E-06	801.46	0.00	1.25E-02	1.04E-02	1.25E-02	Total	Total
U-236	1.5493E-05	801.46	1,602.93	0.00E+00	1.24E-02	2.48E-02		
U-238	-4.2851E-09	801.46	0.00	7.97E-03	7.96E-03	7.97E-03		
Y-90	1.7094E+00	801.46	1,602.93	0.00E+00	1.37E+03	2.74E+03		
Other Radionuclides					1.38E+03	2.76E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used
	LIGHT WATER	LIGHT WATER
	ALUM	ALUM
	U	U
	19.66156126	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)²

	From SFD	Estimated
Nominal		801.46
Bounding		1,602.93

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	0.09	
Bounding	0.17	

Estimated EOL HM/Given EOL HM

1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: IOWA ST UNIV (HEU UALX)
 SNF ID #: 792
 Fuel Units & Descr: 22 - FLAT PLATES IN CAN
 Heavy Metal Mass: BOL=3 478kg, EOL=3 474kg
 ROD Storage Site, SRS

¹Fuel decay start date 1996
 Estimates as of: 2030

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

²Template Burnup(MWd): 367.2

Template BOL Heavy Metal Mass (MT): 0 00116689

Template Decay Time: 25 years

Estimated
 Canister usage
 18"x10"
 0 61

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 1465E-09	4 17	8 33	0 00E+00	4 78E-09	9 55E-09	Avg MeV	
Am-241	2 3056E-03	4 17	8 33	0 00E+00	9 61E-03	1 92E-02	0 0150	7 800E+11
Am-242m	4 1476E-07	4 17	8 33	0 00E+00	1 73E-06	3 46E-06	0 0250	1 620E+11
Am-243	1 4894E-06	4 17	8 33	0 00E+00	6 21E-06	1 24E-05	0 0375	1 411E+11
C-14	5 7108E-09	4 17	8 33	0 00E+00	2 38E-08	4 76E-08	0 0575	1 515E+11
Cl-36	1 3124E-32	4 17	8 33	0 00E+00	5 47E-32	1 09E-31	0 0850	9 143E+10
Cm-243	1 4562E-07	4 17	8 33	0 00E+00	6 07E-07	1 21E-06	0 1250	6 127E+10
Cm-244	2 4221E-05	4 17	8 33	0 00E+00	1 01E-04	2 02E-04	0 2250	7 906E+10
Co-60	2 7560E-06	4 17	8 33	0 00E+00	1 15E-05	2 30E-05	0 3750	3 431E+10
Cs-134	5 8851E-04	4 17	8 33	0 00E+00	2 45E-03	4 90E-03	0 5750	5 625E+11
Cs-135	3 4477E-06	4 17	8 33	0 00E+00	1 44E-05	2 87E-05	0 8500	8 106E+09
Cs-137	1 8099E+00	4 17	8 33	0 00E+00	7 54E+00	1 51E+01	1 2500	4 508E+09
Eu-154	1 6386E-02	4 17	8 33	0 00E+00	6 83E-02	1 37E-01	1 7500	2 227E+08
Eu-155	2 3957E-03	4 17	8 33	0 00E+00	9 98E-03	2 00E-02	2 2500	1 587E+04
Fe-55	3 2707E-05	4 17	8 33	0 00E+00	1 36E-04	2 73E-04	2 7500	1 300E+04
H-3	3 4504E-03	4 17	8 33	0 00E+00	1 44E-02	2 88E-02	3 5000	1 046E+01
I-129	7 5300E-07	4 17	8 33	0 00E+00	3 14E-06	6 28E-06	5 0000	3 572E+00
Kr-85	7 8540E-02	4 17	8 33	0 00E+00	3 27E-01	6 55E-01	7 0000	3 938E-01
Np-237	9 5615E-06	4 17	8 33	0 00E+00	3 98E-05	7 97E-05	11 0000	4 410E-02
Pa-231	2 7968E-09	4 17	8 33	0 00E+00	1 17E-08	2 33E-08		
Pb-210	1 2612E-10	4 17	8 33	0 00E+00	5 26E-10	1 05E-09		
Pm-147	1 2952E-02	4 17	8 33	0 00E+00	5 40E-02	1 08E-01		
Pu-238	1 7549E-02	4 17	8 33	0 00E+00	7 31E-02	1 46E-01		
Pu-239	4 2810E-04	4 17	8 33	0 00E+00	1 78E-03	3 57E-03		
Pu-240	2 4357E-04	4 17	8 33	0 00E+00	1 01E-03	2 03E-03		
Pu-241	2 6277E-02	4 17	8 33	0 00E+00	1 09E-01	2 19E-01		
Pu-242	3 6329E-07	4 17	8 33	0 00E+00	1 51E-06	3 03E-06		
Ra-226	4 4444E-10	4 17	8 33	0 00E+00	1 85E-09	3 70E-09		
Ra-228	1 9714E-14	4 17	8 33	0 00E+00	8 21E-14	1 64E-13		
Ru-106	2 0477E-07	4 17	8 33	0 00E+00	8 53E-07	1 71E-06		
Se-79	1 2933E-05	4 17	8 33	0 00E+00	5 39E-05	1 08E-04		
Sn-126	1 1574E-05	4 17	8 33	0 00E+00	4 82E-05	9 65E-05		
Sr-90	1 7092E+00	4 17	8 33	0 00E+00	7 12E+00	1 42E+01		
Tc-99	4 2239E-04	4 17	8 33	0 00E+00	1 76E-03	3 52E-03		
Th-229	7 7260E-12	4 17	8 33	0 00E+00	3 22E-11	6 44E-11		
Th-230	5 8497E-08	4 17	8 33	0 00E+00	2 44E-07	4 87E-07		
Th-232	2 6906E-14	4 17	8 33	0 00E+00	1 12E-13	2 24E-13		
Th-208	4 4336E-08	4 17	8 33	0 00E+00	1 85E-07	3 69E-07		
U-232	1 2037E-07	4 17	8 33	0 00E+00	5 02E-07	1 00E-06		
U-233	3 0011E-09	4 17	8 33	0 00E+00	1 25E-08	2 50E-08		
U-234	1 8497E-04	4 17	8 33	0 00E+00	7 71E-04	1 54E-03		
U-235	-2 7235E-06	4 17	0 00	7 01E-03	7 00E-03	7 01E-03		
U-236	1 5493E-05	4 17	8 33	0 00E+00	6 46E-05	1 29E-04		
U-238	-4 2851E-09	4 17	0 00	7 82E-05	7 82E-05	7 82E-05		
Y-90	1 7094E+00	4 17	8 33	0 00E+00	7 12E+00	1 42E+01		
Other Radionuclides					7 18E+00	1 44E+01		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	LIGHT WATER
Fuel Cladding:	ALUM	ALUM
BOL HM Constituents:	U	U
BOL Enrichment %:	93.30981127	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)³

	From SFD	Estimated
Nominal		4 17
Bounding		8 33

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 00	
Bounding	0 01	

Estimated EOL HM/Given EOL HM

1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: IOWA STATE UNIVERSITY (U3S2 LEU)
SNF ID #: 953
Fuel Units & Descr: 24 - 24 FLAT PLATES
Heavy Metal Mass BOL=19.205kg EOL=19.195kg
ROD Storage Site SRS

¹Fuel decay start date 1998
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup (MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 25 years

Estimated
Canister usage
18"x10"
0.67

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	1.1465E-09	9.09	18.18	0.00E+00	1.04E-08	2.08E-08	0.0150	1.702E+12
Am-241	2.3056E-03	9.09	18.18	0.00E+00	2.10E-02	4.19E-02	0.0250	3.535E+11
Am-242m	4.1476E-07	9.09	18.18	0.00E+00	3.77E-06	7.54E-06	0.0375	3.078E+11
Am-243	1.4894E-06	9.09	18.18	0.00E+00	1.35E-05	2.71E-05	0.0575	3.305E+11
C-14	5.7108E-09	9.09	18.18	0.00E+00	5.19E-08	1.04E-07	0.0850	1.995E+11
Cl-36	1.3124E-32	9.09	18.18	0.00E+00	1.19E-31	2.39E-31	0.1250	1.336E+11
Cm-243	1.4562E-07	9.09	18.18	0.00E+00	1.32E-06	2.65E-06	0.2250	1.724E+11
Cm-244	2.4221E-05	9.09	18.18	0.00E+00	2.20E-04	4.40E-04	0.3750	7.486E+10
Co-60	2.7560E-06	9.09	18.18	0.00E+00	2.51E-05	5.01E-05	0.5750	1.227E+12
Cs-134	5.8851E-04	9.09	18.18	0.00E+00	5.35E-03	1.07E-02	0.8500	1.768E+10
Cs-135	3.4477E-06	9.09	18.18	0.00E+00	3.13E-05	6.27E-05	1.2500	9.835E+09
Cs-137	1.8099E+00	9.09	18.18	0.00E+00	1.65E+01	3.29E+01	1.7500	4.859E+08
Eu-154	1.6386E-02	9.09	18.18	0.00E+00	1.49E-01	2.98E-01	2.2500	3.468E+04
Eu-155	2.3957E-03	9.09	18.18	0.00E+00	2.18E-02	4.36E-02	2.7500	2.839E+04
Fe-55	3.2707E-05	9.09	18.18	0.00E+00	2.97E-04	5.95E-04	3.5000	4.926E+01
H-3	3.4504E-03	9.09	18.18	0.00E+00	3.14E-02	6.27E-02	5.0000	1.917E+01
I-129	7.5300E-07	9.09	18.18	0.00E+00	6.85E-06	1.37E-05	7.0000	2.170E+00
Kr-85	7.8540E-02	9.09	18.18	0.00E+00	7.14E-01	1.43E+00	11.0000	2.470E-01
Np-237	9.5615E-06	9.09	18.18	0.00E+00	8.69E-05	1.74E-04		
Pa-231	2.7968E-09	9.09	18.18	0.00E+00	2.54E-08	5.09E-08		
Pb-210	1.2612E-10	9.09	18.18	0.00E+00	1.15E-09	2.29E-09		
Pm-147	1.2952E-02	9.09	18.18	0.00E+00	1.18E-01	2.36E-01		
Pu-238	1.7549E-02	9.09	18.18	0.00E+00	1.60E-01	3.19E-01		
Pu-239	4.2810E-04	9.09	18.18	0.00E+00	3.89E-03	7.78E-03		
Pu-240	2.4357E-04	9.09	18.18	0.00E+00	2.21E-03	4.43E-03		
Pu-241	2.6277E-02	9.09	18.18	0.00E+00	2.39E-01	4.78E-01		
Pu-242	3.6329E-07	9.09	18.18	0.00E+00	3.30E-06	6.61E-06		
Ra-226	4.4444E-10	9.09	18.18	0.00E+00	4.04E-09	8.08E-09		
Ra-228	1.9714E-14	9.09	18.18	0.00E+00	1.79E-13	3.58E-13		
Ru-106	2.0477E-07	9.09	18.18	0.00E+00	1.86E-06	3.72E-06		
Se-79	1.2933E-05	9.09	18.18	0.00E+00	1.18E-04	2.35E-04		
Sn-126	1.1574E-05	9.09	18.18	0.00E+00	1.05E-04	2.10E-04		
Sr-90	1.7092E+00	9.09	18.18	0.00E+00	1.55E+01	3.11E+01		
Tc-99	4.2239E-04	9.09	18.18	0.00E+00	3.84E-03	7.68E-03		
Th-229	7.7260E-12	9.09	18.18	0.00E+00	7.02E-11	1.40E-10		
Th-230	5.8497E-08	9.09	18.18	0.00E+00	5.32E-07	1.06E-06		
Th-232	2.6906E-14	9.09	18.18	0.00E+00	2.45E-13	4.89E-13		
Ti-208	4.4336E-08	9.09	18.18	0.00E+00	4.03E-07	8.06E-07		
U-232	1.2037E-07	9.09	18.18	0.00E+00	1.09E-06	2.19E-06		
U-233	3.0011E-09	9.09	18.18	0.00E+00	2.73E-08	5.46E-08		
U-234	1.8497E-04	9.09	18.18	0.00E+00	1.68E-03	3.36E-03		
U-235	-2.7235E-06	9.09	0.00	8.20E-03	8.18E-03	8.20E-03		
U-236	1.5493E-05	9.09	18.18	0.00E+00	1.41E-04	2.82E-04		
U-238	-4.2851E-09	9.09	0.00	5.18E-03	5.18E-03	5.18E-03		
Y-90	1.7094E+00	9.09	18.18	0.00E+00	1.55E+01	3.11E+01		
Other Radionuclides					1.57E+01	3.13E+01		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.76527712	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal	0.02	9.09	
Bounding		18.18	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1.00
Nominal	0.00	473.39	
Bounding	0.00		

¹Reactor shutdown, core removal, storage, shipping or other data confirming that irradiation ceased for fuel

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JEN-1 (HEU UALX) SPAIN
SNF ID #: 795
Fuel Units & Descr: 23 - 16 CURVED PLATES
Heavy Metal Mass: BOL=4 002kg; EOL=3 783kg
ROD Storage Site: SRS

¹Fuel decay start date: 1995
Estimates as of 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time 35 years

Estimated
Canister usage:
18"x10"
0 96

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	206 92	413 85	0 00E+00	4 15E-07	8 31E-07	Avg MeV	
Am-241	2 5251E-03	206 92	413 85	0 00E+00	5 22E-01	1 04E+00	0 0150	3 048E+13
Am-242m	3 9624E-07	206 92	413 85	0 00E+00	8 20E-05	1 64E-04	0 0250	6 329E+12
Am-243	1 4880E-06	206 92	413 85	0 00E+00	3 08E-04	6 16E-04	0 0375	5 501E+12
C-14	5 7053E-09	206 92	413 85	0 00E+00	1 18E-06	2 36E-06	0 0575	5 922E+12
Cl-36	1 3124E-32	206 92	413 85	0 00E+00	2 72E-30	5 43E-30	0 0850	3 568E+12
Cm-243	1 1419E-07	206 92	413 85	0 00E+00	2 36E-05	4 73E-05	0 1250	2 357E+12
Cm-244	1 6522E-05	206 92	413 85	0 00E+00	3 42E-03	6 84E-03	0 2250	3 080E+12
Co-60	7 4047E-07	206 92	413 85	0 00E+00	1 53E-04	3 06E-04	0 3750	1 340E+12
Cs-134	2 0455E-05	206 92	413 85	0 00E+00	4 23E-03	8 47E-03	0 5750	2 215E+13
Cs-135	3 4477E-06	206 92	413 85	0 00E+00	7 13E-04	1 43E-03	0 8500	2 705E+11
Cs-137	1 4365E+00	206 92	413 85	0 00E+00	2 97E+02	5 95E+02	1 2500	1 308E+11
Eu-154	7 3230E-03	206 92	413 85	0 00E+00	1 52E+00	3 03E+00	1 7500	7 264E+09
Eu-155	5 9259E-04	206 92	413 85	0 00E+00	1 23E-01	2 45E-01	2 2500	6 157E+05
Fe-55	2 2791E-06	206 92	413 85	0 00E+00	4 72E-04	9 43E-04	2 7500	5 877E+05
H-3	1 9698E-03	206 92	413 85	0 00E+00	4 08E-01	8 15E-01	3 5000	3 422E+02
I-129	7 5300E-07	206 92	413 85	0 00E+00	1 56E-04	3 12E-04	5 0000	1 398E+02
Kr-85	4 1176E-02	206 92	413 85	0 00E+00	8 52E+00	1 70E+01	7 0000	1 531E+01
Np-237	9 5752E-06	206 92	413 85	0 00E+00	1 98E-03	3 96E-03	11 0000	1 707E+00
Pa-231	3 9379E-09	206 92	413 85	0 00E+00	8 15E-07	1 63E-06		
Pb-210	3 3115E-10	206 92	413 85	0 00E+00	6 85E-08	1 37E-07		
Pm-147	9 2402E-04	206 92	413 85	0 00E+00	1 91E-01	3 82E-01		
Pu-238	1 6217E-02	206 92	413 85	0 00E+00	3 36E+00	6 71E+00		
Pu-239	4 2810E-04	206 92	413 85	0 00E+00	8 86E-02	1 77E-01		
Pu-240	2 4333E-04	206 92	413 85	0 00E+00	5 04E-02	1 01E-01		
Pu-241	1 6242E-02	206 92	413 85	0 00E+00	3 36E+00	6 72E+00		
Pu-242	3 6329E-07	206 92	413 85	0 00E+00	7 52E-05	1 50E-04		
Ra-226	9 0114E-10	206 92	413 85	0 00E+00	1 86E-07	3 73E-07		
Ra-228	3 1019E-14	206 92	413 85	0 00E+00	6 42E-12	1 28E-11		
Ru-106	2 1225E-10	206 92	413 85	0 00E+00	4 39E-08	8 78E-08		
Se-79	1 2930E-05	206 92	413 85	0 00E+00	2 68E-03	5 35E-03		
Sn-126	1 1571E-05	206 92	413 85	0 00E+00	2 39E-03	4 79E-03		
Sr-90	1 3472E+00	206 92	413 85	0 00E+00	2 79E+02	5 58E+02		
Tc-99	4 2239E-04	206 92	413 85	0 00E+00	8 74E-02	1 75E-01		
Th-229	1 2407E-11	206 92	413 85	0 00E+00	2 57E-09	5 13E-09		
Th-230	8 3497E-08	206 92	413 85	0 00E+00	1 73E-05	3 46E-05		
Th-232	3 8371E-14	206 92	413 85	0 00E+00	7 94E-12	1 59E-11		
Ti-208	4 0414E-08	206 92	413 85	0 00E+00	8 36E-06	1 67E-05		
U-232	1 0948E-07	206 92	413 85	0 00E+00	2 27E-05	4 53E-05		
U-233	3 6275E-09	206 92	413 85	0 00E+00	7 51E-07	1 50E-06		
U-234	1 8562E-04	206 92	413 85	0 00E+00	3 84E-02	7 68E-02		
U-235	-2 7235E-06	206 92	0 00	6 71E-03	6 15E-03	6 71E-03		
U-236	1 5493E-05	206 92	413 85	0 00E+00	3 21E-03	6 41E-03		
U-238	-4 2851E-09	206 92	0 00	3 01E-04	3 01E-04	3 01E-04		
Y-90	1 3475E+00	206 92	413 85	0 00E+00	2 79E+02	5 58E+02		
Other Radionuclides					2 83E+02	5 66E+02		

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 %	77 58892697	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		206 92
Bounding		413 85

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 16	
Bounding	0 33	

Estimated EOL HM/Given EOL HM

1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JEN-1 (UALX LEU) SPAIN
SNF ID #: 749
Fuel Units & Descr: 18 - 16 CURVED PLATES
Heavy Metal Mass: BOL=12 64kg EOL=12 447kg
ROD Storage Site: SRS

Fuel decay start date: 1995
Estimates as of: 2030
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: 35 years

Estimated
Canister usage
18"x10"
0 75

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Avg MeV	
Ac-227	2 0068E-09	182 40	364 79	0 00E+00	3 66E-07	7 32E-07	0 0150	2 687E+13
Am-241	2 5251E-03	182 40	364 79	0 00E+00	4 61E-01	9 21E-01	0 0250	5 579E+12
Am-242m	3 9624E-07	182 40	364 79	0 00E+00	7 23E-05	1 45E-04	0 0375	4 849E+12
Am-243	1 4880E-06	182 40	364 79	0 00E+00	2 71E-04	5 43E-04	0 0575	5 220E+12
C-14	5 7053E-09	182 40	364 79	0 00E+00	1 04E-06	2 08E-06	0 0850	3 145E+12
Cl-36	1 3124E-32	182 40	364 79	0 00E+00	2 39E-30	4 79E-30	0 1250	2 077E+12
Cm-243	1 1419E-07	182 40	364 79	0 00E+00	2 08E-05	4 17E-05	0 2250	2 715E+12
Cm-244	1 6522E-05	182 40	364 79	0 00E+00	3 01E-03	6 03E-03	0 3750	1 181E+12
Co-60	7 4047E-07	182 40	364 79	0 00E+00	1 35E-04	2 70E-04	0 5750	1 952E+13
Cs-134	2 0455E-05	182 40	364 79	0 00E+00	3 73E-03	7 46E-03	0 8500	2 384E+11
Cs-135	3 4477E-06	182 40	364 79	0 00E+00	6 29E-04	1 26E-03	1 2500	1 153E+11
Cs-137	1 4365E+00	182 40	364 79	0 00E+00	2 62E+02	5 24E+02	1 7500	6 491E+09
Eu-154	7 3230E-03	182 40	364 79	0 00E+00	1 34E+00	2 67E+00	2 2500	5 427E+05
Eu-155	5 9259E-04	182 40	364 79	0 00E+00	1 08E-01	2 16E-01	2 7500	5 180E+05
Fe-55	2 2791E-06	182 40	364 79	0 00E+00	4 16E-04	8 31E-04	3 5000	3 185E+02
H-3	1 9698E-03	182 40	364 79	0 00E+00	3 59E-01	7 19E-01	5 0000	1 305E+02
I-129	7 5300E-07	182 40	364 79	0 00E+00	1 37E-04	2 75E-04	11 0000	1 601E+00
Kr-85	4 1176E-02	182 40	364 79	0 00E+00	7 51E+00	1 50E+01		
Np-237	9 5752E-06	182 40	364 79	0 00E+00	1 75E-03	3 49E-03		
Pa-231	3 9379E-09	182 40	364 79	0 00E+00	7 18E-07	1 44E-06		
Pb-210	3 3115E-10	182 40	364 79	0 00E+00	6 04E-08	1 21E-07		
Pm-147	9 2402E-04	182 40	364 79	0 00E+00	1 69E-01	3 37E-01		
Pu-238	1 6217E-02	182 40	364 79	0 00E+00	2 96E+00	5 92E+00		
Pu-239	4 2810E-04	182 40	364 79	0 00E+00	7 81E-02	1 56E-01		
Pu-240	2 4333E-04	182 40	364 79	0 00E+00	4 44E-02	8 88E-02		
Pu-241	1 6242E-02	182 40	364 79	0 00E+00	2 96E+00	5 92E+00		
Pu-242	3 6329E-07	182 40	364 79	0 00E+00	6 63E-05	1 33E-04		
Ra-226	9 0114E-10	182 40	364 79	0 00E+00	1 64E-07	3 29E-07		
Ra-228	3 1019E-14	182 40	364 79	0 00E+00	5 66E-12	1 13E-11		
Ru-106	2 1225E-10	182 40	364 79	0 00E+00	3 87E-08	7 74E-08		
Se-79	1 2930E-05	182 40	364 79	0 00E+00	2 36E-03	4 72E-03		
Sn-126	1 1571E-05	182 40	364 79	0 00E+00	2 11E-03	4 22E-03		
Sr-90	1 3472E+00	182 40	364 79	0 00E+00	2 46E+02	4 91E+02		
Tc-99	4 2239E-04	182 40	364 79	0 00E+00	7 70E-02	1 54E-01		
Th-229	1 2407E-11	182 40	364 79	0 00E+00	2 26E-09	4 53E-09		
Th-230	8 3497E-08	182 40	364 79	0 00E+00	1 52E-05	3 05E-05		
Th-232	3 8371E-14	182 40	364 79	0 00E+00	7 00E-12	1 40E-11		
Ti-208	4 0414E-08	182 40	364 79	0 00E+00	7 37E-06	1 47E-05		
U-232	1 0948E-07	182 40	364 79	0 00E+00	2 00E-05	3 99E-05	Thermal Power	
U-233	3 6275E-09	182 40	364 79	0 00E+00	6 62E-07	1 32E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8562E-04	182 40	364 79	0 00E+00	3 39E-02	6 77E-02	3 05E+00	6 11E+00
U-235	-2 7235E-06	182 40	0 00	5 25E-03	4 75E-03	5 25E-03	Total	Total
U-236	1 5493E-05	182 40	364 79	0 00E+00	2 83E-03	5 65E-03		
U-238	-4 2851E-09	182 40	0 00	3 43E-03	3 43E-03	3 43E-03		
Y-90	1 3475E+00	182 40	364 79	0 00E+00	2 46E+02	4 92E+02		
Other Radionuclides					2 50E+02	4 99E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

Reactor Moderator, Fuel Cladding, BOL HM Constituents BOL Enrichment %	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	19 22438767	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Nominal		182 40	
Bounding		364 79	

Checks

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

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JMTR
SNF ID #: 507
Fuel Units & Descr: 574 - ASSEMBLY
Heavy Metal Mass: BOL=1176 kg; EOL=1106 098kg
ROD Storage Site: SRS

Fuel decay start date 1983
Estimates as of 2030
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 35 years

Estimated
Canister usage:
18"x10"
23 92

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	66,861.47	133,722.93	0.00E+00	1.34E-04	2.68E-04	Avg MeV	
Am-241	2.5251E-03	66,861.47	133,722.93	0.00E+00	1.69E+02	3.38E+02	0.0150	9.849E+15
Am-242m	3.9624E-07	66,861.47	133,722.93	0.00E+00	2.65E-02	5.30E-02	0.0250	2.045E+15
Am-243	1.4880E-06	66,861.47	133,722.93	0.00E+00	9.95E-02	1.99E-01	0.0375	1.778E+15
C-14	5.7053E-09	66,861.47	133,722.93	0.00E+00	3.81E-04	7.63E-04	0.0575	1.913E+15
Cl-36	1.3124E-32	66,861.47	133,722.93	0.00E+00	8.77E-28	1.75E-27	0.0850	1.153E+15
Cm-243	1.1419E-07	66,861.47	133,722.93	0.00E+00	7.63E-03	1.53E-02	0.1250	7.615E+14
Cm-244	1.6522E-05	66,861.47	133,722.93	0.00E+00	1.10E+00	2.21E+00	0.2250	9.953E+14
Co-60	7.4047E-07	66,861.47	133,722.93	0.00E+00	4.95E-02	9.90E-02	0.3750	4.330E+14
Cs-134	2.0455E-05	66,861.47	133,722.93	0.00E+00	1.37E+00	2.74E+00	0.5750	7.156E+15
Cs-135	3.4477E-06	66,861.47	133,722.93	0.00E+00	2.31E-01	4.61E-01	0.8500	8.741E+13
Cs-137	1.4365E+00	66,861.47	133,722.93	0.00E+00	9.60E+04	1.92E+05	1.2500	4.228E+13
Eu-154	7.3230E-03	66,861.47	133,722.93	0.00E+00	4.90E+02	9.79E+02	1.7500	2.379E+12
Eu-155	5.9259E-04	66,861.47	133,722.93	0.00E+00	3.96E+01	7.92E+01	2.2500	1.989E+08
Fe-55	2.2791E-06	66,861.47	133,722.93	0.00E+00	1.52E-01	3.05E-01	2.7500	1.899E+08
H-3	1.9698E-03	66,861.47	133,722.93	0.00E+00	1.32E+02	2.63E+02	3.5000	1.117E+05
I-129	7.5300E-07	66,861.47	133,722.93	0.00E+00	5.03E-02	1.01E-01	5.0000	4.567E+04
Kr-85	4.1176E-02	66,861.47	133,722.93	0.00E+00	2.75E+03	5.51E+03	7.0000	5.001E+03
Np-237	9.5752E-06	66,861.47	133,722.93	0.00E+00	6.40E-01	1.28E+00	11.0000	5.579E+02
Pa-231	3.9379E-09	66,861.47	133,722.93	0.00E+00	2.63E-04	5.27E-04		
Pb-210	3.3115E-10	66,861.47	133,722.93	0.00E+00	2.21E-05	4.43E-05		
Pm-147	9.2402E-04	66,861.47	133,722.93	0.00E+00	6.18E+01	1.24E+02		
Pu-238	1.6217E-02	66,861.47	133,722.93	0.00E+00	1.08E+03	2.17E+03		
Pu-239	4.2810E-04	66,861.47	133,722.93	0.00E+00	2.86E+01	5.72E+01		
Pu-240	2.4333E-04	66,861.47	133,722.93	0.00E+00	1.63E+01	3.25E+01		
Pu-241	1.6242E-02	66,861.47	133,722.93	0.00E+00	1.09E+03	2.17E+03		
Pu-242	3.6329E-07	66,861.47	133,722.93	0.00E+00	2.43E-02	4.86E-02		
Ra-226	9.0114E-10	66,861.47	133,722.93	0.00E+00	6.03E-05	1.21E-04		
Ra-228	3.1019E-14	66,861.47	133,722.93	0.00E+00	2.07E-09	4.15E-09		
Ru-106	2.1225E-10	66,861.47	133,722.93	0.00E+00	1.42E-05	2.84E-05		
Se-79	1.2930E-05	66,861.47	133,722.93	0.00E+00	8.65E-01	1.73E+00		
Sn-126	1.1571E-05	66,861.47	133,722.93	0.00E+00	7.74E-01	1.55E+00		
Sr-90	1.3472E+00	66,861.47	133,722.93	0.00E+00	9.01E+04	1.80E+05		
Tc-99	4.2239E-04	66,861.47	133,722.93	0.00E+00	2.82E+01	5.65E+01		
Th-229	1.2407E-11	66,861.47	133,722.93	0.00E+00	8.30E-07	1.66E-06		
Th-230	8.3497E-08	66,861.47	133,722.93	0.00E+00	5.58E-03	1.12E-02		
Th-232	3.8371E-14	66,861.47	133,722.93	0.00E+00	2.57E-09	5.13E-09		
Th-208	4.0414E-08	66,861.47	133,722.93	0.00E+00	2.70E-03	5.40E-03		
U-232	1.0948E-07	66,861.47	133,722.93	0.00E+00	7.32E-03	1.46E-02		
U-233	3.6275E-09	66,861.47	133,722.93	0.00E+00	2.43E-04	4.85E-04		
U-234	1.8562E-04	66,861.47	133,722.93	0.00E+00	1.24E+01	2.48E+01		
U-235	-2.7235E-06	66,861.47	0.00	5.09E-01	3.26E-01	5.09E-01		
U-236	1.5493E-05	66,861.47	133,722.93	0.00E+00	1.04E+00	2.07E+00		
U-238	-4.2851E-09	66,861.47	0.00	3.16E-01	3.16E-01	3.16E-01		
Y-90	1.3475E+00	66,861.47	133,722.93	0.00E+00	9.01E+04	1.80E+05		
Other Radionuclides					9.15E+04	1.83E+05		

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 %	20.0000029	60 to 100

Basis for Parameter Differences:

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

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		66.861.47
Bounding		133.722.93

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	0.18	
Bounding	0.36	

Estimated EOL HM/Given EOL HM

1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JMTR (JALX 45% MEU) JAPAN
SNF ID #: 886
Fuel Units & Descr: 570 - MTR TYPE
Heavy Metal Mass BOL=349 353kg EOL=323 646kg
ROD Storage Site SRS

Fuel decay start date 1989
Estimates as of 2030
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 35 years

Estimated
Canister usage
18"x10"
15 B3

II. Estimates	m	x _m	x _b	b	y _m	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	24,345 03	48,690 06	0 00E+00	4 89E-05	9 77E-05	0 0150	3 586E+15
Am-241	2 5251E-03	24,345 03	48,690 06	0 00E+00	6 15E+01	1 23E+02	0 0250	7 446E+14
Am-242m	3 9624E-07	24,345 03	48,690 06	0 00E+00	9 65E-03	1 93E-02	0 0375	6 473E+14
Am-243	1 4880E-06	24,345 03	48,690 06	0 00E+00	3 62E-02	7 25E-02	0 0575	6 967E+14
C-14	5 7053E-09	24,345 03	48,690 06	0 00E+00	1 39E-04	2 78E-04	0 0850	4 198E+14
Cl-36	1 3124E-32	24,345 03	48,690 06	0 00E+00	3 19E-28	6 39E-28	0 1250	2 773E+14
Cm-243	1 1419E-07	24,345 03	48,690 06	0 00E+00	2 78E-03	5 56E-03	0 2250	3 624E+14
Cm-244	1 6522E-05	24,345 03	48,690 06	0 00E+00	4 02E-01	8 04E-01	0 3750	1 577E+14
Co-60	7 4047E-07	24,345 03	48,690 06	0 00E+00	1 80E-02	3 61E-02	0 5750	2 606E+15
Cs-134	2 0455E-05	24,345 03	48,690 06	0 00E+00	4 98E-01	9 96E-01	0 8500	3 183E+13
Cs-135	3 4477E-06	24,345 03	48,690 06	0 00E+00	8 39E-02	1 68E-01	1 2500	1 539E+13
Cs-137	1 4365E+00	24,345 03	48,690 06	0 00E+00	3 50E+04	6 99E+04	1 7500	8 664E+11
Eu-154	7 3230E-03	24,345 03	48,690 06	0 00E+00	1 78E+02	3 57E+02	2 2500	7 244E+07
Eu-155	5 9259E-04	24,345 03	48,690 06	0 00E+00	1 44E+01	2 89E+01	2 7500	6 914E+07
Fe-55	2 2791E-06	24,345 03	48,690 06	0 00E+00	5 55E-02	1 11E-01	3 5000	4 040E+04
H-3	1 9698E-03	24,345 03	48,690 06	0 00E+00	4 80E+01	9 59E+01	5 0000	1 651E+04
I-129	7 5300E-07	24,345 03	48,690 06	0 00E+00	1 83E-02	3 67E-02	7 0000	1 808E+03
Kr-85	4 1176E-02	24,345 03	48,690 06	0 00E+00	1 00E+03	2 00E+03	11 0000	2 016E+02
Np-237	9 5752E-06	24,345 03	48,690 06	0 00E+00	2 33E-01	4 66E-01		
Pa-231	3 9379E-09	24,345 03	48,690 06	0 00E+00	9 59E-05	1 92E-04		
Pb-210	3 3115E-10	24,345 03	48,690 06	0 00E+00	8 06E-06	1 61E-05		
Pm-147	9 2402E-04	24,345 03	48,690 06	0 00E+00	2 25E+01	4 50E+01		
Pu-238	1 6217E-02	24,345 03	48,690 06	0 00E+00	3 95E+02	7 90E+02		
Pu-239	4 2810E-04	24,345 03	48,690 06	0 00E+00	1 04E+01	2 08E+01		
Pu-240	2 4333E-04	24,345 03	48,690 06	0 00E+00	5 92E+00	1 18E+01		
Pu-241	1 6242E-02	24,345 03	48,690 06	0 00E+00	3 95E+02	7 91E+02		
Pu-242	3 6329E-07	24,345 03	48,690 06	0 00E+00	8 84E-03	1 77E-02		
Ra-226	9 0114E-10	24,345 03	48,690 06	0 00E+00	2 19E-05	4 39E-05		
Ra-228	3 1019E-14	24,345 03	48,690 06	0 00E+00	7 55E-10	1 51E-09		
Ru-106	2 1225E-10	24,345 03	48,690 06	0 00E+00	5 17E-06	1 03E-05		
Se-79	1 2930E-05	24,345 03	48,690 06	0 00E+00	3 15E-01	6 30E-01		
Sn-126	1 1571E-05	24,345 03	48,690 06	0 00E+00	2 82E-01	5 63E-01		
Sr-90	1 3472E+00	24,345 03	48,690 06	0 00E+00	3 28E+04	6 56E+04		
Tc-99	4 2239E-04	24,345 03	48,690 06	0 00E+00	1 03E+01	2 06E+01		
Th-229	1 2407E-11	24,345 03	48,690 06	0 00E+00	3 02E-07	6 04E-07		
Th-230	8 3497E-08	24,345 03	48,690 06	0 00E+00	2 03E-03	4 07E-03		
Th-232	3 8371E-14	24,345 03	48,690 06	0 00E+00	9 34E-10	1 87E-09		
Ti-208	4 0414E-08	24,345 03	48,690 06	0 00E+00	9 84E-04	1 97E-03		
U-232	1 0948E-07	24,345 03	48,690 06	0 00E+00	2 67E-03	5 33E-03		
U-233	3 6275E-09	24,345 03	48,690 06	0 00E+00	8 83E-05	1 77E-04		
U-234	1 8562E-04	24,345 03	48,690 06	0 00E+00	4 52E+00	9 04E+00		
U-235	-2 7235E-06	24,345 03	0 00	3 40E-01	2 74E-01	3 40E-01		
U-236	1 5493E-05	24,345 03	48,690 06	0 00E+00	3 77E-01	7 54E-01		
U-238	-4 2851E-09	24,345 03	0 00	6 46E-02	6 45E-02	6 46E-02		
Y-90	1 3475E+00	24,345 03	48,690 06	0 00E+00	3 28E+04	6 56E+04		
Other Radonucleides					3 33E+04	6 66E+04		

Thermal Power
Nominal Heat Output (Watts) 4 07E+02
Bounding Heat Output (Watts) 8 15E+02
Total Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
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 %	45 011	60 to 100	

Burnup Summary (MWd)³

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		24,345 03	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		48 690 06	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
Nominal	0.22		1 00
Bounding	0.44		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JMTR (UALX HEU) JAPAN
SNF ID #: 123
Fuel Units & Descr: 152 - MTR TYPE
Heavy Metal Mass: BOL=44 384kg EOL=37.21kg
ROD Storage Site: SRS

¹Fuel decay start date: 1989
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd), 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated
Canister usage:
18"x10"
4 22

II. Estimates

Radionuclide	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	6,794 30	13,588 59	0 00E+00	1 36E-05	2 73E-05	Avg MeV	
Am-241	2 5251E-03	6,794 30	13,588 59	0 00E+00	1 72E+01	3 43E+01	0 0150	1 001E+15
Am-242m	3 9624E-07	6,794 30	13,588 59	0 00E+00	2 69E-03	5 38E-03	0 0250	2 078E+14
Am-243	1 4880E-06	6,794 30	13,588 59	0 00E+00	1 01E-02	2 02E-02	0 0375	1 806E+14
C-14	5 7053E-09	6,794 30	13,588 59	0 00E+00	3 88E-05	7 75E-05	0 0575	1 944E+14
Cl-36	1 3124E-32	6,794 30	13,588 59	0 00E+00	8 92E-29	1 78E-28	0 0850	1 172E+14
Cm-243	1 1419E-07	6,794 30	13,588 59	0 00E+00	7 76E-04	1 55E-03	0 1250	7 738E+13
Cm-244	1 6522E-05	6,794 30	13,588 59	0 00E+00	1 12E-01	2 25E-01	0 2250	1 011E+14
Co-60	7 4047E-07	6,794 30	13,588 59	0 00E+00	5 03E-03	1 01E-02	0 3750	4 400E+13
Cs-134	2 0455E-05	6,794 30	13,588 59	0 00E+00	1 39E-01	2 78E-01	0 5750	7 272E+14
Cs-135	3 4477E-06	6,794 30	13,588 59	0 00E+00	2 34E-02	4 68E-02	0 8500	8 882E+12
Cs-137	1 4365E+00	6,794 30	13,588 59	0 00E+00	9 76E+03	1 95E+04	1 2500	4 296E+12
Eu-154	7 3230E-03	6,794 30	13,588 59	0 00E+00	4 98E+01	9 95E+01	1 7500	2 418E+11
Eu-155	5 9259E-04	6,794 30	13,588 59	0 00E+00	4 03E+00	8 05E+00	2 2500	2 022E+07
Fe-55	2 2791E-06	6,794 30	13,588 59	0 00E+00	1 55E-02	3 10E-02	2 7500	1 930E+07
H-3	1 9698E-03	6,794 30	13,588 59	0 00E+00	1 34E+01	2 68E+01	3 5000	1 118E+04
I-129	7 5300E-07	6,794 30	13,588 59	0 00E+00	5 12E-03	1 02E-02	5 0000	4 570E+03
Kr-85	4 1176E-02	6,794 30	13,588 59	0 00E+00	2 80E+02	5 60E+02	7 0000	5 001E+02
Np-237	9 5752E-06	6,794 30	13,588 59	0 00E+00	6 51E-02	1 30E-01	11 0000	5 576E+01
Pa-231	3 9379E-09	6,794 30	13,588 59	0 00E+00	2 68E-05	5 35E-05		
Pb-210	3 3115E-10	6,794 30	13,588 59	0 00E+00	2 25E-06	4 50E-06		
Pm-147	9 2402E-04	6,794 30	13,588 59	0 00E+00	6 28E+00	1 26E+01		
Pu-238	1 6217E-02	6,794 30	13,588 59	0 00E+00	1 10E+02	2 20E+02		
Pu-239	4 2810E-04	6,794 30	13,588 59	0 00E+00	2 91E+00	5 82E+00		
Pu-240	2 4333E-04	6,794 30	13,588 59	0 00E+00	1 65E+00	3 31E+00		
Pu-241	1 6242E-02	6,794 30	13,588 59	0 00E+00	1 10E+02	2 21E+02		
Pu-242	3 6329E-07	6,794 30	13,588 59	0 00E+00	2 47E-03	4 94E-03		
Ra-226	9 0114E-10	6,794 30	13,588 59	0 00E+00	6 12E-06	1 22E-05		
Ra-228	3 1019E-14	6,794 30	13,588 59	0 00E+00	2 11E-10	4 21E-10		
Ru-106	2 1225E-10	6,794 30	13,588 59	0 00E+00	1 44E-06	2 88E-06		
Se-79	1 2930E-05	6,794 30	13,588 59	0 00E+00	8 79E-02	1 76E-01		
Sn-126	1 1571E-05	6,794 30	13,588 59	0 00E+00	7 86E-02	1 57E-01		
Sr-90	1 3472E+00	6,794 30	13,588 59	0 00E+00	9 15E+03	1 83E+04		
Tc-99	4 2239E-04	6,794 30	13,588 59	0 00E+00	2 87E+00	5 74E+00		
Th-229	1 2407E-11	6,794 30	13,588 59	0 00E+00	8 43E-08	1 69E-07		
Th-230	8 3497E-08	6,794 30	13,588 59	0 00E+00	5 67E-04	1 13E-03		
Th-232	3 8371E-14	6,794 30	13,588 59	0 00E+00	2 61E-10	5 21E-10		
Th-208	4 0414E-08	6,794 30	13,588 59	0 00E+00	2 75E-04	5 49E-04		
U-232	1 0948E-07	6,794 30	13,588 59	0 00E+00	7 44E-04	1 49E-03		
U-233	3 6275E-09	6,794 30	13,588 59	0 00E+00	2 46E-05	4 93E-05		
U-234	1 8562E-04	6,794 30	13,588 59	0 00E+00	1 26E+00	2 52E+00		
U-235	-2 7235E-06	6,794 30	0 00	8 94E-02	7 09E-02	8 94E-02		
U-236	1 5493E-05	6,794 30	13,588 59	0 00E+00	1 05E-01	2 11E-01		
U-238	-4 2851E-09	6,794 30	0 00	1 02E-03	9 87E-04	1 02E-03		
Y-90	1 3475E+00	6,794 30	13,588 59	0 00E+00	9 16E+03	1 83E+04		
Other Radionuclides					9 30E+03	1 86E+04		

Thermal Power
Nominal Heat Output (Watts) 1.14E+02
Bounding Heat Output (Watts) 2.27E+02
Total Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93 18522593	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)¹

	From SFD	Estimated
Nominal		6 794 30
Bounding		13 588 59

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 49	
Bounding	0 97	

Estimated EOL HM/Given EOL HM
1 01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name JRR-2 (UALX-HEU 45%) JAPAN
SNF ID # 885
Fuel Units & Descr 144 - 12 CURVED PLATES
Heavy Metal Mass BOL=70.229kg EOL=62.496kg
ROD Storage Site SRS

¹Fuel decay start date 1989
Estimates as of 2030
Template HFBR (Heavy Water Alum 40 to 100% U)
²Template Burnup(MWd): 164.6
Template BOL Heavy Metal Mass (MT) 0.000377
Template Decay Time 35 years

Estimated
Canister usage:
18"x10"
4.00

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.5869E-10	7,122.71	14,245.41	0.00E+00	6.83E-06	1.37E-05	Avg MeV	
Am-241	1.0109E-02	7,122.71	14,245.41	0.00E+00	7.20E+01	1.44E+02	0.0150	1.052E+15
Am-242m	1.2789E-06	7,122.71	14,245.41	0.00E+00	9.11E-03	1.82E-02	0.0250	2.162E+14
Am-243	3.7047E-05	7,122.71	14,245.41	0.00E+00	2.64E-01	5.28E-01	0.0375	1.895E+14
C-14	2.6416E-08	7,122.71	14,245.41	0.00E+00	1.88E-04	3.76E-04	0.0575	2.039E+14
Cl-36	4.4411E-31	7,122.71	14,245.41	0.00E+00	3.17E-27	6.33E-27	0.0850	1.220E+14
Cm-243	3.9605E-06	7,122.71	14,245.41	0.00E+00	2.82E-02	5.64E-02	0.1250	8.227E+13
Cm-244	2.6227E-03	7,122.71	14,245.41	0.00E+00	1.87E+01	3.74E+01	0.2250	1.054E+14
Co-60	6.7740E-06	7,122.71	14,245.41	0.00E+00	4.82E-02	9.65E-02	0.3750	4.575E+13
Cs-134	6.8894E-05	7,122.71	14,245.41	0.00E+00	4.91E-01	9.81E-01	0.5750	7.642E+14
Cs-135	4.2564E-06	7,122.71	14,245.41	0.00E+00	3.03E-02	6.06E-02	0.8500	1.132E+13
Cs-137	1.4399E+00	7,122.71	14,245.41	0.00E+00	1.03E+04	2.05E+04	1.2500	6.763E+12
Eu-154	1.5522E-02	7,122.71	14,245.41	0.00E+00	1.11E+02	2.21E+02	1.7500	3.199E+11
Eu-155	1.7588E-03	7,122.71	14,245.41	0.00E+00	1.25E+01	2.51E+01	2.2500	2.215E+07
Fe-55	2.4933E-05	7,122.71	14,245.41	0.00E+00	1.78E-01	3.55E-01	2.7500	2.226E+07
H-3	1.9945E-03	7,122.71	14,245.41	0.00E+00	1.42E+01	2.84E+01	3.5000	5.919E+05
I-129	6.6403E-07	7,122.71	14,245.41	0.00E+00	4.73E-03	9.46E-03	5.0000	2.516E+05
Kr-85	4.1002E-02	7,122.71	14,245.41	0.00E+00	2.92E+02	5.84E+02	7.0000	2.880E+04
Np-237	3.1610E-05	7,122.71	14,245.41	0.00E+00	2.25E-01	4.50E-01	11.0000	3.296E+03
Pa-231	1.8876E-09	7,122.71	14,245.41	0.00E+00	1.34E-05	2.69E-05		
Pb-210	8.3840E-11	7,122.71	14,245.41	0.00E+00	5.97E-07	1.19E-06		
Pm-147	4.6501E-04	7,122.71	14,245.41	0.00E+00	3.31E+00	6.62E+00		
Pu-238	1.3645E-01	7,122.71	14,245.41	0.00E+00	9.72E+02	1.94E+03		
Pu-239	6.9502E-04	7,122.71	14,245.41	0.00E+00	4.95E+00	9.90E+00		
Pu-240	3.8183E-04	7,122.71	14,245.41	0.00E+00	2.72E+00	5.44E+00		
Pu-241	6.5310E-02	7,122.71	14,245.41	0.00E+00	4.65E+02	9.30E+02		
Pu-242	3.0911E-06	7,122.71	14,245.41	0.00E+00	2.20E-02	4.40E-02		
Ra-226	2.3512E-10	7,122.71	14,245.41	0.00E+00	1.67E-06	3.35E-06		
Ra-228	3.3366E-14	7,122.71	14,245.41	0.00E+00	2.38E-10	4.75E-10		
Ru-106	2.4490E-10	7,122.71	14,245.41	0.00E+00	1.74E-06	3.49E-06		
Se-79	1.2333E-05	7,122.71	14,245.41	0.00E+00	8.78E-02	1.76E-01		
Sn-126	1.0194E-05	7,122.71	14,245.41	0.00E+00	7.26E-02	1.45E-01		
Sr-90	1.3348E+00	7,122.71	14,245.41	0.00E+00	9.51E+03	1.90E+04		
Tc-99	3.8056E-04	7,122.71	14,245.41	0.00E+00	2.71E+00	5.42E+00		
Th-229	1.7868E-11	7,122.71	14,245.41	0.00E+00	1.27E-07	2.55E-07		
Th-230	2.3348E-08	7,122.71	14,245.41	0.00E+00	1.66E-04	3.33E-04		
Th-232	4.1288E-14	7,122.71	14,245.41	0.00E+00	2.94E-10	5.88E-10		
Ti-208	4.3190E-08	7,122.71	14,245.41	0.00E+00	3.08E-04	6.15E-04		
U-232	1.1707E-07	7,122.71	14,245.41	0.00E+00	8.34E-04	1.67E-03		
U-233	7.2175E-09	7,122.71	14,245.41	0.00E+00	5.14E-05	1.03E-04		
U-234	6.1543E-05	7,122.71	14,245.41	0.00E+00	4.38E-01	8.77E-01		
U-235	2.8661E-06	7,122.71	0.00	6.82E-02	4.78E-02	6.82E-02		
U-236	1.6701E-05	7,122.71	14,245.41	0.00E+00	1.19E-01	2.38E-01		
U-238	9.4194E-09	7,122.71	0.00	1.30E-02	1.29E-02	1.30E-02		
Y-90	1.3348E+00	7,122.71	14,245.41	0.00E+00	9.51E+03	1.90E+04		
Other Radionuclides					9.83E+03	1.97E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	HEAVY WATER	HEAVY WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %	44.93930164	40 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		7,122.71	
Bounding		14,245.41	

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

Checks

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

Estimated EOL HM/Given EOL HM
1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JRR-2 (UALX HEU) JAPAN
SNF ID #: 606
Fuel Units & Descr: 34 - 17 FLAT PLATES
Heavy Metal Mass: BOL=6 943kg, EOL=5.222kg
ROD Storage Site: SRS

¹Fuel decay start date: 1989
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum, 40 to 100%, U)
²Template Burnup(MWd), 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time: 35 years

Estimated
Canister usage:
18"x10"
0.94

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	9.5869E-10	1,584.67	3,169.33	0.00E+00	1.52E-06	3.04E-06	Avg MeV	
Am-241	1.0109E-02	1,584.67	3,169.33	0.00E+00	1.60E+01	3.20E+01	0.0150	2.341E+14
Am-242m	1.2789E-06	1,584.67	3,169.33	0.00E+00	2.03E-03	4.05E-03	0.0250	4.810E+13
Am-243	3.7047E-05	1,584.67	3,169.33	0.00E+00	5.87E-02	1.17E-01	0.0375	4.216E+13
C-14	2.6416E-08	1,584.67	3,169.33	0.00E+00	4.19E-05	8.37E-05	0.0575	4.535E+13
Cl-36	4.4411E-31	1,584.67	3,169.33	0.00E+00	7.04E-28	1.41E-27	0.0850	2.714E+13
Cm-243	3.9605E-06	1,584.67	3,169.33	0.00E+00	6.28E-03	1.26E-02	0.1250	1.830E+13
Cm-244	2.6227E-03	1,584.67	3,169.33	0.00E+00	4.16E+00	8.31E+00	0.2250	2.345E+13
Co-60	6.7740E-06	1,584.67	3,169.33	0.00E+00	1.07E-02	2.15E-02	0.3750	1.018E+13
Cs-134	6.8894E-05	1,584.67	3,169.33	0.00E+00	1.09E-01	2.18E-01	0.5750	1.700E+14
Cs-135	4.2564E-06	1,584.67	3,169.33	0.00E+00	6.74E-03	1.35E-02	0.8500	2.518E+12
Cs-137	1.4399E+00	1,584.67	3,169.33	0.00E+00	2.28E+03	4.56E+03	1.2500	1.505E+12
Eu-154	1.5522E-02	1,584.67	3,169.33	0.00E+00	2.46E+01	4.92E+01	1.7500	7.118E+10
Eu-155	1.7588E-03	1,584.67	3,169.33	0.00E+00	2.79E+00	5.57E+00	2.2500	4.928E+06
Fe-55	2.4933E-05	1,584.67	3,169.33	0.00E+00	3.95E-02	7.90E-02	2.7500	4.953E+06
H-3	1.9945E-03	1,584.67	3,169.33	0.00E+00	3.16E+00	6.32E+00	3.5000	1.317E+05
I-129	6.6403E-07	1,584.67	3,169.33	0.00E+00	1.05E-03	2.10E-03	5.0000	5.596E+04
Kr-85	4.1002E-02	1,584.67	3,169.33	0.00E+00	6.50E+01	1.30E+02	7.0000	6.407E+03
Np-237	3.1610E-05	1,584.67	3,169.33	0.00E+00	5.01E-02	1.00E-01	11.0000	7.331E+02
Pa-231	1.8876E-09	1,584.67	3,169.33	0.00E+00	2.99E-06	5.98E-06		
Pb-210	8.3840E-11	1,584.67	3,169.33	0.00E+00	1.33E-07	2.66E-07		
Pm-147	4.6501E-04	1,584.67	3,169.33	0.00E+00	7.37E-01	1.47E+00		
Pu-238	1.3645E-01	1,584.67	3,169.33	0.00E+00	2.16E+02	4.32E+02		
Pu-239	6.9502E-04	1,584.67	3,169.33	0.00E+00	1.10E+00	2.20E+00		
Pu-240	3.8183E-04	1,584.67	3,169.33	0.00E+00	6.05E-01	1.21E+00		
Pu-241	6.5310E-02	1,584.67	3,169.33	0.00E+00	1.03E+02	2.07E+02		
Pu-242	3.0911E-06	1,584.67	3,169.33	0.00E+00	4.90E-03	9.80E-03		
Ra-226	2.3512E-10	1,584.67	3,169.33	0.00E+00	3.73E-07	7.45E-07		
Ra-228	3.3366E-14	1,584.67	3,169.33	0.00E+00	5.29E-11	1.06E-10		
Ru-106	2.4490E-10	1,584.67	3,169.33	0.00E+00	3.88E-07	7.76E-07		
Se-79	1.2333E-05	1,584.67	3,169.33	0.00E+00	1.95E-02	3.91E-02		
Sn-126	1.0194E-05	1,584.67	3,169.33	0.00E+00	1.62E-02	3.23E-02		
Sr-90	1.3348E+00	1,584.67	3,169.33	0.00E+00	2.12E+03	4.23E+03		
Tc-99	3.8056E-04	1,584.67	3,169.33	0.00E+00	6.03E-01	1.21E+00		
Th-229	1.7868E-11	1,584.67	3,169.33	0.00E+00	2.83E-08	5.66E-08		
Th-230	2.3348E-08	1,584.67	3,169.33	0.00E+00	3.70E-05	7.40E-05		
Th-232	4.1288E-14	1,584.67	3,169.33	0.00E+00	6.54E-11	1.31E-10		
Ti-208	4.3190E-08	1,584.67	3,169.33	0.00E+00	6.84E-05	1.37E-04		
U-232	1.1707E-07	1,584.67	3,169.33	0.00E+00	1.86E-04	3.71E-04		
U-233	7.2175E-09	1,584.67	3,169.33	0.00E+00	1.14E-05	2.29E-05		
U-234	6.1543E-05	1,584.67	3,169.33	0.00E+00	9.75E-02	1.95E-01		
U-235	-2.8661E-06	1,584.67	0.00	1.40E-02	9.41E-03	1.40E-02		
U-236	1.6701E-05	1,584.67	3,169.33	0.00E+00	2.65E-02	5.29E-02		
U-238	-9.4194E-09	1,584.67	0.00	1.63E-04	1.48E-04	1.63E-04		
Y-90	1.3348E+00	1,584.67	3,169.33	0.00E+00	2.12E+03	4.23E+03		
Other Radionuclides					2.19E+03	4.37E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	HEAVY WATER	HEAVY WATER	
	ALUM	ALUM	
	U	U	
	93.01903552	40 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		1,584.67 3,169.33	

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.52 1.05		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name JRR-3M (ULAX LEU)
SNF ID # 1056
Fuel Units & Descr: 111 - 20 FLAT PLATES
Heavy Metal Mass BOL=165 701kg EOL=157 043kg
ROD Storage Site SRS

Fuel decay start date 1989
Estimates as of 2030
Template HFBR (Heavy Water Alum, 10 to 20% U)
Template Burnup(MWd): 15
Template BOL Heavy Metal Mass (MT) 0 00034251
Template Decay Time: 35 years

Estimated
Canister usage
18"x10"
4 63

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 6507E-09	8,229 12	16,458.25	0 00E+00	2 18E-05	4.36E-05	Avg MeV	
Am-241	2 8587E-02	8,229 12	16,458.25	0 00E+00	2 35E+02	4 70E+02	0 0150	1 165E+15
Am-242m	8 3267E-06	8,229 12	16,458.25	0 00E+00	6 85E-02	1 37E-01	0 0250	2.415E+14
Am-243	6.3920E-06	8,229 12	16,458.25	0 00E+00	5 26E-02	1 05E-01	0 0375	2 115E+14
C-14	2 9567E-08	8,229 12	16,458.25	0 00E+00	2 43E-04	4 87E-04	0 0575	2.314E+14
Cf-36	5 9507E-35	8,229 12	16,458.25	0 00E+00	4 90E-31	9 79E-31	0 0850	1.358E+14
Cm-243	1 5333E-06	8,229 12	16,458.25	0 00E+00	1.26E-02	2 52E-02	0 1250	8 948E+13
Cm-244	6 1980E-05	8,229 12	16,458.25	0 00E+00	5 10E-01	1 02E+00	0 2250	1 171E+14
Co-60	2.2720E-06	8,229 12	16,458.25	0 00E+00	1 87E-02	3 74E-02	0 3750	5 092E+13
Cs-134	1.3787E-05	8,229 12	16,458.25	0 00E+00	1 13E-01	2 27E-01	0 5750	8 759E+14
Cs-135	4 8607E-06	8,229 12	16,458.25	0 00E+00	4 00E-02	8 00E-02	0.8500	1 005E+13
Cs-137	1 4300E+00	8,229 12	16,458.25	0 00E+00	1 18E+04	2 35E+04	1.2500	4 727E+12
Eu-154	6 2340E-03	8,229 12	16,458.25	0 00E+00	5 13E+01	1.03E+02	1 7500	2 724E+11
Eu-155	5 0213E-04	8,229 12	16,458.25	0 00E+00	4 13E+00	8.26E+00	2.2500	2.352E+07
Fe-55	2 5980E-05	8,229 12	16,458.25	0 00E+00	2 14E-01	4 28E-01	2.7500	3 927E+06
H-3	2.0100E-03	8,229 12	16,458.25	0 00E+00	1 65E+01	3 31E+01	3.5000	7 104E+04
I-129	7.1600E-07	8,229 12	16,458.25	0 00E+00	5 89E-03	1 18E-02	5 0000	2.980E+04
Kr-85	3 8813E-02	8,229 12	16,458.25	0 00E+00	3 19E+02	6 39E+02	7.0000	3.353E+03
Np-237	9 9360E-06	8,229 12	16,458.25	0 00E+00	3.24E-02	6 48E-02	11 0000	3.804E+02
Pa-231	5 2460E-09	8,229 12	16,458.25	0 00E+00	4 32E-05	8 63E-05		
Pb-210	4 8933E-13	8,229 12	16,458.25	0 00E+00	4 03E-09	8 05E-09		
Pm-147	8 8000E-04	8,229 12	16,458.25	0 00E+00	7 24E+00	1 45E+01		
Pu-238	4 9107E-03	8,229 12	16,458.25	0 00E+00	4 04E+01	8 08E+01		
Pu-239	1 0313E-02	8,229 12	16,458.25	0 00E+00	8 49E+01	1.70E+02		
Pu-240	5 4093E-03	8,229 12	16,458.25	0 00E+00	4 45E+01	8 90E+01		
Pu-241	1 8253E-01	8,229 12	16,458.25	0 00E+00	1.50E+03	3 00E+03		
Pu-242	3 0713E-06	8,229 12	16,458.25	0 00E+00	2 53E-02	5 05E-02		
Ra-226	1 5867E-12	8,229 12	16,458.25	0 00E+00	1 31E-08	2 61E-08		
Ra-228	2.6227E-14	8,229 12	16,458.25	0 00E+00	2 16E-10	4.32E-10		
Ru-106	2 8093E-10	8,229 12	16,458.25	0 00E+00	2 31E-06	4 62E-06		
Se-79	1.2533E-05	8,229 12	16,458.25	0 00E+00	1.03E-01	2 06E-01		
Sn-126	1 1393E-05	8,229 12	16,458.25	0 00E+00	9.38E-02	1 88E-01		
Sr-90	1 2873E+00	8,229 12	16,458.25	0 00E+00	1 06E+04	2 12E+04		
Tc-99	4.3533E-04	8,229 12	16,458.25	0 00E+00	3 58E+00	7 16E+00		
Th-229	2.1167E-12	8,229 12	16,458.25	0 00E+00	1 74E-08	3.48E-08		
Th-230	2 0387E-10	8,229 12	16,458.25	0 00E+00	1 68E-06	3 36E-06		
Th-232	3.2393E-14	8,229 12	16,458.25	0 00E+00	2 67E-10	5 33E-10		
Ti-208	6 6553E-09	8,229 12	16,458.25	0 00E+00	5 48E-05	1 10E-04		
U-232	1 8033E-08	8,229 12	16,458.25	0 00E+00	1 48E-04	2 97E-04	Thermal Power	
U-233	8 5800E-10	8,229 12	16,458.25	0 00E+00	7 06E-06	1 41E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	8 0733E-07	8,229 12	16,458.25	0 00E+00	6 64E-03	1.33E-02	1.42E+02	2.84E+02
U-235	-2 5335E-06	8,229 12	0 00	7.10E-02	5 02E-02	7.10E-02	Total	Total
U-236	1.3007E-05	8,229 12	16,458.25	0 00E+00	1.07E-01	2 14E-01		
U-238	-1 4207E-08	8,229 12	0 00	4 46E-02	4 45E-02	4 46E-02		
Y-90	1 2873E+00	8,229 12	16,458.25	0 00E+00	1 06E+04	2 12E+04		
					1 12E+04	2.24E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	HEAVY WATER	HEAVY WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	19.837	10 to 20

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		8,229 12
Bounding		16,458.25

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	1.13	
Bounding	2.27	

Estimated EOL HM/ Given EOL HM

1.01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JRR-4 (U3Si2 LEU)

SNF ID #: 1071

Fuel Units & Descr: 47 - ASSEMBLY

Heavy Metal Mass: BOL=47kg, EOL=44 655kg

ROD Storage Site: SRS

¹Fuel decay start date: 1989

Estimates as of: 2030

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

²Template Burnup(MWd): 367.2

Template BOL Heavy Metal Mass (MT): 0 00116689

Template Decay Time: 35 years

Estimated

Canister usage

18"x10"

1 96

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	2,221 04	4,442 09	0 00E+00	4 46E-06	8 91E-06	Avg MeV	
Am-241	2 5251E-03	2,221 04	4,442 09	0 00E+00	5 61E+00	1.12E+01	0 0150	3.272E+14
Am-242m	3 9624E-07	2,221 04	4,442 09	0 00E+00	8 80E-04	1 76E-03	0 0250	6 794E+13
Am-243	1 4880E-06	2,221 04	4,442 09	0 00E+00	3.30E-03	6 61E-03	0 0375	5 905E+13
C-14	5 7053E-09	2,221 04	4,442 09	0 00E+00	1.27E-05	2.53E-05	0 0575	6.356E+13
Cl-36	1.3124E-32	2,221 04	4,442 09	0 00E+00	2 91E-29	5 83E-29	0 0850	3.830E+13
Cm-243	1.1419E-07	2,221 04	4,442 09	0 00E+00	2.54E-04	5 07E-04	0 1250	2.530E+13
Cm-244	1 6522E-05	2,221 04	4,442 09	0 00E+00	3 67E-02	7.34E-02	0.2250	3 306E+13
Co-60	7 4047E-07	2,221 04	4,442 09	0 00E+00	1 64E-03	3 29E-03	0 3750	1 438E+13
Cs-134	2 0455E-05	2,221 04	4,442 09	0 00E+00	4 54E-02	9 09E-02	0 5750	2 377E+14
Cs-135	3 4477E-06	2,221 04	4,442 09	0 00E+00	7 66E-03	1 53E-02	0.8500	2 904E+12
Cs-137	1 4365E+00	2,221 04	4,442 09	0 00E+00	3 19E+03	6 38E+03	1.2500	1 404E+12
Eu-154	7 3230E-03	2,221 04	4,442 09	0 00E+00	1 63E+01	3 25E+01	1.7500	7 904E+10
Eu-155	5 9259E-04	2,221 04	4,442 09	0 00E+00	1 32E+00	2 63E+00	2.2500	6 609E+06
Fe-55	2 2791E-06	2,221 04	4,442 09	0 00E+00	5 06E-03	1 01E-02	2.7500	6.308E+06
H-3	1 9698E-03	2,221 04	4,442 09	0 00E+00	4 37E+00	8 75E+00	3.5000	3 721E+03
I-129	7 5300E-07	2,221 04	4,442 09	0 00E+00	1 67E-03	3 34E-03	5 0000	1 522E+03
Kr-85	4 1176E-02	2,221 04	4,442 09	0 00E+00	9 15E+01	1 83E+02	7 0000	1 667E+02
Np-237	9 5752E-06	2,221 04	4,442 09	0 00E+00	2 13E-02	4.25E-02	11 0000	1 860E+01
Pa-231	3 9379E-09	2,221 04	4,442 09	0 00E+00	8.75E-06	1 75E-05		
Pb-210	3 3115E-10	2,221 04	4,442 09	0 00E+00	7.36E-07	1 47E-06		
Pm-147	9 2402E-04	2,221 04	4,442 09	0 00E+00	2 05E+00	4 10E+00		
Pu-238	1 6217E-02	2,221 04	4,442 09	0 00E+00	3 60E+01	7.20E+01		
Pu-239	4 2810E-04	2,221 04	4,442 09	0 00E+00	9.51E-01	1 90E+00		
Pu-240	2 4333E-04	2,221 04	4,442 09	0 00E+00	5 40E-01	1 08E+00		
Pu-241	1 6242E-02	2,221 04	4,442 09	0 00E+00	3 61E+01	7 21E+01		
Pu-242	3 6329E-07	2,221 04	4,442 09	0 00E+00	8 07E-04	1 61E-03		
Ra-226	9 0114E-10	2,221 04	4,442 09	0 00E+00	2 00E-06	4 00E-06		
Ra-228	3 1019E-14	2,221 04	4,442 09	0 00E+00	6 89E-11	1 38E-10		
Ru-106	2 1225E-10	2,221 04	4,442 09	0 00E+00	4 71E-07	9 43E-07		
Se-79	1 2930E-05	2,221 04	4,442 09	0 00E+00	2 87E-02	5 74E-02		
Sn-126	1 1571E-05	2,221 04	4,442 09	0 00E+00	2 57E-02	5 14E-02		
Sr-90	1 3472E+00	2,221 04	4,442 09	0 00E+00	2 99E+03	5 98E+03		
Tc-99	4 2239E-04	2,221 04	4,442 09	0 00E+00	9.38E-01	1 88E+00		
Th-229	1 2407E-11	2,221 04	4,442 09	0 00E+00	2.76E-08	5 51E-08		
Th-230	8 3497E-08	2,221 04	4,442 09	0 00E+00	1 85E-04	3 71E-04		
Th-232	3 8371E-14	2,221 04	4,442 09	0 00E+00	8 52E-11	1 70E-10		
Th-208	4 0414E-08	2,221 04	4,442 09	0 00E+00	8 98E-05	1.80E-04		
U-232	1 0948E-07	2,221 04	4,442 09	0 00E+00	2 43E-04	4 86E-04		
U-233	3 6275E-09	2,221 04	4,442 09	0 00E+00	8 06E-06	1 61E-05		
U-234	1 8562E-04	2,221 04	4,442 09	0 00E+00	4 12E-01	8 25E-01		
U-235	-2 7235E-06	2,221 04	0 00	2.03E-02	1 43E-02	2 03E-02		
U-236	1 5493E-05	2,221 04	4,442 09	0 00E+00	3 44E-02	6 88E-02		
U-238	-4.2851E-09	2,221 04	0 00	1.26E-02	1 26E-02	1 26E-02		
Y-90	1 3475E+00	2,221 04	4,442 09	0 00E+00	2.99E+03	5 99E+03		
Other Radionuclides					3.04E+03	6 08E+03		

Thermal Power

Nominal Heat Bounding

Output Heat Output

(Watts) (Watts)

3 72E+01 7 43E+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 %	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)²

	From SFD	Estimated
Nominal		2,221 04
Bounding		4 442 09

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	0.15	
Bounding	0.30	

Estimated EOL HM/Given EOL HM

1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JRR-4 (UALX HEU)
 SNF ID #: 505
 Fuel Units & Descr: 43 - ASSEMBLY
 Heavy Metal Mass BOL=7 676kg EOL=6.338kg
 ROD Storage Site SRS

¹Fuel decay start date 1989
 Estimates as of 2030
 Template ATR (Light Water Alum, 60 to 100% U)
²Template Burnup(MWd) 367.2
 Template BOL Heavy Metal Mass (MT) 0.00116689
 Template Decay Time 35 years

Estimated
 Canister usage
 18"x10"
 1 19

II. Estimates							Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	1,266.45	2,532.90	0.00E+00	2.54E-06	5.08E-06	Avg MeV	
Am-241	2.5251E-03	1,266.45	2,532.90	0.00E+00	3.20E+00	6.40E+00	0.0150	1.866E+14
Am-242m	3.9624E-07	1,266.45	2,532.90	0.00E+00	5.02E-04	1.00E-03	0.0250	3.874E+13
Am-243	1.4880E-06	1,266.45	2,532.90	0.00E+00	1.88E-03	3.77E-03	0.0375	3.367E+13
C-14	5.7053E-09	1,266.45	2,532.90	0.00E+00	7.23E-06	1.45E-05	0.0575	3.624E+13
Ck-36	1.3124E-32	1,266.45	2,532.90	0.00E+00	1.66E-29	3.32E-29	0.0850	2.184E+13
Cm-243	1.1419E-07	1,266.45	2,532.90	0.00E+00	1.45E-04	2.89E-04	0.1250	1.442E+13
Cm-244	1.6522E-05	1,266.45	2,532.90	0.00E+00	2.09E-02	4.18E-02	0.2250	1.885E+13
Co-60	7.4047E-07	1,266.45	2,532.90	0.00E+00	9.38E-04	1.88E-03	0.3750	8.201E+12
Cs-134	2.0455E-05	1,266.45	2,532.90	0.00E+00	2.59E-02	5.18E-02	0.5750	1.355E+14
Cs-135	3.4477E-06	1,266.45	2,532.90	0.00E+00	4.37E-03	8.73E-03	0.8500	1.656E+12
Cs-137	1.4365E+00	1,266.45	2,532.90	0.00E+00	1.82E+03	3.64E+03	1.2500	8.008E+11
Eu-154	7.3230E-03	1,266.45	2,532.90	0.00E+00	9.27E+00	1.85E+01	1.7500	4.507E+10
Eu-155	5.9259E-04	1,266.45	2,532.90	0.00E+00	7.50E-01	1.50E+00	2.2500	3.768E+06
Fe-55	2.2791E-06	1,266.45	2,532.90	0.00E+00	2.89E-03	5.77E-03	2.7500	3.597E+06
H-3	1.9698E-03	1,266.45	2,532.90	0.00E+00	2.49E+00	4.99E+00	3.5000	2.084E+03
I-129	7.5300E-07	1,266.45	2,532.90	0.00E+00	9.54E-04	1.91E-03	5.0000	8.518E+02
Kr-85	4.1176E-02	1,266.45	2,532.90	0.00E+00	5.21E+01	1.04E+02	7.0000	9.321E+01
Np-237	9.5752E-06	1,266.45	2,532.90	0.00E+00	1.21E-02	2.43E-02	11.0000	1.039E+01
Pa-231	3.9379E-09	1,266.45	2,532.90	0.00E+00	4.99E-06	9.97E-06		
Pb-210	3.3115E-10	1,266.45	2,532.90	0.00E+00	4.19E-07	8.39E-07		
Pm-147	9.2402E-04	1,266.45	2,532.90	0.00E+00	1.17E+00	2.34E+00		
Pu-238	1.6217E-02	1,266.45	2,532.90	0.00E+00	2.05E+01	4.11E+01		
Pu-239	4.2810E-04	1,266.45	2,532.90	0.00E+00	5.42E-01	1.08E+00		
Pu-240	2.4333E-04	1,266.45	2,532.90	0.00E+00	3.08E-01	6.16E-01		
Pu-241	1.6242E-02	1,266.45	2,532.90	0.00E+00	2.06E+01	4.11E+01		
Pu-242	3.6329E-07	1,266.45	2,532.90	0.00E+00	4.60E-04	9.20E-04		
Ra-226	9.0114E-10	1,266.45	2,532.90	0.00E+00	1.14E-06	2.28E-06		
Ra-228	3.1019E-14	1,266.45	2,532.90	0.00E+00	3.93E-11	7.86E-11		
Ru-106	2.1225E-10	1,266.45	2,532.90	0.00E+00	2.69E-07	5.38E-07		
Se-79	1.2930E-05	1,266.45	2,532.90	0.00E+00	1.64E-02	3.28E-02		
Sn-126	1.1571E-05	1,266.45	2,532.90	0.00E+00	1.47E-02	2.93E-02		
Sr-90	1.3472E+00	1,266.45	2,532.90	0.00E+00	1.71E+03	3.41E+03		
Tc-99	4.2239E-04	1,266.45	2,532.90	0.00E+00	5.35E-01	1.07E+00		
Th-229	1.2407E-11	1,266.45	2,532.90	0.00E+00	1.57E-08	3.14E-08		
Th-230	8.3497E-08	1,266.45	2,532.90	0.00E+00	1.06E-04	2.11E-04		
Th-232	3.8371E-14	1,266.45	2,532.90	0.00E+00	4.86E-11	9.72E-11		
Th-208	4.0414E-08	1,266.45	2,532.90	0.00E+00	5.12E-05	1.02E-04		
U-232	1.0948E-07	1,266.45	2,532.90	0.00E+00	1.39E-04	2.77E-04	Thermal Power	
U-233	3.6275E-09	1,266.45	2,532.90	0.00E+00	4.59E-06	9.19E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8562E-04	1,266.45	2,532.90	0.00E+00	2.35E-01	4.70E-01	2.12E+01	4.24E+01
U-235	-2.7235E-06	1,266.45	0.00	1.54E-02	1.20E-02	1.54E-02	Total	Total
U-236	1.5493E-05	1,266.45	2,532.90	0.00E+00	1.96E-02	3.92E-02		
U-238	-4.2851E-09	1,266.45	0.00	1.80E-04	1.74E-04	1.80E-04		
Y-90	1.3475E+00	1,266.45	2,532.90	0.00E+00	1.71E+03	3.41E+03		
Other Radionuclides								
1.73E+03								
3.47E+03								

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	Basis for Parameter Differences ¹
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	93.03204799	60 to 100	

Burnup Summary (MWd)²

Nominal Bounding	From SFD	Estimated	Basis for burnup used in estimate ²
		1,266.45	
		2,532.90	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup

Checks

Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	0.52		
	1.05		1.01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: JRR-4 (UALX HEU)
 SNF ID #: 1070
 Fuel Units & Descr: 11 - ASSEMBLY
 Heavy Metal Mass: BOL=1 964kg EOL=1 621kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1989
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0 00116689
 Template Decay Time: 35 years

Estimated
 Canister usage
 18"x10"
 0 31

II. Estimates	m	X _n	X _b	b	Y _n	Y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	323 98	647 95	0 00E+00	6 50E-07	1 30E-06	Avg MeV	
Am-241	2 5251E-03	323 98	647 95	0 00E+00	8 18E-01	1 64E+00	0 0150	4 772E+13
Am-242m	3 9624E-07	323 98	647 95	0 00E+00	1 28E-04	2 57E-04	0 0250	9 910E+12
Am-243	1 4880E-06	323 98	647 95	0 00E+00	4 82E-04	9 64E-04	0 0375	8 613E+12
C-14	5 7053E-09	323 98	647 95	0 00E+00	1 85E-06	3 70E-06	0 0575	9 271E+12
Cf-252	1 3124E-32	323 98	647 95	0 00E+00	4 25E-30	8 50E-30	0 0850	5 586E+12
Cm-243	1 1419E-07	323 98	647 95	0 00E+00	3 70E-05	7 40E-05	0 1250	3 690E+12
Cm-244	1 6522E-05	323 98	647 95	0 00E+00	5 35E-03	1 07E-02	0 2250	4 823E+12
Co-60	7 4047E-07	323 98	647 95	0 00E+00	2 40E-04	4 80E-04	0 3750	2 098E+12
Cs-134	2 0455E-05	323 98	647 95	0 00E+00	6 63E-03	1 33E-02	0 5750	3 467E+13
Cs-135	3 4477E-06	323 98	647 95	0 00E+00	1 12E-03	2 23E-03	0 8500	4 235E+11
Cs-137	1 4365E+00	323 98	647 95	0 00E+00	4 65E+02	9 31E+02	1 2500	2 049E+11
Eu-154	7 3230E-03	323 98	647 95	0 00E+00	2 37E+00	4 74E+00	1 7500	1 153E+10
Eu-155	5 9259E-04	323 98	647 95	0 00E+00	1 92E-01	3 84E-01	2 2500	9 640E+05
Fe-55	2 2791E-06	323 98	647 95	0 00E+00	7 38E-04	1 48E-03	2 7500	9 201E+05
H-3	1 9698E-03	323 98	647 95	0 00E+00	6 38E-01	1 28E+00	3 5000	5 332E+02
I-129	7 5300E-07	323 98	647 95	0 00E+00	2 44E-04	4 88E-04	5 0000	2 179E+02
Kr-85	4 1176E-02	323 98	647 95	0 00E+00	1 33E+01	2 67E+01	7 0000	2 384E+01
Np-237	9 5752E-06	323 98	647 95	0 00E+00	3 10E-03	6 20E-03	11 0000	2 659E+00
Pa-231	3 9379E-09	323 98	647 95	0 00E+00	1 28E-06	2 55E-06		
Pb-210	3 3115E-10	323 98	647 95	0 00E+00	1 07E-07	2 15E-07		
Pm-147	9 2402E-04	323 98	647 95	0 00E+00	2 99E-01	5 99E-01		
Pu-238	1 6217E-02	323 98	647 95	0 00E+00	5 25E+00	1 05E+01		
Pu-239	4 2810E-04	323 98	647 95	0 00E+00	1 39E-01	2 77E-01		
Pu-240	2 4333E-04	323 98	647 95	0 00E+00	7 88E-02	1 58E-01		
Pu-241	1 6242E-02	323 98	647 95	0 00E+00	5 26E+00	1 05E+01		
Pu-242	3 6329E-07	323 98	647 95	0 00E+00	1 18E-04	2 35E-04		
Ra-226	9 0114E-10	323 98	647 95	0 00E+00	2 92E-07	5 84E-07		
Ra-228	3 1019E-14	323 98	647 95	0 00E+00	1 00E-11	2 01E-11		
Ru-106	2 1225E-10	323 98	647 95	0 00E+00	6 88E-08	1 38E-07		
Se-79	1 2930E-05	323 98	647 95	0 00E+00	4 19E-03	8 38E-03		
Sn-126	1 1571E-05	323 98	647 95	0 00E+00	3 75E-03	7 50E-03		
Sr-90	1 3472E+00	323 98	647 95	0 00E+00	4 36E+02	8 73E+02		
Tc-99	4 2239E-04	323 98	647 95	0 00E+00	1 37E-01	2 74E-01		
Th-229	1 2407E-11	323 98	647 95	0 00E+00	4 02E-09	8 04E-09		
Th-230	8 3497E-08	323 98	647 95	0 00E+00	2 71E-05	5 41E-05		
Th-232	3 8371E-14	323 98	647 95	0 00E+00	1 24E-11	2 49E-11		
Ti-208	4 0414E-08	323 98	647 95	0 00E+00	1 31E-05	2 62E-05		
U-232	1 0948E-07	323 98	647 95	0 00E+00	3 55E-05	7 09E-05		
U-233	3 6275E-09	323 98	647 95	0 00E+00	1 18E-06	2 35E-06		
U-234	1 8562E-04	323 98	647 95	0 00E+00	6 01E-02	1 20E-01		
U-235	-2 7235E-06	323 98	0 00	3 95E-03	3 07E-03	3 95E-03		
U-236	1 5493E-05	323 98	647 95	0 00E+00	5 02E-03	1 00E-02		
U-238	-4 2851E-09	323 98	0 00	4 60E-05	4 46E-05	4 60E-05		
Y-90	1 3475E+00	323 98	647 95	0 00E+00	4 37E+02	8 73E+02		
Other Radionuclides					4 43E+02	8 87E+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	
BOL HM Constituents:	ALUM	ALUM	
BOL Enrichment %:	U	U	
	93 03204799	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		323 98	
Bounding		647 95	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	0.52		
Bounding	1 05		1 01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name KURR (JALX-HEU) JAPAN
SNF ID # 601
Fuel Units & Descr: 240 - 18 CURVED PLATES
Heavy Metal Mass: BOL=40.824kg EOL=33.48kg
ROD Storage Site SRS

Fuel decay start date 2006
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
6 67

Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	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	6,954.91	13,909.82	0.00E+00	4.61E-06	9.22E-06	Avg MeV	
Am-241	2.0060E-03	6,954.91	13,909.82	0.00E+00	1.40E+01	2.79E+01	0.0150	1.468E+15
Am-242m	4.2429E-07	6,954.91	13,909.82	0.00E+00	2.95E-03	5.90E-03	0.0250	3.053E+14
Am-243	1.4899E-06	6,954.91	13,909.82	0.00E+00	1.04E-02	2.07E-02	0.0375	2.663E+14
C-14	5.7135E-09	6,954.91	13,909.82	0.00E+00	3.97E-05	7.95E-05	0.0575	2.852E+14
Cl-36	1.3124E-32	6,954.91	13,909.82	0.00E+00	9.13E-29	1.83E-28	0.0850	1.724E+14
Cm-243	1.6443E-07	6,954.91	13,909.82	0.00E+00	1.14E-03	2.29E-03	0.1250	1.166E+14
Cm-244	2.9330E-05	6,954.91	13,909.82	0.00E+00	2.04E-01	4.08E-01	0.2250	1.487E+14
Co-60	5.3186E-06	6,954.91	13,909.82	0.00E+00	3.70E-02	7.40E-02	0.3750	6.474E+13
Cs-134	3.1563E-03	6,954.91	13,909.82	0.00E+00	2.20E+01	4.39E+01	0.5750	1.056E+15
Cs-135	3.4477E-06	6,954.91	13,909.82	0.00E+00	2.40E-02	4.80E-02	0.8500	1.785E+13
Cs-137	2.0313E+00	6,954.91	13,909.82	0.00E+00	1.41E+04	2.83E+04	1.2500	1.019E+13
Eu-154	2.4513E-02	6,954.91	13,909.82	0.00E+00	1.70E+02	3.41E+02	1.7500	4.679E+11
Eu-155	4.8175E-04	6,954.91	13,909.82	0.00E+00	3.35E+01	6.70E+01	2.2500	4.105E+07
Fe-55	1.2397E-04	6,954.91	13,909.82	0.00E+00	8.62E-01	1.72E+00	2.7500	2.321E+07
H-3	4.5697E-03	6,954.91	13,909.82	0.00E+00	3.18E+01	6.36E+01	3.5000	1.066E+05
I-129	7.5300E-07	6,954.91	13,909.82	0.00E+00	5.24E-03	1.05E-02	5.0000	6.028E+03
Kr-85	1.0850E-01	6,954.91	13,909.82	0.00E+00	7.55E+02	1.51E+03	7.0000	6.655E+02
Np-237	9.5561E-06	6,954.91	13,909.82	0.00E+00	6.65E-02	1.33E-01	11.0000	7.459E+01
Pa-231	2.0359E-09	6,954.91	13,909.82	0.00E+00	1.42E-05	2.83E-05		
Pb-210	4.9728E-11	6,954.91	13,909.82	0.00E+00	3.46E-07	6.92E-07		
Pm-147	4.8502E-02	6,954.91	13,909.82	0.00E+00	3.37E+02	6.75E+02		
Pu-238	1.8254E-02	6,954.91	13,909.82	0.00E+00	1.27E+02	2.54E+02		
Pu-239	4.2810E-04	6,954.91	13,909.82	0.00E+00	2.98E+00	5.95E+00		
Pu-240	2.4368E-04	6,954.91	13,909.82	0.00E+00	1.69E+00	3.39E+00		
Pu-241	3.3415E-02	6,954.91	13,909.82	0.00E+00	2.32E+02	4.65E+02		
Pu-242	3.6329E-07	6,954.91	13,909.82	0.00E+00	2.53E-03	5.05E-03		
Ra-226	2.2854E-10	6,954.91	13,909.82	0.00E+00	1.59E-06	3.18E-06		
Ra-228	1.2426E-14	6,954.91	13,909.82	0.00E+00	8.64E-11	1.73E-10		
Ru-106	6.3589E-06	6,954.91	13,909.82	0.00E+00	4.42E-02	8.85E-02		
Se-79	1.2933E-05	6,954.91	13,909.82	0.00E+00	8.99E-02	1.80E-01		
Sn-126	1.1574E-05	6,954.91	13,909.82	0.00E+00	8.05E-02	1.61E-01		
Sr-90	1.9248E+00	6,954.91	13,909.82	0.00E+00	1.34E+04	2.68E+04		
Tc-99	4.2239E-04	6,954.91	13,909.82	0.00E+00	2.94E+00	5.88E+00		
Th-229	5.0953E-12	6,954.91	13,909.82	0.00E+00	3.54E-08	7.09E-08		
Th-230	4.1885E-08	6,954.91	13,909.82	0.00E+00	2.91E-04	5.83E-04		
Th-232	1.9270E-14	6,954.91	13,909.82	0.00E+00	1.34E-10	2.68E-10		
Ti-208	4.6024E-08	6,954.91	13,909.82	0.00E+00	3.20E-04	6.40E-04		
U-232	1.2582E-07	6,954.91	13,909.82	0.00E+00	8.75E-04	1.75E-03	Thermal Power	
U-233	2.5825E-09	6,954.91	13,909.82	0.00E+00	1.80E-05	3.59E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8450E-04	6,954.91	13,909.82	0.00E+00	1.28E+00	2.57E+00		
U-235	-2.7235E-06	6,954.91	0.00	8.22E-02	6.33E-02	8.22E-02	1.66E+02	3.32E+02
U-236	1.5493E-06	6,954.91	13,909.82	0.00E+00	1.08E-01	2.16E-01	Total	Total
U-238	-4.2851E-09	6,954.91	0.00	9.36E-04	9.07E-04	9.36E-04		
Y-90	1.9254E+00	6,954.91	13,909.82	0.00E+00	1.34E+04	2.68E+04		
Other Radionuclides					1.35E+04	2.69E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

Reactor Moderator	From SFD	Used	Basis for Parameter Differences:
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.175	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate
		6,954.91	
Nominal			Nominal burnup calculated from the heavy metal mass destroyed
Bounding		13,909.82	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/ Given EOL HM
	0.54		
Nominal			1.01
Bounding	1.08		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name LWR SAMPLES
SNF ID # 134
Fuel Units & Descr: 5 - ROD
Heavy Metal Mass, BOL= , EOL=12.74kg
ROD Storage Site: INEEL

Fuel decay start date, 1966
Estimates as of: 2030
Template: (Worst Case)
Template Burnup(MWd): 62.5
Template BOL Heavy Metal Mass (MT), 0.00186865
Template Decay Time: 50 years

Estimated
Canister usage:
18"x15"
0.18

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.5200E-06	12,107.49	12,107.49	0.00E+00	3.05E-02	3.05E-02	Avg MeV	
Am-241	8.6432E+00	12,107.49	12,107.49	0.00E+00	1.05E+05	1.05E+05	0.0150	1.026E+16
Am-242m	1.5728E-02	12,107.49	12,107.49	0.00E+00	1.90E+02	1.90E+02	0.0250	2.027E+15
Am-243	1.6288E-02	12,107.49	12,107.49	0.00E+00	1.97E+02	1.97E+02	0.0375	1.713E+15
C-14	1.2068E-01	12,107.49	12,107.49	0.00E+00	1.46E+03	1.46E+03	0.0575	3.237E+15
Cl-36	2.2849E-03	12,107.49	12,107.49	0.00E+00	2.77E+01	2.77E+01	0.0850	1.085E+15
Cm-243	6.0144E-04	12,107.49	12,107.49	0.00E+00	7.28E+00	7.28E+00	0.1250	7.676E+14
Cm-244	9.4880E-02	12,107.49	12,107.49	0.00E+00	1.15E+03	1.15E+03	0.2250	9.390E+14
Co-60	3.9052E+00	12,107.49	12,107.49	0.00E+00	4.73E+04	4.73E+04	0.3750	4.064E+14
Cs-134	2.2139E-06	12,107.49	12,107.49	0.00E+00	2.68E-02	2.68E-02	0.5750	6.725E+15
Cs-135	4.3976E-04	12,107.49	12,107.49	0.00E+00	5.32E+00	5.32E+00	0.8500	1.473E+14
Cs-137	1.4887E+01	12,107.49	12,107.49	0.00E+00	1.80E+05	1.80E+05	1.2500	3.611E+15
Eu-154	3.7342E-01	12,107.49	12,107.49	0.00E+00	4.52E+03	4.52E+03	1.7500	4.339E+12
Eu-155	8.4893E-03	12,107.49	12,107.49	0.00E+00	1.03E+02	1.03E+02	2.2500	1.876E+10
Fe-55	5.3750E-03	12,107.49	12,107.49	0.00E+00	6.51E+01	6.51E+01	2.7500	3.230E+10
H-3	1.0472E-01	12,107.49	12,107.49	0.00E+00	1.27E+03	1.27E+03	3.5000	1.759E+07
I-129	1.0618E-05	12,107.49	12,107.49	0.00E+00	1.29E-01	1.29E-01	5.0000	7.432E+06
Kr-85	2.2717E-01	12,107.49	12,107.49	0.00E+00	2.75E+03	2.75E+03	7.0000	8.464E+05
Np-237	1.6400E-04	12,107.49	12,107.49	0.00E+00	1.99E+00	1.99E+00	11.0000	9.654E+04
Pa-231	2.8688E-06	12,107.49	12,107.49	0.00E+00	3.47E-02	3.47E-02		
Pb-210	4.7312E-08	12,107.49	12,107.49	0.00E+00	5.73E-04	5.73E-04		
Pm-147	3.2198E-04	12,107.49	12,107.49	0.00E+00	3.90E+00	3.90E+00		
Pu-238	-1.1924E+00	12,107.49	0.00	3.27E+03	0.00E+00	3.27E+03		
Pu-239	-4.8600E-02	12,107.49	0.00	3.96E+02	0.00E+00	3.96E+02		
Pu-240	-3.0127E-01	12,107.49	0.00	5.06E+02	0.00E+00	5.06E+02		
Pu-241	-1.2917E+02	12,107.49	0.00	1.30E+05	0.00E+00	1.30E+05		
Pu-242	-1.1381E-04	12,107.49	0.00	2.19E+00	8.12E-01	2.19E+00		
Ra-226	1.0760E-07	12,107.49	12,107.49	0.00E+00	1.30E-03	1.30E-03		
Ra-228	6.0160E-07	12,107.49	12,107.49	0.00E+00	7.28E-03	7.28E-03		
Ru-106	1.3388E-13	12,107.49	12,107.49	0.00E+00	1.62E-09	1.62E-09		
Se-79	1.9179E-04	12,107.49	12,107.49	0.00E+00	2.32E+00	2.32E+00		
Sn-126	1.6669E-04	12,107.49	12,107.49	0.00E+00	2.02E+00	2.02E+00		
Sr-90	1.3859E+01	12,107.49	12,107.49	0.00E+00	1.68E+05	1.68E+05		
Tc-99	6.7678E-03	12,107.49	12,107.49	0.00E+00	8.19E+01	8.19E+01		
Th-229	2.2592E-06	12,107.49	12,107.49	0.00E+00	2.74E-02	2.74E-02		
Th-230	7.5955E-06	12,107.49	12,107.49	0.00E+00	9.20E-02	9.20E-02		
Th-232	6.0208E-07	12,107.49	12,107.49	0.00E+00	7.29E-03	7.29E-03		
Ti-208	7.5795E-05	12,107.49	12,107.49	0.00E+00	9.18E-01	9.18E-01		
U-232	2.0521E-04	12,107.49	12,107.49	0.00E+00	2.48E+00	2.48E+00		
U-233	3.6128E-04	12,107.49	12,107.49	0.00E+00	4.37E+00	4.37E+00		
U-234	1.2788E-02	12,107.49	12,107.49	0.00E+00	1.55E+02	1.55E+02		
U-235	5.7486E-04	12,107.49	12,107.49	1.10E-02	6.97E+00	6.97E+00		
U-236	2.3485E-04	12,107.49	12,107.49	0.00E+00	2.84E+00	2.84E+00		
U-238	1.1581E-04	12,107.49	12,107.49	1.36E-03	1.40E+00	1.40E+00		
Y-90	1.3861E+01	12,107.49	12,107.49	0.00E+00	1.68E+05	1.68E+05		
Other Radionuclides					6.22E+05	6.22E+05		

III. Template Selection Summary, Burnup Summary, and Checks

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

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		12,107.49	Nominal burnup set equal to bounding burnup.
Bounding		12,107.49	
			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		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name MIT
 SNF ID # 135
 Fuel Units & Descr 525 - 15 FLAT PLATES
 Heavy Metal Mass BOL=286 02kg EOL=232 68kg
 ROD Storage Site SRS

¹Fuel decay start date: 2035
 Estimates as of 2030
 Template ATR (Light Water Alum, 60 to 100% U)
²Template Burnup(MWd) 367.2
 Template BOL Heavy Metal Mass (MT): 0 00116689
 Template Decay Time 5 years

Estimated
 Canister usage
 18"x10"
 17 50

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	95,816 70	191,633 40	0 00E+00	1.39E-05	2.79E-05	Avg MeV	
Am-241	1.1190E-03	95,816 70	191,633 40	0 00E+00	1.07E+02	2.14E+02	0 0150	3 697E+16
Am-242m	4.5425E-07	95,816 70	191,633 40	0 00E+00	4.35E-02	8 70E-02	0 0250	7 965E+15
Am-243	1.4921E-06	95,816 70	191,633 40	0 00E+00	1.43E-01	2 86E-01	0 0375	7 350E+15
C-14	5 7244E-09	95,816 70	191,633 40	0 00E+00	5 48E-04	1 10E-03	0 0575	7 227E+15
Cl-36	1.3124E-32	95,816 70	191,633 40	0 00E+00	1 26E-27	2 51E-27	0 0850	4 607E+15
Cm-243	2 3676E-07	95,816 70	191,633 40	0 00E+00	2 27E-02	4 54E-02	0 1250	3 990E+15
Cm-244	5.2042E-05	95,816 70	191,633 40	0 00E+00	4 99E+00	9 97E+00	0 2250	3 905E+15
Co-60	3 8208E-05	95,816 70	191,633 40	0 00E+00	3 66E+00	7 32E+00	0 3750	1 890E+15
Cs-134	4 8693E-01	95,816 70	191,633 40	0 00E+00	4 67E+04	9 33E+04	0 5750	2 596E+16
Cs-135	3 4477E-06	95,816 70	191,633 40	0 00E+00	3 30E-01	6 61E-01	0 8500	3 636E+15
Cs-137	2 8731E+00	95,816 70	191,633 40	0 00E+00	2 75E+05	5 51E+05	1 2500	6 755E+14
Eu-154	8.2053E-02	95,816 70	191,633 40	0 00E+00	7 86E+03	1 57E+04	1 7500	2 837E+13
Eu-155	3 9134E-02	95,816 70	191,633 40	0 00E+00	3 75E+03	7 50E+03	2 2500	5 950E+13
Fe-55	6 7429E-03	95,816 70	191,633 40	0 00E+00	6 46E+02	1 29E+03	2 7500	3 423E+11
H-3	1 0599E-02	95,816 70	191,633 40	0 00E+00	1 02E+03	2 03E+03	3 5000	3 797E+10
I-129	7 5300E-07	95,816 70	191,633 40	0 00E+00	7 21E-02	1 44E-01	5 0000	1 135E+05
Kr-85	2 8595E-01	95,816 70	191,633 40	0 00E+00	2 74E+04	5 48E+04	7 0000	1 265E+04
Np-237	9 5479E-06	95,816 70	191,633 40	0 00E+00	9 15E-01	1 83E+00	11 0000	1 426E+03
Pa-231	8 9297E-10	95,816 70	191,633 40	0 00E+00	8 56E-05	1 71E-04		
Pb-210	3 7609E-12	95,816 70	191,633 40	0 00E+00	3 60E-07	7 21E-07		
Pm-147	2 5452E+00	95,816 70	191,633 40	0 00E+00	2 44E+05	4 88E+05		
Pu-238	2 0550E-02	95,816 70	191,633 40	0 00E+00	1 97E+03	3 94E+03		
Pu-239	4 2838E-04	95,816 70	191,633 40	0 00E+00	4 10E+01	8 21E+01		
Pu-240	2 4401E-04	95,816 70	191,633 40	0 00E+00	2 34E+01	4 68E+01		
Pu-241	6 8764E-02	95,816 70	191,633 40	0 00E+00	6 59E+03	1 32E+04		
Pu-242	3 6329E-07	95,816 70	191,633 40	0 00E+00	3 48E-02	6 96E-02		
Ra-226	3 8045E-11	95,816 70	191,633 40	0 00E+00	3 65E-06	7 29E-06		
Ra-228	2 9902E-15	95,816 70	191,633 40	0 00E+00	2 87E-10	5 73E-10		
Ru-106	1 9055E-01	95,816 70	191,633 40	0 00E+00	1 83E+04	3 65E+04		
Se-79	1 2936E-05	95,816 70	191,633 40	0 00E+00	1 24E+00	2 48E+00		
Sn-126	1 1574E-05	95,816 70	191,633 40	0 00E+00	1 11E+00	2 22E+00		
Sr-90	2 7505E+00	95,816 70	191,633 40	0 00E+00	2 64E+05	5 27E+05		
Tc-99	4 2239E-04	95,816 70	191,633 40	0 00E+00	4 05E+01	8 09E+01		
Th-229	1 8848E-12	95,816 70	191,633 40	0 00E+00	1 81E-07	3 61E-07		
Th-230	1 7042E-08	95,816 70	191,633 40	0 00E+00	1 63E-03	3 27E-03		
Th-232	7 8132E-15	95,816 70	191,633 40	0 00E+00	7 49E-10	1 50E-09		
Ti-208	4 4063E-08	95,816 70	191,633 40	0 00E+00	4 22E-03	8 44E-03		
U-232	1 3151E-07	95,816 70	191,633 40	0 00E+00	1 26E-02	2 52E-02	Thermal Power	
U-233	1 9564E-09	95,816 70	191,633 40	0 00E+00	1 87E-04	3 75E-04	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8371E-04	95,816 70	191,633 40	0 00E+00	1 76E+01	3 52E+01	4 86E+03	9 72E+03
U-235	-2 7235E-06	95,816 70	0 00	5 76E-01	3 15E-01	5 76E-01	Total	Total
U-236	1 5493E-05	95,816 70	191,633 40	0 00E+00	1 48E+00	2 97E+00		
U-238	-4 2851E-09	95,816 70	0 00	6 61E-03	6 20E-03	6 61E-03		
Y-90	2 7505E+00	95,816 70	191,633 40	0 00E+00	2 64E+05	5 27E+05		
Other Radionuclides					4 93E+05	9 86E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD LIGHT WATER	Used LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93 1245618	60 to 100	
Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal	From SFD 95,816 70	Estimated 50 514 01	
Bounding		191,633 40	Nominal burnup taken directly from SFD (converted to MWd) Bounding burnup assumed to be twice nominal burnup
Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier 1.06	Estimated Burnup/ Given Burnup 0.53	
Bounding	2.13		0.82

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: MIT
SNF ID #: 136
Fuel Units & Descr: 120 - 15 FLAT PLATES
Heavy Metal Mass: BOL=65 46kg; EOL=43 032kg
ROD Storage Site: SRS

¹Fuel decay start date: 1994
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 35 years

Estimated
Canister usage
18"x10"
4.00

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	21,239.75	42,479.50	0.00E+00	4.26E-05	8.52E-05	Avg MeV	
Am-241	2.5251E-03	21,239.75	42,479.50	0.00E+00	5.36E+01	1.07E+02	0.0150	3.129E+15
Am-242m	3.9624E-07	21,239.75	42,479.50	0.00E+00	8.42E-03	1.68E-02	0.0250	6.497E+14
Am-243	1.4880E-06	21,239.75	42,479.50	0.00E+00	3.16E-02	6.32E-02	0.0375	5.647E+14
C-14	5.7053E-09	21,239.75	42,479.50	0.00E+00	1.21E-04	2.42E-04	0.0575	6.078E+14
Cl-36	1.3124E-32	21,239.75	42,479.50	0.00E+00	2.79E-28	5.57E-28	0.0850	3.662E+14
Cm-243	1.1419E-07	21,239.75	42,479.50	0.00E+00	2.43E-03	4.85E-03	0.1250	2.419E+14
Cm-244	1.6522E-05	21,239.75	42,479.50	0.00E+00	3.51E-01	7.02E-01	0.2250	3.162E+14
Co-60	7.4047E-07	21,239.75	42,479.50	0.00E+00	1.57E-02	3.15E-02	0.3750	1.375E+14
Cs-134	2.0455E-05	21,239.75	42,479.50	0.00E+00	4.34E-01	8.69E-01	0.5750	2.273E+15
Cs-135	3.4477E-06	21,239.75	42,479.50	0.00E+00	7.32E-02	1.46E-01	0.8500	2.777E+13
Cs-137	1.4365E+00	21,239.75	42,479.50	0.00E+00	3.05E+04	6.10E+04	1.2500	1.343E+13
Eu-154	7.3230E-03	21,239.75	42,479.50	0.00E+00	1.56E+02	3.11E+02	1.7500	7.559E+11
Eu-155	5.9259E-04	21,239.75	42,479.50	0.00E+00	1.26E+01	2.52E+01	2.2500	6.320E+07
Fe-55	2.2791E-06	21,239.75	42,479.50	0.00E+00	4.84E-02	9.68E-02	2.7500	6.032E+07
H-3	1.9698E-03	21,239.75	42,479.50	0.00E+00	4.18E+01	8.37E+01	3.5000	3.495E+04
I-129	7.5300E-07	21,239.75	42,479.50	0.00E+00	1.60E-02	3.20E-02	5.0000	1.428E+04
Kr-85	4.1176E-02	21,239.75	42,479.50	0.00E+00	8.75E+02	1.75E+03	7.0000	1.563E+03
Np-237	9.5752E-06	21,239.75	42,479.50	0.00E+00	2.03E-01	4.07E-01	11.0000	1.742E+02
Pa-231	3.9379E-09	21,239.75	42,479.50	0.00E+00	8.36E-05	1.67E-04		
Pb-210	3.3115E-10	21,239.75	42,479.50	0.00E+00	7.03E-06	1.41E-05		
Pm-147	9.2402E-04	21,239.75	42,479.50	0.00E+00	1.96E+01	3.93E+01		
Pu-238	1.6217E-02	21,239.75	42,479.50	0.00E+00	3.44E+02	6.89E+02		
Pu-239	4.2810E-04	21,239.75	42,479.50	0.00E+00	9.09E+00	1.82E+01		
Pu-240	2.4333E-04	21,239.75	42,479.50	0.00E+00	5.17E+00	1.03E+01		
Pu-241	1.6242E-02	21,239.75	42,479.50	0.00E+00	3.45E+02	6.90E+02		
Pu-242	3.6329E-07	21,239.75	42,479.50	0.00E+00	7.72E-03	1.54E-02		
Ra-226	9.0114E-10	21,239.75	42,479.50	0.00E+00	1.91E-05	3.83E-05		
Ra-228	3.1019E-14	21,239.75	42,479.50	0.00E+00	6.59E-10	1.32E-09		
Ru-106	2.1225E-10	21,239.75	42,479.50	0.00E+00	4.51E-06	9.02E-06		
Se-79	1.2930E-05	21,239.75	42,479.50	0.00E+00	2.75E-01	5.49E-01		
Sn-126	1.1571E-05	21,239.75	42,479.50	0.00E+00	2.46E-01	4.92E-01		
Sr-90	1.3472E+00	21,239.75	42,479.50	0.00E+00	2.86E+04	5.72E+04		
Tc-99	4.2239E-04	21,239.75	42,479.50	0.00E+00	8.97E+00	1.79E+01		
Th-229	1.2407E-11	21,239.75	42,479.50	0.00E+00	2.64E-07	5.27E-07		
Th-230	8.3497E-08	21,239.75	42,479.50	0.00E+00	1.77E-03	3.55E-03		
Th-232	3.8371E-14	21,239.75	42,479.50	0.00E+00	8.15E-10	1.63E-09		
Th-208	4.0414E-08	21,239.75	42,479.50	0.00E+00	8.58E-04	1.72E-03		
U-232	1.0948E-07	21,239.75	42,479.50	0.00E+00	2.33E-03	4.65E-03		
U-233	3.6275E-09	21,239.75	42,479.50	0.00E+00	7.70E-05	1.54E-04		
U-234	1.8562E-04	21,239.75	42,479.50	0.00E+00	3.94E+00	7.89E+00		
U-235	2.7235E-06	21,239.75	0.00	1.32E-01	7.39E-02	1.32E-01		
U-236	1.5493E-05	21,239.75	42,479.50	0.00E+00	3.29E-01	6.58E-01		
U-238	4.2851E-09	21,239.75	0.00	1.51E-03	1.42E-03	1.51E-03		
Y-90	1.3475E+00	21,239.75	42,479.50	0.00E+00	2.86E+04	5.72E+04		
Other Radionuclides								
							2.91E+04	5.81E+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 %	93.145832	60 to 100	

Burnup Summary (MWd) ³			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		21,239.75	
Bounding		42,479.50	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	1.03		
Bounding	2.06		1.03

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: ML-1 (GCRE)
SNF ID #: 137
Fuel Units & Descr: 67 - 19 ROD ASSEMBLY
Heavy Metal Mass BOL=58 625kg EOL=58.29kg
ROD Storage Site INEEL

¹Fuel decay start date 1965
Estimates as of 2030
Template Pathfinder (Light Water SST, 60 to 100%, U)
²Template Burnup(MWd) 6 01
Template BOL Heavy Metal Mass (MT) 0 00012882
Template Decay Time 65 years

Estimated
Canister usage
18"x10"
3 72

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4 5940E-08	316 46	632 91	0 00E+00	1 45E-05	2 91E-05	Avg MeV	
Am-241	1 1471E-04	316 46	632 91	0 00E+00	3 63E-02	7 26E-02	0 0150	2 310E+13
Am-242m	7 4210E-09	316 46	632 91	0 00E+00	2 35E-06	4 70E-06	0 0250	4 800E+12
Am-243	9 8236E-10	316 46	632 91	0 00E+00	3 11E-07	6 22E-07	0 0375	4 171E+12
C-14	2 2928E-04	316 46	632 91	0 00E+00	7 26E-02	1 45E-01	0 0575	4 476E+12
Cl-36	1 2260E-06	316 46	632 91	0 00E+00	3 88E-04	7 76E-04	0 0850	2 704E+12
Cm-243	1 2000E-10	316 46	632 91	0 00E+00	3 80E-08	7 59E-08	0 1250	1 754E+12
Cm-244	7 3577E-10	316 46	632 91	0 00E+00	2 33E-07	4 66E-07	0 2250	2 332E+12
Co-60	1 3732E-03	316 46	632 91	0 00E+00	4 35E-01	8 69E-01	0 3750	1 016E+12
Cs-134	1 2709E-10	316 46	632 91	0 00E+00	4 02E-08	8 04E-08	0 5750	1 710E+13
Cs-135	3 0316E-05	316 46	632 91	0 00E+00	9 59E-03	1 92E-02	0 8500	1 660E+11
Cs-137	7 2579E-01	316 46	632 91	0 00E+00	2 30E+02	4 59E+02	1 2500	1 202E+11
Eu-154	5 9750E-05	316 46	632 91	0 00E+00	1 89E-02	3 78E-02	1 7500	4 271E+09
Eu-155	1 0577E-05	316 46	632 91	0 00E+00	3 35E-03	6 69E-03	2 2500	8 077E+05
Fe-55	4 1631E-07	316 46	632 91	0 00E+00	1 32E-04	2 63E-04	2 7500	3 618E+05
H-3	4 6722E-04	316 46	632 91	0 00E+00	1 48E-01	2 96E-01	3 5000	4 749E+01
I-129	7 3195E-07	316 46	632 91	0 00E+00	2 32E-04	4 63E-04	5 0000	1 969E+01
Kr-85	5 9418E-03	316 46	632 91	0 00E+00	1 88E+00	3 76E+00	7 0000	2 187E+00
Np-237	1 1499E-06	316 46	632 91	0 00E+00	3 64E-04	7 28E-04	11 0000	2 462E-01
Pa-231	7 0899E-08	316 46	632 91	0 00E+00	2 24E-05	4 49E-05		
Pb-210	2 2363E-12	316 46	632 91	0 00E+00	7 08E-10	1 42E-09		
Pm-147	4 2296E-07	316 46	632 91	0 00E+00	1 34E-04	2 68E-04		
Pu-238	2 3295E-04	316 46	632 91	0 00E+00	7 37E-02	1 47E-01		
Pu-239	6 6722E-04	316 46	632 91	0 00E+00	2 11E-01	4 22E-01		
Pu-240	8 6556E-05	316 46	632 91	0 00E+00	2 74E-02	5 48E-02		
Pu-241	1 6889E-04	316 46	632 91	0 00E+00	5 34E-02	1 07E-01		
Pu-242	1 9717E-09	316 46	632 91	0 00E+00	6 24E-07	1 25E-06		
Ra-226	4 5740E-12	316 46	632 91	0 00E+00	1 45E-09	2 89E-09		
Ra-228	8 3511E-12	316 46	632 91	0 00E+00	2 64E-09	5 29E-09		
Ru-106	2 0516E-19	316 46	632 91	0 00E+00	6 49E-17	1 30E-16		
Se-79	1 3220E-05	316 46	632 91	0 00E+00	4 18E-03	8 37E-03		
Sn-126	1 1489E-05	316 46	632 91	0 00E+00	3 64E-03	7 27E-03		
Sr-90	6 6872E-01	316 46	632 91	0 00E+00	2 12E+02	4 23E+02		
Tc-99	4 6639E-04	316 46	632 91	0 00E+00	1 48E-01	2 95E-01		
Th-229	2 3727E-11	316 46	632 91	0 00E+00	7 51E-09	1 50E-08		
Th-230	2 7354E-10	316 46	632 91	0 00E+00	8 66E-08	1 73E-07		
Th-232	8 3594E-12	316 46	632 91	0 00E+00	2 65E-09	5 29E-09		
Ti-208	1 6228E-08	316 46	632 91	0 00E+00	5 14E-06	1 03E-05		
U-232	4 3960E-08	316 46	632 91	0 00E+00	1 39E-05	2 78E-05	Thermal Power	
U-233	3 3344E-09	316 46	632 91	0 00E+00	1 06E-06	2 11E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	4 0749E-07	316 46	632 91	0 00E+00	1 29E-04	2 58E-04	2 58E+00	5 16E+00
U-235	-2 7761E-06	316 46	0 00	1 18E-01	1 17E-01	1 18E-01	Total	Total
U-236	1 6190E-05	316 46	632 91	0 00E+00	5 12E-03	1 02E-02		
U-238	-2 8547E-09	316 46	0 00	1 35E-03	1 35E-03	1 35E-03		
Y-90	6 6889E-01	316 46	632 91	0 00E+00	2 12E+02	4 23E+02		
Other Radionuclides					2 88E+02	5 75E+02		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons This fuel matches on all parameters except cladding (SST is conservative)
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	HASTELLOY	SST	
BOL HM Constituents	U	U	
BOL Enrichment %	93 143	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal		316 46	
Bounding		632 91	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1 00
Nominal	0 12		
Bounding	0 23		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: MNR (UALX-HEU) CANADA
SNF ID #: 614
Fuel Units & Descr: 83 - 18 CURVED PLATES
Heavy Metal Mass: BOL=14 782kg EOL=10 433kg
ROD Storage Site: SRS

¹Fuel decay start date: 2008
Estimates as of 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated
Canister usage:
18"x10"
2 31

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6 6313E-10	4,118 78	8,237 55	0 00E+00	2 73E-06	5 46E-06	Avg MeV	
Am-241	2 0060E-03	4,118 78	8,237 55	0 00E+00	8 26E+00	1 65E+01	0 0150	8 695E+14
Am-242m	4 2429E-07	4,118 78	8,237 55	0 00E+00	1 75E-03	3 50E-03	0 0250	1 808E+14
Am-243	1 4899E-06	4,118 78	8,237 55	0 00E+00	6 14E-03	1 23E-02	0 0375	1 577E+14
C-14	5 7135E-09	4,118 78	8,237 55	0 00E+00	2 35E-05	4 71E-05	0 0575	1 689E+14
Cl-36	1 3124E-32	4,118 78	8,237 55	0 00E+00	5 41E-29	1 08E-28	0 0850	1 021E+14
Cm-243	1 6443E-07	4,118 78	8,237 55	0 00E+00	6 77E-04	1 35E-03	0 1250	6 907E+13
Cm-244	2 9330E-05	4,118 78	8,237 55	0 00E+00	1 21E-01	2 42E-01	0 2250	8 808E+13
Co-60	5 3186E-06	4,118 78	8,237 55	0 00E+00	2 19E-02	4 38E-02	0 3750	3 834E+13
Cs-134	3 1563E-03	4,118 78	8,237 55	0 00E+00	1 30E+01	2 60E+01	0 5750	6 254E+14
Cs-135	3 4477E-06	4,118 78	8,237 55	0 00E+00	1 42E-02	2 84E-02	0 8500	1 057E+13
Cs-137	2 0313E+00	4,118 78	8,237 55	0 00E+00	8 37E+03	1 67E+04	1 2500	6 037E+12
Eu-154	2 4513E-02	4,118 78	8,237 55	0 00E+00	1 01E+02	2 02E+02	1 7500	2 771E+11
Eu-155	4 8175E-03	4,118 78	8,237 55	0 00E+00	1 98E+01	3 97E+01	2 2500	2 431E+07
Fe-55	1 2397E-04	4,118 78	8,237 55	0 00E+00	5 11E-01	1 02E+00	2 7500	1 374E+07
H-3	4 5697E-03	4,118 78	8,237 55	0 00E+00	1 88E+01	3 76E+01	3 5000	6 313E+04
I-129	7 5300E-07	4,118 78	8,237 55	0 00E+00	3 10E-03	6 20E-03	5 0000	3 569E+03
Kr-85	1 0850E-01	4,118 78	8,237 55	0 00E+00	4 47E+02	8 94E+02	7 0000	3 940E+02
Np-237	9 5561E-06	4,118 78	8,237 55	0 00E+00	3 94E-02	7 87E-02	11 0000	4 416E+01
Pa-231	2 0359E-09	4,118 78	8,237 55	0 00E+00	8 39E-06	1 68E-05		
Pb-210	4 9728E-11	4,118 78	8,237 55	0 00E+00	2 05E-07	4 10E-07		
Pm-147	4 8502E-02	4,118 78	8,237 55	0 00E+00	2 00E+02	4 00E+02		
Pu-238	1 8254E-02	4,118 78	8,237 55	0 00E+00	7 52E+01	1 50E+02		
Pu-239	4 2810E-04	4,118 78	8,237 55	0 00E+00	1 76E+00	3 53E+00		
Pu-240	2 4368E-04	4,118 78	8,237 55	0 00E+00	1 00E+00	2 01E+00		
Pu-241	3 3415E-02	4,118 78	8,237 55	0 00E+00	1 38E+02	2 75E+02		
Pu-242	3 6329E-07	4,118 78	8,237 55	0 00E+00	1 50E-03	2 99E-03		
Ra-226	2 2854E-10	4,118 78	8,237 55	0 00E+00	9 41E-07	1 88E-06		
Ra-228	1 2426E-14	4,118 78	8,237 55	0 00E+00	5 12E-11	1 02E-10		
Ru-106	6 3589E-06	4,118 78	8,237 55	0 00E+00	2 62E-02	5 24E-02		
Se-79	1 2933E-05	4,118 78	8,237 55	0 00E+00	5 33E-02	1 07E-01		
Sn-126	1 1574E-05	4,118 78	8,237 55	0 00E+00	4 77E-02	9 53E-02		
Sr-90	1 9248E+00	4,118 78	8,237 55	0 00E+00	7 93E+03	1 59E+04		
Tc-99	4 2239E-04	4,118 78	8,237 55	0 00E+00	1 74E+00	3 48E+00		
Th-229	5 0953E-12	4,118 78	8,237 55	0 00E+00	2 10E-08	4 20E-08		
Th-230	4 1885E-08	4,118 78	8,237 55	0 00E+00	1 73E-04	3 45E-04		
Th-232	1 9270E-14	4,118 78	8,237 55	0 00E+00	7 94E-11	1 59E-10		
Ti-208	4 6024E-08	4,118 78	8,237 55	0 00E+00	1 90E-04	3 79E-04		
U-232	1 2582E-07	4,118 78	8,237 55	0 00E+00	5 18E-04	1 04E-03		
U-233	2 5825E-09	4,118 78	8,237 55	0 00E+00	1 06E-05	2 13E-05		
U-234	1 8450E-04	4,118 78	8,237 55	0 00E+00	7 60E-01	1 52E+00		
U-235	-2 7235E-06	4,118 78	0 00	2 97E-02	1 85E-02	2 97E-02		
U-236	1 5493E-05	4,118 78	8,237 55	0 00E+00	6 38E-02	1 28E-01		
U-238	-4 2851E-09	4,118 78	0 00	3 42E-04	3 24E-04	3 42E-04		
Y-90	1 9254E+00	4,118 78	8,237 55	0 00E+00	7 93E+03	1 59E+04		
Other Radionuclides					7 97E+03	1 59E+04		

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 %	93 11672336	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		4,118 78	
Bounding		8 237 55	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup.

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.89		
Bounding	1.77		1.02

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: MNR (UALX-HEU) CANADA
SNF ID #: 1064
Fuel Units & Descr: 11 - 18 CURVED PLATES
Heavy Metal Mass BOL=1.959kg EOL=1.383kg
ROD Storage Site SRS

*Fuel decay start date 2006
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
*Template Burnup (MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage*
18"x10"
0.31

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	545.86	1,091.72	0.00E+00	3.62E-07	7.24E-07	Avg. MeV	
Am-241	2.0060E-03	545.86	1,091.72	0.00E+00	1.09E+00	2.19E+00	0.0150	1.152E+14
Am-242m	4.2429E-07	545.86	1,091.72	0.00E+00	2.32E-04	4.63E-04	0.0250	2.396E+13
Am-243	1.4899E-06	545.86	1,091.72	0.00E+00	8.13E-04	1.63E-03	0.0375	2.090E+13
C-14	5.7135E-09	545.86	1,091.72	0.00E+00	3.12E-06	6.24E-06	0.0575	2.239E+13
Cl-36	1.3124E-32	545.86	1,091.72	0.00E+00	7.16E-30	1.43E-29	0.0850	1.353E+13
Cm-243	1.6443E-07	545.86	1,091.72	0.00E+00	8.98E-05	1.80E-04	0.1250	9.154E+12
Cm-244	2.9330E-05	545.86	1,091.72	0.00E+00	1.60E-02	3.20E-02	0.2250	1.167E+13
Co-60	5.3186E-06	545.86	1,091.72	0.00E+00	2.90E-03	5.81E-03	0.3750	5.081E+12
Cs-134	3.1563E-03	545.86	1,091.72	0.00E+00	1.72E+00	3.45E+00	0.5750	8.289E+13
Cs-135	3.4477E-06	545.86	1,091.72	0.00E+00	1.88E-03	3.76E-03	0.8500	1.401E+12
Cs-137	2.0313E+00	545.86	1,091.72	0.00E+00	1.11E+03	2.22E+03	1.2500	8.001E+11
Eu-154	2.4513E-02	545.86	1,091.72	0.00E+00	1.34E+01	2.68E+01	1.7500	3.673E+10
Eu-155	4.8175E-03	545.86	1,091.72	0.00E+00	2.63E+00	5.26E+00	2.2500	3.222E+06
Fe-55	1.2397E-04	545.86	1,091.72	0.00E+00	6.77E-02	1.35E-01	2.7500	1.821E+06
H-3	4.5697E-03	545.86	1,091.72	0.00E+00	2.49E+00	4.99E+00	3.5000	8.367E+03
I-129	7.5300E-07	545.86	1,091.72	0.00E+00	5.92E+01	1.18E+02	7.0000	5.222E+01
Kr-85	1.0850E-01	545.86	1,091.72	0.00E+00	5.22E-03	1.04E-02	11.0000	5.853E+00
Np-237	9.5561E-06	545.86	1,091.72	0.00E+00	1.11E-06	2.22E-06		
Pa-231	2.0359E-09	545.86	1,091.72	0.00E+00	2.71E-08	5.43E-08		
Pb-210	4.9728E-11	545.86	1,091.72	0.00E+00	2.65E+01	5.30E+01		
Pm-147	4.8502E-02	545.86	1,091.72	0.00E+00	9.96E+00	1.99E+01		
Pu-238	1.8254E-02	545.86	1,091.72	0.00E+00	2.34E-01	4.67E-01		
Pu-239	4.2810E-04	545.86	1,091.72	0.00E+00	1.33E-01	2.66E-01		
Pu-240	2.4368E-04	545.86	1,091.72	0.00E+00	1.82E+01	3.65E+01		
Pu-241	3.3415E-02	545.86	1,091.72	0.00E+00	1.98E-04	3.97E-04		
Pu-242	3.6329E-07	545.86	1,091.72	0.00E+00	1.25E-07	2.50E-07		
Ra-226	2.2854E-10	545.86	1,091.72	0.00E+00	6.78E-12	1.36E-11		
Ra-228	1.2426E-14	545.86	1,091.72	0.00E+00	3.47E-03	6.94E-03		
Ru-106	6.3589E-06	545.86	1,091.72	0.00E+00	7.06E-03	1.41E-02		
Se-79	1.2933E-05	545.86	1,091.72	0.00E+00	6.32E-03	1.26E-02		
Sn-126	1.1574E-05	545.86	1,091.72	0.00E+00	1.05E+03	2.10E+03		
Sr-90	1.9248E+00	545.86	1,091.72	0.00E+00	2.31E-01	4.61E-01		
Tc-99	4.2239E-04	545.86	1,091.72	0.00E+00	2.78E-09	5.56E-09		
Th-229	5.0953E-12	545.86	1,091.72	0.00E+00	2.29E-05	4.57E-05		
Th-230	4.1885E-08	545.86	1,091.72	0.00E+00	1.05E-11	2.10E-11		
Th-232	1.9270E-14	545.86	1,091.72	0.00E+00	2.51E-05	5.02E-05		
Ti-208	4.6024E-08	545.86	1,091.72	0.00E+00	6.87E-05	1.37E-04		
U-232	1.2582E-07	545.86	1,091.72	0.00E+00	1.41E-06	2.82E-06		
U-233	2.5825E-09	545.86	1,091.72	0.00E+00	1.01E-01	2.01E-01		
U-234	1.8450E-04	545.86	0.00	3.94E-03	2.46E-03	3.94E-03		
U-235	-2.7235E-06	545.86	0.00	4.53E-05	8.46E-03	1.69E-02		
U-236	1.5493E-05	545.86	0.00	4.30E-05	4.30E-05	4.53E-05		
U-238	-4.2851E-09	545.86	1,091.72	0.00E+00	1.05E+03	2.10E+03		
Y-90	1.9254E+00	545.86	1,091.72	0.00E+00	1.06E+03	2.11E+03		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	LIGHT WATER
Fuel Cladding:	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93.11672336	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		545.86
Bounding		1,091.72

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	0.89	
Bounding	1.77	

Estimated EOL HM/Given EOL HM

1.02

*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 MURR (UALX) COLUMBIA
SNF ID #: 144
Fuel Units & Descr: 972 - 24 CURVED PLATES
Heavy Metal Mass BOL=807 732kg; EOL=704 311kg
ROD Storage Site SRS

¹Fuel decay start date 2035
Estimates as of 2030

Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 5 years

Estimated
Canister usage:
18"x10"
40 50

II. Estimates	m	x _a	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	97,941.50	195,883.01	0.00E+00	1.42E-05	2.85E-05	Avg. MeV	
Am-241	1.1190E-03	97,941.50	195,883.01	0.00E+00	1.10E+02	2.19E+02	0.0150	3.779E+16
Am-242m	4.5425E-07	97,941.50	195,883.01	0.00E+00	4.45E-02	8.90E-02	0.0250	8.142E+15
Am-243	1.4921E-06	97,941.50	195,883.01	0.00E+00	1.46E-01	2.92E-01	0.0375	7.513E+15
C-14	5.7244E-09	97,941.50	195,883.01	0.00E+00	5.61E-04	1.12E-03	0.0575	7.387E+15
Cl-36	1.3124E-32	97,941.50	195,883.01	0.00E+00	1.29E-27	2.57E-27	0.0850	4.710E+15
Cm-243	2.3676E-07	97,941.50	195,883.01	0.00E+00	2.32E-02	4.64E-02	0.1250	4.078E+15
Cm-244	5.2042E-05	97,941.50	195,883.01	0.00E+00	5.10E+00	1.02E+01	0.2250	3.992E+15
Co-60	3.8208E-05	97,941.50	195,883.01	0.00E+00	3.74E+00	7.48E+00	0.3750	1.932E+15
Cs-134	4.8693E-01	97,941.50	195,883.01	0.00E+00	4.77E+04	9.54E+04	0.5750	2.654E+16
Cs-135	3.4477E-06	97,941.50	195,883.01	0.00E+00	3.38E-01	6.75E-01	0.8500	3.717E+15
Cs-137	2.8731E+00	97,941.50	195,883.01	0.00E+00	2.81E+05	5.63E+05	1.2500	6.915E+14
Eu-154	8.2053E-02	97,941.50	195,883.01	0.00E+00	8.04E+03	1.61E+04	1.7500	2.900E+13
Eu-155	3.9134E-02	97,941.50	195,883.01	0.00E+00	3.83E+03	7.67E+03	2.2500	6.082E+13
Fe-55	6.7429E-03	97,941.50	195,883.01	0.00E+00	6.60E+02	1.32E+03	2.7500	3.499E+11
H-3	1.0599E-02	97,941.50	195,883.01	0.00E+00	1.04E+03	2.08E+03	3.5000	3.881E+10
I-129	7.5300E-07	97,941.50	195,883.01	0.00E+00	7.37E-02	1.47E-01	5.0000	1.161E+05
Kr-85	2.8595E-01	97,941.50	195,883.01	0.00E+00	2.80E+04	5.60E+04	7.0000	1.294E+04
Np-237	9.5479E-06	97,941.50	195,883.01	0.00E+00	9.35E-01	1.87E+00	11.0000	1.458E+03
Pa-231	8.9297E-10	97,941.50	195,883.01	0.00E+00	8.75E-05	1.75E-04		
Pb-210	3.7609E-12	97,941.50	195,883.01	0.00E+00	3.68E-07	7.37E-07		
Pm-147	2.5452E+00	97,941.50	195,883.01	0.00E+00	2.49E+05	4.99E+05		
Pu-238	2.0550E-02	97,941.50	195,883.01	0.00E+00	2.01E+03	4.03E+03		
Pu-239	4.2838E-04	97,941.50	195,883.01	0.00E+00	4.20E+01	8.39E+01		
Pu-240	2.4401E-04	97,941.50	195,883.01	0.00E+00	2.39E+01	4.78E+01		
Pu-241	6.8764E-02	97,941.50	195,883.01	0.00E+00	6.73E+03	1.35E+04		
Pu-242	3.6329E-07	97,941.50	195,883.01	0.00E+00	3.56E-02	7.12E-02		
Ra-226	3.8045E-11	97,941.50	195,883.01	0.00E+00	3.73E-06	7.45E-06		
Ra-228	2.9902E-15	97,941.50	195,883.01	0.00E+00	2.93E-10	5.86E-10		
Ru-106	1.9055E-01	97,941.50	195,883.01	0.00E+00	1.87E+04	3.73E+04		
Se-79	1.2936E-05	97,941.50	195,883.01	0.00E+00	1.27E+00	2.53E+00		
Sn-126	1.1574E-05	97,941.50	195,883.01	0.00E+00	1.13E+00	2.27E+00		
Sc-90	2.7505E+00	97,941.50	195,883.01	0.00E+00	2.69E+05	5.39E+05		
Tc-99	4.2239E-04	97,941.50	195,883.01	0.00E+00	4.14E+01	8.27E+01		
Th-229	1.8848E-12	97,941.50	195,883.01	0.00E+00	1.85E-07	3.69E-07		
Th-230	1.7042E-08	97,941.50	195,883.01	0.00E+00	1.67E-03	3.34E-03		
Th-232	7.8132E-15	97,941.50	195,883.01	0.00E+00	7.65E-10	1.53E-09		
Ti-208	4.4063E-08	97,941.50	195,883.01	0.00E+00	4.32E-03	8.63E-03		
U-232	1.3151E-07	97,941.50	195,883.01	0.00E+00	1.29E-02	2.58E-02		
U-233	1.9564E-09	97,941.50	195,883.01	0.00E+00	1.92E-04	3.83E-04		
U-234	1.8371E-04	97,941.50	195,883.01	0.00E+00	1.80E+01	3.60E+01		
U-235	-2.7235E-06	97,941.50	0.00	1.63E+00	1.36E+00	1.63E+00		
U-236	1.5493E-05	97,941.50	195,883.01	0.00E+00	1.52E+00	3.03E+00		
U-238	-4.2851E-09	97,941.50	0.00	1.83E-02	1.79E-02	1.83E-02		
Y-90	2.7505E+00	97,941.50	195,883.01	0.00E+00	2.69E+05	5.39E+05		
Other Radionuclides					5.04E+05	1.01E+06		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	93.26113117	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
	Nominal	97,941.50	
	Bounding	195,883.01	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	0.39	
	Bounding	0.77	1.01

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

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

I. Fuel and Template Information

File Name: MURR (ULAX HEU) COLUMBIA

SNF ID # 143

Fuel Units & Descr 312 - 24 CURVED PLATES

Heavy Metal Mass BOL=259.022kg EOL=213.065kg

ROD Storage Site SRS

Fuel decay start date ^a	1990
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Estimates as of:

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

²Template Burnup(MWd)

367.2

Template BOL Heavy Metal Mass (MT)

0 00116689

Template Decay Time

35 years

Estimated Canister usage	18"x10'	13.00
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II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	43,522.74	87,045.48	0 00E+00	8 73E-05	1 75E-04	Avg MeV	
Am-241	2 5251E-03	43,522.74	87,045.48	0 00E+00	1 10E+02	2 20E+02	0 0150	6 411E+15
Am-242m	3 9624E-07	43,522.74	87,045.48	0 00E+00	1 72E-02	3 45E-02	0 0250	1 331E+15
Am-243	1 4880E-06	43,522.74	87,045.48	0 00E+00	6 48E-02	1 30E-01	0 0375	1 157E+15
C-14	5 7053E-09	43,522.74	87,045.48	0 00E+00	4 97E-04	9 97E-04	0 0575	1 245E+15
Ct-36	1 3124E-32	43,522.74	87,045.48	0 00E+00	5 71E-28	1 14E-27	0 0850	7 504E+14
Cm-243	1 1419E-07	43,522.74	87,045.48	0 00E+00	4 97E-03	9 94E-03	0 1250	4 957E+14
Cm-244	1 6522E-05	43,522.74	87,045.48	0 00E+00	7 19E-01	1 44E+00	0 2250	6 479E+14
Co-60	7 4047E-07	43,522.74	87,045.48	0 00E+00	3 22E-02	6 45E-02	0 3750	2 819E+14
Cs-134	2 0455E-05	43,522.74	87,045.48	0 00E+00	8 90E-01	1 78E+00	0 5750	4 658E+15
Cs-135	3 4477E-06	43,522.74	87,045.48	0 00E+00	1 50E-01	3 00E-01	0 8500	5 690E+13
Cs-137	1 4365E+00	43,522.74	87,045.48	0 00E+00	6 25E+04	1 25E+05	1 2500	2 752E+13
Eu-154	7 3230E-03	43,522.74	87,045.48	0 00E+00	3 19E+02	6 37E+02	1 7500	1 549E+12
Eu-155	9 9259E-04	43,522.74	87,045.48	0 00E+00	2 58E+01	5 16E+01	2 2500	1 295E+08
Fe-55	2 2791E-06	43,522.74	87,045.48	0 00E+00	9 92E-02	1 98E-01	2 7500	1 236E+08
H-3	1 9698E-03	43,522.74	87,045.48	0 00E+00	8 57E+01	1 71E+02	3 5000	7 163E+04
I-129	7 5300E-07	43,522.74	87,045.48	0 00E+00	3 28E-02	6 55E-02	5 0000	2 927E+04
Kr-85	4 1176E-02	43,522.74	87,045.48	0 00E+00	1 79E+03	3 58E+03	7 0000	3 203E+03
Np-237	9 5752E-06	43,522.74	87,045.48	0 00E+00	4 17E-01	8 33E-01	11 0000	3 571E+02
Pa-231	3 9379E-09	43,522.74	87,045.48	0 00E+00	1 71E-04	3 43E-04		
Pb-210	3 3115E-10	43,522.74	87,045.48	0 00E+00	1 44E-05	2 88E-05		
Pm-147	9 2402E-04	43,522.74	87,045.48	0 00E+00	4 02E+01	8 04E+01		
Pu-238	1 6217E-02	43,522.74	87,045.48	0 00E+00	7 06E+02	1 41E+03		
Pu-239	4 2810E-04	43,522.74	87,045.48	0 00E+00	1 86E+01	3 73E+01		
Pu-240	2 4333E-04	43,522.74	87,045.48	0 00E+00	1 06E+01	2 12E+01		
Pu-241	1 6242E-02	43,522.74	87,045.48	0 00E+00	7 07E+02	1 41E+03		
Pu-242	3 6319E-07	43,522.74	87,045.48	0 00E+00	1 58E-02	3 16E-02		
Ra-226	9 0114E-10	43,522.74	87,045.48	0 00E+00	3 92E-05	7 84E-05		
Ra-228	3 1019E-14	43,522.74	87,045.48	0 00E+00	1 35E-09	2 70E-09		
Ru-106	2 1225E-10	43,522.74	87,045.48	0 00E+00	9 24E-06	1 85E-05		
Se-79	1 2930E-05	43,522.74	87,045.48	0 00E+00	5 63E-01	1 13E+00		
Sn-126	1 1571E-05	43,522.74	87,045.48	0 00E+00	5 04E-01	1 01E+00		
Sr-90	1 3472E+00	43,522.74	87,045.48	0 00E+00	5 86E+04	1 17E+05		
Tc-99	4 2239E-04	43,522.74	87,045.48	0 00E+00	1 84E+01	3 68E+01		
Th-229	1 2407E-11	43,522.74	87,045.48	0 00E+00	5 40E-07	1 08E-06		
Th-230	8 3497E-08	43,522.74	87,045.48	0 00E+00	3 63E-03	7 27E-03		
Th-232	3 8371E-14	43,522.74	87,045.48	0 00E+00	1 67E-09	3 34E-09		
Ti-208	4 0414E-08	43,522.74	87,045.48	0 00E+00	1 76E-03	3 52E-03		
Ti-208	4 0414E-08	43,522.74	87,045.48	0 00E+00	1 76E-03	3 52E-03		
U-232	1 0948E-07	43,522.74	87,045.48	0 00E+00	4 76E-03	9 53E-03		
U-233	3 6275E-09	43,522.74	87,045.48	0 00E+00	1 58E-04	3 16E-04		
U-234	1 8562E-04	43,522.74	87,045.48	0 00E+00	8 08E+00	1 62E+01		
U-235	-2 7235E-06	43,522.74	0.00	5 21E-01	4 03E-01	5 21E-01		
U-236	1 5493E-05	43,522.74	87,045.48	0 00E+00	6 74E-01	1 35E+00		
U-238	-4 2851E-09	43,522.74	0.00	5 97E-03	5 79E-03	5 97E-03		
Y-90	1 3475E+00	43,522.74	87,045.48	0 00E+00	5 86E+04	1 17E+05		
					5 96E+04	1 19E+05		
							Thermal Power	
							Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
							7 28E+02	1 46E+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:	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.137	60 to 100	

Burnup Summary (MWd) ^a		Basis for burnup used in estimate:
	From SFD	Estimated
Nominal		43,522.74
Bounding		87,045.48
		Nominal burnup calculated from the heavy metal mass destroyed
		Bounding burnup assumed to be twice nominal burnup

Checks		
	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.53	
Bounding	1.07	
		Estimated EOL HM/Given EOL HM
		1.01

Bounding	1.07	
¹ Reactor shutdown, core removal, storage, shipping or other date confirming that irradiation ceased for fuel		

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: N.S. SAVANNAH (UO2)
SNF ID #: 854
Fuel Units & Descr: 12 - UNKNOWN
Heavy Metal Mass: BOL= , EOL=21 09kg
ROD Storage Site: INEEL

¹Fuel decay start date: 1963
Estimates as of: 2030
Template: PWR (Light Water Zirc, 0 to 5%, U)
²Template Burnup(MWd): 61 92
Template BOL Heavy Metal Mass (MT) 0 00176911
Template Decay Time: 65 years

Estimated
Canister usage:
18"x10"
12 00

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.2581E-09	31 68	31 68	0 00E+00	3 99E-08	3 99E-08	Avg MeV	
Am-241	1 4761E-01	31 68	31 68	0 00E+00	4 68E+00	4 68E+00	0 0150	8 578E+11
Am-242m	2 5032E-04	31 68	31 68	0 00E+00	7 93E-03	7 93E-03	0 0250	1 704E+11
Am-243	6 2387E-04	31 68	31 68	0 00E+00	1 98E-02	1 98E-02	0 0375	1 593E+11
C-14	4 7739E-05	31 68	31 68	0 00E+00	1 51E-03	1 51E-03	0 0575	2 186E+11
Cl-36	8 0297E-07	31 68	31 68	0 00E+00	2 54E-05	2 54E-05	0 0850	9 324E+10
Cm-243	1 2099E-04	31 68	31 68	0 00E+00	3 83E-03	3 83E-03	0 1250	6 083E+10
Cm-244	1 5560E-02	31 68	31 68	0 00E+00	4 93E-01	4 93E-01	0 2250	7 932E+10
Co-60	4 9580E-05	31 68	31 68	0 00E+00	1 57E-03	1 57E-03	0 3750	3 432E+10
Cs-134	1 7022E-09	31 68	31 68	0 00E+00	5 39E-08	5 39E-08	0 5750	8 169E+11
Cs-135	1 4433E-05	31 68	31 68	0 00E+00	4 57E-04	4 57E-04	0 8500	6 549E+09
Cs-137	6 9929E-01	31 68	31 68	0 00E+00	2 22E+01	2 22E+01	1 2500	3 062E+09
Eu-154	1 8023E-03	31 68	31 68	0 00E+00	5 71E-02	5 71E-02	1 7500	1 761E+08
Eu-155	2 6793E-05	31 68	31 68	0 00E+00	8 49E-04	8 49E-04	2 2500	3 109E+04
Fe-55	1 4580E-08	31 68	31 68	0 00E+00	4 62E-07	4 62E-07	2 7500	1 543E+05
H-3	3 8566E-03	31 68	31 68	0 00E+00	1 22E-01	1 22E-01	3 5000	7 694E+03
I-129	9 8288E-07	31 68	31 68	0 00E+00	3 11E-05	3 11E-05	5 0000	3 286E+03
Kr-85	4 0617E-03	31 68	31 68	0 00E+00	1 29E-01	1 29E-01	7 0000	3 783E+02
Np-237	1 2645E-05	31 68	31 68	0 00E+00	4 01E-04	4 01E-04	11 0000	4 342E+01
Pa-231	1 6376E-09	31 68	31 68	0 00E+00	5 19E-08	5 19E-08		
Pb-210	2 8795E-10	31 68	31 68	0 00E+00	9 12E-09	9 12E-09		
Pm-147	1 3264E-07	31 68	31 68	0 00E+00	4 20E-06	4 20E-06		
Pu-238	5 8882E-02	31 68	31 68	0 00E+00	1 87E+00	1 87E+00		
Pu-239	1 1613E-02	31 68	31 68	0 00E+00	3 68E-01	3 68E-01		
Pu-240	1 5142E-02	31 68	31 68	0 00E+00	4 80E-01	4 80E-01		
Pu-241	2 1269E-01	31 68	31 68	0 00E+00	6 74E+00	6 74E+00		
Pu-242	6 4260E-05	31 68	31 68	0 00E+00	2 04E-03	2 04E-03		
Ra-226	5 8689E-10	31 68	31 68	0 00E+00	1 86E-08	1 86E-08		
Ra-228	5 3036E-12	31 68	31 68	0 00E+00	1 68E-10	1 68E-10		
Ru-106	6 8136E-19	31 68	31 68	0 00E+00	2 16E-17	2 16E-17		
Se-79	1 2372E-05	31 68	31 68	0 00E+00	3 92E-04	3 92E-04		
Sn-126	2 5194E-05	31 68	31 68	0 00E+00	7 98E-04	7 98E-04		
Sr-90	4 4913E-01	31 68	31 68	0 00E+00	1 42E+01	1 42E+01		
Tc-99	3 9357E-04	31 68	31 68	0 00E+00	1 25E-02	1 25E-02		
Th-229	1 9331E-10	31 68	31 68	0 00E+00	6 13E-09	6 13E-09		
Th-230	3 5223E-08	31 68	31 68	0 00E+00	1 12E-06	1 12E-06		
Th-232	5 3085E-12	31 68	31 68	0 00E+00	1 68E-10	1 68E-10		
Ti-208	1 3102E-07	31 68	31 68	0 00E+00	4 15E-06	4 15E-06		
U-232	3 5497E-07	31 68	31 68	0 00E+00	1 12E-05	1 12E-05		
U-233	2 6647E-08	31 68	31 68	0 00E+00	8 44E-07	8 44E-07		
U-234	5 5023E-05	31 68	31 68	0 00E+00	1 74E-03	1 74E-03		
U-235	-1 4485E-06	31 68	0 00	1 46E-03	1 41E-03	1 46E-03		
U-236	7 5969E-06	31 68	31 68	0 00E+00	2 41E-04	2 41E-04		
U-238	-2 6129E-07	31 68	0 00	6 87E-03	6 86E-03	6 87E-03		
Y-90	4 4913E-01	31 68	31 68	0 00E+00	1 42E+01	1 42E+01		
Other Radionuclides					2 15E+01	2 15E+01		

III. Template Selection Summary, Burnup Summary, and Checks

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

Burnup Summary (MWd) ²			Basis for burnup used in estimate: Nominal burnup set equal to bounding burnup Bounding burnup taken from SFD and converted to MWd using BOL=21 123kg
Nominal	From SFD	Estimated	
Bounding		31 68	

Checks			Estimated EOL HM/Given EOL HM 1 00
Nominal	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Bounding	0 04	0 04	

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: NEREIDE (FRANCE)
SNF ID #: 751
Fuel Units & Descr: 46 - 12 CURVED PLATES
Heavy Metal Mass BOL: ; EOL=35 42kg
ROD Storage Site SRS

¹Fuel decay start date 1982
Estimates as of 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 35 years

Estimated
Canister usage:
18"x10"
1 92

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	2.0068E-09	21.27	42.53	0.00E+00	4.27E-08	8.54E-08	0.0150	3.134E+12
Am-241	2.5251E-03	21.27	42.53	0.00E+00	5.37E-02	1.07E-01	0.0250	6.505E+11
Am-242m	3.9624E-07	21.27	42.53	0.00E+00	8.43E-06	1.69E-05	0.0375	5.654E+11
Am-243	1.4880E-06	21.27	42.53	0.00E+00	3.16E-05	6.33E-05	0.0575	6.086E+11
C-14	5.7053E-09	21.27	42.53	0.00E+00	1.21E-07	2.43E-07	0.0850	3.669E+11
Cl-36	1.3124E-32	21.27	42.53	0.00E+00	2.79E-31	5.58E-31	0.1250	2.426E+11
Cm-243	1.1419E-07	21.27	42.53	0.00E+00	2.43E-06	4.86E-06	0.2250	3.180E+11
Cm-244	1.6522E-05	21.27	42.53	0.00E+00	3.51E-04	7.03E-04	0.3750	1.377E+11
Co-60	7.4047E-07	21.27	42.53	0.00E+00	1.57E-05	3.15E-05	0.5750	2.276E+12
Cs-134	2.0455E-05	21.27	42.53	0.00E+00	4.35E-04	8.70E-04	0.8500	2.780E+10
Cs-135	3.4477E-06	21.27	42.53	0.00E+00	7.33E-05	1.47E-04	1.2500	1.345E+10
Cs-137	1.4365E+00	21.27	42.53	0.00E+00	3.05E+01	6.11E+01	1.7500	7.568E+08
Eu-154	7.3230E-03	21.27	42.53	0.00E+00	1.56E-01	3.11E-01	2.2500	6.329E+04
Eu-155	5.9259E-04	21.27	42.53	0.00E+00	1.26E-02	2.52E-02	2.7500	6.040E+04
Fe-55	2.2791E-06	21.27	42.53	0.00E+00	4.85E-05	9.69E-05	3.5000	4.116E+01
H-3	1.9698E-03	21.27	42.53	0.00E+00	4.19E-02	8.38E-02	5.0000	1.689E+01
I-129	7.5300E-07	21.27	42.53	0.00E+00	1.60E-05	3.20E-05	7.0000	1.856E+00
Kr-85	4.1176E-02	21.27	42.53	0.00E+00	8.76E-01	1.75E+00	11.0000	2.075E-01
Np-237	9.5752E-06	21.27	42.53	0.00E+00	2.04E-04	4.07E-04		
Pa-231	3.9379E-09	21.27	42.53	0.00E+00	8.37E-08	1.67E-07		
Pb-210	3.3115E-10	21.27	42.53	0.00E+00	7.04E-09	1.41E-08		
Pm-147	9.2402E-04	21.27	42.53	0.00E+00	1.96E-02	3.93E-02		
Pu-238	1.6217E-02	21.27	42.53	0.00E+00	3.45E-01	6.90E-01		
Pu-239	4.2810E-04	21.27	42.53	0.00E+00	9.10E-03	1.82E-02		
Pu-240	2.4333E-04	21.27	42.53	0.00E+00	5.17E-03	1.03E-02		
Pu-241	1.6242E-02	21.27	42.53	0.00E+00	3.45E-01	6.91E-01		
Pu-242	3.6329E-07	21.27	42.53	0.00E+00	7.73E-06	1.55E-05		
Ra-226	9.0114E-10	21.27	42.53	0.00E+00	1.92E-08	3.83E-08		
Ra-228	3.1019E-14	21.27	42.53	0.00E+00	6.60E-13	1.32E-12		
Ru-106	2.1225E-10	21.27	42.53	0.00E+00	4.51E-09	9.03E-09		
Se-79	1.2930E-05	21.27	42.53	0.00E+00	2.75E-04	5.50E-04		
Sn-126	1.1571E-05	21.27	42.53	0.00E+00	2.46E-04	4.92E-04		
Sr-90	1.3472E+00	21.27	42.53	0.00E+00	2.86E+01	5.73E+01		
Tc-99	4.2239E-04	21.27	42.53	0.00E+00	8.98E-03	1.80E-02		
Th-229	1.2407E-11	21.27	42.53	0.00E+00	2.64E-10	5.28E-10		
Th-230	8.3497E-08	21.27	42.53	0.00E+00	1.78E-06	3.55E-06		
Th-232	3.8371E-14	21.27	42.53	0.00E+00	8.16E-13	1.63E-12		
Ti-208	4.0414E-08	21.27	42.53	0.00E+00	8.59E-07	1.72E-06		
U-232	1.0948E-07	21.27	42.53	0.00E+00	2.33E-06	4.66E-06		
U-233	3.6275E-09	21.27	42.53	0.00E+00	7.71E-08	1.54E-07		
U-234	1.8562E-04	21.27	42.53	0.00E+00	3.95E-03	7.89E-03		
U-235	-2.7235E-06	21.27	0.00	7.06E-02	7.05E-02	7.06E-02		
U-236	1.5493E-05	21.27	42.53	0.00E+00	3.29E-04	6.59E-04		
U-238	-4.2851E-09	21.27	0.00	7.14E-04	7.14E-04	7.14E-04		
Y-90	1.3475E+00	21.27	42.53	0.00E+00	2.87E+01	5.73E+01		
Other Radionuclides					2.91E+01	5.82E+01		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %		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)²

	From SFD	Estimated
Nominal		21.27
Bounding		42.53

Basis for burnup used in estimate:

Nominal burnup taken from SFD and converted to MWd using BOL=35 442kg
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

0.98

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: NIST
SNF ID #: 154
Fuel Units & Descr: 980 - 17 CURVED PLATES
Heavy Metal Mass: BOL=367.5kg EOL=159.74kg
ROD Storage Site: SRS

Fuel decay start date: 1997
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum, 40 to 100%, U)
Template Burnup (MWd): 164.6
Template BOL Heavy Metal Mass (MT): 0.000377
Template Decay Time: 25 years

Estimated
Canister usage
18"x10"
27.22

II. Estimates

	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	5.4520E-10	191,368.36	338,505.35	0.00E+00	1.04E-04	1.85E-04	Avg MeV	
Am-241	9.2284E-03	191,368.36	338,505.35	0.00E+00	1.77E+03	3.12E+03	0.0150	3.173E+16
Am-242m	1.3390E-06	191,368.36	338,505.35	0.00E+00	2.56E-01	4.53E-01	0.0250	6.532E+15
Am-243	3.7084E-05	191,368.36	338,505.35	0.00E+00	7.10E+00	1.26E+01	0.0375	5.767E+15
C-14	2.6452E-08	191,368.36	338,505.35	0.00E+00	5.06E-03	8.95E-03	0.0575	6.151E+15
Cl-36	4.4441E-31	191,368.36	338,505.35	0.00E+00	8.50E-26	1.50E-25	0.0850	3.702E+15
Cm-243	5.0498E-06	191,368.36	338,505.35	0.00E+00	9.66E-01	1.71E+00	0.1250	2.569E+15
Cm-244	3.8451E-03	191,368.36	338,505.35	0.00E+00	7.36E+02	1.30E+03	0.2250	3.196E+15
Co-60	2.5225E-05	191,368.36	338,505.35	0.00E+00	4.83E+00	8.54E+00	0.3750	1.383E+15
Cs-134	1.9830E-03	191,368.36	338,505.35	0.00E+00	3.79E+02	6.71E+02	0.5750	2.294E+16
Cs-135	4.2564E-06	191,368.36	338,505.35	0.00E+00	8.15E-01	1.44E+00	0.8500	4.518E+14
Cs-137	1.8141E+00	191,368.36	338,505.35	0.00E+00	3.47E+05	6.14E+05	1.2500	3.049E+14
Eu-154	3.4733E-02	191,368.36	338,505.35	0.00E+00	6.65E+03	1.18E+04	1.7500	1.262E+13
Eu-155	7.1081E-03	191,368.36	338,505.35	0.00E+00	1.36E+03	2.41E+03	2.2500	6.803E+08
Fe-55	3.5790E-04	191,368.36	338,505.35	0.00E+00	6.85E+01	1.21E+02	2.7500	5.848E+08
H-3	3.4945E-03	191,368.36	338,505.35	0.00E+00	6.69E+02	1.18E+03	3.5000	2.008E+07
I-129	6.6403E-07	191,368.36	338,505.35	0.00E+00	1.27E-01	2.25E-01	5.0000	8.511E+06
Kr-85	7.8250E-02	191,368.36	338,505.35	0.00E+00	1.50E+04	2.65E+04	7.0000	9.762E+05
Np-237	3.1567E-05	191,368.36	338,505.35	0.00E+00	6.04E+00	1.07E+01	11.0000	1.118E+05
Pa-231	1.3372E-09	191,368.36	338,505.35	0.00E+00	2.56E-04	4.53E-04		
Pb-210	3.0644E-11	191,368.36	338,505.35	0.00E+00	5.86E-06	1.04E-05		
Pm-147	6.5188E-03	191,368.36	338,505.35	0.00E+00	1.25E+03	2.21E+03		
Pu-238	1.4769E-01	191,368.36	338,505.35	0.00E+00	2.83E+04	5.00E+04		
Pu-239	6.9502E-04	191,368.36	338,505.35	0.00E+00	1.33E+02	2.35E+02		
Pu-240	3.7928E-04	191,368.36	338,505.35	0.00E+00	7.26E+01	1.28E+02		
Pu-241	1.0565E-01	191,368.36	338,505.35	0.00E+00	2.02E+04	3.58E+04		
Pu-242	3.0911E-06	191,368.36	338,505.35	0.00E+00	5.92E-01	1.05E+00		
Ra-226	1.1081E-10	191,368.36	338,505.35	0.00E+00	2.12E-05	3.75E-05		
Ra-228	2.1185E-14	191,368.36	338,505.35	0.00E+00	4.05E-09	7.17E-09		
Ru-106	2.3621E-07	191,368.36	338,505.35	0.00E+00	4.52E-02	8.00E-02		
Se-79	1.2339E-05	191,368.36	338,505.35	0.00E+00	2.36E+00	4.18E+00		
Sn-126	1.0194E-05	191,368.36	338,505.35	0.00E+00	1.95E+00	3.45E+00		
Sr-90	1.6932E+00	191,368.36	338,505.35	0.00E+00	3.24E+05	5.73E+05		
Tc-99	3.8056E-04	191,368.36	338,505.35	0.00E+00	7.28E+01	1.29E+02		
Th-229	9.1252E-12	191,368.36	338,505.35	0.00E+00	1.75E-06	3.09E-06		
Th-230	1.5407E-08	191,368.36	338,505.35	0.00E+00	2.95E-03	5.22E-03		
Th-232	2.8937E-14	191,368.36	338,505.35	0.00E+00	5.54E-09	9.80E-09		
Ti-208	4.7272E-08	191,368.36	338,505.35	0.00E+00	9.05E-03	1.60E-02		
U-232	1.2855E-07	191,368.36	338,505.35	0.00E+00	2.46E-02	4.35E-02		
U-233	5.1470E-09	191,368.36	338,505.35	0.00E+00	9.85E-04	1.74E-03		
U-234	5.6069E-05	191,368.36	338,505.35	0.00E+00	1.07E+01	1.90E+01		
U-235	-2.8661E-06	191,368.36	0.00	7.41E-01	1.93E-01	7.41E-01		
U-236	1.6701E-05	191,368.36	338,505.35	0.00E+00	3.20E+00	5.65E+00		
U-238	-9.4194E-09	191,368.36	0.00	8.23E-03	6.43E-03	8.23E-03		
Y-90	1.6932E+00	191,368.36	338,505.35	0.00E+00	3.24E+05	5.73E+05		
Other Radionuclides					3.32E+05	5.88E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	HEAVY WATER	HEAVY WATER	
	ALUM	ALUM	
	U	U	
	93.33333333	40 to 100	

Burnup Summary (MWd) ³			Basis for burnup used in estimate:
	From SFD	Estimated	
	Nominal: 190,365.00	191,368.36	
	Bounding: 338,505.35	338,505.35	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: 1.19	1.03	
	Bounding: 2.11	1.78	

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name NIST (U308 HEU)
 SNF ID #: 752
 Fuel Units & Descr: 420 - 17 CURVED PLATES
 Heavy Metal Mass BOL=72 156kg EOL=33 894kg
 ROD Storage Site SRS

¹Fuel decay start date 1997
 Estimates as of 2030
 Template HFBR (Heavy Water, Alum, 40 to 100%, U)
²Template Burnup(MWd) 164.6
 Template BOL Heavy Metal Mass (MT) 0.000377
 Template Decay Time: 25 years

Estimated
 Canister usage
 18"x10"
 11.67

II. Estimates	m	x _m	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	5.4520E-10	35,243.24	66,463.11	0.00E+00	1.92E-05	3.62E-05	Avg MeV	
Am-241	9.2284E-03	35,243.24	66,463.11	0.00E+00	3.25E+02	6.13E+02	0.0150	6.231E+15
Am-242m	1.3390E-06	35,243.24	66,463.11	0.00E+00	4.72E-02	8.90E-02	0.0250	1.282E+15
Am-243	3.7084E-05	35,243.24	66,463.11	0.00E+00	1.31E+00	2.46E+00	0.0375	1.132E+15
C-14	2.6452E-08	35,243.24	66,463.11	0.00E+00	9.32E-04	1.76E-03	0.0575	1.208E+15
Cl-36	4.4441E-31	35,243.24	66,463.11	0.00E+00	1.57E-26	2.95E-26	0.0850	7.269E+14
Cm-243	5.0498E-06	35,243.24	66,463.11	0.00E+00	1.78E-01	3.36E-01	0.1250	5.044E+14
Cm-244	3.8451E-03	35,243.24	66,463.11	0.00E+00	1.36E+02	2.56E+02	0.2250	6.274E+14
Co-60	2.5225E-05	35,243.24	66,463.11	0.00E+00	8.89E-01	1.68E+00	0.3750	2.716E+14
Cs-134	1.9830E-03	35,243.24	66,463.11	0.00E+00	6.99E+01	1.32E+02	0.5750	4.504E+15
Cs-135	4.2564E-06	35,243.24	66,463.11	0.00E+00	1.50E-01	2.83E-01	0.8500	8.871E+13
Cs-137	1.8141E+00	35,243.24	66,463.11	0.00E+00	6.39E+04	1.21E+05	1.2500	5.987E+13
Eu-154	3.4733E-02	35,243.24	66,463.11	0.00E+00	1.22E+03	2.31E+03	1.7500	2.478E+12
Eu-155	7.1081E-03	35,243.24	66,463.11	0.00E+00	2.51E+02	4.72E+02	2.2500	1.336E+08
Fe-55	3.5790E-04	35,243.24	66,463.11	0.00E+00	1.26E+01	2.38E+01	2.7500	1.148E+08
H-3	3.4945E-03	35,243.24	66,463.11	0.00E+00	1.23E+02	2.32E+02	3.5000	3.942E+06
I-129	6.6403E-07	35,243.24	66,463.11	0.00E+00	2.76E+03	5.20E+03	7.0000	1.917E+05
Kr-85	7.8250E-02	35,243.24	66,463.11	0.00E+00	1.11E+00	2.10E+00	11.0000	2.195E+04
Np-237	3.1567E-05	35,243.24	66,463.11	0.00E+00	4.71E-05	8.89E-05		
Pa-231	1.3372E-09	35,243.24	66,463.11	0.00E+00	1.08E-06	2.04E-06		
Pb-210	3.0644E-11	35,243.24	66,463.11	0.00E+00	1.08E-06	2.04E-06		
Pm-147	6.5188E-03	35,243.24	66,463.11	0.00E+00	2.30E+02	4.33E+02		
Pu-238	1.4769E-01	35,243.24	66,463.11	0.00E+00	5.21E+03	9.82E+03		
Pu-239	6.9502E-04	35,243.24	66,463.11	0.00E+00	2.45E+01	4.62E+01		
Pu-240	3.7928E-04	35,243.24	66,463.11	0.00E+00	1.34E+01	2.52E+01		
Pu-241	1.0565E-01	35,243.24	66,463.11	0.00E+00	3.72E+03	7.02E+03		
Pu-242	3.0911E-06	35,243.24	66,463.11	0.00E+00	1.09E-01	2.05E-01		
Ra-226	1.1081E-10	35,243.24	66,463.11	0.00E+00	3.91E-06	7.37E-06		
Ra-228	2.1185E-14	35,243.24	66,463.11	0.00E+00	7.47E-10	1.41E-09		
Ru-106	2.3621E-07	35,243.24	66,463.11	0.00E+00	8.32E-03	1.57E-02		
Se-79	1.2339E-05	35,243.24	66,463.11	0.00E+00	4.35E-01	8.20E-01		
Sn-126	1.0194E-05	35,243.24	66,463.11	0.00E+00	3.59E-01	6.78E-01		
Sr-90	1.6932E+00	35,243.24	66,463.11	0.00E+00	5.97E+04	1.13E+05		
Tc-99	3.8056E-04	35,243.24	66,463.11	0.00E+00	1.34E+01	2.53E+01		
Th-229	9.1252E-12	35,243.24	66,463.11	0.00E+00	3.22E-07	6.06E-07		
Th-230	1.5407E-08	35,243.24	66,463.11	0.00E+00	5.43E-04	1.02E-03		
Th-232	2.8937E-14	35,243.24	66,463.11	0.00E+00	1.02E-09	1.92E-09		
Th-208	4.7272E-08	35,243.24	66,463.11	0.00E+00	1.67E-03	3.14E-03		
U-232	1.2855E-07	35,243.24	66,463.11	0.00E+00	4.53E-03	8.54E-03		
U-233	5.1470E-09	35,243.24	66,463.11	0.00E+00	1.81E-04	3.42E-04		
U-234	5.6069E-05	35,243.24	66,463.11	0.00E+00	1.98E+00	3.73E+00		
U-235	-2.8661E-06	35,243.24	0.00	1.45E-01	4.43E-02	1.45E-01		
U-236	1.6701E-05	35,243.24	66,463.11	0.00E+00	5.89E-01	1.11E+00		
U-238	-9.4194E-09	35,243.24	0.00	1.66E-03	1.32E-03	1.66E-03		
Y-90	1.6932E+00	35,243.24	66,463.11	0.00E+00	5.97E+04	1.13E+05		
Other Radionuclides					6.12E+04	1.15E+05		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	HEAVY WATER	HEAVY WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.17430199	40 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	43.29	35,243.24	
Bounding		66,463.11	

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	1.12	814.05	
Bounding	2.11		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: OHIO STATE (HEU)
 SNF ID #: 157
 Fuel Units & Descr: 24 - 18 FLAT PLATES
 Heavy Metal Mass: BOL=3.41kg, EOL=3.41kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1995
 Estimates as of: 2030
 Template: ATR (Light Water Alum, 60 to 100%, U)
²Template Burnup (MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 35 years

Estimated
 Canister usage:
 18"x10"
 0.67

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	64.59	129.19	0.00E+00	1.30E-07	2.59E-07	Avg. MeV	
Am-241	2.5251E-03	64.59	129.19	0.00E+00	1.63E-01	3.26E-01	0.0150	9.515E+12
Am-242m	3.9624E-07	64.59	129.19	0.00E+00	2.56E-05	5.12E-05	0.0250	1.976E+12
Am-243	1.4880E-06	64.59	129.19	0.00E+00	9.61E-05	1.92E-04	0.0375	1.717E+12
C-14	5.7053E-09	64.59	129.19	0.00E+00	3.69E-07	7.37E-07	0.0575	1.848E+12
Cl-36	1.3124E-32	64.59	129.19	0.00E+00	8.48E-31	1.70E-30	0.0850	1.114E+12
Cm-243	1.1419E-07	64.59	129.19	0.00E+00	7.38E-06	1.48E-05	0.1250	7.357E+11
Cm-244	1.6522E-05	64.59	129.19	0.00E+00	1.07E-03	2.13E-03	0.2250	9.616E+11
Co-60	7.4047E-07	64.59	129.19	0.00E+00	4.78E-05	9.57E-05	0.3750	4.183E+11
Cs-134	2.0455E-05	64.59	129.19	0.00E+00	1.32E-03	2.64E-03	0.5750	6.913E+12
Cs-135	3.4477E-06	64.59	129.19	0.00E+00	2.23E-04	4.45E-04	0.8500	8.445E+10
Cs-137	1.4365E+00	64.59	129.19	0.00E+00	9.28E+01	1.86E+02	1.2500	4.084E+10
Eu-154	7.3230E-03	64.59	129.19	0.00E+00	4.73E-01	9.46E-01	1.7500	2.299E+09
Eu-155	5.9259E-04	64.59	129.19	0.00E+00	3.83E-02	7.66E-02	2.2500	1.922E+05
Fe-55	2.2791E-06	64.59	129.19	0.00E+00	1.47E-04	2.94E-04	2.7500	1.834E+05
H-3	1.9698E-03	64.59	129.19	0.00E+00	1.27E-01	2.54E-01	3.5000	1.069E+02
I-129	7.5300E-07	64.59	129.19	0.00E+00	4.86E-05	9.73E-05	5.0000	4.368E+01
Kr-85	4.1176E-02	64.59	129.19	0.00E+00	2.66E+00	5.32E+00	7.0000	4.781E+00
Np-237	9.5752E-06	64.59	129.19	0.00E+00	6.19E-04	1.24E-03	11.0000	5.331E-01
Pa-231	3.9379E-09	64.59	129.19	0.00E+00	2.54E-07	5.09E-07		
Pb-210	3.3115E-10	64.59	129.19	0.00E+00	2.14E-08	4.28E-08		
Pm-147	9.2402E-04	64.59	129.19	0.00E+00	5.97E-02	1.19E-01		
Pu-238	1.6217E-02	64.59	129.19	0.00E+00	1.05E+00	2.10E+00		
Pu-239	4.2810E-04	64.59	129.19	0.00E+00	2.77E-02	5.53E-02		
Pu-240	2.4333E-04	64.59	129.19	0.00E+00	1.57E-02	3.14E-02		
Pu-241	1.6242E-02	64.59	129.19	0.00E+00	1.05E+00	2.10E+00		
Pu-242	3.6329E-07	64.59	129.19	0.00E+00	2.35E-05	4.69E-05		
Ra-226	9.0114E-10	64.59	129.19	0.00E+00	5.82E-08	1.16E-07		
Ra-228	3.1019E-14	64.59	129.19	0.00E+00	2.00E-12	4.01E-12		
Ru-106	2.1225E-10	64.59	129.19	0.00E+00	1.37E-08	2.74E-08		
Se-79	1.2930E-05	64.59	129.19	0.00E+00	8.35E-04	1.67E-03		
Sn-126	1.1571E-05	64.59	129.19	0.00E+00	7.47E-04	1.49E-03		
Sr-90	1.3472E+00	64.59	129.19	0.00E+00	8.70E+01	1.74E+02		
Tc-99	4.2239E-04	64.59	129.19	0.00E+00	2.73E-02	5.46E-02		
Th-229	1.2407E-11	64.59	129.19	0.00E+00	8.01E-10	1.60E-09		
Th-230	8.3497E-08	64.59	129.19	0.00E+00	5.39E-06	1.08E-05		
Th-232	3.8371E-14	64.59	129.19	0.00E+00	2.48E-12	4.96E-12		
Th-208	4.0414E-08	64.59	129.19	0.00E+00	2.61E-06	5.22E-06		
U-232	1.0948E-07	64.59	129.19	0.00E+00	7.07E-06	1.41E-05		
U-233	3.6275E-09	64.59	129.19	0.00E+00	2.34E-07	4.69E-07		
U-234	1.8562E-04	64.59	129.19	0.00E+00	1.20E-02	2.40E-02		
U-235	-2.7235E-06	64.59	0.00	6.87E-03	6.70E-03	6.87E-03		
U-236	1.5493E-05	64.59	129.19	0.00E+00	1.00E-03	2.00E-03		
U-238	-4.2851E-09	64.59	0.00	7.73E-05	7.70E-05	7.73E-05		
Y-90	1.3475E+00	64.59	129.19	0.00E+00	8.70E+01	1.74E+02		
Other Radionuclides					8.84E+01	1.77E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	93.25425219	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		64.59	
Bounding		129.19	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
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.06		
Bounding	0.12		0.98

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: OHIO STATE (LEU)
SNF ID #: 158
Fuel Units & Descr. 30 - 18 FLAT PLATES
Heavy Metal Mass BOL=26 151kg EOL=26 151kg
ROD Storage Site SRS

¹Fuel decay start date 2035
Estimates as of 2030
Template ATR (Light Water Alum, 60 to 100% U)
²Template 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							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1 4545E-10	495.31	990.62	0 00E+00	7 20E-08	1 44E-07	0.0150	1 911E+14
Am-241	1 1190E-03	495.31	990.62	0 00E+00	5 54E-01	1 11E+00	0.0250	4 117E+13
Am-242m	4 5425E-07	495.31	990.62	0 00E+00	2 25E-04	4 50E-04	0.0375	3 799E+13
Am-243	1 4921E-06	495.31	990.62	0 00E+00	7 39E-04	1 48E-03	0.0575	3 736E+13
C-14	5 7244E-09	495.31	990.62	0 00E+00	2 84E-06	5 67E-06	0.0850	2 382E+13
Cl-36	1 3124E-32	495.31	990.62	0 00E+00	6 50E-30	1 30E-29	0.1250	2 063E+13
Cm-243	2 3676E-07	495.31	990.62	0 00E+00	1 17E-04	2 35E-04	0.2250	2 019E+13
Cm-244	5 2042E-05	495.31	990.62	0 00E+00	2 58E-02	5 16E-02	0.3750	9 771E+12
Co-60	3 8208E-05	495.31	990.62	0 00E+00	1 89E-02	3 78E-02	0.5750	1 342E+14
Cs-134	4 8693E-01	495.31	990.62	0 00E+00	2 41E+02	4 82E+02	0.8500	1 880E+13
Cs-135	3 4477E-06	495.31	990.62	0 00E+00	1 71E-03	3 42E-03	1.2500	3 497E+12
Cs-137	2 8731E+00	495.31	990.62	0 00E+00	1 42E+03	2 85E+03	1.7500	1 466E+11
Eu-154	8 2053E-02	495.31	990.62	0 00E+00	4 06E+01	8 13E+01	2.2500	3 076E+11
Eu-155	3 9134E-02	495.31	990.62	0 00E+00	1 94E+01	3 88E+01	2.7500	1 770E+09
Fe-55	6 7429E-03	495.31	990.62	0 00E+00	3 34E+00	6 68E+00	3.5000	1 963E+08
H-3	1 0599E-02	495.31	990.62	0 00E+00	5 25E+00	1 05E+01	5.0000	6 030E+02
I-129	7 5300E-07	495.31	990.62	0 00E+00	3 73E-04	7 46E-04	7.0000	6 728E+01
Kr-85	2 8595E-01	495.31	990.62	0 00E+00	1 42E+02	2 83E+02	11.0000	7 588E+00
Np-237	9 5479E-06	495.31	990.62	0 00E+00	4 73E-03	9 46E-03		
Pa-231	8 9297E-10	495.31	990.62	0 00E+00	4 42E-07	8 85E-07		
Pb-210	3 7609E-12	495.31	990.62	0 00E+00	1 86E-09	3 73E-09		
Pm-147	2 5452E+00	495.31	990.62	0 00E+00	1 26E+03	2 52E+03		
Pu-238	2 0550E-02	495.31	990.62	0 00E+00	1 02E+01	2 04E+01		
Pu-239	4 2838E-04	495.31	990.62	0 00E+00	2 12E-01	4 24E-01		
Pu-240	2 4401E-04	495.31	990.62	0 00E+00	1 21E-01	2 42E-01		
Pu-241	6 8764E-02	495.31	990.62	0 00E+00	3 41E+01	6 81E+01		
Pu-242	3 6329E-07	495.31	990.62	0 00E+00	1 80E-04	3 60E-04		
Ra-226	3 8045E-11	495.31	990.62	0 00E+00	1 88E-08	3 77E-08		
Ra-228	2 9902E-15	495.31	990.62	0 00E+00	1 48E-12	2 96E-12		
Ru-106	1 9065E-01	495.31	990.62	0 00E+00	9 44E+01	1 89E+02		
Se-79	1 2936E-05	495.31	990.62	0 00E+00	6 41E-03	1 28E-02		
Sn-126	1 1574E-05	495.31	990.62	0 00E+00	5 73E-03	1 15E-02		
Sr-90	2 7505E+00	495.31	990.62	0 00E+00	1 36E+03	2 72E+03		
Tc-99	4 2239E-04	495.31	990.62	0 00E+00	2 09E-01	4 18E-01		
Th-229	1 8848E-12	495.31	990.62	0 00E+00	9 34E-10	1 87E-09		
Th-230	1 7042E-08	495.31	990.62	0 00E+00	8 44E-06	1 69E-05		
Th-232	7 8132E-15	495.31	990.62	0 00E+00	3 87E-12	7 74E-12		
Ti-208	4 4063E-08	495.31	990.62	0 00E+00	2 18E-05	4 36E-05		
U-232	1 3151E-07	495.31	990.62	0 00E+00	6 51E-05	1 30E-04		
U-233	1 9564E-09	495.31	990.62	0 00E+00	9 69E-07	1 94E-06		
U-234	1 8371E-04	495.31	990.62	0 00E+00	9 10E-02	1 82E-01		
U-235	-2 7235E-06	495.31	0 00	1 12E-02	9 82E-03	1 12E-02		
U-236	1 5493E-05	495.31	990.62	0 00E+00	7 67E-03	1 53E-02		
U-238	-4 2851E-09	495.31	0 00	7 05E-03	7 05E-03	7 05E-03		
Y-90	2 7505E+00	495.31	990.62	0 00E+00	1 36E+03	2 72E+03		
Other Radionuclides					2 55E+03	5 09E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
	LIGHT WATER	LIGHT WATER	
Reactor Moderator			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 76578383	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		495.31	
Bounding		990.62	Nominal burnup assumed to be 2% of BOL heavy metal mass. Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.06		
Bounding	0.12		0.98

*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: OMEGA WEST (204)
SNF ID #: 406
Fuel Units & Descr: 16 - 18 OR 19 FLAT PLATES
Heavy Metal Mass: BOL=3.264kg; EOL=2.525kg
ROD Storage Site: SRS

¹Fuel decay start date: 1992
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 35 years

Estimated
Canister usage:
18"x10"
0.67

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	848.64	1.021.63	0.00E+00	1.70E-06	2.05E-06	Avg MeV	
Am-241	2.5251E-03	848.64	1.021.63	0.00E+00	2.14E+00	2.58E+00	0.0150	7.524E+13
Am-242m	3.9624E-07	848.64	1.021.63	0.00E+00	3.36E-04	4.05E-04	0.0250	1.562E+13
Am-243	1.4880E-06	848.64	1.021.63	0.00E+00	1.26E-03	1.52E-03	0.0375	1.358E+13
C-14	5.7053E-09	848.64	1.021.63	0.00E+00	4.84E-06	5.83E-06	0.0575	1.462E+13
Cl-36	1.3124E-32	848.64	1.021.63	0.00E+00	1.11E-29	1.34E-29	0.0850	8.808E+12
Cm-243	1.1419E-07	848.64	1.021.63	0.00E+00	9.69E-05	1.17E-04	0.1250	5.818E+12
Cm-244	1.6522E-05	848.64	1.021.63	0.00E+00	1.40E-02	1.69E-02	0.2250	7.604E+12
Co-60	7.4047E-07	848.64	1.021.63	0.00E+00	6.28E-04	7.56E-04	0.3750	3.308E+12
Cs-134	2.0455E-05	848.64	1.021.63	0.00E+00	1.74E-02	2.09E-02	0.5750	5.467E+13
Cs-135	3.4477E-06	848.64	1.021.63	0.00E+00	2.93E-03	3.52E-03	0.8500	6.678E+11
Cs-137	1.4365E+00	848.64	1.021.63	0.00E+00	1.22E+03	1.47E+03	1.2500	3.230E+11
Eu-154	7.3230E-03	848.64	1.021.63	0.00E+00	6.21E+00	7.48E+00	1.7500	1.818E+10
Eu-155	5.9259E-04	848.64	1.021.63	0.00E+00	5.03E-01	6.05E-01	2.2500	1.520E+06
Fe-55	2.2791E-06	848.64	1.021.63	0.00E+00	1.93E-03	2.33E-03	2.7500	1.451E+06
H-3	1.9698E-03	848.64	1.021.63	0.00E+00	1.67E+00	2.01E+00	3.5000	8.408E+02
I-129	7.5300E-07	848.64	1.021.63	0.00E+00	6.39E-04	7.69E-04	5.0000	3.436E+02
Kr-85	4.1176E-02	848.64	1.021.63	0.00E+00	3.49E+01	4.21E+01	7.0000	3.760E+01
Np-237	9.5752E-06	848.64	1.021.63	0.00E+00	8.13E-03	9.78E-03	11.0000	4.192E+00
Pa-231	3.9379E-09	848.64	1.021.63	0.00E+00	3.34E-06	4.02E-06		
Pb-210	3.3115E-10	848.64	1.021.63	0.00E+00	2.81E-07	3.38E-07		
Pm-147	9.2402E-04	848.64	1.021.63	0.00E+00	7.84E-01	9.44E-01		
Pu-238	1.6217E-02	848.64	1.021.63	0.00E+00	1.38E+01	1.66E+01		
Pu-239	4.2810E-04	848.64	1.021.63	0.00E+00	3.63E-01	4.37E-01		
Pu-240	2.4333E-04	848.64	1.021.63	0.00E+00	2.06E-01	2.49E-01		
Pu-241	1.6242E-02	848.64	1.021.63	0.00E+00	1.38E+01	1.66E+01		
Pu-242	3.6329E-07	848.64	1.021.63	0.00E+00	3.08E-04	3.71E-04		
Ra-226	9.0114E-10	848.64	1.021.63	0.00E+00	7.65E-07	9.21E-07		
Ra-228	3.1019E-14	848.64	1.021.63	0.00E+00	2.63E-11	3.17E-11		
Ru-106	2.1225E-10	848.64	1.021.63	0.00E+00	1.80E-07	2.17E-07		
Se-79	1.2930E-05	848.64	1.021.63	0.00E+00	1.10E-02	1.32E-02		
Sn-126	1.1571E-05	848.64	1.021.63	0.00E+00	9.82E-03	1.18E-02		
Sr-90	1.3472E+00	848.64	1.021.63	0.00E+00	1.14E+03	1.38E+03		
Tc-99	4.2239E-04	848.64	1.021.63	0.00E+00	3.58E-01	4.32E-01		
Th-229	1.2407E-11	848.64	1.021.63	0.00E+00	1.05E-08	1.27E-08		
Th-230	8.3497E-08	848.64	1.021.63	0.00E+00	7.09E-05	8.53E-05		
Th-232	3.8371E-14	848.64	1.021.63	0.00E+00	3.26E-11	3.92E-11		
Ti-208	4.0414E-08	848.64	1.021.63	0.00E+00	3.43E-05	4.13E-05		
U-232	1.0948E-07	848.64	1.021.63	0.00E+00	9.29E-05	1.12E-04		
U-233	3.6275E-09	848.64	1.021.63	0.00E+00	3.08E-06	3.71E-06		
U-234	1.8562E-04	848.64	1.021.63	0.00E+00	1.58E-01	1.90E-01		
U-235	-2.7235E-06	848.64	0.00	6.57E-03	4.26E-03	6.57E-03		
U-236	1.5493E-05	848.64	1.021.63	0.00E+00	1.31E-02	1.58E-02		
U-238	-4.2851E-09	848.64	0.00	7.53E-05	7.16E-05	7.53E-05		
Y-90	1.3475E+00	848.64	1.021.63	0.00E+00	1.14E+03	1.38E+03		
Other Radionuclides					1.16E+03	1.40E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences ¹
Reactor Moderator:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93.1372549	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	848.64	700.04	
Bounding	1.021.63	1.400.07	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.83	0.82	
Bounding	0.99	1.37	0.96

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name OMEGA WEST (236)
 SNF ID # 407
 Fuel Units & Descr 44 - 18 OR 19 FLAT PLATES
 Heavy Metal Mass BOL=10.384kg EOL=7.264kg
 ROD Storage Site SRS
 Fuel decay start date 1992
 Estimates as of 2030
 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 35 years

Estimated
 Canister usage
 18"x10"
 1 83

II. Estimates	m	x _m	x _b	b	y _m	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	3.665 55	4,475.50	0.00E+00	7.36E-06	8.98E-06	Avg MeV	
Am-241	2.5251E-03	3,665 55	4,475.50	0.00E+00	9.26E+00	1.13E+01	0.0150	3.29E+14
Am-242m	3.9624E-07	3,665 55	4,475 50	0.00E+00	1.45E-03	1.77E-03	0.0250	6.84E+13
Am-243	1.4880E-06	3,665 55	4,475 50	0.00E+00	5.45E-03	6.66E-03	0.0375	5.94E+13
C-14	5.7053E-09	3,665 55	4,475 50	0.00E+00	2.09E-05	2.55E-05	0.0575	6.40E+13
Cl-36	1.3124E-32	3,665 55	4,475 50	0.00E+00	4.81E-29	5.87E-29	0.0850	3.85E+13
Cm-243	1.1419E-07	3,665 55	4,475 50	0.00E+00	4.19E-04	5.11E-04	0.1250	2.54E+13
Cm-244	1.6522E-05	3,665 55	4,475 50	0.00E+00	6.06E-02	7.39E-02	0.2250	3.33E+13
Co-60	7.4047E-07	3,665 55	4,475 50	0.00E+00	2.71E-03	3.31E-03	0.3750	1.44E+13
Cs-134	2.0455E-05	3,665 55	4,475 50	0.00E+00	7.50E-02	9.15E-02	0.5750	2.39E+14
Cs-135	3.4477E-06	3,665 55	4,475 50	0.00E+00	1.26E-02	1.54E-02	0.8500	2.92E+12
Cs-137	1.4365E+00	3,665 55	4,475 50	0.00E+00	5.27E+03	6.43E+03	1.2500	1.41E+12
Eu-154	7.3230E-03	3,665 55	4,475 50	0.00E+00	2.68E+01	3.28E+01	1.7500	7.96E+10
Eu-155	5.9259E-04	3,665 55	4,475 50	0.00E+00	2.17E+00	2.65E+00	2.2500	6.65E+06
Fe-55	2.2791E-06	3,665 55	4,475 50	0.00E+00	8.35E-03	1.02E-02	2.7500	6.35E+06
H-3	1.9698E-03	3,665 55	4,475 50	0.00E+00	7.22E+00	8.82E+00	3.5000	3.68E+03
I-129	7.5300E-07	3,665 55	4,475 50	0.00E+00	2.76E-03	3.37E-03	5.0000	1.50E+03
Kr-85	4.1176E-02	3,665 55	4,475 50	0.00E+00	1.51E+02	1.84E+02	7.0000	1.64E+02
Np-237	9.5752E-06	3,665 55	4,475 50	0.00E+00	3.51E-02	4.29E-02	11.0000	1.83E+01
Pa-231	3.9379E-09	3,665 55	4,475 50	0.00E+00	1.44E-05	1.76E-05		
Pb-210	3.3115E-10	3,665 55	4,475 50	0.00E+00	1.21E-06	1.48E-06		
Pm-147	9.2402E-04	3,665 55	4,475 50	0.00E+00	3.39E+00	4.14E+00		
Pu-238	1.6217E-02	3,665 55	4,475 50	0.00E+00	5.94E+01	7.26E+01		
Pu-239	4.2810E-04	3,665 55	4,475 50	0.00E+00	1.57E+00	1.92E+00		
Pu-240	2.4333E-04	3,665 55	4,475 50	0.00E+00	8.92E-01	1.09E+00		
Pu-241	1.6242E-02	3,665 55	4,475 50	0.00E+00	5.95E+01	7.27E+01		
Pu-242	3.6329E-07	3,665 55	4,475 50	0.00E+00	1.33E-03	1.63E-03		
Ra-226	9.0114E-10	3,665 55	4,475 50	0.00E+00	3.30E-06	4.03E-06		
Ra-228	3.1019E-14	3,665 55	4,475 50	0.00E+00	1.14E-10	1.39E-10		
Ru-106	2.1225E-10	3,665 55	4,475 50	0.00E+00	7.78E-07	9.50E-07		
Se-79	1.2930E-05	3,665 55	4,475 50	0.00E+00	4.74E-02	5.79E-02		
Sn-126	1.1571E-05	3,665 55	4,475 50	0.00E+00	4.24E-02	5.18E-02		
Sr-90	1.3472E+00	3,665 55	4,475 50	0.00E+00	4.94E+03	6.03E+03		
Tc-99	4.2239E-04	3,665 55	4,475 50	0.00E+00	1.55E+00	1.89E+00		
Th-229	1.2407E-11	3,665 55	4,475 50	0.00E+00	4.55E-08	5.55E-08		
Th-230	8.3497E-08	3,665 55	4,475 50	0.00E+00	3.06E-04	3.74E-04		
Th-232	3.8371E-14	3,665 55	4,475 50	0.00E+00	1.41E-10	1.72E-10		
Ti-208	4.0414E-08	3,665 55	4,475 50	0.00E+00	1.48E-04	1.81E-04		
U-232	1.0948E-07	3,665 55	4,475 50	0.00E+00	4.01E-04	4.90E-04		
U-233	3.6275E-09	3,665 55	4,475 50	0.00E+00	1.33E-05	1.62E-05		
U-234	1.8562E-04	3,665 55	4,475 50	0.00E+00	6.80E-01	8.31E-01		
U-235	-2.7235E-06	3,665 55	0.00	2.09E-02	1.09E-02	2.09E-02		
U-236	1.5493E-05	3,665 55	4,475 50	0.00E+00	5.68E-02	6.93E-02		
U-238	-4.2851E-09	3,665 55	0.00	2.37E-04	2.21E-04	2.37E-04		
Y-90	1.3475E+00	3,665 55	4,475.50	0.00E+00	4.94E+03	6.03E+03		
Other Radionuclides					5.02E+03	6.12E+03		

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	
BOL HM Constituents	U	U	
BOL Enrichment %	93.22033898	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
	3.665.55	2.954.32	
Nominal			Nominal burnup taken directly from SFD (converted to MWd)
Bounding	4.475.50	5,908.64	Bounding burnup taken directly from SFD (converted to MWd)

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	1.12	0.81	
Nominal			
Bounding	1.37	1.32	0.93

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: OMEGA WEST (250)

SNF ID #: 408

Fuel Units & Descr: 27 - 18 OR 19 FLAT PLATES

Heavy Metal Mass: BOL=6.75kg, EOL=5.2kg

ROD Storage Site: SRS

¹Fuel decay start date: 1992

Estimates as of: 2030

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

²Template Burnup(MWd): 367.2

Template BOL Heavy Metal Mass (MT): 0.00116689

Template Decay Time: 35 years

Estimated

Canister usage

18"x10"

1 13

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	1.559 25	2.949 75	0.00E+00	3.13E-06	5.92E-06	Avg MeV	
Am-241	2.5251E-03	1.559 25	2.949 75	0.00E+00	3.94E+00	7.45E+00	0.0150	2.173E+14
Am-242m	3.9624E-07	1.559 25	2.949 75	0.00E+00	6.18E-04	1.17E-03	0.0250	4.511E+13
Am-243	1.4880E-06	1.559 25	2.949 75	0.00E+00	2.32E-03	4.39E-03	0.0375	3.921E+13
C-14	5.7053E-09	1.559 25	2.949 75	0.00E+00	8.90E-06	1.68E-05	0.0575	4.221E+13
Cl-36	1.3124E-32	1.559 25	2.949 75	0.00E+00	2.05E-29	3.87E-29	0.0850	2.543E+13
Cm-243	1.1419E-07	1.559 25	2.949 75	0.00E+00	1.78E-04	3.37E-04	0.1250	1.680E+13
Cm-244	1.6522E-05	1.559 25	2.949 75	0.00E+00	2.58E-02	4.87E-02	0.2250	2.195E+13
Co-60	7.4047E-07	1.559 25	2.949 75	0.00E+00	1.15E-03	2.18E-03	0.3750	9.551E+12
Cs-134	2.0455E-05	1.559 25	2.949 75	0.00E+00	3.19E-02	6.03E-02	0.5750	1.579E+14
Cs-135	3.4477E-06	1.559 25	2.949 75	0.00E+00	5.38E-03	1.02E-02	0.8500	1.928E+12
Cs-137	1.4365E+00	1.559 25	2.949 75	0.00E+00	2.24E+03	4.24E+03	1.2500	9.326E+11
Eu-154	7.3230E-03	1.559 25	2.949 75	0.00E+00	1.14E+01	2.16E+01	1.7500	5.249E+10
Eu-155	5.9259E-04	1.559 25	2.949 75	0.00E+00	9.24E-01	1.75E+00	2.2500	4.388E+06
Fe-55	2.2791E-06	1.559 25	2.949 75	0.00E+00	3.55E-03	6.72E-03	2.7500	4.189E+06
H-3	1.9698E-03	1.559 25	2.949 75	0.00E+00	3.07E+00	5.81E+00	3.5000	2.427E+03
I-129	7.5300E-07	1.559 25	2.949 75	0.00E+00	1.17E-03	2.22E-03	5.0000	9.918E+02
Kr-85	4.1176E-02	1.559 25	2.949 75	0.00E+00	6.42E+01	1.21E+02	7.0000	1.085E+02
Np-237	9.5752E-06	1.559 25	2.949 75	0.00E+00	1.49E-02	2.82E-02	11.0000	1.210E+01
Pa-231	3.9379E-09	1.559 25	2.949 75	0.00E+00	6.14E-06	1.16E-05		
Pb-210	3.3115E-10	1.559 25	2.949 75	0.00E+00	5.16E-07	9.77E-07		
Pm-147	9.2402E-04	1.559 25	2.949 75	0.00E+00	1.44E+00	2.73E+00		
Pu-238	1.6217E-02	1.559 25	2.949 75	0.00E+00	2.53E+01	4.78E+01		
Pu-239	4.2810E-04	1.559 25	2.949 75	0.00E+00	6.68E-01	1.26E+00		
Pu-240	2.4333E-04	1.559 25	2.949 75	0.00E+00	3.79E-01	7.18E-01		
Pu-241	1.6242E-02	1.559 25	2.949 75	0.00E+00	2.53E+01	4.79E+01		
Pu-242	3.6329E-07	1.559 25	2.949 75	0.00E+00	5.66E-04	1.07E-03		
Ra-226	9.0114E-10	1.559 25	2.949 75	0.00E+00	1.41E-06	2.66E-06		
Ra-228	3.1019E-14	1.559 25	2.949 75	0.00E+00	4.84E-11	9.15E-11		
Ru-106	2.1225E-10	1.559 25	2.949 75	0.00E+00	3.31E-07	6.26E-07		
Se-79	1.2930E-05	1.559 25	2.949 75	0.00E+00	2.02E-02	3.81E-02		
Sn-126	1.1571E-05	1.559 25	2.949 75	0.00E+00	1.80E-02	3.41E-02		
Sr-90	1.3472E+00	1.559 25	2.949 75	0.00E+00	2.10E+03	3.97E+03		
Tc-99	4.2239E-04	1.559 25	2.949 75	0.00E+00	6.59E-01	1.25E+00		
Th-229	1.2407E-11	1.559 25	2.949 75	0.00E+00	1.93E-08	3.66E-08		
Th-230	8.3497E-08	1.559 25	2.949 75	0.00E+00	1.30E-04	2.46E-04		
Th-232	3.8371E-14	1.559 25	2.949 75	0.00E+00	5.98E-11	1.13E-10		
Ti-208	4.0414E-08	1.559 25	2.949 75	0.00E+00	6.30E-05	1.19E-04		
U-232	1.0948E-07	1.559 25	2.949 75	0.00E+00	1.71E-04	3.23E-04		
U-233	3.6275E-09	1.559 25	2.949 75	0.00E+00	5.66E-06	1.07E-05		
U-234	1.8562E-04	1.559 25	2.949 75	0.00E+00	2.89E-01	5.48E-01		
U-235	-2.7235E-06	1.559 25	0.00	1.36E-02	9.33E-03	1.36E-02		
U-236	1.5493E-05	1.559 25	2.949 75	0.00E+00	2.42E-02	4.57E-02		
U-238	-4.2851E-09	1.559 25	0.00	1.58E-04	1.51E-04	1.58E-04		
Y-90	1.3475E+00	1.559 25	2.949 75	0.00E+00	2.10E+03	3.97E+03		
Other Radionuclides					2.13E+03	4.04E+03		

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 %	93.048	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)³

	From SFD	Estimated
Nominal	1.559 25	1.467 69
Bounding	2.949 75	2.935 38

Basis for burnup used in estimate:

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

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.73	0.94
Bounding	1.39	1.00

Estimated EOL HM/Given EOL HM

1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name ORR (U308 HEU)
SNF ID # 903
Fuel Units & Descr 97 - 19 CURVED PLATES
Heavy Metal Mass BOL=29 643kg EOL=20 777kg
ROD Storage Site: SRS

¹Fuel decay start date 1966
Estimates as of. 2030
Template: ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 50 years

Estimated
Canister usage:
18"x10"
2 69

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 9739E-09	8,396 08	16,792 17	0 00E+00	2.50E-05	4 99E-05	Avg MeV	
Am-241	2 5986E-03	8,396 08	16,792 17	0 00E+00	2 18E+01	4.36E+01	0.0150	8 652E+14
Am-242m	3 7010E-07	8,396 08	16,792 17	0 00E+00	3 11E-03	6 21E-03	0.0250	1 796E+14
Am-243	1 4858E-06	8,396 08	16,792 17	0 00E+00	1.25E-02	2 50E-02	0.0375	1.561E+14
C-14	5 6944E-09	8,396 08	16,792 17	0 00E+00	4 78E-05	9 56E-05	0.0575	1 681E+14
Cl-36	1.3124E-32	8,396 08	16,792 17	0 00E+00	1 10E-28	2.20E-28	0.0850	1 012E+14
Cm-243	7 9303E-08	8,396 08	16,792 17	0 00E+00	6 66E-04	1.33E-03	0.1250	6 611E+13
Cm-244	9 3083E-06	8,396 08	16,792 17	0 00E+00	7 82E-02	1.56E-01	0.2250	8 728E+13
Co-60	1 0310E-07	8 396 08	16,792 17	0 00E+00	8 66E-04	1 73E-03	0.3750	3 802E+13
Cs-134	1 3254E-07	8,396 08	16,792 17	0 00E+00	1 11E-03	2 23E-03	0.5750	6.352E+14
Cs-135	3 4477E-06	8,396 08	16,792 17	0 00E+00	2 89E-02	5 79E-02	0.8500	6.805E+12
Cs-137	1 0161E+00	8,396 08	16,792 17	0 00E+00	8 53E+03	1 71E+04	1.2500	2 752E+12
Eu-154	2 1879E-03	8,396 08	16,792 17	0 00E+00	1 84E+01	3 67E+01	1.7500	1 803E+11
Eu-155	7 2930E-05	8,396 08	16,792 17	0 00E+00	6 12E-01	1.22E+00	2.2500	1 749E+07
Fe-55	4 1912E-08	8,396 08	16,792 17	0 00E+00	3 52E-04	7 04E-04	2.7500	2.065E+07
H-3	8 4913E-04	8,396 08	16,792 17	0 00E+00	7.13E+00	1 43E+01	3 5000	1 133E+04
I-129	7.5300E-07	8,396 08	16,792 17	0 00E+00	6.32E-03	1 31E+02	5 0000	4 605E+03
Kr-85	1 5615E-02	8,396 08	16,792 17	0 00E+00	8 05E-02	1 61E-01	7 0000	5 007E+02
Np-237	9 5861E-06	8,396 08	16,792 17	0 00E+00	4 26E-05	8.53E-05	11 0000	5.562E+01
Pa-231	5 0790E-09	8,396 08	16,792 17	0 00E+00	5 56E-06	1 11E-05		
Pb-210	6 6176E-10	8,396 08	16,792 17	0 00E+00	1 48E-01	2 96E-01		
Pm-147	1.7606E-05	8,396 08	16,792 17	0 00E+00	1.21E+02	2 42E+02		
Pu-238	1 4406E-02	8,396 08	16,792 17	0 00E+00	3.59E+00	7 18E+00		
Pu-239	4 2783E-04	8,396 08	16,792 17	0 00E+00	2 04E+00	4 08E+00		
Pu-240	2 4297E-04	8,396 08	16,792 17	0 00E+00	6 63E+01	1.33E+02		
Pu-241	7 8949E-03	8,396 08	16,792 17	0 00E+00	3 05E-03	6 10E-03		
Pu-242	3 6329E-07	8,396 08	16,792 17	0 00E+00	1.27E-05	2 55E-05		
Ra-226	1.5169E-09	8,396 08	16,792 17	0 00E+00	3 56E-10	7 12E-10		
Ra-228	4.2429E-14	8,396 08	16,792 17	0 00E+00	5.95E-11	1 19E-10		
Ru-106	7 0833E-15	8,396 08	16,792 17	0 00E+00	1 09E-01	2 17E-01		
Se-79	1.2928E-05	8,396 08	16,792 17	0 00E+00	9 72E-02	1.94E-01		
Sn-126	1 1571E-05	8,396 08	16,792 17	0 00E+00	7 92E+03	1.58E+04		
Sr-90	9 4308E-01	8,396 08	16,792 17	0 00E+00	3 55E+00	7.09E+00		
Tc-99	4.2239E-04	8,396 08	16,792 17	0 00E+00	1.51E-07	3 02E-07		
Th-229	1.7968E-11	8,396 08	16,792 17	0 00E+00	9 11E-04	1 82E-03		
Th-230	1.0855E-07	8,396 08	16,792 17	0 00E+00	4 18E-10	8 36E-10		
Th-232	4 9809E-14	8,396 08	16,792 17	0 00E+00	2 94E-04	5 88E-04		
Ti-208	3 4995E-08	8,396 08	16,792 17	0 00E+00	7 96E-04	1.59E-03		
U-232	9 4798E-08	8,396 08	16,792 17	0 00E+00	3 57E-05	7 14E-05		
U-233	4.2538E-09	8,396 08	16,792 17	0 00E+00	1 56E+00	3 13E+00		
U-234	1 8617E-04	8,396 08	0 00	5 97E-02	3 68E-02	5 97E-02		
U-235	-2 7235E-06	8,396 08	16,792 17	0 00E+00	1.30E-01	2 60E-01		
U-236	1.5493E-05	8,396 08	0 00	6 82E-04	6 46E-04	6 82E-04		
U-238	-4 2851E-09	8,396 08	16,792 17	0 00E+00	7.92E+03	1.58E+04		
Y-90	9 4308E-01	8,396 08	16,792 17	0 00E+00	8 14E+03	1.63E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93 15626243	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		8 396 08	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		16 792 17	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.90		1 02
Bounding	1.80		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: ORR (U3O8 HEU)

SNF ID #: 753

Fuel Units & Descr: 4 - 19 CURVED PLATES

Heavy Metal Mass: BOL=0.716kg, EOL=0.308kg

ROD Storage Site: SRS

¹Fuel decay start date: 1966

Estimates as of: 2030

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

²Template Burnup(MWd): 367.2

Template BOL Heavy Metal Mass (MT): 0.00116689

Template Decay Time: 50 years

Estimated

Canister usage:

18"x10"

0.11

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.9739E-09	386.76	678.07	0.00E+00	1.15E-06	2.02E-06	Avg MeV	
Am-241	2.5986E-03	386.76	678.07	0.00E+00	1.01E+00	1.76E+00	0.0150	3.494E+13
Am-242m	3.7010E-07	386.76	678.07	0.00E+00	1.43E-04	2.51E-04	0.0250	7.252E+12
Am-243	1.4858E-06	386.76	678.07	0.00E+00	5.75E-04	1.01E-03	0.0375	6.302E+12
C-14	5.6944E-09	386.76	678.07	0.00E+00	2.20E-06	3.86E-06	0.0575	6.789E+12
Cl-36	1.3124E-32	386.76	678.07	0.00E+00	5.08E-30	8.90E-30	0.0850	4.086E+12
Cm-243	7.9303E-08	386.76	678.07	0.00E+00	3.07E-05	5.38E-05	0.1250	2.670E+12
Cm-244	9.3083E-06	386.76	678.07	0.00E+00	3.60E-03	6.31E-03	0.2250	3.524E+12
Co-60	1.0310E-07	386.76	678.07	0.00E+00	3.99E-05	6.99E-05	0.3750	1.535E+12
Cs-134	1.3254E-07	386.76	678.07	0.00E+00	5.13E-05	8.99E-05	0.5750	2.565E+13
Cs-135	3.4477E-06	386.76	678.07	0.00E+00	1.33E-03	2.34E-03	0.8500	2.748E+11
Cs-137	1.0161E+00	386.76	678.07	0.00E+00	3.93E+02	6.89E+02	1.2500	1.111E+11
Eu-154	2.1879E-03	386.76	678.07	0.00E+00	8.46E-01	1.48E+00	1.7500	7.280E+09
Eu-155	7.2930E-05	386.76	678.07	0.00E+00	2.82E-02	4.95E-02	2.2500	7.061E+05
Fe-55	4.1912E-08	386.76	678.07	0.00E+00	1.62E-05	2.84E-05	2.7500	8.337E+05
H-3	8.4913E-04	386.76	678.07	0.00E+00	3.28E-01	5.76E-01	3.5000	4.572E+02
I-129	7.5300E-07	386.76	678.07	0.00E+00	2.91E-04	5.11E-04	5.0000	1.859E+02
Kr-85	1.5615E-02	386.76	678.07	0.00E+00	6.04E+00	1.06E+01	7.0000	2.021E+01
Np-237	9.5861E-06	386.76	678.07	0.00E+00	3.71E-03	6.50E-03	11.0000	2.245E+00
Pa-231	5.0790E-09	386.76	678.07	0.00E+00	1.96E-06	3.44E-06		
Pb-210	6.6176E-10	386.76	678.07	0.00E+00	2.56E-07	4.49E-07		
Pm-147	1.7606E-05	386.76	678.07	0.00E+00	6.81E-03	1.19E-02		
Pu-238	1.4406E-02	386.76	678.07	0.00E+00	5.57E+00	9.77E+00		
Pu-239	4.2783E-04	386.76	678.07	0.00E+00	1.65E-01	2.90E-01		
Pu-240	2.4297E-04	386.76	678.07	0.00E+00	9.40E-02	1.65E-01		
Pu-241	7.8949E-03	386.76	678.07	0.00E+00	3.05E+00	5.35E+00		
Pu-242	3.6329E-07	386.76	678.07	0.00E+00	1.41E-04	2.46E-04		
Ra-226	1.5169E-09	386.76	678.07	0.00E+00	5.87E-07	1.03E-06		
Ra-228	4.2429E-14	386.76	678.07	0.00E+00	1.64E-11	2.88E-11		
Ru-106	7.0833E-15	386.76	678.07	0.00E+00	2.74E-12	4.80E-12		
Se-79	1.2928E-05	386.76	678.07	0.00E+00	5.00E-03	8.77E-03		
Sn-126	1.1571E-05	386.76	678.07	0.00E+00	4.48E-03	7.85E-03		
Sr-90	9.4308E-01	386.76	678.07	0.00E+00	3.65E+02	6.39E+02		
Tc-99	4.2239E-04	386.76	678.07	0.00E+00	1.63E-01	2.86E-01		
Th-229	1.7968E-11	386.76	678.07	0.00E+00	6.95E-09	1.22E-08		
Th-230	1.0855E-07	386.76	678.07	0.00E+00	4.20E-05	7.36E-05		
Th-232	4.9809E-14	386.76	678.07	0.00E+00	1.93E-11	3.38E-11		
Ti-208	3.4995E-08	386.76	678.07	0.00E+00	1.35E-05	2.37E-05		
U-232	9.4798E-08	386.76	678.07	0.00E+00	3.67E-05	6.43E-05		
U-233	4.2538E-09	386.76	678.07	0.00E+00	1.65E-06	2.88E-06		
U-234	1.8617E-04	386.76	678.07	0.00E+00	7.20E-02	1.26E-01		
U-235	-2.7235E-06	386.76	0.00	1.44E-03	3.90E-04	1.44E-03		
U-236	1.5493E-05	386.76	678.07	0.00E+00	5.99E-03	1.05E-02		
U-238	-4.2851E-09	386.76	0.00	1.61E-05	1.45E-05	1.61E-05		
Y-90	9.4308E-01	386.76	678.07	0.00E+00	3.65E+02	6.39E+02		
Other Radionuclides					3.75E+02	6.58E+02		

Thermal Power

Nominal Heat Output (Watts)

Bounding Heat Output (Watts)

4.59E+00 8.04E+00

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 %	93.29608939	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		386.76
Bounding		678.07

Basis for burnup used in estimate:

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
Nominal	1.72	
Bounding	3.01	

Estimated EOL HM/ Given EOL HM

1.08

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

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

March 2003
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Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: ORR (U3Si2 LEU)
 SNF ID #: 850
 Fuel Units & Descr: 11 - ASSEMBLY
 Heavy Metal Mass: BOL=11 076kg, EOL=9 908kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1968
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 50 years

Estimated
 Canister usage
 18"x10"
 0.31

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.9739E-09	1,106.31	2,212.62	0.00E+00	3.29E-06	6.58E-06	Avg MeV	-
Am-241	2.5986E-03	1,106.31	2,212.62	0.00E+00	2.87E+00	5.75E+00	0.0150	1.140E+14
Am-242m	3.7010E-07	1,106.31	2,212.62	0.00E+00	4.09E-04	8.19E-04	0.0250	2.366E+13
Am-243	1.4858E-06	1,106.31	2,212.62	0.00E+00	1.64E-03	3.29E-03	0.0375	2.056E+13
C-14	5.6944E-09	1,106.31	2,212.62	0.00E+00	6.30E-06	1.26E-05	0.0575	2.215E+13
Cl-36	1.3124E-32	1,106.31	2,212.62	0.00E+00	1.45E-29	2.90E-29	0.0850	1.333E+13
Cm-243	7.9303E-08	1,106.31	2,212.62	0.00E+00	8.77E-05	1.75E-04	0.1250	8.711E+12
Cm-244	9.3083E-06	1,106.31	2,212.62	0.00E+00	1.03E-02	2.06E-02	0.2250	1.150E+13
Co-60	1.0310E-07	1,106.31	2,212.62	0.00E+00	1.14E-04	2.28E-04	0.3750	5.010E+12
Cs-134	1.3254E-07	1,106.31	2,212.62	0.00E+00	1.47E-04	2.93E-04	0.5750	8.370E+13
Cs-135	3.4477E-06	1,106.31	2,212.62	0.00E+00	3.81E-03	7.63E-03	0.8500	8.967E+11
Cs-137	1.0161E+00	1,106.31	2,212.62	0.00E+00	1.12E+03	2.25E+03	1.2500	3.626E+11
Eu-154	2.1879E-03	1,106.31	2,212.62	0.00E+00	2.42E+00	4.84E+00	1.7500	2.375E+10
Eu-155	7.2930E-05	1,106.31	2,212.62	0.00E+00	8.07E-02	1.61E-01	2.2500	2.304E+06
Fe-55	4.1912E-08	1,106.31	2,212.62	0.00E+00	4.64E-05	9.27E-05	2.7500	2.721E+06
H-3	8.4913E-04	1,106.31	2,212.62	0.00E+00	9.39E-01	1.88E+00	3.5000	1.508E+03
I-129	7.5300E-07	1,106.31	2,212.62	0.00E+00	8.33E-04	1.67E-03	5.0000	6.134E+02
Kr-85	1.5615E-02	1,106.31	2,212.62	0.00E+00	1.73E+01	3.46E+01	7.0000	6.674E+01
Np-237	9.5861E-06	1,106.31	2,212.62	0.00E+00	1.06E-02	2.12E-02	11.0000	7.416E+00
Pa-231	5.0790E-09	1,106.31	2,212.62	0.00E+00	5.62E-06	1.12E-05		
Pb-210	6.6176E-10	1,106.31	2,212.62	0.00E+00	7.32E-07	1.46E-06		
Pm-147	1.7606E-05	1,106.31	2,212.62	0.00E+00	1.95E-02	3.90E-02		
Pu-238	1.4406E-02	1,106.31	2,212.62	0.00E+00	1.59E+01	3.19E+01		
Pu-239	4.2783E-04	1,106.31	2,212.62	0.00E+00	4.73E-01	9.47E-01		
Pu-240	2.4297E-04	1,106.31	2,212.62	0.00E+00	2.69E-01	5.38E-01		
Pu-241	7.8949E-03	1,106.31	2,212.62	0.00E+00	8.73E+00	1.75E+01		
Pu-242	3.6329E-07	1,106.31	2,212.62	0.00E+00	4.02E-04	8.04E-04		
Ra-226	1.5169E-09	1,106.31	2,212.62	0.00E+00	1.68E-06	3.36E-06		
Ra-228	4.2429E-14	1,106.31	2,212.62	0.00E+00	4.69E-11	9.39E-11		
Ru-106	7.0833E-15	1,106.31	2,212.62	0.00E+00	7.84E-12	1.57E-11		
Se-79	1.2928E-05	1,106.31	2,212.62	0.00E+00	1.43E-02	2.86E-02		
Sn-126	1.1571E-05	1,106.31	2,212.62	0.00E+00	1.28E-02	2.56E-02		
Sr-90	9.4308E-01	1,106.31	2,212.62	0.00E+00	1.04E+03	2.09E+03		
Tc-99	4.2239E-04	1,106.31	2,212.62	0.00E+00	4.67E-01	9.35E-01		
Th-229	1.7968E-11	1,106.31	2,212.62	0.00E+00	1.99E-08	3.98E-08		
Th-230	1.0855E-07	1,106.31	2,212.62	0.00E+00	1.20E-04	2.40E-04		
Th-232	4.9809E-14	1,106.31	2,212.62	0.00E+00	5.51E-11	1.10E-10		
Ti-208	3.4995E-08	1,106.31	2,212.62	0.00E+00	3.87E-05	7.74E-05		
U-232	9.4798E-08	1,106.31	2,212.62	0.00E+00	1.05E-04	2.10E-04	Thermal Power	
U-233	4.2538E-09	1,106.31	2,212.62	0.00E+00	4.71E-06	9.41E-06	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8617E-04	1,106.31	2,212.62	0.00E+00	2.06E-01	4.12E-01	1.31E+01	2.62E+01
U-235	-2.7235E-06	1,106.31	0.00	4.74E-03	1.73E-03	4.74E-03	Total	Total
U-236	1.5493E-05	1,106.31	2,212.62	0.00E+00	1.71E-02	3.43E-02		
U-238	-4.2851E-09	1,106.31	0.00	2.99E-03	2.98E-03	2.99E-03		
Y-90	9.4308E-01	1,106.31	2,212.62	0.00E+00	1.04E+03	2.09E+03		
Other Radionuclides					1.07E+03	2.15E+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 %	19.81328831	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		1,106.31	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup.
Bounding		2,212.62	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.32		1.01
Bounding	0.63		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: ORR (U3Si2 LEU)
SNF ID #: 944
Fuel Units & Descr: 33 - 19 CURVED PLATES
Heavy Metal Mass BOL=56 539kg EOL=53 655kg
ROD Storage Site SRS

¹Fuel decay start date 1987
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd). 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 35 years

Estimated
Canister usage
18"x10"
138

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	2,731.39	5,462.79	0.00E+00	5.48E-06	1.10E-05	Avg MeV	
Am-241	2.5251E-03	2,731.39	5,462.79	0.00E+00	6.90E+00	1.38E+01	0.0150	4.023E+14
Am-242m	3.9624E-07	2,731.39	5,462.79	0.00E+00	1.08E-03	2.16E-03	0.0250	8.355E+13
Am-243	1.4880E-06	2,731.39	5,462.79	0.00E+00	4.06E-03	8.13E-03	0.0375	7.262E+13
C-14	5.7053E-09	2,731.39	5,462.79	0.00E+00	1.56E-05	3.12E-05	0.0575	7.816E+13
Cl-36	1.3124E-32	2,731.39	5,462.79	0.00E+00	3.58E-29	7.17E-29	0.0850	4.710E+13
Cm-243	1.1419E-07	2,731.39	5,462.79	0.00E+00	3.12E-04	6.24E-04	0.1250	3.111E+13
Cm-244	1.6522E-05	2,731.39	5,462.79	0.00E+00	4.51E-02	9.03E-02	0.2250	4.066E+13
Co-60	7.4047E-07	2,731.39	5,462.79	0.00E+00	2.02E-03	4.05E-03	0.3750	1.769E+13
Cs-134	2.0455E-05	2,731.39	5,462.79	0.00E+00	5.59E-02	1.12E-01	0.5750	2.923E+14
Cs-135	3.4477E-06	2,731.39	5,462.79	0.00E+00	9.42E-03	1.88E-02	0.8500	3.571E+12
Cs-137	1.4365E+00	2,731.39	5,462.79	0.00E+00	3.92E+03	7.85E+03	1.2500	1.727E+12
Eu-154	7.3230E-03	2,731.39	5,462.79	0.00E+00	2.00E+01	4.00E+01	1.7500	9.720E+10
Eu-155	5.9259E-04	2,731.39	5,462.79	0.00E+00	1.62E+00	3.24E+00	2.2500	8.127E+06
Fe-55	2.2791E-06	2,731.39	5,462.79	0.00E+00	6.23E-03	1.25E-02	2.7500	7.757E+06
H-3	1.9698E-03	2,731.39	5,462.79	0.00E+00	5.38E+00	1.08E+01	3.5000	4.574E+03
I-129	7.5300E-07	2,731.39	5,462.79	0.00E+00	2.06E-03	4.11E-03	5.0000	1.871E+03
Kr-85	4.1176E-02	2,731.39	5,462.79	0.00E+00	1.12E+02	2.25E+02	7.0000	2.049E+02
Np-237	9.5752E-06	2,731.39	5,462.79	0.00E+00	2.62E-02	5.23E-02	11.0000	2.286E+01
Pa-231	3.9379E-09	2,731.39	5,462.79	0.00E+00	1.08E-05	2.15E-05		
Pb-210	3.3115E-10	2,731.39	5,462.79	0.00E+00	9.05E-07	1.81E-06		
Pm-147	9.2402E-04	2,731.39	5,462.79	0.00E+00	2.52E+00	5.05E+00		
Pu-238	1.6217E-02	2,731.39	5,462.79	0.00E+00	4.43E+01	8.86E+01		
Pu-239	4.2810E-04	2,731.39	5,462.79	0.00E+00	1.17E+00	2.34E+00		
Pu-240	2.4333E-04	2,731.39	5,462.79	0.00E+00	6.65E-01	1.33E+00		
Pu-241	1.6242E-02	2,731.39	5,462.79	0.00E+00	4.44E+01	8.87E+01		
Pu-242	3.6329E-07	2,731.39	5,462.79	0.00E+00	9.92E-04	1.98E-03		
Ra-226	9.0114E-10	2,731.39	5,462.79	0.00E+00	2.46E-06	4.92E-06		
Ra-228	3.1019E-14	2,731.39	5,462.79	0.00E+00	8.47E-11	1.69E-10		
Ru-106	2.1225E-10	2,731.39	5,462.79	0.00E+00	5.80E-07	1.16E-06		
Se-79	1.2930E-05	2,731.39	5,462.79	0.00E+00	3.53E-02	7.06E-02		
Sn-126	1.1571E-05	2,731.39	5,462.79	0.00E+00	3.16E-02	6.32E-02		
Sr-90	1.3472E+00	2,731.39	5,462.79	0.00E+00	3.68E+03	7.36E+03		
Tc-99	4.2239E-04	2,731.39	5,462.79	0.00E+00	1.15E+00	2.31E+00		
Th-229	1.2407E-11	2,731.39	5,462.79	0.00E+00	3.39E-08	6.78E-08		
Th-230	8.3497E-08	2,731.39	5,462.79	0.00E+00	2.28E-04	4.56E-04		
Th-232	3.8371E-14	2,731.39	5,462.79	0.00E+00	1.05E-10	2.10E-10		
Ti-208	4.0414E-08	2,731.39	5,462.79	0.00E+00	1.10E-04	2.21E-04		
U-232	1.0948E-07	2,731.39	5,462.79	0.00E+00	2.99E-04	5.98E-04		
U-233	3.6275E-09	2,731.39	5,462.79	0.00E+00	9.91E-06	1.98E-05		
U-234	1.8562E-04	2,731.39	5,462.79	0.00E+00	5.07E-01	1.01E+00		
U-235	-2.7235E-06	2,731.39	0.00	2.42E-02	1.68E-02	2.42E-02		
U-236	1.5493E-05	2,731.39	5,462.79	0.00E+00	4.23E-02	8.46E-02		
U-238	-4.2851E-09	2,731.39	0.00	1.52E-02	1.52E-02	1.52E-02		
Y-90	1.3475E+00	2,731.39	5,462.79	0.00E+00	3.68E+03	7.36E+03		
Other Radionuclides					3.74E+03	7.48E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.57E+01	9.14E+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 %	19.818	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		2,731.39	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		5,462.79	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.15		1.00
Bounding	0.31		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: ORR SPECIAL
SNF ID #: 163
Fuel Units & Descr: 11 - 19 CURVED PLATES
Heavy Metal Mass: BOL=22 045kg, EOL=18 48kg
ROD Storage Site: SRS

Fuel decay start date: 1966
Estimates as of: 2030
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: 50 years

Estimated
Canister usage
18"x10"
0 31

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 9739E-09	3,376.22	6,752.44	0 00E+00	1 00E-05	2 01E-05	Avg MeV	
Am-241	2 5986E-03	3,376.22	6,752.44	0 00E+00	8 77E+00	1 75E+01	0 0150	3 479E+14
Am-242m	3 7010E-07	3,376.22	6,752.44	0 00E+00	1 25E-03	2 50E-03	0 0250	7 221E+13
Am-243	1 4858E-06	3,376.22	6,752.44	0 00E+00	5 02E-03	1 00E-02	0 0375	6 276E+13
C-14	5 6944E-09	3,376.22	6,752.44	0 00E+00	1 92E-05	3 85E-05	0 0575	6 760E+13
Cl-36	1 3124E-32	3,376.22	6,752.44	0 00E+00	4 43E-29	8 86E-29	0 0850	4 069E+13
Cm-243	7 9303E-08	3 376.22	6,752.44	0 00E+00	2 68E-04	5 35E-04	0 1250	2 658E+13
Cm-244	9 3083E-06	3,376.22	6,752.44	0 00E+00	3 14E-02	6 29E-02	0 2250	3 510E+13
Co-60	1 0310E-07	3,376.22	6,752.44	0 00E+00	3 48E-04	6 96E-04	0 3750	1 529E+13
Cs-134	1 3254E-07	3,376.22	6,752.44	0 00E+00	4 47E-04	8 95E-04	0 5750	2 554E+14
Cs-135	3 4477E-06	3,376.22	6,752.44	0 00E+00	1 16E-02	2 33E-02	0 8500	2 737E+12
Cs-137	1 0161E+00	3,376.22	6,752.44	0 00E+00	3 43E+03	6 86E+03	1 2500	1 107E+12
Eu-154	2 1879E-03	3,376.22	6,752.44	0 00E+00	7 39E+00	1 48E+01	1 7500	7 249E+10
Eu-155	7 2930E-05	3,376.22	6,752.44	0 00E+00	2 46E-01	4 92E-01	2 2500	7 031E+06
Fe-55	4 1912E-08	3,376.22	6,752.44	0 00E+00	1 42E-04	2 83E-04	2 7500	8 302E+06
H-3	8 4913E-04	3,376.22	6,752.44	0 00E+00	2 87E+00	5 73E+00	3 5000	4 582E+03
I-129	7 5300E-07	3,376.22	6,752.44	0 00E+00	2 54E-03	5 08E-03	5 0000	1 864E+03
Kr-85	1 5615E-02	3,376.22	6,752.44	0 00E+00	5 27E+01	1 05E+02	7 0000	2 027E+02
Np-237	9 5861E-06	3,376.22	6,752.44	0 00E+00	3 24E-02	6 47E-02	11 0000	2 253E+01
Pa-231	5 0790E-09	3,376.22	6,752.44	0 00E+00	1 71E-05	3 43E-05		
Pb-210	6 6176E-10	3,376.22	6,752.44	0 00E+00	2 23E-06	4 47E-06		
Pm-147	1 7606E-05	3,376.22	6,752.44	0 00E+00	5 94E-02	1 19E-01		
Pu-238	1 4406E-02	3,376.22	6,752.44	0 00E+00	4 86E+01	9 73E+01		
Pu-239	4 2783E-04	3,376.22	6,752.44	0 00E+00	1 44E+00	2 89E+00		
Pu-240	2 4297E-04	3,376.22	6,752.44	0 00E+00	8 20E-01	1 64E+00		
Pu-241	7 8949E-03	3,376.22	6,752.44	0 00E+00	2 67E+01	5 33E+01		
Pu-242	3 6329E-07	3,376.22	6,752.44	0 00E+00	1 23E-03	2 45E-03		
Ra-226	1 5169E-09	3,376.22	6,752.44	0 00E+00	5 12E-06	1 02E-05		
Ra-228	4 2429E-14	3,376.22	6,752.44	0 00E+00	1 43E-10	2 87E-10		
Ru-106	7 0833E-15	3,376.22	6,752.44	0 00E+00	2 39E-11	4 78E-11		
Se-79	1 2928E-05	3,376.22	6,752.44	0 00E+00	4 36E-02	8 73E-02		
Sn-126	1 1571E-05	3,376.22	6,752.44	0 00E+00	3 91E-02	7 81E-02		
Sr-90	9 4308E-01	3,376.22	6,752.44	0 00E+00	3 18E+03	6 37E+03		
Tc-99	4 2239E-04	3,376.22	6,752.44	0 00E+00	1 43E+00	2 85E+00		
Th-229	1 7968E-11	3,376.22	6,752.44	0 00E+00	6 07E-08	1 21E-07		
Th-230	1 0855E-07	3,376.22	6,752.44	0 00E+00	3 66E-04	7 33E-04		
Th-232	4 9809E-14	3,376.22	6,752.44	0 00E+00	1 68E-10	3 36E-10		
Ti-208	3 4995E-08	3,376.22	6,752.44	0 00E+00	1 18E-04	2 36E-04		
U-232	9 4798E-08	3,376.22	6,752.44	0 00E+00	3 20E-04	6 40E-04		
U-233	4 2538E-09	3,376.22	6,752.44	0 00E+00	1 44E-05	2 87E-05		
U-234	1 8617E-04	3,376.22	6,752.44	0 00E+00	6 29E-01	1 26E+00		
U-235	2 7235E-06	3,376.22	0 00	1 13E-02	2 07E-03	1 13E-02		
U-236	1 5493E-05	3,376.22	6,752.44	0 00E+00	5 23E-02	1 05E-01		
U-238	4 2851E-09	3,376.22	0 00	5 66E-03	5 64E-03	5 66E-03		
Y-90	9 4308E-01	3,376.22	6,752.44	0 00E+00	3 18E+03	6 37E+03		
Other Radionuclides					3 27E+03	6 55E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 00E+01	8 01E+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.
BOL HM Constituents	ALUM	ALUM	This fuel matches on all parameters except enrichment.
BOL Enrichment %	U	U	
	23 64708607	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		3,376.22	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		6,752.44	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 49		1 01
Bounding	0 97		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information
 Fuel Name: ORR-BW-1 (MOX)
 SNF ID #: 160
 Fuel Units & Descr: 1 - 19 CURVED PLATES
 Heavy Metal Mass BOL: ; EOL=0.07kg
 ROD Storage Site: INEEL

¹Fuel decay start date: 1966
 Estimates as of: 2030
 Template (Worst Case)
²Template Burnup(MWd): 62.5
 Template BOL Heavy Metal Mass (MT): 0.00186865
 Template Decay Time: 50 years

Estimated
 Canister usage:
 18"x10"
 0.03

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.5200E-06	66.52	66.52	0.00E+00	1.68E-04	1.68E-04	Avg MeV	
Am-241	8.6432E+00	66.52	66.52	0.00E+00	5.75E+02	5.75E+02	0.0150	5.639E+13
Am-242m	1.5728E-02	66.52	66.52	0.00E+00	1.05E+00	1.05E+00	0.0250	1.114E+13
Am-243	1.6288E-02	66.52	66.52	0.00E+00	1.08E+00	1.08E+00	0.0375	9.415E+12
C-14	1.2068E-01	66.52	66.52	0.00E+00	8.03E+00	8.03E+00	0.0575	1.778E+13
Cl-36	2.2849E-03	66.52	66.52	0.00E+00	1.52E-01	1.52E-01	0.0850	5.961E+12
Cm-243	6.0144E-04	66.52	66.52	0.00E+00	4.00E-02	4.00E-02	0.1250	4.218E+12
Cm-244	9.4880E-02	66.52	66.52	0.00E+00	6.31E+00	6.31E+00	0.2250	5.159E+12
Co-60	3.9052E+00	66.52	66.52	0.00E+00	2.60E+02	2.60E+02	0.3750	2.233E+12
Cs-134	2.2139E-06	66.52	66.52	0.00E+00	1.47E-04	1.47E-04	0.5750	3.695E+13
Cs-135	4.3976E-04	66.52	66.52	0.00E+00	2.93E-02	2.93E-02	0.8500	8.094E+11
Cs-137	1.4887E+01	66.52	66.52	0.00E+00	9.90E+02	9.90E+02	1.2500	1.984E+13
Eu-154	3.7342E-01	66.52	66.52	0.00E+00	2.48E+01	2.48E+01	1.7500	2.384E+10
Eu-155	8.4893E-03	66.52	66.52	0.00E+00	5.65E-01	5.65E-01	2.2500	1.031E+08
Fe-55	5.3750E-03	66.52	66.52	0.00E+00	3.58E-01	3.58E-01	2.7500	1.775E+08
H-3	1.0472E-01	66.52	66.52	0.00E+00	6.97E+00	6.97E+00	3.5000	9.662E+04
I-129	1.0618E-05	66.52	66.52	0.00E+00	7.06E-04	7.06E-04	5.0000	4.083E+04
Kr-85	2.2717E-01	66.52	66.52	0.00E+00	1.51E+01	1.51E+01	7.0000	4.651E+03
Np-237	1.6400E-04	66.52	66.52	0.00E+00	1.09E-02	1.09E-02	11.0000	5.305E+02
Pa-231	2.8688E-06	66.52	66.52	0.00E+00	1.91E-04	1.91E-04		
Pb-210	4.7312E-08	66.52	66.52	0.00E+00	3.15E-06	3.15E-06		
Pm-147	3.2198E-04	66.52	66.52	0.00E+00	2.14E-02	2.14E-02		
Pu-238	-1.1924E+00	66.52	0.00	1.80E+01	0.00E+00	1.80E+01		
Pu-239	-4.8600E-02	66.52	0.00	2.18E+00	0.00E+00	2.18E+00		
Pu-240	-3.0127E-01	66.52	0.00	2.78E+00	0.00E+00	2.78E+00		
Pu-241	-1.2917E+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	1.0760E-07	66.52	66.52	0.00E+00	7.16E-06	7.16E-06		
Ra-228	6.0160E-07	66.52	66.52	0.00E+00	4.00E-05	4.00E-05		
Ru-106	1.3388E-13	66.52	66.52	0.00E+00	8.91E-12	8.91E-12		
Se-79	1.9179E-04	66.52	66.52	0.00E+00	1.28E-02	1.28E-02		
Sn-126	1.6669E-04	66.52	66.52	0.00E+00	1.11E-02	1.11E-02		
Sr-90	1.3859E+01	66.52	66.52	0.00E+00	9.22E+02	9.22E+02		
Tc-99	6.7678E-03	66.52	66.52	0.00E+00	4.50E-01	4.50E-01		
Th-229	2.2592E-06	66.52	66.52	0.00E+00	1.50E-04	1.50E-04		
Th-230	7.5955E-06	66.52	66.52	0.00E+00	5.05E-04	5.05E-04		
Th-232	6.0208E-07	66.52	66.52	0.00E+00	4.01E-05	4.01E-05		
Ti-208	7.5795E-05	66.52	66.52	0.00E+00	5.04E-03	5.04E-03		
U-232	2.0521E-04	66.52	66.52	0.00E+00	1.37E-02	1.37E-02	Thermal Power	
U-233	3.6128E-04	66.52	66.52	0.00E+00	2.40E-02	2.40E-02	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.2788E-02	66.52	66.52	0.00E+00	8.51E-01	8.51E-01	3.57E+01	3.65E+01
U-235	5.7486E-04	66.52	66.52	6.02E-05	3.83E-02	3.83E-02	Total	Total
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	1.3861E+01	66.52	66.52	0.00E+00	9.22E+02	9.22E+02		
Other Radionuclides					3.42E+03	3.42E+03		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences ¹
	From SFD	Used (Worst Case)	
Reactor Moderator	LIGHT WATER	SST/Inconel	This fuel didn't closely match any existing templates, therefore the worst case template was used
Fuel Cladding	SST	U, Th & Pu	
BOL HM Constituents	Pu and U	0 to 100	
BOL Enrichment %			

Burnup Summary (MWd) ²			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		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: PRR-1 (JALX-HEU) PHILIPPINES
 SNF ID #: 638
 Fuel Units & Descr: 21 - 18 FLAT PLATES
 Heavy Metal Mass: BOL=3.286kg, EOL=3.286kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1998
 Estimates as of: 2030
 Template: TRIGA-AI (LW/U-Zr, Alum, 10 to 20%, U)
²Template Burnup(MWd): 6.65
 Template BOL Heavy Metal Mass (MT): 0.00018
 Template Decay Time: 25 years

Estimated
 Canister usage:
 18"x10"
 0.88

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.8271E-09	62.74	125.48	0.00E+00	2.40E-07	4.80E-07	Avg MeV	
Am-241	4.4195E-03	62.74	125.48	0.00E+00	2.77E-01	5.55E-01	0.0150	1.134E+13
Am-242m	1.8195E-06	62.74	125.48	0.00E+00	1.14E-04	2.28E-04	0.0250	2.343E+12
Am-243	2.3278E-07	62.74	125.48	0.00E+00	1.46E-05	2.92E-05	0.0375	2.346E+12
C-14	4.3203E-05	62.74	125.48	0.00E+00	2.71E-03	5.42E-03	0.0575	2.250E+12
Cl-36	4.3023E-08	62.74	125.48	0.00E+00	2.70E-06	5.40E-06	0.0850	1.353E+12
Cm-243	1.6872E-07	62.74	125.48	0.00E+00	1.06E-05	2.12E-05	0.1250	1.376E+12
Cm-244	1.4660E-06	62.74	125.48	0.00E+00	9.20E-05	1.84E-04	0.2250	1.225E+12
Co-60	2.2376E-03	62.74	125.48	0.00E+00	1.40E-01	2.81E-01	0.3750	5.093E+11
Cs-134	1.2525E-04	62.74	125.48	0.00E+00	7.86E-03	1.57E-02	0.5750	8.237E+12
Cs-135	3.1549E-05	62.74	125.48	0.00E+00	1.98E-03	3.96E-03	0.8500	6.798E+11
Cs-137	1.7368E+00	62.74	125.48	0.00E+00	1.09E+02	2.18E+02	1.2500	7.134E+11
Eu-154	2.6947E-01	62.74	125.48	0.00E+00	1.69E+01	3.38E+01	1.7500	2.184E+10
Eu-155	2.6857E-02	62.74	125.48	0.00E+00	1.69E+00	3.37E+00	2.2500	3.350E+05
Fe-55	4.2105E-05	62.74	125.48	0.00E+00	2.64E-03	5.28E-03	2.7500	7.716E+04
H-3	3.5173E-03	62.74	125.48	0.00E+00	2.21E-01	4.41E-01	3.5000	1.809E+02
I-129	7.3805E-07	62.74	125.48	0.00E+00	4.63E-05	9.26E-05	5.0000	7.058E+01
Kr-85	6.9263E-02	62.74	125.48	0.00E+00	4.35E+00	8.69E+00	7.0000	7.960E+00
Np-237	1.4752E-06	62.74	125.48	0.00E+00	9.26E-05	1.85E-04	11.0000	9.048E-01
Pa-231	8.3970E-09	62.74	125.48	0.00E+00	5.27E-07	1.05E-06		
Pb-210	1.4995E-13	62.74	125.48	0.00E+00	9.41E-12	1.88E-11		
Pm-147	1.0567E-02	62.74	125.48	0.00E+00	6.63E-01	1.33E+00		
Pu-238	1.1543E-03	62.74	125.48	0.00E+00	7.24E-02	1.45E-01		
Pu-239	5.6917E-03	62.74	125.48	0.00E+00	3.57E-01	7.14E-01		
Pu-240	2.2602E-03	62.74	125.48	0.00E+00	1.42E-01	2.84E-01		
Pu-241	4.8045E-02	62.74	125.48	0.00E+00	3.01E+00	6.03E+00		
Pu-242	3.0602E-07	62.74	125.48	0.00E+00	1.92E-05	3.84E-05		
Ra-226	5.1293E-13	62.74	125.48	0.00E+00	3.22E-11	6.44E-11		
Ra-228	2.3323E-10	62.74	125.48	0.00E+00	1.46E-08	2.93E-08		
Ru-106	1.0075E-07	62.74	125.48	0.00E+00	6.32E-06	1.26E-05		
Se-79	1.2935E-05	62.74	125.48	0.00E+00	8.12E-04	1.62E-03		
Sn-126	1.2238E-05	62.74	125.48	0.00E+00	7.68E-04	1.54E-03		
Sr-90	1.6165E+00	62.74	125.48	0.00E+00	1.01E+02	2.03E+02		
Tc-99	4.4120E-04	62.74	125.48	0.00E+00	2.77E-02	5.54E-02		
Th-229	4.5684E-10	62.74	125.48	0.00E+00	2.87E-08	5.73E-08		
Th-230	6.8271E-11	62.74	125.48	0.00E+00	4.28E-09	8.57E-09		
Th-232	2.3744E-10	62.74	125.48	0.00E+00	1.49E-08	2.98E-08		
Ti-208	1.7368E-08	62.74	125.48	0.00E+00	1.09E-06	2.18E-06		
U-232	4.6797E-08	62.74	125.48	0.00E+00	2.94E-06	5.87E-06		
U-233	1.3146E-07	62.74	125.48	0.00E+00	8.25E-06	1.65E-05		
U-234	2.5729E-07	62.74	125.48	0.00E+00	1.61E-05	3.23E-05		
U-235	-2.6159E-06	62.74	0.00	6.62E-03	6.45E-03	6.62E-03		
U-236	1.2719E-05	62.74	125.48	0.00E+00	7.98E-04	1.60E-03		
U-238	-3.8857E-08	62.74	0.00	7.57E-05	7.33E-05	7.57E-05		
Y-90	1.6165E+00	62.74	125.48	0.00E+00	1.01E+02	2.03E+02		
Other Radonuchdes					1.18E+02	2.36E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE	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 %	93.14680552	10 to 20.1	

Burnup Summary (MWd)³

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		62.74	Nominal burnup assumed to be 2% of BOL heavy metal mass.
Bounding		125.48	Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.52		0.98
Bounding	1.03		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name PRR-1 (UALX-LEU) PHILIPPINES

SNF ID #: 558

Fuel Units & Descr: 30 - 17 FLAT PLATES

Heavy Metal Mass BOL=20 328kg, EOL=19 713kg

ROD Storage Site SRS

Fuel decay start date 1998

Estimates as of 2030

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 25 years

Estimated
Canister usage
18"x10"
1 25

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3 8271E-09	587 03	1,174 06	0 00E+00	2 25E-06	4 49E-06	Avg MeV	
Am-241	4 4195E-03	587 03	1,174 06	0 00E+00	2 59E+00	5 19E+00	0 0150	1 061E+14
Am-242m	1 8195E-06	587 03	1,174 06	0 00E+00	1 07E-03	2 14E-03	0 0250	2 192E+13
Am-243	2 3278E-07	587 03	1,174 06	0 00E+00	1 37E-04	2 73E-04	0 0375	2 195E+13
C-14	4 3203E-05	587 03	1,174 06	0 00E+00	2 54E-02	5 07E-02	0 0575	2 105E+13
Cl-36	4 3023E-08	587 03	1,174 06	0 00E+00	2 53E-05	5 05E-05	0 0850	1 266E+13
Cm-243	1 6872E-07	587 03	1,174 06	0 00E+00	9 90E-05	1 98E-04	0 1250	1 287E+13
Cm-244	1 4660E-06	587 03	1,174 06	0 00E+00	8 61E-04	1 72E-03	0 2250	1 146E+13
Co-60	2 2376E-03	587 03	1,174 06	0 00E+00	1 31E+00	2 63E+00	0 3750	4 765E+12
Cs-134	1 2525E-04	587 03	1,174 06	0 00E+00	7 35E-02	1 47E-01	0 5750	7 707E+13
Cs-135	3 1549E-05	587 03	1,174 06	0 00E+00	1 85E-02	3 70E-02	0 8500	6 361E+12
Cs-137	1 7368E+00	587 03	1,174 06	0 00E+00	1 02E+03	2 04E+03	1 2500	6 674E+12
Eu-154	2 6947E-01	587 03	1,174 06	0 00E+00	1 58E+02	3 16E+02	1 7500	2 043E+11
Eu-155	2 6857E-02	587 03	1,174 06	0 00E+00	1 58E+01	3 15E+01	2 2500	3 135E+06
Fe-55	4 2105E-05	587 03	1,174 06	0 00E+00	2 47E-02	4 94E-02	2 7500	7 219E+05
H-3	3 5173E-03	587 03	1,174 06	0 00E+00	2 06E+00	4 13E+00	3 5000	1 716E+03
I-129	7 3805E-07	587 03	1,174 06	0 00E+00	4 33E-04	8 67E-04	5 0000	6 706E+02
Kr-85	6 9263E-02	587 03	1,174 06	0 00E+00	4 07E+01	8 13E+01	7 0000	7 566E+01
Np-237	1 4752E-06	587 03	1,174 06	0 00E+00	8 66E-04	1 73E-03	11 0000	8 602E+00
Pa-231	8 3970E-09	587 03	1,174 06	0 00E+00	4 93E-06	9 86E-06		
Pb-210	1 4995E-13	587 03	1,174 06	0 00E+00	8 80E-11	1 76E-10		
Pm-147	1 0567E-02	587 03	1,174 06	0 00E+00	6 20E+00	1 24E+01		
Pu-238	1 1543E-03	587 03	1,174 06	0 00E+00	6 78E-01	1 36E+00		
Pu-239	5 6917E-03	587 03	1,174 06	0 00E+00	3 34E+00	6 68E+00		
Pu-240	2 2602E-03	587 03	1,174 06	0 00E+00	1 33E+00	2 65E+00		
Pu-241	4 8045E-02	587 03	1,174 06	0 00E+00	2 82E+01	5 64E+01		
Pu-242	3 0602E-07	587 03	1,174 06	0 00E+00	1 80E-04	3 59E-04		
Pa-226	5 1293E-13	587 03	1,174 06	0 00E+00	3 01E-10	6 02E-10		
Pa-228	2 3323E-10	587 03	1,174 06	0 00E+00	1 37E-07	2 74E-07		
Ru-106	1 0075E-07	587 03	1,174 06	0 00E+00	5 91E-05	1 18E-04		
Se-79	1 2935E-05	587 03	1,174 06	0 00E+00	7 59E-03	1 52E-02		
Sn-126	1 2238E-05	587 03	1,174 06	0 00E+00	7 18E-03	1 44E-02		
Sr-90	1 6165E+00	587 03	1,174 06	0 00E+00	9 49E+02	1 90E+03		
Tc-99	4 4120E-04	587 03	1,174 06	0 00E+00	2 59E-01	5 18E-01		
Th-229	4 5684E-10	587 03	1,174 06	0 00E+00	2 68E-07	5 36E-07		
Th-230	6 8271E-11	587 03	1,174 06	0 00E+00	4 01E-08	8 02E-08		
Th-232	2 3744E-10	587 03	1,174 06	0 00E+00	1 39E-07	2 79E-07		
Th-232	1 7368E-08	587 03	1,174 06	0 00E+00	1 02E-05	2 04E-05		
Th-232	1 7368E-08	587 03	1,174 06	0 00E+00	2 75E-05	5 49E-05		
U-232	4 6797E-08	587 03	1,174 06	0 00E+00	7 72E-05	1 54E-04		
U-233	1 3146E-07	587 03	1,174 06	0 00E+00	1 51E-04	3 02E-04		
U-234	2 5729E-07	587 03	1,174 06	0 00E+00	7 20E-03	8 73E-03		
U-235	-2 6159E-06	587 03	0 00	8 73E-03	7 47E-03	1 49E-02		
U-236	1 2719E-05	587 03	1,174 06	0 00E+00	5 45E-03	5 47E-03		
U-238	-3 8857E-08	587 03	0 00	5 47E-03	9 49E+02	1 90E+03		
Y-90	1 6165E+00	587 03	1,174 06	0 00E+00	1 10E+03	2 21E+03		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	19 87821382	10 to 20 1

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		587 03
Bounding		1 174 06

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 78	
Bounding	1 56	

Estimated EOL HM/Given EOL HM

1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: PURDUE UNIVERSITY (U-ALX HEU)
 SNF ID #: 177
 Fuel Units & Descr: 124 - ELEMENT
 Heavy Metal Mass BOL=2.22kg EOL=2.22kg
 ROD Storage Site SRS

¹Fuel decay start date: 2035
 Estimates as of: 2030
 Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 5 years

Estimated
 Canister usage
 18"x10"
 3.44

II. Estimates

	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	42.04	84.08	0.00E+00	6.11E-09	1.22E-08	Avg MeV	
Am-241	1.1190E-03	42.04	84.08	0.00E+00	4.70E-02	9.41E-02	0.0150	1.622E+13
Am-242m	4.5425E-07	42.04	84.08	0.00E+00	1.91E-05	3.82E-05	0.0250	3.495E+12
Am-243	1.4921E-06	42.04	84.08	0.00E+00	6.27E-05	1.25E-04	0.0375	3.225E+12
C-14	5.7244E-09	42.04	84.08	0.00E+00	2.41E-07	4.81E-07	0.0575	3.171E+12
Cl-36	1.3124E-32	42.04	84.08	0.00E+00	5.52E-31	1.10E-30	0.0850	2.022E+12
Cm-243	2.3676E-07	42.04	84.08	0.00E+00	9.95E-06	1.99E-05	0.1250	1.751E+12
Cm-244	5.2042E-05	42.04	84.08	0.00E+00	2.19E-03	4.38E-03	0.2250	1.713E+12
Co-60	3.8208E-05	42.04	84.08	0.00E+00	1.61E-03	3.21E-03	0.3750	8.293E+11
Cs-134	4.8693E-01	42.04	84.08	0.00E+00	2.05E+01	4.09E+01	0.5750	1.139E+13
Cs-135	3.4477E-06	42.04	84.08	0.00E+00	1.45E-04	2.90E-04	0.8500	1.595E+12
Cs-137	2.8731E+00	42.04	84.08	0.00E+00	1.21E+02	2.42E+02	1.2500	2.968E+11
Eu-154	8.2053E-02	42.04	84.08	0.00E+00	3.45E+00	6.90E+00	1.7500	1.245E+10
Eu-155	3.9134E-02	42.04	84.08	0.00E+00	1.65E+00	3.29E+00	2.2500	2.611E+10
Fe-55	6.7429E-03	42.04	84.08	0.00E+00	2.83E-01	5.67E-01	2.7500	1.502E+08
H-3	1.0599E-02	42.04	84.08	0.00E+00	4.46E-01	8.91E-01	3.5000	1.666E+07
I-129	7.5300E-07	42.04	84.08	0.00E+00	3.17E-05	6.33E-05	5.0000	4.999E+01
Kr-85	2.8595E-01	42.04	84.08	0.00E+00	1.20E+01	2.40E+01	7.0000	5.573E+00
Np-237	9.5479E-06	42.04	84.08	0.00E+00	4.01E-04	8.03E-04	11.0000	6.282E-01
Pa-231	8.9297E-10	42.04	84.08	0.00E+00	3.75E-08	7.51E-08		
Pb-210	3.7609E-12	42.04	84.08	0.00E+00	1.58E-10	3.16E-10		
Pm-147	2.5452E+00	42.04	84.08	0.00E+00	1.07E+02	2.14E+02		
Pu-238	2.0550E-02	42.04	84.08	0.00E+00	8.64E-01	1.73E+00		
Pu-239	4.2838E-04	42.04	84.08	0.00E+00	1.80E-02	3.60E-02		
Pu-240	2.4401E-04	42.04	84.08	0.00E+00	1.03E-02	2.05E-02		
Pu-241	6.8764E-02	42.04	84.08	0.00E+00	2.89E+00	5.78E+00		
Pu-242	3.6329E-07	42.04	84.08	0.00E+00	1.53E-05	3.05E-05		
Ra-226	3.8045E-11	42.04	84.08	0.00E+00	1.60E-09	3.20E-09		
Ra-228	2.9902E-15	42.04	84.08	0.00E+00	1.26E-13	2.51E-13		
Ru-106	1.9055E-01	42.04	84.08	0.00E+00	8.01E+00	1.60E+01		
Se-79	1.2936E-05	42.04	84.08	0.00E+00	5.44E-04	1.09E-03		
Sn-126	1.1574E-05	42.04	84.08	0.00E+00	4.87E-04	9.73E-04		
Sr-90	2.7505E+00	42.04	84.08	0.00E+00	1.16E+02	2.31E+02		
Tc-99	4.2239E-04	42.04	84.08	0.00E+00	1.78E-02	3.55E-02		
Th-229	1.8848E-12	42.04	84.08	0.00E+00	7.92E-11	1.58E-10		
Th-230	1.7042E-08	42.04	84.08	0.00E+00	7.16E-07	1.43E-06		
Th-232	7.8132E-15	42.04	84.08	0.00E+00	3.28E-13	6.57E-13		
Ti-208	4.4063E-08	42.04	84.08	0.00E+00	1.85E-06	3.70E-06		
U-232	1.3151E-07	42.04	84.08	0.00E+00	5.53E-06	1.11E-05		
U-233	1.9564E-09	42.04	84.08	0.00E+00	8.22E-08	1.64E-07		
U-234	1.8371E-04	42.04	84.08	0.00E+00	7.72E-03	1.54E-02		
U-235	-2.7235E-06	42.04	0.00	4.41E-03	4.30E-03	4.41E-03		
U-236	1.5493E-05	42.04	84.08	0.00E+00	6.51E-04	1.30E-03		
U-238	-4.2851E-09	42.04	0.00	5.97E-05	5.95E-05	5.97E-05		
Y-90	2.7505E+00	42.04	84.08	0.00E+00	1.16E+02	2.31E+02		
Other Radionuclides					2.16E+02	4.32E+02		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.13E+00	4.26E+00
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 %:	92.00045093	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		42.04
Bounding		84.08

Basis for burnup used in estimate:
 Nominal burnup assumed to be 2% of BOL heavy metal mass.
 Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.06	
Bounding	0.12	

Estimated EOL HM/ Given EOL HM
 0.98

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name PURDUE UNIVERSITY-MTR-SI
SNF ID # 178
Fuel Units & Descr 16 - 10 FLAT PLATES
Heavy Metal Mass BOL=18 182kg EOL=18 182kg
ROD Storage Site: SRS

¹Fuel decay start date 2035
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.0016689
Template Decay Time 5 years

Estimated
Canister usage
18"x10"
0.44

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	344.38	688.76	0.00E+00	5.01E-08	1.00E-07	Avg MeV	
Am-241	1.1190E-03	344.38	688.76	0.00E+00	3.85E-01	7.71E-01	0.0150	1.329E+14
Am-242m	4.5425E-07	344.38	688.76	0.00E+00	1.56E-04	3.13E-04	0.0250	2.863E+13
Am-243	1.4921E-06	344.38	688.76	0.00E+00	5.14E-04	1.03E-03	0.0375	2.642E+13
C-14	5.7244E-09	344.38	688.76	0.00E+00	1.97E-06	3.94E-06	0.0575	2.598E+13
Cl-36	1.3124E-32	344.38	688.76	0.00E+00	4.52E-30	9.04E-30	0.0850	1.656E+13
Cm-243	2.9676E-07	344.38	688.76	0.00E+00	8.15E-05	1.63E-04	0.1250	1.434E+13
Cm-244	5.2042E-05	344.38	688.76	0.00E+00	1.79E-02	3.58E-02	0.2250	1.404E+13
Co-60	3.8208E-05	344.38	688.76	0.00E+00	1.32E-02	2.63E-02	0.3750	6.794E+12
Cs-134	4.8693E-01	344.38	688.76	0.00E+00	1.68E+02	3.35E+02	0.5750	9.332E+13
Cs-135	3.4477E-06	344.38	688.76	0.00E+00	1.19E-03	2.37E-03	0.8500	1.307E+13
Cs-137	2.8731E+00	344.38	688.76	0.00E+00	9.89E+02	1.98E+03	1.2500	2.431E+12
Eu-154	8.2053E-02	344.38	688.76	0.00E+00	2.83E+01	5.65E+01	1.7500	1.020E+11
Eu-155	3.9134E-02	344.38	688.76	0.00E+00	1.35E+01	2.70E+01	2.2500	2.139E+11
Fe-55	6.7429E-03	344.38	688.76	0.00E+00	2.32E+00	4.64E+00	2.7500	1.230E+09
H-3	1.0599E-02	344.38	688.76	0.00E+00	3.65E+00	7.30E+00	3.5000	1.365E+08
I-129	7.5300E-07	344.38	688.76	0.00E+00	2.59E-04	5.19E-04	5.0000	4.193E+02
Kr-85	2.8595E-01	344.38	688.76	0.00E+00	9.85E+01	1.97E+02	7.0000	4.679E+01
Np-237	9.5479E-06	344.38	688.76	0.00E+00	3.29E-03	6.58E-03	11.0000	5.277E+00
Pa-231	8.9297E-10	344.38	688.76	0.00E+00	3.08E-07	6.15E-07		
Pb-210	3.7609E-12	344.38	688.76	0.00E+00	1.30E-09	2.59E-09		
Pm-147	2.5452E+00	344.38	688.76	0.00E+00	8.77E+02	1.75E+03		
Pu-238	2.0550E-02	344.38	688.76	0.00E+00	7.08E+00	1.42E+01		
Pu-239	4.2838E-04	344.38	688.76	0.00E+00	1.48E-01	2.95E-01		
Pu-240	2.4401E-04	344.38	688.76	0.00E+00	8.40E-02	1.68E-01		
Pu-241	6.8764E-02	344.38	688.76	0.00E+00	2.37E+01	4.74E+01		
Pu-242	3.6329E-07	344.38	688.76	0.00E+00	1.25E-04	2.50E-04		
Ra-226	3.8045E-11	344.38	688.76	0.00E+00	1.31E-08	2.62E-08		
Ra-228	2.9902E-15	344.38	688.76	0.00E+00	1.03E-12	2.06E-12		
Ru-106	1.9055E-01	344.38	688.76	0.00E+00	6.56E+01	1.31E+02		
Sa-79	1.2936E-05	344.38	688.76	0.00E+00	4.45E-03	8.91E-03		
Sn-126	1.1574E-05	344.38	688.76	0.00E+00	3.99E-03	7.97E-03		
Sr-90	2.7505E+00	344.38	688.76	0.00E+00	9.47E+02	1.89E+03		
Tc-99	4.2239E-04	344.38	688.76	0.00E+00	1.45E-01	2.91E-01		
Th-229	1.8848E-12	344.38	688.76	0.00E+00	6.49E-10	1.30E-09		
Th-230	1.7042E-08	344.38	688.76	0.00E+00	5.87E-06	1.17E-05		
Th-232	7.8132E-15	344.38	688.76	0.00E+00	2.69E-12	5.38E-12		
Ti-208	4.4063E-08	344.38	688.76	0.00E+00	1.52E-05	3.03E-05		
U-232	1.3151E-07	344.38	688.76	0.00E+00	4.53E-05	9.06E-05		
U-233	1.9564E-09	344.38	688.76	0.00E+00	6.74E-07	1.35E-06		
U-234	1.8371E-04	344.38	688.76	0.00E+00	6.33E-02	1.27E-01		
U-235	-2.7235E-06	344.38	0.00	7.47E-03	6.53E-03	7.47E-03		
U-236	1.5493E-05	344.38	688.76	0.00E+00	5.34E-03	1.07E-02		
U-238	-4.2851E-09	344.38	0.00	4.95E-03	4.95E-03	4.95E-03		
Y-90	2.7505E+00	344.38	688.76	0.00E+00	9.47E+02	1.89E+03		
Other Radionuclides					1.77E+03	3.54E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons. This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.0001402	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup assumed to be 2% of BOL heavy metal mass. Bounding burnup assumed to be twice nominal burnup.
Nominal		344.38	
Bounding		688.76	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.06		0.98
Bounding	0.12		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: R 2 SVTR (U3Si2 LEU) SWEDEN
SNF ID #: 942
Fuel Units & Descr: 183 - MTR TYPE
Heavy Metal Mass: BOL=351 47kg, EOL=308 977kg
ROD Storage Site: SRS

Fuel decay start date: 1996
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
*Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated
Canister usage*
18"x10"
5 08

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	CvMWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 1465E-09	40,241 32	80,482 63	0 00E+00	4 61E-05	9 23E-05	Avg MeV	
Am-241	2 3056E-03	40,241 32	80,482 63	0 00E+00	9 28E+01	1 86E+02	0 0150	7 531E+15
Am-242m	4 1476E-07	40,241 32	80,482 63	0 00E+00	1 67E-02	3 34E-02	0 0250	1 565E+15
Am-243	1 4894E-06	40,241 32	80,482 63	0 00E+00	5 99E-02	1 20E-01	0 0375	1 363E+15
C-14	5 7108E-09	40,241 32	80,482 63	0 00E+00	2 30E-04	4 60E-04	0 0575	1 463E+15
Cl-36	1 3124E-32	40,241 32	80,482 63	0 00E+00	5 28E-28	1 06E-27	0 0850	8 828E+14
Cm-243	1 4562E-07	40,241 32	80,482 63	0 00E+00	5 86E-03	1 17E-02	0 1250	5 913E+14
Cm-244	2 4221E-05	40,241 32	80,482 63	0 00E+00	9 75E-01	1 95E+00	0 2250	7 622E+14
Co-60	2 7560E-06	40,241 32	80,482 63	0 00E+00	1 11E-01	2 22E-01	0 3750	3 314E+14
Cs-134	5 8851E-04	40,241 32	80,482 63	0 00E+00	2 37E+01	4 74E+01	0 5750	5 432E+15
Cs-135	3 4477E-06	40,241 32	80,482 63	0 00E+00	1 39E-01	2 77E-01	0 8500	7 828E+13
Cs-137	1 8099E+00	40,241 32	80,482 63	0 00E+00	7 28E+04	1 46E+05	1 2500	4 353E+13
Eu-154	1 6386E-02	40,241 32	80,482 63	0 00E+00	6 59E+02	1 32E+03	1 7500	2 151E+12
Eu-155	2 3957E-03	40,241 32	80,482 63	0 00E+00	9 64E+01	1 93E+02	2 2500	1 533E+08
Fe-55	3 2707E-05	40,241 32	80,482 63	0 00E+00	1 32E+00	2 63E+00	2 7500	1 255E+08
H-3	3 4504E-03	40,241 32	80,482 63	0 00E+00	1 39E+02	2 78E+02	3 5000	9 520E+04
I-129	7 5300E-07	40,241 32	80,482 63	0 00E+00	3 03E-02	6 06E-02	5 0000	3 207E+04
Kr-85	7 8540E-02	40,241 32	80,482 63	0 00E+00	3 16E+03	6 32E+03	7 0000	3 529E+03
Np-237	9 5615E-06	40,241 32	80,482 63	0 00E+00	3 85E-01	7 70E-01	11 0000	3 949E+02
Pa-231	2 7968E-09	40,241 32	80,482 63	0 00E+00	1 13E-04	2 25E-04		
Pb-210	1 2612E-10	40,241 32	80,482 63	0 00E+00	5 08E-06	1 02E-05		
Pm-147	1 2952E-02	40,241 32	80,482 63	0 00E+00	5 21E+02	1 04E+03		
Pu-238	1 7549E-02	40,241 32	80,482 63	0 00E+00	7 06E+02	1 41E+03		
Pu-239	4 2810E-04	40,241 32	80,482 63	0 00E+00	1 72E+01	3 45E+01		
Pu-240	2 4357E-04	40,241 32	80,482 63	0 00E+00	9 80E+00	1 96E+01		
Pu-241	2 6277E-02	40,241 32	80,482 63	0 00E+00	1 06E+03	2 11E+03		
Pu-242	3 6329E-07	40,241 32	80,482 63	0 00E+00	1 46E-02	2 92E-02		
Ra-226	4 4444E-10	40,241 32	80,482 63	0 00E+00	1 79E-05	3 58E-05		
Ra-228	1 9714E-14	40,241 32	80,482 63	0 00E+00	7 93E-10	1 59E-09		
Ru-106	2 0477E-07	40,241 32	80,482 63	0 00E+00	8 24E-03	1 65E-02		
Se-79	1 2933E-05	40,241 32	80,482 63	0 00E+00	5 20E-01	1 04E+00		
Sn-126	1 1574E-05	40,241 32	80,482 63	0 00E+00	4 66E-01	9 32E-01		
Sr-90	1 7092E+00	40,241 32	80,482 63	0 00E+00	6 88E+04	1 38E+05		
Tc-99	4 2239E-04	40,241 32	80,482 63	0 00E+00	1 70E+01	3 40E+01		
Th-229	7 7260E-12	40,241 32	80,482 63	0 00E+00	3 11E-07	6 22E-07		
Th-230	5 8497E-08	40,241 32	80,482 63	0 00E+00	2 35E-03	4 71E-03		
Th-232	2 6906E-14	40,241 32	80,482 63	0 00E+00	1 08E-09	2 17E-09		
Th-208	4 4336E-08	40,241 32	80,482 63	0 00E+00	1 78E-03	3 57E-03		
U-232	1 2037E-07	40,241 32	80,482 63	0 00E+00	4 84E-03	9 69E-03		
U-233	3 0011E-09	40,241 32	80,482 63	0 00E+00	1 21E-04	2 42E-04		
U-234	1 8497E-04	40,241 32	80,482 63	0 00E+00	7 44E+00	1 49E+01		
U-235	-2 7235E-06	40,241 32	0 00	1 51E-01	4 11E-02	1 51E-01		
U-236	1 5493E-05	40,241 32	80,482 63	0 00E+00	6 23E-01	1 25E+00		
U-238	-4 2851E-09	40,241 32	0 00	9 47E-02	9 45E-02	9 47E-02		
Y-90	1 7094E+00	40,241 32	80,482 63	0 00E+00	6 88E+04	1 38E+05		
Other Radionuclides					6 93E+04	1 39E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator:	From SFD	Used	
Fuel Cladding:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
BOL HM Constituents:	ALUM	ALUM	
BOL Enrichment %:	U	U	
	19 84262055	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		40,241 32	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		80 482 63	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.36		1 01
Bounding	0.73		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name R-2 SVTR (JALX HEU) SWEDEN
SNF ID # 801
Fuel Units & Descr 450 - MTR TYPE
Heavy Metal Mass BOL=111 015kg EOL=59 85kg
ROD Storage Site SRS

Fuel decay start date 1996
Estimates as of 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
*Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 25 years

Estimated
Canister usage
18"x10"
12 50

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1 1465E-09	48,454.25	96,908.50	0 00E+00	5 56E-05	1 11E-04	0 0150	9 068E+15
Am-241	2 3056E-03	48,454.25	96,908.50	0 00E+00	1 12E+02	2 23E+02	0 0250	1 884E+15
Am-242m	4 1476E-07	48,454.25	96,908.50	0 00E+00	2 01E-02	4 02E-02	0 0375	1 641E+15
Am-243	1 4894E-06	48,454.25	96,908.50	0 00E+00	7 22E-02	1 44E-01	0 0575	1 762E+15
C-14	5 7108E-09	48,454.25	96,908.50	0 00E+00	2 77E-04	5 53E-04	0 0850	1 063E+15
Ct-36	1 3124E-32	48,454.25	96,908.50	0 00E+00	6 36E-28	1 27E-27	0 1250	7 120E+14
Cm-243	1 4562E-07	48,454.25	96,908.50	0 00E+00	7 06E-03	1 41E-02	0 2250	9 177E+14
Cm-244	2 4221E-05	48,454.25	96,908.50	0 00E+00	1 17E+00	2 35E+00	0 3750	3 990E+14
Co-60	2 7560E-06	48,454.25	96,908.50	0 00E+00	1 34E-01	2 67E-01	0 5750	6 541E+15
Cs-134	5 8851E-04	48,454.25	96,908.50	0 00E+00	2 85E+01	5 70E+01	0 8500	9 425E+13
Cs-135	3 4477E-06	48,454.25	96,908.50	0 00E+00	1 67E-01	3 34E-01	1 2500	5 242E+13
Cs-137	1 8099E+00	48,454.25	96,908.50	0 00E+00	8 77E+04	1 75E+05	1 7500	2 590E+12
Eu-154	1 6386E-02	48,454.25	96,908.50	0 00E+00	7 94E+02	1 59E+03	2 2500	1 846E+08
Eu-155	2 3957E-03	48,454.25	96,908.50	0 00E+00	1 16E+02	2 32E+02	2 7500	1 511E+08
Fe-55	3 2707E-05	48,454.25	96,908.50	0 00E+00	1 58E+00	3 17E+00	3 5000	1 140E+05
H-3	3 4504E-03	48,454.25	96,908.50	0 00E+00	1 67E+02	3 34E+02	5 0000	3 836E+04
I-129	7 5300E-07	48,454.25	96,908.50	0 00E+00	3 65E-02	7 30E-02	7 0000	4 220E+03
Kr-85	7 8540E-02	48,454.25	96,908.50	0 00E+00	3 81E+03	7 61E+03	11 0000	4 721E+02
Np-237	9 5615E-06	48,454.25	96,908.50	0 00E+00	4 63E-01	9 27E-01		
Pa-231	2 7968E-09	48,454.25	96,908.50	0 00E+00	1 36E-04	2 71E-04		
Pb-210	1 2612E-10	48,454.25	96,908.50	0 00E+00	6 11E-06	1 22E-05		
Pm-147	1 2952E-02	48,454.25	96,908.50	0 00E+00	6 28E+02	1 26E+03		
Pu-238	1 7549E-02	48,454.25	96,908.50	0 00E+00	8 50E+02	1 70E+03		
Pu-239	4 2810E-04	48,454.25	96,908.50	0 00E+00	2 07E+01	4 15E+01		
Pu-240	2 4357E-04	48,454.25	96,908.50	0 00E+00	1 18E+01	2 36E+01		
Pu-241	2 6277E-02	48,454.25	96,908.50	0 00E+00	1 27E+03	2 55E+03		
Pu-242	3 6329E-07	48,454.25	96,908.50	0 00E+00	1 76E-02	3 52E-02		
Ra-226	4 4444E-10	48,454.25	96,908.50	0 00E+00	2 15E-05	4 31E-05		
Ra-228	1 9714E-14	48,454.25	96,908.50	0 00E+00	9 55E-10	1 91E-09		
Ru-106	2 0477E-07	48,454.25	96,908.50	0 00E+00	9 92E-03	1 98E-02		
Se-79	1 2933E-05	48,454.25	96,908.50	0 00E+00	6 27E-01	1 25E+00		
Sn-126	1 1574E-05	48,454.25	96,908.50	0 00E+00	5 61E-01	1 12E+00		
Sr-90	1 7092E+00	48,454.25	96,908.50	0 00E+00	8 28E+04	1 66E+05		
Tc-99	4 2239E-04	48,454.25	96,908.50	0 00E+00	2 05E+01	4 09E+01		
Th-229	7 7260E-12	48,454.25	96,908.50	0 00E+00	3 74E-07	7 49E-07		
Th-230	5 8497E-08	48,454.25	96,908.50	0 00E+00	2 83E-03	5 67E-03		
Th-232	2 6906E-14	48,454.25	96,908.50	0 00E+00	1 30E-09	2 61E-09		
Th-208	4 4336E-08	48,454.25	96,908.50	0 00E+00	2 15E-03	4 30E-03		
U-232	1 2037E-07	48,454.25	96,908.50	0 00E+00	5 83E-03	1 17E-02		
U-233	3 0011E-09	48,454.25	96,908.50	0 00E+00	1 45E-04	2 91E-04		
U-234	1 8497E-04	48,454.25	96,908.50	0 00E+00	8 96E+00	1 79E+01		
U-235	2 7235E-06	48,454.25	0 00	2 22E-01	9 00E-02	2 22E-01		
U-236	1 5493E-05	48,454.25	96,908.50	0 00E+00	7 51E-01	1 50E+00		
U-238	4 2851E-09	48,454.25	0 00	2 79E-03	2 58E-03	2 79E-03		
Y-90	1 7094E+00	48,454.25	96,908.50	0 00E+00	8 28E+04	1 66E+05		
Other Radionuclides					8 35E+04	1 67E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92 5168132	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		48 454.25	
Bounding		96 908.50	

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1 39		1 05
Bounding	2 77		

*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: RA-3 (UALX-HEU) (ARGENTINA)
 SNF ID #: 634
 Fuel Units & Descr: 32 - 19 CURVED PLATES
 Heavy Metal Mass: BOL=5 722kg; EOL=4 595kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1987
 Estimates as of 2030

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

²Template Burnup(MWd): 367.2

Template BOL Heavy Metal Mass (MT): 0 00116689

Template Decay Time 35 years

Estimated
 Canister usage
 18"x10"
 1 33

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	1,066 72	2,133 45	0 00E+00	2 14E-06	4 28E-06	Avg MeV	
Am-241	2 5251E-03	1,066 72	2,133 45	0 00E+00	2 69E+00	5 39E+00	0 0150	1 571E+14
Am-242m	3 9624E-07	1,066 72	2,133 45	0 00E+00	4 23E-04	8 45E-04	0 0250	3 263E+13
Am-243	1 4880E-06	1,066 72	2,133 45	0 00E+00	1 59E-03	3 17E-03	0 0375	2 836E+13
C-14	5 7053E-09	1,066 72	2,133 45	0 00E+00	6 09E-06	1 22E-05	0 0675	3 053E+13
Cl-36	1 3124E-32	1,066 72	2,133 45	0 00E+00	1 40E-29	2 80E-29	0 0850	1 839E+13
Cm-243	1 1419E-07	1,066 72	2,133 45	0 00E+00	1 22E-04	2 44E-04	0 1250	1 215E+13
Cm-244	1 6522E-05	1,066 72	2,133 45	0 00E+00	1 76E-02	3 52E-02	0 2250	1 588E+13
Co-60	7 4047E-07	1,066 72	2,133 45	0 00E+00	7 90E-04	1 58E-03	0 3750	6 908E+12
Cs-134	2 0455E-05	1,066 72	2,133 45	0 00E+00	2 18E-02	4 36E-02	0 5750	1 142E+14
Cs-135	3 4477E-06	1,066 72	2,133 45	0 00E+00	3 68E-03	7 36E-03	0 8500	1 395E+12
Cs-137	1 4365E+00	1,066 72	2,133 45	0 00E+00	1 53E+03	3 06E+03	1 2500	6 745E+11
Eu-154	7 3230E-03	1,066 72	2,133 45	0 00E+00	7 81E+00	1 56E+01	1 7500	3 796E+10
Eu-155	5 9259E-04	1,066 72	2,133 45	0 00E+00	6 32E-01	1 26E+00	2 2500	3 174E+06
Fe-55	2 2791E-06	1,066 72	2,133 45	0 00E+00	2 43E-03	4 86E-03	2 7500	3 030E+06
H-3	1 9698E-03	1,066 72	2,133 45	0 00E+00	2 10E+00	4 20E+00	3 5000	1 756E+03
I-129	7 5300E-07	1,066 72	2,133 45	0 00E+00	8 03E-04	1 61E-03	5 0000	7 175E+02
Kr-85	4 1176E-02	1,066 72	2,133 45	0 00E+00	4 39E+01	8 78E+01	7 0000	7 852E+01
Np-237	9 5752E-06	1,066 72	2,133 45	0 00E+00	1 02E-02	2 04E-02	11 0000	8 754E+00
Pa-231	3 9379E-09	1,066 72	2,133 45	0 00E+00	4 20E-06	8 40E-06		
Pb-210	3 3115E-10	1,066 72	2,133 45	0 00E+00	3 53E-07	7 07E-07		
Pm-147	9 2402E-04	1,066 72	2,133 45	0 00E+00	9 86E-01	1 97E+00		
Pu-238	1 6217E-02	1,066 72	2,133 45	0 00E+00	1 73E+01	3 46E+01		
Pu-239	4 2810E-04	1,066 72	2,133 45	0 00E+00	4 57E-01	9 13E-01		
Pu-240	2 4333E-04	1,066 72	2,133 45	0 00E+00	2 60E-01	5 19E-01		
Pu-241	1 6242E-02	1,066 72	2,133 45	0 00E+00	1 73E+01	3 47E+01		
Pu-242	3 6329E-07	1,066 72	2,133 45	0 00E+00	3 88E-04	7 75E-04		
Ra-226	9 0114E-10	1,066 72	2,133 45	0 00E+00	9 61E-07	1 92E-06		
Ra-228	3 1019E-14	1,066 72	2,133 45	0 00E+00	3 31E-11	6 62E-11		
Ru-106	2 1225E-10	1,066 72	2,133 45	0 00E+00	2 26E-07	4 53E-07		
Se-79	1 2930E-05	1,066 72	2,133 45	0 00E+00	1 38E-02	2 76E-02		
Sn-126	1 1571E-05	1,066 72	2,133 45	0 00E+00	1 23E-02	2 47E-02		
Sr-90	1 3472E+00	1,066 72	2,133 45	0 00E+00	1 44E+03	2 87E+03		
Tc-99	4 2239E-04	1,066 72	2,133 45	0 00E+00	4 51E-01	9 01E-01		
Th-229	1 2407E-11	1,066 72	2,133 45	0 00E+00	1 32E-08	2 65E-08		
Th-230	8 3497E-08	1,066 72	2,133 45	0 00E+00	8 91E-05	1 78E-04		
Th-232	3 8371E-14	1,066 72	2,133 45	0 00E+00	4 09E-11	8 19E-11		
Ti-208	4 0414E-08	1,066 72	2,133 45	0 00E+00	4 31E-05	8 62E-05		
U-232	1 0948E-07	1,066 72	2,133 45	0 00E+00	1 17E-04	2 34E-04		
U-233	3 6275E-09	1,066 72	2,133 45	0 00E+00	3 87E-06	7 74E-06		
U-234	1 8562E-04	1,066 72	2,133 45	0 00E+00	1 98E-01	3 96E-01		
U-235	-2 7235E-06	1,066 72	0 00	1 11E-02	8 22E-03	1 11E-02		
U-236	1 5493E-05	1,066 72	2,133 45	0 00E+00	1 65E-02	3 31E-02		
U-238	-4 2851E-09	1,066 72	0 00	1 93E-04	1 88E-04	1 93E-04		
Y-90	1 3475E+00	1,066 72	2,133 45	0 00E+00	1 44E+03	2 87E+03		
Other Radionuclides					1 46E+03	2 92E+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:
Reactor Moderator Fuel Cladding BOL HM Constituents BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	89.96321383	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal Bounding	From SFD	Estimated	
		1 066 72 2,133 45	

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

Checks			Estimated EOL HM/Given EOL HM
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.59 1 18		

1 01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name RA-3 (UALX-HEU) (ARGENTINA)
SNF ID # 636
Fuel Units & Descr: 207 - 19 CURVED PLATES
Heavy Metal Mass BOL=37 84kg EOL=30 139kg
ROD Storage Site: SRS

¹Fuel decay start date: 1987
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 0016689
Template Decay Time: 35 years

Estimated
Canister usage
18"x10"
8 G3

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	7,292 43	14,584 86	0 00E+00	1 46E-05	2 93E-05	Avg MeV	
Am-241	2 5251E-03	7,292 43	14,584 86	0 00E+00	1 84E+01	3 68E+01	0 0150	1 074E+15
Am-242m	3 9624E-07	7,292 43	14,584 86	0 00E+00	2 89E-03	5 78E-03	0 0250	2 231E+14
Am-243	1 4880E-06	7,292 43	14,584 86	0 00E+00	1 09E-02	2 17E-02	0 0375	1 939E+14
C-14	5 7053E-09	7,292 43	14,584 86	0 00E+00	4 16E-05	8 32E-05	0 0575	2 087E+14
Cf-252	1 3124E-32	7,292 43	14,584 86	0 00E+00	9 57E-29	1 91E-28	0 0850	1 257E+14
Cm-243	1 1419E-07	7,292 43	14,584 86	0 00E+00	8 33E-04	1 67E-03	0 1250	8 305E+13
Cm-244	1 6522E-05	7,292 43	14,584 86	0 00E+00	1 20E-01	2 41E-01	0 2250	1 086E+14
Co-60	7 4047E-07	7,292 43	14,584 86	0 00E+00	5 40E-03	1 08E-02	0 3750	4 723E+13
Cs-134	2 0455E-05	7,292 43	14,584 86	0 00E+00	1 49E-01	2 98E-01	0 5750	7 805E+14
Cs-135	3 4477E-06	7,292 43	14,584 86	0 00E+00	2 51E-02	5 03E-02	0 8500	9 534E+12
Cs-137	1 4365E+00	7,292 43	14,584 86	0 00E+00	1 05E+04	2 10E+04	1 2500	4 611E+12
Eu-154	7 3230E-03	7,292 43	14,584 86	0 00E+00	5 34E+01	1 07E+02	1 7500	2 595E+11
Eu-155	5 9259E-04	7,292 43	14,584 86	0 00E+00	4 32E+00	8 64E+00	2 2500	2 170E+07
Fe-55	2 2791E-06	7,292 43	14,584 86	0 00E+00	1 66E-02	3 32E-02	2 7500	2 071E+07
H-3	1 9698E-03	7,292 43	14,584 86	0 00E+00	1 44E+01	2 87E+01	3 5000	1 200E+04
I-129	7 5300E-07	7,292 43	14,584 86	0 00E+00	5 49E-03	1 10E-02	5 0000	4 905E+03
Kr-85	4 1176E-02	7,292 43	14,584 86	0 00E+00	3 00E+02	6 01E+02	7 0000	5 367E+02
Np-237	9 5752E-06	7,292 43	14,584 86	0 00E+00	6 98E-02	1 40E-01	11 0000	5 985E+01
Pa-231	3 9379E-09	7,292 43	14,584 86	0 00E+00	2 87E-05	5 74E-05		
Pb-210	3 3115E-10	7,292 43	14,584 86	0 00E+00	2 41E-06	4 83E-06		
Pm-147	9 2402E-04	7,292 43	14,584 86	0 00E+00	6 74E+00	1 35E+01		
Pu-238	1 6217E-02	7,292 43	14,584 86	0 00E+00	1 18E+02	2 37E+02		
Pu-239	4 2810E-04	7,292 43	14,584 86	0 00E+00	3 12E+00	6 24E+00		
Pu-240	2 4333E-04	7,292 43	14,584 86	0 00E+00	1 77E+00	3 55E+00		
Pu-241	1 6242E-02	7,292 43	14,584 86	0 00E+00	1 18E+02	2 37E+02		
Pu-242	3 6329E-07	7,292 43	14,584 86	0 00E+00	2 65E-03	5 30E-03		
Ra-226	9 0114E-10	7,292 43	14,584 86	0 00E+00	6 57E-06	1 31E-05		
Ra-228	3 1019E-14	7,292 43	14,584 86	0 00E+00	2 26E-10	4 52E-10		
Ru-106	2 1225E-10	7,292 43	14,584 86	0 00E+00	1 55E-06	3 10E-06		
Se-79	1 2930E-05	7,292 43	14,584 86	0 00E+00	9 43E-02	1 89E-01		
Sn-126	1 1571E-05	7,292 43	14,584 86	0 00E+00	8 44E-02	1 69E-01		
Sr-90	1 3472E+00	7,292 43	14,584 86	0 00E+00	9 82E+03	1 96E+04		
Tc-99	4 2239E-04	7,292 43	14,584 86	0 00E+00	3 08E+00	6 16E+00		
Th-229	1 2407E-11	7,292 43	14,584 86	0 00E+00	9 05E-08	1 81E-07		
Th-230	8 3497E-08	7,292 43	14,584 86	0 00E+00	6 09E-04	1 22E-03		
Th-232	3 8371E-14	7,292 43	14,584 86	0 00E+00	2 80E-10	5 60E-10		
Th-208	4 0414E-08	7,292 43	14,584 86	0 00E+00	2 95E-04	5 89E-04		
U-232	1 0948E-07	7,292 43	14,584 86	0 00E+00	7 98E-04	1 60E-03		
U-233	3 6275E-09	7,292 43	14,584 86	0 00E+00	2 65E-05	5 29E-05		
U-234	1 8562E-04	7,292 43	14,584 86	0 00E+00	1 35E+00	2 71E+00		
U-235	2 7235E-06	7,292 43	0 00	7 36E-02	5 37E-02	7 36E-02		
U-236	1 5493E-05	7,292 43	14,584 86	0 00E+00	1 13E-01	2 26E-01		
U-238	4 2851E-09	7,292 43	0 00	1 27E-03	1 24E-03	1 27E-03		
Y-90	1 3475E+00	7,292 43	14,584 86	0 00E+00	9 83E+03	1 97E+04		
Other Radionuclides					9 98E+03	2 00E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	89 97773401	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		7 292 43	
Bounding		14 584 86	

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 61		1 01
Bounding	1 22		

*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: RECH-1 (CHILE)
 SNF ID #: 708
 Fuel Units & Descr: 58 - MTR TYPE
 Heavy Metal Mass: BOL=11 873kg; EOL=7 998kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1999
 Estimates as of 2030
 Template: ATR (Light Water Alum 60 to 100%, U)
²Template Burnup(MWd)³: 367.2
 Template BOL Heavy Metal Mass (MT): 0 00116689
 Template Decay Time: 25 years

Estimated
 Canister usage
 18"x10"
 2 42

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 1465E-09	3,669 13	7,338.26	0 00E+00	4 21E-06	8 41E-06	Avg MeV	
Am-241	2 3056E-03	3,669 13	7,338.26	0 00E+00	8 46E+00	1 69E+01	0 0150	6 867E+14
Am-242m	4 1476E-07	3,669 13	7,338.26	0 00E+00	1 52E-03	3 04E-03	0 0250	1 427E+14
Am-243	1 4894E-06	3,669 13	7,338.26	0 00E+00	5 46E-03	1 09E-02	0 0375	1 242E+14
C-14	5 7108E-09	3,669 13	7,338.26	0 00E+00	2 10E-05	4 19E-05	0 0575	1 334E+14
Cl-36	1 3124E-32	3,669 13	7,338.26	0 00E+00	4 82E-29	9 63E-29	0 0850	8 049E+13
Cm-243	1 4562E-07	3,669 13	7,338.26	0 00E+00	5 34E-04	1 07E-03	0 1250	5 392E+13
Cm-244	2 4221E-05	3,669 13	7,338.26	0 00E+00	8 89E-02	1 78E-01	0 2250	6 949E+13
Co-60	2 7560E-06	3,669 13	7,338.26	0 00E+00	1 01E-02	2 02E-02	0 3750	3 021E+13
Cs-134	5 8851E-04	3,669 13	7,338.26	0 00E+00	2 16E+00	4 32E+00	0 5750	4 953E+14
Cs-135	3 4477E-06	3,669 13	7,338.26	0 00E+00	1 27E-02	2 53E-02	0 8500	7 137E+12
Cs-137	1 8099E+00	3,669 13	7,338.26	0 00E+00	6 64E+03	1 33E+04	1 2500	3 969E+12
Eu-154	1 6386E-02	3,669 13	7,338.26	0 00E+00	6 01E+01	1 20E+02	1 7500	1 961E+11
Eu-155	2 3957E-03	3,669 13	7,338.26	0 00E+00	8 79E+00	1 76E+01	2 2500	1 398E+07
Fe-55	3 2707E-05	3,669 13	7,338.26	0 00E+00	1 20E-01	2 40E-01	2 7500	1 144E+07
H-3	3 4504E-03	3,669 13	7,338.26	0 00E+00	1 27E+01	2 53E+01	3 5000	8 639E+03
I-129	7 5300E-07	3,669 13	7,338.26	0 00E+00	2 76E-03	5 53E-03	5 0000	2 906E+03
Kr-85	7 8540E-02	3,669 13	7,338.26	0 00E+00	2 88E+02	5 76E+02	7 0000	3 197E+02
Np-237	9 5615E-06	3,669 13	7,338.26	0 00E+00	3 51E-02	7 02E-02	11 0000	3 577E+01
Pa-231	2 7968E-09	3,669 13	7,338.26	0 00E+00	1 03E-05	2 05E-05		
Pb-210	1 2612E-10	3,669 13	7,338.26	0 00E+00	4 63E-07	9 25E-07		
Pm-147	1 2952E-02	3,669 13	7,338.26	0 00E+00	4 75E+01	9 50E+01		
Pu-238	1 7549E-02	3,669 13	7,338.26	0 00E+00	6 44E+01	1 29E+02		
Pu-239	4 2810E-04	3,669 13	7,338.26	0 00E+00	1 57E+00	3 14E+00		
Pu-240	2 4357E-04	3,669 13	7,338.26	0 00E+00	8 94E-01	1 79E+00		
Pu-241	2 6277E-02	3,669 13	7,338.26	0 00E+00	9 64E+01	1 93E+02		
Pu-242	3 6329E-07	3,669 13	7,338.26	0 00E+00	1 33E-03	2 67E-03		
Ra-226	4 4444E-10	3,669 13	7,338.26	0 00E+00	1 63E-06	3 26E-06		
Ra-228	1 9714E-14	3,669 13	7,338.26	0 00E+00	7 23E-11	1 45E-10		
Ru-106	2 0477E-07	3,669 13	7,338.26	0 00E+00	7 51E-04	1 50E-03		
Se-79	1 2933E-05	3,669 13	7,338.26	0 00E+00	4 75E-02	9 49E-02		
Sn-126	1 1574E-05	3,669 13	7,338.26	0 00E+00	4 25E-02	8 49E-02		
Sr-90	1 7092E+00	3,669 13	7,338.26	0 00E+00	6 27E+03	1 25E+04		
Tc-99	4 2239E-04	3,669 13	7,338.26	0 00E+00	1 55E+00	3 10E+00		
Th-229	7 7260E-12	3,669 13	7,338.26	0 00E+00	2 83E-08	5 67E-08		
Th-230	5 8497E-08	3,669 13	7,338.26	0 00E+00	2 15E-04	4 29E-04		
Th-232	2 6906E-14	3,669 13	7,338.26	0 00E+00	9 87E-11	1 97E-10		
Ti-208	4 4336E-08	3,669 13	7,338.26	0 00E+00	1 63E-04	3 25E-04		
U-232	1 2037E-07	3,669 13	7,338.26	0 00E+00	4 42E-04	8 83E-04		
U-233	3 0011E-09	3,669 13	7,338.26	0 00E+00	1 10E-05	2 20E-05		
U-234	1 8497E-04	3,669 13	7,338.26	0 00E+00	6 79E-01	1 36E+00		
U-235	-2 7235E-06	3,669 13	0 00	2 05E-02	1 05E-02	2 05E-02		
U-236	1 5493E-05	3,669 13	7,338.26	0 00E+00	5 68E-02	1 14E-01		
U-238	-4 2851E-09	3,669 13	0 00	7 98E-04	7 83E-04	7 98E-04		
Y-90	1 7094E+00	3,669 13	7,338.26	0 00E+00	6 27E+03	1 25E+04		
Other Radionuclides					6 32E+03	1 26E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	79 9939132	60 to 100	

Burnup Summary (MWd) ³			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal:		3 669 13	
Bounding:		7 338.26	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 98		
Bounding	1 96		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name RHF (FRANCE)
SNF ID # 179
Fuel Units & Descr 4 - 2 CONCENTRIC TUBES
Heavy Metal Mass: BOL=36.9kg EOL=25.51kg
ROD Storage Site SRS

Fuel decay start date 1989
Estimates as of 2030
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 35 years

Estimated
Canister usage
18"x10"
0 67

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.0068E-09	10,786.55	21,573.10	0.00E+00	2.16E-05	4.33E-05	Avg MeV	
Am-241	2.5251E-03	10,786.55	21,573.10	0.00E+00	2.72E+01	5.45E+01	0.0150	1.589E+15
Am-242m	3.9624E-07	10,786.55	21,573.10	0.00E+00	4.27E-03	8.55E-03	0.0250	3.299E+14
Am-243	1.4880E-06	10,786.55	21,573.10	0.00E+00	1.61E-02	3.21E-02	0.0375	2.868E+14
C-14	5.7053E-09	10,786.55	21,573.10	0.00E+00	6.15E-05	1.23E-04	0.0575	3.087E+14
Cl-36	1.3124E-32	10,786.55	21,573.10	0.00E+00	1.42E-28	2.83E-28	0.0850	1.860E+14
Cm-243	1.1419E-07	10,786.55	21,573.10	0.00E+00	1.23E-03	2.46E-03	0.1250	1.228E+14
Cm-244	1.6522E-05	10,786.55	21,573.10	0.00E+00	1.78E-01	3.56E-01	0.2250	1.606E+14
Co-60	7.4047E-07	10,786.55	21,573.10	0.00E+00	7.99E-03	1.60E-02	0.3750	6.985E+13
Cs-134	2.0455E-05	10,786.55	21,573.10	0.00E+00	2.21E-01	4.41E-01	0.5750	1.154E+15
Cs-135	3.4477E-06	10,786.55	21,573.10	0.00E+00	3.72E-02	7.44E-02	0.8500	1.410E+13
Cs-137	1.4365E+00	10,786.55	21,573.10	0.00E+00	1.55E+04	3.10E+04	1.2500	6.820E+12
Eu-154	7.3230E-03	10,786.55	21,573.10	0.00E+00	7.90E+01	1.58E+02	1.7500	3.839E+11
Eu-155	5.9259E-04	10,786.55	21,573.10	0.00E+00	6.39E+00	1.28E+01	2.2500	3.210E+07
Fe-55	2.2791E-06	10,786.55	21,573.10	0.00E+00	2.46E-02	4.92E-02	2.7500	3.063E+07
H-3	1.9698E-03	10,786.55	21,573.10	0.00E+00	2.12E+01	4.25E+01	3.5000	1.775E+04
I-129	7.5300E-07	10,786.55	21,573.10	0.00E+00	8.12E-03	1.62E-02	5.0000	7.252E+03
Kr-85	4.1176E-02	10,786.55	21,573.10	0.00E+00	4.44E+02	8.88E+02	7.0000	7.936E+02
Np-237	9.5752E-06	10,786.55	21,573.10	0.00E+00	1.03E-01	2.07E-01	11.0000	8.848E+01
Pa-231	3.9379E-09	10,786.55	21,573.10	0.00E+00	4.25E-05	8.50E-05		
Pb-210	3.3115E-10	10,786.55	21,573.10	0.00E+00	3.57E-06	7.14E-06		
Pm-147	9.2402E-04	10,786.55	21,573.10	0.00E+00	9.97E+00	1.99E+01		
Pu-238	1.6217E-02	10,786.55	21,573.10	0.00E+00	1.75E+02	3.50E+02		
Pu-239	4.2810E-04	10,786.55	21,573.10	0.00E+00	4.62E+00	9.24E+00		
Pu-240	2.4333E-04	10,786.55	21,573.10	0.00E+00	2.62E+00	5.25E+00		
Pu-241	1.6242E-02	10,786.55	21,573.10	0.00E+00	1.75E+02	3.50E+02		
Pu-242	3.6329E-07	10,786.55	21,573.10	0.00E+00	3.92E-03	7.84E-03		
Ra-226	9.0114E-10	10,786.55	21,573.10	0.00E+00	9.72E-06	1.94E-05		
Ra-228	3.1019E-14	10,786.55	21,573.10	0.00E+00	3.35E-10	6.69E-10		
Ru-106	2.1225E-10	10,786.55	21,573.10	0.00E+00	2.29E-06	4.58E-06		
Se-79	1.2930E-05	10,786.55	21,573.10	0.00E+00	1.39E-01	2.79E-01		
Sn-126	1.1571E-05	10,786.55	21,573.10	0.00E+00	1.25E-01	2.50E-01		
Sr-90	1.3472E+00	10,786.55	21,573.10	0.00E+00	1.45E+04	2.91E+04		
Tc-99	4.2239E-04	10,786.55	21,573.10	0.00E+00	4.56E+00	9.11E+00		
Th-229	1.2407E-11	10,786.55	21,573.10	0.00E+00	1.34E-07	2.68E-07		
Th-230	8.3497E-08	10,786.55	21,573.10	0.00E+00	9.01E-04	1.80E-03		
Th-232	3.8371E-14	10,786.55	21,573.10	0.00E+00	4.14E-10	8.28E-10		
Ti-208	4.0414E-08	10,786.55	21,573.10	0.00E+00	4.36E-04	8.72E-04		
U-232	1.0948E-07	10,786.55	21,573.10	0.00E+00	1.18E-03	2.36E-03	Thermal Power	
U-233	3.6275E-09	10,786.55	21,573.10	0.00E+00	3.91E-05	7.83E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1.8562E-04	10,786.55	21,573.10	0.00E+00	2.00E+00	4.00E+00	1.81E+02	3.61E+02
U-235	-2.7235E-06	10,786.55	0.00	7.41E-02	4.48E-02	7.41E-02	Total	Total
U-236	1.5493E-05	10,786.55	21,573.10	0.00E+00	1.67E-01	3.34E-01		
U-238	-4.2851E-09	10,786.55	0.00	8.72E-04	8.26E-04	8.72E-04		
Y-90	1.3475E+00	10,786.55	21,573.10	0.00E+00	1.45E+04	2.91E+04		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	92.97	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		10.786.55	
Bounding		21,573.10	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	0.93		
Bounding	1.86		1.03

*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, RINSC
SNF ID #: 181
Fuel Units & Descr: 44 - 18 FLAT PLATES
Heavy Metal Mass: BOL=61 12kg; EOL=60 465kg
ROD Storage Site: SRS

¹Fuel decay start date: 2035
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 5 years

Estimated
Canister usage
18"x10"
1 83

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cv/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 4545E-10	620 87	1,241 73	0 00E+00	9 03E-08	1 81E-07	Avg. MeV	
Am-241	1 1190E-03	620 87	1,241 73	0 00E+00	6 95E-01	1 39E+00	0 0150	2 396E+14
Am-242m	4 5425E-07	620 87	1,241 73	0 00E+00	2 82E-04	5 64E-04	0 0250	5 161E+13
Am-243	1 4921E-06	620 87	1,241 73	0 00E+00	9 26E-04	1 85E-03	0 0375	4 783E+13
C-14	5 7244E-09	620 87	1,241 73	0 00E+00	3 55E-06	7 11E-06	0 0575	4 683E+13
Cf-252	1 3124E-32	620 87	1,241 73	0 00E+00	8 15E-30	1 63E-29	0 0850	2 965E+13
Cm-243	2 3676E-07	620 87	1,241 73	0 00E+00	1 47E-04	2 94E-04	0 1250	2 585E+13
Cm-244	5 2042E-05	620 87	1,241 73	0 00E+00	3 23E-02	6 46E-02	0 2250	2 530E+13
Co-60	3 8208E-05	620 87	1,241 73	0 00E+00	2 37E-02	4 74E-02	0 3750	1 225E+13
Cs-134	4 8693E-01	620 87	1,241 73	0 00E+00	3 02E+02	6 05E+02	0 5750	1 682E+14
Cs-135	3 4477E-06	620 87	1,241 73	0 00E+00	2 14E-03	4 28E-03	0 8500	2 356E+13
Cs-137	2 8731E+00	620 87	1,241 73	0 00E+00	1 78E+03	3 57E+03	1 2500	4 383E+12
Eu-154	8 2053E-02	620 87	1,241 73	0 00E+00	5 09E+01	1 02E+02	1 7500	1 838E+11
Eu-155	3 9134E-02	620 87	1,241 73	0 00E+00	2 43E+01	4 86E+01	2 2500	3 855E+11
Fe-55	6 7429E-03	620 87	1,241 73	0 00E+00	4 19E+00	8 37E+00	2 7500	2 218E+09
H-3	1 0599E-02	620 87	1,241 73	0 00E+00	6 58E+00	1 32E+01	3 5000	2 460E+08
I-129	7 5300E-07	620 87	1,241 73	0 00E+00	4 68E-04	9 35E-04	5 0000	7 735E+02
Kr-85	2 8595E-01	620 87	1,241 73	0 00E+00	1 78E+02	3 55E+02	7 0000	8 636E+01
Np-237	9 5479E-06	620 87	1,241 73	0 00E+00	5 93E-03	1 19E-02	11 0000	9 745E+00
Pa-231	8 9297E-10	620 87	1,241 73	0 00E+00	5 54E-07	1 11E-06		
Pb-210	3 7609E-12	620 87	1,241 73	0 00E+00	2 34E-09	4 67E-09		
Pm-147	2 5452E+00	620 87	1,241 73	0 00E+00	1 58E+03	3 16E+03		
Pu-238	2 0550E-02	620 87	1,241 73	0 00E+00	1 28E+01	2 55E+01		
Pu-239	4 2838E-04	620 87	1,241 73	0 00E+00	2 66E-01	5 32E-01		
Pu-240	2 4401E-04	620 87	1,241 73	0 00E+00	1 51E-01	3 03E-01		
Pu-241	6 8764E-02	620 87	1,241 73	0 00E+00	4 27E+01	8 54E+01		
Pu-242	3 6329E-07	620 87	1,241 73	0 00E+00	2 26E-04	4 51E-04		
Ra-226	3 8045E-11	620 87	1,241 73	0 00E+00	2 36E-08	4 72E-08		
Ra-228	2 9902E-15	620 87	1,241 73	0 00E+00	1 86E-12	3 71E-12		
Ru-106	1 9055E-01	620 87	1,241 73	0 00E+00	1 18E+02	2 37E+02		
Se-79	1 2936E-05	620 87	1,241 73	0 00E+00	8 03E-03	1 61E-02		
Sn-126	1 1574E-05	620 87	1,241 73	0 00E+00	7 19E-03	1 44E-02		
Sr-90	2 7505E+00	620 87	1,241 73	0 00E+00	1 71E+03	3 42E+03		
Tc-99	4 2239E-04	620 87	1,241 73	0 00E+00	2 62E-01	5 24E-01		
Th-229	1 8848E-12	620 87	1,241 73	0 00E+00	1 17E-09	2 34E-09		
Th-230	1 7042E-08	620 87	1,241 73	0 00E+00	1 06E-05	2 12E-05		
Th-232	7 8132E-15	620 87	1,241 73	0 00E+00	4 85E-12	9 70E-12		
Ti-208	4 4063E-08	620 87	1,241 73	0 00E+00	2 74E-05	5 47E-05		
U-232	1 3151E-07	620 87	1,241 73	0 00E+00	8 16E-05	1 63E-04		
U-233	1 9564E-09	620 87	1,241 73	0 00E+00	1 21E-06	2 43E-06		
U-234	1 8371E-04	620 87	1,241 73	0 00E+00	1 14E-01	2 28E-01		
U-235	-2 7235E-06	620 87	0 00	2 61E-02	2 44E-02	2 61E-02		
U-236	1 5493E-05	620 87	1,241 73	0 00E+00	9 62E-03	1 92E-02		
U-238	-4 2851E-09	620 87	0 00	1 65E-02	1 65E-02	1 65E-02		
Y-90	2 7505E+00	620 87	1,241 73	0 00E+00	1 71E+03	3 42E+03		
Other Radionuclides					3 19E+03	6 39E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons. This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 7728395	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Nominal		620 87	
Bounding		1 241 73	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1 00
Nominal	0 03		
Bounding	0 06		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: RINSC
SNF ID #: 180
Fuel Units & Descr 70 - 18 FLAT PLATES
Heavy Metal Mass BOL=9 366kg EOL=8 498kg
ROD Storage Site* SRS

Fuel decay start date 1992
Estimates as of 2030
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 35 years

Estimated
Canister usage
18"x10"
1.94

II. Estimates		m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	822.01	1,644.03	0 00E+00	1 65E-06	3 30E-06	0 0150	1 211E+14	
Am-241	2 5251E-03	822.01	1,644.03	0 00E+00	2 08E+00	4 15E+00	0 0250	2 514E+13	
Am-242m	3 9624E-07	822.01	1,644.03	0 00E+00	3 26E-04	6 51E-04	0 0375	2 185E+13	
Am-243	1 4880E-06	822.01	1,644.03	0 00E+00	1 22E-03	2 45E-03	0 0575	2 352E+13	
C-14	5.7053E-09	822.01	1,644.03	0 00E+00	4 69E-06	9 38E-06	0 0850	1 417E+13	
Cf-252	1.3124E-32	822.01	1,644.03	0 00E+00	1 08E-29	2 16E-29	0 1250	9 362E+12	
Cm-243	1.1419E-07	822.01	1,644.03	0 00E+00	9 39E-05	1 88E-04	0 2250	1 224E+13	
Cm-244	1 6522E-05	822.01	1,644.03	0 00E+00	1 36E-02	2 72E-02	0 3750	5 323E+12	
Co-60	7 4047E-07	822.01	1,644.03	0 00E+00	6 09E-04	1 22E-03	0 5750	8 798E+13	
Cs-134	2 0455E-05	822.01	1,644.03	0 00E+00	1 68E-02	3 36E-02	0 8500	1 075E+12	
Cs-135	3 4477E-06	822.01	1,644.03	0 00E+00	2 83E-03	5 67E-03	1 2500	5 198E+11	
Cs-137	1 4365E+00	822.01	1,644.03	0 00E+00	1 18E+03	2 36E+03	1 7500	2 925E+10	
Eu-154	7 3230E-03	822.01	1,644.03	0 00E+00	6 02E+00	1 20E+01	2 2500	2 446E+06	
Eu-155	5 9259E-04	822.01	1,644.03	0 00E+00	4 87E-01	9 74E-01	2 7500	2 335E+06	
Fe-55	2 2791E-06	822.01	1,644.03	0 00E+00	1 87E-03	3 75E-03	3 5000	1 354E+03	
H-3	1 9698E-03	822.01	1,644.03	0 00E+00	1 62E+00	3 24E+00	5 0000	5 532E+02	
I-129	7.5300E-07	822.01	1,644.03	0 00E+00	6 19E-04	1 24E-03	7 0000	6 054E+01	
Kr-85	4 1176E-02	822.01	1,644.03	0 00E+00	3 38E+01	6 77E+01	11.0000	6 750E+00	
Np-237	9 5752E-06	822.01	1,644.03	0 00E+00	7 87E-03	1 57E-02			
Pa-231	3 9379E-09	822.01	1,644.03	0 00E+00	3 24E-06	6 47E-06			
Pb-210	3 3115E-10	822.01	1,644.03	0 00E+00	2 72E-07	5 44E-07			
Pm-147	9 2402E-04	822.01	1,644.03	0 00E+00	7 60E-01	1 52E+00			
Pu-238	1 6217E-02	822.01	1,644.03	0 00E+00	1 33E+01	2 67E+01			
Pu-239	4 2810E-04	822.01	1,644.03	0 00E+00	3 52E-01	7 04E-01			
Pu-240	2 4333E-04	822.01	1,644.03	0 00E+00	2 00E-01	4 00E-01			
Pu-241	1 6242E-02	822.01	1,644.03	0 00E+00	1 34E+01	2 67E+01			
Pu-242	3 6329E-07	822.01	1,644.03	0 00E+00	2 99E-04	5 97E-04			
Ra-226	9 0114E-10	822.01	1,644.03	0 00E+00	7 41E-07	1 48E-06			
Ra-228	3 1019E-14	822.01	1,644.03	0 00E+00	2 55E-11	5 10E-11			
Ru-106	2 1225E-10	822.01	1,644.03	0 00E+00	1 74E-07	3 49E-07			
Se-79	1 2930E-05	822.01	1,644.03	0 00E+00	1 06E-02	2 13E-02			
Sn-126	1 1571E-05	822.01	1,644.03	0 00E+00	9 51E-03	1 90E-02			
Sr-90	1 3472E+00	822.01	1,644.03	0 00E+00	1 11E+03	2 21E+03			
Tc-99	4 2239E-04	822.01	1,644.03	0 00E+00	3 47E-01	6 94E-01			
Th-229	1 2407E-11	822.01	1,644.03	0 00E+00	1 02E-08	2 04E-08			
Th-230	8 3497E-08	822.01	1,644.03	0 00E+00	6 86E-05	1 37E-04			
Th-232	3 8371E-14	822.01	1,644.03	0 00E+00	3 15E-11	6 31E-11			
Ti-208	4 0414E-08	822.01	1,644.03	0 00E+00	3 32E-05	6 64E-05			
U-232	1 0948E-07	822.01	1,644.03	0 00E+00	9 00E-05	1 80E-04			
U-233	3 6275E-09	822.01	1,644.03	0 00E+00	2 98E-06	5 96E-06			
U-234	1 8562E-04	822.01	1,644.03	0 00E+00	1 53E-01	3 05E-01			
U-235	-2 7235E-06	822.01	0 00	1 89E-02	1 66E-02	1 89E-02			
U-236	1 5493E-05	822.01	1,644.03	0 00E+00	1 27E-02	2 55E-02			
U-238	-4 2851E-09	822.01	0 00	2 16E-04	2 13E-04	2 16E-04			
Y-90	1 3475E+00	822.01	1,644.03	0 00E+00	1 11E+03	2 22E+03			
Other Radionuclides					1 12E+03	2 25E+03			

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences*
Reactor Moderator:	From SFD	Used	
Fuel Cladding	LIGHT WATER	LIGHT WATER	
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	93 13598185	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		822.01	
Bounding	37.46	1,644.03	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	0.28		
Bounding	0.56	43.88	1.01

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: RPI (JALX-LEU) PORTUGAL

SNF ID #: 943

Fuel Units & Descr: 39 - ASSEMBLY

Heavy Metal Mass: BOL=30.381kg EOL=29.23kg

ROD Storage Site: SRS

Fuel decay start date: 1998

Estimates as of: 2030

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

Template Burnup (MWd), 367.2

Template BOL Heavy Metal Mass (MT): 0.00116689

Template Decay Time: 25 years

Estimated

Canister usage

18"x10"

1.63

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	1.089 55	2.179 09	0.00E+00	1.25E-06	2.50E-06	Avg MeV	
Am-241	2.3056E-03	1.089 55	2.179 09	0.00E+00	2.51E+00	5.02E+00	0.0150	2.039E+14
Am-242m	4.1476E-07	1.089 55	2.179 09	0.00E+00	4.52E-04	9.04E-04	0.0250	4.236E+13
Am-243	1.4894E-06	1.089 55	2.179 09	0.00E+00	1.62E-03	3.25E-03	0.0375	3.689E+13
C-14	5.7108E-09	1.089 55	2.179 09	0.00E+00	6.22E-06	1.24E-05	0.0575	3.961E+13
Cl-36	1.3124E-32	1.089 55	2.179 09	0.00E+00	1.43E-29	2.86E-29	0.0850	2.390E+13
Cm-243	1.4562E-07	1.089 55	2.179 09	0.00E+00	1.59E-04	3.17E-04	0.1250	1.601E+13
Cm-244	2.4221E-05	1.089 55	2.179 09	0.00E+00	2.64E-02	5.28E-02	0.2250	2.064E+13
Co-60	2.7560E-06	1.089 55	2.179 09	0.00E+00	3.00E-03	6.01E-03	0.3750	8.972E+12
Cs-134	5.8851E-04	1.089 55	2.179 09	0.00E+00	6.41E-01	1.28E+00	0.5750	1.471E+14
Cs-135	3.4477E-06	1.089 55	2.179 09	0.00E+00	3.76E-03	7.51E-03	0.8500	2.119E+12
Cs-137	1.8099E+00	1.089 55	2.179 09	0.00E+00	1.97E+03	3.94E+03	1.2500	1.179E+12
Eu-154	1.6386E-02	1.089 55	2.179 09	0.00E+00	1.79E+01	3.57E+01	1.7500	5.823E+10
Eu-155	2.3957E-03	1.089 55	2.179 09	0.00E+00	2.61E+00	5.22E+00	2.2500	4.150E+06
Fe-55	3.2707E-05	1.089 55	2.179 09	0.00E+00	3.56E-02	7.13E-02	2.7500	3.398E+06
H-3	3.4504E-03	1.089 55	2.179 09	0.00E+00	3.76E+00	7.52E+00	3.5000	2.608E+03
I-129	7.5300E-07	1.089 55	2.179 09	0.00E+00	8.20E-04	1.64E-03	5.0000	8.812E+02
Kr-85	7.8540E-02	1.089 55	2.179 09	0.00E+00	8.56E+01	1.71E+02	7.0000	9.705E+01
Np-237	9.5615E-06	1.089 55	2.179 09	0.00E+00	1.04E-02	2.08E-02	11.0000	1.086E+01
Pa-231	2.7968E-09	1.089 55	2.179 09	0.00E+00	3.05E-06	6.09E-06		
Pb-210	1.2612E-10	1.089 55	2.179 09	0.00E+00	1.37E-07	2.75E-07		
Pm-147	1.2952E-02	1.089 55	2.179 09	0.00E+00	1.41E+01	2.82E+01		
Pu-238	1.7549E-02	1.089 55	2.179 09	0.00E+00	1.91E+01	3.82E+01		
Pu-239	4.2810E-04	1.089 55	2.179 09	0.00E+00	4.66E-01	9.33E-01		
Pu-240	2.4357E-04	1.089 55	2.179 09	0.00E+00	2.65E-01	5.31E-01		
Pu-241	2.6277E-02	1.089 55	2.179 09	0.00E+00	2.86E+01	5.73E+01		
Pu-242	3.6329E-07	1.089 55	2.179 09	0.00E+00	3.96E-04	7.92E-04		
Ra-226	4.4444E-10	1.089 55	2.179 09	0.00E+00	4.84E-07	9.68E-07		
Ra-228	1.9714E-14	1.089 55	2.179 09	0.00E+00	2.15E-11	4.30E-11		
Ru-106	2.0477E-07	1.089 55	2.179 09	0.00E+00	2.23E-04	4.46E-04		
Se-79	1.2933E-05	1.089 55	2.179 09	0.00E+00	1.41E-02	2.82E-02		
Sn-126	1.1574E-05	1.089 55	2.179 09	0.00E+00	1.26E-02	2.52E-02		
Sr-90	1.7092E+00	1.089 55	2.179 09	0.00E+00	1.86E+03	3.72E+03		
Tc-99	4.2239E-04	1.089 55	2.179 09	0.00E+00	4.60E-01	9.20E-01		
Th-229	7.7260E-12	1.089 55	2.179 09	0.00E+00	8.42E-09	1.68E-08		
Th-230	5.8497E-08	1.089 55	2.179 09	0.00E+00	6.37E-05	1.27E-04		
Th-232	2.6906E-14	1.089 55	2.179 09	0.00E+00	2.93E-11	5.86E-11		
Ti-208	4.4336E-08	1.089 55	2.179 09	0.00E+00	4.83E-05	9.66E-05		
U-232	1.2037E-07	1.089 55	2.179 09	0.00E+00	1.31E-04	2.62E-04		
U-233	3.0011E-09	1.089 55	2.179 09	0.00E+00	3.27E-06	6.54E-06		
U-234	1.8497E-04	1.089 55	2.179 09	0.00E+00	2.02E-01	4.03E-01		
U-235	-2.7235E-06	1.089 55	0.00	1.30E-02	1.01E-02	1.30E-02		
U-236	1.5493E-05	1.089 55	2.179 09	0.00E+00	1.69E-02	3.38E-02		
U-238	-4.2851E-09	1.089 55	0.00	8.19E-03	8.18E-03	8.19E-03		
Y-90	1.7094E+00	1.089 55	2.179 09	0.00E+00	1.86E+03	3.72E+03		
Other Radionuclides					1.88E+03	3.75E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons. This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %:	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	19.83094182	60 to 100	

Burnup Summary (MWd) ²			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:		1.089 55	
Bounding:		2.179 09	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.11		
Bounding	0.23		1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name RSG-GAS (U308-LEU) INDONESIA
SNF ID # 288
Fuel Units & Descr. 47 - ASSEMBLY
Heavy Metal Mass BOL=56 188kg EOL=51 479kg
ROD Storage Site SRS

¹Fuel decay start date 1999
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 25 years

Estimated
Canister usage
18"x10"
1 96

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1 1465E-09	4,459 89	8,919 79	0 00E+00	5 11E-06	1 02E-05	0 0150	8 347E+14
Am-241	2 3056E-03	4,459 89	8,919 79	0 00E+00	1 03E+01	2 06E+01	0 0250	1 734E+14
Am-242m	4 1476E-07	4,459 89	8,919 79	0 00E+00	1 85E-03	3.70E-03	0 0375	1.510E+14
Am-243	1 4894E-06	4,459 89	8,919.79	0 00E+00	6 64E-03	1.33E-02	0 0575	1.622E+14
C-14	5 7108E-09	4,459 89	8,919 79	0 00E+00	2 55E-05	5 09E-05	0 0850	9 784E+13
Cl-36	1.3124E-32	4,459 89	8,919 79	0 00E+00	5 85E-29	1 17E-28	0 1250	6.553E+13
Cm-243	1 4562E-07	4,459 89	8,919 79	0 00E+00	6 49E-04	1 30E-03	0 2250	8 447E+13
Cm-244	2 4221E-05	4,459 89	8,919 79	0 00E+00	1 08E-01	2 16E-01	0 3750	3 672E+13
Co-60	2 7560E-06	4,459 89	8,919 79	0 00E+00	1 23E-02	2 46E-02	0 5750	6 021E+14
Cs-134	5 8851E-04	4,459 89	8,919 79	0 00E+00	2 62E+00	5 25E+00	0.8500	8 676E+12
Cs-135	3 4477E-06	4,459 89	8,919 79	0 00E+00	1.54E-02	3 08E-02	1.2500	4 825E+12
Cs-137	1 8099E+00	4,459 89	8,919 79	0 00E+00	8 07E+03	1 61E+04	1 7500	2.384E+11
Eu-154	1 6388E-02	4,459 89	8,919 79	0 00E+00	7.31E+01	1.46E+02	2 2500	1.699E+07
Eu-155	2.3957E-03	4,459 89	8,919 79	0 00E+00	1 07E+01	2 14E+01	2 7500	1.391E+07
Fe-55	3.2707E-03	4,459 89	8,919 79	0 00E+00	1 46E-01	2 92E-01	3 5000	1 058E+04
H-3	3 4504E-03	4,459 89	8,919 79	0 00E+00	1.54E+01	3 08E+01	5 0000	3.565E+03
I-129	7 5300E-07	4,459 89	8,919 79	0 00E+00	3 36E-03	6 72E-03	7.0000	3 924E+02
Kr-85	7 8540E-02	4,459 89	8,919 79	0 00E+00	3 50E+02	7 01E+02	11 0000	4 391E+01
Np-237	9 5615E-06	4,459 89	8,919 79	0 00E+00	4.26E-02	8.53E-02		
Pa-231	2 7968E-09	4,459 89	8,919 79	0 00E+00	1.25E-05	2 49E-05		
Pb-210	1.2612E-10	4,459 89	8,919 79	0.00E+00	5 62E-07	1 12E-06		
Pm-147	1.2952E-02	4,459 89	8,919 79	0 00E+00	5.78E+01	1 16E+02		
Pu-238	1.7549E-02	4,459 89	8,919 79	0 00E+00	7.83E+01	1.57E+02		
Pu-239	4.2810E-04	4,459 89	8,919 79	0 00E+00	1 91E+00	3 82E+00		
Pu-240	2 4357E-04	4,459 89	8,919 79	0 00E+00	1 09E+00	2 17E+00		
Pu-241	2 6277E-02	4,459 89	8,919 79	0 00E+00	1 17E+02	2 34E+02		
Pu-242	3 6329E-07	4,459 89	8,919 79	0 00E+00	1 62E-03	3.24E-03		
Ra-226	4 4444E-10	4,459 89	8,919 79	0 00E+00	1.98E-06	3 96E-06		
Ra-228	1 9714E-14	4,459 89	8,919 79	0 00E+00	8 79E-11	1 76E-10		
Ru-106	2 0477E-07	4,459 89	8,919 79	0 00E+00	9 13E-04	1 83E-03		
Se-79	1.2933E-05	4,459 89	8,919.79	0 00E+00	5 77E-02	1 15E-01		
Sn-126	1.1574E-05	4,459 89	8,919 79	0 00E+00	5 16E-02	1 03E-01		
Sr-90	1 7092E+00	4,459 89	8,919 79	0 00E+00	7 62E+03	1 52E+04		
Tc-99	4.2239E-04	4,459 89	8,919 79	0 00E+00	1 88E+00	3 77E+00		
Th-229	7 7260E-12	4,459 89	8,919 79	0 00E+00	3 45E-08	6.89E-08		
Th-230	5 8497E-08	4,459 89	8,919 79	0 00E+00	2 61E-04	5.22E-04		
Th-232	2 6906E-14	4,459 89	8,919 79	0 00E+00	1.20E-10	2 40E-10		
Th-208	4 4336E-08	4,459 89	8,919 79	0 00E+00	1.98E-04	3 95E-04		
U-232	1.2037E-07	4,459 89	8,919 79	0 00E+00	5.37E-04	1 07E-03		
U-233	3 0011E-09	4,459 89	8,919 79	0 00E+00	1.34E-05	2 68E-05		
U-234	1 8497E-04	4,459 89	8,919 79	0 00E+00	8 25E-01	1 65E+00		
U-235	-2 7235E-06	4,459 89	0 00	2 39E-02	1.18E-02	2.39E-02		
U-236	1.5493E-05	4,459 89	8,919 79	0 00E+00	6 91E-02	1.38E-01		
U-238	-4 2851E-09	4,459 89	0 00	1 52E-02	1.51E-02	1.52E-02		
Y-90	1 7094E+00	4,459 89	8,919 79	0 00E+00	7 62E+03	1.52E+04		
Other Radionuclides					7 68E+03	1.54E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons. This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19 68299334	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal		4 459 89	
Bounding		8 919 79	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1 01
Nominal	0 25		
Bounding	0 50		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: RU-1 (UALX LEU) URAGUAY
 SNF ID #: 557
 Fuel Units & Descr: 4 - ASSEMBLY
 Heavy Metal Mass: BOL=2.112kg, EOL=2.11kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1998
 Estimates as of: 2030
 Template: ATR (Light Water, Alum 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 25 years

Estimated
 Canister usage:
 18"x10"
 0.11

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	1.89	3.79	0.00E+00	2.17E-09	4.34E-09	Avg MeV	
Am-241	2.3056E-03	1.89	3.79	0.00E+00	4.37E-03	8.73E-03	0.0150	3.545E+11
Am-242m	4.1476E-07	1.89	3.79	0.00E+00	7.86E-07	1.57E-06	0.0250	7.364E+10
Am-243	1.4894E-06	1.89	3.79	0.00E+00	2.82E-06	5.64E-06	0.0375	6.413E+10
C-14	5.7108E-09	1.89	3.79	0.00E+00	1.08E-08	2.16E-08	0.0575	6.886E+10
Cl-36	1.3124E-32	1.89	3.79	0.00E+00	2.49E-32	4.97E-32	0.0850	4.155E+10
Cm-243	1.4562E-07	1.89	3.79	0.00E+00	2.76E-07	5.52E-07	0.1250	2.784E+10
Cm-244	2.4221E-05	1.89	3.79	0.00E+00	4.59E-05	9.18E-05	0.2250	3.589E+10
Co-60	2.7560E-06	1.89	3.79	0.00E+00	5.22E-06	1.04E-05	0.3750	1.560E+10
Cs-134	5.8851E-04	1.89	3.79	0.00E+00	1.11E-03	2.23E-03	0.5750	2.557E+11
Cs-135	3.4477E-06	1.89	3.79	0.00E+00	6.53E-06	1.31E-05	0.8500	3.684E+09
Cs-137	1.8099E+00	1.89	3.79	0.00E+00	3.43E+00	6.86E+00	1.2500	2.049E+09
Eu-154	1.6386E-02	1.89	3.79	0.00E+00	3.10E-02	6.21E-02	1.7500	1.012E+08
Eu-155	2.3957E-03	1.89	3.79	0.00E+00	4.54E-03	9.08E-03	2.2500	7.221E+03
Fe-55	3.2707E-05	1.89	3.79	0.00E+00	6.19E-05	1.24E-04	2.7500	5.911E+03
H-3	3.4504E-03	1.89	3.79	0.00E+00	6.54E-03	1.31E-02	3.5000	7.520E+00
I-129	7.5300E-07	1.89	3.79	0.00E+00	1.43E-06	2.85E-06	5.0000	2.815E+00
Kr-85	7.8540E-02	1.89	3.79	0.00E+00	1.49E-01	2.98E-01	7.0000	3.164E-01
Np-237	9.5615E-06	1.89	3.79	0.00E+00	1.81E-05	3.62E-05	11.0000	3.587E-02
Pa-231	2.7968E-09	1.89	3.79	0.00E+00	5.30E-09	1.06E-08		
Pb-210	1.2612E-10	1.89	3.79	0.00E+00	2.39E-10	4.78E-10		
Pm-147	1.2952E-02	1.89	3.79	0.00E+00	2.45E-02	4.91E-02		
Pu-238	1.7549E-02	1.89	3.79	0.00E+00	3.32E-02	6.65E-02		
Pu-239	4.2810E-04	1.89	3.79	0.00E+00	8.11E-04	1.62E-03		
Pu-240	2.4357E-04	1.89	3.79	0.00E+00	4.61E-04	9.23E-04		
Pu-241	2.6277E-02	1.89	3.79	0.00E+00	4.98E-02	9.95E-02		
Pu-242	3.6329E-07	1.89	3.79	0.00E+00	6.88E-07	1.38E-06		
Ra-226	4.4444E-10	1.89	3.79	0.00E+00	8.42E-10	1.68E-09		
Ra-228	1.9714E-14	1.89	3.79	0.00E+00	3.73E-14	7.47E-14		
Ru-106	2.0477E-07	1.89	3.79	0.00E+00	3.88E-07	7.76E-07		
Se-79	1.2933E-05	1.89	3.79	0.00E+00	2.45E-05	4.90E-05		
Sn-126	1.1574E-05	1.89	3.79	0.00E+00	2.19E-05	4.38E-05		
Sr-90	1.7092E+00	1.89	3.79	0.00E+00	3.24E+00	6.47E+00		
Tc-99	4.2239E-04	1.89	3.79	0.00E+00	8.00E-04	1.60E-03		
Th-229	7.7260E-12	1.89	3.79	0.00E+00	1.46E-11	2.93E-11		
Th-230	5.8497E-08	1.89	3.79	0.00E+00	1.11E-07	2.22E-07		
Th-232	2.6906E-14	1.89	3.79	0.00E+00	5.10E-14	1.02E-13		
Ti-208	4.4336E-08	1.89	3.79	0.00E+00	8.40E-08	1.68E-07		
U-232	1.2037E-07	1.89	3.79	0.00E+00	2.28E-07	4.56E-07		
U-233	3.0011E-09	1.89	3.79	0.00E+00	5.68E-09	1.14E-08		
U-234	1.8497E-04	1.89	3.79	0.00E+00	3.50E-04	7.01E-04		
U-235	-2.7235E-06	1.89	0.00	9.04E-04	8.99E-04	9.04E-04		
U-236	1.5493E-05	1.89	3.79	0.00E+00	2.93E-05	5.87E-05		
U-238	-4.2851E-09	1.89	0.00	5.69E-04	5.69E-04	5.69E-04		
Y-90	1.7094E+00	1.89	3.79	0.00E+00	3.24E+00	6.48E+00		
Other Radionuclides					3.26E+00	6.53E+00		

Thermal Power
 Nominal Heat Output (Watts)
 Bounding Heat Output (Watts)
 4.01E-02
 8.02E-02
 Total
 Total

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	Used	
	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.81060606	60 to 100	

Burnup Summary (MWd) ³			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	0.00	1.89	
Bounding		3.79	

Checks			Estimated EOL HM/Given EOL HM 1.00
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.00	448.40	
Bounding	0.01		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name RU-1 (JALX LEU) URUGUAY
SNF ID #: 1073
Fuel Units & Descr: 15 - ASSEMBLY
Heavy Metal Mass BOL=7.92kg EOL=7.912kg
ROD Storage Site SRS

Fuel decay start date 1998
Estimates as of 2030
Template ATR (Light Water, Alum, 60 to 100% U)
*Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 25 years

Estimated
Canister usage
18"x10"
0.42

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	7.10	14.21	0.00E+00	8.14E-09	1.63E-08	Avg MeV	
Am-241	2.3056E-03	7.10	14.21	0.00E+00	1.64E-02	3.28E-02	0.0150	1.329E+12
Am-242m	4.1476E-07	7.10	14.21	0.00E+00	2.95E-06	5.89E-06	0.0250	2.761E+11
Am-243	1.4894E-06	7.10	14.21	0.00E+00	1.06E-05	2.12E-05	0.0375	2.405E+11
C-14	5.7108E-09	7.10	14.21	0.00E+00	4.06E-08	8.11E-08	0.0575	2.582E+11
Cl-36	1.3124E-32	7.10	14.21	0.00E+00	9.32E-32	1.86E-31	0.0850	1.558E+11
Cm-243	1.4562E-07	7.10	14.21	0.00E+00	1.03E-06	2.07E-06	0.1250	1.044E+11
Cm-244	2.4221E-05	7.10	14.21	0.00E+00	1.72E-04	3.44E-04	0.2250	1.346E+11
Co-60	2.7560E-06	7.10	14.21	0.00E+00	1.96E-05	3.91E-05	0.3750	5.849E+10
Cs-134	5.8851E-04	7.10	14.21	0.00E+00	4.18E-03	8.36E-03	0.5750	9.588E+11
Cs-135	3.4477E-06	7.10	14.21	0.00E+00	2.45E-05	4.90E-05	0.8500	1.382E+10
Cs-137	1.8099E+00	7.10	14.21	0.00E+00	1.29E+01	2.57E+01	1.2500	7.683E+09
Eu-154	1.6386E-02	7.10	14.21	0.00E+00	1.16E-01	2.33E-01	1.7500	3.796E+08
Eu-155	2.3957E-03	7.10	14.21	0.00E+00	1.70E-02	3.40E-02	2.2500	2.708E+04
Fe-55	3.2707E-05	7.10	14.21	0.00E+00	2.32E-04	4.65E-04	2.7500	2.217E+04
H-3	3.4504E-03	7.10	14.21	0.00E+00	2.45E-02	4.90E-02	3.5000	2.820E+01
I-129	7.5300E-07	7.10	14.21	0.00E+00	5.58E-01	1.12E+00	5.0000	1.056E+01
Kr-85	7.8540E-02	7.10	14.21	0.00E+00	6.79E-05	1.36E-04	7.0000	1.187E+00
Np-237	9.5615E-06	7.10	14.21	0.00E+00	1.99E-08	3.97E-08	11.0000	1.345E-01
Pa-231	2.7968E-09	7.10	14.21	0.00E+00	8.96E-10	1.79E-09		
Pb-210	1.2612E-10	7.10	14.21	0.00E+00	9.20E-02	1.84E-01		
Pm-147	1.2952E-02	7.10	14.21	0.00E+00	1.25E-01	2.49E-01		
Pu-238	1.7549E-02	7.10	14.21	0.00E+00	3.04E-03	6.08E-03		
Pu-239	4.2810E-04	7.10	14.21	0.00E+00	1.73E-03	3.46E-03		
Pu-240	2.4357E-04	7.10	14.21	0.00E+00	1.87E-01	3.73E-01		
Pu-241	2.6277E-02	7.10	14.21	0.00E+00	2.58E-06	5.16E-06		
Pu-242	3.6329E-07	7.10	14.21	0.00E+00	3.16E-09	6.31E-09		
Ra-226	4.4444E-10	7.10	14.21	0.00E+00	1.40E-13	2.80E-13		
Ra-228	1.9714E-14	7.10	14.21	0.00E+00	1.45E-06	2.91E-06		
Ru-106	2.0477E-07	7.10	14.21	0.00E+00	9.19E-05	1.84E-04		
Se-79	1.2933E-05	7.10	14.21	0.00E+00	8.22E-05	1.64E-04		
Sn-126	1.1574E-05	7.10	14.21	0.00E+00	1.21E+01	2.43E+01		
Sr-90	1.7092E+00	7.10	14.21	0.00E+00	3.00E-03	6.00E-03		
Tc-99	4.2239E-04	7.10	14.21	0.00E+00	5.49E-11	1.10E-10		
Th-229	7.7260E-12	7.10	14.21	0.00E+00	4.15E-07	8.31E-07		
Th-230	5.8497E-08	7.10	14.21	0.00E+00	1.91E-13	3.82E-13		
Th-232	2.6906E-14	7.10	14.21	0.00E+00	3.15E-07	6.30E-07		
Ti-208	4.4336E-08	7.10	14.21	0.00E+00	8.55E-07	1.71E-06		
U-232	1.2037E-07	7.10	14.21	0.00E+00	2.13E-08	4.26E-08		
U-233	3.0011E-09	7.10	14.21	0.00E+00	1.31E-03	2.63E-03		
U-234	1.8497E-04	7.10	0.00	3.39E-03	3.37E-03	3.39E-03		
U-235	-2.7235E-06	7.10	0.00	0.00E+00	1.10E-04	2.20E-04		
U-236	1.5493E-05	7.10	0.00	2.13E-03	2.13E-03	2.13E-03		
U-238	-4.2851E-09	7.10	14.21	0.00E+00	1.21E+01	2.43E+01		
Y-90	1.7094E+00	7.10	14.21	0.00E+00	1.22E+01	2.45E+01		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.81060606	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal	0.02	7.10	
Bounding		14.21	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.00	448.40	1.00
Bounding	0.01		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: RV-1 (UALX LEU) VENEZUELA
SNF ID #: 816
Fuel Units & Descr: 56 - MTR TYPE
Heavy Metal Mass: BOL=39 698kg EOL=38.713kg
ROD Storage Site: SRS

¹Fuel decay start date: 1997
Estimates as of: 2030
Template: ATR (Light Water Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 25 years

Estimated
Canister usage
18"x10"
2.33

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	933.38	1,866.76	0.00E+00	1.07E-06	2.14E-06	Avg. MeV	
Am-241	2.3056E-03	933.38	1,866.76	0.00E+00	2.15E+00	4.30E+00	0.0150	1.747E+14
Am-242m	4.1476E-07	933.38	1,866.76	0.00E+00	3.87E-04	7.74E-04	0.0250	3.629E+13
Am-243	1.4894E-06	933.38	1,866.76	0.00E+00	1.39E-03	2.78E-03	0.0375	3.160E+13
C-14	5.7108E-09	933.38	1,866.76	0.00E+00	5.33E-06	1.07E-05	0.0575	3.394E+13
Cl-36	1.3124E-32	933.38	1,866.76	0.00E+00	1.22E-29	2.45E-29	0.0850	2.048E+13
Cm-243	1.4562E-07	933.38	1,866.76	0.00E+00	1.36E-04	2.72E-04	0.1250	1.372E+13
Cm-244	2.4221E-05	933.38	1,866.76	0.00E+00	2.26E-02	4.52E-02	0.2250	1.768E+13
Co-60	2.7560E-06	933.38	1,866.76	0.00E+00	2.57E-03	5.14E-03	0.3750	7.686E+12
Cs-134	5.8851E-04	933.38	1,866.76	0.00E+00	5.49E-01	1.10E+00	0.5750	1.260E+14
Cs-135	3.4477E-06	933.38	1,866.76	0.00E+00	3.22E-03	6.44E-03	0.8500	1.816E+12
Cs-137	1.8099E+00	933.38	1,866.76	0.00E+00	1.69E+03	3.38E+03	1.2500	1.010E+12
Eu-154	1.6386E-02	933.38	1,866.76	0.00E+00	1.53E+01	3.06E+01	1.7500	4.988E+10
Eu-155	2.3957E-03	933.38	1,866.76	0.00E+00	2.24E+00	4.47E+00	2.2500	3.555E+06
Fe-55	3.2707E-05	933.38	1,866.76	0.00E+00	3.05E-02	6.11E-02	2.7500	2.911E+06
H-3	3.4504E-03	933.38	1,866.76	0.00E+00	3.22E+00	6.44E+00	3.5000	2.254E+03
I-129	7.5300E-07	933.38	1,866.76	0.00E+00	7.03E-04	1.41E-03	5.0000	7.636E+02
Kr-85	7.8540E-02	933.38	1,866.76	0.00E+00	7.33E+01	1.47E+02	7.0000	8.415E+01
Np-237	9.5615E-06	933.38	1,866.76	0.00E+00	8.92E-03	1.78E-02	11.0000	9.422E+00
Pa-231	2.7968E-09	933.38	1,866.76	0.00E+00	2.61E-06	5.22E-06		
Pb-210	1.2612E-10	933.38	1,866.76	0.00E+00	1.18E-07	2.35E-07		
Pm-147	1.2952E-02	933.38	1,866.76	0.00E+00	1.21E+01	2.42E+01		
Pu-238	1.7549E-02	933.38	1,866.76	0.00E+00	1.64E+01	3.28E+01		
Pu-239	4.2810E-04	933.38	1,866.76	0.00E+00	4.00E-01	7.99E-01		
Pu-240	2.4357E-04	933.38	1,866.76	0.00E+00	2.27E-01	4.55E-01		
Pu-241	2.6277E-02	933.38	1,866.76	0.00E+00	2.45E+01	4.91E+01		
Pu-242	3.6329E-07	933.38	1,866.76	0.00E+00	3.39E-04	6.78E-04		
Ra-226	4.4444E-10	933.38	1,866.76	0.00E+00	4.15E-07	8.30E-07		
Ra-228	1.9714E-14	933.38	1,866.76	0.00E+00	1.84E-11	3.68E-11		
Ru-106	2.0477E-07	933.38	1,866.76	0.00E+00	1.91E-04	3.82E-04		
Se-79	1.2933E-05	933.38	1,866.76	0.00E+00	1.21E-02	2.41E-02		
Sn-126	1.1574E-05	933.38	1,866.76	0.00E+00	1.08E-02	2.16E-02		
Sr-90	1.7092E+00	933.38	1,866.76	0.00E+00	1.60E+03	3.19E+03		
Tc-99	4.2239E-04	933.38	1,866.76	0.00E+00	3.94E-01	7.88E-01		
Th-229	7.7260E-12	933.38	1,866.76	0.00E+00	7.21E-09	1.44E-08		
Th-230	5.8497E-08	933.38	1,866.76	0.00E+00	5.46E-05	1.09E-04		
Th-232	2.6906E-14	933.38	1,866.76	0.00E+00	2.51E-11	5.02E-11		
Ti-208	4.4336E-08	933.38	1,866.76	0.00E+00	4.14E-05	8.28E-05		
U-232	1.2037E-07	933.38	1,866.76	0.00E+00	1.12E-04	2.25E-04		
U-233	3.0011E-09	933.38	1,866.76	0.00E+00	2.80E-06	5.60E-06		
U-234	1.8497E-04	933.38	1,866.76	0.00E+00	1.73E-01	3.45E-01		
U-235	-2.7235E-06	933.38	0.00	1.64E-02	1.39E-02	1.64E-02		
U-236	1.5493E-05	933.38	1,866.76	0.00E+00	1.45E-02	2.89E-02		
U-238	-4.2851E-09	933.38	0.00	1.08E-02	1.08E-02	1.08E-02		
Y-90	1.7094E+00	933.38	1,866.76	0.00E+00	1.60E+03	3.19E+03		
Other Radionuclides					1.61E+03	3.22E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator:	From SFD	Used	
Fuel Cladding:	LIGHT WATER	LIGHT WATER	
BOL HM Constituents:	ALUM	ALUM	
BOL Enrichment %:	U	U	
	19.1126847	60 to 100	

Burnup Summary (MWd) ³			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		933.38	
Bounding		1.866.76	

Checks			Estimated EOL HM/Given EOL HM 1.00
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.07		
Bounding	0.15		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name SAPHIR U3S2-LEU (SWITZERLAND)
SNF ID # 443
Fuel Units & Descr: 39 - MTR TYPE
Heavy Metal Mass BOL=79 732kg EOL=71 191kg
ROD Storage Site: SRS

¹Fuel decay start date 1993
Estimates as of 2030
Template ATR (Light Water, Akum, 60 to 100%, U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 35 years

Estimated
Canister usage
18"x10"
1 63

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	8,088 49	16,176 99	0 00E+00	1 62E-05	3 25E-05	Avg MeV	
Am-241	2 5251E-03	8,088 49	16,176 99	0 00E+00	2 04E+01	4 08E+01	0 0150	1 191E+15
Am-242m	3 9624E-07	8,088 49	16,176 99	0 00E+00	3 20E-03	6 41E-03	0 0250	2 474E+14
Am-243	1 4880E-06	8,088 49	16,176 99	0 00E+00	1 20E-02	2 41E-02	0 0375	2 150E+14
C-14	5 7053E-09	8,088 49	16,176 99	0 00E+00	4 61E-05	9 23E-05	0 0575	2 315E+14
Cl-36	1 3124E-32	8,088 49	16,176 99	0 00E+00	1 06E-28	2 12E-28	0 0850	1 395E+14
Cm-243	1 1419E-07	8,088 49	16,176 99	0 00E+00	9 24E-04	1 85E-03	0 1250	9 212E+13
Cm-244	1 6522E-05	8,088 49	16,176 99	0 00E+00	1 34E-01	2 67E-01	0 2250	1 204E+14
Co-60	7 4047E-07	8,088 49	16,176 99	0 00E+00	5 99E-03	1 20E-02	0 3750	5 238E+13
Cs-134	2 0455E-05	8,088 49	16,176 99	0 00E+00	1 65E-01	3 31E-01	0 5750	8 657E+14
Cs-135	3 4477E-06	8,088 49	16,176 99	0 00E+00	2 79E-02	5 58E-02	0 8500	1 057E+13
Cs-137	1 4365E+00	8,088 49	16,176 99	0 00E+00	1 16E+04	2 32E+04	1 2500	5 114E+12
Eu-154	7 3230E-03	8,088 49	16,176 99	0 00E+00	5 92E+01	1 18E+02	1 7500	2 878E+11
Eu-155	5 9259E-04	8,088 49	16,176 99	0 00E+00	4 79E+00	9 59E+00	2 2500	2 407E+07
Fe-55	2 2791E-06	8,088 49	16,176 99	0 00E+00	1 84E-02	3 69E-02	2 7500	2 297E+07
H-3	1 9698E-03	8,088 49	16,176 99	0 00E+00	1 59E+01	3 19E+01	3 5000	1 342E+04
I-129	7 5300E-07	8,088 49	16,176 99	0 00E+00	6 09E-03	1 22E-02	5 0000	5 486E+03
Kr-85	4 1176E-02	8,088 49	16,176 99	0 00E+00	3 33E+02	6 66E+02	7 0000	6 006E+02
Np-237	9 5752E-06	8,088 49	16,176 99	0 00E+00	7 74E-02	1 55E-01	11.0000	6 698E+01
Pa-231	3 9379E-09	8,088 49	16,176 99	0 00E+00	3 19E-05	6 37E-05		
Pb-210	3 3115E-10	8,088 49	16,176 99	0 00E+00	2 68E-06	5 36E-06		
Pm-147	9 2402E-04	8,088 49	16,176 99	0 00E+00	7 47E+00	1 49E+01		
Pu-238	1 6217E-02	8,088 49	16,176 99	0 00E+00	1 31E+02	2 62E+02		
Pu-239	4 2810E-04	8,088 49	16,176 99	0 00E+00	3 46E+00	6 93E+00		
Pu-240	2 4333E-04	8,088 49	16,176 99	0 00E+00	1 97E+00	3 94E+00		
Pu-241	1 6242E-02	8,088 49	16,176 99	0 00E+00	1 31E+02	2 63E+02		
Pu-242	3 6329E-07	8,088 49	16,176 99	0 00E+00	2 94E-03	5 88E-03		
Ra-226	9 0114E-10	8,088 49	16,176 99	0 00E+00	7 29E-06	1 46E-05		
Ra-228	3 1019E-14	8,088 49	16,176 99	0 00E+00	2 51E-10	5 02E-10		
Ru-106	2 1225E-10	8,088 49	16,176 99	0 00E+00	1 72E-06	3 43E-06		
Se-79	1 2930E-05	8,088 49	16,176 99	0 00E+00	1 05E-01	2 09E-01		
Sn-126	1 1571E-05	8,088 49	16,176 99	0 00E+00	9 36E-02	1 87E-01		
Sr-90	1 3472E+00	8,088 49	16,176 99	0 00E+00	1 09E+04	2 18E+04		
Tc-99	4 2239E-04	8,088 49	16,176 99	0 00E+00	3 42E+00	6 83E+00		
Th-229	1 2407E-11	8,088 49	16,176 99	0 00E+00	1 00E-07	2 01E-07		
Th-230	8 3497E-08	8,088 49	16,176 99	0 00E+00	6 75E-04	1 35E-03		
Th-232	3 8371E-14	8,088 49	16,176 99	0 00E+00	3 10E-10	6 21E-10		
Ti-208	4 0414E-08	8,088 49	16,176 99	0 00E+00	3 27E-04	6 54E-04		
U-232	1 0948E-07	8,088 49	16,176 99	0 00E+00	8 86E-04	1 77E-03	Thermal Power	
U-233	3 6275E-09	8,088 49	16,176 99	0 00E+00	2 93E-05	5 87E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8562E-04	8,088 49	16,176 99	0 00E+00	1 50E+00	3 00E+00	1.35E+02	2.71E+02
U-235	-2 7235E-06	8,088 49	0 00	3 42E-02	1 22E-02	3 42E-02	Total	Total
U-236	1 5493E-05	8,088 49	16,176 99	0 00E+00	1 25E-01	2 51E-01		
U-238	-4 2851E-09	8,088 49	0 00	2 15E-02	2 14E-02	2 15E-02		
Y-90	1 3475E+00	8,088 49	16,176 99	0 00E+00	1 09E+04	2 18E+04		
Other Radionuclides					1 11E+04	2 21E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.83740991	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal		8 088 49	
Bounding		16 176 99	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1 01
Nominal	0.32		
Bounding	0.64		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: SAPHIR UALX-HEU (SWITZERLAND)
SNF ID #: 444
Fuel Units & Descr. 76 - MTR TYPE
Heavy Metal Mass, BOL=21 447kg; EOL=12kg
ROD Storage Site, SRS

¹Fuel decay start date: 1993
Estimates as of: 2030

Template: ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time 35 years

Estimated
Canister usage
18"x10"
3.17

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	8,946.30	17,892.61	0 00E+00	1 80E-05	3 59E-05	Avg MeV	
Am-241	2 5251E-03	8,946.30	17,892.61	0 00E+00	2 26E+01	4 52E+01	0 0150	1 318E+15
Am-242m	3 9624E-07	8,946.30	17,892.61	0 00E+00	3 54E-03	7 09E-03	0 0250	2 736E+14
Am-243	1 4880E-06	8,946.30	17,892.61	0 00E+00	1 33E-02	2 66E-02	0 0375	2 379E+14
C-14	5 7053E-09	8,946.30	17,892.61	0 00E+00	5 10E-05	1 02E-04	0 0575	2 560E+14
Cl-36	1 3124E-32	8,946.30	17,892.61	0 00E+00	1 17E-28	2 35E-28	0 0850	1 543E+14
Cm-243	1 1419E-07	8,946.30	17,892.61	0 00E+00	1 02E-03	2 04E-03	0 1250	1 019E+14
Cm-244	1 6522E-05	8,946.30	17,892.61	0 00E+00	1 48E-01	2 96E-01	0 2250	1 332E+14
Co-60	7 4047E-07	8,946.30	17,892.61	0 00E+00	6 62E-03	1 32E-02	0 3750	5 794E+13
Cs-134	2 0455E-05	8,946.30	17,892.61	0 00E+00	1 83E-01	3 66E-01	0 5750	9 575E+14
Cs-135	3 4477E-06	8,946.30	17,892.61	0 00E+00	3 08E-02	6 17E-02	0 8500	1 170E+13
Cs-137	1 4365E+00	8,946.30	17,892.61	0 00E+00	1 29E+04	2 57E+04	1 2500	5 657E+12
Eu-154	7 3230E-03	8,946.30	17,892.61	0 00E+00	6 55E+01	1 31E+02	1 7500	3 184E+11
Eu-155	5 9259E-04	8,946.30	17,892.61	0 00E+00	5 30E+00	1 06E+01	2 2500	2 662E+07
Fe-55	2 2791E-06	8,946.30	17,892.61	0 00E+00	2 04E-02	4 08E-02	2 7500	2 541E+07
H-3	1 9698E-03	8,946.30	17,892.61	0 00E+00	1 76E+01	3 52E+01	3 5000	1 472E+04
I-129	7 5300E-07	8,946.30	17,892.61	0 00E+00	6 74E-03	1 35E-02	5 0000	6 015E+03
Kr-85	4 1176E-02	8,946.30	17,892.61	0 00E+00	3 68E+02	7 37E+02	7 0000	6 582E+02
Np-237	9 5752E-06	8,946.30	17,892.61	0 00E+00	8 57E-02	1 71E-01	11 0000	7 338E+01
Pa-231	3 9379E-09	8,946.30	17,892.61	0 00E+00	3 52E-05	7 05E-05		
Pb-210	3 3115E-10	8,946.30	17,892.61	0 00E+00	2 96E-06	5 93E-06		
Pm-147	9 2402E-04	8,946.30	17,892.61	0 00E+00	8 27E+00	1 65E+01		
Pu-238	1 6217E-02	8,946.30	17,892.61	0 00E+00	1 45E+02	2 90E+02		
Pu-239	4 2810E-04	8,946.30	17,892.61	0 00E+00	3 83E+00	7 66E+00		
Pu-240	2 4333E-04	8,946.30	17,892.61	0 00E+00	2 18E+00	4 35E+00		
Pu-241	1 6242E-02	8,946.30	17,892.61	0 00E+00	1 45E+02	2 91E+02		
Pu-242	3 6329E-07	8,946.30	17,892.61	0 00E+00	3 25E-03	6 50E-03		
Ra-226	9 0114E-10	8,946.30	17,892.61	0 00E+00	8 06E-06	1 61E-05		
Ra-228	3 1019E-14	8,946.30	17,892.61	0 00E+00	2 78E-10	5 55E-10		
Ru-106	2 1225E-10	8,946.30	17,892.61	0 00E+00	1 90E-06	3 80E-06		
Se-79	1 2930E-05	8,946.30	17,892.61	0 00E+00	1 16E-01	2 31E-01		
Sn-126	1 1571E-05	8,946.30	17,892.61	0 00E+00	1 04E-01	2 07E-01		
Sr-90	1 3472E+00	8,946.30	17,892.61	0 00E+00	1 21E+04	2 41E+04		
Tc-99	4 2239E-04	8,946.30	17,892.61	0 00E+00	3 78E+00	7 56E+00		
Th-229	1 2407E-11	8,946.30	17,892.61	0 00E+00	1 11E-07	2 22E-07		
Th-230	8 3497E-08	8,946.30	17,892.61	0 00E+00	7 47E-04	1 49E-03		
Th-232	3 8371E-14	8,946.30	17,892.61	0 00E+00	3 43E-10	6 87E-10		
Th-208	4 0414E-08	8,946.30	17,892.61	0 00E+00	3 62E-04	7 23E-04		
U-232	1 0948E-07	8,946.30	17,892.61	0 00E+00	9 79E-04	1 96E-03		
U-233	3 6275E-09	8,946.30	17,892.61	0 00E+00	3 25E-05	6 49E-05		
U-234	1 8562E-04	8,946.30	17,892.61	0 00E+00	1 66E+00	3 32E+00		
U-235	-2 7235E-06	8,946.30	0 00	4 20E-02	1 76E-02	4 20E-02		
U-236	1 5493E-05	8,946.30	17,892.61	0 00E+00	1 39E-01	2 77E-01		
U-238	-4 2851E-09	8,946.30	0 00	6 76E-04	6 38E-04	6 76E-04		
Y-90	1 3475E+00	8,946.30	17,892.61	0 00E+00	1 21E+04	2 41E+04		
Other Radionuclides					1 22E+04	2 45E+04		

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	
	90 62318257	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		8 946.30	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		17 892.61	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal:	1.33		1 05
Bounding:	2 65		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: SAPHIR ULAX MEU (SWITZERLAND)

SNF ID #: 945

Fuel Units & Descr: 52 - MTR TYPE

Heavy Metal Mass: BOL=35.984kg EOL=28 808kg

ROD Storage Site: SRS

Fuel decay start date: 1993

Estimates as of: 2030

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: 35 years

Estimated
Canister usage
18"x10"
2 17

II. Estimates							Gamma Sources	
	m	x _n	x _b	b	y _n	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	2.0068E-09	6,795.81	13,591.62	0.00E+00	1.36E-05	2.73E-05	0.0150	1.001E+15
Am-241	2.5251E-03	6,795.81	13,591.62	0.00E+00	1.72E+01	3.43E+01	0.0250	2.079E+14
Am-242m	3.9624E-07	6,795.81	13,591.62	0.00E+00	2.69E-03	5.39E-03	0.0375	1.807E+14
Am-243	1.4880E-06	6,795.81	13,591.62	0.00E+00	1.01E-02	2.02E-02	0.0575	1.945E+14
C-14	5.7053E-09	6,795.81	13,591.62	0.00E+00	3.88E-05	7.75E-05	0.0850	1.172E+14
Cf-253	1.3124E-32	6,795.81	13,591.62	0.00E+00	8.92E-29	1.78E-28	0.1250	7.740E+13
Cm-243	1.1419E-07	6,795.81	13,591.62	0.00E+00	7.76E-04	1.55E-03	0.2250	1.012E+14
Cm-244	1.6522E-05	6,795.81	13,591.62	0.00E+00	1.12E-01	2.25E-01	0.3750	4.401E+13
Co-60	7.4047E-07	6,795.81	13,591.62	0.00E+00	5.03E-03	1.01E-02	0.5750	7.273E+14
Cs-134	2.0455E-05	6,795.81	13,591.62	0.00E+00	1.39E-01	2.78E-01	0.8500	8.884E+12
Cs-135	3.4477E-06	6,795.81	13,591.62	0.00E+00	2.34E-02	4.69E-02	1.2500	4.297E+12
Cs-137	1.4365E+00	6,795.81	13,591.62	0.00E+00	9.76E+03	1.95E+04	1.7500	2.418E+11
Eu-154	7.3230E-03	6,795.81	13,591.62	0.00E+00	4.98E+01	9.95E+01	2.2500	2.022E+07
Eu-155	5.9259E-04	6,795.81	13,591.62	0.00E+00	4.03E+00	8.05E+00	2.7500	1.930E+07
Fe-55	2.2791E-06	6,795.81	13,591.62	0.00E+00	1.55E-02	3.10E-02	3.5000	1.121E+04
H-3	1.9698E-03	6,795.81	13,591.62	0.00E+00	1.34E+01	2.68E+01	5.0000	4.583E+03
I-129	7.5300E-07	6,795.81	13,591.62	0.00E+00	5.12E-03	1.02E-02	7.0000	5.016E+02
Kr-85	4.1176E-02	6,795.81	13,591.62	0.00E+00	2.80E+02	5.60E+02	11.0000	5.593E+01
Np-237	9.5752E-06	6,795.81	13,591.62	0.00E+00	6.51E-02	1.30E-01		
Pa-231	3.9379E-09	6,795.81	13,591.62	0.00E+00	2.68E-05	5.35E-05		
Pb-210	3.3115E-10	6,795.81	13,591.62	0.00E+00	2.25E-06	4.50E-06		
Pm-147	9.2402E-04	6,795.81	13,591.62	0.00E+00	6.28E+00	1.26E+01		
Pu-238	1.6217E-02	6,795.81	13,591.62	0.00E+00	1.10E+02	2.20E+02		
Pu-239	4.2810E-04	6,795.81	13,591.62	0.00E+00	2.91E+00	5.82E+00		
Pu-240	2.4333E-04	6,795.81	13,591.62	0.00E+00	1.65E+00	3.31E+00		
Pu-241	1.6242E-02	6,795.81	13,591.62	0.00E+00	1.10E+02	2.21E+02		
Pu-242	3.6329E-07	6,795.81	13,591.62	0.00E+00	2.47E-03	4.94E-03		
Ra-226	9.0114E-10	6,795.81	13,591.62	0.00E+00	6.12E-06	1.22E-05		
Ra-228	3.1019E-14	6,795.81	13,591.62	0.00E+00	2.11E-10	4.22E-10		
Ru-106	2.1225E-10	6,795.81	13,591.62	0.00E+00	1.44E-06	2.88E-06		
Se-79	1.2930E-05	6,795.81	13,591.62	0.00E+00	8.79E-02	1.76E-01		
Sn-126	1.1571E-05	6,795.81	13,591.62	0.00E+00	7.86E-02	1.57E-01		
Sr-90	1.3472E+00	6,795.81	13,591.62	0.00E+00	9.16E+03	1.83E+04		
Tc-99	4.2239E-04	6,795.81	13,591.62	0.00E+00	2.87E+00	5.74E+00		
Th-229	1.2407E-11	6,795.81	13,591.62	0.00E+00	8.43E-08	1.69E-07		
Th-230	8.3497E-08	6,795.81	13,591.62	0.00E+00	5.67E-04	1.13E-03		
Th-232	3.8371E-14	6,795.81	13,591.62	0.00E+00	2.61E-10	5.22E-10		
Ti-208	4.0414E-08	6,795.81	13,591.62	0.00E+00	2.75E-04	5.49E-04		
U-232	1.0948E-07	6,795.81	13,591.62	0.00E+00	7.44E-04	1.49E-03		
U-233	3.6275E-09	6,795.81	13,591.62	0.00E+00	2.47E-05	4.93E-05		
U-234	1.8562E-04	6,795.81	13,591.62	0.00E+00	1.26E+00	2.52E+00		
U-235	-2.7235E-06	6,795.81	0.00	3.50E-02	1.65E-02	3.50E-02		
U-236	1.5493E-05	6,795.81	13,591.62	0.00E+00	1.05E-01	2.11E-01		
U-238	-4.2851E-09	6,795.81	0.00	6.64E-03	6.61E-03	6.64E-03		
Y-90	1.3475E+00	6,795.81	13,591.62	0.00E+00	9.16E+03	1.83E+04		
Other Radionuclides					9.30E+03	1.86E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	45.07146122	60 to 100	
Burnup Summary (MWd) ²			Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Nominal Bounding	From SFD	Estimated	
		6,795.81 13,591.62	
Checks			Estimated EOL HM/Given EOL HM 1.01
Nominal Bounding	Burnup Multiplier	Estimated Burnup/ Given Burnup	
	0.60		
	1.20		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: SAXTON (MOX SST)
SNF ID #: 883
Fuel Units & Descr: 25 - ELEMENT
Heavy Metal Mass: BOL=, EOL=95 588kg
ROD Storage Site: INEEL

Fuel decay start date: 1972
Estimates as of: 2030
Template* (Worst Case)
Template Burnup(MWd): 62.5
Template BOL Heavy Metal Mass (MT): 0 00186865
Template Decay Time: 50 years

Estimated
Canister usage:
18"x10"
0.78

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 5200E-06	95 69	95 69	0 00E+00	2 41E-04	2 41E-04	Avg. MeV	
Am-241	8 6432E+00	95 69	95 69	0 00E+00	8 27E+02	8 27E+02	0 0150	1 798E+14
Am-242m	1 5728E-02	95 69	95 69	0 00E+00	1 50E+00	1 50E+00	0 0250	1 602E+13
Am-243	1 6288E-02	95 69	95 69	0 00E+00	1 56E+00	1 56E+00	0 0375	1 375E+13
C-14	1 2068E-01	95 69	95 69	0 00E+00	1 15E+01	1 15E+01	0 0575	2 562E+13
Cl-36	2 2849E-03	95 69	95 69	0 00E+00	2 19E-01	2 19E-01	0 0850	8 615E+12
Cm-243	6 0144E-04	95 69	95 69	0 00E+00	5 76E-02	5 76E-02	0 1250	6 076E+12
Cm-244	9 4880E-02	95 69	95 69	0 00E+00	9 08E+00	9 08E+00	0 2250	7 426E+12
Co-60	3 9052E+00	95 69	95 69	0 00E+00	3 74E+02	3 74E+02	0 3750	3 216E+12
Cs-134	2 2139E-06	95 69	95 69	0 00E+00	2 12E-04	2 12E-04	0 5750	5 315E+13
Cs-135	4 3976E-04	95 69	95 69	0 00E+00	4 21E-02	4 21E-02	0 8500	1 164E+12
Cs-137	1 4887E+01	95 69	95 69	0 00E+00	1 42E+03	1 42E+03	1 2500	2 854E+13
Eu-154	3 7342E-01	95 69	95 69	0 00E+00	3 57E+01	3 57E+01	1 7500	3 430E+10
Eu-155	8 4893E-03	95 69	95 69	0 00E+00	8 12E-01	8 12E-01	2 2500	1 518E+08
Fe-55	5 3750E-03	95 69	95 69	0 00E+00	5 14E-01	5 14E-01	2 7500	2 573E+08
H-3	1 0472E-01	95 69	95 69	0 00E+00	1 00E+01	1 00E+01	3 5000	1 945E+06
I-129	1 0618E-05	95 69	95 69	0 00E+00	1 02E-03	1 02E-03	5 0000	8 206E+05
Kr-85	2 2717E-01	95 69	95 69	0 00E+00	2 17E+01	2 17E+01	7 0000	9 287E+04
Np-237	1 6400E-04	95 69	95 69	0 00E+00	1 57E-02	1 57E-02	11 0000	1 058E+04
Pa-231	2 8688E-06	95 69	95 69	0 00E+00	2 75E-04	2 75E-04		
Pb-210	4 7312E-08	95 69	95 69	0 00E+00	4 53E-06	4 53E-06		
Pm-147	3 2198E-04	95 69	95 69	0 00E+00	3 08E-02	3 08E-02		
Pu-238	-1 1924E+00	95 69	0 00	1 23E+04	1 22E+04	1 23E+04		
Pu-239	-4 8600E-02	95 69	0 00	1 49E+03	1 48E+03	1 49E+03		
Pu-240	-3 0127E-01	95 69	0 00	1 90E+03	1 87E+03	1 90E+03		
Pu-241	-1 2917E+02	95 69	0 00	4 89E+05	4 77E+05	4 89E+05		
Pu-242	-1 1381E-04	95 69	0 00	8 22E+00	8 21E+00	8 22E+00		
Ra-226	1 0760E-07	95 69	95 69	0 00E+00	1 03E-05	1 03E-05		
Ra-228	6 0160E-07	95 69	95 69	0 00E+00	5 76E-05	5 76E-05		
Ru-106	1 3388E-13	95 69	95 69	0 00E+00	1 28E-11	1 28E-11		
Se-79	1 9179E-04	95 69	95 69	0 00E+00	1 84E-02	1 84E-02		
Sn-126	1 6669E-04	95 69	95 69	0 00E+00	1 59E-02	1 59E-02		
Sr-90	1 3859E+01	95 69	95 69	0 00E+00	1 33E+03	1 33E+03		
Tc-99	6 7678E-03	95 69	95 69	0 00E+00	6 48E-01	6 48E-01		
Th-229	2 2592E-06	95 69	95 69	0 00E+00	2 16E-04	2 16E-04		
Th-230	7 5955E-06	95 69	95 69	0 00E+00	7 27E-04	7 27E-04		
Th-232	6 0208E-07	95 69	95 69	0 00E+00	5 76E-05	5 76E-05		
Ti-208	7 5795E-05	95 69	95 69	0 00E+00	7 25E-03	7 25E-03		
U-232	2 0521E-04	95 69	95 69	0 00E+00	1 96E-02	1 96E-02		
U-233	3 6128E-04	95 69	95 69	0 00E+00	3 46E-02	3 46E-02		
U-234	1 2788E-02	95 69	95 69	0 00E+00	1 22E+00	1 22E+00		
U-235	5 7486E-04	95 69	95 69	4 12E-02	9 62E-02	9 62E-02		
U-236	2 3485E-04	95 69	95 69	0 00E+00	2 25E-02	2 25E-02		
U-238	1 1581E-04	95 69	95 69	5 12E-03	1 62E-02	1 62E-02		
Y-90	1 3861E+01	95 69	95 69	0 00E+00	1 33E+03	1 33E+03		
Other Radionuclides					4 92E+03	4 92E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup set equal to bounding burnup 95 69 Bounding burnup taken from SFD and converted to MWd using BOL=95 688kg
Nominal		95 69	
Bounding		95 69	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1 40
Nominal	0 03		
Bounding	0 03		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: SAXTON (MOX ZR)
SNF ID #: 787
Fuel Units & Descr: 43 - ELEMENT
Heavy Metal Mass: BOL= , EOL=239.88kg
ROD Storage Site: INEEL

Fuel decay start date: 1972
Estimates as of: 2030
Template (Worst Case)
*Template Burnup(MWd): 62.5
Template BOL Heavy Metal Mass (MT): 0.00186865
Template Decay Time: 50 years

Estimated
Canister usage:
18"x10"
134

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.5200E-06	240.13	240.13	0.00E+00	6.05E-04	6.05E-04	Avg MeV	
Am-241	8.6432E+00	240.13	240.13	0.00E+00	2.08E+03	2.08E+03	0.0150	4.512E+14
Am-242m	1.5728E-02	240.13	240.13	0.00E+00	3.78E+00	3.78E+00	0.0250	4.020E+13
Am-243	1.6288E-02	240.13	240.13	0.00E+00	3.91E+00	3.91E+00	0.0375	3.451E+13
C-14	1.2068E-01	240.13	240.13	0.00E+00	2.90E+01	2.90E+01	0.0575	6.429E+13
Ct-36	2.2849E-03	240.13	240.13	0.00E+00	5.49E-01	5.49E-01	0.0850	2.162E+13
Cm-243	6.0144E-04	240.13	240.13	0.00E+00	1.44E-01	1.44E-01	0.1250	1.525E+13
Cm-244	9.4880E-02	240.13	240.13	0.00E+00	2.28E+01	2.28E+01	0.2250	1.864E+13
Co-60	3.9052E+00	240.13	240.13	0.00E+00	9.38E+02	9.38E+02	0.3750	8.070E+12
Cs-134	2.2139E-06	240.13	240.13	0.00E+00	5.32E-04	5.32E-04	0.5750	1.334E+14
Cs-135	4.3976E-04	240.13	240.13	0.00E+00	1.06E-01	1.06E-01	0.8500	2.922E+12
Cs-137	1.4887E+01	240.13	240.13	0.00E+00	3.57E+03	3.57E+03	1.2500	7.161E+13
Eu-154	3.7342E-01	240.13	240.13	0.00E+00	8.97E+01	8.97E+01	1.7500	8.608E+10
Eu-155	8.4893E-03	240.13	240.13	0.00E+00	2.04E+00	2.04E+00	2.2500	3.810E+08
Fe-55	5.3750E-03	240.13	240.13	0.00E+00	1.29E+00	1.29E+00	2.7500	6.457E+08
H-3	1.0472E-01	240.13	240.13	0.00E+00	2.51E+01	2.51E+01	3.5000	4.880E+06
I-129	1.0618E-05	240.13	240.13	0.00E+00	2.55E-03	2.55E-03	5.0000	2.059E+06
Kr-85	2.2717E-01	240.13	240.13	0.00E+00	5.46E+01	5.46E+01	7.0000	2.331E+05
Np-237	1.6400E-04	240.13	240.13	0.00E+00	3.94E-02	3.94E-02	11.0000	2.654E+04
Pa-231	2.8688E-06	240.13	240.13	0.00E+00	6.89E-04	6.89E-04		
Pb-210	4.7312E-08	240.13	240.13	0.00E+00	1.14E-05	1.14E-05		
Pm-147	3.2198E-04	240.13	240.13	0.00E+00	7.73E-02	7.73E-02		
Pu-238	-1.1924E+00	240.13	0.00	3.09E+04	3.06E+04	3.09E+04		
Pu-239	-4.8600E-02	240.13	0.00	3.73E+03	3.72E+03	3.73E+03		
Pu-240	-3.0127E-01	240.13	0.00	4.77E+03	4.70E+03	4.77E+03		
Pu-241	-1.2917E+02	240.13	0.00	1.23E+06	1.20E+06	1.23E+06		
Pu-242	-1.1381E-04	240.13	0.00	2.06E+01	2.06E+01	2.06E+01		
Ra-226	1.0760E-07	240.13	240.13	0.00E+00	2.58E-05	2.58E-05		
Ra-228	6.0160E-07	240.13	240.13	0.00E+00	1.44E-04	1.44E-04		
Ru-106	1.3388E-13	240.13	240.13	0.00E+00	3.21E-11	3.21E-11		
Se-79	1.9179E-04	240.13	240.13	0.00E+00	4.61E-02	4.61E-02		
Sn-126	1.6669E-04	240.13	240.13	0.00E+00	4.00E-02	4.00E-02		
Sr-90	1.3859E+01	240.13	240.13	0.00E+00	3.33E+03	3.33E+03		
Tc-99	6.7678E-03	240.13	240.13	0.00E+00	1.63E+00	1.63E+00		
Th-229	2.2592E-06	240.13	240.13	0.00E+00	5.43E-04	5.43E-04		
Th-230	7.5955E-06	240.13	240.13	0.00E+00	1.82E-03	1.82E-03		
Th-232	6.0208E-07	240.13	240.13	0.00E+00	1.45E-04	1.45E-04		
Ti-208	7.5795E-05	240.13	240.13	0.00E+00	1.82E-02	1.82E-02		
U-232	2.0521E-04	240.13	240.13	0.00E+00	4.93E-02	4.93E-02		
U-233	3.6128E-04	240.13	240.13	0.00E+00	8.68E-02	8.68E-02		
U-234	1.2788E-02	240.13	240.13	0.00E+00	3.07E+00	3.07E+00		
U-235	5.7486E-04	240.13	240.13	1.03E-01	2.41E-01	2.41E-01		
U-236	2.3485E-04	240.13	240.13	0.00E+00	5.64E-02	5.64E-02		
U-238	1.1581E-04	240.13	240.13	1.29E-02	4.07E-02	4.07E-02		
Y-90	1.3861E+01	240.13	240.13	0.00E+00	3.33E+03	3.33E+03		
Other Radionuclides					1.23E+04	1.23E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences*
Reactor Moderator	LIGHT WATER	(Worst Case)	
Fuel Cladding	ZIRC	SST/Inconel	
BOL HM Constituents	Pu and U	U Th, & Pu	
BOL Enrichment %		0 to 100	

This fuel didn't closely match any existing templates, therefore the worst case template was used

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		240.13	
Bounding		240.13	Nominal burnup set equal to bounding burnup Bounding burnup taken from SFD and converted to MWd using BOL=240.132kg

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.03		
Bounding	0.03		1.40

*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: SAXTON (UO2 SST)

SNF ID #: 882

Fuel Units & Descr. 20 - ELEMENT

Heavy Metal Mass BOL= , EOL=10.402kg

ROD Storage Site INEEL

¹Fuel decay start date: 1972

Estimates as of: 2030

Template: Pathfinder (Light Water, SST 60 to 100%, U)

²Template Burnup(MWd): 6.01

Template BOL Heavy Metal Mass (MT): 0.00012882

Template Decay Time: 50 years

Estimated

Canister usage:

18"x10"

0.69

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.4276E-08	16.67	16.67	0.00E+00	5.71E-07	5.71E-07	Avg MeV	
Am-241	1.1458E-04	16.67	16.67	0.00E+00	1.91E-03	1.91E-03	0.0150	8.698E+11
Am-242m	7.9468E-09	16.67	16.67	0.00E+00	1.32E-07	1.32E-07	0.0250	1.807E+11
Am-243	9.8386E-10	16.67	16.67	0.00E+00	1.64E-08	1.64E-08	0.0375	1.566E+11
C-14	2.2978E-04	16.67	16.67	0.00E+00	3.83E-03	3.83E-03	0.0575	1.685E+11
Cl-36	1.2261E-06	16.67	16.67	0.00E+00	2.04E-05	2.04E-05	0.0850	1.018E+11
Cm-243	1.7271E-10	16.67	16.67	0.00E+00	2.88E-09	2.88E-09	0.1250	6.614E+10
Cm-244	1.3058E-09	16.67	16.67	0.00E+00	2.18E-08	2.18E-08	0.2250	8.812E+10
Co-60	9.8636E-03	16.67	16.67	0.00E+00	1.64E-01	1.64E-01	0.3750	3.825E+10
Cs-134	1.9617E-08	16.67	16.67	0.00E+00	3.27E-07	3.27E-07	0.5750	6.369E+11
Cs-135	3.0316E-05	16.67	16.67	0.00E+00	5.05E-04	5.05E-04	0.8500	6.288E+09
Cs-137	1.0263E+00	16.67	16.67	0.00E+00	1.71E+01	1.71E+01	1.2500	1.432E+10
Eu-154	2.0017E-04	16.67	16.67	0.00E+00	3.34E-03	3.34E-03	1.7500	1.619E+08
Eu-155	8.5957E-05	16.67	16.67	0.00E+00	1.43E-03	1.43E-03	2.2500	8.206E+04
Fe-55	2.2646E-05	16.67	16.67	0.00E+00	3.78E-04	3.78E-04	2.7500	1.118E+04
H-3	1.0835E-03	16.67	16.67	0.00E+00	1.81E-02	1.81E-02	3.5000	2.892E+00
I-129	7.3195E-07	16.67	16.67	0.00E+00	1.22E-05	1.22E-05	5.0000	1.208E+00
Kr-85	1.5661E-02	16.67	16.67	0.00E+00	2.61E-01	2.61E-01	7.0000	1.352E-01
Np-237	1.1494E-06	16.67	16.67	0.00E+00	1.92E-05	1.92E-05	11.0000	1.529E-02
Pa-231	5.8070E-08	16.67	16.67	0.00E+00	9.68E-07	9.68E-07		
Pb-210	1.2985E-12	16.67	16.67	0.00E+00	2.16E-11	2.16E-11		
Pm-147	2.2196E-05	16.67	16.67	0.00E+00	3.70E-04	3.70E-04		
Pu-238	2.6223E-04	16.67	16.67	0.00E+00	4.37E-03	4.37E-03		
Pu-239	6.6739E-04	16.67	16.67	0.00E+00	1.11E-02	1.11E-02		
Pu-240	8.6705E-05	16.67	16.67	0.00E+00	1.45E-03	1.45E-03		
Pu-241	3.4759E-04	16.67	16.67	0.00E+00	5.79E-03	5.79E-03		
Pu-242	1.9717E-09	16.67	16.67	0.00E+00	3.29E-08	3.29E-08		
Ra-226	3.0000E-12	16.67	16.67	0.00E+00	5.00E-11	5.00E-11		
Ra-228	8.3328E-12	16.67	16.67	0.00E+00	1.39E-10	1.39E-10		
Ru-106	6.1464E-15	16.67	16.67	0.00E+00	1.02E-13	1.02E-13		
Se-79	1.3221E-05	16.67	16.67	0.00E+00	2.20E-04	2.20E-04		
Sn-126	1.1491E-05	16.67	16.67	0.00E+00	1.92E-04	1.92E-04		
Sr-90	9.5541E-01	16.67	16.67	0.00E+00	1.59E+01	1.59E+01		
Tc-99	4.6656E-04	16.67	16.67	0.00E+00	7.78E-03	7.78E-03		
Th-229	1.9085E-11	16.67	16.67	0.00E+00	3.18E-10	3.18E-10		
Th-230	2.1913E-10	16.67	16.67	0.00E+00	3.65E-09	3.65E-09		
Th-232	8.3478E-12	16.67	16.67	0.00E+00	1.39E-10	1.39E-10		
Th-208	1.8752E-08	16.67	16.67	0.00E+00	3.13E-07	3.13E-07		
U-232	5.0782E-08	16.67	16.67	0.00E+00	8.47E-07	8.47E-07		
U-233	3.2596E-09	16.67	16.67	0.00E+00	5.43E-08	5.43E-08		
U-234	3.9817E-07	16.67	16.67	0.00E+00	6.64E-06	6.64E-06		
U-235	-2.7761E-06	16.67	0.00	2.10E-02	2.10E-02	2.10E-02		
U-236	1.6190E-05	16.67	16.67	0.00E+00	2.70E-04	2.70E-04		
U-238	-2.8547E-09	16.67	0.00	2.28E-04	2.27E-04	2.28E-04		
Y-90	9.5557E-01	16.67	16.67	0.00E+00	1.59E+01	1.59E+01		
Other Radionuclides					2.03E+01	2.03E+01		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

Burnup Summary (MWd)¹

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup set equal to bounding burnup Bounding burnup taken from SFD and converted to MWd using BOL=10.42kg
Nominal		16.67	
Bounding		16.67	

Checks

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

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: SAXTON (UO2 ZR)
SNF ID #: 788
Fuel Units & Descr: 9 - ELEMENT
Heavy Metal Mass BOL = ; EOL=41 482kg
ROD Storage Site INEEL

¹Fuel decay start date 1972
Estimates as of 2030
Template PWR (Light Water Zirc, 0 to 5%, U)
²Template Burnup(MWd) 61 92
Template BOL Heavy Metal Mass (MT): 0 00176911
Template Decay Time 50 years

Estimated
Canister usage
18"x10"
0 31

II. Estimates							Gamma Sources	
	m	x _a	x _b	b	y _a	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg MeV	
Ac-227	1 0733E-09	66 48	66 48	0 00E+00	7 14E-08	7 14E-08	0.0150	2.530E+12
Am-241	1 4751E-01	66 48	66 48	0 00E+00	9 81E+00	9 81E+00	0.0250	5 070E+11
Am-242m	2 6809E-04	66 48	66 48	0 00E+00	1 78E-02	1 78E-02	0.0375	4 777E+11
Am-243	6 2484E-04	66 48	66 48	0 00E+00	4 15E-02	4 15E-02	0.0575	5 978E+11
C-14	4 7820E-05	66 48	66 48	0 00E+00	3 18E-03	3 18E-03	0.0850	2 793E+11
Cl-36	8 0297E-07	66 48	66 48	0 00E+00	5 34E-05	5 34E-05	0.1250	1 858E+11
Cm-243	1 7426E-04	66 48	66 48	0 00E+00	1 16E-02	1 16E-02	0.2250	2 385E+11
Cm-244	2 7616E-02	66 48	66 48	0 00E+00	1 84E+00	1 84E+00	0.3750	1 030E+11
Co-60	3 5610E-04	66 48	66 48	0 00E+00	2 37E-02	2 37E-02	0.5750	2 425E+12
Cs-134	2 6260E-07	66 48	66 48	0 00E+00	1 75E-05	1 75E-05	0.8500	2 368E+10
Cs-135	1 4433E-05	66 48	66 48	0 00E+00	9 60E-04	9 60E-04	1.2500	1 507E+10
Cs-137	9 8870E-01	66 48	66 48	0.00E+00	6 57E+01	6 57E+01	1.7500	6 625E+08
Eu-154	6 0320E-03	66 48	66 48	0 00E+00	4 01E-01	4 01E-01	2.2500	1 090E+05
Eu-155	2 1770E-04	66 48	66 48	0 00E+00	1 45E-02	1 45E-02	2.7500	3 839E+05
Fe-55	7 9296E-07	66 48	66 48	0 00E+00	5 27E-05	5 27E-05	3.5000	2 745E+04
H-3	8 9486E-03	66 48	66 48	0 00E+00	5 95E-01	5 95E-01	5.0000	1 173E+04
I-129	9 8288E-07	66 48	66 48	0.00E+00	6 53E-05	6 53E-05	7.0000	1 352E+03
Kr-85	1 0707E-02	66 48	66 48	0 00E+00	7 12E-01	7 12E-01	11.0000	1 552E+02
Np-237	1 1927E-05	66 48	66 48	0 00E+00	7 93E-04	7 93E-04		
Pa-231	1 4703E-09	66 48	66 48	0 00E+00	9 77E-08	9 77E-08		
Pb-210	1 6828E-10	66 48	66 48	0 00E+00	1 12E-08	1 12E-08		
Pm-147	6 9606E-06	66 48	66 48	0 00E+00	4 63E-04	4 63E-04		
Pu-238	6 6263E-02	66 48	66 48	0 00E+00	4 41E+00	4 41E+00		
Pu-239	1 1618E-02	66 48	66 48	0 00E+00	7 72E-01	7 72E-01		
Pu-240	1 5142E-02	66 48	66 48	0 00E+00	1 01E+00	1 01E+00		
Pu-241	4 3766E-01	66 48	66 48	0 00E+00	2 91E+01	2 91E+01		
Pu-242	6 4260E-05	66 48	66 48	0 00E+00	4 27E-03	4 27E-03		
Ra-226	3 8501E-10	66 48	66 48	0 00E+00	2 56E-08	2 56E-08		
Ra-228	5 2955E-12	66 48	66 48	0 00E+00	3 52E-10	3 52E-10		
Ru-106	2 0413E-14	66 48	66 48	0 00E+00	1 36E-12	1 36E-12		
Se-79	1 2376E-05	66 48	66 48	0 00E+00	8 23E-04	8 23E-04		
Sn-126	2 5210E-05	66 48	66 48	0 00E+00	1 68E-03	1 68E-03		
Sr-90	6 4163E-01	66 48	66 48	0 00E+00	4 27E+01	4 27E+01		
Tc-99	3 9357E-04	66 48	66 48	0 00E+00	2 62E-02	2 62E-02		
Th-229	1 5644E-10	66 48	66 48	0 00E+00	1 04E-08	1 04E-08		
Th-230	2 7972E-08	66 48	66 48	0 00E+00	1 86E-06	1 86E-06		
Th-232	5 3036E-12	66 48	66 48	0 00E+00	3 53E-10	3 53E-10		
Ti-208	1 5136E-07	66 48	66 48	0.00E+00	1 01E-05	1 01E-05		
U-232	4 1005E-07	66 48	66 48	0 00E+00	2 73E-05	2 73E-05		
U-233	2 5856E-08	66 48	66 48	0 00E+00	1 72E-06	1 72E-06		
U-234	5 2665E-05	66 48	66 48	0 00E+00	3 50E-03	3 50E-03		
U-235	-1 4487E-06	66 48	0 00	2 87E-03	2 78E-03	2 87E-03		
U-236	7 5888E-06	66 48	66 48	0 00E+00	5 05E-04	5 05E-04		
U-238	-2 6129E-07	66 48	0 00	1 35E-02	1 35E-02	1 35E-02		
Y-90	6 4180E-01	66 48	66 48	0.00E+00	4 27E+01	4 27E+01		
Other Radionuclides					6 34E+01	6 34E+01		

Thermal Power		
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)	
1.20E+00	1.20E+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	ZIRC	ZIRC	
BOL HM Constituents	U	U	This fuel matches on all parameters except enrichment (unknown)
BOL Enrichment %		0 to 5	
Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		66 48	
Bounding		66 48	Nominal burnup set equal to bounding burnup Bounding burnup taken from SFD and converted to MWd using BOL=41.552kg
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.05		
Bounding	0.05		
			1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: SHIPPINGPORT PWR C1 BLKT (RODS)
 SNF ID #: 189
 Fuel Units & Descr: 2 - ROD
 Heavy Metal Mass: BOL=16.891kg; EOL=16 108kg
 ROD Storage Site: INEEL

Fuel decay start date: 1959
 Estimates as of: 2030
 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: 65 years

Estimated
 Canister usage:
 18"x15"
 0 07

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 2581E-09	744 60	1,489 19	0 00E+00	9 37E-07	1 87E-06	Avg. MeV	
Am-241	1 4761E-01	744 60	1,489 19	0 00E+00	1 10E+02	2 20E+02	0 0150	4 032E+13
Am-242m	2 5032E-04	744 60	1,489 19	0 00E+00	1 86E-01	3 73E-01	0 0250	8 008E+12
Am-243	6 2387E-04	744 60	1,489 19	0 00E+00	4 65E-01	9 29E-01	0 0375	7 486E+12
C-14	4 7739E-05	744 60	1,489 19	0 00E+00	3 55E-02	7 11E-02	0 0575	1 027E+13
Cl-36	8 0297E-07	744 60	1,489 19	0 00E+00	5 98E-04	1 20E-03	0 0850	4 382E+12
Cm-243	1 2099E-04	744 60	1,489 19	0 00E+00	9 01E-02	1 80E-01	0 1250	2 859E+12
Cm-244	1 5560E-02	744 60	1,489 19	0 00E+00	1 16E+01	2 32E+01	0 2250	3 727E+12
Co-60	4 9580E-05	744 60	1,489 19	0 00E+00	3 69E-02	7 38E-02	0 3750	1 613E+12
Cs-134	1 7022E-09	744 60	1,489 19	0 00E+00	1 27E-06	2 53E-06	0 5750	3 840E+13
Cs-135	1 4433E-05	744 60	1,489 19	0 00E+00	1 07E-02	2 15E-02	0 8500	3 078E+11
Cs-137	6 9929E-01	744 60	1,489 19	0 00E+00	5 21E+02	1 04E+03	1 2500	1 439E+11
Eu-154	1 8023E-03	744 60	1,489 19	0 00E+00	1 34E+00	2 68E+00	1 7500	8 279E+09
Eu-155	2 6793E-05	744 60	1,489 19	0 00E+00	1 99E-02	3 99E-02	2 2500	1 458E+06
Fe-55	1 4580E-08	744 60	1,489 19	0 00E+00	1 09E-05	2 17E-05	2 7500	7 252E+06
H-3	3 8566E-03	744 60	1,489 19	0 00E+00	2 87E+00	5 74E+00	3 5000	3 599E+05
I-129	9 8288E-07	744 60	1,489 19	0 00E+00	7 32E-04	1 46E-03	5 0000	1 537E+05
Kr-85	4 0617E-03	744 60	1,489 19	0 00E+00	3 02E+00	6 05E+00	7 0000	1 769E+04
Np-237	1 2645E-05	744 60	1,489 19	0 00E+00	9 42E-03	1 88E-02	11 0000	2 031E+03
Pa-231	1 6376E-09	744 60	1,489 19	0 00E+00	1 22E-06	2 44E-06		
Pb-210	2 8795E-10	744 60	1,489 19	0 00E+00	2 14E-07	4 29E-07		
Pm-147	1 3264E-07	744 60	1,489 19	0 00E+00	9 88E-05	1 98E-04		
Pu-238	5 8882E-02	744 60	1,489 19	0 00E+00	4 38E+01	8 77E+01		
Pu-239	1 1613E-02	744 60	1,489 19	0 00E+00	8 65E+00	1 73E+01		
Pu-240	1 5142E-02	744 60	1,489 19	0 00E+00	1 13E+01	2 25E+01		
Pu-241	2 1269E-01	744 60	1,489 19	0 00E+00	1 58E+02	3 17E+02		
Pu-242	6 4260E-05	744 60	1,489 19	0 00E+00	4 78E-02	9 57E-02		
Ra-226	5 8689E-10	744 60	1,489 19	0 00E+00	4 37E-07	8 74E-07		
Ra-228	5 3036E-12	744 60	1,489 19	0 00E+00	3 95E-09	7 90E-09		
Ru-106	6 8136E-19	744 60	1,489 19	0 00E+00	5 07E-16	1 01E-15		
Se-79	1 2372E-05	744 60	1,489 19	0 00E+00	9 21E-03	1 84E-02		
Sn-126	2 5194E-05	744 60	1,489 19	0 00E+00	1 88E-02	3 75E-02		
Sr-90	4 4913E-01	744 60	1,489 19	0 00E+00	3 34E+02	6 69E+02		
Tc-99	3 9357E-04	744 60	1,489 19	0 00E+00	2 93E-01	5 86E-01		
Th-229	1 9331E-10	744 60	1,489 19	0 00E+00	1 44E-07	2 88E-07		
Th-230	3 5223E-08	744 60	1,489 19	0 00E+00	2 62E-05	5 25E-05		
Th-232	5 3085E-12	744 60	1,489 19	0 00E+00	3 95E-09	7 91E-09		
Ti-208	1 3102E-07	744 60	1,489 19	0 00E+00	9 76E-05	1 95E-04		
U-232	3 5497E-07	744 60	1,489 19	0 00E+00	2 64E-04	5 29E-04	Thermal Power	
U-233	2 6647E-08	744 60	1,489 19	0 00E+00	1 98E-05	3 97E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	5 5023E-05	744 60	1,489 19	0 00E+00	4 10E-02	8 19E-02	1 09E+01	2 19E+01
U-235	-1 4485E-06	744 60	0 00	2 60E-04	0 00E+00	2 60E-04	Total	Total
U-236	7 5969E-06	744 60	1,489 19	0 00E+00	5 66E-03	1 13E-02		
U-238	-2 6129E-07	744 60	0 00	5 64E-03	5 44E-03	5 64E-03		
Y-90	4 4913E-01	744 60	1,489 19	0 00E+00	3 34E+02	6 69E+02		
Other Radionuclides					5 04E+02	1 01E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ZIRC	ZIRC
BOL HM Constituents	U	U
BOL Enrichment %	0 71099907	0 to 5

Basis for Parameter Differences:

Burnup Summary (MWd)³

	From SFD	Estimated
Nominal		744 60
Bounding	304 04	1 489 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	1 26	
Bounding	2 52	4 90

Estimated EOL HM/Given EOL HM

1 02

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name SLOWPOKE (HEU) CANADA
SNF ID # 296
Fuel Units & Descr: 1 - 297 ROD ARRAY
Heavy Metal Mass: BOL=0.875kg, EOL=0.87kg
ROD Storage Site SRS

Fuel decay start date: 2010
Estimates as of: 2030
Template ATR (Light Water, Alum, 60 to 100% U)
Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 20 years

Estimated
Canister usage
18"x10"
0.04

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	12.53	25.06	0.00E+00	8.31E-09	1.66E-08	Avg MeV	
Am-241	2.0060E-03	12.53	25.06	0.00E+00	2.51E-02	5.03E-02	0.0150	2.645E+12
Am-242m	4.2429E-07	12.53	25.06	0.00E+00	5.32E-06	1.06E-05	0.0250	5.500E+11
Am-243	1.4899E-06	12.53	25.06	0.00E+00	1.87E-05	3.73E-05	0.0375	4.797E+11
C-14	5.7135E-09	12.53	25.06	0.00E+00	7.16E-08	1.43E-07	0.0575	5.138E+11
Cl-36	1.3124E-32	12.53	25.06	0.00E+00	1.64E-31	3.29E-31	0.0850	3.105E+11
Cm-243	1.6443E-07	12.53	25.06	0.00E+00	2.06E-06	4.12E-06	0.1250	2.101E+11
Cm-244	2.9330E-05	12.53	25.06	0.00E+00	3.67E-04	7.35E-04	0.2250	2.679E+11
Co-60	5.3186E-06	12.53	25.06	0.00E+00	6.66E-05	1.33E-04	0.3750	1.166E+11
Cs-134	3.1563E-03	12.53	25.06	0.00E+00	3.95E-02	7.91E-02	0.5750	1.902E+12
Cs-135	3.4477E-06	12.53	25.06	0.00E+00	4.32E-05	8.64E-05	0.8500	3.216E+10
Cs-137	2.0313E+00	12.53	25.06	0.00E+00	2.54E+01	5.09E+01	1.2500	1.836E+10
Eu-154	2.4513E-02	12.53	25.06	0.00E+00	3.07E-01	6.14E-01	1.7500	8.429E+08
Eu-155	4.8175E-03	12.53	25.06	0.00E+00	6.04E-02	1.21E-01	2.2500	7.394E+04
Fe-55	1.2397E-04	12.53	25.06	0.00E+00	1.55E-03	3.11E-03	2.7500	4.180E+04
H-3	4.5697E-03	12.53	25.06	0.00E+00	5.73E-02	1.15E-01	3.5000	1.922E+02
I-129	7.5300E-07	12.53	25.06	0.00E+00	9.43E-06	1.89E-05	5.0000	1.092E+01
Kr-85	1.0850E-01	12.53	25.06	0.00E+00	1.36E+00	2.72E+00	7.0000	1.205E+00
Np-237	9.5561E-06	12.53	25.06	0.00E+00	1.20E-04	2.39E-04	11.0000	1.351E-01
Pa-231	2.0359E-09	12.53	25.06	0.00E+00	2.55E-08	5.10E-08		
Pb-210	4.9728E-11	12.53	25.06	0.00E+00	6.23E-10	1.25E-09		
Pm-147	4.8502E-02	12.53	25.06	0.00E+00	6.08E-01	1.22E+00		
Pu-238	1.8254E-02	12.53	25.06	0.00E+00	2.29E-01	4.57E-01		
Pu-239	4.2810E-04	12.53	25.06	0.00E+00	5.36E-03	1.07E-02		
Pu-240	2.4368E-04	12.53	25.06	0.00E+00	3.05E-03	6.11E-03		
Pu-241	3.3415E-02	12.53	25.06	0.00E+00	4.19E-01	8.37E-01		
Pu-242	3.6329E-07	12.53	25.06	0.00E+00	4.55E-06	9.10E-06		
Ra-226	2.2854E-10	12.53	25.06	0.00E+00	2.86E-09	5.73E-09		
Ra-228	1.2426E-14	12.53	25.06	0.00E+00	1.56E-13	3.11E-13		
Ru-106	6.3589E-06	12.53	25.06	0.00E+00	7.97E-05	1.59E-04		
Se-79	1.2933E-05	12.53	25.06	0.00E+00	1.62E-04	3.24E-04		
Sn-126	1.1574E-05	12.53	25.06	0.00E+00	1.45E-04	2.90E-04		
Sr-90	1.9248E+00	12.53	25.06	0.00E+00	2.41E+01	4.82E+01		
Tc-99	4.2239E-04	12.53	25.06	0.00E+00	5.29E-03	1.06E-02		
Th-229	5.0953E-12	12.53	25.06	0.00E+00	6.38E-11	1.28E-10		
Th-230	4.1885E-08	12.53	25.06	0.00E+00	5.25E-07	1.05E-06		
Th-232	1.9270E-14	12.53	25.06	0.00E+00	2.41E-13	4.83E-13		
Ti-208	4.6024E-08	12.53	25.06	0.00E+00	5.77E-07	1.15E-06		
U-232	1.2582E-07	12.53	25.06	0.00E+00	1.58E-06	3.15E-06		
U-233	2.5825E-09	12.53	25.06	0.00E+00	3.24E-08	6.47E-08		
U-234	1.8450E-04	12.53	25.06	0.00E+00	2.31E-03	4.62E-03		
U-235	2.7235E-06	12.53	0.00	1.78E-03	1.75E-03	1.78E-03		
U-236	1.5493E-05	12.53	25.06	0.00E+00	1.94E-04	3.88E-04		
U-238	4.2851E-09	12.53	0.00	1.68E-05	1.68E-05	1.68E-05		
Y-90	1.9254E+00	12.53	25.06	0.00E+00	2.41E+01	4.82E+01		
Other Radionuclides					2.42E+01	4.85E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.99E-01	5.97E-01
Total	Total

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	LIGHT WATER
Fuel Cladding:	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	94.28571429	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal	12.53	4.74
Bounding		25.06

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	0.05	0.38
Bounding	0.09	

Estimated EOL HM/Given EOL HM
0.99

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: SLOWPOKE (HEU) CANADA
SNF ID #: 1065
Fuel Units & Descr: 1 - 297 ROD ARRAY
Heavy Metal Mass: BOL=0.875kg; EOL=0.87kg
ROD Storage Site: SRS

¹Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 20 years

Estimated
Canister usage*
18"x10"
0.04

II. Estimates	m	X _a	X _b	b	Y _a	Y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	6.6313E-10	12.53	25.06	0.00E+00	8.31E-09	1.66E-08	Avg MeV	
Am-241	2.0060E-03	12.53	25.06	0.00E+00	2.51E-02	5.03E-02	0.0150	2.645E+12
Am-242m	4.2429E-07	12.53	25.06	0.00E+00	5.32E-06	1.06E-05	0.0250	5.500E+11
Am-243	1.4899E-06	12.53	25.06	0.00E+00	1.87E-05	3.73E-05	0.0375	4.797E+11
C-14	5.7135E-09	12.53	25.06	0.00E+00	7.16E-08	1.43E-07	0.0575	5.138E+11
Cl-36	1.3124E-32	12.53	25.06	0.00E+00	1.64E-31	3.29E-31	0.0850	3.105E+11
Cm-243	1.6443E-07	12.53	25.06	0.00E+00	2.06E-06	4.12E-06	0.1250	2.101E+11
Cm-244	2.9330E-05	12.53	25.06	0.00E+00	3.67E-04	7.35E-04	0.2250	2.679E+11
Co-60	5.3186E-06	12.53	25.06	0.00E+00	6.66E-05	1.33E-04	0.3750	1.166E+11
Cs-134	3.1563E-03	12.53	25.06	0.00E+00	3.95E-02	7.91E-02	0.5750	1.902E+12
Cs-135	3.4477E-06	12.53	25.06	0.00E+00	4.32E-05	8.64E-05	0.8500	3.216E+10
Cs-137	2.0313E+00	12.53	25.06	0.00E+00	2.54E+01	5.09E+01	1.2500	1.836E+10
Eu-154	2.4513E-02	12.53	25.06	0.00E+00	3.07E-01	6.14E-01	1.7500	8.429E+08
Eu-155	4.8175E-03	12.53	25.06	0.00E+00	6.04E-02	1.21E-01	2.2500	7.394E+04
Fe-55	1.2397E-04	12.53	25.06	0.00E+00	1.55E-03	3.11E-03	2.7500	4.180E+04
H-3	4.5697E-03	12.53	25.06	0.00E+00	5.73E-02	1.15E-01	3.5000	1.922E+02
I-129	7.5300E-07	12.53	25.06	0.00E+00	9.43E-06	1.89E-05	5.0000	1.092E+01
Kr-85	1.0850E-01	12.53	25.06	0.00E+00	1.36E+00	2.72E+00	7.0000	1.205E+00
Np-237	9.5561E-06	12.53	25.06	0.00E+00	1.20E-04	2.39E-04	11.0000	1.351E-01
Pa-231	2.0359E-09	12.53	25.06	0.00E+00	2.55E-08	5.10E-08		
Pb-210	4.9728E-11	12.53	25.06	0.00E+00	6.23E-10	1.25E-09		
Pm-147	4.8502E-02	12.53	25.06	0.00E+00	6.08E-01	1.22E+00		
Pu-238	1.8254E-02	12.53	25.06	0.00E+00	2.29E-01	4.57E-01		
Pu-239	4.2810E-04	12.53	25.06	0.00E+00	5.36E-03	1.07E-02		
Pu-240	2.4368E-04	12.53	25.06	0.00E+00	3.05E-03	6.11E-03		
Pu-241	3.3415E-02	12.53	25.06	0.00E+00	4.19E-01	8.37E-01		
Pu-242	3.6329E-07	12.53	25.06	0.00E+00	4.55E-06	9.10E-06		
Ra-226	2.2854E-10	12.53	25.06	0.00E+00	2.86E-09	5.73E-09		
Ra-228	1.2426E-14	12.53	25.06	0.00E+00	1.56E-13	3.11E-13		
Ru-106	6.3589E-06	12.53	25.06	0.00E+00	7.97E-05	1.59E-04		
Se-79	1.2933E-05	12.53	25.06	0.00E+00	1.62E-04	3.24E-04		
Sn-126	1.1574E-05	12.53	25.06	0.00E+00	1.45E-04	2.90E-04		
Sr-90	1.9248E+00	12.53	25.06	0.00E+00	2.41E+01	4.82E+01		
Tc-99	4.2239E-04	12.53	25.06	0.00E+00	5.29E-03	1.06E-02		
Th-229	5.0953E-12	12.53	25.06	0.00E+00	6.38E-11	1.28E-10		
Th-230	4.1885E-08	12.53	25.06	0.00E+00	5.25E-07	1.05E-06		
Th-232	1.9270E-14	12.53	25.06	0.00E+00	2.41E-13	4.83E-13		
Ti-208	4.6024E-08	12.53	25.06	0.00E+00	5.77E-07	1.15E-06		
U-232	1.2582E-07	12.53	25.06	0.00E+00	1.58E-06	3.15E-06		
U-233	2.5825E-09	12.53	25.06	0.00E+00	3.24E-08	6.47E-08		
U-234	1.8450E-04	12.53	25.06	0.00E+00	2.31E-03	4.62E-03		
U-235	-2.7235E-06	12.53	0.00	1.78E-03	1.75E-03	1.78E-03		
U-236	1.5493E-05	12.53	25.06	0.00E+00	1.94E-04	3.88E-04		
U-238	-4.2851E-09	12.53	0.00	1.68E-05	1.68E-05	1.68E-05		
Y-90	1.9254E+00	12.53	25.06	0.00E+00	2.41E+01	4.82E+01		
Other Radionuclides					2.42E+01	4.85E+01		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.99E-01	5.97E-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 %	94.28571429	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal	12.53	4.74
Bounding		25.06

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	0.05	0.38
Bounding	0.09	

Estimated EOL HM/Given EOL HM

0.99

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information
 Fuel Name SPERT-III
 SNF ID # 209
 Fuel Units & Descr 3 - CANISTER OF SCRAP
 Heavy Metal Mass BOL= : EOL=974kg
 ROD Storage Site INEEL

¹Fuel decay start date: 1966
 Estimates as of 2030
 Template: PWR (Light Water Zirc, 0 to 5% U)
²Template Burnup(MWd) 61.92
 Template BOL Heavy Metal Mass (MT) 0.00176911
 Template Decay Time 50 years

Estimated
 Canister usage
 HIC
 1.00

III. Estimates		m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)	Avg MeV
Ac-227	1.0733E-09	9,262.37	9,262.37	0.00E+00	9.94E-06	9.94E-06	0.0150	3.524E+14	0.0150
Am-241	1.4751E-01	9,262.37	9,262.37	0.00E+00	1.37E+03	1.37E+03	0.0250	7.063E+13	0.0250
Am-242m	2.6809E-04	9,262.37	9,262.37	0.00E+00	2.48E+00	2.48E+00	0.0375	6.655E+13	0.0375
Am-243	6.2484E-04	9,262.37	9,262.37	0.00E+00	5.79E+00	5.79E+00	0.0575	8.328E+13	0.0575
C-14	4.7820E-05	9,262.37	9,262.37	0.00E+00	4.43E-01	4.43E-01	0.0850	3.891E+13	0.0850
Ci-36	8.0297E-07	9,262.37	9,262.37	0.00E+00	7.44E-03	7.44E-03	0.1250	2.589E+13	0.1250
Cm-243	1.7426E-04	9,262.37	9,262.37	0.00E+00	1.61E+00	1.61E+00	0.2250	3.322E+13	0.2250
Cm-244	2.7616E-02	9,262.37	9,262.37	0.00E+00	2.56E+02	2.56E+02	0.3750	1.435E+14	0.3750
Co-60	3.6610E-04	9,262.37	9,262.37	0.00E+00	3.30E+00	3.30E+00	0.5750	3.379E+13	0.5750
Cs-134	2.6260E-07	9,262.37	9,262.37	0.00E+00	2.43E-03	2.43E-03	0.8500	3.299E+12	0.8500
Cs-135	1.4433E-05	9,262.37	9,262.37	0.00E+00	1.34E-01	1.34E-01	1.2500	2.099E+12	1.2500
Cs-137	9.8870E-01	9,262.37	9,262.37	0.00E+00	9.16E+03	9.16E+03	1.7500	9.230E+10	1.7500
Eu-154	6.0320E-03	9,262.37	9,262.37	0.00E+00	5.59E+01	5.59E+01	2.2500	1.517E+07	2.2500
Eu-155	2.1770E-04	9,262.37	9,262.37	0.00E+00	2.02E+00	2.02E+00	2.7500	5.347E+07	2.7500
Fe-55	7.9296E-07	9,262.37	9,262.37	0.00E+00	7.34E-03	7.34E-03	3.5000	3.815E+06	3.5000
H-3	8.9486E-03	9,262.37	9,262.37	0.00E+00	8.29E+01	8.29E+01	5.0000	1.630E+06	5.0000
I-129	9.8288E-07	9,262.37	9,262.37	0.00E+00	9.10E-03	9.10E-03	7.0000	1.878E+05	7.0000
Kr-85	1.0707E-02	9,262.37	9,262.37	0.00E+00	9.92E+01	9.92E+01	11.0000	2.157E+04	11.0000
Np-237	1.1927E-05	9,262.37	9,262.37	0.00E+00	1.10E-01	1.10E-01			
Pa-231	1.4703E-09	9,262.37	9,262.37	0.00E+00	1.36E-05	1.36E-05			
Pb-210	1.6828E-10	9,262.37	9,262.37	0.00E+00	1.56E-06	1.56E-06			
Pm-147	6.9606E-06	9,262.37	9,262.37	0.00E+00	6.45E-02	6.45E-02			
Pu-238	6.6263E-02	9,262.37	9,262.37	0.00E+00	6.14E+02	6.14E+02			
Pu-239	1.1618E-02	9,262.37	9,262.37	0.00E+00	1.08E+02	1.08E+02			
Pu-240	1.5142E-02	9,262.37	9,262.37	0.00E+00	1.40E+02	1.40E+02			
Pu-241	4.3766E-01	9,262.37	9,262.37	0.00E+00	4.05E+03	4.05E+03			
Pu-242	6.4260E-05	9,262.37	9,262.37	0.00E+00	5.95E-01	5.95E-01			
Ra-226	3.8501E-10	9,262.37	9,262.37	0.00E+00	3.57E-06	3.57E-06			
Ra-228	5.2955E-12	9,262.37	9,262.37	0.00E+00	4.90E-08	4.90E-08			
Ru-106	2.0413E-14	9,262.37	9,262.37	0.00E+00	1.89E-10	1.89E-10			
Se-79	1.2376E-05	9,262.37	9,262.37	0.00E+00	1.15E-01	1.15E-01			
Sn-126	2.5210E-05	9,262.37	9,262.37	0.00E+00	2.34E-01	2.34E-01			
Sr-90	6.4163E-01	9,262.37	9,262.37	0.00E+00	5.94E+03	5.94E+03			
Tc-99	3.9357E-04	9,262.37	9,262.37	0.00E+00	3.65E+00	3.65E+00			
Th-229	1.5644E-10	9,262.37	9,262.37	0.00E+00	1.45E-06	1.45E-06			
Th-230	2.7972E-08	9,262.37	9,262.37	0.00E+00	2.59E-04	2.59E-04			
Th-232	5.3036E-12	9,262.37	9,262.37	0.00E+00	4.91E-08	4.91E-08			
Ti-208	1.5136E-07	9,262.37	9,262.37	0.00E+00	1.40E-03	1.40E-03			
U-232	4.1005E-07	9,262.37	9,262.37	0.00E+00	3.80E-03	3.80E-03			
U-233	2.5856E-08	9,262.37	9,262.37	0.00E+00	2.39E-04	2.39E-04			
U-234	5.2665E-05	9,262.37	9,262.37	0.00E+00	4.88E-01	4.88E-01			
U-235	-1.4487E-06	9,262.37	0.00	1.35E-03	0.00E+00	1.35E-03			
U-236	7.5888E-06	9,262.37	9,262.37	0.00E+00	7.03E-02	7.03E-02			
U-238	-2.6129E-07	9,262.37	0.00	6.33E-03	3.91E-03	6.33E-03			
Y-90	6.4180E-01	9,262.37	9,262.37	0.00E+00	5.94E+03	5.94E+03			
Other Radionuclides					8.83E+03	8.83E+03			

Thermal Power
 Nominal Heat Output (Watts) 1.68E+02
 Bounding Heat Output (Watts) 1.68E+02
 Total Total

III. Template Selection Summary, Burnup Summary, and Checks

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

Burnup Summary (MWd) ²			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		9,262.37	
Bounding		9,262.37	

Checks			Estimated EOL HM/Given EOL HM 1.58
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	13.58		
Bounding	13.58		

¹Reactor shutdown, core removal, storage, shipping or other data confirming that irradiation ceased for fuel

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: THOR (UALX-HEU) TAIWAN
SNF ID #: 629
Fuel Units & Descr: 35 - MTR TYPE
Heavy Metal Mass: BOL=5.061kg; EOL=4.098kg
ROD Storage Site: SRS

Fuel decay start date: 1997
Estimates as of: 2030
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: 25 years

Estimated
Canister usage:
18"x10"
1.46

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.8271E-09	918.72	1,837.45	0.00E+00	3.52E-06	7.03E-06	Avg. MeV	
Am-241	4.4195E-03	918.72	1,837.45	0.00E+00	4.06E+00	8.12E+00	0.0150	1.681E+14
Am-242m	1.8195E-06	918.72	1,837.45	0.00E+00	1.67E-03	3.34E-03	0.0250	3.431E+13
Am-243	2.3278E-07	918.72	1,837.45	0.00E+00	2.14E-04	4.28E-04	0.0375	3.436E+13
C-14	4.3203E-05	918.72	1,837.45	0.00E+00	3.97E-02	7.94E-02	0.0575	3.295E+13
Cl-36	4.3023E-08	918.72	1,837.45	0.00E+00	3.95E-05	7.91E-05	0.0850	1.982E+13
Cm-243	1.6872E-07	918.72	1,837.45	0.00E+00	1.55E-04	3.10E-04	0.1250	2.015E+13
Cm-244	1.4660E-06	918.72	1,837.45	0.00E+00	1.35E-03	2.69E-03	0.2250	1.793E+13
Co-60	2.2376E-03	918.72	1,837.45	0.00E+00	2.06E+00	4.11E+00	0.3750	7.458E+12
Cs-134	1.2525E-04	918.72	1,837.45	0.00E+00	1.15E-01	2.30E-01	0.5750	1.206E+14
Cs-135	3.1549E-05	918.72	1,837.45	0.00E+00	2.90E-02	5.80E-02	0.8500	9.955E+12
Cs-137	1.7368E+00	918.72	1,837.45	0.00E+00	1.60E+03	3.19E+03	1.2500	1.045E+13
Eu-154	2.6947E-01	918.72	1,837.45	0.00E+00	2.48E+02	4.95E+02	1.7500	3.198E+11
Eu-155	2.6857E-02	918.72	1,837.45	0.00E+00	2.47E+01	4.93E+01	2.2500	4.906E+06
Fe-55	4.2105E-05	918.72	1,837.45	0.00E+00	3.87E-02	7.74E-02	2.7500	1.130E+06
H-3	3.5173E-03	918.72	1,837.45	0.00E+00	3.23E+00	6.46E+00	3.5000	2.640E+03
I-129	7.3805E-07	918.72	1,837.45	0.00E+00	6.78E-04	1.36E-03	5.0000	1.030E+03
Kr-85	6.9263E-02	918.72	1,837.45	0.00E+00	6.36E+01	1.27E+02	7.0000	1.162E+02
Np-237	1.4752E-06	918.72	1,837.45	0.00E+00	1.36E-03	2.71E-03	11.0000	1.321E+01
Pa-231	8.3970E-09	918.72	1,837.45	0.00E+00	7.71E-06	1.54E-05		
Pb-210	1.4995E-13	918.72	1,837.45	0.00E+00	1.38E-10	2.76E-10		
Pm-147	1.0567E-02	918.72	1,837.45	0.00E+00	9.71E+00	1.94E+01		
Pu-238	1.1543E-03	918.72	1,837.45	0.00E+00	1.06E+00	2.12E+00		
Pu-239	5.6917E-03	918.72	1,837.45	0.00E+00	5.23E+00	1.05E+01		
Pu-240	2.2602E-03	918.72	1,837.45	0.00E+00	2.08E+00	4.15E+00		
Pu-241	4.8045E-02	918.72	1,837.45	0.00E+00	4.41E+01	8.83E+01		
Pu-242	3.0602E-07	918.72	1,837.45	0.00E+00	2.81E-04	5.62E-04		
Ra-226	5.1293E-13	918.72	1,837.45	0.00E+00	4.71E-10	9.42E-10		
Ra-228	2.3323E-10	918.72	1,837.45	0.00E+00	2.14E-07	4.29E-07		
Ru-106	1.0075E-07	918.72	1,837.45	0.00E+00	9.26E-05	1.85E-04		
Se-79	1.2935E-05	918.72	1,837.45	0.00E+00	1.19E-02	2.38E-02		
Sn-126	1.2238E-05	918.72	1,837.45	0.00E+00	1.12E-02	2.25E-02		
Sr-90	1.6165E+00	918.72	1,837.45	0.00E+00	1.49E+03	2.97E+03		
Tc-99	4.4120E-04	918.72	1,837.45	0.00E+00	4.05E-01	8.11E-01		
Th-229	4.5684E-10	918.72	1,837.45	0.00E+00	4.20E-07	8.39E-07		
Th-230	6.8271E-11	918.72	1,837.45	0.00E+00	6.27E-08	1.25E-07		
Th-232	2.3744E-10	918.72	1,837.45	0.00E+00	2.18E-07	4.36E-07		
Th-208	1.7368E-08	918.72	1,837.45	0.00E+00	1.60E-05	3.19E-05		
U-232	4.6797E-08	918.72	1,837.45	0.00E+00	4.30E-05	8.60E-05		
U-233	1.3146E-07	918.72	1,837.45	0.00E+00	1.21E-04	2.42E-04		
U-234	2.5729E-07	918.72	1,837.45	0.00E+00	2.36E-04	4.73E-04		
U-235	-2.6159E-06	918.72	0.00	1.02E-02	7.79E-03	1.02E-02		
U-236	1.2719E-05	918.72	1,837.45	0.00E+00	1.17E-02	2.34E-02		
U-238	-3.8857E-08	918.72	0.00	1.16E-04	8.06E-05	1.16E-04		
Y-90	1.6165E+00	918.72	1,837.45	0.00E+00	1.49E+03	2.97E+03		
Other Radionuclides					1.73E+03	3.46E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences: This Template was used for the following reasons: This fuel matches on all parameters except enrichment.
	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 %	93 16330608	10 to 20 1	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
Nominal	From SFD	Estimated	
Bounding		918.72	Nominal burnup calculated from the heavy metal mass destroyed.
		1,837.45	Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
Bounding	4.91		1.01
	9.83		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name TRR-1 (UALX-HEU) THAILAND
SNF ID # 633
Fuel Units & Descr: 31 - MTR TYPE
Heavy Metal Mass: BOL=5.295kg EOL=4.771kg
ROD Storage Site: SRS

¹Fuel decay start date 1998
Estimates as of 2030
Template TRIGA-AI (LW/U-Zrx Alum, 10 to 20% U)
²Template Burnup(MWd) 6.65
Template BOL Heavy Metal Mass (MT) 0.00018
Template Decay Time 25 years

Estimated
Canister usage
18"x10"
1.29

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	3.8271E-09	500.07	1,000.14	0.00E+00	1.91E-06	3.83E-06	Avg MeV	
Am-241	4.4195E-03	500.07	1,000.14	0.00E+00	2.21E+00	4.42E+00	0.0150	9.039E+13
Am-242m	1.8195E-06	500.07	1,000.14	0.00E+00	9.10E-04	1.82E-03	0.0250	1.867E+13
Am-243	2.3278E-07	500.07	1,000.14	0.00E+00	1.16E-04	2.33E-04	0.0375	1.870E+13
C-14	4.3203E-05	500.07	1,000.14	0.00E+00	2.16E-02	4.32E-02	0.0575	1.793E+13
Cl-36	4.3023E-08	500.07	1,000.14	0.00E+00	2.15E-05	4.30E-05	0.0850	1.079E+13
Cm-243	1.6872E-07	500.07	1,000.14	0.00E+00	8.44E-05	1.69E-04	0.1250	1.097E+13
Cm-244	1.4660E-06	500.07	1,000.14	0.00E+00	7.33E-04	1.47E-03	0.2250	9.760E+12
Co-60	2.2376E-03	500.07	1,000.14	0.00E+00	1.12E+00	2.24E+00	0.3750	4.059E+12
Cs-134	1.2525E-04	500.07	1,000.14	0.00E+00	6.26E-02	1.25E-01	0.5750	6.565E+13
Cs-135	3.1549E-05	500.07	1,000.14	0.00E+00	1.58E-02	3.16E-02	0.8500	5.419E+12
Cs-137	1.7368E+00	500.07	1,000.14	0.00E+00	8.69E+02	1.74E+03	1.2500	5.686E+12
Eu-154	2.6947E-01	500.07	1,000.14	0.00E+00	1.35E+02	2.70E+02	1.7500	1.741E+11
Eu-155	2.6857E-02	500.07	1,000.14	0.00E+00	1.34E+01	2.69E+01	2.2500	2.670E+06
Fe-55	4.2105E-05	500.07	1,000.14	0.00E+00	2.11E-02	4.21E-02	2.7500	6.150E+05
H-3	3.5173E-03	500.07	1,000.14	0.00E+00	1.76E+00	3.52E+00	3.5000	1.438E+03
I-129	7.3805E-07	500.07	1,000.14	0.00E+00	3.69E-04	7.38E-04	5.0000	5.610E+02
Kr-85	6.9263E-02	500.07	1,000.14	0.00E+00	3.46E+01	6.93E+01	7.0000	6.327E+01
Np-237	1.4752E-06	500.07	1,000.14	0.00E+00	7.38E-04	1.48E-03	11.0000	7.192E+00
Pa-231	8.3970E-09	500.07	1,000.14	0.00E+00	4.20E-06	8.40E-06		
Pb-210	1.4995E-13	500.07	1,000.14	0.00E+00	7.50E-11	1.50E-10		
Pm-147	1.0567E-02	500.07	1,000.14	0.00E+00	5.28E+00	1.06E+01		
Pu-238	1.1543E-03	500.07	1,000.14	0.00E+00	5.77E-01	1.15E+00		
Pu-239	5.6917E-03	500.07	1,000.14	0.00E+00	2.85E+00	5.69E+00		
Pu-240	2.2602E-03	500.07	1,000.14	0.00E+00	1.13E+00	2.26E+00		
Pu-241	4.8045E-02	500.07	1,000.14	0.00E+00	2.40E+01	4.81E+01		
Pu-242	3.0602E-07	500.07	1,000.14	0.00E+00	1.53E-04	3.06E-04		
Ra-226	5.1293E-13	500.07	1,000.14	0.00E+00	2.57E-10	5.13E-10		
Ra-228	2.3323E-10	500.07	1,000.14	0.00E+00	1.17E-07	2.33E-07		
Ru-106	1.0075E-07	500.07	1,000.14	0.00E+00	5.04E-05	1.01E-04		
Se-79	1.2935E-05	500.07	1,000.14	0.00E+00	6.47E-03	1.29E-02		
Sn-126	1.2238E-05	500.07	1,000.14	0.00E+00	6.12E-03	1.22E-02		
Sr-90	1.6165E+00	500.07	1,000.14	0.00E+00	8.08E+02	1.62E+03		
Tc-99	4.4120E-04	500.07	1,000.14	0.00E+00	2.21E-01	4.41E-01		
Th-229	4.5684E-10	500.07	1,000.14	0.00E+00	2.28E-07	4.57E-07		
Th-230	6.8271E-11	500.07	1,000.14	0.00E+00	3.41E-08	6.83E-08		
Th-232	2.3744E-10	500.07	1,000.14	0.00E+00	1.19E-07	2.37E-07		
Ti-208	1.7368E-08	500.07	1,000.14	0.00E+00	8.69E-06	1.74E-05		
U-232	4.6797E-08	500.07	1,000.14	0.00E+00	2.34E-05	4.68E-05		
U-233	1.3146E-07	500.07	1,000.14	0.00E+00	6.57E-05	1.31E-04		
U-234	2.5729E-07	500.07	1,000.14	0.00E+00	1.29E-04	2.57E-04		
U-235	-2.6159E-06	500.07	0.00	1.03E-02	8.98E-03	1.03E-02		
U-236	1.2719E-05	500.07	1,000.14	0.00E+00	6.36E-03	1.27E-02		
U-238	-3.8857E-08	500.07	0.00	1.80E-04	1.60E-04	1.80E-04		
Y-90	1.6165E+00	500.07	1,000.14	0.00E+00	8.08E+02	1.62E+03		
Other Radionuclides					9.41E+02	1.88E+03		

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	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 %	89.90758798	10 to 20.1	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		500.07	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Bounding		1,000.14	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	2.56		1.00
Bounding	5.11		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UMR (HEU) ROLLA
SNF ID #: 881
Fuel Units & Descr: 28 - 24 CURVED PLATES
Heavy Metal Mass: BOL=5 096kg, EOL=4 771kg
ROD Storage Site: SRS

Fuel decay start date: 1996
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
Template Burnup (MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated
Canister usage:
18"x10"
1.17

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 1465E-09	307.59	615.18	0 00E+00	3 53E-07	7 05E-07	Avg. MeV	
Am-241	2 3066E-03	307.59	615.18	0 00E+00	7 09E-01	1 42E+00	0 0150	5.756E+13
Am-242m	4 1476E-07	307.59	615.18	0 00E+00	1 28E-04	2 55E-04	0 0250	1 196E+13
Am-243	1 4894E-06	307.59	615.18	0 00E+00	4 58E-04	9 16E-04	0 0375	1 041E+13
C-14	5 7108E-09	307.59	615.18	0 00E+00	1.76E-06	3 51E-06	0 0575	1 118E+13
Cl-36	1 3124E-32	307.59	615.18	0 00E+00	4 04E-30	8 07E-30	0 0850	6 748E+12
Cm-243	1 4562E-07	307.59	615.18	0 00E+00	4 48E-05	8 96E-05	0 1250	4 520E+12
Cm-244	2 4221E-05	307.59	615.18	0 00E+00	7.45E-03	1 49E-02	0 2250	5 826E+12
Co-60	2 7560E-06	307.59	615.18	0 00E+00	8 48E-04	1.70E-03	0 3750	2 533E+12
Cs-134	5 8851E-04	307.59	615.18	0 00E+00	1.81E-01	3.62E-01	0 5750	4 152E+13
Cs-135	3 4477E-06	307.59	615.18	0 00E+00	1.06E-03	2.12E-03	0 8500	5 983E+11
Cs-137	1 8099E+00	307.59	615.18	0 00E+00	5 57E+02	1 11E+03	1 2500	3 327E+11
Eu-154	1 6386E-02	307.59	615.18	0 00E+00	5 04E+00	1 01E+01	1 7500	1 644E+10
Eu-155	2 3957E-03	307.59	615.18	0 00E+00	7 37E-01	1 47E+00	2 2500	1 172E+06
Fe-55	3 2707E-05	307.59	615.18	0 00E+00	1 01E-02	2 01E-02	2 7500	9 594E+05
H-3	3 4504E-03	307.59	615.18	0 00E+00	1 06E+00	2 12E+00	3 5000	7 247E+02
I-129	7 5300E-07	307.59	615.18	0 00E+00	2 32E-04	4 63E-04	5 0000	2 438E+02
Kr-85	7 8540E-02	307.59	615.18	0 00E+00	2 42E+01	4 83E+01	7 0000	2 683E+01
Np-237	9 5615E-06	307.59	615.18	0 00E+00	2 94E-03	5 88E-03	11 0000	3 001E+00
Pa-231	2 7968E-09	307.59	615.18	0 00E+00	8 60E-07	1 72E-06		
Pb-210	1 2612E-10	307.59	615.18	0 00E+00	3 88E-08	7 76E-08		
Pm-147	1 2952E-02	307.59	615.18	0 00E+00	3 98E+00	7 97E+00		
Pu-238	1 7549E-02	307.59	615.18	0 00E+00	5 40E+00	1 08E+01		
Pu-239	4 2810E-04	307.59	615.18	0 00E+00	1 32E-01	2 63E-01		
Pu-240	2 4357E-04	307.59	615.18	0 00E+00	7 49E-02	1 50E-01		
Pu-241	2 6277E-02	307.59	615.18	0 00E+00	8 08E+00	1 62E+01		
Pu-242	3 6329E-07	307.59	615.18	0 00E+00	1 12E-04	2 23E-04		
Ra-226	4 4444E-10	307.59	615.18	0 00E+00	1 37E-07	2 73E-07		
Ra-228	1 9714E-14	307.59	615.18	0 00E+00	6 06E-12	1 21E-11		
Ru-106	2 0477E-07	307.59	615.18	0 00E+00	6 30E-05	1 26E-04		
Se-79	1 2933E-05	307.59	615.18	0 00E+00	3 98E-03	7 96E-03		
Sn-126	1 1574E-05	307.59	615.18	0 00E+00	3 56E-03	7 12E-03		
Sr-90	1 7092E+00	307.59	615.18	0 00E+00	5.26E+02	1 05E+03		
Tc-99	4 2239E-04	307.59	615.18	0 00E+00	1.30E-01	2 60E-01		
Th-229	7 7260E-12	307.59	615.18	0 00E+00	2 38E-09	4 75E-09		
Th-230	5 8497E-08	307.59	615.18	0 00E+00	1.80E-05	3 60E-05		
Th-232	2 6906E-14	307.59	615.18	0 00E+00	8.28E-12	1 66E-11		
Ti-208	4 4336E-08	307.59	615.18	0 00E+00	1.36E-05	2.73E-05		
U-232	1 2037E-07	307.59	615.18	0 00E+00	3.70E-05	7 40E-05		
U-233	3 0011E-09	307.59	615.18	0 00E+00	9.23E-07	1 85E-06		
U-234	1 8497E-04	307.59	615.18	0 00E+00	5 69E-02	1.14E-01		
U-235	-2 7235E-06	307.59	0 00	1 03E-02	9 45E-03	1 03E-02		
U-236	1 5493E-05	307.59	615.18	0 00E+00	4 77E-03	9 53E-03		
U-238	-4 2851E-09	307.59	0 00	1 13E-04	1 12E-04	1.13E-04		
Y-90	1 7094E+00	307.59	615.18	0 00E+00	5 26E+02	1 05E+03		
Other Radionuclides					5 30E+02	1 06E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding:	ALUM	ALUM	
BOL HM Constituents:	U	U	
BOL Enrichment %:	93 40659341	60 to 100	

Burnup Summary (MWd)³

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		307.59	
Bounding		615.18	

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	0.19		
Bounding	0.38		

1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UMRR (LEU) ROLLA

SNF ID #: 146

Fuel Units & Descr: 28 - 24 CURVED PLATES

Heavy Metal Mass BOL=31.89kg EOL=26.46kg

ROD Storage Site SRS

Fuel decay start date 2035

Estimates as of 2030

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"
0.78

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	5,149.51	10,299.02	0.00E+00	7.49E-07	1.50E-06	Avg MeV	
Am-241	1.1190E-03	5,149.51	10,299.02	0.00E+00	5.76E+00	1.15E+01	0.0150	1.987E+15
Am-242m	4.5425E-07	5,149.51	10,299.02	0.00E+00	2.34E-03	4.68E-03	0.0250	4.281E+14
Am-243	1.4921E-06	5,149.51	10,299.02	0.00E+00	7.68E-03	1.54E-02	0.0375	3.950E+14
C-14	5.7244E-09	5,149.51	10,299.02	0.00E+00	2.95E-05	5.90E-05	0.0575	3.884E+14
Cl-36	1.3124E-32	5,149.51	10,299.02	0.00E+00	6.76E-29	1.35E-28	0.0850	2.476E+14
Cm-243	2.3676E-07	5,149.51	10,299.02	0.00E+00	1.22E-03	2.44E-03	0.1250	2.144E+14
Cm-244	5.2042E-05	5,149.51	10,299.02	0.00E+00	2.68E-01	5.36E-01	0.2250	2.099E+14
Co-60	3.8208E-05	5,149.51	10,299.02	0.00E+00	1.97E-01	3.94E-01	0.3750	1.016E+14
Cs-134	4.8693E-01	5,149.51	10,299.02	0.00E+00	2.51E+03	5.01E+03	0.5750	1.395E+15
Cs-135	3.4477E-06	5,149.51	10,299.02	0.00E+00	1.78E-02	3.55E-02	0.8500	1.954E+14
Cs-137	2.8731E+00	5,149.51	10,299.02	0.00E+00	1.48E+04	2.96E+04	1.2500	3.636E+13
Eu-154	8.2053E-02	5,149.51	10,299.02	0.00E+00	4.23E+02	8.45E+02	1.7500	1.525E+12
Eu-155	3.9134E-02	5,149.51	10,299.02	0.00E+00	2.02E+02	4.03E+02	2.2500	3.198E+12
Fe-55	6.7429E-03	5,149.51	10,299.02	0.00E+00	3.47E+01	6.94E+01	2.7500	1.840E+10
H-3	1.0599E-02	5,149.51	10,299.02	0.00E+00	5.46E+01	1.09E+02	3.5000	2.040E+09
I-129	7.5300E-07	5,149.51	10,299.02	0.00E+00	3.88E-03	7.76E-03	5.0000	6.119E+03
Kr-85	2.8595E-01	5,149.51	10,299.02	0.00E+00	1.47E+03	2.94E+03	7.0000	6.822E+01
Np-237	9.5479E-06	5,149.51	10,299.02	0.00E+00	4.92E-02	9.83E-02	11.0000	7.690E+01
Pa-231	8.9297E-10	5,149.51	10,299.02	0.00E+00	4.60E-06	9.20E-06		
Pb-210	3.7609E-12	5,149.51	10,299.02	0.00E+00	1.94E-08	3.87E-08		
Pm-147	2.5452E+00	5,149.51	10,299.02	0.00E+00	1.31E+04	2.62E+04		
Pu-238	2.0550E-02	5,149.51	10,299.02	0.00E+00	1.06E+02	2.12E+02		
Pu-239	4.2838E-04	5,149.51	10,299.02	0.00E+00	2.21E+00	4.41E+00		
Pu-240	2.4401E-04	5,149.51	10,299.02	0.00E+00	1.26E+00	2.51E+00		
Pu-241	6.8764E-02	5,149.51	10,299.02	0.00E+00	3.54E+02	7.08E+02		
Pu-242	3.6329E-07	5,149.51	10,299.02	0.00E+00	1.87E-03	3.74E-03		
Ra-226	3.8045E-11	5,149.51	10,299.02	0.00E+00	1.96E-07	3.92E-07		
Ra-228	2.9902E-15	5,149.51	10,299.02	0.00E+00	1.54E-11	3.08E-11		
Ru-106	1.9055E-01	5,149.51	10,299.02	0.00E+00	9.81E+02	1.96E+03		
Se-79	1.2936E-05	5,149.51	10,299.02	0.00E+00	6.66E-02	1.33E-01		
Sn-126	1.1574E-05	5,149.51	10,299.02	0.00E+00	5.96E-02	1.19E-01		
Sr-90	2.7505E+00	5,149.51	10,299.02	0.00E+00	1.42E+04	2.83E+04		
Tc-99	4.2239E-04	5,149.51	10,299.02	0.00E+00	2.18E+00	4.35E+00		
Th-229	1.8848E-12	5,149.51	10,299.02	0.00E+00	9.71E-09	1.94E-08		
Th-230	1.7042E-08	5,149.51	10,299.02	0.00E+00	8.78E-05	1.76E-04		
Th-232	7.8132E-15	5,149.51	10,299.02	0.00E+00	4.02E-11	8.05E-11		
Ti-208	4.4063E-08	5,149.51	10,299.02	0.00E+00	2.27E-04	4.54E-04		
U-232	1.3151E-07	5,149.51	10,299.02	0.00E+00	6.77E-04	1.35E-03		
U-233	1.9564E-09	5,149.51	10,299.02	0.00E+00	1.01E-05	2.01E-05		
U-234	1.8371E-04	5,149.51	10,299.02	0.00E+00	9.46E-01	1.89E+00		
U-235	-2.7235E-06	5,149.51	0.00	1.36E-02	0.00E+00	1.36E-02		
U-236	1.5493E-05	5,149.51	10,299.02	0.00E+00	7.98E-02	1.60E-01		
U-238	-4.2851E-09	5,149.51	0.00	8.60E-03	8.58E-03	8.60E-03		
Y-90	2.7505E+00	5,149.51	10,299.02	0.00E+00	1.42E+04	2.83E+04		
Other Radionuclides					2.65E+04	5.30E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences: This Template was used for the following reasons. This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
Reactor Moderator	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	19.7500078	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup
Nominal		5,149.51	
Bounding		10,299.02	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	0.51		1.02
Bounding	1.03		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UNIV OF FLORIDA (ARGONAUT) HEU
 SNF ID #: 272
 Fuel Units & Descr: 259 - ELEMENT
 Heavy Metal Mass*: BOL=4 144kg EOL=4 092kg
 ROD Storage Site, SRS

¹Fuel decay start date: 2035
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup(MWD): 367.2
 Template BOL Heavy Metal Mass (MT): 0 00116689
 Template Decay Time: 5 years

Estimated
 Canister usage
 18"x10"
 7 19

II, Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	CI/MWD From Template	Nominal Fuel Burnup (MWD) ²	Bounding Fuel Burnup (MWD) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 4545E-10	49 06	98 11	0 00E+00	7 14E-09	1 43E-08	Avg MeV	
Am-241	1 1190E-03	49 06	98 11	0 00E+00	5 49E-02	1 10E-01	0 0150	1 893E+13
Am-242m	4 5425E-07	49 06	98 11	0 00E+00	2 23E-05	4 46E-05	0 0250	4 078E+12
Am-243	1 4921E-06	49 06	98 11	0 00E+00	7 32E-05	1 46E-04	0 0375	3 763E+12
C-14	5 7244E-09	49 06	98 11	0 00E+00	2 81E-07	5 62E-07	0 0575	3 700E+12
Cl-36	1 3124E-32	49 06	98 11	0 00E+00	6 44E-31	1 29E-30	0 0850	2 359E+12
Cm-243	2 3676E-07	49 06	98 11	0 00E+00	1 16E-05	2 32E-05	0 1250	2 043E+12
Cm-244	5 2042E-05	49 06	98 11	0 00E+00	2 55E-03	5 11E-03	0 2250	1 999E+12
Co-60	3 8208E-05	49 06	98 11	0 00E+00	1 87E-03	3 75E-03	0 3750	9 677E+11
Cs-134	4 8693E-01	49 06	98 11	0 00E+00	2 39E+01	4 78E+01	0 5750	1 329E+13
Cs-135	3 4477E-06	49 06	98 11	0 00E+00	1 69E-04	3 38E-04	0 8500	1 862E+12
Cs-137	2 8731E+00	49 06	98 11	0 00E+00	1 41E+02	2 82E+02	1 2500	3 463E+11
Eu-154	8 2053E-02	49 06	98 11	0 00E+00	4 03E+00	8 05E+00	1 7500	1 452E+10
Eu-155	3 9134E-02	49 06	98 11	0 00E+00	1 92E+00	3 84E+00	2 2500	3 046E+10
Fe-55	6 7429E-03	49 06	98 11	0 00E+00	3 31E-01	6 62E-01	2 7500	1 753E+08
H-3	1 0599E-02	49 06	98 11	0 00E+00	5 20E-01	1 04E+00	3 5000	1 944E+07
I-129	7 5300E-07	49 06	98 11	0 00E+00	3 69E-05	7 39E-05	5 0000	5 844E+01
Kr-85	2 8595E-01	49 06	98 11	0 00E+00	1 40E+01	2 81E+01	7 0000	6 515E+00
Np-237	9 5479E-06	49 06	98 11	0 00E+00	4 68E-04	9 37E-04	11 0000	7 344E-01
Pa-231	8 9297E-10	49 06	98 11	0 00E+00	4 38E-08	8 76E-08		
Pb-210	3 7609E-12	49 06	98 11	0 00E+00	1 84E-10	3 69E-10		
Pm-147	2 5452E+00	49 06	98 11	0 00E+00	1 25E+02	2 50E+02		
Pu-238	2 0550E-02	49 06	98 11	0 00E+00	1 01E+00	2 02E+00		
Pu-239	4 2838E-04	49 06	98 11	0 00E+00	2 10E-02	4 20E-02		
Pu-240	2 4401E-04	49 06	98 11	0 00E+00	1 20E-02	2 39E-02		
Pu-241	6 8764E-02	49 06	98 11	0 00E+00	3 37E+00	6 75E+00		
Pu-242	3 6329E-07	49 06	98 11	0 00E+00	1 78E-05	3 56E-05		
Ra-226	3 8045E-11	49 06	98 11	0 00E+00	1 87E-09	3 73E-09		
Ra-228	2 9902E-15	49 06	98 11	0 00E+00	1 47E-13	2 93E-13		
Ru-106	1 9055E-01	49 06	98 11	0 00E+00	9 35E+00	1 87E+01		
Se-79	1 2936E-05	49 06	98 11	0 00E+00	6 35E-04	1 27E-03		
Sn-126	1 1574E-05	49 06	98 11	0 00E+00	5 68E-04	1 14E-03		
Sr-90	2 7505E+00	49 06	98 11	0 00E+00	1 35E+02	2 70E+02		
Tc-99	4 2239E-04	49 06	98 11	0 00E+00	2 07E-02	4 14E-02		
Th-229	1 8848E-12	49 06	98 11	0 00E+00	9 25E-11	1 85E-10		
Th-230	1 7042E-08	49 06	98 11	0 00E+00	8 36E-07	1 67E-06		
Th-232	7 8132E-15	49 06	98 11	0 00E+00	3 83E-13	7 67E-13		
Ti-208	4 4063E-08	49 06	98 11	0 00E+00	2 16E-06	4 32E-06		
U-232	1 3151E-07	49 06	98 11	0 00E+00	6 45E-06	1 29E-05		
U-233	1 9564E-09	49 06	98 11	0 00E+00	9 60E-08	1 92E-07		
U-234	1 8371E-04	49 06	98 11	0 00E+00	9 01E-03	1 80E-02		
U-235	-2 7235E-06	49 06	0 00	8 34E-03	8 21E-03	8 34E-03		
U-236	1 5493E-05	49 06	98 11	0 00E+00	7 60E-04	1 52E-03		
U-238	-4 2851E-09	49 06	0 00	9 54E-05	9 52E-05	9 54E-05		
Y-90	2 7505E+00	49 06	98 11	0 00E+00	1 35E+02	2 70E+02		
Other Radionuclides					2 52E+02	5 05E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
	From SFD	Used	
Reactor Moderator:	LIGHT WATER	LIGHT WATER	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %:	93 15	60 to 100	

Burnup Summary (MWD) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	28.18	49 06	
Bounding		98 11	Nominal burnup calculated from the heavy metal mass destroyed Bounding burnup assumed to be twice nominal burnup

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0 04	1 74	
Bounding	0 08		1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UNIV OF FLORIDA (ARGONAUT) LEU
SNF ID #: 273
Fuel Units & Descr: 14 - ELEMENT
Heavy Metal Mass: BOL=0.995kg EOL=0.995kg
ROD Storage Site: SRS

¹Fuel decay start date: 2035
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
²Template 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 _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	0.60	1.19	0.00E+00	8.69E-11	1.74E-10	Avg MeV	
Am-241	1.1190E-03	0.60	1.19	0.00E+00	6.68E-04	1.34E-03	0.0150	2.305E+11
Am-242m	4.5425E-07	0.60	1.19	0.00E+00	2.71E-07	5.43E-07	0.0250	4.965E+10
Am-243	1.4921E-06	0.60	1.19	0.00E+00	8.91E-07	1.78E-06	0.0375	4.581E+10
C-14	5.7244E-09	0.60	1.19	0.00E+00	3.42E-09	6.84E-09	0.0575	4.505E+10
Cl-36	1.3124E-32	0.60	1.19	0.00E+00	7.84E-33	1.57E-32	0.0850	2.872E+10
Cm-243	2.3676E-07	0.60	1.19	0.00E+00	1.41E-07	2.83E-07	0.1250	2.487E+10
Cm-244	5.2042E-05	0.60	1.19	0.00E+00	3.11E-05	6.22E-05	0.2250	2.435E+10
Co-60	3.8208E-05	0.60	1.19	0.00E+00	2.28E-05	4.56E-05	0.3750	1.178E+10
Cs-134	4.8693E-01	0.60	1.19	0.00E+00	2.91E-01	5.82E-01	0.5750	1.618E+11
Cs-135	3.4477E-06	0.60	1.19	0.00E+00	2.06E-06	4.12E-06	0.8500	2.266E+10
Cs-137	2.8731E+00	0.60	1.19	0.00E+00	1.72E+00	3.43E+00	1.2500	4.217E+09
Eu-154	8.2053E-02	0.60	1.19	0.00E+00	4.90E-02	9.80E-02	1.7500	1.768E+08
Eu-155	3.9134E-02	0.60	1.19	0.00E+00	2.34E-02	4.67E-02	2.2500	3.709E+08
Fe-55	6.7429E-03	0.60	1.19	0.00E+00	4.03E-03	8.05E-03	2.7500	2.134E+06
H-3	1.0599E-02	0.60	1.19	0.00E+00	6.33E-03	1.27E-02	3.5000	2.366E+05
I-129	7.5300E-07	0.60	1.19	0.00E+00	4.50E-07	8.99E-07	5.0000	1.327E+00
Kr-85	2.8595E-01	0.60	1.19	0.00E+00	1.71E-01	3.42E-01	7.0000	1.502E-01
Np-237	9.5479E-06	0.60	1.19	0.00E+00	5.70E-06	1.14E-05	11.0000	1.710E-02
Pa-231	8.9297E-10	0.60	1.19	0.00E+00	5.33E-10	1.07E-09		
Pb-210	3.7609E-12	0.60	1.19	0.00E+00	2.25E-12	4.49E-12		
Pm-147	2.5452E+00	0.60	1.19	0.00E+00	1.52E+00	3.04E+00		
Pu-238	2.0550E-02	0.60	1.19	0.00E+00	1.23E-02	2.45E-02		
Pu-239	4.2838E-04	0.60	1.19	0.00E+00	2.56E-04	5.12E-04		
Pu-240	2.4401E-04	0.60	1.19	0.00E+00	1.46E-04	2.91E-04		
Pu-241	6.8764E-02	0.60	1.19	0.00E+00	4.11E-02	8.21E-02		
Pu-242	3.6329E-07	0.60	1.19	0.00E+00	2.17E-07	4.34E-07		
Ra-226	3.8045E-11	0.60	1.19	0.00E+00	2.27E-11	4.54E-11		
Ra-228	2.9902E-15	0.60	1.19	0.00E+00	1.79E-15	3.57E-15		
Ru-106	1.9055E-01	0.60	1.19	0.00E+00	1.14E-01	2.28E-01		
Se-79	1.2936E-05	0.60	1.19	0.00E+00	7.73E-06	1.55E-05		
Sn-126	1.1574E-05	0.60	1.19	0.00E+00	6.91E-06	1.38E-05		
Sr-90	2.7505E+00	0.60	1.19	0.00E+00	1.64E+00	3.29E+00		
Tc-99	4.2239E-04	0.60	1.19	0.00E+00	2.52E-04	5.05E-04		
Th-229	1.8848E-12	0.60	1.19	0.00E+00	1.13E-12	2.25E-12		
Th-230	1.7042E-08	0.60	1.19	0.00E+00	1.02E-08	2.04E-08		
Th-232	7.8132E-15	0.60	1.19	0.00E+00	4.67E-15	9.33E-15		
Th-208	4.4063E-08	0.60	1.19	0.00E+00	2.63E-08	5.26E-08		
U-232	1.3151E-07	0.60	1.19	0.00E+00	7.85E-08	1.57E-07		
U-233	1.9564E-09	0.60	1.19	0.00E+00	1.17E-09	2.34E-09		
U-234	1.8371E-04	0.60	1.19	0.00E+00	1.10E-04	2.19E-04		
U-235	-2.7235E-06	0.60	0.00	4.27E-04	4.25E-04	4.27E-04		
U-236	1.5493E-05	0.60	1.19	0.00E+00	9.25E-06	1.85E-05		
U-238	-4.2851E-09	0.60	0.00	2.68E-04	2.68E-04	2.68E-04		
Y-90	2.7505E+00	0.60	1.19	0.00E+00	1.64E+00	3.29E+00		
Other Radionuclides					3.07E+00	6.14E+00		

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:
BOL HM Constituents	ALUM	ALUM	This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
BOL Enrichment %	19.8359342	60 to 100	
Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal	0.60		Nominal burnup taken directly from SFD (converted to MWd)
Bounding		1.19	Bounding burnup assumed to be twice nominal burnup
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/Given Burnup	
Nominal	0.00	0.00	1.00
Bounding	0.00		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UNIV OF MASS-LOWELL (HEU)
SNF ID #: 274
Fuel Units & Descr: 34 - 18 FLAT PLATES
Heavy Metal Mass, BOL=4 784kg; EOL=4 498kg
ROD Storage Site: SRS

¹Fuel decay start date: 2035
Estimates as of: 2030
Template: ATR (Light Water, Alum 60 to 100%, U)
²Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 5 years

Estimated
Canister usage,
18"x10"
0.94

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1 4545E-10	270 47	540 94	0 00E+00	3 93E-08	7 87E-08	Avg MeV	
Am-241	1 1190E-03	270 47	540 94	0 00E+00	3 03E-01	6 06E-01	0 0150	1 044E+14
Am-242m	4 5425E-07	270 47	540 94	0 00E+00	1 23E-04	2 46E-04	0 0250	2 248E+13
Am-243	1 4921E-06	270 47	540 94	0 00E+00	4 04E-04	8 07E-04	0 0375	2 075E+13
C-14	5 7244E-09	270 47	540 94	0 00E+00	1 55E-06	3 10E-06	0 0575	2 040E+13
Cl-36	1 3124E-32	270 47	540 94	0 00E+00	3 55E-30	7 10E-30	0 0850	1 301E+13
Cm-243	2 3676E-07	270 47	540 94	0 00E+00	6 40E-05	1 28E-04	0 1250	1 126E+13
Cm-244	5 2042E-05	270 47	540 94	0 00E+00	1 41E-02	2 82E-02	0 2250	1 102E+13
Co-60	3 8208E-05	270 47	540 94	0 00E+00	1 03E-02	2 07E-02	0 3750	5 336E+12
Cs-134	4 8693E-01	270 47	540 94	0 00E+00	1 32E+02	2 63E+02	0 5750	7 329E+13
Cs-135	3 4477E-06	270 47	540 94	0 00E+00	9 32E-04	1 86E-03	0 8500	1 026E+13
Cs-137	2 8731E+00	270 47	540 94	0 00E+00	7 77E+02	1 55E+03	1 2500	1 910E+12
Eu-154	8 2053E-02	270 47	540 94	0 00E+00	2 22E+01	4 44E+01	1 7500	8 008E+10
Eu-155	3 9134E-02	270 47	540 94	0 00E+00	1 06E+01	2 12E+01	2 2500	1 680E+11
Fe-55	6 7429E-03	270 47	540 94	0 00E+00	1 82E+00	3 65E+00	2 7500	9 663E+08
H-3	1 0599E-02	270 47	540 94	0 00E+00	2 87E+00	5 73E+00	3 5000	1 072E+08
I-129	7 5300E-07	270 47	540 94	0 00E+00	2 04E-04	4 07E-04	5 0000	3 207E+02
Kr-85	2 8595E-01	270 47	540 94	0 00E+00	7 73E+01	1 55E+02	7 0000	3 576E+01
Np-237	9 5479E-06	270 47	540 94	0 00E+00	2 58E-03	5 16E-03	11 0000	4 030E+00
Pa-231	8 9297E-10	270 47	540 94	0 00E+00	2 42E-07	4 83E-07		
Pb-210	3 7609E-12	270 47	540 94	0 00E+00	1 02E-09	2 03E-09		
Pm-147	2 5452E+00	270 47	540 94	0 00E+00	6 88E+02	1 38E+03		
Pu-238	2 0550E-02	270 47	540 94	0 00E+00	5 56E+00	1 11E+01		
Pu-239	4 2838E-04	270 47	540 94	0 00E+00	1 16E-01	2 32E-01		
Pu-240	2 4401E-04	270 47	540 94	0 00E+00	6 60E-02	1 32E-01		
Pu-241	6 8764E-02	270 47	540 94	0 00E+00	1 86E+01	3 72E+01		
Pu-242	3 6329E-07	270 47	540 94	0 00E+00	9 83E-05	1 97E-04		
Ra-226	3 8045E-11	270 47	540 94	0 00E+00	1 03E-08	2 06E-08		
Ra-228	2 9902E-15	270 47	540 94	0 00E+00	8 09E-13	1 62E-12		
Ru-106	1 9055E-01	270 47	540 94	0 00E+00	5 15E+01	1 03E+02		
Se-79	1 2936E-05	270 47	540 94	0 00E+00	3 50E-03	7 00E-03		
Sn-126	1 1574E-05	270 47	540 94	0 00E+00	3 13E-03	6 26E-03		
Sr-90	2 7505E+00	270 47	540 94	0 00E+00	7 44E+02	1 49E+03		
Tc-99	4 2239E-04	270 47	540 94	0 00E+00	1 14E-01	2 28E-01		
Th-229	1 8848E-12	270 47	540 94	0 00E+00	5 10E-10	1 02E-09		
Th-230	1 7042E-08	270 47	540 94	0 00E+00	4 61E-06	9 22E-06		
Th-232	7 8132E-15	270 47	540 94	0 00E+00	2 11E-12	4 23E-12		
Ti-208	4 4063E-08	270 47	540 94	0 00E+00	1 19E-05	2 38E-05		
U-232	1 3151E-07	270 47	540 94	0 00E+00	3 56E-05	7 11E-05		
U-233	1 9564E-09	270 47	540 94	0 00E+00	5 29E-07	1 06E-06		
U-234	1 8371E-04	270 47	540 94	0 00E+00	4 97E-02	9 94E-02		
U-235	-2 7235E-06	270 47	0 00	9 63E-03	8 89E-03	9 63E-03		
U-236	1 5493E-05	270 47	540 94	0 00E+00	4 19E-03	8 38E-03		
U-238	-4 2851E-09	270 47	0 00	1 10E-04	1 09E-04	1 10E-04		
Y-90	2 7505E+00	270 47	540 94	0 00E+00	7 44E+02	1 49E+03		
Other Radionuclides					1 39E+03	2 78E+03		

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 16325044	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)⁴

	From SFD	Estimated
Nominal:		270 47
Bounding:		540 94

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 18	
Bounding	0 36	

Estimated EOL HM/Given EOL HM

1 00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name UNIV OF MASS-LOWELL (LEU)
SNF ID # 275
Fuel Units & Descr: 41 - 18 FLAT PLATES
Heavy Metal Mass BOL=14.321kg EOL=14.321kg
ROD Storage Site: SRS

Fuel decay start date 2035
Estimates as of 2030
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"
1 14

II. Estimates

	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	271.25	542.50	0.00E+00	3.95E-08	7.89E-08	Avg MeV	
Am-241	1.1190E-03	271.25	542.50	0.00E+00	3.04E-01	6.07E-01	0.0150	1.047E+14
Am-242m	4.5425E-07	271.25	542.50	0.00E+00	1.23E-04	2.46E-04	0.0250	2.255E+13
Am-243	1.4921E-06	271.25	542.50	0.00E+00	4.05E-04	8.09E-04	0.0375	2.081E+13
C-14	5.7244E-09	271.25	542.50	0.00E+00	1.55E-06	3.11E-06	0.0575	2.046E+13
Ci-36	1.3124E-32	271.25	542.50	0.00E+00	3.56E-30	7.12E-30	0.0850	1.304E+13
Cm-243	2.3676E-07	271.25	542.50	0.00E+00	6.42E-05	1.28E-04	0.1250	1.130E+13
Cm-244	5.2042E-05	271.25	542.50	0.00E+00	1.41E-02	2.82E-02	0.2250	1.105E+13
Co-60	3.8208E-05	271.25	542.50	0.00E+00	1.04E-02	2.07E-02	0.3750	5.351E+12
Cs-134	4.8693E-01	271.25	542.50	0.00E+00	1.32E+02	2.64E+02	0.5750	7.350E+13
Cs-135	3.4477E-06	271.25	542.50	0.00E+00	9.35E-04	1.87E-03	0.8500	1.029E+13
Cs-137	2.8731E+00	271.25	542.50	0.00E+00	7.79E+02	1.56E+03	1.2500	1.915E+12
Eu-154	8.2053E-02	271.25	542.50	0.00E+00	2.23E+01	4.45E+01	1.7500	8.031E+10
Eu-155	3.9134E-02	271.25	542.50	0.00E+00	1.06E+01	2.12E+01	2.2500	1.684E+11
Fe-55	6.7429E-03	271.25	542.50	0.00E+00	1.83E+00	3.66E+00	2.7500	9.691E+08
H-3	1.0599E-02	271.25	542.50	0.00E+00	2.88E+00	5.75E+00	3.5000	1.075E+08
I-129	7.5300E-07	271.25	542.50	0.00E+00	2.04E-04	4.09E-04	5.0000	3.302E+02
Kr-85	2.8595E-01	271.25	542.50	0.00E+00	7.76E+01	1.55E+02	7.0000	3.684E+01
Np-237	9.5479E-06	271.25	542.50	0.00E+00	2.59E-03	5.18E-03	11.0000	4.155E+00
Pa-231	8.9297E-10	271.25	542.50	0.00E+00	2.42E-07	4.84E-07		
Pb-210	3.7609E-12	271.25	542.50	0.00E+00	1.02E-09	2.04E-09		
Pm-147	2.5452E+00	271.25	542.50	0.00E+00	6.90E+02	1.38E+03		
Pu-238	2.0550E-02	271.25	542.50	0.00E+00	5.57E+00	1.11E+01		
Pu-239	4.2838E-04	271.25	542.50	0.00E+00	1.16E-01	2.32E-01		
Pu-240	2.4401E-04	271.25	542.50	0.00E+00	6.62E-02	1.32E-01		
Pu-241	6.8764E-02	271.25	542.50	0.00E+00	1.87E+01	3.73E+01		
Pu-242	3.6329E-07	271.25	542.50	0.00E+00	9.85E-05	1.97E-04		
Ra-226	3.8045E-11	271.25	542.50	0.00E+00	1.03E-08	2.06E-08		
Ra-228	2.9902E-15	271.25	542.50	0.00E+00	8.11E-13	1.62E-12		
Ru-106	1.9055E-01	271.25	542.50	0.00E+00	5.17E+01	1.03E+02		
Se-79	1.2936E-05	271.25	542.50	0.00E+00	3.51E-03	7.02E-03		
Sn-126	1.1574E-05	271.25	542.50	0.00E+00	3.14E-03	6.28E-03		
Sr-90	2.7505E+00	271.25	542.50	0.00E+00	7.46E+02	1.49E+03		
Tc-99	4.2239E-04	271.25	542.50	0.00E+00	1.15E-01	2.29E-01		
Th-229	1.8848E-12	271.25	542.50	0.00E+00	5.11E-10	1.02E-09		
Th-230	1.7042E-08	271.25	542.50	0.00E+00	4.62E-06	9.25E-06		
Th-232	7.8132E-15	271.25	542.50	0.00E+00	2.12E-12	4.24E-12		
Ti-208	4.4063E-08	271.25	542.50	0.00E+00	1.20E-05	2.39E-05		
U-232	1.3151E-07	271.25	542.50	0.00E+00	3.57E-05	7.13E-05		
U-233	1.9564E-09	271.25	542.50	0.00E+00	5.31E-07	1.06E-06		
U-234	1.8371E-04	271.25	542.50	0.00E+00	4.98E-02	9.97E-02		
U-235	-2.7235E-06	271.25	0.00	6.10E-03	5.36E-03	6.10E-03		
U-236	1.5493E-05	271.25	542.50	0.00E+00	4.20E-03	8.40E-03		
U-238	-4.2851E-09	271.25	0.00	3.86E-03	3.86E-03	3.86E-03		
Y-90	2.7505E+00	271.25	542.50	0.00E+00	7.46E+02	1.49E+03		
Other Radionuclides					1.40E+03	2.79E+03		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences:
Reactor Moderator	From SFD	Used	
Fuel Cladding	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons:
BOL HM Constituents	ALUM	ALUM	This fuel matches ATR Template on all but one parameter (enrichment) making ATR a reasonable match.
BOL Enrichment %	19.71401492	60 to 100	
Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		271.25	Nominal burnup assumed to be 2% of BOL heavy metal mass
Bounding		542.50	Bounding burnup assumed to be twice nominal burnup
Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.06		0.98
Bounding	0.12		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UNIV OF MICHIGAN
SNF ID #: 276

Fuel Units & Descr: 130 - 18 CURVED PLATES

Heavy Metal Mass: BOL=100.854kg, EOL=89 882kg

ROD Storage Site: SRS

¹Fuel decay start date: 1992
Estimates as of: 2030

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

²Template Burnup(MWd): 367.2

Template BOL Heavy Metal Mass (MT): 0.00116689

Template Decay Time: 35 years

Estimated
Canister usage
18"x10"
5 42

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	C/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2 0068E-09	10,390 70	20,781 39	0 00E+00	2 09E-05	4 17E-05	Avg MeV	
Am-241	2 5251E-03	10,390 70	20,781 39	0 00E+00	2 62E+01	5 25E+01	0 0150	1 531E+15
Am-242m	3 9624E-07	10,390 70	20,781 39	0 00E+00	4 12E-03	8 23E-03	0 0250	3 178E+14
Am-243	1 4880E-06	10,390 70	20,781 39	0 00E+00	1 55E-02	3 09E-02	0 0375	2 763E+14
C-14	5 7053E-09	10,390 70	20,781 39	0 00E+00	5 93E-05	1 19E-04	0 0575	2 973E+14
Cl-36	1 3124E-32	10,390 70	20,781 39	0 00E+00	1 36E-28	2 73E-28	0 0850	1 792E+14
Cm-243	1 1419E-07	10,390 70	20,781 39	0 00E+00	1 19E-03	2 37E-03	0 1250	1 183E+14
Cm-244	1 6522E-05	10,390 70	20,781 39	0 00E+00	1 72E-01	3 43E-01	0 2250	1 547E+14
Co-60	7 4047E-07	10,390 70	20,781 39	0 00E+00	7 69E-03	1 54E-02	0 3750	6 729E+13
Cs-134	2 0455E-05	10,390 70	20,781 39	0 00E+00	2 13E-01	4 25E-01	0 5750	1 112E+15
Cs-135	3 4477E-06	10,390 70	20,781 39	0 00E+00	3 58E-02	7 16E-02	0 8500	1 358E+13
Cs-137	1 4365E+00	10,390 70	20,781 39	0 00E+00	1 49E+04	2 99E+04	1 2500	6 570E+12
Eu-154	7 3230E-03	10,390 70	20,781 39	0 00E+00	7 61E+01	1 52E+02	1 7500	3 698E+11
Eu-155	5 9259E-04	10,390 70	20,781 39	0 00E+00	6 16E+00	1 23E+01	2 2500	3 092E+07
Fe-55	2 2791E-06	10,390 70	20,781 39	0 00E+00	2 37E-02	4 74E-02	2 7500	2 951E+07
H-3	1 9698E-03	10,390 70	20,781 39	0 00E+00	2 05E+01	4 09E+01	3 5000	1 724E+04
I-129	7 5300E-07	10,390 70	20,781 39	0 00E+00	7 82E-03	1 56E-02	5 0000	7 046E+03
Kr-85	4 1176E-02	10,390 70	20,781 39	0 00E+00	4 28E+02	8 56E+02	7 0000	7 714E+02
Np-237	9 5752E-06	10,390 70	20,781 39	0 00E+00	9 95E-02	1 99E-01	11 0000	8 603E+01
Pa-231	3 9379E-09	10,390 70	20,781 39	0 00E+00	4 09E-05	8 18E-05		
Pb-210	3 3115E-10	10,390 70	20,781 39	0 00E+00	3 44E-06	6 88E-06		
Pm-147	9 2402E-04	10,390 70	20,781 39	0 00E+00	9 60E+00	1 92E+01		
Pu-238	1 6217E-02	10,390 70	20,781 39	0 00E+00	1 69E+02	3 37E+02		
Pu-239	4 2810E-04	10,390 70	20,781 39	0 00E+00	4 45E+00	8 90E+00		
Pu-240	2 4333E-04	10,390 70	20,781 39	0 00E+00	2 53E+00	5 06E+00		
Pu-241	1 6242E-02	10,390 70	20,781 39	0 00E+00	1 69E+02	3 38E+02		
Pu-242	3 6329E-07	10,390 70	20,781 39	0 00E+00	3 77E-03	7 55E-03		
Ra-226	9 0114E-10	10,390 70	20,781 39	0 00E+00	9 36E-06	1 87E-05		
Ra-228	3 1019E-14	10,390 70	20,781 39	0 00E+00	3 22E-10	6 45E-10		
Ru-106	2 1225E-10	10,390 70	20,781 39	0 00E+00	2 21E-06	4 41E-06		
Se-79	1 2930E-05	10,390 70	20,781 39	0 00E+00	1 34E-01	2 69E-01		
Sn-126	1 1571E-05	10,390 70	20,781 39	0 00E+00	1 20E-01	2 40E-01		
Sr-90	1 3472E+00	10,390 70	20,781 39	0 00E+00	1 40E+04	2 80E+04		
Tc-99	4 2239E-04	10,390 70	20,781 39	0 00E+00	4 39E+00	8 78E+00		
Tb-229	1 2407E-11	10,390 70	20,781 39	0 00E+00	1 29E-07	2 58E-07		
Th-230	8 3497E-08	10,390 70	20,781 39	0 00E+00	8 68E-04	1 74E-03		
Th-232	3 8371E-14	10,390 70	20,781 39	0 00E+00	3 99E-10	7 97E-10		
Ti-208	4 0414E-08	10,390 70	20,781 39	0 00E+00	4 20E-04	8 40E-04		
U-232	1 0948E-07	10,390 70	20,781 39	0 00E+00	1 14E-03	2 28E-03	Thermal Power	
U-233	3 6275E-09	10,390 70	20,781 39	0 00E+00	3 77E-05	7 54E-05	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-234	1 8562E-04	10,390 70	20,781 39	0 00E+00	1 93E+00	3 86E+00	1 74E+02	3 48E+02
U-235	-2 7235E-06	10,390 70	0 00	4 31E-02	1 48E-02	4 31E-02	Total	Total
U-236	1 5493E-05	10,390 70	20,781 39	0 00E+00	1 61E-01	3 22E-01		
U-238	-4 2851E-09	10,390 70	0 00	2 72E-02	2 71E-02	2 72E-02		
Y-90	1 3475E+00	10,390 70	20,781 39	0 00E+00	1 40E+04	2 80E+04		
Other Radionuclides					1 42E+04	2 84E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator:	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons. 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 7909823	60 to 100	

Burnup Summary (MWd)¹

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		10,390 70	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		20 781 39	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 01
Bounding	0 65		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name UNIV OF MICHIGAN (CONTROL)
 SNF ID #: 1005
 Fuel Units & Descr: 82 - 9 CURVED PLATES
 Heavy Metal Mass BOL=34 67kg EOL=32 866kg
 ROD Storage Site SRS

Fuel decay start date 2035
 Estimates as of 2030
 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"
 3 42

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	1,708.42	3,416.85	0.00E+00	2.48E-07	4.97E-07	Avg MeV	
Am-241	1.1190E-03	1,708.42	3,416.85	0.00E+00	1.91E+00	3.82E+00	0.0150	6.592E+14
Am-242m	4.5425E-07	1,708.42	3,416.85	0.00E+00	7.76E-04	1.55E-03	0.0250	1.420E+14
Am-243	1.4921E-06	1,708.42	3,416.85	0.00E+00	2.55E-03	5.10E-03	0.0375	1.311E+14
C-14	5.7244E-09	1,708.42	3,416.85	0.00E+00	9.78E-06	1.96E-05	0.0575	1.289E+14
Cf-252	1.3124E-32	1,708.42	3,416.85	0.00E+00	2.24E-29	4.48E-29	0.0850	8.215E+13
Cm-243	2.3676E-07	1,708.42	3,416.85	0.00E+00	4.04E-04	8.09E-04	0.1250	7.114E+13
Cm-244	5.2042E-05	1,708.42	3,416.85	0.00E+00	8.89E-02	1.78E-01	0.2250	6.963E+13
Co-60	3.8208E-06	1,708.42	3,416.85	0.00E+00	6.53E-02	1.31E-01	0.3750	3.370E+13
Cs-134	4.8693E-01	1,708.42	3,416.85	0.00E+00	8.32E+02	1.66E+03	0.5750	4.629E+14
Cs-135	3.4477E-06	1,708.42	3,416.85	0.00E+00	5.89E-03	1.18E-02	0.8500	6.483E+13
Cs-137	2.8731E+00	1,708.42	3,416.85	0.00E+00	4.91E+03	9.82E+03	1.2500	1.206E+13
Eu-154	8.2053E-02	1,708.42	3,416.85	0.00E+00	1.40E+02	2.80E+02	1.7500	5.058E+11
Eu-155	3.9134E-02	1,708.42	3,416.85	0.00E+00	6.69E+01	1.34E+02	2.2500	1.061E+12
Fe-55	6.7429E-03	1,708.42	3,416.85	0.00E+00	1.15E+01	2.30E+01	2.7500	6.104E+09
H-3	1.0599E-02	1,708.42	3,416.85	0.00E+00	1.81E+01	3.62E+01	3.5000	6.769E+08
I-129	7.5300E-07	1,708.42	3,416.85	0.00E+00	1.29E-03	2.57E-03	5.0000	2.045E+03
Kr-85	2.8595E-01	1,708.42	3,416.85	0.00E+00	4.89E+02	9.77E+02	7.0000	2.281E+02
Np-237	9.5479E-06	1,708.42	3,416.85	0.00E+00	1.63E-02	3.26E-02	11.0000	2.571E+01
Pa-231	8.9297E-10	1,708.42	3,416.85	0.00E+00	1.53E-06	3.05E-06		
Pb-210	3.7609E-12	1,708.42	3,416.85	0.00E+00	6.43E-09	1.29E-08		
Pm-147	2.5452E+00	1,708.42	3,416.85	0.00E+00	4.35E+03	8.70E+03		
Pu-238	2.0550E-02	1,708.42	3,416.85	0.00E+00	3.51E+01	7.02E+01		
Pu-239	4.2838E-04	1,708.42	3,416.85	0.00E+00	7.32E-01	1.46E+00		
Pu-240	2.4401E-04	1,708.42	3,416.85	0.00E+00	4.17E-01	8.34E-01		
Pu-241	6.8764E-02	1,708.42	3,416.85	0.00E+00	1.17E+02	2.35E+02		
Pu-242	3.6329E-07	1,708.42	3,416.85	0.00E+00	6.21E-04	1.24E-03		
Ra-226	3.8045E-11	1,708.42	3,416.85	0.00E+00	6.50E-08	1.30E-07		
Ra-228	2.9902E-15	1,708.42	3,416.85	0.00E+00	5.11E-12	1.02E-11		
Ru-106	1.9055E-01	1,708.42	3,416.85	0.00E+00	3.26E+02	6.51E+02		
Se-79	1.2936E-05	1,708.42	3,416.85	0.00E+00	2.21E-02	4.42E-02		
Sn-126	1.1574E-05	1,708.42	3,416.85	0.00E+00	1.98E-02	3.95E-02		
Sr-90	2.7505E+00	1,708.42	3,416.85	0.00E+00	4.70E+03	9.40E+03		
Tc-99	4.2239E-04	1,708.42	3,416.85	0.00E+00	7.22E-01	1.44E+00		
Th-229	1.8848E-12	1,708.42	3,416.85	0.00E+00	3.22E-09	6.44E-09		
Th-230	1.7042E-08	1,708.42	3,416.85	0.00E+00	2.91E-05	5.82E-05		
Th-232	7.8132E-15	1,708.42	3,416.85	0.00E+00	1.33E-11	2.67E-11		
Ti-208	4.4063E-08	1,708.42	3,416.85	0.00E+00	7.53E-05	1.51E-04		
U-232	1.3151E-07	1,708.42	3,416.85	0.00E+00	2.25E-04	4.49E-04		
U-233	1.9564E-09	1,708.42	3,416.85	0.00E+00	3.34E-06	6.68E-06		
U-234	1.8371E-04	1,708.42	3,416.85	0.00E+00	3.14E-01	6.28E-01		
U-235	-2.7235E-06	1,708.42	0.00	1.48E-02	1.01E-02	1.48E-02		
U-236	1.5493E-05	1,708.42	3,416.85	0.00E+00	2.65E-02	5.29E-02		
U-238	-4.2851E-09	1,708.42	0.00	9.35E-03	9.34E-03	9.35E-03		
Y-90	2.7505E+00	1,708.42	3,416.85	0.00E+00	4.70E+03	9.40E+03		
Other Radionuclides					8.79E+03	1.76E+04		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary			Basis for Parameter Differences*
Reactor Moderator: Fuel Cladding: BOL HM Constituents: BOL Enrichment %	From SFD	Used	
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
	19.74999113	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate*
Nominal	From SFD	Estimated	
		1,708.42	
Bounding		3,416.85	

Checks			Estimated EOL HM/Given EOL HM
Nominal	Burnup Multiplier	Estimated Burnup/Given Burnup	
	0.16		
Bounding	0.31		1.00

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UNIV OF MICHIGAN (REG)
 SNF ID #: 277
 Fuel Units & Descr: 225 - 18 CURVED PLATES
 Heavy Metal Mass: BOL=190.26kg EOL=174.082kg
 ROD Storage Site: SRS

¹Fuel decay start date: 2035
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100% U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 5 years

Estimated
 Canister usage
 18"x10"
 9.38

II. Estimates	m	x _m	x _b	b	y _m	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	15,320.41	30,640.81	0.00E+00	2.23E-06	4.46E-06	Avg. MeV	
Am-241	1.1190E-03	15,320.41	30,640.81	0.00E+00	1.71E+01	3.43E+01	0.0150	5.911E+15
Am-242m	4.5425E-07	15,320.41	30,640.81	0.00E+00	6.96E-03	1.39E-02	0.0250	1.274E+15
Am-243	1.4921E-06	15,320.41	30,640.81	0.00E+00	2.29E-02	4.57E-02	0.0375	1.175E+15
C-14	5.7244E-09	15,320.41	30,640.81	0.00E+00	8.77E-05	1.75E-04	0.0575	1.156E+15
Cl-36	1.3124E-32	15,320.41	30,640.81	0.00E+00	2.01E-28	4.02E-28	0.0850	7.367E+14
Cm-243	2.3676E-07	15,320.41	30,640.81	0.00E+00	3.63E-03	7.25E-03	0.1250	6.380E+14
Cm-244	5.2042E-05	15,320.41	30,640.81	0.00E+00	7.97E-01	1.59E+00	0.2250	6.244E+14
Co-60	3.8208E-05	15,320.41	30,640.81	0.00E+00	5.85E-01	1.17E+00	0.3750	3.022E+14
Cs-134	4.8693E-01	15,320.41	30,640.81	0.00E+00	7.46E+03	1.49E+04	0.5750	4.151E+15
Cs-135	3.4477E-06	15,320.41	30,640.81	0.00E+00	5.28E-02	1.06E-01	0.8500	5.814E+14
Cs-137	2.8731E+00	15,320.41	30,640.81	0.00E+00	4.40E+04	8.80E+04	1.2500	1.082E+14
Eu-154	8.2053E-02	15,320.41	30,640.81	0.00E+00	1.26E+03	2.51E+03	1.7500	4.536E+12
Eu-155	3.9134E-02	15,320.41	30,640.81	0.00E+00	6.00E+02	1.20E+03	2.2500	9.514E+12
Fe-55	6.7429E-03	15,320.41	30,640.81	0.00E+00	1.03E+02	2.07E+02	2.7500	5.474E+10
H-3	1.0599E-02	15,320.41	30,640.81	0.00E+00	1.62E+02	3.25E+02	3.5000	6.070E+09
I-129	7.5300E-07	15,320.41	30,640.81	0.00E+00	1.15E-02	2.31E-02	5.0000	1.826E+04
Kr-85	2.8595E-01	15,320.41	30,640.81	0.00E+00	4.38E+03	8.76E+03	7.0000	2.037E+03
Np-237	9.5479E-06	15,320.41	30,640.81	0.00E+00	1.46E-01	2.93E-01	11.0000	2.296E+02
Pa-231	8.9297E-10	15,320.41	30,640.81	0.00E+00	1.37E-05	2.74E-05		
Pb-210	3.7609E-12	15,320.41	30,640.81	0.00E+00	5.76E-08	1.15E-07		
Pm-147	2.5452E+00	15,320.41	30,640.81	0.00E+00	3.90E+04	7.80E+04		
Pu-238	2.0550E-02	15,320.41	30,640.81	0.00E+00	3.15E+02	6.30E+02		
Pu-239	4.2838E-04	15,320.41	30,640.81	0.00E+00	6.56E+00	1.31E+01		
Pu-240	2.4401E-04	15,320.41	30,640.81	0.00E+00	3.74E+00	7.48E+00		
Pu-241	6.8764E-02	15,320.41	30,640.81	0.00E+00	1.05E+03	2.11E+03		
Pu-242	3.6329E-07	15,320.41	30,640.81	0.00E+00	5.57E-03	1.11E-02		
Ra-226	3.8045E-11	15,320.41	30,640.81	0.00E+00	5.83E-07	1.17E-06		
Ra-228	2.9902E-15	15,320.41	30,640.81	0.00E+00	4.58E-11	9.16E-11		
Ru-106	1.9055E-01	15,320.41	30,640.81	0.00E+00	2.92E+03	5.84E+03		
Se-79	1.2936E-05	15,320.41	30,640.81	0.00E+00	1.98E-01	3.96E-01		
Sn-126	1.1574E-05	15,320.41	30,640.81	0.00E+00	1.77E-01	3.55E-01		
Sr-90	2.7505E+00	15,320.41	30,640.81	0.00E+00	4.21E+04	8.43E+04		
Tc-99	4.2239E-04	15,320.41	30,640.81	0.00E+00	6.47E+00	1.29E+01		
Th-229	1.8848E-12	15,320.41	30,640.81	0.00E+00	2.89E-08	5.78E-08		
Th-230	1.7042E-08	15,320.41	30,640.81	0.00E+00	2.61E-04	5.22E-04		
Th-232	7.8132E-15	15,320.41	30,640.81	0.00E+00	1.20E-10	2.39E-10		
Th-208	4.4063E-08	15,320.41	30,640.81	0.00E+00	6.75E-04	1.35E-03		
U-232	1.3151E-07	15,320.41	30,640.81	0.00E+00	2.01E-03	4.03E-03		
U-233	1.9564E-09	15,320.41	30,640.81	0.00E+00	3.00E-05	5.99E-05		
U-234	1.8371E-04	15,320.41	30,640.81	0.00E+00	2.81E+00	5.63E+00		
U-235	-2.7235E-06	15,320.41	0.00	8.12E-02	3.95E-02	8.12E-02		
U-236	1.5493E-05	15,320.41	30,640.81	0.00E+00	2.37E-01	4.75E-01		
U-238	-4.2851E-09	15,320.41	0.00	5.13E-02	5.13E-02	5.13E-02		
Y-90	2.7505E+00	15,320.41	30,640.81	0.00E+00	4.21E+04	8.43E+04		
Other Radionuclides					7.88E+04	1.58E+05		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

Reactor Moderator	From SFD	Used	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.
Fuel Cladding	LIGHT WATER	LIGHT WATER	
BOL HM Constituents	ALUM	ALUM	
BOL Enrichment %	U	U	
	19.74999113	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate: Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Nominal		15,320.41	
Bounding		30,640.81	

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM 1.01
Nominal	0.26		
Bounding	0.51		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name UNIV OF VIRGINIA (U3SI2 LEU)
SNF ID #: 952
Fuel Units & Descr: 20 - 22 FLAT PLATES
Heavy Metal Mass: BOL=24.31kg EOL=23.964kg
ROD Storage Site SRS

Fuel decay start date: 1993
Estimates as of: 2030
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: 35 years

Estimated
Canister usage
18"x10"
0.83

II. Estimates							Gamma Sources	
	m	x _m	x _b	b	y _m	y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	CI/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Avg. MeV	
Ac-227	2.0068E-09	327.67	655.34	0.00E+00	6.58E-07	1.32E-06	0.0150	4.827E+13
Am-241	2.5251E-03	327.67	655.34	0.00E+00	8.27E-01	1.65E+00	0.0250	1.002E+13
Am-242m	3.9624E-07	327.67	655.34	0.00E+00	1.30E-04	2.60E-04	0.0375	8.712E+12
Am-243	1.4880E-06	327.67	655.34	0.00E+00	4.88E-04	9.75E-04	0.0675	9.377E+12
C-14	5.7053E-09	327.67	655.34	0.00E+00	1.87E-06	3.74E-06	0.0850	5.650E+12
Cl-36	1.3124E-32	327.67	655.34	0.00E+00	4.30E-30	8.60E-30	0.1250	3.732E+12
Cm-243	1.1419E-07	327.67	655.34	0.00E+00	3.74E-05	7.48E-05	0.2250	4.878E+12
Cm-244	1.6522E-05	327.67	655.34	0.00E+00	5.41E-03	1.08E-02	0.3750	2.122E+12
Co-60	7.4047E-07	327.67	655.34	0.00E+00	2.43E-04	4.85E-04	0.5750	3.507E+13
Cs-134	2.0455E-05	327.67	655.34	0.00E+00	6.70E-03	1.34E-02	0.8500	4.284E+11
Cs-135	3.4477E-06	327.67	655.34	0.00E+00	1.13E-03	2.26E-03	1.2500	2.072E+11
Cs-137	1.4365E+00	327.67	655.34	0.00E+00	4.71E+02	9.41E+02	1.7500	1.166E+10
Eu-154	7.3230E-03	327.67	655.34	0.00E+00	2.40E+00	4.80E+00	2.2500	9.750E+05
Eu-155	5.9259E-04	327.67	655.34	0.00E+00	1.94E-01	3.88E-01	2.7500	9.306E+05
Fe-55	2.2791E-06	327.67	655.34	0.00E+00	7.47E-04	1.49E-03	3.5000	5.742E+02
H-3	1.9698E-03	327.67	655.34	0.00E+00	6.45E-01	1.29E+00	5.0000	2.354E+02
I-129	7.5300E-07	327.67	655.34	0.00E+00	2.47E-04	4.93E-04	7.0000	2.584E+01
Kr-85	4.1176E-02	327.67	655.34	0.00E+00	1.35E+01	2.70E+01	11.0000	2.887E+00
Np-237	9.5752E-06	327.67	655.34	0.00E+00	3.14E-03	6.27E-03		
Pa-231	3.9379E-09	327.67	655.34	0.00E+00	1.29E-06	2.58E-06		
Pb-210	3.3115E-10	327.67	655.34	0.00E+00	1.09E-07	2.17E-07		
Pm-147	9.2402E-04	327.67	655.34	0.00E+00	3.03E-01	6.06E-01		
Pu-238	1.6217E-02	327.67	655.34	0.00E+00	5.31E+00	1.06E+01		
Pu-239	4.2810E-04	327.67	655.34	0.00E+00	1.40E-01	2.81E-01		
Pu-240	2.4333E-04	327.67	655.34	0.00E+00	7.97E-02	1.59E-01		
Pu-241	1.6242E-02	327.67	655.34	0.00E+00	5.32E+00	1.06E+01		
Pu-242	3.6329E-07	327.67	655.34	0.00E+00	1.19E-04	2.38E-04		
Ra-226	9.0114E-10	327.67	655.34	0.00E+00	2.95E-07	5.91E-07		
Ra-228	3.1019E-14	327.67	655.34	0.00E+00	1.02E-11	2.03E-11		
Ru-106	2.1225E-10	327.67	655.34	0.00E+00	6.95E-08	1.39E-07		
Se-79	1.2930E-05	327.67	655.34	0.00E+00	4.24E-03	8.47E-03		
Sn-126	1.1571E-05	327.67	655.34	0.00E+00	3.79E-03	7.58E-03		
Sr-90	1.3472E+00	327.67	655.34	0.00E+00	4.41E+02	8.83E+02		
Tc-99	4.2239E-04	327.67	655.34	0.00E+00	1.38E-01	2.77E-01		
Th-229	1.2407E-11	327.67	655.34	0.00E+00	4.07E-09	8.13E-09		
Th-230	8.3497E-08	327.67	655.34	0.00E+00	2.74E-05	5.47E-05		
Th-232	3.8371E-14	327.67	655.34	0.00E+00	1.26E-11	2.51E-11		
Th-208	4.0414E-08	327.67	655.34	0.00E+00	1.32E-05	2.65E-05		
U-232	1.0948E-07	327.67	655.34	0.00E+00	3.59E-05	7.17E-05		
U-233	3.6275E-09	327.67	655.34	0.00E+00	1.19E-06	2.38E-06		
U-234	1.8562E-04	327.67	655.34	0.00E+00	6.08E-02	1.22E-01		
U-235	-2.7235E-06	327.67	0.00	1.04E-02	9.50E-03	1.04E-02		
U-236	1.5493E-05	327.67	655.34	0.00E+00	5.08E-03	1.02E-02		
U-238	-4.2851E-09	327.67	0.00	6.55E-03	6.55E-03	6.55E-03		
Y-90	1.3475E+00	327.67	655.34	0.00E+00	4.42E+02	8.83E+02		
Other Radionuclides					4.48E+02	8.97E+02		

Other Radionuclides

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
	LIGHT WATER	LIGHT WATER	
Reactor Moderator			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 %	19.77478682	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		327.67	
Bounding		655.34	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
	0.04		
Nominal			1.00
Bounding	0.09		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: UNIV OF VIRGINIA (ULAX HEU)
 SNF ID #: 279
 Fuel Units & Descr: 44 - 22 FLAT PLATES
 Heavy Metal Mass: BOL=7.924kg, EOL=6.855kg
 ROD Storage Site: SRS

¹Fuel decay start date: 1966
 Estimates as of: 2030
 Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup(MWd): 367.2
 Template BOL Heavy Metal Mass (MT): 0.00116689
 Template Decay Time: 50 years

Estimated
 Canister usage
 18"x10"
 1.83

II. Estimates -							Gamma Sources	
	m	X _a	X _b	b	Y _a	Y _b	Photon Energy Group	Total Photons/sec (bounding)
Radionuclide	Cu/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)		
Ac-227	2.9739E-09	1,012.55	2,025.11	0.00E+00	3.01E-06	6.02E-06	Avg. MeV	
Am-241	2.5986E-03	1,012.55	2,025.11	0.00E+00	2.63E+00	5.26E+00	0.0150	1.043E+14
Am-242m	3.7010E-07	1,012.55	2,025.11	0.00E+00	3.75E-04	7.49E-04	0.0250	2.166E+13
Am-243	1.4858E-06	1,012.55	2,025.11	0.00E+00	1.50E-03	3.01E-03	0.0375	1.882E+13
C-14	5.6944E-09	1,012.55	2,025.11	0.00E+00	5.77E-06	1.15E-05	0.0575	2.027E+13
Cl-36	1.3124E-32	1,012.55	2,025.11	0.00E+00	1.33E-29	2.66E-29	0.0850	1.220E+13
Cm-243	7.9303E-08	1,012.55	2,025.11	0.00E+00	8.03E-05	1.61E-04	0.1250	7.973E+12
Cm-244	9.3083E-06	1,012.55	2,025.11	0.00E+00	9.43E-03	1.89E-02	0.2250	1.053E+13
Co-60	1.0310E-07	1,012.55	2,025.11	0.00E+00	1.04E-04	2.09E-04	0.3750	4.585E+12
Cs-134	1.3254E-07	1,012.55	2,025.11	0.00E+00	1.34E-04	2.68E-04	0.5750	7.661E+13
Cs-135	3.4477E-06	1,012.55	2,025.11	0.00E+00	3.49E-03	6.98E-03	0.8500	8.207E+11
Cs-137	1.0161E+00	1,012.55	2,025.11	0.00E+00	1.03E+03	2.06E+03	1.2500	3.319E+11
Eu-154	2.1879E-03	1,012.55	2,025.11	0.00E+00	2.22E+00	4.43E+00	1.7500	2.174E+10
Eu-155	7.2930E-05	1,012.55	2,025.11	0.00E+00	7.38E-02	1.48E-01	2.2500	2.109E+06
Fe-55	4.1912E-08	1,012.55	2,025.11	0.00E+00	4.24E-05	8.49E-05	2.7500	2.490E+06
H-3	8.4913E-04	1,012.55	2,025.11	0.00E+00	8.60E-01	1.72E+00	3.5000	1.367E+03
I-129	7.5300E-07	1,012.55	2,025.11	0.00E+00	7.62E-04	1.52E-03	5.0000	5.557E+02
Kr-85	1.5615E-02	1,012.55	2,025.11	0.00E+00	1.58E+01	3.16E+01	7.0000	6.043E+01
Np-237	9.5861E-06	1,012.55	2,025.11	0.00E+00	9.71E-03	1.94E-02	11.0000	6.712E+00
Pa-231	5.0790E-09	1,012.55	2,025.11	0.00E+00	5.14E-06	1.03E-05		
Pb-210	6.6176E-10	1,012.55	2,025.11	0.00E+00	6.70E-07	1.34E-06		
Pm-147	1.7606E-05	1,012.55	2,025.11	0.00E+00	1.78E-02	3.57E-02		
Pu-238	1.4406E-02	1,012.55	2,025.11	0.00E+00	1.46E+01	2.92E+01		
Pu-239	4.2783E-04	1,012.55	2,025.11	0.00E+00	4.33E-01	8.66E-01		
Pu-240	2.4297E-04	1,012.55	2,025.11	0.00E+00	2.46E-01	4.92E-01		
Pu-241	7.8949E-03	1,012.55	2,025.11	0.00E+00	7.99E+00	1.60E+01		
Pu-242	3.6329E-07	1,012.55	2,025.11	0.00E+00	3.68E-04	7.36E-04		
Ra-226	1.5169E-09	1,012.55	2,025.11	0.00E+00	1.54E-06	3.07E-06		
Ra-228	4.2429E-14	1,012.55	2,025.11	0.00E+00	4.30E-11	8.59E-11		
Ru-106	7.0833E-15	1,012.55	2,025.11	0.00E+00	7.17E-12	1.43E-11		
Se-79	1.2928E-05	1,012.55	2,025.11	0.00E+00	1.31E-02	2.62E-02		
Sn-126	1.1571E-05	1,012.55	2,025.11	0.00E+00	1.17E-02	2.34E-02		
Sr-90	9.4308E-01	1,012.55	2,025.11	0.00E+00	9.55E+02	1.91E+03		
Tc-99	4.2239E-04	1,012.55	2,025.11	0.00E+00	4.28E-01	8.55E-01		
Th-229	1.7968E-11	1,012.55	2,025.11	0.00E+00	1.82E-08	3.64E-08		
Th-230	1.0855E-07	1,012.55	2,025.11	0.00E+00	1.10E-04	2.20E-04		
Th-232	4.9809E-14	1,012.55	2,025.11	0.00E+00	5.04E-11	1.01E-10		
Ti-208	3.4995E-08	1,012.55	2,025.11	0.00E+00	3.54E-05	7.09E-05		
U-232	9.4798E-08	1,012.55	2,025.11	0.00E+00	9.60E-05	1.92E-04		
U-233	4.2538E-09	1,012.55	2,025.11	0.00E+00	4.31E-06	8.61E-06		
U-234	1.8617E-04	1,012.55	2,025.11	0.00E+00	1.89E-01	3.77E-01		
U-235	2.7235E-06	1,012.55	0.00	1.59E-02	1.32E-02	1.59E-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	1.88E-04	1.84E-04	1.88E-04		
Y-90	9.4308E-01	1,012.55	2,025.11	0.00E+00	9.55E+02	1.91E+03		
Other Radionuclides					9.82E+02	1.96E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.20E+01	2.40E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
	LIGHT WATER	LIGHT WATER	
	ALUM	ALUM	
	U	U	
BOL HM Constituents			
BOL Enrichment %	92.93756073	60 to 100	

Burnup Summary (MWd)²

	From SFD	Estimated	Basis for burnup used in estimate:
	230.24	1,012.55	
Nominal			Nominal burnup calculated from the heavy metal mass destroyed.
Bounding	280.84	2,025.11	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
	0.41	4.40	
Nominal			
Bounding	0.81	7.21	1.01

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

²Total burnup for all fuel associated with this worksheet must be 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 (UO2)
SNF ID # 855
Fuel Units & Descr 7 - ROD
Heavy Metal Mass BOL=6 578kg EOL=4 04kg
ROD Storage Site INEEL

¹Fuel decay start date 1962
Estimates as of. 2030
Template PWR (Light Water, Zirc 0 to 5%, U)
²Template Burnup(MWd) 61 92
Template BOL Heavy Metal Mass (MT) 0 00176911
Template Decay Time 65 years

Estimated
Canister usage.
18"x10"
0 19

II. Estimates	m	x _n	x _b	b	y _n	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.2581E-09	2,413 71	4,827 42	0 00E+00	3 04E-06	6 07E-06	Avg MeV	
Am-241	1 4761E-01	2,413 71	4,827 42	0 00E+00	3 56E+02	7 13E+02	0 0150	1.307E+14
Am-242m	2 5032E-04	2,413 71	4,827 42	0 00E+00	6 04E-01	1 21E+00	0 0250	2 596E+13
Am-243	6 2387E-04	2,413 71	4,827 42	0 00E+00	1 51E+00	3 01E+00	0 0375	2 427E+13
C-14	4 7739E-05	2,413 71	4,827 42	0 00E+00	1 15E-01	2 30E-01	0 0575	3 330E+13
Cl-36	8 0297E-07	2,413 71	4,827 42	0 00E+00	1 94E-03	3 88E-03	0 0850	1 421E+13
Cm-243	1 2099E-04	2,413 71	4,827 42	0 00E+00	2 92E-01	5 84E-01	0 1250	9 266E+12
Cm-244	1 5560E-02	2,413 71	4,827 42	0 00E+00	3 76E+01	7 51E+01	0 2250	1 208E+13
Co-60	4 9580E-05	2,413 71	4,827 42	0 00E+00	1 20E-01	2 39E-01	0 3750	5 229E+12
Cs-134	1 7022E-09	2,413 71	4,827 42	0 00E+00	4 11E-06	8 22E-06	0 5750	1 245E+14
Cs-135	1 4433E-05	2,413 71	4,827 42	0 00E+00	3 48E-02	6 97E-02	0 8500	9 978E+11
Cs-137	6 9929E-01	2,413 71	4,827 42	0 00E+00	1 69E+03	3 38E+03	1 2500	4 664E+11
Eu-154	1 8023E-03	2,413 71	4,827 42	0 00E+00	4 35E+00	8 70E+00	1 7500	2 684E+10
Eu-155	2 6793E-05	2,413 71	4,827 42	0 00E+00	6 47E-02	1 29E-01	2 2500	4 726E+06
Fe-55	1 4580E-08	2,413 71	4,827 42	0 00E+00	3 52E-05	7 04E-05	2 7500	2 351E+07
H-3	3 8566E-03	2,413 71	4,827 42	0 00E+00	9 31E+00	1 86E+01	3 5000	1 167E+06
I-129	9 8288E-07	2,413 71	4,827 42	0 00E+00	2 37E-03	4 74E-03	5 0000	4 983E+05
Kr-85	4 0617E-03	2,413 71	4,827 42	0 00E+00	9 80E+00	1 96E+01	7 0000	5 735E+04
Np-237	1 2645E-05	2,413 71	4,827 42	0 00E+00	3 05E-02	6 10E-02	11 0000	6 583E+03
Pa-231	1 6376E-09	2,413 71	4,827 42	0 00E+00	3 95E-06	7 91E-06		
Pb-210	2 8795E-10	2,413 71	4,827 42	0 00E+00	6 95E-07	1 39E-06		
Pm-147	1 3264E-07	2,413 71	4,827 42	0 00E+00	3 20E-04	6 40E-04		
Pu-238	5 8882E-02	2,413 71	4,827 42	0 00E+00	1 42E+02	2 84E+02		
Pu-239	1 1613E-02	2,413 71	4,827 42	0 00E+00	2 80E+01	5 61E+01		
Pu-240	1 5142E-02	2,413 71	4,827 42	0 00E+00	3 65E+01	7 31E+01		
Pu-241	2 1269E-01	2,413 71	4,827 42	0 00E+00	5 13E+02	1 03E+03		
Pu-242	6 4260E-05	2,413 71	4,827 42	0 00E+00	1 55E-01	3 10E-01		
Ra-226	5 8689E-10	2,413 71	4,827 42	0 00E+00	1 42E-06	2 83E-06		
Ra-228	5 3036E-12	2,413 71	4,827 42	0 00E+00	1 28E-08	2 56E-08		
Ru-106	6 8136E-19	2,413 71	4,827 42	0 00E+00	1 64E-15	3 29E-15		
Se-79	1 2372E-05	2,413 71	4,827 42	0 00E+00	2 99E-02	5 97E-02		
Sn-126	2 5194E-05	2,413 71	4,827 42	0 00E+00	6 08E-02	1 22E-01		
Sr-90	4 4913E-01	2,413 71	4,827 42	0 00E+00	1 08E+03	2 17E+03		
Tc-99	3 9357E-04	2,413 71	4,827 42	0 00E+00	9 50E-01	1 90E+00		
Th-229	1 9331E-10	2,413 71	4,827 42	0 00E+00	4 67E-07	9 33E-07		
Th-230	3 5223E-08	2,413 71	4,827 42	0 00E+00	8 50E-05	1 70E-04		
Th-232	5 3085E-12	2,413 71	4,827 42	0 00E+00	1 28E-08	2 56E-08		
Th-208	1 3102E-07	2,413 71	4,827 42	0 00E+00	3 16E-04	6 33E-04		
U-232	3 5497E-07	2,413 71	4,827 42	0 00E+00	8 57E-04	1 71E-03		
U-233	2 6647E-08	2,413 71	4,827 42	0 00E+00	6 43E-05	1 29E-04		
U-234	5 5023E-05	2,413 71	4,827 42	0 00E+00	1 33E-01	2 66E-01		
U-235	-1 4485E-06	2,413 71	0 00	3 29E-03	0 00E+00	3 29E-03		
U-236	7 5969E-06	2,413 71	4,827 42	0 00E+00	1 83E-02	3 67E-02		
U-238	-2 6129E-07	2,413 71	0 00	1 70E-03	1 07E-03	1 70E-03		
Y-90	4 4913E-01	2,413 71	4,827 42	0 00E+00	1 08E+03	2 17E+03		
Other Radionuclides					1 63E+03	3 27E+03		

Thermal Power
Nominal Heat Output (Watts)
Bounding Heat Output (Watts)
Total Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ZIRC	ZIRC
BOL HM Constituents	U	U
BOL Enrichment %	23 16820093	0 to 5

Basis for Parameter Differences:
This Template was used for the following reasons.
This fuel matches on all parameters except enrichment.

Burnup Summary (MWd)²

	From SFD	Estimated
Nominal		2,413 71
Bounding		4,827 42

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	10 48	
Bounding	20 97	

Estimated EOL HM/Given EOL HM
1 03

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name: WORCESTER POLY INSTITUTE
SNF ID #: 287
Fuel Units & Descr: 26 - 18 FLAT PLATES
Heavy Metal Mass: BOL=22.776kg, EOL=22.753kg
ROD Storage Site: SRS

¹Fuel decay start date: 2035
Estimates as of: 2030
Template: ATR (Light Water, Alum, 60 to 100%, U)
²Template Burnup (MWd) 367.2
Template BOL Heavy Metal Mass (MT)* 0.00116689
Template Decay Time: 5 years

Estimated
Canister usage
18"x10"
0.72

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ³	Bounding Fuel Burnup (MWd) ³	Initial Activity (Ci)	Nominal Fuel Inventories (Ci)	Bounding Fuel Inventories (Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.4545E-10	22.16	44.32	0.00E+00	3.22E-09	6.45E-09	Avg MeV	
Am-241	1.1190E-03	22.16	44.32	0.00E+00	2.48E-02	4.96E-02	0.0150	8.551E+12
Am-242m	4.5425E-07	22.16	44.32	0.00E+00	1.01E-05	2.01E-05	0.0250	1.842E+12
Am-243	1.4921E-06	22.16	44.32	0.00E+00	3.31E-05	6.61E-05	0.0375	1.700E+12
C-14	5.7244E-09	22.16	44.32	0.00E+00	1.27E-07	2.54E-07	0.0575	1.671E+12
Cl-36	1.3124E-32	22.16	44.32	0.00E+00	2.91E-31	5.82E-31	0.0850	1.066E+12
Cm-243	2.3676E-07	22.16	44.32	0.00E+00	5.25E-06	1.05E-05	0.1250	9.228E+11
Cm-244	5.2042E-05	22.16	44.32	0.00E+00	1.15E-03	2.31E-03	0.2250	9.033E+11
Co-60	3.8208E-05	22.16	44.32	0.00E+00	8.47E-04	1.69E-03	0.3750	4.372E+11
Cs-134	4.8693E-01	22.16	44.32	0.00E+00	1.08E+01	2.16E+01	0.5750	6.005E+12
Cs-135	3.4477E-06	22.16	44.32	0.00E+00	7.64E-05	1.53E-04	0.8500	8.409E+11
Cs-137	2.8731E+00	22.16	44.32	0.00E+00	6.37E+01	1.27E+02	1.2500	1.565E+11
Eu-154	8.2053E-02	22.16	44.32	0.00E+00	1.82E+00	3.64E+00	1.7500	6.561E+09
Eu-155	3.9134E-02	22.16	44.32	0.00E+00	8.67E-01	1.73E+00	2.2500	1.376E+10
Fe-55	6.7429E-03	22.16	44.32	0.00E+00	1.49E-01	2.99E-01	2.7500	7.917E+07
H-3	1.0599E-02	22.16	44.32	0.00E+00	2.35E-01	4.70E-01	3.5000	8.781E+06
I-129	7.5300E-07	22.16	44.32	0.00E+00	1.67E-05	3.34E-05	5.0000	4.043E+01
Kr-85	2.8595E-01	22.16	44.32	0.00E+00	6.34E+00	1.27E+01	7.0000	4.559E+00
Np-237	9.5479E-06	22.16	44.32	0.00E+00	2.12E-04	4.23E-04	11.0000	5.175E-01
Pa-231	8.9297E-10	22.16	44.32	0.00E+00	1.98E-08	3.96E-08		
Pb-210	3.7609E-12	22.16	44.32	0.00E+00	8.33E-11	1.67E-10		
Pm-147	2.5452E+00	22.16	44.32	0.00E+00	5.64E+01	1.13E+02		
Pu-238	2.0550E-02	22.16	44.32	0.00E+00	4.55E-01	9.11E-01		
Pu-239	4.2838E-04	22.16	44.32	0.00E+00	9.49E-03	1.90E-02		
Pu-240	2.4401E-04	22.16	44.32	0.00E+00	5.41E-03	1.08E-02		
Pu-241	6.8764E-02	22.16	44.32	0.00E+00	1.52E+00	3.05E+00		
Pu-242	3.6329E-07	22.16	44.32	0.00E+00	8.05E-06	1.61E-05		
Ra-226	3.8045E-11	22.16	44.32	0.00E+00	8.43E-10	1.69E-09		
Ra-228	2.9902E-15	22.16	44.32	0.00E+00	6.63E-14	1.33E-13		
Ru-106	1.9055E-01	22.16	44.32	0.00E+00	4.22E+00	8.45E+00		
Se-79	1.2936E-05	22.16	44.32	0.00E+00	2.87E-04	5.73E-04		
Sn-126	1.1574E-05	22.16	44.32	0.00E+00	2.56E-04	5.13E-04		
Sr-90	2.7505E+00	22.16	44.32	0.00E+00	6.10E+01	1.22E+02		
Tc-99	4.2239E-04	22.16	44.32	0.00E+00	9.36E-03	1.87E-02		
Th-229	1.8848E-12	22.16	44.32	0.00E+00	4.18E-11	8.35E-11		
Th-230	1.7042E-08	22.16	44.32	0.00E+00	3.78E-07	7.55E-07		
Th-232	7.8132E-15	22.16	44.32	0.00E+00	1.73E-13	3.46E-13		
Ti-208	4.4063E-08	22.16	44.32	0.00E+00	9.76E-07	1.95E-06		
U-232	1.3151E-07	22.16	44.32	0.00E+00	2.91E-06	5.83E-06		
U-233	1.9564E-09	22.16	44.32	0.00E+00	4.34E-08	8.67E-08		
U-234	1.8371E-04	22.16	44.32	0.00E+00	4.07E-03	8.14E-03		
U-235	2.7235E-06	22.16	0.00	9.78E-03	9.72E-03	9.78E-03		
U-236	1.5493E-05	22.16	44.32	0.00E+00	3.43E-04	6.87E-04		
U-238	4.2851E-09	22.16	0.00	6.13E-03	6.13E-03	6.13E-03		
Y-90	2.7505E+00	22.16	44.32	0.00E+00	6.10E+01	1.22E+02		
Other Radionuclides					1.14E+02	2.28E+02		

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used	Basis for Parameter Differences:
Reactor Moderator	LIGHT WATER	LIGHT WATER	This Template was used for the following reasons
Fuel Cladding	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 %	19.8630137	60 to 100	

Burnup Summary (MWd)³

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		22.16	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		44.32	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:	0.01		

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

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

Fuel Radionuclide Inventory Worksheet

I. Fuel and Template Information

Fuel Name ZPRL (UALX-LEU) TAIWAN
SNF ID # 554
Fuel Units & Descr 35 - ASSEMBLY
Heavy Metal Mass BOL=23.748kg EOL=23.348kg
ROD Storage Site: SRS

¹Fuel decay start date: 1997
Estimates as of 2030
Template ATR (Light Water Alum, 60 to 100% U)
²Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT)* 0.00116689
Template Decay Time 25 years

Estimated
Canister usage
18"x10"
0.97

II. Estimates	m	x _a	x _b	b	y _a	y _b	Gamma Sources	
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd) ²	Bounding Fuel Burnup (MWd) ²	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Photon Energy Group	Total Photons/sec (bounding)
Ac-227	1.1465E-09	377.86	755.72	0.00E+00	4.33E-07	8.66E-07	Avg MeV	
Am-241	2.3056E-03	377.86	755.72	0.00E+00	8.71E-01	1.74E+00	0.0150	7.072E+13
Am-242m	4.1476E-07	377.86	755.72	0.00E+00	1.57E-04	3.13E-04	0.0250	1.469E+13
Am-243	1.4894E-06	377.86	755.72	0.00E+00	5.63E-04	1.13E-03	0.0375	1.279E+13
C-14	5.7108E-09	377.86	755.72	0.00E+00	2.16E-06	4.32E-06	0.0575	1.374E+13
Cl-36	1.3124E-32	377.86	755.72	0.00E+00	4.96E-30	9.92E-30	0.0850	8.290E+12
Cm-243	1.4562E-07	377.86	755.72	0.00E+00	5.50E-05	1.10E-04	0.1250	5.552E+12
Cm-244	2.4221E-05	377.86	755.72	0.00E+00	9.15E-03	1.83E-02	0.2250	7.157E+12
Co-60	2.7560E-06	377.86	755.72	0.00E+00	1.04E-03	2.08E-03	0.3750	3.111E+12
Cs-134	5.8851E-04	377.86	755.72	0.00E+00	2.22E-01	4.45E-01	0.5750	5.101E+13
Cs-135	3.4477E-06	377.86	755.72	0.00E+00	1.30E-03	2.61E-03	0.8500	7.350E+11
Cs-137	1.8099E+00	377.86	755.72	0.00E+00	6.84E+02	1.37E+03	1.2500	4.088E+11
Eu-154	1.6386E-02	377.86	755.72	0.00E+00	6.19E+00	1.24E+01	1.7500	2.019E+10
Eu-155	2.3957E-03	377.86	755.72	0.00E+00	9.05E-01	1.81E+00	2.2500	1.439E+06
Fe-55	3.2707E-05	377.86	755.72	0.00E+00	1.24E-02	2.47E-02	2.7500	1.179E+06
H-3	3.4504E-03	377.86	755.72	0.00E+00	1.30E+00	2.61E+00	3.5000	9.236E+02
I-129	7.5300E-07	377.86	755.72	0.00E+00	2.85E-04	5.69E-04	5.0000	3.138E+02
Kr-85	7.8540E-02	377.86	755.72	0.00E+00	2.97E+01	5.94E+01	7.0000	3.461E+01
Np-237	9.5615E-06	377.86	755.72	0.00E+00	3.61E-03	7.23E-03	11.0000	3.877E+00
Pa-231	2.7968E-09	377.86	755.72	0.00E+00	1.06E-06	2.11E-06		
Pb-210	1.2612E-10	377.86	755.72	0.00E+00	4.77E-08	9.53E-08		
Pm-147	1.2952E-02	377.86	755.72	0.00E+00	4.89E+00	9.79E+00		
Pu-238	1.7549E-02	377.86	755.72	0.00E+00	6.63E+00	1.33E+01		
Pu-239	4.2810E-04	377.86	755.72	0.00E+00	1.62E-01	3.24E-01		
Pu-240	2.4357E-04	377.86	755.72	0.00E+00	9.20E-02	1.84E-01		
Pu-241	2.6277E-02	377.86	755.72	0.00E+00	9.93E+00	1.99E+01		
Pu-242	3.6329E-07	377.86	755.72	0.00E+00	1.37E-04	2.75E-04		
Ra-226	4.4444E-10	377.86	755.72	0.00E+00	1.68E-07	3.36E-07		
Ra-228	1.9714E-14	377.86	755.72	0.00E+00	7.45E-12	1.49E-11		
Ru-106	2.0477E-07	377.86	755.72	0.00E+00	7.74E-05	1.55E-04		
Se-79	1.2933E-05	377.86	755.72	0.00E+00	4.89E-03	9.77E-03		
Sn-126	1.1574E-05	377.86	755.72	0.00E+00	4.37E-03	8.75E-03		
Sr-90	1.7092E+00	377.86	755.72	0.00E+00	6.46E+02	1.29E+03		
Tc-99	4.2239E-04	377.86	755.72	0.00E+00	1.60E-01	3.19E-01		
Th-229	7.7260E-12	377.86	755.72	0.00E+00	2.92E-09	5.84E-09		
Th-230	5.8497E-08	377.86	755.72	0.00E+00	2.21E-05	4.42E-05		
Th-232	2.6906E-14	377.86	755.72	0.00E+00	1.02E-11	2.03E-11		
Ti-208	4.4336E-08	377.86	755.72	0.00E+00	1.68E-05	3.35E-05		
U-232	1.2037E-07	377.86	755.72	0.00E+00	4.55E-05	9.10E-05		
U-233	3.0011E-09	377.86	755.72	0.00E+00	1.13E-06	2.27E-06		
U-234	1.8497E-04	377.86	755.72	0.00E+00	6.99E-02	1.40E-01		
U-235	-2.7235E-06	377.86	0.00	1.01E-02	9.11E-03	1.01E-02		
U-236	1.5493E-05	377.86	755.72	0.00E+00	5.85E-03	1.17E-02		
U-238	-4.2851E-09	377.86	0.00	6.41E-03	6.40E-03	6.41E-03		
Y-90	1.7094E+00	377.86	755.72	0.00E+00	6.46E+02	1.29E+03		
Other Radonucleides					6.51E+02	1.30E+03		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.99E+00	1.60E+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 %	19.74998117	60 to 100	

Burnup Summary (MWd) ²			Basis for burnup used in estimate:
	From SFD	Estimated	
Nominal		377.86	Nominal burnup calculated from the heavy metal mass destroyed. Bounding burnup assumed to be twice nominal burnup
Bounding		755.72	

Checks			Estimated EOL HM/Given EOL HM
	Burnup Multiplier	Estimated Burnup/ Given Burnup	
Nominal	0.05		1.00
Bounding	0.10		

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

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

2030 Summary, Totals for all Spent Fuels

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon	Total
			Energy Group	Photons/sec (bounding)
Ac-227	2.96E+02	3.52E+02	Avg. MeV	
Am-241	2.81E+06	4.01E+06	0.0150	2.404E+18
Am-242m	6.08E+03	9.59E+03	0.0250	4.961E+17
Am-243	5.44E+03	8.47E+03	0.0375	4.459E+17
C-14	2.92E+04	3.85E+04	0.0575	5.107E+17
Cl-36	5.09E+02	6.82E+02	0.0850	2.801E+17
Cm-243	1.19E+03	2.12E+03	0.1250	2.005E+17
Cm-244	1.44E+05	2.52E+05	0.2250	2.407E+17
Co-60	4.51E+06	8.25E+06	0.3750	1.062E+17
Cs-134	6.41E+05	1.28E+06	0.5750	1.847E+18
Cs-135	4.00E+02	5.77E+02	0.8500	7.223E+16
Cs-137	2.98E+07	4.77E+07	1.2500	6.333E+17
Eu-154	3.97E+05	6.96E+05	1.7500	1.149E+15
Eu-155	9.86E+04	1.88E+05	2.2500	7.981E+14
Fe-55	2.04E+06	4.07E+06	2.7500	1.512E+15
H-3	1.18E+05	1.97E+05	3.5000	5.204E+11
I-129	2.23E+01	3.28E+01	5.0000	1.695E+09
Kr-85	9.96E+05	1.77E+06	7.0000	1.947E+08
Np-237	2.08E+02	3.22E+02	11.0000	2.233E+07
Pa-231	3.41E+02	4.08E+02		
Pb-210	8.57E-02	9.90E-02		
Pm-147	3.41E+06	6.82E+06		
Pu-238	8.20E+05	1.37E+06		
Pu-239	4.80E+05	5.86E+05		
Pu-240	3.50E+05	4.54E+05		
Pu-241	1.08E+07	2.33E+07		
Pu-242	4.96E+02	7.26E+02		
Ra-226	1.54E-01	1.78E-01		
Ra-228	1.39E+01	1.68E+01		
Ru-106	2.48E+05	4.97E+05		
Se-79	3.68E+02	5.32E+02		
Sn-126	3.88E+02	6.00E+02		
Sr-90	2.52E+07	4.04E+07		
Tc-99	9.53E+03	1.44E+04		
Th-229	2.33E+02	2.74E+02		
Th-230	8.32E+00	9.90E+00		
Th-232	8.04E+00	8.40E+00		
Ti-208	3.51E+04	4.29E+04		
U-232	9.52E+04	1.16E+05		
U-233	1.74E+04	2.16E+04		
U-234	1.01E+04	1.26E+04		
U-235	1.93E+02	2.66E+02		
U-236	2.83E+02	4.19E+02		
U-238	7.89E+02	8.00E+02		
Y-90	2.52E+07	4.04E+07		
Other Radionuclides	4.06E+07	6.38E+07		

Thermal Power	
Nominal Heat	
Output (Watts)	Bounding Heat Output (Watts)
5.92E+05	9.40E+05
Total	Total

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	1402.9	1446.1	165.3	27.0	162.4	403.0

Bare Fuel Transfers	
166	Assemblies

2030 Summary, Totals for 18" x 10' Canister

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg MeV	
Ac-227	3 31E+00	7 53E+00		
Am-241	1 40E+06	1 91E+06	0 0150	1.117E+18
Am-242m	2 51E+03	3 49E+03	0 0250	2.334E+17
Am-243	2 60E+03	3 61E+03	0 0375	2 087E+17
C-14	2.26E+04	2 91E+04	0 0575	2.396E+17
Cl-36	4 18E+02	5.42E+02	0 0850	1 321E+17
Cm-243	1.42E+02	2.21E+02	0.1250	1 017E+17
Cm-244	2.18E+04	3.29E+04	0.2250	1 131E+17
Co-60	9 36E+05	1 29E+06	0.3750	5 167E+16
Cs-134	6 16E+05	1 23E+06	0.5750	7.924E+17
Cs-135	9 74E+01	1 47E+02	0 8500	5.598E+16
Cs-137	1 07E+07	1 93E+07	1.2500	1.097E+17
Eu-154	2.29E+05	4 12E+05	1 7500	6 064E+14
Eu-155	6.25E+04	1.23E+05	2 2500	7.769E+14
Fe-55	4.73E+04	9.18E+04	2 7500	3 302E+13
H-3	4.30E+04	7.10E+04	3 5000	4 994E+11
I-129	5.20E+00	8.83E+00	5.0000	2 349E+08
Kr-85	5 60E+05	1 09E+06	7 0000	2 683E+07
Np-237	7 64E+01	1.29E+02	11 0000	3 066E+06
Pa-231	3 77E+00	8 57E+00		
Pb-210	1 65E-02	2 02E-02		
Pm-147	3 25E+06	6 50E+06		
Pu-238	2 57E+05	4 75E+05		
Pu-239	1.15E+05	1.31E+05		
Pu-240	6 08E+04	8 66E+04		
Pu-241	3.78E+06	1.04E+07		
Pu-242	1.51E+02	1.88E+02		
Ra-226	3 54E-02	4 36E-02		
Ra-228	2 19E-01	4 29E-01		
Ru-106	2 40E+05	4 80E+05		
Se-79	9 21E+01	1 54E+02		
Sn-126	8 62E+01	1 47E+02		
Sr-90	9 95E+06	1 80E+07		
Tc-99	2.98E+03	5 00E+03		
Th-229	2.60E+00	5.88E+00		
Th-230	2.32E+00	2 93E+00		
Th-232	5 98E-01	6 31E-01		
Ti-208	3 43E+02	8 12E+02		
U-232	9 30E+02	2 20E+03		
U-233	1 85E+03	1 96E+03	Thermal Power	
U-234	3 90E+03	5 19E+03	Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
U-235	1 09E+02	1 51E+02	2.21E+05	3.73E+05
U-236	1.11E+02	1.82E+02	Total	Total
U-238	2 69E+01	3.34E+01		
Y-90	9 96E+06	1 80E+07		
Other Radionuclides	1 99E+07	3 32E+07		

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	1402.9	0 0	0 0	0 0	0 0	0.0

Bare Fuel Transfers	
0	Assemblies

2030 Summary, Totals for 18" x 15' Canister

Radionuclide	Nominal Fuel Inventories(CI)	Bounding Fuel Inventories(CI)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.64E+02	2.78E+02	Avg. MeV	
Am-241	5.08E+05	7.93E+05	0.0150	7.232E+17
Am-242m	2.30E+03	4.16E+03	0.0250	1.478E+17
Am-243	1.31E+03	2.20E+03	0.0375	1.333E+17
C-14	3.97E+03	4.44E+03	0.0575	1.472E+17
Cl-36	5.00E+01	5.77E+01	0.0850	8.369E+16
Cm-243	6.71E+02	1.24E+03	0.1250	5.640E+16
Cm-244	6.42E+04	1.13E+05	0.2250	7.211E+16
Co-60	3.50E+06	6.82E+06	0.3750	3.067E+16
Cs-134	2.48E+04	4.72E+04	0.5750	5.807E+17
Cs-135	1.96E+02	2.76E+02	0.8500	1.083E+16
Cs-137	1.06E+07	1.55E+07	1.2500	5.103E+17
Eu-154	1.23E+05	2.06E+05	1.7500	3.646E+14
Eu-155	3.22E+04	5.88E+04	2.2500	2.104E+13
Fe-55	1.99E+06	3.97E+06	2.7500	1.146E+15
H-3	4.52E+04	7.29E+04	3.5000	1.920E+10
I-129	9.51E+00	1.30E+01	5.0000	7.482E+08
Kr-85	2.89E+05	4.40E+05	7.0000	8.606E+07
Np-237	5.40E+01	8.29E+01	11.0000	9.874E+06
Pa-231	3.01E+02	3.18E+02		
Pb-210	6.33E-02	6.60E-02		
Pm-147	1.59E+05	3.09E+05		
Pu-238	3.19E+05	5.10E+05		
Pu-239	1.93E+05	2.44E+05		
Pu-240	1.42E+05	1.80E+05		
Pu-241	4.55E+06	7.41E+06		
Pu-242	1.38E+02	2.34E+02		
Ra-226	1.08E-01	1.12E-01		
Ra-228	1.23E+01	1.32E+01		
Ru-106	8.39E+03	1.68E+04		
Se-79	1.71E+02	2.20E+02		
Sn-126	2.25E+02	3.14E+02		
Sr-90	8.90E+06	1.25E+07		
Tc-99	3.34E+03	4.73E+03		
Th-229	2.11E+02	2.24E+02		
Th-230	5.28E+00	5.55E+00		
Th-232	3.48E+00	3.77E+00		
Ti-208	3.07E+04	3.26E+04		
U-232	8.31E+04	8.84E+04		
U-233	3.18E+03	6.22E+03		
U-234	5.18E+03	5.52E+03		
U-235	2.20E+01	3.15E+01		
U-236	7.84E+01	1.06E+02		
U-238	4.20E+01	4.30E+01		
Y-90	8.90E+06	1.25E+07		
Other Radionuclides	1.18E+07	1.68E+07		

Thermal Power	
Nominal Heat	
Output (Watts)	Bounding Heat Output (Watts)
2.31E+05	3.56E+05
Total	Total

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	00	1446.1	00	00	00	00

Bare Fuel Transfers	
0	Assemblies

2030 Summary, Totals for 24" x 10' Canister

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg. MeV	
Ac-227	1.95E-03	3.89E-03		
Am-241	2.45E+03	4.90E+03	0.0150	1.428E+17
Am-242m	3.84E-01	7.68E-01	0.0250	2.965E+16
Am-243	1.44E+00	2.88E+00	0.0375	2.577E+16
C-14	5.53E-03	1.11E-02	0.0575	2.774E+16
Cl-36	1.27E-26	2.54E-26	0.0850	1.671E+16
Cm-243	1.11E-01	2.21E-01	0.1250	1.104E+16
Cm-244	1.60E+01	3.20E+01	0.2250	1.443E+16
Co-60	7.18E-01	1.44E+00	0.3750	6.278E+15
Cs-134	1.98E+01	3.97E+01	0.5750	1.037E+17
Cs-135	3.34E+00	6.68E+00	0.8500	1.267E+15
Cs-137	1.39E+06	2.79E+06	1.2500	6.129E+14
Eu-154	7.10E+03	1.42E+04	1.7500	3.450E+13
Eu-155	5.74E+02	1.15E+03	2.2500	2.884E+09
Fe-55	2.21E+00	4.42E+00	2.7500	2.753E+09
H-3	1.91E+03	3.82E+03	3.5000	1.595E+06
I-129	7.30E-01	1.46E+00	5.0000	6.518E+05
Kr-85	3.99E+04	7.98E+04	7.0000	7.132E+04
Np-237	9.28E+00	1.86E+01	11.0000	7.952E+03
Pa-231	3.82E-03	7.63E-03		
Pb-210	3.21E-04	6.42E-04		
Pm-147	8.96E+02	1.79E+03		
Pu-238	1.57E+04	3.14E+04		
Pu-239	4.15E+02	8.30E+02		
Pu-240	2.36E+02	4.72E+02		
Pu-241	1.57E+04	3.15E+04		
Pu-242	3.52E-01	7.04E-01		
Ra-226	8.74E-04	1.75E-03		
Ra-228	3.01E-08	6.01E-08		
Ru-106	2.06E-04	4.12E-04		
Se-79	1.25E+01	2.51E+01		
Sn-126	1.12E+01	2.24E+01		
Sr-90	1.31E+06	2.61E+06		
Tc-99	4.09E+02	8.19E+02		
Th-229	1.20E-05	2.41E-05		
Th-230	8.09E-02	1.62E-01		
Th-232	3.72E-08	7.44E-08		
Ti-208	3.92E-02	7.84E-02		
U-232	1.06E-01	2.12E-01		
U-233	3.52E-03	7.03E-03	Thermal Power	
U-234	1.80E+02	3.60E+02	Nominal Heat	
U-235	4.64E+00	7.28E+00	Output (Watts)	Bounding Heat Output (Watts)
U-236	1.50E+01	3.00E+01	1.62E+04	3.24E+04
U-238	8.14E-02	8.55E-02	Total	Total
Y-90	1.31E+06	2.61E+06		
Other Radionuclides	1.33E+06	2.65E+06		

Total Canister Usage Summary

	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	0.0	0.0	165.3	0.0	0.0	0.0

Bare Fuel Transfers

0 Assemblies

2030 Summary, Totals for 24" x 15' Canister

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg. MeV	
Ac-227	2.74E+01	4.84E+01		
Am-241	6.85E+01	1.21E+02	0.0150	4.104E+16
Am-242m	4.17E-01	7.37E-01	0.0250	8.451E+15
Am-243	8.77E-02	1.55E-01	0.0375	7.223E+15
C-14	2.60E+01	4.60E+01	0.0575	7.895E+15
Cl-36	5.10E-01	9.01E-01	0.0850	5.043E+15
Cm-243	8.61E-02	1.52E-01	0.1250	3.160E+15
Cm-244	3.98E+00	7.04E+00	0.2250	4.522E+15
Co-60	2.46E+02	4.35E+02	0.3750	1.816E+15
Cs-134	7.21E+00	1.27E+01	0.5750	2.773E+16
Cs-135	8.06E+00	1.42E+01	0.8500	4.955E+14
Cs-137	4.16E+05	7.35E+05	1.2500	2.189E+14
Eu-154	2.42E+03	4.28E+03	1.7500	3.413E+13
Eu-155	1.86E+02	3.29E+02	2.2500	9.919E+08
Fe-55	6.48E-01	1.14E+00	2.7500	2.439E+14
H-3	5.99E+02	1.06E+03	3.5000	9.483E+05
I-129	4.46E-01	7.89E-01	5.0000	2.968E+05
Kr-85	1.76E+04	3.12E+04	7.0000	2.163E+04
Np-237	3.55E-02	6.28E-02	11.0000	1.648E+03
Pa-231	3.38E+01	5.98E+01		
Pb-210	4.01E-03	7.09E-03		
Pm-147	7.38E+01	1.30E+02		
Pu-238	1.20E+02	2.11E+02		
Pu-239	7.75E+00	1.37E+01		
Pu-240	4.56E+00	8.05E+00		
Pu-241	4.14E+02	7.31E+02		
Pu-242	1.15E-02	2.03E-02		
Ra-226	6.03E-03	1.07E-02		
Ra-228	1.30E+00	2.30E+00		
Ru-106	1.13E-05	2.00E-05		
Se-79	9.97E+00	1.76E+01		
Sn-126	1.12E+01	1.98E+01		
Sr-90	4.20E+05	7.43E+05		
Tc-99	9.16E+01	1.62E+02		
Th-229	1.82E+01	3.21E+01		
Th-230	3.22E-01	5.69E-01		
Th-232	3.60E+00	3.62E+00		
Ti-208	3.93E+03	6.95E+03		
U-232	1.06E+04	1.88E+04		
U-233	1.12E+04	1.22E+04		
U-234	2.30E+02	4.07E+02		
U-235	1.88E-02	3.13E-02		
U-236	3.74E-02	6.60E-02		
U-238	1.51E-03	1.59E-03		
Y-90	4.20E+05	7.43E+05		
Other Radionuclides	4.70E+05	8.30E+05		

Total Canister Usage Summary						
	18" x 10"	18" x 15"	24" x 10"	24" x 15"	HIC	MCO
Number of Canisters	0.0	0.0	0.0	27.0	0.0	0.0
Bare Fuel Transfers						
	0	Assemblies				

2030 Summary, Totals for High Integrity Canister (HIC)

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon	Total
			Energy Group	Photons/sec (bounding)
Ac-227	1.18E+00	1.75E+01	Avg. MeV	
Am-241	3.26E+04	3.68E+04	0.0150	3.328E+16
Am-242m	3.15E+02	3.23E+02	0.0250	6.815E+15
Am-243	8.98E+01	1.08E+02	0.0375	6.252E+15
C-14	2.40E+01	4.10E+01	0.0575	6.814E+15
Cl-36	3.43E-01	6.73E-01	0.0850	3.919E+15
Cm-243	7.92E+01	8.55E+01	0.1250	2.554E+15
Cm-244	4.62E+03	5.76E+03	0.2250	3.410E+15
Co-60	2.09E+03	3.24E+03	0.3750	1.427E+15
Cs-134	2.36E+02	3.09E+02	0.5750	2.899E+16
Cs-135	1.42E+01	1.95E+01	0.8500	3.842E+14
Cs-137	4.93E+05	7.80E+05	1.2500	4.276E+14
Eu-154	3.69E+03	5.56E+03	1.7500	1.791E+13
Eu-155	1.79E+03	1.95E+03	2.2500	1.551E+11
Fe-55	6.21E+02	1.20E+03	2.7500	8.829E+13
H-3	2.65E+03	3.47E+03	3.5000	2.316E+08
I-129	4.44E-01	7.40E-01	5.0000	3.757E+07
Kr-85	1.05E+04	2.18E+04	7.0000	4.322E+06
Np-237	2.13E+00	2.52E+00	11.0000	4.959E+05
Pa-231	1.46E+00	2.17E+01		
Pb-210	1.86E-04	2.58E-03		
Pm-147	3.37E+03	4.98E+03		
Pu-238	9.29E+03	1.15E+04		
Pu-239	3.16E+03	8.30E+03		
Pu-240	7.15E+03	7.60E+03		
Pu-241	7.96E+04	2.10E+05		
Pu-242	8.83E+00	1.07E+01		
Ra-226	2.96E-04	3.91E-03		
Ra-228	5.55E-02	8.33E-01		
Ru-106	6.98E+01	1.38E+02		
Se-79	5.17E+00	1.15E+01		
Sn-126	1.36E+01	2.10E+01		
Sr-90	3.07E+05	5.84E+05		
Tc-99	1.59E+02	2.26E+02		
Th-229	7.74E-01	1.16E+01		
Th-230	1.70E-02	2.10E-01		
Th-232	3.55E-01	3.56E-01		
Tl-208	1.67E+02	2.51E+03		
U-232	4.53E+02	6.81E+03		
U-233	1.16E+03	1.20E+03		
U-234	1.70E+01	1.56E+02		
U-235	1.77E-01	3.83E-01		
U-236	2.40E+00	2.67E+00		
U-238	4.32E-01	4.95E-01		
Y-90	3.07E+05	5.84E+05		
Other Radionuclides	4.96E+05	8.14E+05		

Thermal Power

Nominal Heat	
Output (Watts)	Bounding Heat Output (Watts)
6.56E+03	1.19E+04
Total	Total

Total Canister Usage Summary

	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	0.0	0.0	0.0	0.0	162.4	0.0

Bare Fuel Transfers

0 Assemblies

2030 Summary, Totals for MCO

Radionuclide	Nominal Fuel Inventories(CI)	Bounding Fuel Inventories(CI)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
Ac-227	4.89E-03	5.94E-03	Avg. MeV	
Am-241	5.66E+05	6.96E+05	0.0150	2.296E+17
Am-242m	3.93E+02	5.45E+02	0.0250	4.657E+16
Am-243	5.05E+02	8.07E+02	0.0375	4.304E+16
C-14	4.86E+02	5.68E+02	0.0575	5.228E+16
Cl-36	3.48E-01	6.96E-01	0.0850	2.573E+16
Cm-243	7.56E+01	1.51E+02	0.1250	1.687E+16
Cm-244	1.33E+04	2.54E+04	0.2250	2.203E+16
Co-60	1.99E+02	3.60E+02	0.3750	9.543E+15
Cs-134	5.73E-01	7.47E-01	0.5750	2.105E+17
Cs-135	5.73E+01	7.02E+01	0.8500	1.836E+15
Cs-137	4.71E+06	5.70E+06	1.2500	8.630E+14
Eu-154	1.27E+04	1.66E+04	1.7500	4.947E+13
Eu-155	2.75E+02	3.93E+02	2.2500	5.404E+09
Fe-55	6.11E-01	9.90E-01	2.7500	5.126E+09
H-3	8.48E+03	1.30E+04	3.5000	4.631E+08
I-129	4.78E+00	5.78E+00	5.0000	1.973E+08
Kr-85	5.60E+04	6.74E+04	7.0000	2.263E+07
Np-237	5.09E+01	6.21E+01	11.0000	2.593E+06
Pa-231	1.04E-02	1.23E-02		
Pb-210	4.57E-04	5.81E-04		
Pm-147	6.06E+01	7.12E+01		
Pu-238	1.19E+05	1.59E+05		
Pu-239	1.51E+05	1.75E+05		
Pu-240	1.22E+05	1.44E+05		
Pu-241	1.69E+06	2.08E+06		
Pu-242	1.01E+02	1.39E+02		
Ra-226	1.34E-03	1.66E-03		
Ra-228	2.40E-06	4.71E-06		
Ru-106	1.08E-07	1.30E-07		
Se-79	6.06E+01	7.32E+01		
Sn-126	1.09E+01	2.19E+01		
Sr-90	3.29E+06	3.96E+06		
Tc-99	2.02E+03	2.43E+03		
Th-229	8.36E-05	1.53E-04		
Th-230	1.40E-01	1.69E-01		
Th-232	2.43E-06	4.74E-06		
Ti-208	6.56E-02	1.31E-01		
U-232	1.78E-01	3.56E-01		
U-233	1.92E-02	3.14E-02		
U-234	3.59E+02	4.26E+02		
U-235	4.57E+01	5.25E+01		
U-236	6.39E+01	7.51E+01		
U-238	7.03E+02	7.05E+02		
Y-90	3.29E+06	3.96E+06		
Other Radionuclides	4.54E+06	5.49E+06		

Total Canister Usage Summary						
	18" x 10"	18" x 15"	24" x 10"	24" x 15"	HIC	MCO
Number of Canisters	0.0	0.0	0.0	0.0	0.0	403.0

Bare Fuel Transfers	
0	Assemblies

2030 Summary, Totals for Bare Fuel Transfers

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg MeV	
Ac-227	4.49E-02	8.96E-02		
Am-241	3.00E+05	5.72E+05	0.0150	1.173E+17
Am-242m	5.58E+02	1.07E+03	0.0250	2.344E+16
Am-243	9.29E+02	1.74E+03	0.0375	2.162E+16
C-14	2.13E+03	4.26E+03	0.0575	2.920E+16
Cl-36	4.02E+01	8.03E+01	0.0850	1.287E+16
Cm-243	2.27E+02	4.21E+02	0.1250	8.849E+15
Cm-244	4.02E+04	7.53E+04	0.2250	1.104E+16
Co-60	6.88E+04	1.38E+05	0.3750	4.764E+15
Cs-134	1.91E+01	3.82E+01	0.5750	1.031E+17
Cs-135	2.29E+01	4.32E+01	0.8500	1.435E+15
Cs-137	1.49E+06	2.79E+06	1.2500	1.117E+16
Eu-154	1.93E+04	3.75E+04	1.7500	4.170E+13
Eu-155	1.10E+03	2.15E+03	2.2500	5.828E+10
Fe-55	1.14E+02	2.27E+02	2.7500	1.040E+11
H-3	1.66E+04	3.15E+04	3.5000	1.114E+09
I-129	1.21E+00	2.24E+00	5.0000	4.758E+08
Kr-85	2.34E+04	4.48E+04	7.0000	5.480E+07
Np-237	1.49E+01	2.75E+01	11.0000	6.291E+06
Pa-231	5.17E-02	1.03E-01		
Pb-210	9.51E-04	1.87E-03		
Pm-147	1.80E+02	3.59E+02		
Pu-238	9.96E+04	1.80E+05		
Pu-239	1.70E+04	2.77E+04		
Pu-240	1.78E+04	3.59E+04		
Pu-241	6.70E+05	3.15E+06		
Pu-242	9.65E+01	1.53E+02		
Ra-226	2.18E-03	4.29E-03		
Ra-228	1.04E-02	2.07E-02		
Ru-106	2.85E-04	5.71E-04		
Se-79	1.63E+01	3.03E+01		
Sn-126	2.92E+01	5.36E+01		
Sr-90	1.05E+06	1.97E+06		
Tc-99	5.31E+02	9.87E+02		
Th-229	3.91E-02	7.81E-02		
Th-230	1.57E-01	3.08E-01		
Th-232	1.04E-02	2.08E-02		
Ti-208	1.47E+00	2.92E+00		
U-232	3.99E+00	7.91E+00		
U-233	6.25E+00	1.25E+01		
U-234	2.74E+02	5.38E+02		
U-235	1.17E+01	2.31E+01		
U-236	1.21E+01	2.28E+01		
U-238	1.62E+01	1.85E+01		
Y-90	1.05E+06	1.97E+06		
Other Radionuclides	2.07E+06	3.96E+06		

Thermal Power	
Nominal Heat	
Output (Watts)	Bounding Heat Output (Watts)
3.16E+04	5.95E+04
Total	Total

Total Canister Usage Summary					
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	MCO
Number of Canisters	0.0	0.0	0.0	0.0	0.0

Bare Fuel Transfers		BWR	PWR
166	Assemblies	87	79

2030 Summary, TSPA Category 2: Pu/U Alloy

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
				Avg. MeV
Ac-227	1.81E-02	3.13E-02		
Am-241	1.73E+04	1.96E+04	0.0150	3.010E+16
Am-242m	5.98E+00	1.00E+01	0.0250	6.220E+15
Am-243	1.53E+01	1.98E+01	0.0375	5.474E+15
C-14	7.45E+02	7.80E+02	0.0575	6.050E+15
Cl-36	6.31E-01	1.26E+00	0.0850	3.490E+15
Cm-243	2.69E-01	3.84E-01	0.1250	2.267E+15
Cm-244	1.67E+01	3.14E+01	0.2250	3.003E+15
Co-60	9.63E+02	1.14E+03	0.3750	1.308E+15
Cs-134	5.65E-04	9.21E-04	0.5750	2.337E+16
Cs-135	9.06E+00	1.31E+01	0.8500	2.216E+14
Cs-137	5.41E+05	6.29E+05	1.2500	1.631E+14
Eu-154	4.18E+02	4.54E+02	1.7500	5.728E+12
Eu-155	2.14E+01	3.68E+01	2.2500	1.055E+09
Fe-55	6.22E-02	1.12E-01	2.7500	2.070E+09
H-3	2.94E+03	3.08E+03	3.5000	3.849E+06
I-129	5.77E-01	6.80E-01	5.0000	1.613E+06
Kr-85	4.78E+03	6.08E+03	7.0000	1.812E+05
Np-237	4.02E+00	4.36E+00	11.0000	2.054E+04
Pa-231	2.91E-02	5.13E-02		
Pb-210	9.33E-03	9.35E-03		
Pm-147	2.14E+00	4.06E+00		
Pu-238	3.86E+03	4.52E+03		
Pu-239	1.37E+04	1.55E+04		
Pu-240	5.35E+03	5.44E+03		
Pu-241	2.50E+04	2.81E+04		
Pu-242	1.96E+00	2.63E+00		
Ra-226	1.88E-02	1.88E-02		
Ra-228	9.21E-04	1.09E-03		
Ru-106	8.92E-10	1.78E-09		
Se-79	9.42E+00	1.09E+01		
Sn-126	1.09E+01	1.43E+01		
Sr-90	4.68E+05	5.44E+05		
Tc-99	3.20E+02	3.62E+02		
Th-229	5.14E-03	5.91E-03		
Th-230	1.08E+00	1.09E+00		
Th-232	2.34E-03	2.34E-03		
Tl-208	4.04E-02	5.88E-02		
U-232	1.09E-01	1.58E-01		
U-233	6.80E-01	7.79E-01		
U-234	1.49E+03	1.49E+03		
U-235	2.21E+00	2.72E+00		
U-236	1.80E+01	1.92E+01		
U-238	1.36E+00	1.49E+00		
Y-90	4.68E+05	5.45E+05		
Other Radionuclides	5.31E+05	6.29E+05		

Total Canister Usage Summary						
	18" x 10"	18" x 15"	24" x 10"	24" x 15"	HIC	MCO
Number of Canisters	8.0	7.7	0.0	0.0	5.0	0.0

Bare Fuel Transfers	
0	Assemblies

2030 Summary, TSPA Category 3: U/Pu Carbide

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg MeV	
Ac-227	1.99E-03	3.98E-03	0.0150	2.713E+16
Am-241	1.08E+04	2.13E+04	0.0250	5.306E+15
Am-242m	5.94E+01	1.17E+02	0.0375	4.631E+15
Am-243	3.81E+01	7.62E+01	0.0575	4.516E+15
C-14	2.76E+02	5.53E+02	0.0850	2.451E+15
Cl-36	5.20E+00	1.04E+01	0.1250	2.599E+15
Cm-243	7.36E+00	1.44E+01	0.2250	1.657E+15
Cm-244	1.22E+03	2.44E+03	0.3750	7.841E+14
Co-60	3.31E+06	6.62E+06	0.5750	1.035E+16
Cs-134	1.85E+04	3.71E+04	0.8500	2.584E+15
Cs-135	1.38E+00	2.73E+00	1.2500	4.911E+17
Cs-137	1.07E+05	2.13E+05	1.7500	4.464E+13
Eu-154	3.20E+04	6.40E+04	2.2500	2.094E+13
Eu-155	1.05E+04	2.10E+04	2.7500	1.747E+11
Fe-55	1.99E+06	3.97E+06	3.5000	1.744E+10
H-3	3.01E+03	6.02E+03	5.0000	1.582E+07
I-129	3.45E-02	6.79E-02	7.0000	1.820E+06
Kr-85	9.70E+03	1.94E+04	11.0000	2.089E+05
Np-237	3.86E-01	7.68E-01		
Pa-231	6.51E-03	1.30E-02		
Pb-210	7.41E-07	1.48E-06		
Pm-147	1.06E+05	2.12E+05		
Pu-238	8.71E+03	1.74E+04		
Pu-239	1.91E+03	3.14E+03		
Pu-240	1.47E+03	2.28E+03		
Pu-241	4.88E+05	9.68E+05		
Pu-242	5.85E+00	1.15E+01		
Ra-226	6.94E-06	1.39E-05		
Ra-228	1.01E-03	2.03E-03		
Ru-106	8.37E+03	1.67E+04		
Se-79	5.18E-01	1.03E+00		
Sn-126	7.32E-01	1.43E+00		
Sr-90	9.60E+04	1.92E+05		
Tc-99	1.86E+01	3.68E+01		
Th-229	9.55E-04	1.91E-03		
Th-230	2.89E-03	5.79E-03		
Th-232	1.37E-03	2.74E-03		
Ti-208	2.54E-01	5.08E-01		
U-232	7.31E-01	1.46E+00	Thermal Power	
U-233	8.23E-01	1.65E+00	Nominal Heat	
U-234	2.91E+01	5.83E+01	Output (Watts)	Bounding Heat Output (Watts)
U-235	1.55E+00	2.86E+00	5.67E+04	1.13E+05
U-236	5.36E-01	1.07E+00	Total	Total
U-238	2.84E-01	5.49E-01		
Y-90	9.61E+04	1.92E+05		
Other Radionuclides	2.99E+05	5.97E+05		

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	12	82	00	00	00	00

Bare Fuel Transfers	
0	Assemblies

2030 Summary, TSPA Category 4: MOX

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
Ac-227	2.31E-01	4.03E-01	Avg. MeV	
Am-241	9.30E+05	1.61E+06	0.0150	2.002E+17
Am-242m	3.37E+03	5.96E+03	0.0250	3.932E+16
Am-243	1.61E+03	2.81E+03	0.0375	3.694E+16
C-14	1.12E+04	1.95E+04	0.0575	5.717E+16
Cl-36	2.12E+02	3.68E+02	0.0850	2.129E+16
Cm-243	4.55E+02	8.16E+02	0.1250	1.515E+16
Cm-244	1.12E+04	1.90E+04	0.2250	1.806E+16
Co-60	6.53E+05	9.29E+05	0.3750	7.811E+15
Cs-134	1.47E+03	2.70E+03	0.5750	1.825E+17
Cs-135	8.79E+01	1.55E+02	0.8500	3.112E+15
Cs-137	2.82E+06	4.94E+06	1.2500	7.112E+16
Eu-154	6.04E+04	9.89E+04	1.7500	8.998E+13
Eu-155	1.45E+04	2.60E+04	2.2500	3.701E+11
Fe-55	4.28E+03	5.03E+03	2.7500	4.641E+11
H-3	1.50E+04	2.52E+04	3.5000	4.173E+08
I-129	2.26E+00	4.00E+00	5.0000	1.652E+08
Kr-85	5.21E+04	8.96E+04	7.0000	1.883E+07
Np-237	1.88E+01	3.30E+01	11.0000	2.150E+06
Pa-231	2.66E-01	4.62E-01		
Pb-210	4.11E-03	7.33E-03		
Pm-147	1.50E+04	2.74E+04		
Pu-238	1.51E+05	2.51E+05		
Pu-239	1.73E+05	2.12E+05		
Pu-240	1.27E+05	1.65E+05		
Pu-241	4.56E+06	1.32E+07		
Pu-242	1.76E+02	1.96E+02		
Ra-226	9.46E-03	1.68E-02		
Ra-228	5.57E-02	9.68E-02		
Ru-106	1.42E+01	2.61E+01		
Se-79	2.78E+01	4.88E+01		
Sn-126	5.89E+01	1.05E+02		
Sr-90	1.84E+06	3.18E+06		
Tc-99	1.02E+03	1.79E+03		
Th-229	2.03E-01	3.57E-01		
Th-230	6.84E-01	1.20E+00		
Th-232	5.58E-02	9.69E-02		
Ti-208	7.62E+00	1.32E+01		
U-232	2.06E+01	3.56E+01		
U-233	3.35E+01	5.81E+01		
U-234	1.19E+03	2.07E+03		
U-235	5.40E+01	9.33E+01		
U-236	2.19E+01	3.81E+01		
U-238	1.34E+01	2.15E+01		
Y-90	1.84E+06	3.18E+06		
Other Radionuclides	6.26E+06	1.09E+07		

Thermal Power	
Nominal Heat	
Output (Watts)	Bounding Heat Output (Watts)
8.41E+04	1.38E+05
Total	Total

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	13.3	127.5	0.0	0.0	4.0	0.0

Bare Fuel Transfers	
3	Assemblies

2030 Summary, TSPA Category 5: U/Th Carbide

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg MeV	
Ac-227	3.56E+00	5.21E+00		
Am-241	2.83E+03	4.11E+03	0.0150	7.885E+16
Am-242m	2.10E+00	3.01E+00	0.0250	1.613E+16
Am-243	4.11E+01	5.96E+01	0.0375	1.404E+16
C-14	2.06E+01	2.99E+01	0.0575	1.513E+16
Cl-36	9.53E-01	1.38E+00	0.0850	9.130E+15
Cm-243	2.04E+01	2.84E+01	0.1250	6.105E+15
Cm-244	4.95E+03	6.73E+03	0.2250	7.915E+15
Co-60	2.91E+02	3.61E+02	0.3750	3.424E+15
Cs-134	2.32E+01	2.78E+01	0.5750	5.580E+16
Cs-135	2.21E+01	3.20E+01	0.8500	8.157E+14
Cs-137	1.07E+06	1.50E+06	1.2500	4.853E+14
Eu-154	1.09E+04	1.40E+04	1.7500	2.499E+13
Eu-155	6.68E+02	8.26E+02	2.2500	1.914E+09
Fe-55	2.74E-02	3.29E-02	2.7500	2.545E+13
H-3	2.85E+03	3.79E+03	3.5000	1.063E+08
I-129	9.01E-01	1.31E+00	5.0000	4.529E+07
Kr-85	2.83E+04	3.71E+04	7.0000	5.201E+06
Np-237	1.12E+01	1.62E+01	11.0000	5.962E+05
Pa-231	4.23E+00	6.13E+00		
Pb-210	1.49E-03	2.28E-03		
Pm-147	9.28E+01	1.11E+02		
Pu-238	1.40E+05	2.00E+05		
Pu-239	1.21E+02	1.76E+02		
Pu-240	2.44E+02	3.54E+02		
Pu-241	1.44E+04	1.94E+04		
Pu-242	3.47E+00	5.03E+00		
Ra-226	2.88E-03	4.38E-03		
Ra-228	8.20E-01	1.19E+00		
Ru-106	2.39E-05	3.06E-05		
Se-79	1.88E+01	2.73E+01		
Sn-126	1.98E+01	2.87E+01		
Sr-90	1.02E+06	1.42E+06		
Tc-99	2.98E+02	4.31E+02		
Th-229	1.03E+01	1.54E+01		
Th-230	1.80E-01	2.67E-01		
Th-232	2.64E+00	2.70E+00		
Ti-208	5.09E+02	7.25E+02		
U-232	1.38E+03	1.96E+03		
U-233	1.84E+03	2.67E+03	Thermal Power	
U-234	2.60E+02	3.78E+02	Nominal Heat	
U-235	3.85E+00	5.40E+00	Output (Watts)	Bounding Heat Output (Watts)
U-236	7.71E+00	1.12E+01	1.75E+04	2.45E+04
U-238	4.87E-02	5.37E-02	Total	Total
Y-90	1.02E+06	1.42E+06		
Other Radionuclides	1.03E+06	1.44E+06		

Total Canister Usage Summary

	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	00	567.2	00	00	10	00

Bare Fuel Transfers

0 Assemblies

2030 Summary, TSPA Category 6: U/Th Oxide

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
				Avg. MeV
Ac-227	2.92E+02	3.46E+02	0.0150	2.244E+17
Am-241	2.66E+04	5.27E+04	0.0250	4.609E+16
Am-242m	5.57E+01	1.08E+02	0.0375	3.941E+16
Am-243	5.10E+01	1.01E+02	0.0575	4.371E+16
C-14	6.29E+02	1.05E+03	0.0850	2.763E+16
Cl-36	1.21E+01	2.01E+01	0.1250	1.718E+16
Cm-243	3.30E+00	6.12E+00	0.2250	2.486E+16
Cm-244	5.43E+02	1.07E+03	0.3750	9.899E+15
Co-60	8.69E+04	1.74E+05	0.5750	1.523E+17
Cs-134	1.29E+01	2.70E+01	0.8500	2.757E+15
Cs-135	8.14E+01	9.84E+01	1.2500	1.385E+16
Cs-137	3.18E+06	4.03E+06	1.7500	2.002E+14
Eu-154	1.37E+04	2.20E+04	2.2500	7.261E+10
Eu-155	6.99E+02	1.25E+03	2.7500	1.481E+15
Fe-55	9.01E+02	1.80E+03	3.5000	2.263E+07
H-3	3.85E+03	5.71E+03	5.0000	9.005E+06
I-129	4.46E+00	5.36E+00	7.0000	9.599E+05
Kr-85	8.57E+04	1.20E+05	11.0000	1.051E+05
Np-237	8.37E-01	1.39E+00		
Pa-231	3.36E+02	4.01E+02		
Pb-210	4.97E-02	5.77E-02		
Pm-147	1.81E+02	3.66E+02		
Pu-238	1.02E+04	1.96E+04		
Pu-239	1.36E+03	2.65E+03		
Pu-240	9.44E+02	1.85E+03		
Pu-241	1.52E+05	3.02E+05		
Pu-242	7.66E+00	1.52E+01		
Ra-226	7.79E-02	9.01E-02		
Ra-228	1.30E+01	1.55E+01		
Ru-106	2.65E-03	5.29E-03		
Se-79	9.96E+01	1.19E+02		
Sn-126	1.12E+02	1.34E+02		
Sr-90	3.18E+06	4.04E+06		
Tc-99	9.30E+02	1.13E+03		
Th-229	2.22E+02	2.58E+02		
Th-230	3.47E+00	4.12E+00		
Th-232	5.34E+00	5.59E+00		
Ti-208	3.46E+04	4.22E+04		
U-232	9.38E+04	1.14E+05		
U-233	1.55E+04	1.88E+04		
U-234	2.32E+03	2.81E+03		
U-235	1.94E+00	3.73E+00		
U-236	1.09E+00	1.89E+00		
U-238	3.58E-01	7.14E-01		
Y-90	3.18E+06	4.04E+06		
Other Radionuclides	3.81E+06	4.89E+06		

Thermal Power	
Nominal Heat	
Output (Watts)	Bounding Heat Output (Watts)
6.32E+04	8.10E+04
Total	Total

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	11.8	17.0	0.0	27.0	8.0	0.0

Bare Fuel Transfers	
0	Assemblies

2030 Summary, TSPA Category 7: U-Metal

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg MeV	
Ac-227	1.77E-02	1.84E-02		
Am-241	5.41E+05	6.16E+05	0.0150	2.262E+17
Am-242m	3.03E+02	3.56E+02	0.0250	4.602E+16
Am-243	2.80E+02	3.49E+02	0.0375	4.221E+16
C-14	2.89E+03	2.96E+03	0.0575	5.074E+16
Cl-36	3.72E+01	3.73E+01	0.0850	2.547E+16
Cm-243	1.21E+01	2.29E+01	0.1250	1.665E+16
Cm-244	3.11E+03	4.98E+03	0.2250	2.182E+16
Co-60	1.02E+04	1.02E+04	0.3750	9.461E+15
Cs-134	6.25E-01	7.02E-01	0.5750	2.028E+17
Cs-135	6.05E+01	6.81E+01	0.8500	1.754E+15
Cs-137	4.86E+06	5.49E+06	1.2500	1.507E+15
Eu-154	1.08E+04	1.25E+04	1.7500	4.675E+13
Eu-155	3.43E+02	3.80E+02	2.2500	8.650E+09
Fe-55	9.32E+00	9.40E+00	2.7500	1.757E+09
H-3	8.12E+03	9.27E+03	3.5000	1.619E+08
I-129	4.94E+00	5.57E+00	5.0000	6.854E+07
Kr-85	5.92E+04	6.66E+04	7.0000	7.795E+06
Np-237	5.12E+01	5.80E+01	11.0000	8.894E+05
Pa-231	3.36E-02	3.50E-02		
Pb-210	7.68E-03	7.74E-03		
Pm-147	1.85E+02	1.93E+02		
Pu-238	9.92E+04	1.15E+05		
Pu-239	1.62E+05	1.82E+05		
Pu-240	1.22E+05	1.38E+05		
Pu-241	1.57E+06	1.80E+06		
Pu-242	8.01E+01	9.37E+01		
Ra-226	1.59E-02	1.61E-02		
Ra-228	5.20E-04	5.20E-04		
Ru-106	3.16E-05	3.16E-05		
Se-79	6.56E+01	7.36E+01		
Sn-126	1.20E+01	1.35E+01		
Sr-90	3.50E+06	3.93E+06		
Tc-99	2.15E+03	2.41E+03		
Th-229	3.18E-03	3.19E-03		
Th-230	9.76E-01	9.94E-01		
Th-232	5.20E-04	5.20E-04		
Ti-208	3.52E-02	4.45E-02		
U-232	9.48E-02	1.20E-01		
U-233	4.29E-01	4.32E-01		
U-234	1.50E+03	1.55E+03		
U-235	4.59E+01	5.28E+01		
U-236	7.59E+01	8.43E+01		
U-238	7.00E+02	7.02E+02		
Y-90	3.50E+06	3.93E+06		
Other Radionuclides	5.20E+06	5.80E+06		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.78E+04	8.79E+04
Total	Total

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	117	14	00	00	40	3850

Bare Fuel Transfers	
0	Assemblies

2030 Summary, TSPA Category 8: U-Oxide

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg. MeV	
Ac-227	3.11E-02	4.32E-02		
Am-241	4.76E+05	8.53E+05	0.0150	3.360E+17
Am-242m	8.53E+02	1.56E+03	0.0250	6.806E+16
Am-243	1.92E+03	3.53E+03	0.0375	6.313E+16
C-14	2.74E+03	2.93E+03	0.0575	7.435E+16
Cl-36	3.92E+01	4.16E+01	0.0850	3.779E+16
Cm-243	6.30E+02	1.16E+03	0.1250	2.540E+16
Cm-244	1.11E+05	2.04E+05	0.2250	3.238E+16
Co-60	5.62E+04	7.59E+04	0.3750	1.401E+16
Cs-134	1.11E+03	2.21E+03	0.5750	3.034E+17
Cs-135	7.26E+01	1.19E+02	0.8500	3.533E+15
Cs-137	4.93E+06	8.20E+06	1.2500	7.691E+15
Eu-154	3.73E+04	6.75E+04	1.7500	9.811E+13
Eu-155	3.21E+03	5.65E+03	2.2500	1.534E+12
Fe-55	9.59E+03	1.87E+04	2.7500	5.222E+10
H-3	4.66E+04	8.21E+04	3.5000	4.846E+09
I-129	4.03E+00	6.78E+00	5.0000	1.287E+09
Kr-85	8.15E+04	1.33E+05	7.0000	1.483E+08
Np-237	4.12E+01	7.17E+01	11.0000	1.703E+07
Pa-231	5.30E-02	7.30E-02		
Pb-210	8.43E-03	8.80E-03		
Pm-147	9.75E+03	1.90E+04		
Pu-238	2.18E+05	3.98E+05		
Pu-239	5.05E+04	8.08E+04		
Pu-240	5.26E+04	9.17E+04		
Pu-241	1.97E+06	3.56E+06		
Pu-242	1.99E+02	3.65E+02		
Ra-226	1.71E-02	1.80E-02		
Ra-228	5.97E-04	6.14E-04		
Ru-106	8.83E+02	1.77E+03		
Se-79	5.68E+01	9.26E+01		
Sn-126	9.37E+01	1.62E+02		
Sr-90	3.57E+06	5.79E+06		
Tc-99	1.82E+03	2.97E+03		
Th-229	3.94E-03	4.32E-03		
Th-230	1.01E+00	1.08E+00		
Th-232	5.97E-04	6.15E-04		
Ti-208	5.34E-01	9.54E-01		
U-232	1.45E+00	2.58E+00		
U-233	5.44E-01	6.12E-01		
U-234	1.44E+03	1.57E+03		
U-235	1.01E+01	1.58E+01		
U-236	5.08E+01	7.51E+01		
U-238	5.79E+01	5.88E+01		
Y-90	3.57E+06	5.80E+06		
Other Radionuclides	5.43E+06	8.65E+06		

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	250.5	481.2	0.0	0.0	132.8	18.0

Bare Fuel Transfers	
163	Assemblies

2030 Summary, TSPA Category 9: AI-Based Fuel

Radionuclide	Nominal Fuel Inventories(CI)	Bounding Fuel Inventories(CI)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg MeV	
Ac-227	6.27E-03	1.24E-02		
Am-241	3.22E+04	6.20E+04	0.0150	1.183E+18
Am-242m	9.41E+00	1.84E+01	0.0250	2.491E+17
Am-243	3.86E+01	6.81E+01	0.0375	2.230E+17
C-14	1.53E+00	3.03E+00	0.0575	2.307E+17
Cl-36	1.45E-03	2.89E-03	0.0850	1.421E+17
Cm-243	6.11E+00	1.08E+01	0.1250	1.073E+17
Cm-244	3.17E+03	5.23E+03	0.2250	1.217E+17
Co-60	2.29E+02	4.46E+02	0.3750	5.538E+16
Cs-134	6.09E+05	1.22E+06	0.5750	8.494E+17
Cs-135	2.17E+01	4.21E+01	0.8500	5.509E+16
Cs-137	1.08E+07	2.09E+07	1.2500	1.353E+16
Eu-154	1.88E+05	3.62E+05	1.7500	5.877E+14
Eu-155	6.38E+04	1.24E+05	2.2500	7.673E+14
Fe-55	9.98E+03	1.97E+04	2.7500	4.425E+12
H-3	2.62E+04	5.10E+04	3.5000	4.897E+11
I-129	4.08E+00	7.94E+00	5.0000	3.818E+07
Kr-85	6.41E+05	1.25E+06	7.0000	4.360E+06
Np-237	6.48E+01	1.21E+02	11.0000	4.982E+05
Pa-231	1.44E-02	2.83E-02		
Pb-210	8.10E-04	1.61E-03		
Pm-147	3.21E+06	6.42E+06		
Pu-238	1.86E+05	3.34E+05		
Pu-239	1.02E+04	2.01E+04		
Pu-240	5.40E+03	1.07E+04		
Pu-241	4.99E+05	9.64E+05		
Pu-242	6.09E+00	1.14E+01		
Ra-226	2.30E-03	4.56E-03		
Ra-228	7.75E-06	1.54E-05		
Ru-106	2.35E+05	4.71E+05		
Se-79	7.09E+01	1.38E+02		
Sr-126	6.30E+01	1.23E+02		
Sr-90	1.01E+07	1.97E+07		
Tc-99	2.32E+03	4.51E+03		
Th-229	5.21E-05	1.02E-04		
Th-230	2.43E-01	4.81E-01		
Th-232	8.17E-06	1.62E-05		
Ti-208	2.11E-01	4.06E-01		
U-232	5.87E-01	1.13E+00		
U-233	2.05E-02	3.97E-02	Thermal Power	
U-234	7.82E+02	1.54E+03	Nominal Heat	
U-235	2.21E+01	3.71E+01	Output (Watts)	Bounding Heat Output (Watts)
U-236	8.48E+01	1.64E+02	1.51E+05	2.93E+05
U-238	3.51E+00	3.55E+00	Total	Total
Y-90	1.01E+07	1.97E+07		
Other Radionuclides	1.32E+07	2.59E+07		

Total Canister Usage Summary

	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	1017.2	235.8	165.3	0.0	1.0	0.0

Bare Fuel Transfers

0 Assemblies

2030 Summary, TSPA Category 10: Miscellaneous SNF

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg. MeV	
Ac-227	2.23E-01	2.23E-01	0.0150	7.646E+16
Am-241	7.75E+05	7.77E+05	0.0250	1.502E+16
Am-242m	1.42E+03	1.45E+03	0.0375	1.276E+16
Am-243	1.44E+03	1.45E+03	0.0575	2.400E+16
C-14	1.07E+04	1.07E+04	0.0850	8.043E+15
Cl-36	2.02E+02	2.02E+02	0.1250	5.691E+15
Cm-243	5.87E+01	6.56E+01	0.2250	6.955E+15
Cm-244	8.42E+03	8.45E+03	0.3750	3.010E+15
Co-60	3.46E+05	3.46E+05	0.5750	5.074E+16
Cs-134	2.10E+01	4.77E+01	0.8500	1.093E+15
Cs-135	3.96E+01	4.04E+01	1.2500	2.642E+16
Cs-137	1.34E+06	1.36E+06	1.7500	3.217E+13
Eu-154	3.33E+04	3.36E+04	2.2500	1.373E+11
Eu-155	9.35E+02	1.17E+03	2.7500	2.367E+11
Fe-55	4.81E+02	4.87E+02	3.5000	1.490E+08
H-3	9.32E+03	9.39E+03	5.0000	6.281E+07
I-129	9.57E-01	9.79E-01	7.0000	7.153E+06
Kr-85	2.05E+04	2.10E+04	11.0000	8.161E+05
Np-237	1.46E+01	1.46E+01		
Pa-231	2.54E-01	2.54E-01		
Pb-210	4.19E-03	4.19E-03		
Pm-147	2.38E+02	5.07E+02		
Pu-238	1.99E+02	2.44E+04		
Pu-239	6.58E+04	6.91E+04		
Pu-240	3.39E+04	3.80E+04		
Pu-241	1.49E+06	2.46E+06		
Pu-242	1.51E+01	2.53E+01		
Ra-226	9.53E-03	9.53E-03		
Ra-228	5.33E-02	5.33E-02		
Ru-106	2.01E-01	4.60E-01		
Se-79	1.71E+01	1.73E+01		
Sn-126	1.53E+01	1.61E+01		
Sr-90	1.23E+06	1.24E+06		
Tc-99	6.04E+02	6.11E+02		
Th-229	2.00E-01	2.00E-01		
Th-230	6.72E-01	6.72E-01		
Th-232	3.40E-03	3.78E-03		
Tl-208	6.72E+00	6.72E+00		
U-232	1.82E+01	1.82E+01		
U-233	3.20E+01	3.20E+01		
U-234	1.13E+03	1.13E+03		
U-235	5.10E+01	5.10E+01		
U-236	2.08E+01	2.08E+01		
U-238	1.12E+01	1.13E+01		
Y-90	1.23E+06	1.24E+06		
Other Radionuclides	4.57E+06	4.59E+06		

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	26	00	00	00	00	00

Bare Fuel Transfers	
0	Assemblies

2030 Summary, TSPA Category 11: U-Zr-Hx

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)	Gamma Sources	
			Photon Energy Group	Total Photons/sec (bounding)
			Avg MeV	
Ac-227	5.49E-04	7.42E-04	0.0150	2.225E+16
Am-241	7.30E+02	1.33E+03	0.0250	4.767E+15
Am-242m	8.92E-01	1.74E+00	0.0375	4.305E+15
Am-243	1.09E+00	2.16E+00	0.0575	4.341E+15
C-14	1.47E+01	2.57E+01	0.0850	2.686E+15
Cl-36	3.10E-01	5.39E-01	0.1250	2.145E+15
Cm-243	8.89E-01	1.76E+00	0.2250	2.292E+15
Cm-244	8.06E+01	1.60E+02	0.3750	1.074E+15
Co-60	4.67E+04	9.33E+04	0.5750	1.637E+16
Cs-134	1.10E+04	2.19E+04	0.8500	1.274E+15
Cs-135	3.49E+00	6.06E+00	1.2500	7.432E+15
Cs-137	2.12E+05	4.03E+05	1.7500	1.848E+13
Eu-154	1.06E+04	2.13E+04	2.2500	7.824E+12
Eu-155	3.92E+03	7.84E+03	2.7500	6.552E+10
Fe-55	2.60E+04	5.20E+04	3.5000	7.634E+09
H-3	6.00E+02	1.19E+03	5.0000	1.108E+06
I-129	8.93E-02	1.57E-01	7.0000	1.271E+05
Kr-85	1.32E+04	2.61E+04	11.0000	1.457E+04
Np-237	5.41E-01	1.04E+00		
Pa-231	9.96E-04	1.46E-03		
Pb-210	1.94E-07	3.50E-07		
Pm-147	6.86E+04	1.37E+05		
Pu-238	1.71E+03	3.37E+03		
Pu-239	5.33E+02	9.08E+02		
Pu-240	2.27E+02	3.93E+02		
Pu-241	1.20E+04	2.38E+04		
Pu-242	1.95E-01	3.80E-01		
Ra-226	5.20E-07	9.60E-07		
Ra-228	2.09E-05	3.46E-05		
Ru-106	3.67E+03	7.34E+03		
Se-79	1.58E+00	2.79E+00		
Sn-126	1.49E+00	2.62E+00		
Sr-90	1.98E+05	3.77E+05		
Tc-99	5.27E+01	9.25E+01		
Th-229	5.30E-05	7.90E-05		
Th-230	5.46E-05	1.04E-04		
Th-232	2.27E-05	3.83E-05		
Ti-208	5.80E-03	1.12E-02		
U-232	1.62E-02	3.13E-02	Thermal Power	
U-233	1.32E-02	2.29E-02	Nominal Heat	
U-234	2.07E-01	4.00E-01	Output (Watts)	Bounding Heat Output (Watts)
U-235	8.49E-01	1.12E+00	3.62E+03	7.00E+03
U-236	1.58E+00	2.79E+00	Total	Total
U-238	5.20E-01	5.24E-01		
Y-90	1.98E+05	3.77E+05		
Other Radionuclides	2.46E+05	4.70E+05		

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	86.8	0.0	0.0	0.0	6.7	0.0

Bare Fuel Transfers	
0	Assemblies

Appendix E

Uncertainty Estimates in the Template Source Terms

Appendix E

Uncertainty Estimates in the Template Source Terms

Spent nuclear fuel (SNF) source terms generated using the template methodology are estimates based on reasonable assumptions, conservative analyses, and available characterization data. Each assumption, analysis, and piece of data introduces some level of uncertainty into the final source estimate. However, to predict an absolute uncertainty associated with each SNF would require knowledge of the true source term. From the true source terms, comparisons could then be made relative to the template estimates, and from the comparisons, one could then theoretically predict an uncertainty for the template estimates.

Unfortunately, the true source terms are unknown and not available for such comparisons, and therefore, their accuracy cannot be ascertained. But if the true source terms were available, we could predict absolute uncertainties for the total activity of a specific fuel element, or for a specific radionuclide within a specific fuel element, or the total activity for elements from one reactor, or the total inventory of all U.S. Department of Energy (DOE) SNFs. Of course, if the true source terms were available, there would be no need for the template methodology and estimation of SNF source terms. It is for this reason that the template methodology takes the "bounding" approach.

The bounding approach assumes, in those circumstances where bounding or maximum values can be inserted into the analysis, that the source term will not exceed the estimated value. And although conservatism is used everywhere possible in the template methodology, there is no guarantee that the final template source term is indeed conservative. For example, the burnup used in all the templates is extracted from the National SNF Database, and even the available maximum burnups do not have an uncertainty associated with the given value. Therefore, one could argue that it is still possible that using even the maximum burnup would underpredict an element source term.

However, if one were to use the maximum burnup for an entire group of elements, a group with an associated range of burnups extending from a minimum value to a maximum value, the total source term estimated for the group would necessarily have to be bounding. The question still remains though as to uncertainty in the database burnup uncertainty. If the burnups in the database are taken as a given (the maximum value is ideally the true maximum), then arguments similar to the one here that lead to bounding source terms are valid. This is the approach taken in the template methodology.

Uncertainties in the template-generated source term estimates can, however, be identified, and a quantitative value can be assigned to the uncertainty. This should help the reader better understand the limitations and sources of uncertainties as applied to the template-generated source terms. The discussion below focuses on this line of reasoning in an attempt to establish the limits of precision in the source term estimates rather than in their accuracy.

The discussion is broken into two parts: (1) input data uncertainty estimation and (2) estimation of uncertainties arising from the template methodology. The input data uncertainties arise from data used primarily in the ORIGEN2 depletion calculation that is used to generate the radionuclide source term for each SNF. The uncertainties arising from the template methodology are based on validation studies that provide a confidence level on how well the calculations compare to measured assay data.

An additional complexity associated with the discussion here is because each SNF will necessarily have a unique set of uncertainties. This is based on the fact that each SNF fuel has a unique set of available characterization data. Some SNFs do not have a complete set of characterization data (for

example, a fuel may not have a known burnup). Uncertainties in the available database characterization data are not known. The quantitative values assigned in the following discussions are based on SNF experience and are themselves estimates.

INPUT DATA UNCERTAINTY

The SNF fuel input data parameters that have associated uncertainties include the following: (1) burnup (MWD, MWD/MT, fissions/cc, %FIMA, etc.), (2) beginning-of-life (BOL) heavy metal and structural mass loadings, and (3) neutron cross sections. The influence of these three parameters and their uncertainties varies depending on the particular radionuclides selected from the template source term.

Burnup

The source term can be understood to be the gamma energy emission emanating from, or the decay heat generated by a particular SNF, or the concentration or activity of a particular nuclide. The source term can be used for a variety of purposes. For example, it is used as input for both shielding and thermal analyses.

First consider the source term in terms of its gamma energy emission rates over the 5 to 100-year time span of interest. The gamma energy for the high burnup Advanced Test Reactor and Fort St. Vrain fuel elements are given in Tables 1 and 2, respectively.

Table 1. Gamma radiation energy emission by component for high burnup Advanced Test Reactor as a function of decay time.

Component	5-Year Decay	35-Year Decay	100-Year Decay
Activation products	0.02%	0.0002%	4E-6%
Actinides/daughters	0.002%	0.01%	0.04%
Fission products	99.98%	99.99%	99.96%

Table 2. Gamma radiation energy emission by component for high burnup FSV SNF as a function of decay time.

Component	5-Year Decay	35-Year Decay	100-Year Decay
Activation products	1.69%	0.124%	5.68E-3%
Actinides/daughters	0.1%	0.319%	0.82%
Fission products	98.21%	99.56%	99.17%

The table data show that the fission products dominate the gamma energy emission rate across the 5 to 100-year decay times for both reactor SNF elements. Because the fission products dominate, the fuel element burnup is the key factor in estimating a gamma-ray emission source term.

A similar analysis shows that the decay heat (beta-gamma emission energy) is also dominated by the fission products, particularly at early times (<50-year decay). Therefore, again the uncertainty in the burnup is the major contributor to the decay heat source term (see Tables 3 and 4).

Table 3. Advanced Test Reactor SNF decay heat partitions as a function of decay time.

Component	5-Year Decay	35-Year Decay	100-Year Decay
Activation products	0.027%	0.0005%	0.0012%
Actinides/daughters	1.44%	3.84%	11.11%
Fission products	98.53%	96.16%	88.89%

Table 4. Fort St. Vrain SNF decay heat partitions as a function of decay time.

Component	5-Year Decay	35-Year Decay	100-Year Decay
Activation Products	0.756%	0.0366%	0.0016%
Actinides/Daughters	15.77%	29.07%	52.99%
Fission Products	83.47%	70.89%	47.0%

The source term associated with the end-of-life (EOL) actinide concentrations is driven by both burnup and neutron cross sections. Uncertainties in both will impact the actinide concentrations.

Therefore, the uncertainty in the burnup is the major contributor to the input data uncertainty for gamma-ray emission, decay heat, and actinide/fission product/activation product concentration source terms. Burnups used in the source term estimates using the template methodology are typically taken directly from the National SNF Database. For the majority of the SNFs or approximately 88% by mass, a burnup is provided in the database. In addition to the nominal burnup, a maximum as well as a minimum burnup is also given. Unfortunately, there is no uncertainty associated with these burnups.

Probably most of the burnups provided in the SNF database are derived from calculations (or in a small number of cases derived from measurements). The calculations would most likely be based on actual reactor power histories and estimated fuel element burnups appropriately partitioned based on a total core power output over the known burnup period. The burnups are probably reasonable, but none (or very few) are validated. Often, a single burnup is assigned to a group of elements to save time, despite the fact that no two fuel elements would have identical burnups.

The difference between the database nominal and the maximum, and the difference between the nominal and the minimum, does provide a quasi-uncertainty band about the nominal. This would be the spread in burnup for the particular SNF. Use of the maximum burnup would necessarily imply a bounding source term. However, one might argue that an uncertainty would still exist based on the calculational determination using input data with associated uncertainties for the maximum value.

An estimate for the uncertainty associated with a calculated burnup value would be approximately $\pm 10\%$, and a ± 5 to 10% uncertainty assigned to a measured burnup value.

Beginning-of-life Mass Loadings

Another calculation input data field with an associated uncertainty is the BOL heavy metal mass loading. The BOL heavy metal mass loading of an element could potentially influence the neutron cross sections used in the depletion calculation. However, typically, the BOL heavy metal masses are quite well known with typical uncertainties in the range of \pm a few percent for the major heavy metal components (U-235, U-238, Pu-239). For the minor BOL actinides (U-234, U-236, etc.), the uncertainties may be in the range of 5 to 10% and are typically based on measured data.

In addition to the heavy metal mass loading, the fuel element structural material masses are also part of the source term as activation products. BOL concentration uncertainties in the structural materials are on the order of ± 2 to 10% for the major constituents. Structural materials also contain impurities that can contribute significantly to the source term. Impurities with concentrations in the 0–500 ppm range can have uncertainties in the range of 10–200%. In order to reduce these uncertainties, the BOL impurity concentration would have to actually be measured. In the template methodology, the major and impurity concentrations are provided and referenced. In the conservative approach of the template methodology, typically the upper limit ppm concentrations were taken for each impurity, and the impurity mass is assumed to be additional mass relative to the major structural material components. Also, the total mass of structural materials is slightly overestimated in order to be conservative, particularly for fuel elements with complex fabrication features (grooves, holes, slots, tapers, etc.).

Neutron Reaction Cross Sections

The neutron cross sections for primarily actinides change as a complex function of core burnup, mass loading, location in the core relative to targets, safety rods, etc., shim control rod/drum movement, and other neutron spatial and spectral effects. All the templates, which are based on a particular fuel and represent a particular fuel type, enrichment, moderator, and clad, have had specific cross sections developed specially for that fuel and the represented fuel group. Cross sections were specifically developed for 37 actinides and their (n,γ) , $(n,2n)$, $(n,3n)$, and (n,f) nuclear reactions. The statistical uncertainty in these cross sections at BOL are less than 1% for the (n,γ) and (n,f) nuclear reactions, approximately 5 to 10% for the $(n,2n)$, >10% for the $(n,3n)$ reaction cross sections.

CALCULATIONAL METHODOLOGY UNCERTAINTY

There is an uncertainty associated with the calculational methodology used to generate the template source terms or radionuclide inventories. The greatest uncertainties typically are the uncertainties associated with the input data. The methods or computer codes used to estimate radionuclide depletion, buildup, and decay are, however, quite accurate if the input data are exact. The closest we can come to demonstrating the uncertainty in the calculational methodology is to perform validation studies. In validation studies, the calculation input is assumed to be exact, and the calculated source terms are then compared against measured data. Based on calculated and measured data comparisons, the uncertainty or level of confidence bands can be determined on a radionuclide-by-radionuclide basis. Integrated values, such as decay heats and gross gamma dose rates, are also compared in order to draw conclusions relative to total inventories.

Measured Versus Calculated

In order to understand the magnitude of expected uncertainty under the best input data conditions, a limited number of validation studies have been performed to support the template methodology. These studies compare measured radionuclide concentrations, isotopic ratios, decay heats, or gamma dose rates with calculated values. The input data for the calculation is based on measured values that would include burnup data, power or irradiation history information, BOL fuel element heavy metal loadings, and material constituent impurity concentrations.

Validation Studies

The following uncertainty estimates are based on generalized results from template validation studies and represent expected calculated uncertainties for various radionuclides for EOL conditions:

1. $\pm 1\text{--}5\%$ for U-235, U-238, Pu-239, Th-232 concentrations
2. $\pm 10\text{--}30\%$ for U-233, U-234, U-236, Np-237, Pu-240 concentrations
3. $\pm 30\text{--}50\%$ for other significant concentration higher-order actinides (Pu-238, Pu-241, Pu-242, etc.)
4. $\pm 50\text{--}400\%$ for other insignificant concentration higher order actinides and daughter decay products
5. $\pm 1\text{--}5\%$ for direct yield fission products
6. $\pm 5\text{--}50\%$ for indirect yield and transmutation fission products
7. $\pm 5\text{--}50\%$ for major constituent activation products
8. \pm factor of 2–3 for activation product impurities (Co-60, C-14, etc.)
9. $\pm 5\text{--}10\%$ for decay heat
10. \pm factor of 1.2–2.0 gross gamma dose rates.

It should also be remembered that the measurement data used in the comparisons also have associated measurement uncertainties.

Application of templates to a particular SNF:

1. Burnup uncertainty is the major factor for fission product, actinides, and activation products.
2. If burnup is exact, the only uncertainty in the fission products are the fission yields. The fission yields are based on best available measurements. Indirect-yield and transmutation fission products, although typically very low concentrations in SNFs, have a cross-section dependency and, therefore, a cross-sectional uncertainty from the calculation.
3. If the burnup is exact, the actinides' cross sections for a particular SNF may not coincide exactly with cross sections of the template. However, the template uses a moderator, clad, and enrichment similar to the SNF and, therefore, should be within a factor of 2. For high burnup fuels, the cross section can change significantly with burnup, and differences of factors of 2–3 might be possible.
4. If burnup is exact, activation products from particle threshold reactions (high energy neutrons) will be relatively independent of cross section and a very small cross-section uncertainty could be expected ($<20\%$). On the other hand, activation products produced from thermal reactions will be cross-section dependent and may vary by a factor of 2 or more from the template-generated cross sections.

CONCLUSIONS

Based on the above discussions, the following conclusions are drawn:

1. The uncertainty for the total DOE SNF inventory activity is estimated to be:
 - If, X is the total nominal burnup (MWD) of all DOE SNFs,
 - Then, the uncertainty band is given by $X \pm X/4$, where $\pm X/4$ is then uncertainty in the nominal burnup and also the total activity.
 - If, Y is the total maximum burnup (MWD) of all DOE SNFs,
 - Then, the uncertainty band is given by $Y \pm Y/10$, where $\pm Y/10$ is then uncertainty in the maximum burnup and also the total activity.
2. Uncertainties will vary, however, from radionuclide-to-radionuclide in each of the template-generated source terms, and between each template source term.
3. In addition to the burnup uncertainty, the template-generated values will also have the following cross-section uncertainty and are broken out as follows:
 - For actinides:
 - $\pm 5\%$ for U-235, U-238, Pu-239, Th-232
 - $\pm 50\%$ for U-233, U-234, U-236, Pu-240, Np-237
 - $\pm 100\%$ for other significant concentration higher order actinides (Pu-238, Pu-241, Pu-242, etc.)
 - $\pm 200\text{--}400\%$ for other insignificant concentration higher order actinides and daughter decay products
 - For fission products:
 - $\pm 1\%$ for all direct yield fission products
 - $\pm 5\text{--}50\%$ for all indirect/transmutation fission products
 - For activation products:
 - $\pm 5\%$ for high energy threshold particle reactions (n,p), (n, α)
 - $\pm 5\text{--}10\%$ for high energy threshold particle reactions (n,2n)
 - $\pm >10\%$ for high energy threshold particle reactions (n,3n)
 - $\pm 50\%$ for thermal activation products

4. In addition to the burnup and cross-section uncertainties, the template-generated values will also have uncertainties in the BOL mass loadings and are broken out as follows:

- For actinides:
 - $\pm < 2\%$ for U-233, U-235, U-238, Pu-239, Th-232
 - $\pm 10\%$ for U-234, U-236, Pu-240
- For activation products:
 - $\pm 2\text{--}10\%$ for major structural constituents
 - $\pm 10\text{--}200\%$ for impurity generated activation products.